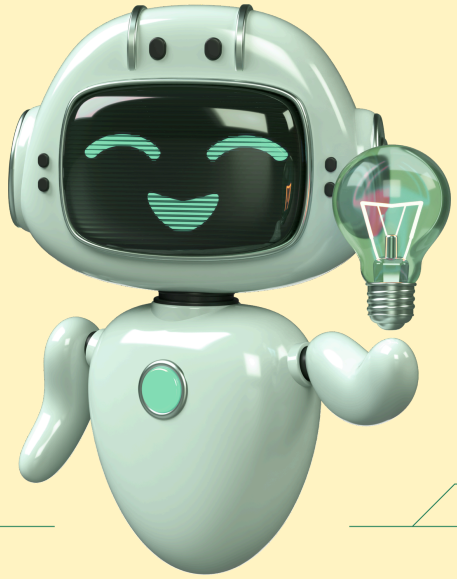
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International Conference on

Explainable AI,Green Edge Computing and Autonomous Systems

ICXGA - 2K26

10th April 2026

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DHANALAKSHMI SRINIVASAN
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solicit your esteemed presence in the

International Conference on Explainable AI, Green Edge Computing and Autonomous Systems
ICXGA - 2K26

Date : 10.04.2026 Time : 09.30 a.m

Venue : B-Block Seminar Hall

Shri.P.NEELARAJ
Secretary
presides

in the presence of

Dr.VINOTH NEELARAJ
Director

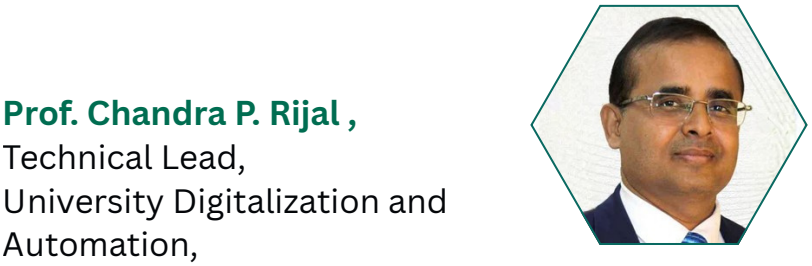
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Keynote Speakers



Dr. Ir. Noor Akhmad Setiawan,
Professor,
Department of Information Systems,
Universitas Gadjah Mada,
Indonesia.



Dr. G. Kulanthaivel
Professor & Head,
Department of ECE,
NITTTR,
Chennai.



Prof. Chandra P. Rijal ,
Technical Lead,
University Digitalization and Automation,
Mid-West University,
Nepal



Dr. Tibebe Beshah,
Professor in Information Systems,
School of Information Science,
Addis Ababa University,
Addis Ababa,
Ethiopia. **(ONLINE)**

Panel of Jury



Dr.S.V.Manisekaran
Assistant Professor & Head(I/C),
Department of CSE,
Anna University Regional Campus,
Coimbatore.

Dr.D.Prabhu
Assistant Professor (Sr.Grade),
Department of CSE,
Anna University Regional Campus,
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Dr.R.Devi
Assistant Professor,
Department of CSE,
Government College of Technology,
Coimbatore,

Dr. V. Ulagamuthalvi,
Professor of CSE,
IEEE TEMS Madras Chapter,
Sathyabama Institute of Science and Technology,
Chennai





Message from the Secretary

It gives me immense pleasure to extend my warm greetings to all participants, researchers, academicians, industry experts, and students attending the **International Conference on Explainable AI, Green Edge Computing and Autonomous Systems**.

In today's rapidly evolving technological landscape, the convergence of **Artificial Intelligence, sustainable computing, and autonomous technologies** is transforming industries and redefining societies. As innovation accelerates global progress, it is imperative that these advancements remain transparent, ethical, and environmentally responsible. The emergence of **Explainable AI** fosters trust and accountability in intelligent systems, while **Green Edge Computing** promotes sustainable technological practices that safeguard our planet for future generations.

At **Dhanalakshmi Srinivasan College of Engineering (Autonomous)**, **Coimbatore**, we strongly believe that education must transcend conventional learning. Our institution is committed to nurturing an innovative ecosystem that encourages research excellence, interdisciplinary collaboration, and meaningful industry engagement. Through diverse academic initiatives, research platforms, and innovation-driven activities, we empower to develop transformative solutions to real-world challenges.

This conference serves as a vital platform for knowledge exchange insights, collaborative research, and intellectual dialogue among global experts. I am confident that the contributions presented during this event will inspire innovative thinking and significantly advance sustainable and intelligent technologies.

I extend my best wishes to the organizers and participants for a successful and enriching conference.

Secretary



Message from the Director

It is my great pleasure to welcome all the distinguished researchers, academicians, industry professionals, and students to the **International Conference on Explainable AI, Green Edge Computing and Autonomous Systems**.

The today's dynamic technological era, the world is witnessing transformative advancement driven by **Artificial Intelligence and autonomous technologies**. As these innovations continue to shape diverse sectors, the need for transparency, sustainability, and responsible innovation has become increasingly vital. **Explainable AI** plays a pivotal role in enhancing trust and interpretability in intelligent systems, while **Green Edge Computing** emphasizes the development of energy-efficient and environmentally responsible solutions.

At **Dhanalakshmi Srinivasan College of Engineering (Autonomous)**, **Coimbatore**, we are committed to fostering an academic environment where **knowledge, innovation, and research excellence** flourish in synergy. We believe that meaningful progress emerges when education is seamlessly integrated with research and collaborative exploration. Platforms such as this conference enable scholars and experts to exchange ideas, showcase innovative research, and explore interdisciplinary approaches to address contemporary challenges.

This international gathering of experts and emerging researchers will undoubtedly stimulate constructive dialogue, intellectual exchange and new directions in research and technological advancement. I sincerely appreciate the dedicated efforts of the organizing committee in orchestrating this prestigious academic event.

I extend my best wishes to all participants for a productive and intellectually enriching conference experience.

Director



Message from the Principal

I am privileged to extend my warm greetings to the distinguished academicians, researchers, industry experts, faculty members, and students participating in the **International Conference on Explainable AI, Green Edge Computing and Autonomous Systems**, organized by **Dhanalakshmi Srinivasan College of Engineering (Autonomous), Coimbatore**.

The landscape of science and technology is evolving rapidly, and emerging domains such as **Artificial Intelligence, sustainable computing, and autonomous systems** are significantly influencing the future of industries and society. In this dynamic global environment, it becomes essential for institutions to promote platforms that encourage intellectual exchange, research collaboration, and innovative problem-solving.

This conference provides an excellent opportunity for researchers and professionals to present their scholarly contributions, exchange knowledge, and explore emerging trends in these transformative fields. Such initiatives play a vital role in strengthening the research culture within academic institutions and in advancing technological solutions that support sustainable development.

At **Dhanalakshmi Srinivasan College of Engineering (Autonomous)**, **Coimbatore,** we remain committed to delivering quality education while fostering innovation and research-oriented learning. Our goal is to empower students and scholars with the knowledge and skills necessary to contribute effectively to the **technological, economic, and social development** of the nation.

I appreciate the dedication of the organizing committee in conducting this conference and wish all participants a successful and enriching academic experience.

Principal



Message from the Dean Academic

It is a distinct pleasure to welcome all distinguished delegates, researchers, academicians, faculty members, and students to the **International Conference on Explainable AI, Green Edge Computing and Autonomous Systems** organized by **Dhanalakshmi Srinivasan College of Engineering (Autonomous), Coimbatore**.

At the core of DSCE lies a steadfast commitment to advancing academic excellence through **innovation, interdisciplinary research, and intellectual exploration**. In today's era of technological convergence, domains such as **Artificial Intelligence, sustainable computing, and autonomous systems** are redefining the frontiers of engineering and scientific inquiry. The growing significance of **Explainable AI** highlights the need for transparency and accountability in intelligent systems, while **Green Edge Computing** advocates sustainable practices aligned with global environmental priorities .

This conference reflects our academic mission to cultivate a vibrant research culture that fosters deep inquiry, scholarly collaboration, and the exchange of innovative ideas. It offers a dynamic platform for researchers, academicians, and professionals to present pioneering methodologies and impactful findings that contribute to both academic advancement and industrial progress.

Moreover, this event represents a collaborative ecosystem where brilliant minds converge to address complex future challenges. Beyond showcasing cutting-edge technologies, the conference promotes meaningful discourse on the **ethical, societal, and environmental dimensions** of emerging innovations.

I, encourage all participants to actively engage in the sessions, exchange perspectives, and build meaningful research collaborations. May this conference inspire transformative ideas and contribute significantly to the advancement of science and technology.

Dean Academic

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IOT-BASED SMART HYDROPONICS SYSTEM FOR CONTROLLED CULTIVATION

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Abstract: Hydroponics is gaining popularity in horticulture due to its efficient resource utilization. This paper proposes an IoT-based smart hydroponics system for real-time monitoring and control of nutrient solutions. Sensors measure pH, electrical conductivity, temperature, and water levels, ensuring optimal conditions for plant growth. The system automatically adjusts nutrient supply and environmental parameters using actuators. Remote monitoring and control are enabled through cloud integration. Experimental results show increased yield and better quality produce compared to traditional methods. The system promotes sustainable and efficient horticultural practices in controlled environments.

Keywords: *Hydroponics, IoT, Smart Farming, Controlled Environment, Nutrient Solution*

REAL-TIME IOT AND AUTONOMOUS SYSTEMS FOR SMART AGRICULTURAL ECONOMIC DECISION-MAKING

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[2]Assistant Professor, Agricultural Engineering, Dhanalakshmi Srinivasan College of Engineering,Coimbatore.

Abstract: The integration of real-time IoT-based intelligence, autonomous systems, and robotics is transforming agricultural economics by enabling data-driven decision-making and improving resource efficiency. This paper explores how IoT sensors collect continuous data on soil conditions, weather patterns, crop health, and market logistics, which are analyzed using intelligent algorithms to optimize production and supply chain processes. Autonomous systems, including drones and robotic machinery, reduce labor costs and enhance operational precision, directly influencing farm profitability. Furthermore, real-time data integration with market information systems enables farmers to make informed decisions regarding pricing, storage, and distribution, minimizing post-harvest losses and market risks. The study highlights the economic benefits of adopting these technologies, including increased productivity, reduced input costs, and improved income stability. It also discusses challenges such as high initial investment and technology adoption barriers. The proposed framework supports sustainable agricultural development by aligning technological innovation with economic efficiency.

Keywords: *Agricultural Economics, IoT, Real-Time Data, Autonomous Systems, Robotics, Smart Farming, Decision Support Systems*

A SMART AGRICULTURE FRAMEWORK USING GPS GUIDED AUTONOMOUS DRONE, QGIS SPATIAL MAPPING, AND AI-DRIVEN FARMER ADVISORY SYSTEM

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Abstract: Agriculture plays a vital role in ensuring food security and economic stability, especially in developing regions; however, traditional farming practices rely heavily on manual observation, leading to inefficient crop monitoring, delayed disease detection, and improper use of fertilizers and pesticides. This creates a need for an intelligent system that can continuously monitor crops, analyze soil conditions, and support timely decision-making. This study proposes a smart agriculture framework that integrates GPS-enabled drone and autonomous drone technology, QGIS-based spatial mapping, artificial intelligence, and a farmer advisory application for efficient farm management. The system uses drones to capture high-resolution crop images along with geo-tagged location data, which are analyzed using AI algorithms to detect diseases and crop stress at an early stage. Simultaneously, soil parameters such as nutrient levels, pH, and moisture content are evaluated to provide accurate crop and fertilizer recommendations. All processed data and insights are delivered through the farmer advisory application, enabling farmers to access field conditions and recommendations for further processes. The integration of spatial mapping enables targeted spraying, reducing chemical usage and environmental impact, thereby supporting precision agriculture practices. The proposed framework improves efficiency, reduces costs, and enhances decision-making for farmers.

Keywords: *Smart agriculture, autonomous drone, GPS-enabled drone, spatial mapping, QGIS, artificial intelligence, targeted spraying, precision agriculture*

GREEN EDGE COMPUTING FOR SUSTAINABLE MONITORING AND INTELLIGENT MAINTENANCE OF AGRICULTURAL MACHINERY COMPONENTS: A COMPREHENSIVE REVIEW OF ENERGY-EFFICIENT IOT-DRIVEN MECHANICAL SYSTEMS

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Abstract: The rapid mechanization of agriculture, coupled with increasing energy demand and environmental concerns, has necessitated the development of sustainable and intelligent monitoring systems for agro-mechanical components.The review further evaluates energy-efficient communication protocols (e.g., LoRa, Zigbee, NB-IoT), demonstrating potential power savings of 20–65% depending on deployment conditions, along with improved network lifetime for remote agricultural environments.Despite these advancements, several challenges persist, including the lack of standardized architectures for edge-based mechanical health monitoring, limited robustness under harsh field conditions (dust, humidity, temperature variations), and issues related to model interpretability and data heterogeneity.

Keywords: *Green edge computing; Smart agriculture; Agricultural machinery.*

AUTONOMOUS TRACTOR NAVIGATION SYSTEM USING GPS AND AI

Preethijohnevelin S[1], Nihasri N[2], Pavithra[3] M,Sowmiya R[4], Nishanthi V[5]
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Abstract: The adoption of automation in agricultural machinery has the potential to enhance productivity and reduce labor requirements. This research presents an autonomous tractor navigation system that integrates GPS, artificial intelligence, and sensor technologies. The system enables tractors to perform field operations such as plowing, seeding, and harvesting with minimal human intervention. Obstacle detection and path planning algorithms ensure safe and efficient navigation. Field experiments demonstrate improved operational accuracy and reduced time consumption. The proposed system offers a cost-effective solution for modernizing agricultural practices and increasing farm efficiency.

Keywords: *Autonomous Tractor, GPS Navigation, AI, Farm Automation, Agricultural Machinery*

IOT-BASED SMART IRRIGATION SYSTEM FOR PRECISION AGRICULTURE

BalaChandraKumar V[1], Hrudya r Nair[2], Dinesh V[3], Sumithraja R[4], Prasanthu S[5]
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Abstract: Efficient water management remains a major challenge in agriculture due to unpredictable climate and limited resources. This study presents an IoT-based smart irrigation system designed to optimize water usage through real-time monitoring of soil and environmental conditions. Sensors measure soil moisture, temperature, and humidity, and transmit data to a cloud platform for analysis. Based on threshold values and predictive models, irrigation is automatically controlled to deliver the required amount of water. The system also enables remote access through mobile applications, allowing farmers to monitor field conditions and make informed decisions. Field implementation results show a significant reduction in water wastage and improved crop productivity. The proposed system contributes to sustainable farming practices by enhancing resource efficiency and reducing manual intervention.

Keywords: *IoT, Smart Irrigation, Precision Agriculture, Automation, Water Management*

AUTONOMOUS DRONE-BASED CROP SURVEILLANCE SYSTEM

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Abstract: The integration of drones in agriculture has significantly improved crop monitoring and management. This paper presents an autonomous drone-based system for real-time crop surveillance using advanced imaging techniques. The drone is equipped with multispectral cameras to capture high-resolution images, which are processed using artificial intelligence algorithms to assess crop health and detect diseases. The system enables rapid data collection and analysis over large areas, reducing the need for manual inspection. Results indicate improved accuracy in identifying stress conditions and estimating crop yield. The proposed solution enhances precision agriculture practices and supports efficient resource management.

Keywords: *Drones, Autonomous Systems, Crop Monitoring, Remote Sensing, Precision Agriculture*

IOT-ENABLED LIVESTOCK MONITORING AND MANAGEMENT SYSTEM

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Abstract: Efficient livestock management is crucial for improving productivity and animal welfare. This paper introduces an IoT-enabled monitoring system that tracks key physiological and behavioural parameters of livestock in real time. Wearable sensors are used to measure body temperature, heart rate, and activity levels, while data are transmitted to a centralized platform for analysis. The system identifies abnormalities and generates alerts to farmers, enabling early detection of diseases and timely intervention. Additionally, the system provides insights into feeding patterns and overall animal health, improving farm management practices. Field testing indicates enhanced livestock productivity and reduced mortality rates. The integration of IoT technology in livestock farming ensures better decision-making and promotes sustainable animal husbandry practices.

Keywords: *Livestock Monitoring, IoT, Wearable Sensors, Animal Health, Smart Farming*

IOT AND ROBOTICS-BASED POST-HARVEST HANDLING SYSTEM

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Abstract: Post-harvest losses remain a major challenge in agricultural supply chains. This study presents an integrated system combining IoT and robotics for efficient post-harvest handling. Sensors monitor environmental conditions such as temperature and humidity during storage, while robotic systems automate sorting, grading, and packaging processes. The system ensures minimal damage to produce and maintains quality standards. Data analytics provide insights for optimizing storage and transportation conditions. Experimental results show a significant reduction in post-harvest losses and improved product quality. The proposed solution enhances supply chain efficiency and supports sustainable agricultural practices.

Keywords: *Post-Harvest Technology, Robotics, IoT, Automation, Supply Chain Management*

AUTONOMOUS ROBOTIC SYSTEM FOR PRECISION WEED MANAGEMENT

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Abstract: Weed management is a critical and labor-intensive task in agriculture that significantly affects crop yield. This research presents an autonomous robotic system designed for precision weed detection and removal. The robot is equipped with cameras and sensors, using computer vision algorithms to distinguish between crops and weeds in real time. Navigation is achieved through GPS and sensor fusion techniques, enabling accurate movement across the field. Once identified, weeds are removed mechanically or treated with minimal herbicide application. The system reduces labor dependency and chemical usage, contributing to environmentally friendly farming practices. Experimental validation shows high accuracy in weed detection and significant cost savings. The proposed solution offers a scalable and efficient alternative to traditional weed control methods.

Keywords: *Agricultural Robotics, Weed Detection, Autonomous Systems, Computer Vision, Precision Agriculture*

REAL-TIME SOIL NUTRIENT MONITORING USING IOT SENSORS

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Abstract: Soil nutrient management is essential for achieving high agricultural productivity and sustainability. This paper proposes a real-time soil nutrient monitoring system using IoT sensors. The system measures key nutrients such as nitrogen, phosphorus, and potassium, along with soil pH and moisture levels. Data are transmitted to a cloud platform for analysis, providing farmers with accurate and timely information. The system enables precise fertilizer application, reducing excessive usage and environmental impact. Field results indicate improved nutrient efficiency and better crop yield. The proposed solution supports precision agriculture by promoting data-driven decision-making.

Keywords: *Soil Nutrients, IoT Sensors, Precision Fertilization, Real-Time Monitoring, Sustainable Agriculture*

REAL-TIME WEATHER-BASED DECISION SUPPORT SYSTEM FOR FARMERS

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Abstract: Weather variability plays a significant role in agricultural productivity and farm management decisions. This study presents a real-time weather-based decision support system using IoT technology. Sensors collect local weather data, including temperature, humidity, rainfall, and wind speed, which are transmitted to a cloud-based platform. Advanced analytics and predictive models are applied to generate actionable recommendations for irrigation scheduling, fertilizer application, and pest management. The system provides timely alerts and forecasts, helping farmers reduce risks associated with climate variability. Implementation results show improved crop planning and reduced losses due to adverse weather conditions. The proposed system enhances resilience and supports climate-smart agricultural practices.

Keywords: *Weather Monitoring, Decision Support System, IoT, Climate Smart Agriculture, Real-Time Data*

REAL-TIME CROP HEALTH MONITORING USING IOT AND MACHINE LEARNING

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Abstract: Maintaining crop health is essential for ensuring agricultural productivity and sustainability. This paper proposes a real-time crop health monitoring system that integrates IoT sensors with machine learning algorithms. Environmental parameters such as temperature, humidity, and soil moisture are continuously monitored, while image data from cameras are analyzed to detect early signs of disease or nutrient deficiencies. The collected data are processed using predictive models to identify abnormal patterns and generate timely alerts for farmers. The system supports decision-making by recommending appropriate interventions, thereby reducing crop losses and improving yield quality. Experimental results demonstrate the effectiveness of the system in early disease detection and precision farming. This approach enhances efficiency, minimizes chemical usage, and promotes sustainable agricultural practices.

Keywords: *Crop Monitoring, Machine Learning, IoT, Disease Detection, Precision Farming*

SMART GREENHOUSE AUTOMATION USING IOT AND ROBOTICS

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Abstract: Controlled environment agriculture requires precise monitoring and regulation of environmental conditions. This study presents a smart greenhouse automation system integrating IoT and robotics technologies. Sensors continuously monitor parameters such as temperature, humidity, soil moisture, and light intensity. Based on real-time data, actuators automatically control irrigation, ventilation, and lighting systems. The system is connected to a cloud platform, enabling remote monitoring and control through mobile devices. Experimental results demonstrate improved crop growth, reduced resource consumption, and enhanced operational efficiency. The proposed system minimizes human intervention and ensures optimal growing conditions, contributing to sustainable agricultural practices.

Keywords: *Smart Greenhouse, IoT, Automation, Robotics, Controlled Environment*

SMART CROP WATER STRESS INDEX BASED IoT SOLUTION FOR PRECISION IRRIGATION FOR LEAFY VEGETABLES

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Abstract: Conventional irrigation methods based on fixed schedules or limited soil parameters often fail to reflect real-time crop water requirements, resulting in inefficient resource use. This study presents the design of a Crop Water Stress Index (CWSI)-based Internet of Things (IoT)-enabled precision irrigation system for adaptive water management in leafy vegetable cultivation The proposed system integrates an ESP32-based IoT platform with multi-sensor inputs, including canopy temperature, ambient temperature, humidity, soil moisture, and light intensity, for continuous monitoring of crop and environmental conditions. CWSI is computed using canopy-air temperature differentials, supported by a dynamic baseline calibration approach to ensure accuracy under varying climatic conditions. An intelligent irrigation control strategy combines CWSI and soil moisture thresholds to enable responsive irrigation scheduling. The system also incorporates variable rate irrigation and fail-safe mechanisms to ensure reliability, with a cloud-based interface for real-time monitoring and control.

Keywords:*Crop Water Stress Index (CWSI), Precision Irrigation, Internet of Things (IoT), Smart Irrigation Management, Canopy Temperature Monitoring, Dynamic Baseline Calibration (DBC), Variable Rate Irrigation*

AI-DRIVEN OPTIMIZATION OF BIOCHAR APPLICATION FOR ENHANCED SOIL CARBON SEQUESTRATION IN PRECISION AGRICULTURE

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Agricultural Engineering, Dhanalakshmi Srinivasan College of Engineering, Coimbatore.

Abstract: Soil organic carbon (SOC) is a key determinant of soil fertility, water retention, and climate resilience. This study proposes an integrated artificial intelligence (AI)-driven framework to optimize biochar application for maximizing SOC sequestration and crop productivity. Machine learning models such as Random Forest and Artificial Neural Networks are trained on multi-source datasets comprising soil, environmental, and biochar parameters to predict SOC enhancement. A Genetic Algorithm (GA)-based optimization layer identifies optimal biochar configurations under varying agro-climatic conditions. Experimental results indicate improved SOC levels and yield compared to conventional approaches. This work contributes to sustainable agriculture by integrating AI, biochar optimization, and carbon management strategies.

Keywords : *Soil Organic Carbon, Biochar, Machine Learning, Explainable AI, Genetic Algorithm, Precision Agriculture, Carbon Sequestration.*

INTELLIGENT CROP HEALTH MONITORING USING IOT AND MACHINE LEARNING TECHNIQUES

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Abstract: Agricultural productivity is increasingly challenged by climate variability, pest infestations, and inefficient resource management. Traditional crop monitoring methods rely on manual inspection, which is time-consuming and often inaccurate. This paper presents a real-time crop health monitoring system using Internet of Things (IoT) and machine learning (ML) techniques. The proposed system integrates environmental sensors, imaging devices, and cloud-based analytics to continuously monitor crop conditions. Machine learning algorithms are used to detect diseases, predict crop stress, and recommend corrective actions. The system enables data-driven decision-making, reduces crop losses, and improves yield. Experimental observations show improved monitoring accuracy and reduced dependency on manual intervention [1], [3]. The proposed solution is scalable, cost-effective, and suitable for precision agriculture applications.

Keywords: *IoT, Machine Learning, Crop Health Monitoring, Precision Agriculture, Smart Farming, Deep Learning*

DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

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OPTIMIZATION STRATEGIES FOR MOBILE RELAYS IN WSNS

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Abstract: Wireless Sensor Networks (WSNs) are increasingly used in data-intensive applications such as microclimate monitoring, precision agriculture, and audio/video surveillance. A key challenge faced by data-intensive WSNs is to transmit all the data generated within an application's lifetime to the base station despite the fact that sensor nodes have limited power supplies. We propose using low- cost disposable mobile relays to reduce the energy consumption of data-intensive WSNs. Our approach differs from previous work in two main aspects. Our framework consists of three main algorithms. The first algorithm computes an optimal routing tree assuming no nodes can move. The second algorithm improves the topology of the routing tree by greedily adding new nodes exploiting mobility of the newly added nodes. The third algorithm improves the routing tree by relocating its nodes without changing its topology. This iterative algorithm converges on the optimal position for each node given the constraint that the routing tree topology does not change. We present efficient distributed implementations for each algorithm that require only limited, localized synchronization. Because we do not necessarily compute an optimal topology, our final routing tree is not necessarily optimal. However, our simulation results show that our algorithms significantly outperform the best existing solutions.

Keywords - Wireless sensor networks, energy optimization, mobile nodes, wireless routing

DESIGN AND DEVELOPMENT OF AN AI-ASSISTED CIVIC ISSUE REPORTING AND DECISION SUPPORT SYSTEM FOR URBAN GOVERNANCE

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Abstract: Urban local governments frequently encounter inefficiencies in managing civic complaints due to fragmented reporting mechanisms and limited real-time monitoring capabilities. These challenges often delay the identification, prioritization, and resolution of urban infrastructure issues. This paper presents the design and development of an AI-assisted civic issue reporting and decision support system aimed at enhancing urban governance through citizen participation and intelligent processing. The proposed platform enables users to report issues such as potholes, drainage blockages, garbage accumulation, and streetlight failures via a mobile application supporting geolocation tagging, imagebased reporting, and multilingual interaction. A multilingual processing pipeline converts user-submitted descriptions into a common language to ensure consistent analysis. AI-driven modules perform image validation and description-based severity estimation, while a non-blocking validation strategy ensures that all reports are recorded for administrative review. A rule-based mechanism is incorporated to identify potential duplicate reports using issue category and location information. The system further integrates a human-in-the-loop administrative workflow, where authorities monitor reports, assign tasks, and verify issue resolution through proof-based validation before notifying users.

ENHANCED MULTIMODAL ANEMIA DETECTION

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Abstract: Anemia is a common hematologic disorder that needs to be effectively and timely diagnosed in order to alleviate the disorders associated with it. The given study proposes a recommendation of a better multimodal anemia detector that would utilize palm image recognition and complete blood count (CBC) variables with the purpose of using the concept of artificial intelligence. The palm images are processed with a deep learning vision pipeline to extract the discriminating visual features between pallor and vascular visual features and using the CBC parameters, they are trained with the state-of-the-art tabular learning algorithms such as Cat Boost, Light GBM and TabNet. The clinical features and the image are taken out and pooled together to increase the reliability and the power of the diagnosis. The deep learning methodologies are included to make clinical trust and interpretability of such models more pronounced to identify areas of influence of the visual features, and the hematological features of the key reasons of the model prediction. The model using palm images based on visual features of palm color intensity and vascular images and attained an accuracy of 81, important scores of 80 and an F1-score of 81, which indicates that it might be a useful tool to screen people non-invasively. The experimental results prove that the multimodal fusion strategy is superior to the unimodal strategies because it is more accurate and generalized in regards to the level of anemia severity.

Keywords— Anemia Detection, Multimodal Learning, Palm Image Analysis, Complete Blood Count, Deep Learning

AI-BASED HEALTHCARE MONITORING AND DISEASE PREDICTION SYSTEM USING MACHINE LEARNING

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Abstract: Artificial Intelligence (AI) is transforming the healthcare industry by improving diagnosis and patient monitoring. In many medical environments, early detection of diseases and continuous monitoring of patients remain major challenges. This paper proposes an AI-based healthcare monitoring and disease prediction system using machine learning techniques. The system collects patient health data such as heart rate, temperature, and blood pressure through sensors or medical records. The collected data is analyzed using machine learning algorithms to predict possible diseases at an early stage. This approach helps doctors in making faster and more accurate decisions, reducing human errors and improving patient outcomes. The proposed system is especially useful in remote and rural areas where access to healthcare is limited. Overall, the integration of AI in healthcare enhances efficiency, accuracy, and quality of medical services.

Keywords: Artificial Intelligence, Healthcare, Machine Learning, Disease Prediction, Patient Monitoring

WEB-BASED USER FEEDBACK MANAGEMENT SYSTEM USING NEXT.JS FOR REAL-TIME FEEDBACK COLLECTION AND ANALYSIS

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Abstract**:** User Feedback is vital for the improvement of services, products, and overall user experience of the various online channels. Traditional ways to gather user feedback are typically time-consuming, and predominantly collected manually. To overcome these issues, a new Web Based Feedback Management System has been developed using several different innovative web technologies, including Next.js, in order to provide front-end and back-end rendering of content, which in turn facilitates development of faster, scalable web applications. An interactive customer interface will be used to obtain user feedback, and the feedback received from a user will travel through API routes and be displayed within the application in real time. The FMS will enable organizations and administrators to store and retrieve user feedback in an orderly and systematized manner, which will allow the more effective analysis of user feedback and/or suggestions. This proposal provides a user-friendly, effective, efficient way to collect, manage and analyze user feedback in real-time. Individuals or companies that use FMS will have potential for further enhancing the functionality of the system through the addition of databases, authentication tools and analytical tools for statistical analysis and management of user feedback.

Keywords: Feedback System, Next.js, Web Application, API Integration, User Feedback

AI-INTEGRATED SMART HEALTH KIOSK FOR AUTOMATED HEALTHCARE ASSISTANCE

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Abstract: The increasing demand for efficient and accessible healthcare services has led to the development of intelligent automated systems. This paper presents an AI-integrated Smart Health Kiosk designed to streamline patient registration, vital monitoring, appointment scheduling, prescription generation, and pharmacy services. The system combines IoT-based sensors with artificial intelligence and voice interaction to create a seamless and user-friendly healthcare experience. It automatically captures patient details and vital parameters such as weight, temperature, and blood pressure, and maps symptoms to appropriate medical specialists. The kiosk also supports digital payment, medicine ordering, and provides personalized dietary and lifestyle advice. By reducing manual intervention, waiting time, and workload on healthcare staff, the proposed system enhances operational efficiency in hospitals and improves accessibility in rural and underserved areas. The integration of cloud services and secure data handling ensures reliability and scalability, making it a viable solution for modern smart healthcare infrastructure.

Keywords : Artificial Intelligence, Smart Health Kiosk, IoT, Healthcare Automation, Patient Monitoring, Telemedicine.

ST-ZTNET: A REAL-TIME, ADVERSARIALLY ROBUST SPATIO-TEMPORAL GRAPH NEURAL NETWORK FOR ZERO TRUST–ENABLED INTRUSION DETECTION IN CLOUD ENVIRONMENTS

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Abstract: Cloud computing's flexible and shared nature makes securing it much more complicated for typical intrusion detection systems. And while recent studies have explore during artificial intelligence, specifically Graph Neural Networks (GNNs) and Transformers, to locate break-ins in the cloud, significant problems remain. These relate to using these systems in real-time, defending against attackers who actively attempt to mislead them, and integrating with security frameworks like Zero Trust Architecture (ZTA).We've developed ST-ZTNet, a new Transformer-based Spatio- Temporal Graph Neural Network, that considers both the connections with in the cloud infrastructure and the flow of data within it using five-minute activity updates. ST-ZT Net employs Sharpness- Aware Minimization(SAM) to be more resilient to attack, validates its incoming information during operation to avoid deception, and provides both a danger ranking, plus security actions which adhere to ZTA principles, for example isolating a Virtual Machine or mandating two-factor authentication. We assessed ST-ZTNet against three datasets: We measured F1-score, ROC-AUC, detection speed and resilience to FGSM/PGD attacks. On CICIDS2017, ST-ZTNet scored 92.3% on F1 and 0.981 for AUC, an improvement over the original ST-GNN's 89.1% F1 score.

EDGE AI-BASED REAL-TIME CROP DISEASE DETECTION AND MONITORING SYSTEM

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Abstract: Agricultural productivity is frequently compromised by crop diseases, which lead to significant economic losses and food insecurity worldwide. Traditional methods of disease detection often rely on manual inspection, which is time-consuming and prone to human error. This paper presents an Edge AI-driven solution designed for the early and automated identification of plant pathologies. The proposed system utilizes an ESP32-CAM module to capture real-time images of crop leaves, which are subsequently analyzed locally using a light-weight Convolutional Neural Network (CNN) optimized through TensorFlow Lite. Once a disease is identified, the system provides immediate diagnostic feedback via an integrated IoT module or localized display. Prototype testing demonstrates high accuracy in detecting common leaf infections while maintaining low power consumption and minimal latency. This study highlights the potential of localized Artificial Intelligence in enabling precision agriculture, reducing pesticide overuse, and contributing to sustainable farming practices.

Keywords: Edge AI, Convolutional Neural Networks, ESP32-CAM, Precision Agriculture, IoT, TensorFlow Lite.

GROCERY AI REVOLUTIONIZING ONLINE GROCERY SHOPPING WITH AI-DRIVEN RECOMMENDATIONS AND FOOD WASTE REDUCTION

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Abstract**:** Online grocery shopping has become increasingly popular, but existing systems still rely heavily on manual search and lack intelligent personalization. This project presents Grocery AI, a smart mobile application designed to enhance the grocery shopping experience using Artificial Intelligence. The system is developed using a cross-platform framework to ensure seamless usage on both Android and iOS devices. The proposed system integrates an AI-based recommendation engine that analyzes user purchase history and time-based consumption patterns to provide personalized suggestions such as "You may need this now." Additionally, the application includes an expiry tracking module that monitors the shelf-life of purchased items and notifies users before products expire, thereby reducing household food waste. The system also features essential e-commerce functionalities such as product browsing, cart management, secure checkout, and order tracking. By combining predictive analytics with real-time notifications, the application transforms traditional grocery shopping into a proactive and efficient experience. This solution not only saves time and effort for users but also promotes sustainable consumption by minimizing food wastage.

Keywords: Artificial Intelligence, Smart Recommendation System, Expiry Date Tracking, Mobile Application, Food Waste Reduction, E-commerce System

EXPLAINABLE AI-DRIVEN OBJECT DETECTION FOR ASSISTIVE NAVIGATION OF VISUALLY IMPAIRED INDIVIDUALS

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Abstract**:** Visual impairment significantly restricts independent mobility, making real-time environmental awareness a critical challenge. Existing assistive systems rely on basic obstacle detection or GPS navigation, lacking contextual understanding and interpretability. This paper proposes an Explainable Artificial Intelligence (XAI)-driven object detection framework to enhance safe navigation for visually impaired individuals. The system employs a deep learning pipeline to detect diverse environmental elements such as pedestrians, road hazards, steps, puddles and small obstacles. A major contribution of this system is an adaptive risk prioritization mechanism, which considers object evaluation based on proximity, motion trajectory, and obstruction risk. Furthermore, explainability techniques based on attention maps and feature attribution are also provided. The system also facilitates real-time response using audio or haptic interfaces, making it easier for users to interact. The proposed system can be a significant advancement for transparent, reliable, and safe next-generation assistive navigation systems.

Keywords: YOLO, Embedded system, machine learning, Explainable AI

HYRD - AGENTIC AI BASED JOB APPLICATION ASSISTANT

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Abstract**:** The increasing complexity of the modern job market necessitates intelligent systems that can effectively assist candidates in resume evaluation, job matching, and application processes. Conventional job portals rely primarily on keyword-based filtering, which often fails to capture the semantic relationships between candidate profiles and job requirements, leading to suboptimal recommendations. This paper proposes Hyrd, an agentic AI-based job application assistant designed to automate and enhance the end-to-end recruitment workflow. The system integrates Natural Language Processing (NLP), semantic similarity modeling using cosine similarity, and clustering techniques to evaluate and rank job relevance. A dynamic resume optimization module iteratively refines candidate resumes by incorporating context-aware skills and keywords aligned with job descriptions. Furthermore, the system employs automated job retrieval and application mechanisms to reduce manual effort and improve efficiency. Experimental evaluation demonstrates that the proposed approach significantly improves matching accuracy, resume quality, and application success rates compared to traditional methods. The modular and scalable architecture of Hyrd enables adaptability across diverse job domains, making it a robust solution for intelligent recruitment systems.

SMART AUTO HEALING CLOUD INFRASTRUCTURE

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Abstract**:** The increasing complexity of cloud-native environments demands intelligent, self-managing infrastructures capable of maintaining high availability with minimal human intervention. This paper presents a smart auto-healing cloud framework that integrates AIOps and DevOps principles to achieve autonomous detection, diagnosis, and remediation of system failures. The proposed architecture combines real-time monitoring, anomaly detection, predictive analytics, and automated recovery actions using tools such as Prometheus, Grafana, Kubernetes, Terraform, and Jenkins. Experimental evaluation demonstrates that the system reduces Mean Time to Recovery (MTTR) by over 80%, improves resource utilization efficiency, and minimizes down time through proactive scaling andself-repair mechanisms.The integration of AI Ops-driven intelligence with DevOps automation establishes are silent, adaptive infrastructure model suitable for modern multi-cloud deployments.

ACCIDENT SHIELD – SMART REAL-TIME CRASH DETECTION & EMERGENCY ALERT SYSTEM FOR TWO-WHEELERS

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Abstract: Problem Statement: India records over 1.5 lakh road accident deaths every year, with a significant percentage involving two-wheelers. In many cases, victims lose their lives not solely due to the severity of the crash, but because of delayed emergency response and lack of immediate location tracking. Currently, most two-wheelers do not have an integrated automatic crash detection and alert mechanism. In the event of an accident, especially in isolated or low-traffic areas, victims may be unconscious or unable to call for help, leading to critical delays during the "golden hour" of medical response. There is a need for an affordable, real-time accident detection system that can automatically detect crashes, verify impact severity, and instantly alert emergency contacts with precise location data — without requiring manual intervention.

EXPLAINABLE ARTIFICIAL INTELLIGENCE FOR BLACK-BOX CREDIT SCORING: A SHAP-BASED TRANSPARENCY AND FAIRNESS FRAMEWORK

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Abstract— Machine learning models used in credit scoring often function as black boxes, providing loan decisions without any explanation. This lack of transparency raises serious concerns around fairness and regulatory compliance, particularly under GDPR Article 22, which requires automated decisions to be explainable. In this work, we develop a credit scoring system combining XGBoost with SHAP (SHapley Additive exPlanations) to address this problem. Using the German Credit Dataset of 1,000 instances, our pipeline applies SMOTE-based class balancing, interaction feature engineering, and isotonic probability calibration to improve model reliability. The trained model achieves an AUC ROC of 0.94, with SHAP analysis identifying loan amount, duration, and checking account status as the dominant risk factors. An interactive Streamlit dashboard presents model decisions in plain English, and a counterfactual advice engine guides rejected applicants on specific steps to improve their creditworthiness. This framework promotes fair, transparent, and legally compliant AI deployment in financial systems.

AI-DRIVEN INTELLIGENT PETITION MANAGEMENT AND DECISION SUPPORT SYSTEM USING NLP

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Abstract: The AI Driven Intelligent Petition Management System Is a web based grievance redressal platform designed to enhance the submission, analysis and resolution of student petitions. Leveraging Natural Language Processing (NLP), Machine Learning (ML), and sentiment analysis, the system automates complaint classification, urgency prediction, and emotion detection. It incorporates a duplicate complaint detection mechanism that identifies and merges similar petitions, reducing redundancy and improving prioritization. The system also includes a decision support module that recommends solutions based on previously resolved cases, assisting administrators in faster decision-making. Developed using Python, web technologies, and My SQL, the platform ensures secure, scalable, and efficient petition handling. It features real- time tracking, automated notifications, and analytical dashboards for monitoring complaint trends and system performance.

AI IN BLOOD BANK TRACKING

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Abstract: The current blood distribution system is largely manual, resulting in inefficiencies, delays, and errors that often compromise patient safety. Moreover, the lack of transparency enables unethical practices such as black-market trading of blood. This paper propose san AI-Powered Smart Blood Management and Tracking System (SBMTS) designed to address these critical challenges by introducing real-time monitoring, intelligent demand prediction, and unique tracking IDs for every unit of blood, along with end- to-end visibility across the supply chain. The system integrates donor registration, smart inventory management, automated request processing, and enhanced patient-matching modules. The proposed framework ensures transparency, prevents misuse, and improves timely access to safe blood. Through its comprehensive features, the SBMT Envisions paradigm shift in healthcare resource management, making the blood supply chain efficient, intelligent, ethical, and life-saving.

SMART DAIRY DEMAND FORECASTING SYSTEM: A COMPARATIVESTUDYOFARIMA,SARIMA,ANDPROPHET MODELS FOR SUPPLY CHAIN OPTIMIZATION

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Abstract: The dairy industry is highly sensitive to demand fluctuations due to the perishable nature of its products and constantly changing consumer behavior. Inefficient demand forecasting often results in overproduction, leading to significant wastage, or underproduction, causing stock shortages and revenue loss. Addressing these challenges requires accurate and reliable forecasting methods. This study presents a Smart Dairy Demand Forecasting System designed to improve inventory management and optimize supply chain operations. The proposed system evaluates three widely used time-series forecasting models: ARIMA, SARIMA, and Prophet. The dataset used in this study consists of multi-year daily dairy sales records. Before model development, the data undergoes preprocessing steps such as handling missing values, removing outliers, and performing exploratory data analysis to understand underlying patterns. Future enhancements may include incorporating external factors such as weather conditions and exploring advanced machine learning models to further improve forecasting accuracy.

NEXUS AI: A SMART E-COMMERCE PLATFORM

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Abstract: E-commerce platforms have significantly transformed the way people buy and sell products in the digital era. However, existing systems often lack intelligent features, structured local marketplaces, and efficient product comparison mechanisms. This paper presents Nexus AI, a smart e-commerce platform designed to enhance online shopping through advanced features and a user-friendly interface. The proposed system enables users to act as both buyers and sellers within a unified platform. It supports essential functionalities such as product listing, product browsing, cart management, and order processing. Additionally, the platform integrates AI-driven features like product comparison and recommendation systems to assist users in making informed purchasing decisions. The system also includes an admin module for managing users, monitoring transactions, and handling financial settlements. By utilizing modern web technologies, the platform ensures scalability, security, and reliability. Nexus AI aims to provide a structured, efficient, and intelligent digital marketplace, improving user experience and bridging the gap between traditional and modern e-commerce systems.

Keywords: E-Commerce, Artificial Intelligence, Online Shopping, Web Application, Smart Marketplace

REAL-TIME SMS SPAM DETECTION ON MOBILE DEVICES USING INDICBERT

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Abstract: Mobile communication remains a primary vector for spam and phishing attacks. Traditional rule-based filters and classical machine learning models fail in multilingual en vironments common in India, where users mix English, Hindi, and Tamil. This paper presents Spam Detector App, a real-time SMS spam detection system built on Indic BERT, a transformer pre-trained on 12 Indian languages. The model is fine-tuned on a curated multilingual dataset of 12,851 labeled messages and achieves 97.96The trained model is deployed on-device via TensorFlow Lite with post-training quantization, achieving 187 ms inference latency on a mid-range Android device. Complete on-device inference eliminates privacy risks by ensuring no SMS content is transmitted to external servers. Evaluation results confirm that Indic BERT outperforms Naive Bayes, SVM, and LSTM baselines by 4–16 percentage points, demonstrating robust multilingual spam detection suitable for real-world deployment.

Keywords: SMS spam detection; IndicBERT; multilingual NLP; TensorFlow Lite; Android; transformer models

AN ILLUSTRATIVE STUDY OF BINARY CLASSIFICATION OF DIABETES MELLITUS USING MACHINE LEARNING ALGORITHMS

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Abstract **:** Diabetes Mellitus is a chronic metabolic disorder affecting millions worldwide, where early and accurate diagnosis is critical to preventing life-threatening complications, including cardiovascular disease, neuropathy, and renal failure. With the exponential growth of medical data and advancements in computational techniques, machine learning has emerged as a powerful tool for disease prediction and clinical decision support. This study presents a comprehensive and illustrative analysis of binary classification techniques applied to Diabetes Mellitus — distinguishing diabetic from non-diabetic individuals — using structured clinical and demographic patient data.

Keywords: Diabetes Mellitus, Binary Classification, Machine Learning, Supervised Learning, Random Forest, Gradient Boosting, AUC-ROC, Clinical Decision Support

AI-BASED CAR OVERTAKING ANALYSIS AND ACCIDENT PREVENTION SYSTEM

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Abstract**:** With the rapid growth of vehicles and increasing traffic density, road accidents—especially during overtaking—have become a major concern. Traditional driver assistance systems rely heavily on human judgment, which is prone to errors and delays. This paper proposes an AI-based car overtaking analysis and accident prevention system using deep learning techniques. The system uses computer vision and real-time sensor data to analyze road conditions, vehicle speed, distance, and surrounding traffic patterns. A deep learning model processes sequential driving data to predict whether overtaking is safe or risky. The system provides real-time alerts to drivers, helping them avoid dangerous maneuvers. Experimental results show that the proposed system improves decision accuracy, reduces accident risks, and enhances road safety. This solution can be integrated into modern intelligent transportation systems for safer driving experiences.

Keywords: AI, Computer Vision, Overtaking Detection, Deep Learning, Road Safety, Accident Prevention

AI-POWERED MEDICAL CHECKER

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Abstract: Medication safety is an important concern in healthcare due to the risks associated with improper drug usage and interactions. This paper presents an AI-powered medicine safety checker that evaluates drug safety based on patient conditions, pregnancy status, and drug–drug interactions. The system integrates real-time data from OpenFDA and RxNav APIs and uses semantic analysis through a Sentence Transformer model to improve accuracy. Based on the analysis, medicines are classified as SAFE, CAUTION, or UNSAFE. The proposed system provides reliable and user-friendly support for safer medication decisions.

Keywords—Artificial intelligence, Drug Healthcare system, API, RxNav API, Healthcare System

AI MENTOR: INTELLIGENT CAREER GUIDANCE SYSTEM USING MACHINE LEARNING AND NATURAL LANGUAGE PROCESSING

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Abstract: This paper presents an AI Mentor system designed to provide intelligent career guidance using Machine Learning and Natural Language Processing techniques. The system automates resume analysis, job matching, and career recommendation processes. It extracts structured information from unstructured resumes, evaluates candidate skills, and compares them with job requirements. The proposed system enhances accuracy in job recommendations and reduces manual effort involved in career counselling. Experimental results show improved efficiency in resume parsing, skill gap identification, and personalized recommendation generation.

Keywords— Artificial Intelligence, Machine Learning, Natural Language Processing, Resume Parsing, Career Recommendation

AI BASED RESUME SCREENING AND HIRING SYSTEM

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Abstract***:*** Traditional recruitment processes are time-consuming, inconsistent, and prone to human bias. This paper presents an AI-Based Resume Screening and Hiring System that automates candidate shortlisting through intelligent document parsing, identity verification, and skills-based matching. The system integrates Google Gemini 2.5 Flash for resume and PAN card parsing, a React.js frontend, and a Node.js backend with MySQL. Candidates upload PAN cards for identity verification and resume in PDF or DOCX format, automatically parsed to extract structured professional data. An admin dashboard enables recruiters to post jobs, review applicants, generate shortlists, and dispatch automated email notifications. Results demonstrate a 95.6% reduction in screening time compared to manual processes.

*Keywords—Resume Screening, AI Recruitment, NLP, Gemini AI, PAN Verification, Automated Shortlisting, React.js, Node.js.*u

ADAPTIVE GLASS BOX AI: A USER-CENTRIC AND ENERGY-EFFICIENT EXPLAINABLE FRAMEWORK FOR AUTONOMOUS EDGE SYSTEMS

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Abstract**:** Artificial Intelligence (AI) systems are increasingly deployed in autonomous environments such as smart cities, healthcare, and intelligent transportation. However, most AI models operate as black boxes, limiting user trust and interpretability. While Explainable Artificial Intelligence (XAI) addresses this issue, existing approaches provide static explanations that are often not suitable for diverse users. Unlike traditional XAI systems, the proposed framework adapts its explanations based on user type, such as technical experts or general users, improving accessibility and usability. The architecture includes a decision module, an explanation generator, and an adaptive interface that modifies explanation complexity. Experimental evaluation demonstrates that the proposed system enhances user trust, reduces energy consumption, and maintains high prediction accuracy compared to conventional cloud-based AI systems. This work contributes to the development of transparent, efficient, and human-centered AI systems for next-generation autonomous applications.

*Keywords***:** *Explainable Artificial Intelligence (XAI), Edge AI, Adaptive Systems, Glass Box AI, Energy-Efficient Computing, Autonomous Systems, User-Centric AI*

ARCHITECTURAL FRAMEWORKS IN SPEECH AND PATTERN RECOGNITION

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Abstract : The field of Speech and Pattern Recognition represents a critical bridge between human linguistics and computational intelligence. At its core, this discipline focuses on the development of algorithms capable of identifying, categorizing, and interpreting regularities within acoustic signals to facilitate seamless human-computer interaction. Filtering noise and normalizing audio data. Converting raw waves into mathematical representations, such as Mel-frequency cepstral coefficients (MFCCs) Utilizing statistical models traditionally Hidden Markov Models (HMMs) and more recently Deep Neural Networks (DNNs) to map these features to phonemes, words, or intent. While early systems relied on rigid template matching, modern pattern recognition leverages Machine Learning (ML) to account for the immense variability in human speech, including accents, emotional tone, and environmental interference. These advancements have catalyzed the proliferation of virtual assistants, real-time translation services, and biometric security systems.

Keyword : Speech Recognition, Pattern Recognition , Human-Computer Interaction (HCI), Signal Processing, Machine Learning (ML),Natural Language Understanding (NLU),Biometrics.

ARTIFICIAL INTELIGENCE IN GOVERNANCE : A NEW ERA OF DECISION MAKING

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Abstract: The concept of AI-driven governance explores whether artificial intelligence can enhance or replace human decision-making in political systems. With rapid advancements in machine learning, data analytics, and automation, AI has the potential to improve efficiency, reduce corruption, and enable data-driven policy decisions. This study examines the capabilities of AI in governance, including its ability to process vast datasets, predict societal needs, and optimize resource allocation. At the same time, it critically evaluates the limitations of AI, such as lack of emotional intelligence, ethical reasoning challenges, accountability concerns, and the risk of bias embedded in algorithms. The paper also discusses the implications for democracy, transparency, and public trust. While AI can significantly support governance through informed decision-making and administrative efficiency, fully autonomous machine rule raises complex moral and societal questions. The study concludes that a hybrid model—where AI assists human leaders rather than replaces them—offers the most practical and balanced approach to future governance.

EXPLAINABLE AND ENERGY-EFFICIENT AI FOR AUTONOMOUS SYSTEMS USING GREEN EDGE COMPUTING

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Abstract: The rapid advancement of Artificial Intelligence (AI) has led to widespread deployment of intelligent systems across critical domains such as healthcare, smart cities, and autonomous transportation. However, the opaque nature of traditional AI models limits their trustworthiness, especially in safety-critical and real-time environments. This paper presents an integrated framework combining Explainable Artificial Intelligence (XAI), Furthermore, the integration with autonomous systems allows intelligent agents to make accountable decisions while maintaining high performance. Experimental evaluations demonstrate improved system efficiency, reduced energy overhead, and enhanced user trust without compromising predictive accuracy. This work contributes toward building human-centric, environmentally sustainable, and trustworthy AI systems for future intelligent ecosystems.

Keywords: Explainable Artificial Intelligence (XAI), Edge AI, Green Edge Computing, Energy-Efficient Computing, Autonomous Systems

EXPLAINABLE ARTIFICIAL INTELLIGENCE FOR DETECTING FAKE NEWS ON SOCIAL

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Abstract: The widespread use of social media has enabled information to spread rapidly across the world. While this has improved communication and access to news, it has also increased the circulation of misleading and false information. Fake news shared on online platforms can influence public perception, create confusion, and sometimes lead to serious social consequences. As a result, there is a growing need for intelligent systems that can automatically identify unreliable or fabricated information. Artificial Intelligence (AI) has shown promising results in detecting patterns associated with fake news by analyzing textual features, user behaviour, and content credibility. However, many machine learning models provide predictions without clearly explaining how those conclusions are reached. \ This study discusses the role of explainable AI methods in improving the transparency and reliability of fake news detection systems on social media platforms.

Keywords: Explainable Artificial Intelligence-Fake News Detection-Social Media-Machine Learning-Interpretability

EXPLAINABLE AI FOR TACTICAL DECISION INTELLIGENCE IN ELITE FOOTBALL

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ABSTRACT Elite football analytics has evolved into a highly sophisticated, data-intensive discipline that leverages player tracking data, event tagging, and advanced machine learning techniques to extract insights into performance and tactics. Despite these advancements, a fundamental limitation persists in the form of limited interpretability of AI-driven outputs, particularly in complex tactical scenarios such as low-block defensive systems. These systems, characterized by compact spatial organization and reduced attacking opportunities, pose significant analytical challenges that traditional models fail to adequately explain. This study proposes an Explainable Artificial Intelligence (XAI) framework that integrates multiple industry-standard platforms, including Hudl Sportscode, Nacsport, Wyscout, and Veo Camera, to bridge the gap between predictive analytics and tactical understanding. A comprehensive case study demonstrates how explainability transforms abstract model outputs into actionable coaching intelligence, thereby enabling more effective strategies against compact defensive structures.

Keywords: Explainable AI, Low Block, Positional Play, Expected Threat (xT), Rest Defense, Tactical Analytics

GREEN EDGE COMPUTING IN SMARTCITIES AND IOT

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Abstract: Green Edge Computing is an emerging paradigm that combines energy-efficient computing with edge-based data processing to support sustainable smart city and Internet of Things (IoT) applications. In modern smart cities, a large number of IoT devices such as sensors, cameras, and smart meters continuously generate massive amounts of data. Traditional cloud based processing leads to high energy consumption, increased latency, and network congestion. This project focuses on utilizing edge computing techniques to process data closer to the source, thereby reducing energy usage and improving response timeFurthermore, the adoption of green computing principles ensures reduced carbon footprint, lower operational costs, and improved sustainability. The combination of edge computing with eco-friendly practices creates a scalable and efficient framework for future smart cities. This approach not only improves system performance but also contributes to building environmentally responsible and intelligent urban infrastructures.

Keywords: Green Computing, Edge Computing, Smart Cities, Internet of Things (IoT), Energy Efficiency, Sustainable System

REAL-TIME AND IOT-BASED INTELLIGENCE CAN IMPROVE SMART DECISION MAKING SYSTEMS

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Abstract: Real-Time and Internet of Things (loT)-based intelligence has Emerged as a transformative approach in modern computing, enabling systems to collect, process, and respond to data instantly. This study explores how loT devices integrated with real-time analytics can enhance decision-making across various domains such as smart homes, healthcare, agriculture, and urban infrastructure. By utilizing sensors, connected devices, and cloud-based platforms, real-time systems continuously monitor environmental and operational parameters. Furthermore, the implementation of such systems contributes to resource optimization, energy efficiency, and improved user experience. However, challenges such as data security, privacy concerns, and scalability must be addressed to ensure reliable deployment. This study highlights the growing importance of real-time loT intelligence in building smarter and more responsive systems for the future.

Keywords: Real-Time Intelligence, Internet of Things (loT), Smart Systems, Sensors, Automation, Data Processing, Smart Applications

TOWARDS TRANSPARENT AND FAIR FINANCIAL SYSTEMS USING EXPLAINABLE AI

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Abstract: The increasing adoption of Artificial Intelligence (Al) in financial systems has significantly improved the efficiency of tasks such as credit scoring, fraud detection, and risk assessment. However, the opaque nature of many advanced machine learning models raises concerns regarding transparency, fairness, and accountability. This paper explores the role of Explainable Artificial Intelligence (XAI) in developing transparent and fair financial systems. It proposes a framework that integrates explainability techniques into existing financial models to provide clear and interpretable insights into decision-making processes. Methods such as Shapley Additive explanations (SHAP) and Local Interpretable Model Agnostic Explanations (LIME) are utilized to identify key features influencing predictions and to detect potential biases in model outputs. The proposed approach enables financial institutions to enhance regulatory compliance, build user trust, and ensure ethical decision-making. Experimental analysis demonstrates that incorporating XAl techniques maintains model performance while significantly improving interpretability and fairness. This study highlights the importance of balancing accuracy with transparency in the deployment of Al-driven financial applications.

Keywords: Explainable Artificial Intelligence, Financial Systems, Fairness, Transparency, Credit Scoring, Fraud Detection, SHAP, LIME, Ethical Al

AI IN EDUCATION: PERSONALISED LEARNING SYSTEMS FOR THE FUTURE CLASSROOM

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Abstract**:** The integration of Artificial Intelligence (AI) into education is revolutionizing the traditional classroom by enabling personalized learning systems that adapt to individual student needs, preferences, and progress. This paper explores the transformative potential of AI-driven tools—such as intelligent tutoring systems, adaptive learning platforms, and predictive analytics—in creating future-ready classrooms. By Analysing student data in real time, these systems can customize content delivery, provide targeted feedback, and support differentiated instruction, thereby enhancing engagement and academic outcomes. The abstract also discusses the ethical considerations, data privacy challenges, and the evolving role of educators in AI-enhanced environments. Ultimately, personalized learning powered by AI promises to democratize education, foster lifelong learning, and prepare students for a rapidly changing digital world.

Keywords: Personalized Learning, Adaptive Learning Systems ,Intelligent Tutoring Systems, Learning Analytics, Real-Time Feedback, Future Classroom, Data-Driven Instruction, EdTech Innovation

AN AI-DRIVEN REAL-TIME CIVIC INTELLIGENCE FRAMEWORK FOR TRANSPARENT AND COLLABORATIVE PROBLEM SOLVING

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Abstract: Despite the availability of multiple digital platforms for addressing civic and societal challenges, existing systems remain fragmented, reactive, and lack real-time collaboration, intelligent verification, and transparency. There is no unified, AI-driven, and citizen-inclusive platform that seamlessly connects governments, organizations, and individuals to collaboratively identify, verify, prioritize, and resolve interconnected local and global issues. This paper proposes a scalable AI-driven civic intelligence framework that integrates machine learning, natural language processing (NLP), Internet of Things (IoT), and real-time data analytics into a unified system for efficient problem solving. The proposed system utilizes Convolutional Neural Networks (CNNs) for image-based issue verification, Transformer-based NLP models for text classification and semantic analysis, and clustering algorithms such as DBSCAN and K-Means to group similar reports and eliminate redundancy.

Keywords — Artificial Intelligence (AI), Smart Cities, Civic Intelligence, Machine Learning (ML), Internet of Things (IoT), Real-Time Data Analytics, Participatory Governance.

AI-DRIVEN SMART CITY FRAMEWORK FOR SUSTAINABLE URBAN PLANNING USING REAL-TIME DATA ANALYTICS

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Abstract: An AI-driven smart city framework for sustainable urban planning leverages advanced technologies such as machine learning, Internet of Things (IoT), and real-time data analytics to transform the way urban environments are designed, managed, and optimized. In this framework, vast amounts of data are continuously collected from diverse sources including traffic sensors, satellite imagery, energy grids, weather stations, and citizen-generated inputs, enabling city administrators to gain dynamic insights into urban systems. By applying intelligent algorithms, the framework can predict traffic congestion, optimize energy consumption, manage waste efficiently, and enhance water resource distribution, thereby improving overall urban sustainability. This proactive and data-driven approach not only reduces resource wastage and carbon emissions but also enhances the quality of life for citizens by ensuring better infrastructure, mobility, and public services. The integration of real-time analytics enables cities to respond quickly to emergencies, climate changes, and population growth challenges, fostering resilience and adaptability.

Keywords— Artificial Intelligence (AI), Smart Cities, Sustainable Urban Planning, Machine Learning (ML), Internet of Things (IoT), Real-Time Data Analytics, Urban Sustainability.

AI-ENABLED SMART MANUFACTURING SYSTEM FOR PREDICTIVE MAINTENANCE AND PROCESS OPTIMIZATION IN INDUSTRY 4.0

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Abstract— The evolution of Industry 4.0 demands intelligent manufacturing systems that reduce disruptions and improve efficiency. This paper presents an AI-enabled smart manufacturing framework integrating predictive maintenance and real-time process optimization. A hybrid deep learning model combining LSTM and CNN analyses continuous sensor data to predict equipment failures up to 72 hours in advance. An Industrial Internet of Things (IIoT) infrastructure supports seamless edge-to-cloud data communication, while a digital twin module enables real-time simulation and anomaly detection. Reinforcement learning dynamically optimizes operational parameters such as temperature, pressure, and cycle time without human intervention. Experimental validation in simulated CNC environments and real-world automotive manufacturing demonstrates significant improvements, including a 34.7% reduction in unplanned downtime, 21.3% increase in Overall Equipment Effectiveness (OEE), and 18.6% reduction in energy consumption. The system achieves 96.4% accuracy with a low false positive rate, supporting a shift toward proactive, intelligent manufacturing.

Keywords— Industry 4.0, Smart Manufacturing, Predictive Maintenance, Real-Time Process Optimization, Industrial Internet of Things (IIoT), Digital Twin, Deep Learning (LSTM, CNN), Reinforcement Learning, Fault Prediction, Overall Equipment Effectiveness (OEE), Energy Efficiency, Edge-to-Cloud Computing.

NETWORK SLICING IN ARTIFICIAL INTELLIGENCE

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Abstract: Network slicing is a key feature of 5G and future communication networks that allows multiple virtual networks to operate on the same physical infrastructure. Each slice is designed to meet specific service requirements such as speed, latency, bandwidth, and security. This technology helps network providers deliver customized services for different applications including smart cities, autonomous vehicles, healthcare, industrial automation, and Internet of Things (IoT) devices. For example, one slice can support ultra-reliable low-latency communication for remote surgery, while another slice can provide high bandwidth for video streaming. Network slicing improves resource utilization, reduces operational costs, and enhances user experience by allocating resources efficiently according to demand. It is made possible through technologies such as Software Defined Networking (SDN) and Network Function Virtualization (NFV), which enable flexible control and management of network resources. Despite its benefits, network slicing also faces challenges such as security risks, slice isolation, and complex management. Overall, network slicing is an important innovation that supports the growing demand for diverse and high-performance network services in modern communication systems.

Keywords: 5G, Network Slicing, SDN, NFV, IoT, Low Latency, Virtual Networks, Resource

EXPLAINABLE AI FOR CLINICAL DECISION SUPPORT SYSTEMS IN HEALTHCARE

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Abstract— The integration of Artificial Intelligence (AI) in healthcare has significantly enhanced clinical decision-making. However, the black-box nature of many AI models limits their adoption due to lack of transparency and trust. This paper proposes an Explainable AI (XAI) framework for Clinical Decision Support Systems (CDSS) that enhances interpretability while maintaining high predictive accuracy. The framework integrates machine learning models with explainability techniques such as SHAP and LIME to provide clear insights into model decisions. The system analyzes patient data, including medical history, lab reports, and imaging data, to assist clinicians in diagnosis and treatment planning. Experimental results demonstrate improved trust, interpretability, and decision reliability compared to traditional AI systems.

Keywords— Explainable AI, Clinical Decision Support Systems, Healthcare Analytics, SHAP, LIME, Machine Learning, Trustworthy AI.

FEDERATED INTELLIGENCE ENABLED IOT FOR INDUSTRY 4.0 APPLICATIONS IN HEALTHCARE AND SMART CITIES

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Abstract: The rapid evolution of Industry 4.0 has led to the convergence of Artificial Intelligence (AI) and the Internet of Things (IoT), enabling intelligent and interconnected systems across healthcare and smart city domains. However, traditional centralized learning approaches face challenges related to data privacy, security, and scalability. This paper presents a federated intelligence-enabled IoT framework that leverages Federated Learning (FL) to enable decentralized model training across distributed devices without sharing raw data. The proposed system integrates edge, fog, and cloud computing to support real-time analytics and efficient data processing. In healthcare applications, the framework enhances patient monitoring, disease prediction, and medical data security, while in smart cities, it improves traffic management, energy optimization, and environmental monitoring. By preserving data privacy and enabling collaborative intelligence, the framework addresses key challenges of Industry 4.0 systems. Experimental insights from recent studies demonstrate that federated approaches significantly improve data utilization while maintaining privacy and reducing communication overhead.

Keywords— Federated Learning (FL), Internet of Things (IoT), Industry 4.0, Smart Cities, Smart Healthcare, Edge Computing, Privacy-Preserving AI

TOWARDS EXPLAINABLE AI 2.0: INTERPRETING LARGE NEURAL NETWORKS BEYOND BLACK BOXES

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Abstract: Recent advances in deep learning have yielded large neural networks that achieve state-of-the-art performance across image, text, and multimodal tasks. However, their complexity and opaque internal representations limit trust, accountability, and broader deployment in sensitive and high-stakes applications. This work advocates for the next stage—Explainable AI 2.0—going beyond treating neural networks simply as black boxes and pushing for deeper mechanistic understanding, transparency, and interpretability. We explore emerging techniques for peering into neural internals: circuit-level analysis, concept activation vectors, subnet works, and disentangled latent representations. We also examine methods of integrating interpretability during training rather than relying exclusively on post-hoc explanations, so that models are designed to be more inherently understandable. Challenges addressed include scalability to large-scale models, aligning explanations with human conceptual understanding, robustness of explanations under different inputs or perturbations, and the tension between interpretability and performance. Finally, we propose a roadmap for future research in XAI 2.0: developing standardized benchmarks for interpretability, formal metrics of explanation quality and fidelity, tools that make explanations usable by diverse stakeholders, and regulatory or ethical frameworks to guide deployment.

*Keywords**: Explainable AI(XAI 2.0),Neural Networks, Interpretability, Transperancy, Robustness, Human-Aligned explanations, Trustworthy AI.*

FAKE MEDICINE IDENTIFICATION USING BLOCKCHAIN

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Abstract**:** This project develops a blockchain-based web application designed to detect and prevent counterfeit medicines in the pharmaceutical supply chain. The system ensures secure and transparent tracking of medicines from manufacturers to end users by storing data in a decentralized and tamper-proof ledger. Each medicine is assigned a unique QR code that allows users to verify its authenticity instantly. The platform includes modules for manufacturers, administrators, regulatory authorities, and consumers, enabling real-time monitoring and validation of drug information. The application is built with a user-friendly interface while maintaining high security and reliability. The main goal of this project is to enhance trust, improve patient safety, and reduce the circulation of fake medicines by providing a single, efficient verification system

AI BASED FIRE FIGHTING ROBOT (HYBRID): AN AUTONOMOUS MULTI-SENSOR EDGE COMPUTING APPROACH WITH IOT INTEGRATION

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Abstract**:** Fire accidents remain one of the most devastating global hazards, causing severe damage to human life, property, and the environment. This paper presents an AI-Based Fire Fighting Robot (Hybrid) designed to autonomously detect and extinguish fires using advanced sensor fusion, edge computing, and Internet of Things (IoT) technology. The system integrates a multi-sensor array comprising infrared flame sensors, MQ2 smoke/gas sensors, and DHT11 temperature sensors, all managed by an Arduino Uno microcontroller. Upon detecting a verified fire threat, the robot autonomously navigates toward the ignition source via L298N-driven DC motors, activates a servo-mounted water pump for targeted suppression, and transmits real-time telemetry to a cloud dashboard via an ESP8266 Wi-Fi module. Empirical testing across 50+ controlled scenarios yielded an average detection latency of 1.4 seconds, 98% navigation success, 95% suppression accuracy, and 100% IoT alert delivery—demonstrating the viability of accessible, low-cost autonomous robotics for emergency response.

ELEVIQ: A GENAI-POWERED PERSONAL FINANCE ASSISTANT

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Abstract: India processed over 10 billion UPI transactions monthly in 2024, yet no single platform intelligently consolidates, analyses, and advises on this financial data for students and young professionals. ElevIQ is a production-grade, full-stack, GenAI-powered personal finance web application purpose-built for India's digital economy, architected on Next.js 16, React 19, TypeScript 5, and Firebase, with Google Gemini as the core intelligence engine deployed serverlessly on Vercel. The system delivers: (i) a dual-mode AI document intelligence scanner using 7 Gemini Vision prompts with a field-weighted confidence model $C = \Sigma(W_v \times S_v)$ achieving 70–100 % extraction accuracy on clear receipts; (ii) real-time bank statement analysis generating personalised financial reports via token-streamed Gemini; and (iii) an LLM-powered conversational financial advisor with SSE delivery across 20 analytical sections. Built across 107 TypeScript/TSX source files, 30 pages, 6 Zustand stores, 201 Firestore security rule lines, and 6 deployed Firebase Cloud Functions, ElevIQ validates that AI-first, India-specific FinTech can be built at student level and deployed at production scale, directly supporting UN SDGs 1, 4, 8, 9, and 10.

Keywords—GenAI, Personal Finance, Google Gemini, LLM, FinTech, Firebase, Next.js, Receipt Scanning, Bank Statement Analysis, India, UPI, Serverless Architecture.

ARTIFICIAL INTELLIGENCE IN EDUCATION: TRANSFORMING INSTRUCTIONAL DELIVERY AND LEARNING OUTCOMES

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Abstract: Artificial Intelligence (AI) is swiftly changing the educational environment by enhancing teaching methods and improving student outcomes. This paper investigates the incorporation of AI technologies, including machine learning, natural language processing, and intelligent tutoring systems, within the educational sector. It looks at how AI-powered tools customize learning experiences, streamline administrative functions, and offer data-driven insights for educators. The research also underscores challenges such as ethical issues, data privacy concerns, and obstacles to implementation. The results indicate that AI can greatly enhance educational efficiency, accessibility, and quality when applied thoughtfully.

Keywords—Artificial Intelligence, Educational Technology, Personalized Learning, Intelligent Tutoring Systems, Learning Analytic

BEHAVIOURAL ANOMALY DETECTION FOR INSIDER THREATS USING MACHINE LEARNING

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Abstract: Insider threats represent one of the most critical and challenging problems in contemporary cybersecurity. Unlike external attacks, insider threats originate from authorized users — employees, contractors, or partners — who possess legitimate access to organizational systems and data. The covert nature of these threats renders traditional security mechanisms such as rule-based monitoring, signature-based intrusion detection, and perimeter firewalls fundamentally inadequate. This paper proposes a comprehensive behavioral anomaly detection system leveraging the Isolation Forest machine learning algorithm to identify insider threats in real time. The system continuously analyzes multi-dimensional user activity logs encompassing login patterns, file access behavior, command execution sequences, and network usage metrics to construct and maintain dynamic normal behavioral profiles for each user. When deviations from these established profiles are detected, the system generates risk-scored alerts and, upon exceeding configurable thresholds, invokes automated access control mechanisms including temporary account suspension. A Django-based web dashboard provides administrators with intuitive alert visualization, trend analysis, and audit trail capabilities. Experimental evaluations on simulated insider threat scenarios demonstrate detection accuracy of approximately 80%, with a precision of 0.82 and recall of 0.78, validating the efficacy of the proposed unsupervised approach.

Keywords — Insider Threat Detection, Behavioral Anomaly Detection, Isolation Forest, Cybersecurity, Machine Learning, Unsupervised Learning, User Entity Behavior Analytics (UEBA)

STARTUP SURVIVAL PREDICTION USING BUSINESS ANALYTICS

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Abstract**:** This paper presents a machine learning–based approach for predicting the long-term survival of startup companies using business analytics. The proposed system analyzes critical business attributes—including funding rounds, total investment, milestones, business category, founding year, and geographic location—to build a reliable predictive model. The Random Forest algorithm is employed due to its robustness with both numerical and categorical data, high accuracy, and capacity to identify the most influential features. The model classifies startup's into survival categories (active, acquired, or closed) and provides feature-importance rankings to guide entrepreneurs, investors, and policy makers in data-driven decision-making. Experimental results demonstrate that the proposed system significantly outperforms traditional manual analysis in terms of accuracy, consistency, and scalability.

Keywords—Startup, Survival Prediction; Business Analytics; Machine Learning; Random Forest Algorithm; Data Preprocessing; Feature Selection; Financial Analysis; Predictive Modeling; Decision Support System.

HAZARDAVERT AI: SMART DETECTION OF INVISIBLE HOUSEHOLD HAZARDS USING IOT AND ARTIFICIAL INTELLIGENCE

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Abstract: HazardAvert AI is an intelligent residential monitoring system designed to detect invisible household hazards that silently threaten occupant health and security. The system integrates seven specialized sensors—ROM32 electromagnetic field (EMF) sensor, MQ-2 smoke sensor, MQ-6 LPG sensor, MQ-135 air quality sensor, DHT22 temperature-humidity sensor, MAX4466 sound sensor, and LDR light sensor—alongside an ESP32-CAM surveillance module, all connected through an Arduino ESP32 microcontroller. Sensor data is transmitted to a cloud-based backend via Supabase Post greSQL for real-time storageAutomatic email notifications with photo attachments are triggered upon hazard detection or motion events. Performance evaluation over 30 days achieved greater than 95% sensor accuracy, sub-3-second alert response, 88% predictive accuracy, and greater than 99% system uptime. The platform aligns with UN Sustainable Development Goals 3, 9, 11, and 13, offering an affordable and comprehensive alternative to fragmented residential safety solutions.

Keywords—Internet of Things; household hazard detection; air quality monitoring; electromagnetic radiation; ESP32; predictive analytics; Grok AI; residential safety; smart home.

INSURANCE FRAUD DETECTION USING BLOCK CHAIN

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Abstract: Addresses insurance fraud and document tampering caused by centralized and non-transparent systems. Uses a blockchain-based architecture where an authorized insurance agency (admin) issues certificates. Stores cryptographically hashed insurance certificate data on the Ganache blockchain to ensure immutability. Enables users to securely view and verify certificates by matching blockchain hashes. Prevents forgery, duplication, and post-issuance modification while improving trust and transparency.

IMMERSIVE VR CAMPUS TOUR

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Abstract—This paper presents an interactive Virtual Reality (VR) based campus tour application developed using Unity for immersive exploration of a college environment. The system integrates 360 degree and standard video footage captured from key campus locations into a VR platform, enabling users to freely look around, navigate between sites, and perceive the spatial layout realistically. The application is primarily designed for prospective students, parents, and visitors who are unable to physically visit the campus but require a credible representation of its infrastructure and surroundings. By leveraging immersive technologies, the proposed system enhances user engagement, accessibility, and visualization of real world environments. The work demonstrates the practical application of AR/VR technologies in the education domain, offering an intuitive and interactive alternative to traditional campus tours.

Keywords— Virtual Reality, VR campus tour, Unity, 360 degree video, immersive education, interactive navigation.

INDIAN SIGN LANGUAGE LIVE TRANSLATOR: A BROWSER-BASED ASSISTIVE APPLICATION USING MULTI-MODAL DEEP LEARNING AND REAL-TIME LANDMARK INFERENCE

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Abstract: Communication barriers between hearing-impaired individuals and the general public represent a persistent and consequential challenge across social, educational, and professional domains in India. Indian Sign Language (ISL) is the primary linguistic medium for millions of deaf and hard-of hearing individuals, yet the vast majority of everyday interaction environments remain entirely sign-unaware. This paper presents the design, implementation, and evaluation of an Indian Sign Language Live Translator — a browser-based assistive application that detects hand gestures and sign patterns in real time using a standard consumer-grade webcam and converts recognized outputs into readable text and speech-ready transcript content.

MENTAL HEALTH PREDICTION MODEL

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Abstract**:** This project focuses on developing an Explainable Artificial Intelligence (XAI) system for mental health treatment using a human-centered approach. With the increasing need for early detection of mental health issues, Artificial Intelligence (AI) is used to analyze and predict mental health conditions. In this project, both audio and video data are utilized to improve the accuracy of prediction. Audio analysis is performed using feature extraction techniques such as MFCC to capture speech patterns, while video analysis is used to study facial expressions and behavioral cues. Traditional AI models often act as "black boxes," making it difficult to understand their decisions. To address this, explainability techniques such as SHAP and LIME are applied to provide clear and interpretable explanations for the predictions. The system is designed with a user-friendly interface to ensure that both healthcare professionals and patients can easily understand the results

Keywords - Artificial Intelligence, Cybersecurity, Multi-Factor Authentication, AES Encryption, Secure Communication, Data Protection

NEURO GUARD: AI-POWERED INTELLIGENT VAULT & SECURE CHAT WITH MULTI-FACTOR AUTHENTICATION

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Abstract: Neuro Guard is an advanced security system designed to enhance data protection and secure communication in modern digital environments. Traditional password-based systems are insufficient against increasing cyber threats. This system integrates an intelligent chatbot interface with a secure vault for storing confidential files. It uses multi-factor authentication, including password, facial recognition, fingerprint, and voice verification, to ensure strong user authentication. Files are protected using AES encryption with unique keys. Artificial intelligence techniques such as natural language processing are used for user interaction and threat detection. Additional features include automatic vault locking, encrypted cloud backup, and secure chat. Neuro Guard provides a scalable, efficient, and user-friendly solution for modern cybersecurity challenges.

Keywords—Artificial Intelligence, Cybersecurity, Multi-Factor Authentication, AES Encryption, Secure Communication, Data Protection

DATA DRIVEN HOUSE PRICE PREDICTION USING LINEAR REGRESSION

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Abstract: House Price Prediction is a machine learning application designed to estimate property prices based on key features such as area, number of rooms, location, and other relevant factors. This project uses Linear Regression, a supervised learning algorithm, to analyze the relationship between housing features and prices. Historical housing data is collected and preprocessed to remove missing values and outliers. Feature selection is performed to improve model accuracy and efficiency. The cleaned dataset is then split into training and testing sets. The Linear Regression model is trained using the training data to learn price patterns. Model performance is evaluated using accuracy metrics such as R-squared and Mean Squared Error. The trained model can predict house prices for new input data. Finally, the trained model can be used to predict the price of a house when new input data such as area, number of rooms, and location is given. This type of prediction system can be very useful in the real estate industry, helping buyers, sellers, and property agents make better pricing decisions.

Keywords— Linear Regression, Predictive Analytics, Supervised Learning, Feature Engineering, Real Estate Valuation

ECO QUEST: A GAMIFIED EDUCATIONAL PLATFORM INTEGRATING VIRTUAL ASSESSMENTS AND REAL-WORLD ENVIRONMENTAL MISSIONS

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Abstract: This paper presents EcoQuest, a comprehensive gamified educational platform built to foster student engagement through a hybrid approach of virtual learning assessments and real-world environmental missions. The system leverages gamification mechanics—including point tracking, dynamic levelling, and role-based access control—to motivate students. It seamlessly integrates traditional online quizzes with offline, physical tasks that are verified via image submissions. Developed using the Django framework, the platform demonstrates a scalable architecture for modern e-learning ecosystems that bridge the gap between digital education and physical environmental action.

Keywords—Gamification, e-learning, Django, environmental education, hybrid learning, assessment systems

EMERGENCY DEPARTMENT OVERCROWDING PREDICTION USING DATA SCIENCE AND REAL-TIME ANALYTICS

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Abstract: Emergency Department (ED) overcrowding is a major challenge in healthcare systems, leading to delays in treatment and reduced quality of care. This project presents a Data Science-driven solution to predict ED overcrowding using both historical and real-time data. The system leverages data preprocessing, exploratory data analysis (EDA), feature engineering, and machine learning models to forecast patient congestion levels.The system collects real-time data such as patient arrivals, triage levels, waiting time, and bed occupancy, and combines it with historical datasets. Using machine learning algorithms like Linear Regression, Random Forest, and XGBoost, the model predicts overcrowding conditions in advance. The system also includes an automated alert mechanism that sends email notifications to hospital administrators when overcrowding is likely to occur. A visualization dashboard is developed to display real-time insights, trends, and predictive analytics, enabling data-driven decision-making. This project demonstrates how Data Science techniques can improve hospital efficiency, optimize resource allocation, and enhance patient care outcomes.

Keywords— Data Science, Machine Learning, ED Overcrowding, Predictive Analytics, Real-Time Data, Healthcare Analytics.

ENHANCING DIGITAL IMAGE FORGERY DETECTION USING TRANSFER LEARNING

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Abstract**:** Digital image forgery has emerged as a critical issue due to the widespread availability of advanced image editing tools, leading to concerns about the authenticity and reliability of visual content. Traditional forgery detection methods often struggle to identify complex manipulations such as splicing, copy-move, and image tampering. To address these challenges, this paper proposes an enhanced digital image forgery detection approach using transfer learning. The proposed method utilizes pre-trained convolutional neural network (CNN) models, including architectures such as VGG, ResNet, and EfficientNet, to extract deep features from images. By fine-tuning these models on a dataset containing both authentic and forged images, the system effectively learns to detect subtle inconsistencies and manipulation artifacts. Transfer learning significantly reduces training time and computational complexity while improving detection accuracy. Experimental results demonstrate that the proposed approach outperforms conventional machine learning techniques in terms of accuracy, precision, and robustness. The model achieves reliable performance in identifying various types of forgeries, making it suitable for real-world applications such as digital forensics, media authentication, and cyber security.

Keywords: Digital Image Forgery; Transfer Learning; Convolutional Neural Network; Deep Learning; Image Authentication.

ENHANCING VILOENCE DETECTION ON SURVEILLANCE CAMERA USING YOLOV7

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Abstract**:** Real-time violence detection in public spaces is critical for ensuring safety and enabling rapid response to emergencies. This system integrates YOLOv7 for high- speed human detection with a temporal attention-based classifier to recognize complex violent actions from video streams. YOLOv7 efficiently identifies human presence and tracks motion across frames, while the temporal attention module captures temporal dependencies and overlapping behaviors, improving recognition of subtle or simultaneous violent activities. Optimized for deployment on edge devices, the system ensures low-latency processing with minimal computational resources, making it suitable for large-scale surveillance networks. Detected violent events are displayed on a responsive web interface, providing authorities with real-time alerts and actionable insights. Extensive evaluations indicate a detection accuracy exceeding **95%**, demonstrating the system's robustness, scalability, and practical applicability for enhancing public security in crowded or high-risk environments.

MACHINE LEARNING DRIVEN FINANCIAL FRAUD DETECTION WITH REAL-TIME ALERT SYSTEM

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Abstract**:** This paper presents a machine learning-based system for real-time financial fraud detection with a selective alert mechanism. The system is developed using HTML, CSS, and JavaScript for the frontend and a Python Flask framework for the backend. It analyzes transaction data, including time, amount, merchant details, geolocation, and historical spending patterns, to identify fraudulent activities. The XG Boost algorithm is utilized due to its high accuracy and effectiveness in handling imbalanced datasets. The model classifies transactions as legitimate or fraudulent and assigns a probability score to estimate risk. The system also evaluates transaction frequency and compares user and merchant locations to detect anomalies. Unlike traditional systems, SMS alerts are triggered only for transactions identified as fraudulent, reducing unnecessary notifications and alert fatigue. Real-time monitoring ensures immediate detection and response, improving security and user trust. The proposed system enhances fraud detection accuracy while minimizing false alerts. It also adapts to evolving fraud patterns through continuous learning, making it a reliable solution for financial institutions.

Keywords— Machine Learning, Fraud Detection, XGBoost, Real-Time Systems, Credit Card Transactions, Flask, SMS Alerts.

MULTILINGUAL VOICE BASED INTELLIGENT INVITATION ASSISTANT

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Abstract: In a linguistically diverse country like India, communication barriers often arise when information is not available in a user's preferred language. Traditional wedding invitations, whether printed or digital, lack interactivity and accessibility for users from different linguistic backgrounds. This paper presents a multilingual voice-based wedding invitation system that enables users to interact with invitation content through voice input and receive responses in their native language. The proposed system enhances user experience by providing an intuitive, accessible, and engaging interface. It ensures inclusivity and efficient communication, making it highly suitable for real-world applications in multicultural environments.

Keywords-Speech Recognition, Natural Language Processing, Multilingual Systems, Text-to-Speech, Wedding Invitation System

NEXT-GENERATION COMPUTING ARTIFICIAL INTELLIGENCE AS A CATALYST FOR NEXT-GENERATION COMPUTING: ARCHITECTURES, SYMBIOSIS, ANDETHICALHORIZONS*MRS*.

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Abstract**:** Artificial Intelligence(AI) is not merely an extension of computational progress; it is the defining catalyst of next-generation computing. Unlike traditional computational paradigms that follow deterministic logic, AI introduces adaptive, self-learning systems capable of reasoning, perception, and autonomous decision-making. This paper explores show AI is shaping the evolution of computing architectures, enabling human– machine symbiosis, and redefining the boundaries of technological capability. The discussion Integrates advancements in machine learning, neuromorphic systems, and quantum AI, while analysing societal implications and ethical considerations.

Keyword: AI , AGI , Quantum &Neuromorphic Computing, Ethical AI.

SENTIMENT ANALYSIS USING BERT: A TRANSFORMER-BASED DEEP LEARNING FRAMEWORK FOR CONTEXTUAL OPINION MINING

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Abstract: In the digital era, vast amounts of user-generated content on social media, product reviews, and online forums demand efficient techniques for extracting sentiment. Traditional methods based on rule-based approaches, bag-of-words representations, and classical machine learning algorithms fail to capture contextual meaning, sarcasm, and negation. This paper proposes a BERT-based Sentiment Analysis System leveraging Bidirectional Encoder Representations from Transformers (BERT) and its lightweight variant DistilBERT to classify text into positive and negative sentiment categories. The system integrates a Flask-based web application for real-time inference, batch processing, and interactive analytics. Experimental results on a labelled dataset of 3,309 samples demonstrate a classification accuracy of 94.4%, with a confusion matrix showing 300 True Positives, 300 True Negatives, 20 False Positives, and 20 False Negatives. The proposed framework significantly outperforms traditional approaches and supports multiple NLP analytics features including attention visualization, confidence scoring, and session-based trend analysis.

Keywords—BERT, DistilBERT, Sentiment Analysis, Natural Language Processing, Transformer, Deep Learning, Flask, Opinion Mining

SMART FOREST SAFETY SYSTEM: EARLY WARNING SYSTEM FOR WILD ANIMAL INTRUSION DETECTION WITH AI-POWERED ASSISTANCE

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Abstract: Human-wildlife conflict and forest fire incidents pose significant threats to both ecosystems and nearby human settlements. This paper presents a Smart Forest Safety System: Early Warning System for Wild Animal Intrusion Detection with AI-Powered Assistance, designed to provide real-time monitoring and early alerts using an IoT-based multi-sensor architecture. The system integrates infrared proximity sensors, vibration sensors, laser beam sensors, and flame detectors to identify animal movement and fire hazards even in low-light or remote environments. An ESP32 microcontroller processes sensor data and transmits it to a cloud-based backend built using Django and MySQL.The platform generates instant alerts through local sirens, mobile applications, and an administrative dashboard. Additionally, map-based tracking enables real-time location monitoring of incidents, while an AI-powered chatbot assists users with emergency guidance. Experimental evaluation demonstrates improved detection reliability and reduced response time compared to traditional monitoring systems. The proposed solution offers a low-cost, energy-efficient, and scalable approach for enhancing forest safety and minimizing human-wildlife conflicts.

Keywords— IoT, Forest Safety, Animal Intrusion Detection, Early Warning System, ESP32, Multi-Sensor Fusion, AI Chatbot, Django, Real-Time Monitoring.

SMART STUDENT ATTENDANCE AND PERFORMANCE ANALYSIS SYSTEM USING FACE RECOGNITION AND DATA ANALYTICS

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Abstract: The Smart Student Attendance and Performance Analysis System is an intelligent educational automation solution that integrates face recognition technology with academic performance analytics. This system captures real-time student facial images using a camera and automatically marks attendance after verifying the student identity through facial recognition algorithms. In addition to attendance monitoring, the system also stores academic performance details such as internal marks, subject-wise test scores, and assessment records in a centralized database. Using data analytics techniques, the system calculates student performance for each subject, identifies trends, and generates performance reports for faculty members.

Keywords— Face Recognition, Attendance Automation, OpenCV, Data Analytics, Student Performance, Machine Learning, Database Management.

STUDENT PERFORMANCE PREDICTION SYSTEM USING MACHINE LEARNING AND DATA ANALYTICS

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Abstract**:** Student performance prediction is an important task in the education system to identify students who are at risk of poor academic performance. This project presents a machine learning-based system that predicts student performance using factors such as attendance, internal marks, study hours, and previous academic records. The system uses data preprocessing and machine learning algorithms like Decision Tree, Random Forest, and Linear Regression to analyze student data and predict outcomes. The results help teachers take early action to improve student performance.

Keywords— Machine Learning, Student Performance, Prediction, Data Analytics, Education, Classification

SUSPICIOUS ACCESS DETECTION USING SERVER LOG DATA WITH LSTM-BASED DEEP LEARNING

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Abstract**:** The rapid growth of web-based applications has led to an exponential increase in server log data, making manual monitoring and analysis highly inefficient. Traditional intrusion detection systems rely on rule-based or signature-based techniques, which are limited in detecting unknown or evolving cyber threats. This paper proposes a deep learning-based approach for detecting suspicious access patterns using server log data. The system utilizes a Long Short-Term Memory (LSTM) model to analyze sequential log patterns and identify anomalies. The system processes log data through multiple stages including data collection, preprocessing, feature extraction, and model training. It supports real-time monitoring and alert generation for early detection of malicious activities. Experimental results demonstrate that the proposed system achieves high accuracy, precision, and recall compared to traditional approaches. The system enhances cybersecurity by providing an intelligent and automated solution for detecting suspicious access in modern web environments**.**

Keywords— Server Logs, LSTM, Deep Learning, Cyber Security, Intrusion Detection, Anomaly Detection.

HISTOPATHOLOGIC CANCER DETECTION USING CONVOLUTIONAL NEURAL NETWORKS (CNN)

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Abstract: Histopathologic cancer detection is one of the most critical and time-sensitive challenges in modern clinical oncology. Breast cancer remains the leading cause of global mortality among women, with metastasis in the lymphatic system being the primary determinant of oncological staging, treatment planning, and survival prognosis. Traditional diagnosis relies entirely on manual microscopic examination by pathologists an approach that is labor-intensive, subject to significant inter-observer variability, and highly susceptible to cognitive fatigue, frequently resulting in delayed diagnoses or missed micrometastases. This paper engineers a robust deep learning framework to automate binary classification of histopathologic tissue patches using a Convolutional Neural Network (CNN) trained on the PatchCamelyon (PCam) benchmark dataset of 327,680 labeled 96x96 pixel H&E-stained patches. The architecture employs four progressive convolutional blocks (32-256 filters), batch normalization, dropoutregularization, and global average pooling. Training uses the Adam optimizer with adaptive learning rate scheduling and early stopping. The system achieves an AUC-ROC of 0.952 and test accuracy of 88.7%, competitive with fine-tuned large pre-trained networks. Deployment via a Gradio web interface provides medical professionals instant AI-driven diagnostic predictions without specialist infrastructure.

AI POWERED FOOD & MUSIC RECOMMENDATION WEBSITE BASED ON USER MOOD

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Abstract: This project presents an AI-based personalized recommendation system that suggests both music and food based on user mood, preferences, and contextual factors such as time and location. The system utilizes machine learning techniques, including collaborative filtering and content-based filtering, to analyze user behavior and generate accurate recommendations. By integrating entertainment and lifestyle domains into a single platform, the system enhances user experience and engagement. It aims to provide intelligent, real-time suggestions that adapt to individual needs. This approach not only improves decision-making but also creates a unique and enjoyable experience for users in their daily lives.

Keywords--Artificial intelligence, recommendation systems, music recommendation, food recommendation, collaborative filtering, content-based filtering, hybrid models, machine learning, personalization, context-aware systems, user preferences, mood-based recommendation, counterfactual explanation

AI-POWERED HEALTHCARE MANAGEMENT AND DIAGNOSIS

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Abstract: The integration of artificial intelligence into healthcare is opening up new frontiers in patient care, clinical efficiency, and medical research. This paper presents a comprehensive digital platform that tackles the everyday challenges of healthcare scheduling while also laying the groundwork for advanced AI-driven diagnostics and drug discovery. Our system brings together two powerful components: a user-friendly Healthcare Appointment Web App and a cutting-edge Tesseract OCR engine. This combination creates a seamless experience for patients, doctors, and administrators alike. This process enriches the EHR system, building a vast and searchable database of long-term patient information. Built on a modern tech stack that includes React, TypeScript, and Python with Fast API, our platform is designed to be scalable, secure, and easy to integrate with other systems. By converting unstructured health data into a structured and accessible format, we are paving the way for the use of sophisticated machine learning models.

Keywords: Artificial Intelligence, Healthcare Management, Optical Character Recognition (OCR), Electronic Health Records (EHR), Teleconsultation, Machine Learning, Digital Health, Clinical Workflow, Drug Discovery, Diagnostic AI.

AI FOR PREDICTING PERSONALITY FROM DIGITAL FOOTPRINT

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Abstract: AI for Predicting Personality from Digital Footprints. The proliferation of digital platforms has resulted in vast amounts of user-generated data, commonly referred to as digital footprints, which provide valuable insights into individual behavior and psychological characteristics. This paper examines the use of artificial intelligence (AI) techniques to predict human personality traits from such data. By leveraging machine learning and deep learning models, along with natural language processing (NLP) and behavioral analytics, it is possible to extract meaningful patterns from social media activity, text data, and online interactions. These patterns are mapped to established psychological frameworks, particularly the Big Five personality traits: openness, conscientiousness, extraversion, agreeableness, and neuroticism. The study highlights the effectiveness of AI models in achieving reliable personality predictions and discusses their applications in areas such as personalized services, targeted advertising, recruitment, and mental health assessment. However, the paper also addresses significant ethical concerns, including data privacy, user consent, and potential algorithmic bias. The findings suggest that while AI-based personality prediction offers substantial benefits, careful consideration of ethical and regulatory aspects is essential to ensure responsible and transparent deployment.

Keywords—Artificial Intelligence, Personality Prediction, Digital Footprint, Machine Learning, Social Media Analytics

ETHICAL IMPLICATIONS OF GENERATIVE AI IN EDUCATION

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Abstract: Generative Artificial Intelligence (GenAI) has emerged as one of the most disruptive technologies in modern education. Tools such as ChatGPT, Bard, and other large language models (LLMs) can produce essays, solve problems, and even simulate tutoring sessions. While these capabilities promise efficiency and personalization, they also raise ethical dilemmas around academic integrity, privacy, bias, and equitable access. This paper explores these challenges, drawing on recent research to highlight both risks and opportunities.

Keywords: Generative artificial intelligence, Large language models, Modern education, Academic integrity, Ethical dilemmas and Equitable access

IMPLEMENTATION OF LANDMINE DETECTION CHIP IN ROBOTIC DOGS

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Abstract: Innovative solutions that combine high detection accuracy with low human risk are necessary to address the ongoing global threat posed by unexploded landmines. To improve autonomous demining operations, this paper investigates the incorporation of a specialized landmine detection chip into quadrupedal robotic platforms, or "robotic dogs." First, we examine existing multi-sensor architectures that combine chemical, metal detectors, and ground penetrating radar (GPR) sensors, and we point out their drawbacks in terms of size, power usage, and false-alarm rates. We suggest a novel mixed signal application-specific integrated circuit (ASIC) that combines AI-accelerated signal processing, nanowire chemical sensing, and quantum magnetometer read-out on a single chip in order to overcome these difficulties. Our results show that robotic demining can be significantly enhanced in terms of efficiency, safety, and scalability with a unified detection ASIC. This strategy opens the door for broad implementation in both military and humanitarian settings by offering a low-power, miniature platform for advanced sensing and on-board AI, which will ultimately speed up landmine removal and save lives.

Keywords: Landmine, Robotic Dogs, ASIC, Quantum Magnetometer, Nanowire Sensing, Autonomous Demining, Sensor Fusion

THE ROLE OF AI IN SMART CITIES AND IOT ECOSYSTEMS

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Abstract: The rapid growth of urban populations has increased the need for efficient and sustainable city management. Smart cities utilize advanced technologies to address challenges such as traffic congestion, energy consumption, and public safety. The integration of Artificial Intelligence (AI) with the Internet of Things (IoT) enables intelligent data collection and real-time decision-making. IoT devices gather vast amounts of data through sensors and connected systems. AI analyzes this data to optimize city operations and automate services. Applications include smart traffic control, energy management, healthcare, and waste management. Despite its benefits, challenges such as data security, privacy, and scalability remain significant concerns. This paper highlights the transformative role of AI in enhancing IoT ecosystems for smarter and more sustainable urban environments.

Keywords: Artificial Intelligence (AI), Internet of Things (IoT), Smart Cities, Machine Learning, Data Analytics, Automation, Smart Infrastructure, Urban Sustainability

QUANTUM COMPUTING AND MEMBRANE COMPUTING: A COMPREHENSIVE SURVEY OF MODELS, TYPES, AND FUTURE CONVERGENCE

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Abstract: This paper presents a comprehensive survey of two transformative computational paradigms: Quantum Computing (QC) and Membrane Computing (MC). We explore the theoretical foundations, subtypes, architectural models, and practical implications of each paradigm. Quantum computing, inspired by quantum mechanical phenomena, leverages qubits, superposition, and entanglement to achieve exponential speedups for specific problem classes. Membrane computing, also known as P systems, is a nature-inspired framework based on the structure and functioning of biological cells. We examine the types within each domain, including gate-based quantum computing, adiabatic quantum computing, topological quantum computing, cell-like P systems, tissue P systems, and spiking neural P systems. ASCII diagrams, worked examples, comparative analysis tables, and discussions of advantages, limitations, and future research directions are provided. We further explore the emerging intersection of these two paradigms and its potential impact on computational biology, cryptography, combinatorial optimization, and artificial intelligence.

Keywords — Quantum computing, membrane computing, P systems, qubits, topological qubits, adiabatic computing, cell-like P systems, tissue P systems, quantum membrane computing, nature-inspired computing.

REAL-TIME AI-BASED SPEECH ENHANCEMENT SYSTEM FOR DYSARTHRIC VOICE COMMUNICATION

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Abstract: Dysarthria, a motor speech disorder resulting from neurological impairment, severely compromises speech intelligibility, leading to significant communication barriers and diminished quality of life. Traditional speech enhancement systems often fail to address the unique, non-linear distortions characteristic of dysarthric speech, and existing assistive technologies rarely operate in real-time with naturalistic voice output. This paper proposes a novel, end-to-end framework for real-time dysarthric speech enhancement and voice conversion. The proposed system integrates a deep learning-based Automatic Speech Recognition (ASR) module fine-tuned on dysarthric speech, a Natural Language Processing (NLP) module for grammatical correction, Unlike conventional approaches that focus solely on recognition or post-hoc correction, our system operates in a streaming fashion, enabling seamless, real-time communication. We evaluate the system using the TORGO and UA-Speech datasets, measuring performance through Word Error Rate (WER), Mean Opinion Score (MOS), and real-time factor (RTF).

Keywords— Dysarthria, Speech Enhancement, Voice Conversion, Real-Time Processing, Deep Learning, GAN, Transformer, Assistive Technology.

SENTIMENT ANALYSIS OF SOCIAL MEDIA POSTS ON MOVIES / OTT SERIES

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Abstract: Movies and OTT (Over-The-Top) series have become an integral part of modern entertainment, with their success often determined not only by critical reviews but also by the opinions shared by audiences on social media. Platforms such as Twitter, Instagram, and YouTube serve as powerful spaces where viewers instantly express their reactions, shaping public perception and influencing viewership trends. This project focuses on developing a system that collects and analyzes these online reactions to evaluate audience sentiment toward newly released films and digital series. The system continuously gathers comments and posts using publicly available data streams, then processes the information to identify patterns of appreciation, criticism, or neutrality. By organizing audience responses into clear categories, the analysis highlights what aspects of the content resonate well—such as story, acting, or music—and what factors receive negative feedback. Ultimately, this work demonstrates how public opinion expressed through social media can be systematically captured and converted into meaningful insights that support both creative and business decisions in the entertainment industry.

Keywords: Social media, Audience Feedback, Movies, OTT Series, Sentiment Analysis, Entertainment Industry

AI-DRIVEN IN SILICO CLINICAL TRIALS USING VIRTUAL PATIENT TWINS FOR ACCELERATED DRUG DISCOVERY

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Abstract: Traditional drug testing relies heavily on in vivo methods such as animal testing and human clinical trials, which are inherently time-consuming, expensive, and ethically restrictive. To address these challenges, In Silico Clinical Trials offer a transformative paradigm shift by leveraging high-fidelity computer modeling and Artificial Intelligence (AI) to simulate complex biological processes. This paper presents an AI-driven framework based on Virtual Patient Twins—mathematically modeled digital representations of biological systems—to predict pharmacokinetic (PK) and pharmaco dynamic (PD) interactions of drug compounds. By integrating molecular docking with predictive analytics, the system enables real-time monitoring of physiological responses, metabolic pathways, and potential toxicity. Experimental evaluation using public datasets demonstrates improved prediction accuracy (92.4%) and a reduction in drug discovery time by nearly 68%. The proposed approach supports high-throughput screening and advances precision medicine.

Keywords—In Silico Clinical Trials, Artificial Intelligence, Virtual Patient Twins, Drug Discovery, Molecular Simulation, Digital Healthcare

XAI IN HIGH-STAKES MEDICINE: SAVING LIVES WITH TRANSPARENCY

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Abstract: Explainable AI (XAI) is increasingly recognized as a non-negotiable requirement for deploying machine learning models in high-stakes medical settings—such as intensive care, radiology, and emergency diagnosis—where opaque "black box" predictions can lead to preventable patient harm, eroded clinician trust, and regulatory non-compliance. This presentation examines real-world clinical case studies, including a chest X-ray pneumonia classifier and an ICU mortality predictor, to demonstrate how post-hoc explanation methods (e.g., LIME, SHAP, Grad-CAM) and inherently interpretable models (e.g., Explainable Boosting Machines) can reveal spurious correlations, highlight anatomically relevant features, and support collaborative human-AI decision-making. We also discuss emerging FDA guidance on algorithm transparency, the dangers of over-trust or under-trust driven by poor explanations, and practical evaluation criteria for clinical XAI, concluding that meaningful, faithful, and actionable explanations are essential not merely for regulatory approval but for genuinely saving lives through safer AI-assisted medicine.

Keywords: Explainable AI (XAI), high-stakes medicine, clinical decision support, black box models, model transparency, feature attribution, LIME, SHAP, Grad-CAM.

EXPLAINABLE AI FOR TRANSPARENT AND TRUSTWORTHY DECISION-MAKING SYSTEMS

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Abstract**:** In critical decision-making environments such as healthcare, finance, defence, and autonomous systems, user trust in AI systems is essential for effective human-AI collaboration. Mis-calibrated trust—either over-trust or under-trust—can lead to severe consequences, including poor decision-making and system misuse. Explainable Artificial Intelligence (XAI) has emerged as a tool to align user trust with the actual reliability and limitations of AI systems. This article examines the mechanisms through which XAI influences trust calibration, evaluates empirical evidence, identifies challenges, and proposes strategies to optimize trust alignment. Findings indicate that appropriately designed explainable AI interfaces enhance decision-making performance, mitigate risks of overreliance, and foster a more accurate understanding of AI capabilities, ultimately improving safety and effectiveness in high-stakes contexts. It discusses existing limitations, proposes a generalized framework for explainable systems, and highlights key applications across multiple domains. The study emphasizes the importance of interpretability in ensuring ethical and reliable AI deployment.

Keywords: Explainable AI, Transparency, Trustworthy Systems, Interpretability, Decision-Making.

NETWORK SLICING IN 6G OVER 5G NETWORKS

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Abstract**:** The evolution from fifth-generation (5G) to sixth-generation (6G) wireless communication systems is expected to bring unprecedented advancements in connectivity, intelligence, and service customization. One of the key enabling technologies in this transition is network slicing, which allows multiple virtual networks to operate on a shared physical infrastructure. While 5G has already introduced network slicing to support diverse use cases such as enhanced mobile broadband (eMBB), ultra-reliable low-latency communications (URLLC), and massive machine-type communications (mMTC), 6G aims to extend these capabilities with higher flexibility, intelligence, and automation. The study highlights key challenges, including resource allocation, security, interoperability, and slice management across heterogeneous networks. It also outlines potential solutions and future research directions to achieve seamless integration and efficient operation.

Keywords: 6G, 5G, Network Slicing, Software-Defined Networking (SDN), Network Function Virtualization (NFV), Artificial Intelligence (AI), Edge Computing, URLLC, eMBB, mMTC, Smart Networks.

MEDICAL DISEASE CLASSIFICATION AND PREDICTION - BRAIN TUMOR

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Abstract**:** Medical disease classification and prediction play a vital role in enhancing modern healthcare systems by enabling early diagnosis, efficient treatment planning, and improved patient outcomes. With the rapid growth of healthcare data, traditional diagnostic methods are often insufficient to handle large and complex datasets. Advanced techniques such as machine learning and data mining provide effective solutions by analyzing patient records, identifying hidden patterns, and predicting potential diseases with high accuracy. These approaches assist healthcare professionals in making informed clinical decisions while reducing human error and operational costs. Furthermore, disease classification helps in categorizing patients based on symptoms, severity, and risk factors, thereby supporting personalized medicine. Prediction models enable early detection of chronic and life-threatening diseases such as diabetes, cancer, and cardiovascular disorders. The integration of artificial intelligence in medical systems also improves the efficiency of medical imaging, electronic health record analysis, and epidemic fore casting. However, challenges such as data privacy, quality of medical datasets, and model interpretability remain significant concerns.

Keywords: Brain Tumor, Image Classification, Image Segmentation, Deep Learning, and Machine Learning.

PRIVACY-PRESERVING XAI IN FEDERATED LEARNING

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Abstract**:** Federated Learning (FL) enables collaborative model training across decentralized clients without sharing raw data, yet it introduces a critical interpretability challenge: how can we explain a globally aggregated model's decisions when individual client data remains inaccessible? Traditional Explainable AI (XAI) methods, such as SHAP or LIME, require direct access to training data or model internals, violating FL's privacy guarantees. This paper presents a framework for privacy-preserving XAI in FL by combining differentially private surrogate models with secure aggregation of local explanations. We generate local feature attributions on each client, perturb them with calibrated noise, and securely aggregate only the noisy explanations to construct a global interpretable model. Empirical evaluation on healthcare and financial benchmarks shows that our method achieves high faithfulness (within 5% of non-private XAI) while providing strong differential privacy guarantees ($\varepsilon \leq 2.0$). We further analyze the trade-off between explanation accuracy, privacy budget, and communication overhead, offering practical guidelines for deploying XAI in privacy-sensitive FL settings. Our work bridges the gap between transparency and confidentiality, enabling compliant AI in regulated domains such as medicine and finance.

Keywords: Federated Learning, Explainable AI (XAI), Privacy-preserving, Differential privacy, Secure aggregation, Local explanations, Global interpretable model.

XAI IN CYBERSECURITY: ENHANCING TRANSPARENCY FOR THREAT DETECTION AND RESPONSE

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Abstract**:** Explainable Artificial Intelligence (XAI) has emerged as a critical component for deploying machine learning models in cybersecurity applications. While modern AI systems can detect cyber threats with high accuracy, their lack of transparency limits operational trust and interpretability. This paper investigates the role of XAI techniques such as SHAP and LIME in improving transparency in cybersecurity systems. Through experiments involving intrusion detection, malware classification, and phishing detection datasets, the study evaluates model performance using metrics including accuracy, precision, recall, and AUC. The results demonstrate that integrating XAI explanations improves analyst understanding and supports more reliable decision-making in security operations centers.

Keywords: Explainable AI, Cybersecurity, Intrusion Detection, SHAP, LIME, Machine in security operations centers. Learning.

A CYBER-PHYSICAL DIGITAL TWIN ARCHITECTURE FOR PRECISION HYDROPONIC FARMING USING ARTIFICIAL INTELLIGENCE

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Abstract**:** Precision hydroponic farming demands continuous monitoring and adaptive control of environmental and nutrient parameters to ensure optimal plant growth and resource efficiency. However, traditional hydroponic systems often lack real-time intelligence and predictive capabilities, limiting their scalability and reliability. This paper presents a cyber-physical digital twin architecture integrated with artificial intelligence (AI) for intelligent monitoring, prediction, and control of hydroponic systems. The proposed framework establishes a real-time bidirectional link between the physical hydroponic setup and its virtual replica, enabling dynamic system modeling and state synchronization. AI techniques are employed to analyze multi-sensor data, predict key growth parameters, and optimize nutrient concentration, pH levels, and environmental conditions. A closed-loop control strategy is implemented to ensure autonomous and adaptive system operation under varying conditions. Experimental evaluation demonstrates improved resource utilization, enhanced crop yield, and reduced human intervention compared to conventional approaches. The proposed system highlights the potential of combining digital twins and AI for scalable, efficient, and sustainable smart agriculture.

Keywords: Digital Twin, Cyber-Physical Systems (CPS), Hydroponic Farming, Artificial Intelligence (AI), Precision Agriculture, Smart Farming, Internet of Things (IoT), Predictive Analytics, Closed-Loop Control, Resource Optimization, Sensor-Based Monitoring, Sustainable Agriculture.

SMART NETWORK SECURITY: LEVERAGING AI FOR THREAT DETECTION AND PREVENTION

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Abstract: With the exponential growth of networked systems and digital communication, ensuring data security has become increasingly challenging. Traditional security systems are insufficient against evolving cyber threats. This paper presents Artificial Intelligence (AI)-based approaches for enhancing network security. AI techniques such as Machine Learning (ML) and Deep Learning (DL) provide adaptive and intelligent solutions for intrusion detection, anomaly detection, and threat mitigation. These systems improve accuracy, reduce false positives, and enable real-time responses. The study explores methodologies, implementation strategies, challenges, and future directions of AI-driven network security.

Keywords: Artificial Intelligence, Network Security, Machine Learning, Deep Learning, Intrusion Detection System, Cybersecurity

A HYBRID EXPLAINABLE AI FRAMEWORK USING SHAP AND MODEL COMPRESSION FOR GREEN EDGE INTELLIGENCE

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Abstract **:**This paper proposes a hybrid framework that integrates explainable artificial intelligence (XAI) with model compression techniques to enable energy-efficient and interpretable machine learning on edge devices. Traditional AI models often achieve high accuracy at the cost of increased computational complexity and energy consumption, making them unsuitable for resource-constrained environments. To address this challenge, the proposed framework combines SHAP-based interpretability with model pruning and quantization techniques to reduce model size and computational overhead while maintaining transparency. Experimental results demonstrate that the optimized models achieve comparable accuracy with reduced energy consumption and improved inference speed. This work contributes to the development of sustainable and trustworthy AI systems for real-time edge applications.

Keyword: Explainable AI, SHAP, Model Compression, Edge Computing, Green AI, Energy Efficiency.

AI ALIGNMENT AND SAFETY FOR LARGE LANGUAGE MODEL

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Abstract: The rapid evolution of large language models (LLMs) has significantly enhanced capabilities in natural language understanding, reasoning, and generation. Despite these advancements, concerns surrounding alignment and safety remain critical. AI alignment ensures that model outputs conform to human values, intentions, and ethical standards, while safety focuses on minimizing risks such as harmful outputs, bias, and misuse. This paper examines key alignment techniques, including Reinforcement Learning from Human Feedback (RLHF), constitutional AI, and interpretability methods. It also analyzes major safety challenges such as hallucinations, adversarial attacks, and privacy risks. Furthermore, the paper discusses open challenges in scalability, value alignment, and governance, proposing a multidisciplinary approach to ensure robust and safe deployment of LLMs.

Keywords—AI alignment, AI safety, large language models (LLMs), reinforcement learning from human feedback (RLHF), value alignment

A CORPUS-BASED QUALITY ASSESSMENT OF AI AND MACHINE TRANSLATION IN PARKINSON'S DISEASE LITERATURE

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Abstract: While AI-powered and machine translation (MT) systems are increasingly being used to bridge language gaps in therapeutic settings, the scientific literature warns of substantial linguistic difficulties that require human intervention. This study compares the quality of Italian-to-English translations of a popular medical article about Parkinson's disease (PD) using NotebookLM and DeepL. The study uses a reference corpus of 10,000 papers specializing on Parkinson's disease to evaluate accuracy.The findings show that automatic translations commonly make errors in word choice, syntactic modification (pre- and post-modification), and idiomatic usage (collocations and collations). The study indicates that, while AI-generated texts may be "acceptable" for informal physician-patient encounters where basic communication is paramount, they lack the precision required for formal medical contexts. To assure clinical reliability in professional applications, the study recommends human translation supplemented by similar corpora or expert post-editing of MT outputs.

*Keywords**:** Machine Translation, AI, Parkinson's Disease, Comparable Corpus Analysis, Medical Translation.*

AI DRIVEN AUTONOMOUS SYSTEMS AND ROBOTICS FOR REAL - TIME DECISION MAKING IN DYNAMIC AND UNSTRUCTURED ENVIRONMENTS

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ABSTRACT: Artificial intelligence (AI) has become a cornerstone in advancing autonomous systems and robotics, enabling them to function effectively in dynamic and unstructured environments where conventional rule-based approaches often fail. Real-time decision-making in such contexts requires the integration of perception, reasoning, and adaptive learning to manage uncertainty, incomplete information, and rapidly changing conditions. AI-driven techniques—such as deep learning, reinforcement learning, computer vision, and sensor fusion—empower robots to interpret complex surroundings, predict environmental changes, and select optimal actions with minimal human oversight. The research emphasizes both the opportunities and challenges of deploying such systems. On one hand, they promise enhanced productivity, safety, and autonomy across diverse applications. On the other hand, issues of scalability, transparency, ethical responsibility, and trust in machine-led decisions remain pressing. Addressing these challenges requires interdisciplinary approaches that combine technical innovation with policy frameworks and human-centred design.

Keywords: Artificial Intelligence (AI), Autonomous Systems, Robotics, Dynamic Environments, Unstructured Environments, Machine Learning, Sensor Fusion.

AI-BASED AUTONOMOUS PARKING SYSTEM

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Abstract: The rapid growth of urbanization and the increasing number of vehicles have significantly intensified the demand for efficient, reliable, and intelligent parking solutions. This paper presents an AI-based Autonomous Parking System designed to enhance parking efficiency, improve safety, and reduce driver effort in complex and congested environments. The proposed system integrates advanced technologies such as artificial intelligence, computer vision, sensor fusion, and real-time control mechanisms to enable vehicles to autonomously detect, navigate, and park in suitable spaces without human intervention. A dedicated control module translates planned trajectories into real-time vehicle actions by regulating steering, acceleration, and braking systems with high precision. TFuture enhancements may include integration with cloud-based services, vehicle-to-infrastructure (V2I) communication, and smart city frameworks to enable fully automated valet parking systems.

Keywords : Artificial Intelligence (AI), Autonomous Parking System, Computer Vision, Machine Learning, Deep Learning, Path Planning, Object Detection, Smart Vehicles, LiDAR,

BRAIN TUMOUR DETECTION SYSTEM

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Abstract - This project focuses on the development of an automated Brain Tumor Detection System using Convolutional Neural Networks (CNNs). Brain tumors are among the most critical neurological disorders, where early and accurate detection is essential for effective treatment and improved patient survival rates. Magnetic Resonance Imaging (MRI) is widely used for diagnosing brain abnormalities, but manual analysis by radiologists is time-consuming and prone to human error. A CNN model is then trained to extract important features and accurately detect the presence of tumors.To improve model performance and generalization, data augmentation techniques such as rotation, flipping, and scaling are applied. The system is implemented using Python with deep learning frameworks such as TensorFlow and Keras. Performance is evaluated using metrics like accuracy, precision, recall, and F1-score.The results demonstrate that the proposed CNN-based system provides high accuracy and reliable predictions, making it a useful tool for assisting healthcare professionals in early diagnosis. This system aims to reduce diagnostic time, improve consistency, and support medical decision-making in real-world clinical applications.

Keywords - Artificial Intelligence, Cybersecurity, Multi-Factor Authentication, AES Encryption, Secure Communication, Data Protection

DEPARTMENT OF BIOMEDICAL ENGINEERING

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WIRELESS IoT MONITORING FRAMEWORK FOR PARALYZED PATIENT CARE

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Abstract: The goal of this internet of things (IOT)based observation and notification system for a paralyzed patients healthcare is to enable the patient to communicate with a physician, nurses, or caregiver via message or the internet regarding their health issues and status. As everyone knows paralyzes is characterized by a lack of muscle function in certain body region. Our objective is to create an inexpensive, user-friendly device that combines nursing care and a simple health monitoring system.

Keywords: *Paralysis, IoT, Patient monitoring, Microcontroller.*

SMART LOW-COST WEARABLE SYSTEM FOR INHALER USAGE TRACKING

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Abstract: The goal of an Internet of Things-based inhaler monitoring system is to enhance patient outcomes and care for people with long-term respiratory conditions including COPD and asthma. With the use of real-time data that can be evaluated to learn more about patient behavior and medication consumption patterns, the system is intended to track and monitor how patients use their inhalers. The following goals are intended to be accomplished by the system through the collection and analysis of data from inhalers: 1. By reminding and alerting patients to take their prescription at the right time, the system can assist patients in adhering to their prescribed regimen. 2. By customizing treatment programs to meet each patient's unique needs, the data gathered from inhalers can enhance the efficacy of patients' care. 3. Identify areas for improvement: By identifying potential problem areas, such as drug regimen exacerbations.

Keywords: *IoT, Inhaler, Wearable System, Respiratory disorders, Patient Care.*

A TRUSTWORTHY, SECURE, AND HUMAN-CENTERED IoT-ENABLED SMART GLUCOSE MONITORING SYSTEM FOR REAL-TIME DIABETES MANAGEMENT

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Abstract: By processing data from a blood glucose sensor on an Arduino Uno and sending it to the cloud over Wi-Fi, this project improves remote glucose monitoring for medical professionals. Users receive notifications when their blood glucose levels rise above typical ranges, which helps them decide how much insulin to take. Iterative redesign is supported by the Iterative Waterfall Model, which guarantees functionality and problem fixes. For diabetic individuals, the method successfully increases awareness and regulates glucose consumption.

Keywords: *Arduino UNO, HC SR-04 ultra sonic sensor LDR, Wi-Fi model*

DESIGN AND DEVELOPMENT OF IoT-ENABLED CARDIAC MONITORING SYSTEM USING ADVANCED BIOSENSORS

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Abstract: Nearness of specialist is basic for legitimate patient consideration. In any case, they can't be available on every single spot to give drug or treatment. So, remote observing of a patient is the correct arrangement. This framework is utilized to screen physical parameter like heart beat and send the deliberate information straight forwardly through a display. This system comprises of a heart beat sensor, LCD display, bread board, Arduino UNO. This estimates a heartbeat from a baby to a senior individual. The minimal effect of the gadget will give fitting command post successful checking framework. Heart Rate observing using framework utilizing Heart Rate Sensor and Arduino." An integrated portable device for continuous heart rate. Heart related disease is increasing day by day; therefore, an accurate, affordable and portable heart rate and body temperature measuring device is essential for taking action in proper time. Such a device is more essential in a situation where there is no doctor or clinic nearby and patients are unable not recognize their actual condition. This paper presents the solution to it. The cardiac monitoring system using Arduino gives the real time solution for these problems and it is accurate and affordable. The developed device is shown acceptable outcomes when compared with other measuring devices.

Keywords: *Arduino, Heart rate, Clinician, LCD Display,Patient, Pulse Sensor, Cardiac Monitoring System.*

A REAL-TIME IoT AND EDGE AI-BASED AUTOMATED IV DRIP MANAGEMENT SYSTEM FOR INTELLIGENT HEALTHCARE

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Abstract: Bypassing your digestive tract and using a tiny line called a catheter, drip monitoring therapy allows nutrition, food, and essential medications to enter your bloodstream immediately. These liquids support a patient's blood sugar, electrolyte, and hydration levels during surgical procedures. To give the fluid a pressure caused by gravitational potential energy that surpasses the circulatory pressure, a container containing the required fluid medication is hung at a level higher than the patient's body. With the current manual drip monitoring system, a nurse or physician must constantly monitor the patient's infusion configuration.

Keywords: *Blood Sugar, Drip Monitoring, Digestive tract, Automation.*

AI AND OPENCV-BASED GESTURE RECOGNITION FOR ASSISTIVE CONTROL SYSTEMS

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Abstract: The goal of this project was to use cutting-edge computer vision technologies to create an item tracking and detection system. An operational tracking system is delivered by the project. It uses a combination of contemporary infrared and optical technology and is useful in situations like semiautonomous control or uncontrolled surveillance. It can be readily integrated into a bigger system and also function as a standalone system due to its stability. The project involved robotic automation and computer vision research, and it was completed in five months. Additionally, cutting-edge software and hardware technologies were incorporated. The project's outcomes, which are presented in this report, consist of using computer vision algorithms to follow moving objects in both a Paraphrase without limits.

Keywords: *Vision Technology, AI, Gesture Control, Robotic Automation.*

HUMAN-CENTERED PORTABLE SMART ECG SYSTEM FOR EARLY ARRHYTHMIA DETECTION

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Abstract: The Arduino Uno with ECG (Electrocardiography) module project aims to develop a system that can monitor and analyze the electrical activity of the human heart. The project utilizes the Arduino Uno microcontroller board and an ECG module to capture the heart's electrical signals and display them in a meaningful way. An electrocardiogram (ECG) is a test that determines the heart's rhythm and electrical activities. Heart rhythm problems (arrhythmias) occur when the electrical impulses that coordinate your heartbeats don't work properly. To detect such anomalies a medical diagnosis by a specialist is required.

Keywords: *ECG, Arduino Uno, Smart System, Portable, Arrhythmia detection.*

INTELLIGENT IoT-BASED HEALTH MONITORING SYSTEM FOR QUALITY- OF-LIFE IMPROVEMENT

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Abstract: This paper introduces a real-time health monitoring system tailored for coma patients, utilizing IoT and GSM technologies for efficient patient status recognition. It incorporates smart sensors to capture vital parameters, which are processed and transmitted using an ARDUINO-UNO board and Cloud computing. Data is transmitted to authorized devices for remote monitoring and analysis, aiding in timely decision- making and improving patient care. The broader implications of IoT in healthcare are discussed, highlighting its potential for cost savings, enhanced patient satisfaction, and improved clinical outcomes. The Mobile Healthcare Management System is presented as a prime example, demonstrating the collaboration of IoT with technologies like Wireless Sensor Networks and smart mobile devices. Addressing global health challenges, particularly cardiovascular and respiratory diseases, the paper emphasizes the importance of IoT-based monitoring systems in early detection and intervention, with smartphone-based solutions offering potential life-saving capabilities.

Keywords: *IoT (Internet of Things), Sensors, Wi-Fi, Module,Smart Healthcare.*

IoT BASED PATIENT MONITORING SYSTEM IN HEALTHCARE SERVICE

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Abstract: The goal of this internet of things (IOT) is having a healthy mind and body. The internet of things allows communication between machines and programmed actions to be triggered automatically. The health data can visualize in real time. In this project, a node MCU is used as gateway to collect the health data of the user, and a raspberry Pi 3 model B+ broker is used as the CPU. The system is capable of tracking the location of the user by using the google geolocation service.

Keywords: *IOT, Patient monitoring, Node MCU.*

IoT BASED ARDUINO UNO WEARABLE SYSTEM FOR EARLY HEALTH PARAMETER DETECTION

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Abstract: Internet-based technologies, as well as the creation and implementation of wireless wearable and smart gadgets, are gaining attention in several fields of study. The healthcare sector, like others, is using technology to enhance patient care and reduce reliance on manual processes like paper notes for vital sign data. Vital signs are closely observed physiological aspects that provide significant data and require close monitoring to accurately assess a patient's health status. Continuous vital sign monitoring uses many devices and methods to generate data and improve actions.

Keywords: *Healthcare, Participatory Design, eHealth, Vital Sign.*

AUTOMATIC IV INFUSION POLE WITH IOT-BASED BAG REFILL MONITORING AND NOTIFICATION SYSTEM

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Abstract: The focal point of the hospital is the IV pole. Medical equipment known as intravenous (IV) stands or poles are used to suspend bags that hold intravenous fluids or medications that the patient needs to receive. They minimize space and are utilized for the highest level of hygiene. They are a regular sight in any hospital. Intravenous poles are sturdy, dependable, adaptable, conveniently movable, and able to hold many IV bags. We create automatic IV pole operations in this project. The load cells employed here serve as the sensor, and an LCD is utilized to determine when the fluid in the bag attached in the IV pole has to be refilled. This allows us to give patients who require medical liquids on a continual and urgent basis. It lessens the workload for nurses who must constantly check on patients who depend on fluids to survive.

Keywords: *Intravenous fluid, LCD, IV pole, Automatic.*

ADVANCED E-HEALTH MONITORING SYSTEM USING SMART PULSE OXIMETRY TECHNOLOGY

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Abstract: Every day, pulse oximeters are utilized in a variety of clinical situations to monitor pulse rate (PR) and arterial hemoglobin oxygen saturation (spo2). In this project, we employ IOT health monitoring to help diagnose patients accurately even when a doctor is far away, helping to stop the spread of disease. An IOT platform stores data that may be accessed by individuals through the use of remote patient monitoring systems. The doctor remote can determine distance based on the data it has received. The best thing about this project is that it allows us to connect this gadget to the Android app, which will record and update data for both of them on a regular basis.

Keywords: *Internet of things (IOT), oxygen level, pulse rate, Oxygen sensor, pulse rate sensor, Arduino*

SMART IOT-ENABLED MRI ANALYSIS SYSTEM FOR BRAIN TUMOR DETECTION USING HYBRID SEGMENTATION

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Abstract: This paper reviews the comparative analysis of medical image segmentation techniques for segmenting tumor from MRI images to clearly determine brain tumours and help the physician to make a better diagnosis. Brain tumors are the leading cause of cancer death in children under the age of 20. The brain tumor segmentation is a challenging and complex task. In recent years segmentation problems have been attracted interest and ongoing research. In this paper comparative study of hybrid segmentation techniques like K-means, PSO-K means, Firefly-K means, Seg-UNet architecture were carried out and found that hybrid Seg-UNet can provide better output of original image and visual observation of tumors. This hybrid method achieves 99.2% segmentation accuracy with sensitivity 96% and specificity 94%. The results showed that hybrid methods provide a significant contribution to help the physicians in Magnetic resonance brain image tumor detection.

Keywords: *Segmentation, K-means. PSO-Kmeans, Seg-UNet, segmentation accuracy.*

REMOTE HEALTHCARE MONITORING IN RURAL AREAS USING IOT-BASED TELEMONITORING

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Abstract: The Rural IoT - Medical ATM is a cost-effective and accessible solution for providing basic medical services in rural areas. This system combines Arduino UNO R3, DHT11 or LM 35 module, BPM sensor, servo motor SG, transformer 1 A 30 V, and power supply to create an automated medical ATM that can measure patients' vital signs and dispense medication. The system is designed to be easy to operate and maintain, making it suitable for use in areas with limited healthcare resources. Patients can use the system to measure their vital signs, including body temperature, heart rate, and blood pressure, which are then displayed on an LCD screen. The use of a servo motor SG allows for precise medication dispensing, reducing the risk of errors and ensuring that patients receive the correct dosage. The Rural IoT - Medical ATM is a promising solution for providing basic medical services in rural areas, where access to healthcare is often limited. By leveraging the latest in sensor and microcontroller technology, this system can improve patient outcomes and reduce healthcare costs, while remaining cost-effective and easy to use.

Keywords: *Arduino UNO R3, BPM sensor, servo motor, DHT 11 or LM 35 module.*

NEXT-GENERATION HEALTHCARE SYSTEM USING DIGITAL TWIN AND AUGMENTED VISION

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Abstract: This research presents an in-depth study of Digital Twin-Augmented Health and its transformative applications within hospital environments. A digital twin is a dynamic, real-time virtual model that mirrors physical entities—ranging from individual patients to complex hospital systems—through the integration of data from electronic health records (EHRs), medical imaging, biosensors, and Internet of Things (IoT) devices. In clinical contexts, digital twins facilitate real-time monitoring, predictive diagnostics, and the simulation of disease progression and treatment outcomes, thereby enabling personalized and precision medicine. Hospitals can utilize digital twins to optimize resource allocation, improve patient flow, and conduct predictive maintenance of critical medical equipment. Moreover, these models support clinical decision-making by allowing healthcare providers to evaluate therapeutic strategies in silico prior to implementation.

Keywords: *Digital twin, smart healthcare, hospital systems, personalized medicine, predictive analytics, electronic health records (EHRs), clinical decision support, medical Internet of Things (IoT)*

WEARABLE FETAL MOVEMENT DETECTION

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Abstract: This project presents the development of a wearable fetal movement detection system employing an ADXL335 accelerometer sensor interfaced with an Arduino microcontroller. The system aims to provide real-time monitoring of fetal movements during pregnancy, with a focus on timely detection and alerting in emergency situations. Traditional methods of fetal movement monitoring, such as kick counting charts and periodic visits to healthcare professionals, are limited in their ability to provide real time, continuous surveillance. Recognizing the need for a more proactive and accessible solution, this project introduces a wearable fetal movement detection system empowered by accelerometer sensor technology and Arduino microcontroller integration. The proposed system leverages the ADXL335 accelerometer sensor to detect fetal movements through changes in acceleration. The core1 functionality of the system revolves around the continuous monitoring of fetal movements, with a focus on promptly identifying any deviations from normal patterns. Incorporating an incrementing count mechanism, the system resets the count.

Keywords: *Fetal Monitoring, Sensor, Microcontroller, Wearable.*

NON INVASIVE GLUCOSE MONITORING FOR DIABETIC PATIENT

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Abstract: In recent years, diabetes has become more prevalent, and patients suffer from pain and infection due to invasive procedures. Non-invasive glucose monitoring devices improve patient comfort by reducing pain and infection compared to invasive methods. This paper presents a novel non- invasive glucose monitoring system by employing NIR technology and a machine learning algorithm to provide an accurate and continuous monitoring system that simultaneously displays a result on a mobile app in a user-friendly way. This can lead to an optimized system than conventional methods that require blood samples, which is significant for diabetic therapy. By incorporating the proposed technology, a non-invasive as well as user-friendly system is implemented that improves the quality of life of diabetic patients with the potential to completely transform glucose monitoring, reduce the burden on diabetics, and provide healthcare professionals with a valuable tool for improved patient care.

***Keywords**: Diabetes, Glucose monitoring, Non-Invasive, Machine Learning, Blood Glucose, Glucometer*

A MULTIVENT SYSTEM FOR NON-INVASIVE VENTILATION

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Abstract: The COVID-19 epidemic has led to a serious worldwide scarcity of ventilators. To improve the cure rate for ventilated patients, dual patient ventilation or placing numerous patients on a single ventilator (ventilator sharing) have been suggested and tried. But the ventilator-sharing approach must configure the ventilator at the same settings for every patient, which makes it unable to accommodate varying patient ventilation requirements. As a result, our study has proposed a revolutionary multivent system for non-invasive ventilation. The proportional valve and flow pressure sensor that make up the closed loop system are capable of controlling each patient's airway pressure and flow. To address patients' ventilation needs at the same time, multiple ventilation circuits can be combined in parallel. In the meantime, tests are conducted to establish and validate the multivent system's mathematical model.

Keywords: *Aurdino, Mechanical ventilation, Multivent system, pneumatic system, proportional control*

PATIENT RE-ADMISSION PREDICTION IN HOSPITALS USING AI

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Abstract: To improve patient care and reduce unnecessary hospital readmissions, this project presents an AI-based hospital Re-Admission prediction system using advanced machine learning techniques. The system utilizes patient data such as medical history, lab reports, demographic details, and previous admissions to predict the likelihood of readmission. Machine learning models like XG Boost are employed to analyze complex patterns and generate accurate predictions. The system processes the input data, performs feature selection, and applies predictive algorithms to classify patients into risk categories. The predicted results help healthcare professionals take preventive measures, optimize treatment plans, and reduce healthcare costs. Additionally, the model enhances decision-making by providing early warnings for high-risk patients. By integrating artificial intelligence into healthcare analytics, the proposed system improves efficiency, supports data-driven decisions, and enhances overall patient outcomes, especially in high-volume hospital environments.

Keywords: *Medical History, Lab Reports, Demographic Details, XG Boost.*

AI-POWERED EARLY DETECTION OF PNEUMONIA VIA CHEST IMAGING

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Abstract: Pneumonia remains a significant global cause of morbidity and mortality, particularly among paediatric and elderly populations. Timely and accurate diagnosis is essential for effective clinical management; however, interpretation of chest radiographs is often challenging and highly dependent on radiologist expertise, which can lead to delays and inter-observer variability. This study proposes an automated approach for pneumonia detection using chest X-ray images and deep learning techniques. The method employs a pre-trained Residual Neural Network (ResNet) architecture integrated with a convolutional neural network (CNN) using transfer learning to enhance feature extraction and classification performance. These findings highlight the applicability of deep learning methods in medical image analysis and their potential to contribute to the development of scalable and cost-effective computer-aided diagnostic systems for practical healthcare applications.

Keywords: *Residual Neural Network, convolutional neural network (CNN), Paediatric chest X-ray images.*

INTEND-BASED LOW-COST PATIENT BED EXIT ALERT SYSTEM

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Abstract: Patient Safety is a critical concern in healthcare environments, especially for elderly and post-operative patients. Unassisted bed exit is one of the major causes of patient falls in hospitals. This project proposes an intent-based patient bed exit monitoring system. The system aims to detect patient movement and prevent accidental falls. A Force Sensitive Resistor (FSR) sensor is used to measure the pressure on the bed. When the patient attempts to get up, the pressure on the bed reduces. This reduction is detected as a change in sensor output. The sensor data is processed using an Arduino microcontroller. The alert system includes a buzzer, visual indication using an LCD, and a GSM based messaging system to notify caregivers remotely. When a bed exit is detected, an SMS alert is automatically sent to the caregiver or nurse, enabling immediate response even if they are not nearby. The design ensures patient comfort and non-invasive monitoring. The system can be used in hospitals, clinics, and home care settings. This project contributes to low-cost healthcare technology solutions. Overall, the system ensures safe, efficient, and reliable patient monitoring.

Keywords- *Patient Safety, Bed Exit Detection, FSR Sensor, Arduino, Fall Prevention, Sensor-Based Monitoring, Intent Detection, Healthcare System, Alert System, Low-Cost Medical Device.*

HOSPITAL EQUIPMENT MAINTENANCE MANAGEMENT SYSTEM (HEMMS)

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Abstract: Hospitals use many critical biomedical devices that require regular maintenance to ensure proper functioning and patient safety. In many healthcare facilities, equipment maintenance records are still managed manually using paper files or spreadsheets. To address these challenges, a web-based application called Hospital Equipment Maintenance Management System (HEMMS) is proposed. The system provides a centralized platform for managing biomedical equipment information and maintenance activities. It allows users to register equipment details, including department, installation date, warranty information, and AMC details. HEMMS automatically generates alerts and notifications for maintenance due dates, warranty expiry, and AMC expiry.. By digitizing equipment management, the system improves maintenance efficiency, reduces equipment downtime, and enhances patient safety. The application is developed using technologies such as Node.js, Express.js, MongoDB, and JavaScript, which provide a reliable and scalable web-based solution for hospital equipment management.

Keywords- *Healthcare Equipment Monitoring, Biomedical Engineering Management,Digital Maintenance Records, Node.js, Express.js, MongoDB, JavaScript.*

DETECTION OF MITOSIS COUNT AND 3+ CELL IMAGES IN BREAST CANCER TISSUES

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Abstract: Automated analysis of histopathology images plays an important role in improving the accuracy and efficiency of cancer diagnosis. This study proposes a Convolutional Neural Network (CNN) based approach for automated HER2 cell grading and mitosis detection using histopathology images. The input images are first pre-processed through resizing, normalization, and standardization to ensure consistent data for model training. The images are then divided into smaller patches, which are processed by a CNN to extract important spatial features. The extracted features are passed through fully connected layers and classified using a SoftMax function into four categories: HER21+, HER22+, HER23+ and mitosis. The system also performs automated cell counting and calculates the percentage distribution of each class to support HER2 grading. Experimental results show that the proposed method achieves an accuracy of 85%, sensitivity of 88%, and specificity of 82%, demonstrating its potential to assist pathologists in efficient and reliable cancer diagnosis.

Keywords- *HER2Cell Grading, Histopathology Image Analysis, Convolutional Neural Network (CNN), Mitosis Detection, Deep Learning, Medical Image Processing, Explainable Artificial Intelligence (XAI), Grad-CAM, SoftMax Classification, Breast Cancer Diagnosis.*

SMART AXILLARY CRUTCH

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Abstract: The Smart Axillary Crutch is an intelligent assistive mobility device designed to enhance safety, stability, and rehabilitation for individuals with lower limb disabilities. Conventional axillary crutches lack real-time monitoring and feedback mechanisms, which can lead to improper usage and increased risk of injury. To address these limitations, the proposed system integrates multiple sensors, including an MPU6050 for posture detection, a Force Sensitive Resistor (FSR) for pressure monitoring, and a vibration sensor for detecting sudden shocks or fall conditions. The system is implemented using the ESP32, which processes sensor data in real time using threshold-based algorithms to identify abnormal conditions such as improper posture, excessive load, and instability. Experimental results demonstrate that the system effectively detects critical conditions with low latency and provides reliable performance. The proposed solution is cost-effective, energy-efficient, and suitable for practical rehabilitation applications, offering a smart and user-friendly alternative to conventional mobility aids.

Keywords-*Internet of Things (IoT), Force Sensitive Resistor (FSR), MPU6050, Vibration Sensor, Real-Time Monitoring, Posture Detection, Fall Detection, Rehabilitation Systems.*

LOW COST PREECLAMPSIA DETECTION KIT FOR RURAL AREAS

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Abstract: Preeclampsia is a leading cause of maternal and fetal complications, especially in low-resource and rural settings where access to regular antenatal care is limited. It is characterized by hypertension and proteinuria after twenty weeks of pregnancy and can lead to severe outcomes if not detected early. Challenges such as lack of healthcare facilities, trained personnel, and diagnostic tools often delay timely diagnosis. This project presents a low-cost, portable preeclampsia detection kit designed for rural use. The system combines automated blood pressure measurement using an oscillometric sensor and urinary protein detection using colorimetric strips with an optical sensor, ensuring accurate and objective results. A microcontroller processes the data and applies clinical thresholds (BP ≥140/90 mmHg or protein ≥1+) to identify high-risk cases. The device provides simple outputs through visual indicators and an alert system, enabling easy use by community health workers. It is compact, durable, and powered by rechargeable batteries, making it suitable for field conditions.

Keywords- *Preeclampsia, oscillometric sensor, colorimetric strips, diagnostic tools.*

HEALTH TRACK

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Abstract: Efficient management of hospital operations is essential to ensure high-quality patient care and streamlined workflows in modern healthcare environments. This project presents the design and development of a comprehensive Hospital Management System aimed at digitizing and integrating key healthcare processes such as patient registration, token generation, medical record management, centralized data entry, and report generation. The implementation of role-based access control ensures that only authorized personnel can access specific data, thereby maintaining confidentiality and integrity of patient information. Furthermore, the system incorporates a patient access portal that allows users to view and download medical reports, improving transparency and patient engagement. The proposed solution also helps in reducing patient waiting time, optimizing resource utilization, and enhancing the overall efficiency of hospital operations. It is particularly suitable for small to medium-sized healthcare institutions that are transitioning from manual to digital systems. In conclusion, this Hospital Management System offers a scalable, cost-effective, and user-friendly platform that supports the digital transformation of healthcare services while improving both operational performance and patient satisfaction

Keywords- *Hospital Management System, Patient Registration, Centralized Database, Patient Portal, Data Security, Workflow Automation.*

SMART DIGITAL HOSPITAL DOCUMENTATION AND RECORD MANAGEMENT SYSTEM

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Abstract: The healthcare industry increasingly demands efficient and reliable digital solutions to manage patient information, streamline hospital workflows, and minimize administrative errors. Traditional hospital management systems rely heavily on manual documentation, which often results in data loss. To overcome these challenges, a Smart Hospital Management System using barcode technology is proposed as an effective and modern solution. This system automates key hospital operations by integrating patient registration, barcode-based identification, doctor consultation management, and digital prescription storage into a centralized and user-friendly platform. Each patient is assigned a unique identification code during registration, which is automatically converted into a barcode that serves as a secure digital identity. Additionally, the barcode generation module automatically creates and stores barcode images, which can be printed or digitally accessed when needed. This digital approach not only enhances data accuracy and reduces the chances of human error but also improves overall hospital service quality and patient satisfaction.

Keywords: *Healthcare, Smart Hospital, Patient monitoring, Barcode.*

SALIVA SENSE – AN AI BASED NON-INVASIVE GLUCOSE MONITORING SYSTEM

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Abstract: Saliva-based non-invasive glucose monitoring has gained significant attention as an alternative to conventional blood-based methods due to reduced discomfort and improved patient compliance. An electrochemical biosensor-based system is developed to measure glucose concentration using saliva samples. The biosensor strip is fabricated using an SLA resin substrate and coated with glucose oxidase (GOx) enzyme, which reacts with glucose present in saliva to produce hydrogen peroxide, generating an electrical signal proportional to glucose concentration. Experimental results demonstrate stable sensor response and reliable performance of the system under varying conditions. This study highlights the feasibility of integrating biosensor technology with embedded artificial intelligence for developing efficient non-invasive healthcare monitoring systems.

Keywords: *Saliva glucose monitoring, Biosensor, Glucose oxidase, ESP32, TinyML, Non-invasive system.*

WEARABLE DEVICE FOR EARLY DETECTION OF VASCULAR ISSUES

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Abstract: The early detection of vascular issues is crucial for preventing severe cardiovascular complications. This project presents the development of a wearable device designed to monitor vascular health using photoplethysmography (PPG) and temperature sensors. The device captures raw PPG and skin temperature signals, processes the data to extract meaningful vascular parameters, and provides real-time analysis. Key metrics such as the Perfusion Index (PI), Arterial Stiffness Index, Peripheral Vascular Resistance, and Capillary Refill Time are computed to assess vascular health. The results are displayed on an interface with alerts for abnormal trends. By enabling real-time tracking, the device empowers users to make informed health decisions and seek timely medical interventions, ultimately reducing the risk of severe complications. Furthermore, the integration of advanced signal processing techniques enhances measurement accuracy, ensuring reliable data for clinical and personal use. With further advancements, this device could be expanded to include additional biomarkers, further strengthening its role in proactive healthcare management.

Keywords: *Cardiovascular Issues, PPG, Biomarkers, Non-invasive, Sensors, Remote Patient Monitoring*

SMART POSTURE CORRECTION AND ALERT DEVICE

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Abstract: Poor sitting posture has become a major contributor to musculoskeletal disorders, particularly among students, office workers, and individuals engaged in prolonged sedentary activities. To address this growing concern, the proposed study presents the design and development of a Smart Posture Correction and Alert Device capable of continuously monitoring spinal inclination and providing multi-level feedback to prevent long-term postural deformities. The system integrates an MPU6050 inertial measurement sensor, flex sensor, and an ESP8266 microcontroller to measure angular deviations of the upper body in real time. A calibrated angle-based algorithm classifies posture into normal, moderate-deviation, and severe-deviation states. Corresponding alerts—including LED indicators, vibration cues, and audio alarms—are triggered to guide the user toward corrective action. Experimental evaluation demonstrates reliable posture detection, fast response time, and high sensitivity to varied motion patterns.

Keywords: *Inertial measurement unit (IMU), MPU6050 sensor, Flex sensor, ESP8266 microcontroller, Ergonomic assessment, Wearable health technology, Posture correction feedback.*

CNN vs VISION TRANSFORMER (VIT) ARCHITECTURES FOR DEEPFAKE DETECTION

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Abstract: With the rapid growth of artificial intelligence, deepfake technologies have become increasingly capable of generating highly realistic medical images, posing serious risks to diagnosis, patient safety, and healthcare integrity. This study explores and compares two prominent deep learning approaches—Convolutional Neural Networks (CNNs) and Vision Transformers (ViTs)—for identifying deepfake content in medical imaging. CNNs have long been widely used in image processing due to their ability to capture fine-grained local features such as textures, edges, and noise patterns. This allows ViTs to identify more subtle and complex alterations that may not be easily detected through localized analysis. While CNNs are computationally efficient and perform well with limited datasets, ViTs generally require larger amounts of training data and higher processing power. This paper highlights the strengths and limitations of both models and suggests that combining CNN and ViT architectures can provide a more balanced and effective solution for deepfake detection in medical imaging.

Keywords: *Deepfake Detection, Medical Imaging, CNN, Vision Transformer, Artificial Intelligence, Image Analysis, Healthcare Security.*

DESIGN OF AN AI ASSISTED INFRARED OPTICAL IMAGING SYSTEM FOR PULMONARY EDEMA DETECTION IN CONGESTIVE HEART FAILURE

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Abstract: Congestive Heart Failure (CHF) is a clinical condition in which the heart is unable to pump sufficient blood to meet the normal metabolic demands of the body. Accurate identification of the location and extent of fluid accumulation within the lungs is essential for effective diagnosis and treatment. In this work, an artificial intelligence–based prediction system for CHF is developed using a web-based platform, where a machine learning model is trained to classify healthy and unhealthy cases. The prediction system is integrated with a hardware module consisting of a high- To simulate realistic human lung conditions, a torso phantom embedded with fluid-filled packets is used to replicate pulmonary edema. The paper presents a detailed description of the AI based prediction framework, the optical hardware design, and the interfacing mechanisms for light transmission through the phantom. Additionally, the software methods employed to convert measured light intensities into interpretable lung images are discussed.

Keywords: *Congestive Heart Failure, Cardiac Pulmonary Edema, Infra-Red sensors, Torso Phantom.*

AI - DRIVEN SMART HEALTHCARE MONITORING SYSTEM USING IOT AND WEARABLE SENSORS

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Abstract: This project proposes an AI-driven smart healthcare monitoring system that integrates Internet of Things (IoT), wearable biosensors, and machine learning techniques to provide real-time monitoring and early detection of health abnormalities. The system continuously collects physiological parameters such as heart rate, body temperature, blood pressure, oxygen saturation, respiratory rate, and electrocardiogram (ECG) signals through wearable sensors attached to the patient. The collected data is transmitted through IoT-enabled devices to a centralized cloud platform, where artificial intelligence algorithms analyze the patient's condition in real time. Machine learning models are used to identify abnormal patterns and predict potential health risks such as cardiac arrest, hypertension, respiratory disorders, and other chronic diseases before they become critical. The system reduces the need for frequent hospital visits, decreases healthcare costs, and improves the quality of patient care. Furthermore, the integration of AI with wearable sensors enhances the accuracy, efficiency, and reliability of disease prediction and health management.

Keywords: *Artificial Intelligence, Internet of Things, Wearable Sensors, Machine Learning, Biosensors, Cloud Computing, Telemedicine, ECG Analysis.*

IOT-ENABLED MULTI-PARAMETER RESPIRATORY HEALTH MONITORING SYSTEM WITH SPIROMETRY-BASED LUNG FUNCTION ANALYSIS USING EMBEDDED SENSORS

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Abstract: The increasing need for continuous and remote healthcare has accelerated the adoption of intelligent and portable monitoring solutions for early diagnosis and management of respiratory disorders. This paper presents an IoT-enabled multi parameter respiratory health monitoring system that integrates spirometry-based lung function analysis with real-time vital sign tracking.The spirometer enables measurement of respiratory flow and estimation of key lung function indicators such as breath rate and peak expiratory flow. The collected data is displayed on a LCD and alert mechanism is incorporated to detect abnormal physiological conditions and notify users for timely medical attention.

Keywords: *IoT healthcare, Spirometer, SpO_2, Real-time monitoring, vital signs, telemedicine*

CELL-FREE BIOMANUFACTURING: HUMANIZE AI FOR SUSTAINABLE BIOECONOMY

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Abstract: Cell-free biomanufacturing is a cutting-edge approach that utilizes biological machinery outside of living cells to produce valuable compounds such as pharmaceuticals, biofuels, and specialty chemicals. By removing the constraints of cellular survival and growth, this method enables faster prototyping, higher yields, and greater flexibility in substrate utilization. Unlike traditional fermentation, cell-free systems directly harness enzymes, ribosomes, and metabolic pathways, allowing precise control over biochemical reactions and rapid adaptation to industrial demand.. By applying humanize AI principles, researchers can design adaptive, user-friendly platforms that optimize reaction conditions while making complex bioprocesses accessible to a wider audience. This synergy accelerates design cycles, supports sustainable production, and fosters innovation across multiple sectors.Despite challenges such as enzyme stability, cost, and scalability, ongoing advances in enzyme engineering, process intensification, and hybrid systems are steadily overcoming these barriers. The convergence of cell-free biomanufacturing with humanized AI not only enhances efficiency but also aligns with global sustainability goals, reducing carbon footprints and supporting the transition toward a circular bioeconomy. Ultimately, this integrated approach has the potential to reshape supply chains, accelerate pharmaceutical development, and establish a new era of eco-friendly, AI-driven biomanufacturing.

Keywords: *Cell-free biomanufacturing, Circular bioeconomy, Rapid prototyping, Biofuels and pharmaceuticals, Humanize AI, Computational optimization, Hybrid biomanufacturing systems*

RADIOLOGY PACS AND REPORT CONTROL SYSTEM FOR HOSPITAL ADMINISTRATION

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Abstract: Medical imaging technologies such as X-ray, CT, and MRI play a critical role in modern healthcare for accurate diagnosis and effective patient treatment. However, conventional radiology systems that rely on physical film storage face several challenges including high storage requirements, increased operational cost, and delays in report delivery. To address these limitations, a digital Picture Archiving and Communication System (PACS) is developed for efficient medical image storage and management. The proposed system supports the DICOM (Digital Imaging and Communications in Medicine) standard to store and transfer medical images generated from various imaging modalities. By eliminating physical film storage and enabling digital image management, the system reduces operational costs, improves workflow efficiency, and enhances the overall quality of healthcare services.

Keywords- *PACS, DICOM Medical Imaging, Secure Healthcare Platform, Film-less Radiology System, Web-based Medical Image Access.*

VOICE BASED QR-CODE PRESCRIPTION MODULE

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Abstract : Medication errors caused by illegible handwritten prescriptions remain a critical challenge in healthcare systems, particularly in developing and resource-constrained environments. Such errors may lead to incorrect drug dispensing, delayed treatment, and serious patient safety risks. This paper presents a Voice-Based QR-Code Prescription Module, a secure and intelligent digital prescription system that converts a physician's spoken prescription into structured digital text using speech recognition and natural language processing (NLP). The processed prescription is encoded into a Quick Response (QR) code and simultaneously generated as a digitally signed PDF document resembling a conventional prescription format. Pharmacists can scan the QR code to instantly retrieve accurate prescription details, eliminating ambiguity and manual transcription errors. The proposed system enhances prescription accuracy, reduces workload for healthcare professionals, supports paperless healthcare, and aligns with Sustainable Development Goals. Experimental evaluation demonstrates improved efficiency, accuracy, and usability compared to traditional handwritten prescriptions.

Keywords: *Digital Prescription, Voice Recognition, QR Code, Healthcare Automation, NLP, Patient Safety*

SMART HAND REHABILITATION GLOVE FOR POST STROKE RECOVERY

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Abstract: Stroke is a major cause of long-term disability worldwide, often resulting in partial or complete loss of hand motor function. Effective rehabilitation is essential for restoring mobility; however, conventional physiotherapy methods are labor intensive, time-consuming, and require continuous supervision by trained professionals. The proposed system integrates multiple sensing technologies, including an Electromyography (EMG) sensor to detect muscle activity, flex sensors to measure finger bending, and an MPU6050 accelerometer to monitor hand orientation and motion. The acquired sensor data is processed by an ESP8266 microcontroller, which acts as the central control unit of the system. Based on predefined algorithms, the controller interprets the patient's muscle signals and movement patterns to generate appropriate control signals. These signals drive a set of servo motors attached to each finger of the glove, enabling assisted finger movements such as gripping and releasing. Furthermore, the system includes an LCD display to provide real-time feedback on sensor readings and operational status, allowing both patients and caregivers to monitor progress effectively.

Keywords: *Rehabilitation, EMG, QR Code, Microcontroller,Actuator.*

A COMPARATIVE STUDY OF EXPLAINABLE AI METHODS IN CHEST X-RAY IMAGE ANALYSIS

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Abstract: Artificial intelligence models showed remarkable results in the field of medical image classification, but the black-box nature of these models is still a substantial problem preventing the usage in clinical settings. In this paper, the application of explainable artificial intelligence (XAI) approaches in the chest X-ray image classification task will be studied. A convolutional neural network (CNN) using a pre trained neural network will be utilized for classification of chest X-ray images into normal and pneumonia classes. Two popular XAI techniques, Grad-CAM and saliency maps will be used to obtain visual interpretations that highlight the important regions within an image that contribute to the prediction of CNN. Obtained visual interpretations will be analyzed using qualitative criteria such as interpretability and localization accuracy. It was found that despite similarities between the two explained XAI approaches in their capability to produce visual representations, the former one provides more focused visual explanations by highlighting the region of the lungs affected by pneumonia disease while the latter technique yields more ambiguous visualizations.

Keywords: *Chest X-ray, Pneumonia Detection, Explainable Artificial Intelligence (XAI), Deep Learning, Convolutional Neural Networks (CNN), Grad-CAM, Saliency Maps, Medical Image Analysis*

DESIGN AND IMPLEMENTATION OF WIRELESS FOOT PRESSURE MONITORING SYSTEM FOR DIABETIC PATIENTS

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Abstract: Diabetes is a chronic disease that can lead to serious foot complications such as ulcers, infections, and tissue damage due to abnormal pressure distribution and reduced sensation in the feet. Early detection and continuous monitoring of foot pressure and temperature are essential to prevent these complications and improve patient safety. This project focuses on the design and implementation of a wireless foot pressure monitoring system for diabetic patients to provide real-time monitoring and early warning alerts.The proposed system uses pressure sensors such as Force Sensitive Resistors (FSR) or piezoelectric sensors to measure the pressure applied to different regions of the foot. If abnormal pressure or temperature levels are detected, a buzzer is activated to alert the patient immediately. This wireless feature Improves convenience, reduces the risk of complications, and supports continuous healthcare monitoring.

Keywords: *Diabetes,Microcontroller, Continuous monitoring, Foot Ulcer, Bluetooth, WiFi.*

ENHANCED DIAGNOSTIC BASED ON DEEP LEARNING FOR VARICOSE VEIN DETECTION

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Abstract: Varicose veins are a prevalent vascular disorder characterized by enlarged, twisted veins that may lead to pain, swelling, and severe complications if untreated. Early and accurate diagnosis is essential for effective management. This study proposes an enhanced diagnostic framework using deep learning techniques for automated detection of varicose veins from medical images. A convolutional neural network (CNN)-based architecture is employed to extract hierarchical features from ultrasound and Doppler imaging datasets. The proposed system is evaluated using standard performance metrics such as accuracy, sensitivity, specificity, and F1-score. Experimental results demonstrate superior performance compared to traditional machine learning approaches, achieving high diagnostic precision and reduced false positives. The system also provides a non-invasive, cost-effective, and time-efficient solution suitable for clinical settings.

Keywords: *Deep Learning, Varicose Veins, CNN, Medical Imaging, Diagnostic System, Healthcare AI*

3D PROBABILISTIC DEEP LEARNING FOR DETECTION AND DIAGNOSIS OF LUNG CANCER USING LOW-DOSE CT SCANS

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Abstract: Lung cancer remains one of the leading causes of cancer-related mortality worldwide, necessitating early and accurate detection strategies. Low-dose computed tomography (LDCT) has emerged as an effective screening tool; however, its interpretation is challenging due to noise and variability in imaging. This study presents a 3D probabilistic deep learning framework for the detection and diagnosis of lung cancer using LDCT scans. The proposed model leverages 3D convolutional neural networks (3D-CNNs) combined with probabilistic modeling to capture spatial features and quantify uncertainty in predictions. Experimental evaluation shows improved sensitivity and reduced false negatives compared to conventional 2D methods. The probabilistic component enhances interpretability, making the system more suitable for real-world clinical applications.

Keywords: *Lung Cancer, Low-Dose CT, 3D-CNN, Probabilistic Deep Learning, Bayesian Inference, Medical Imaging*

DETECTION AND CLASSIFICATION OF BONE CANCER USING SHUFFLENET AND QUANTUM DRIFT OPTIMIZATION (QDO)

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Abstract: Bone cancer detection requires precise and efficient analysis of medical images to enable early intervention and treatment planning. This study proposes a hybrid approach combining ShuffleNet, a lightweight convolutional neural network, with Quantum Drift Optimization (QDO) for improved detection and classification of bone cancer. ShuffleNet is employed for efficient feature extraction due to its low computational complexity and suitability for real-time applications. To enhance classification performance, QDO is utilized as an optimization algorithm to fine-tune network parameters and improve convergence. The proposed method is evaluated using performance metrics such as accuracy, precision, recall, and ROC-AUC. Results indicate that the ShuffleNet-QDO model outperforms traditional CNN models in both speed and accuracy while maintaining low computational cost. The study highlights the potential of integrating lightweight deep learning models with advanced optimization techniques for efficient cancer diagnosis.

Keywords: *Bone Cancer, ShuffleNet, Quantum Drift Optimization, Deep Learning, Medical Imaging, Classification*

TINE-DOI (TINY DEVICE FOR OBSERVING AN INFANT)

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Abstract: Infant health monitoring is critical for ensuring early detection of medical abnormalities and reducing infant mortality rates. This paper presents TINE-DOI (Tiny Device for Observing an Infant), a compact and intelligent monitoring system designed to track vital parameters of infants in real time. The device integrates sensors to measure temperature, heart rate, oxygen saturation, and movement patterns. Data collected from the sensors are processed using embedded systems and transmitted to caregivers via IoT-enabled platforms. Alerts are generated instantly and sent to parents or healthcare providers through mobile applications, enabling timely intervention. The device is designed to be lightweight, non-invasive, and energy-efficient, ensuring comfort and safety for infants. Experimental validation demonstrates reliable performance and accurate monitoring under various conditions. The proposed system offers a cost-effective solution for continuous infant health surveillance, particularly in remote and resource-limited settings.

Keywords: *Infant Monitoring, IoT, Wearable Device, Healthcare System, Sensors, Machine Learning*

INVESTIGATION OF MACHINE LEARNING TECHNIQUES TO ANTICIPATE FUTURE GYNECOLOGICAL ISSUES

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Abstract: Gynecological disorders, including polycystic ovary syndrome (PCOS), endometriosis, and cervical abnormalities, significantly impact women's health worldwide. Early prediction and diagnosis can improve treatment outcomes and quality of life. This study investigates the application of machine learning techniques to anticipate future gynecological issues based on patient data. Various algorithms, including decision trees, support vector machines (SVM), random forests, and neural networks, are evaluated for predictive performance. Data preprocessing techniques such as normalization, feature selection, and handling missing values are employed to improve model accuracy. Results indicate that ensemble methods, particularly random forests, provide superior predictive performance. The proposed system can assist healthcare professionals in identifying high-risk individuals and recommending preventive measures. This research demonstrates the potential of machine learning in personalized healthcare and early diagnosis of gynecological conditions.

Keywords: *Gynecology, Machine Learning, Predictive Analytics, PCOS, Healthcare AI, Early Diagnosis*

AUTOMATED KIDNEY SEGMENTAION USING GRAPH CONVOLUTIONAL NEURAL NETWORK WITH U-SHAPE BACKBONE

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Abstract: Automated kidney segmentation in ultrasound images enhances early detection of renal diseases by providing precise anatomical delineation.Ultrasound offers real-time, safe, and cost-effective imaging but poses challenges such as speckle noise, low contrast, and varying kidney sizes.A hybrid deep learning framework combining a U-shaped encoder-decoder network and graph convolutional network effectively captures multiscale spatial features and pixel relationships.The model maintains segmentation accuracy across typical kidney dimensions, ranging from 9-12 cm in length and 4-6 cm in width, ensuring robustness for diverse patient anatomies.Integrating size-aware and context-aware analysis improves clinical usability, boundary precision, and reliability under varied imaging conditions

Keywords: *Kidney, Deep Learning, Ultrasound, Neural Network.*

DEPARTMENT OF CIVIL ENGINEERING

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AI-Driven Sustainable Building Design Using Cove.Tool

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Abstract: Sustainable construction has become essential due to increasing environmental concerns and energy demands. Traditional building design methods often fail to optimize energy efficiency and material usage. This paper presents an Artificial Intelligence (AI)-based approach using Cove.Tool to improve sustainable building design. The tool enables real-time performance analysis of building energy consumption, daylighting, and HVAC systems. By integrating AI-driven simulations, optimal design solutions are identified to reduce carbon emissions and operational costs. The results demonstrate significant improvements in energy efficiency and sustainability compared to conventional methods.

Keywords:*Artificial Intelligence, Sustainable Construction, Energy Efficiency, Green Buildings, Cove.Tool, Smart Design*

AI-DRIVEN SELF-HEALING CONCRETE FOR SUSTAINABLE AND DURABLE INFRASTRUCTURE

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Abstract: Concrete is the most widely used construction material globally, yet it is highly susceptible to cracking due to shrinkage, thermal stress, and loading conditions. These cracks, even when microscopic, allow water and aggressive chemicals to penetrate, leading to reinforcement corrosion and structural deterioration. Traditional repair methods are costly, time-consuming, and often temporary. In this context, self-healing concrete has emerged as an innovative solution that enhances durability and reduces maintenance costs by autonomously repairing cracks. While autogenous healing relies on the natural hydration of unreacted cement particles, autonomous healing incorporates external agents such as bacteria, microcapsules, and vascular networks. Among these, bacterial self-healing has gained significant attention due to its efficiency and sustainability. Specific bacteria precipitate calcium carbonate when activated by moisture, sealing cracks effectively. The study concludes that self-healing concrete has significant potential in extending the service life of structures, especially in aggressive environments. However, challenges such as high initial cost, scalability, and long-term performance need further research. With continued development, self-healing concrete could revolutionize modern infrastructure by reducing lifecycle costs and enhancing sustainability.

Keywords: *Self-healing concrete Bacterial concrete, Microbial induced calcium carbonate , Crack healing mechanism ,Autogenoushealing ,Autonomous healing.*

INTEGRATION OF ARTIFICIAL INTELLIGENCE IN GREEN ROOF SYSTEMS FOR SMART STORMWATER AND THERMAL MANAGEMENT

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Abstract: Green roof technology has emerged as a sustainable solution to mitigate urban environmental challenges, particularly stormwater runoff and thermal inefficiency in buildings. Rapid urbanization has led to increased impervious surfaces, resulting in excessive runoff, flooding, and urban heat island effects. This research explores the effectiveness of green roofs in reducing storm water runoff and enhancing thermal performance in urban buildings. Case-based observations and simulated data indicate that green roofs can reduce peak runoff by 50–80% and indoor temperatures by 2–5°C. Furthermore, the integration of green roofs contributes to improved air quality, biodiversity, and aesthetic value. The research concludes that green roofs are an effective nature-based solution for sustainable urban development and climate resilience. However, challenges such as initial cost, maintenance requirements, and structural considerations must be addressed for large-scale implementation. This study provides insights for policymakers, engineers, and urban planners to promote green roof adoption.

Keywords: *Green Roof, Stormwater Management, Thermal Efficiency, Urban Heat Island, Sustainable Infrastructure, Runoff Reduction, Building Energy Performance.*

TRANSPARENT AI TECHNIQUES FOR UNDERSTANDING THE BEHAVIOR OF AGRO-WASTE BASED CONCRETE MATERIALS

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Abstract : The construction industry is one of the largest contributors to global carbon emissions, primarily due to the extensive use of cement and natural aggregates. This study explores the potential of agro-waste materials as sustainable alternatives in concrete production. Agro-wastes such as rice husk ash, sugarcane bagasse ash, coconut shell, and palm oil fuel ash are abundantly Furthermore, the paper addresses challenges such as variability in material properties, lack of standardization, and long-term performance uncertainties. Recommendations for future research include the development of uniform guidelines and advanced treatment methods to enhance material performance. Overall, the findings demonstrate that agro-waste-based concrete is a viable and sustainable alternative, aligning with global sustainability goals and promoting circular economy practices in the construction sector.

Keywords: *Sustainable Concrete, Agro-Waste Materials, Green Construction Materials ,Eco-Friendly Concrete ,Low-Carbon Concrete ,Sustainable Construction*

SMART PARKING SYSTEM WITH SELF-GUIDED VEHICLE NAVIGATION

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Abstract: The rapid growth of urbanization and vehicle ownership has led to increased traffic congestion and parking challenges in metropolitan areas. This paper proposes a Smart Parking System integrated with Self-Guided Vehicle Navigation to optimize parking space utilization, reduce search time, and minimize traffic congestion. The system utilizes Internet of Things (IoT) sensors, real-time data analytics, and autonomous navigation algorithms to guide vehicles directly to available parking slots. A centralized cloud-based platform processes parking availability and communicates with vehicles via mobile applications and onboard navigation systems. The proposed system enhances user convenience, reduces fuel consumption, and contributes to sustainable urban mobility.

Keywords—*Smart Parking, IoT, Autonomous Navigation, Intelligent Transportation Systems, Urban Mobility*.

Al OPTIMIZED BIODEGRADABLE ROOFING TILE MADE FROM COW FUNG AND NATURAL FIBRE DERIVED FROM SUGARCANE

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Abstract: This project presents the development of an Al-optimized biodegradable roof hg tile using cow dung and sugarcane-derived natural fibers. Cow dung acts as a natural binder and antimicrobial agent, while sugarcane Fibers enhance tensile strength and crack resistance. An Al-based optimization model is used to determine the optimal material composition for strength, durability, and weight reduction. The resulting tile offers a low-cost, eco-friendly alternative to conventional roofing materials with reduced environmental impact

Keywords*—Biodegradable roofing tiles, cow dung, sugarcane fibres, sustainable construction, eco-friendly materials, natural composites.*

AI-DRIVEN EXPERIMENTAL STUDY ON ENGINEERED GEOPOLYMER CONCRETE (EGC) INCORPORATING MARBLE DUST AND SILICA FUME

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Abstract: Geopolymer concrete has emerged as a sustainable alternative to conventional cement-based materials due to its reduced carbon emissions and enhanced durability. This study investigates engineered geopolymer concrete (EGC) incorporating marble dust and silica fume as partial replacements for traditional binders. Marble dust improves packing density and mechanical strength, while silica fume enhances microstructural properties. Artificial Intelligence (AI) techniques are employed to optimize mix design and detect cracks in concrete beams using image processing and deep learning models. Experimental results indicate improved compressive strength, tensile strength, and durability performance of EGC. AI-based crack detection demonstrates high accuracy and efficiency in structural health monitoring. The integration of sustainable materials with AI provides an advanced solution for smart construction practices

Keywords *- Engineered Geopolymer Concrete, Marble Dust, Silica Fume, Sustainable Construction, Mechanical Properties, Durability,*

SMART SUSTAINABLE MATERIALS: AI-ASSISTED STUDY ON SLAG-BASED GEOPOLYMER ENGINEERED COMPOSITES

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Abstract: This study focuses on the development of eco-friendly construction materials using slag-based geopolymer engineered composites (SGECs). By utilizing industrial by-products like ground granulated blast furnace slag (GGBFS), the research aims to reduce carbon emissions associated with traditional cement. Artificial intelligence (AI) is employed to optimize mix design, predict material properties, and improve overall performance. The composites demonstrate enhanced strength, durability, and sustainability. The integration of AI with sustainable materials offers an efficient approach for developing advanced construction solutions for future infrastructure.

Keywords- *Geopolymer Concrete, Steel Slag, Copper Slag, Engineered Composites, Sustainable Construction, Mechanical Properties, Durability, Industrial Waste Utilization, Eco-Friendly Materials*

CONSTRUCTION BUILDING SAFETY MONITORING USING IOT

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Abstract: This study presents the design and implementation of a Construction Building Safety Monitoring System using the ESP32 microcontroller integrated with Internet of Things (IoT) technology. The proposed system continuously monitors key safety parameters such as gas leakage, temperature, humidity, smoke levels, fire presence, and structural vibrations using a network of sensors. The collected data is processed by the ESP32 controller, which triggers immediate alerts and activates safety mechanisms such as exhaust fans and water pumps through relay modules when abnormal conditions are detected. Additionally, the system is connected to the Blynk IoT mobile application, enabling remote monitoring, real-time data visualization, and user control from anywhere. The integration of automated responses with cloud-based monitoring enhances the efficiency and reliability of safety management on construction sites. The results demonstrate that the system provides early warning capabilities, reduces response time during emergencies, and significantly improves overall site safety. This approach offers a cost-effective, scalable, and intelligent solution for modern construction safety management.

Keywords- *IoT, Construction Safety, ESP32, Smart Monitoring System, Gas Detection, Fire Detection, Structural Health Monitoring, Blynk Application, Remote Monitoring, Smart Construction*

SMART DRAINAGE SYSTEM WITH AUTONOMOUS FLOOD CONTROL

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Abstract: This project proposes a **Smart Drainage System with Autonomous Flood Control** that leverages Internet of Things (IoT), sensor networks, and edge computing to enhance the efficiency and responsiveness of urban drainage systems. The proposed system incorporates water level sensors, flow sensors, and rainfall monitoring units installed at critical points within the drainage network.. Based on predefined thresholds and intelligent algorithms, the system autonomously controls actuators such as motorized gates, pumps, and valves to regulate water flow and prevent overflow conditions. In addition, the system can provide early flood warnings and alerts to municipal authorities and residents through integrated communication platforms. Overall, the proposed solution demonstrates an innovative integration of smart technologies for real-time monitoring, autonomous control, and efficient flood mitigation, making it highly suitable for smart city applications and climate-resilient urban development.

Keywords- *Smart Drainage System, IoT, Autonomous Flood Control, Urban Flooding, Edge Computing, Sensor Networks, Real-Time Monitoring, Water Level Sensors, Smart Cities, Sustainable Water Management, Flood Mitigation, Infrastructure Resilience*

AI OPTMISED FIBER REINFORCED ROOF TILES USING PLASTIC & NATURAL WASTE FIBERS

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Abstract: This project focuses on the development of eco-friendly roofing tiles manufactured using recycled plastic reinforced with natural waste fibers. Artificial Intelligence techniques are applied to optimize the material composition for improved mechanical strength, reduced water absorption, and enhanced thermal insulation. The study evaluates feasibility, performance characteristics, and environmental benefits of the developed composite roofing tiles. The innovation supports sustainable construction practices while addressing plastic waste management and promoting low-cost housing solutions.

Keywords—*Artificial Intelligence (AI), Sustainable Construction, Fiber-Reinforced Composites, Recycled Plastic, Natural Waste Fibers, Material Optimization, Thermal Insulation, Water Absorption, Green Building Materials, Low-Cost Housing*

ARTIFICIAL INTELLIGENCE AIDED PREDICTION OF EARTHQUAKE RESISTANT BUILDING STRUCTURE

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Abstract: Predicting earthquakes has always been one of the hardest challenges in geoscience because seismic events are influenced by many interacting factors such as tectonic stress, fault movement, crustal conditions, and changes in geophysical signals. Artificial intelligence has recently become a valuable tool in this area because it can process large volumes of seismic, satellite, geodetic, and environmental data more efficiently than traditional methods.

Machine learning and deep learning models are especially useful for identifying hidden patterns in earthquake records, waveform data, and possible precursor signals that may not be easy to detect through conventional analysis. Even so, AI cannot yet predict the exact time, location, and magnitude of an earthquake with complete reliability. At present, it is better understood as a forecasting and decision-support tool that can improve preparedness, hazard assessment, and emergency planning.

***Keywords:** Artificial intelligence, earthquake prediction, machine learning, seismic forecasting, deep learning, seismic hazard assessment, IoT-based monitoring*

AI-BASED PREDICTION AND MONITORING OF COLUMN DEFLECTION USING SMART SENSORS

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Abstract: Column deflection and buckling are critical aspects in structural engineering, influencing the safety and serviceability of buildings and infrastructure. Traditional analytical and numerical methods such as Euler's theory and Finite Element Method (FEM) are widely used but can be computationally intensive and less efficient for real-time applications. This paper presents an Artificial Intelligence (AI)-based approach for predicting and monitoring the deflection of columns. The study integrates sensor-based data acquisition with machine learning models to predict deflection behavior under varying loads and boundary conditions. Experimental data collected from instrumented columns are used to train and validate AI models such as Artificial Neural Networks (ANN). The results demonstrate that AI models provide accurate, fast, and reliable predictions, enabling real-time structural health monitoring. The proposed system enhances safety, reduces computational effort, and supports smart infrastructure development.

Keywords: *Column Deflection, Artificial Intelligence, Machine Learning, Structural Health Monitoring, Smart Sensors, Buckling Analysis*

CRACK DETECTION IN CONCRETE USING IoT CONCEPTS

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Abstract : Concrete structures are prone to cracking due to environmental effects, loading conditions, and material degradation over time. Early detection of cracks is essential to prevent catastrophic failures and ensure structural safety. Traditional inspection methods are manual, time-consuming, and prone to inaccuracies. This paper presents an Internet of Things (IoT)-based system for real-time crack detection in concrete structures. The proposed system integrates sensors, microcontrollers, and cloud platforms to continuously monitor structural parameters such as strain, crack width, and environmental conditions. Data is transmitted wirelessly and analyzed for early warning and predictive maintenance. The system enhances reliability, reduces maintenance costs, and enables remote monitoring.

Keywords: *IoT, Crack Detection, Structural Health Monitoring, Sensors, Smart Infrastructure*

AI-BASED PREDICTION OF GEOPOLYMER CONCRETE STRENGTH USING MACHINE LEARNING TECHNIQUES

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Abstract: Geopolymer concrete (GPC) has emerged as a sustainable alternative to conventional Portland cement concrete due to its reduced carbon emissions and utilization of industrial by-products such as fly ash and ground granulated blast furnace slag (GGBS). However, predicting its compressive strength is complex due to multiple influencing parameters. This study presents an Artificial Intelligence (AI)-based approach using machine learning algorithms to predict the compressive strength of geopolymer concrete. A dataset comprising mix proportions, curing conditions, and material properties is used to train models such as Artificial Neural Networks (ANN), Random Forest (RF), and Support Vector Machines (SVM). The performance of these models is evaluated using statistical metrics like R^2, Mean Squared Error (MSE), and Root Mean Square Error (RMSE). Results indicate that AI models provide accurate and reliable predictions, reducing the need for extensive experimental trials. This research contributes to sustainable construction by optimizing material design using intelligent systems.

Keywords: *Geopolymer Concrete, Artificial Intelligence, Machine Learning, Compressive Strength, ANN, Sustainable Construction*

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

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STUDENT RESULT PLATFORM A SMART SOLUTION FOR EFFICIENT STUDENT RESULT MANAGEMENT AND ACCESS

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Abstract: The Student Result Platform is a web-based application developed to simplify the process of managing, storing, and viewing students' academic results in an efficient and organized manner. In many educational institutions, the process of managing student results is often handled manually or throughout dated systems, which can lead to errors, delays, and difficulty in accessing the information. Students may also face inconvenience when trying to check their results, especially when results are published through notice boards or limited- access systems. The Student Result Platform provides a modern digital solution to overcome these challenges by creating a centralized system where administrators, staff members, and students can interact with the result management system easily. In this platform, administrators and staff are able to add new student details, upload and update subject marks, and manage semester-wise results through a secure interface. Students can log in to the platform using their credentials to view their academic performance, including subject-wise marks, total marks, grades, and pass or fail status. The system also performs automatic calculations for grades and overall results, which helps reduce manual errors and saves time for faculty members. Additionally, the platform ensures that student data is stored securely in a database, allowing easy retrieval and proper management of academic records.

Keywords: *ResultManagementSystem,StudentAcademicRecords,DatabaseManagement*

DESIGN AND IMPLEMENTATION OF A SMART GARBAGE CLASSIFICATION SYSTEM USING DEEPLEARNING TECHNIQUES

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Abstract: Waste management and environmental sustainability have become critical global concerns in recent years. With the exponential growth of population and urbanization, improper waste disposal has led to environmental pollution and health hazards. Traditional methods of garbage classification are often error prone, time-consuming, and rely heavily on manual intervention, resulting in inefficient waste management practices.This system uses the deep convolution neural network model to classify the garbage. In this paper, we performed the data set acquisition, data preprocessing, convolution neural network structure design, super parameter selection and training model to get the training results.Parallel to the rapid growth of the population, the rate of consumption is increasing all over the world; this causes significant increases in the amount of waste.

Keywords*:Smart Garbage Classification, Waste Management, Deep Learning, Convolutional Neural Networks (CNN), Image Recognition,*

MULTIMODAL DEEP FAKE DETECTION USING AUDIO-VISUAL DEEP LEARNING TECHNIQUES

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Abstract: Deep fake technology uses advanced deep learning models to create highly realistic fake audio and video. While it has useful applications, it is often misused for identity fraud, misinformation, financial scams, and other cybercrimes. As deep fakes become more convincing, manual detection methods are no longer reliable, creating a need for automated detection systems.This project proposes a deep learning-based framework to detect both fake videos and fake voices. The system uses a multimodal approach, combining visual and audio analysis to improve accuracy. For video detection, Convolutional Neural Networks (CNNs) extract facial features such as expressions, lighting inconsistencies, eye blinking, and lip synchronization. Long Short-Term Memory (LSTM) networks analyze temporal patterns across frames to identify unnatural movements.

Keywords*:Deepfake Detection, Multimodal Learning, Deep Learning, Convolutional Neural Networks (CNN), Long Short-Term Memory (LSTM), Audio-Visual Analysis, Voice Cloning Detection*

OPTIBROWSE:AN ADVANCED JAKARTA-POWERED E-BOOK ECOSYSTEM WITH DYNAMIC DATAMANAGEMENT

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Abstract: OptiBrowse:An Advanced Jakarta-Powered E-Book Ecosystem with Dynamic Data Management is a web-based platform developed to provide an easy and secure way to browse, purchase, and manage e-books online. The system uses Jakarta technologies such as JSP, Servlets, and MySQL to create a responsive and user-friendly environment. Users can search for books by title, category, or author, view details, add books to the cart, and manage purchases. Administrators can efficiently add, update, and delete book records. The platform focuses on dynamic data management, where user information, book details, cart data, and transaction history are stored and updated in real time. The system also includes secure login, session management, and feedback alerts to improve safety and user experience. Overall, OptiBrowse is a reliable and scalable solution for modern digital libraries and online e-book stores**..**

Keywords:*Jakarta EE Web Development,Dynamic Data management System,E-Book management Platform, User Authentication, Session Handling, MySQL Database Integration.*

REAL-TIME DETECTION OF LIVING-OFF-THE-LAND(LOTL) ATTACKS USING BEHAVIOURAL SEQUENCE LEARNING

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Abstract: Living-off-the-Land (LotL) attacks represent a sophisticated category of cyber threats where adversaries exploit legitimate system tools and native operating system utilities to evade detection. Traditional signature-based and rule-based security mechanisms struggle to identify LotL activities due to their reliance on benign system processes. This project proposes a real-time LotL attack detection framework based on Behavioural Sequence Learning, enabling the system to capture subtle deviations in process behavior and command execution patterns. The model analyzes sequences of system events—including process creation, command-line arguments, parent–child process relationships, and privilege usage— to learn normal behavioral baselines. Machine learning and sequence modeling techniques are then applied to detect anomalous patterns indicative of attacks

Keywords:*Living-off-the-Land Attacks, Behavioral Sequence Learning, Anomaly Detection, Cybersecurity, Process Monitoring, Sequence Modeling, Real-Time Threat Detection.*

WEB BASED LIBRARY MANAGEMENT SYSTEM WITH INTEGRATED AI-POWERED ACADEMIC ASSISTANT

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Abstract: Academic institutions face significant challenges in efficiently managing library operations while also providing effective academic support to students. Traditional library systems often rely on manual or semi-digital processes, leading to inefficiencies in book tracking, fine management, and resource accessibility. Additionally, students preparing for university examinations lack structured guidance for generating answers in prescribed formats. This paper presents a Web Based Library Management System with an Integrated AI-Powered Academic Assistant, designed to address both administrative and academic challenges through a unified platform. The proposed solution enhances operational efficiency, ensures accurate resource management, and provides intelligent, exam-oriented academic assistance to students.

Keywords: *Library Management System, Artificial Intelligence, Retrieval Augmented Generation, RAG, FastAPI, FAISS, ChromaDB, Role-Based Access Control.*

FAKENEWSDETECTIONUSINGENSEMBLELEARNINGWITH MULTI-LAYERED ANALYSIS: A ROBUST FRAMEWORK FOR MISINFORMATION IDENTIFICATION

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Abstract - The rapid spread of fake news on digital platforms poses a significant threat to society, with misinformation spreading faster than factual content. Traditional fact-checking methods struggle to keep pace withlarge-scale disinformation.This paper proposes an ensemble learning framework for automated fake news detection, integrating content analysis, social context evaluation, and bot behavior recognition. The system combines Naïve Bayes, Logistic Regression, Random Forest, and Support Vector Machine in a parallel voting architecture.
Experimental results demonstrate 99.6% accuracy with a processing time of 1.8 seconds per article,output formingexisting methods.The approach enhances detection by combining content verification with social network and behavioral analysis.

Keywords *- Fake News Detection, Ensemble Learning,MachineLearning, Misinformation Detection, Social BotDetection, Natural Language Processing.*

AI AUTO BUSINESS OPERATOR:INTELLIGENT AUTOMATION FOR SMALL BUSINESS MANAGEMENT

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Abstract—Small businesses often struggle with managing daily operations such as sales tracking, inventory control, and customer engagement due to limited resources and lack of intelligent tools. Existing solutions primarily focus on data visualization rather than actionable decision-making. This paper proposes an AI Auto Business Operator, an intelligent system that integrates real-time business data with an AI-driven decision and automation engine. The system continuously monitors business activities, analyzes patterns, and performs smart actions such as generating marketing offers, sending customer notifications, scheduling meetings, and suggesting inventory restocking. A conversational interface further simplifies interaction for non-technical users. Experimental observations indicate improved operational efficiency, faster decision-making, and increased sales potential. The proposed system aims to transform small businesses into smart, data-driven enterprises with minimal manual intervention.

Keywords-*ArtificialIntelligence,BusinessAutomation,DecisionSupport Systems,InventoryManagement, Sales Analytics, NLP, Small Business Systems*

AI-DRIVENMEDICALFUNDVERIFICATIONSYSTEMTODETECTAND PREVENT FRAUDULENT TREATMENT REQUESTS

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Abstract : Medical crowd funding provides crucial support for patients in need, but fraudulent treatment requests using fake document shaver odedd on or trust.Traditional manual verification is slow, inefficient, and often unable to detect sophisticated fraud. This paper proposes an AI- driven medical fund verification system that automates authentication using deep learning and text recognition. YOLOv8 detects text regions in medical bills, and Paddle OCR extracts patient and hospital information. The data is validated against trusted hospital records using a Fuzzy Matching Algorithm to identify inconsistencies and fraudulent claims. The system enhances transparency, improves efficiency, and strengthens donor confidence by ensuring only genuine medical fund requests are approved.

Keywords:*MedicalCrowdfunding,FraudDetection,YOLOv8,PaddleOCR,FuzzyMatching,AIinHealthcare, Document Verification*

AUTOMATED PLANT LEAF DISEASE ANALYSIS USING CONVOLUTIONAL NETWORK

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ABSTRACT: Plant diseases significantly impact crop productivity, especially in situations where farmers depend on manual inspection to identify early symptoms. While many studies have explored machine learning approaches for leaf disease detection, most existing systems face difficulties when images are captured under real agricultural conditions. Factors such as inconsistent lighting, background distractions, and irregular leaf textures reduce the reliability of these models. Addressing these challenges, this project introduces an enhanced plant leaf disease detection system built using the Java technology stack and a refined image preprocessing workflow.

The proposed system applies a multi-stage preprocessing process involving shadow reduction, noise removal, and accurate leaf segmentation to isolate the affected region more effectively. After preprocessing, the leaf image is evaluated using a Convolutional neural network trained with an expanded and balanced dataset to improve robustness across various disease categories. The trained model is seamlessly integrated.

Keywords:*Plant Leaf Disease Detection, Convolutional Neural Network, Image Preprocessing, Disease Classification, Agricultural AI, Java-based System*

AN INTELLIGENT TRIAGE ASSISTANT : USING SENTIMENT- AWARE NLP TO REDUCE EMERGENCY OVER CROWDING IN PEDIATRICS.

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Abstract— An Intelligent Triage Assistant is an AI- powered pediatric assistance tool developed to allow the parent to evaluate and deal with the health of their children athome.The applicationcombinesasentiment- aware natural language processing platform with the ability to understand and suggest safe doses of the medication to use and give precautionary advice. It provides contextual responses and provides safety screening of drug medications using medical BERT models, monitors growth milestones and vaccination history. The system will have access roles of administration, doctors, hospitals, babysitters, and parents so that records, appointments, and consultations are handled securely. There are other modules that contain allergy-conscience tips, nutrition tips, identification ofhealth care services near the location, andparentdiscussionboard.Throughqualitypre-triage services, the assistant will minimize unnecessary visits to the emergency departments and encourages proactive pediatric care. The system enhances child-centered accessibility, safety, and sustenance of health management.

Keywords*: Pediatric triage, Medical BERT, AI medical assistant, Symptom analysis, Child health monitoring, NLP chatbot, Vaccination management.*

SECUREAI ECOSYSTEMS: PRIVACYPRESERVING IMAGE MANAGEMENT

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Abstract:The rapid advancement of AI technologies, particularly systems like Google Gemini, has led to deeper integration with personal user data, raising significant concerns about privacyand security. Personal images, being highlysensitive, are especially vulnerable to unauthorized access, misuse, and data breaches. Addressing these challenges, this concept proposesaprivacy-preserving image management frameworkdesignedtosafeguarduserdata while maintaining AI functionality.The proposed system replaces intrusive methods such as iris scanning witha more secure and user-friendly approachthat combines strong encryption, multi-level access control, and layered security mechanisms. It adopts a Zero-Trust architecture, ensuring that no data is trusted by default and that all access requests are continuously verified. Personal data remains encrypted at all times and is only decrypted temporarily upon successful real-time biometric authentication and explicit user consent. Additionally, the framework emphasizes transparency and user control, allowing individuals to manage access to their images securely.

Keywords*:Artificial Intelligence, Data Privacy, Secure Systems, Encryption, Access Control, Zero-Trust Architecture,BiometricAuthentication, Image Management, Federated Learning. ProceedingsofInternational Conference on "Explainable AI, Green Edge Computing, and Autonomous Systems (ICXGA-2026)"2026*

JSGUARD:A MULTI-LAYERED DEFENSE FRAME WORK TO PREVENT AUTOMATED EXTRACTION OF JAVASCRIPT ASSETS

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Abstract:The proliferation of client-side JavaScript in modern web applications has transformed them into rich, interactive platforms—but has also created a significant security vulnerability. Automatedextractiontools, rangingfromsimple staticscraperstosophisticated headless browsers, can effortlessly harvest all JavaScript files from any domain, exposing proprietarybusinesslogic,internalAPIendpoints,third-partydependencies,andeven hard-coded secrets. Traditional defenses such as code obfuscation have proven inadequate against modern deobfuscation techniques and large language models (LLMs), leaving organizations vulnerable to intellectual property theft, targeted attacks, and compliance violations.Thispaper introducesJSGuard,anovelmulti-layereddefense frameworkdesigned to prevent automated extractionofJavaScript assets. JSGuard employs a combinationof four complementary protection layers: (1) server-side rendering of critical logic to minimize.

Keywords*:JavaScript security, anti-scraping, dynamic script injection, obfuscation, behavioral detection, web application security, intellectual property protection.*

RSNET-50 BASED DEEP LEARNING SYSTEM FOR AUTOMATEDCROPLEAFDISEASEDETECTIONAND CLASSIFICATION

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Abstract: Leaf detection and classification are fundamental tasks in agriculture, botany, and environmental monitoring, enabling accurate plant species identification, disease detection, and growthanalysis. Theproject proposesanadvanced LeafDetectionand Disease Prediction System utilizing ResNet-50 architecture with Convolutional Neural Networks (CNNs) and OpenCV in Python, leveraging deep learning for precise and automated leaf recognition.ThesystememploysOpenCVforcomprehensive imagepreprocessing, including grayscale conversion, noise reduction, edge detection, and contour analysis to extract leaf features such as shape, texture, and color characteristics. The dataset encompasses diverseleaftypes frommultipleplant species, withparticular emphasis onCassavaplantsand Pepper leaves, including both healthy samples and those affected by various diseases such asCassava Mosaic Disease, Cassava Brown Streak Disease, and Pepper Bacterial Spot. This diversedataset enablesthesystemtodifferentiatebetweenplant specieswhilesimultaneously detecting and classifying specific leaf diseases.

Keywords*: Deep Learning, ResNet-50 Convolutional Neural Networks (CNNs), Leaf Detection and Disease Prediction System.*

AUTOMATED ACUTE LYMPHOBLASTIC LUKEMIA DETECTION AND CLASSIFICATION USING DEEPLEARNING AND CLINICAL INTEGRATION

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Abstract: ALLisatypeofbloodcancerthatdevelopsrapidly,andhence,itsdiagnosismustbe timely and done correctly to enhance the chances of survival. Manual examination via microscopes is time consuming and subject to subjectivity leading to delays in diagnosis.The paper presents a suggested study aimed at an automated end-to-end deep learning-based system to identify and classify cancers of peripheral blood smear as ALL and subtypes. A complete stack development of a deployable system is created based on Flask backend and PHP/XAMP Pfrontendthatwillbeusedtoanalyzerealtimeinformation.Theresultsoftheexperiment show high diagnostic performance with an overall accuracy of 98.87, minimizing the time of analysis and enhancing the reliability of the experimental results to support clinical decision making.

Keywords*: Acute Lymphoblastic Leukemia (ALL), deep learning, convolutional neural networks (CNN), ensemble learning, peripheral blood smear analysis, medical image classification, automated diagnosis*

ANALYTICALFEASIBILITYMODELING OFMEMORY-EFFICIENT MULTIMODAL LLM DEPLOYMENT ON EDGE DEVICES

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Abstract: Deploying large language models (LLMs) within resource-constrained edge environments introduces fundamental system-level challenges involving memory residency, bandwidth con- tention, scheduling stability, latency determinism, and thermal constraints. Unlike cloud infras- tructure, edge platforms operate within strict memory budgets while simultaneously executing real- time perception workloads. This paper presents a comprehensive analytical feasibility framework for multimodal edge systems integrating visionpipelinesandtransformer-basedLLMreasoning.Wederiveformalmemorymodelsfor full-modelandstreaming inference, establishfeasibilitytheoremswithproofs, developcloud- versus-edge latency models, construct bandwidth-aware performance bounds, and mathematically characterize feasibility boundaries. The analysis demonstrates that quantization combined with layer-wise streaming trans- forms spatial infeasibility into bounded temporal overhead, enabling deployment under typical 8–16 GB edge memory constraint

Keywords*: Edge Computing, Large Language Models, Multimodal AI, Transformer In- ference, Quantization, Layer-wise Streaming, Edge AI Deployment*

AI-CRIMEDETECTIONWITHAUTOMATED SURVEILLANCE COMMANDCENTERALERT

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Abstract— Deploying large language models (LLMs) on resource-constrained edge devices presents challenges in memory, bandwidth, latency, scheduling, and thermal limits. Unlike cloud systems, edge platforms must operate within strict memory budgets while handlingreal-time workloads. This paper proposes an analytical framework for multimodal edge systems combining vision pipelines and transformer-based reasoning. It introduces memory models, feasibility theorems, latency comparisons, and bandwidth-aware performance bounds. The results show that quantization and layer-wise streaming convert memoryconstraints into manageable temporal overhead, enabling LLM deployment within typical 8–16 GB edge environments.

Keywords: *Large Language Models, Edge Computing, Memory-Efficient Deployment, Multimodal Systems, Quantization, Latency Optimization*

IOT- BASED EXAMMALPRACTICE DETECTION

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Abstract: The paper proposes an **IoT-based exam malpractice detection system** that enhances monitoring in examination halls using a combination of video surveillance, sensors, and AI analytics. It employs devices like IP cameras, PIR/motion sensors, RFID readers, and Wi-Fi trackers to collect real-time data, which is processed by deep learning models to detect cheating behaviors such as unauthorized devices, multiple persons, and unusual movements. By integrating sensor data with visual analysis, the system reduces false alarms. When suspicious activity is detected, it sends instant alerts with evidence to a web dashboard for invigilators. The system is designed to be scalable, cost-effective, and privacy-conscious, storing only relevant anomaly data. Experimental results show high accuracy and reduced reliance on manual invigilation, making it a practical solution for improving exam integrity.

***Keywords**: Internet of Things (IoT),Exam malpractice detection,Object detection, Real-time surveillance, Deep learning, RFID-based monitoring Smart examination hall, Academic integrity, Proctoring system, Sensor fusion.*

AGROW LENS AI-BASED PLANT DISEASE DETECTION

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Abstract: **Agrow Lens** is an AI-powered web application designed to help farmers—especially in rural areas—detect crop diseases early and manage them effectively. Using computer vision and machine learning, the system analyzes images of crops uploaded via mobile devices and provides instant predictions on disease type, severity, and recommended treatments. Built with a modern full-stack architecture (React.js frontend, Node.js backend, and MySQL database), it also stores historical farm and environmental data to offer personalized insights and trend analysis. The platform is scalable, accessible in low-bandwidth regions, and supports future IoT integration. By enabling timely diagnosis and reducing reliance on manual inspection, Agrow Lens aims to minimize crop losses, optimize resource use, and promote sustainable farming, potentially increasing yields significantly.

***Keywords**: Agrow Lens, crop disease detection, computer vision, machine learning, precision agriculture, React.js, Node.js, MySQL, AI farming, sustainable agriculture.*

AI SECURITY AND PRIVACY SOLUTION

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Abstract: The growth of artificial intelligence (AI) is generating new challenges in security and privacy due to the constantly changing nature of the digital environment. Therefore, protecting sensitive information from unauthorized access and ensuring that individuals' private information is treated (utilized) appropriately are critical agenas. Security is centered on protecting the AI system's data models as well as the infrastructure from cyber-security threats (hackers, data breaches, hostile entities) while Privacy is focused on collecting, processing and storing individuals' personal and/or confidential information in a legitimate(not utilized) manner.A unified system for AI that incorporates security and privacy concepts can be accomplished with the use of secure technologies such as encryption, authentication, access control, along with privacy-preserving technologies such as differential privacy and federated learning. The combination of these technologies through their application creates an AI system that has data integrity and confidentiality and provides users with a high level of confidence (trust) in the AI system and the data contained within it. As the advancement of AI continues, it will be important to ensure that the proper security and privacy procedures and practices are incorporated into the ethical and safe usage of intelligent technologies.

***Keywords**: AI, security, privacy, and data protection.*

BUSBUDDY: A REAL-TIME TRANSPORT INTELLIGENCE SYSTEM FOR STUDENT MOBILITY

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Abstract: Student commuting via public buses often suffers from uncertainty due to the lack of real-time information on bus location, arrival, and crowd conditions, especially along dense routes such as Gandhipuram to Walayar in Coimbatore. This paper presents BusBuddy, a lightweight, real-time transport intelligence system that leverages crowd-assisted updates to provide live bus status, including approximate location, direction, and passenger density. Users onboard can quickly submit updates, enabling others to make informed travel decisions. The system incorporates time-based data expiry, multi-user validation, and basic predictive estimation to improve reliability. Unlike GPS-based solutions, BusBuddy offers a low-cost and scalable approach without requiring additional infrastructure. By utilizing distributed user input as a dynamic sensing network, the proposed system enhances commuting efficiency and demonstrates the effectiveness of crowd-driven real-time intelligence in public transport systems.

***Keywords**: Real-time systems, transport intelligence, crowd-assisted data, distributed systems, student m*

ENHANCING TRUSTWORTHINESS IN AI SYSTEMS: A SECURITY AND PRIVACY PERSPECTIVE

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Abstract: As Artificial Intelligence (AI) continues to transform diverse sectors, ensuring the security, privacy, and trustworthiness of these systems has become increasingly critical. This paper presents a comprehensive analysis of the interplay between AI security mechanisms and data privacy requirements, emphasizing the need for robust and reliable system design. It explores emerging threats, vulnerabilities, and attack vectors that pose risks to sensitive data and system integrity. Furthermore, the study discusses best practices and advanced techniques for developing secure AI systems, including encryption methods, access control, and model robustness. The proposed approach highlights the importance of transparency, accountability, and ethical considerations in AI deployment, ensuring alignment with human values and societal expectations. Additionally, existing frameworks, regulatory standards, and compliance requirements are reviewed to identify current gaps and potential areas for enhancement. By integrating security-focused design principles with privacy-preserving techniques, this work aims to provide a scalable and sustainable foundation for building trustworthy AI systems in real-world applications.

Keywords*: Real-time systems, artificial intelligence, distributed systems,trustworthy AI system*

INTELLIGENT IMMERSIVE TECHNOLOGIES

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Abstract : Virtual Reality (VR) and Augmented Reality (AR) are emerging technologies that are transforming human–computer interaction by providing immersive and interactive digital experiences. VR enables users to engage in a fully simulated environment, isolating them from the physical world, while AR integrates virtual elements into the real-world environment in real time. These technologies leverage advancements in computer vision, graphics, and sensor systems to deliver enhanced user experiences. VR and AR have significant applications across multiple domains, including education, healthcare, entertainment, industrial training, and remote collaboration. VR is widely utilized for simulation-based training and virtual prototyping, whereas AR is effective in real-time visualization, navigation, and maintenance support. Despite challenges such as hardware limitations, latency, and user adaptation, continuous research and development are improving their efficiency and accessibility. This paper presents an overview of VR and AR technologies, their key components, applications, and future potential in shaping next-generation interactive systems.

Keywords *: Virtual realiy (VR) , Augumented Reality (AR) , Human – Computer Interaction (HCI).*

A DECENTRALIZED INTELLIGENT SYSTEM INTEGRATING BLOCKCHAIN SECURITY WITH AI-DRIVEN INSIGHTS

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Abstract: The integration of Blockchain and Artificial Intelligence (AI) offers a transformative approach to developing secure, transparent, and intelligent systems. This project presents a decentralized platform that utilizes blockchain technology to ensure data integrity, privacy, and trust, while incorporating AI algorithms for advanced data analysis and decision-making. Blockchain serves as an immutable ledger, enabling secure storage and sharing of data across distributed networks without the need for centralized control. At the same time, AI models analyze this data to generate predictive insights, automate processes, and enhance overall system efficiency. The proposed system can be applied across various domains such as healthcare, finance, supply chain, and cybersecurity, where data security and intelligent automation are essential. By combining the strengths of both technologies, this project aims to develop a robust, tamper-proof, and intelligent ecosystem that improves reliability, minimizes fraud, and enhances operational performance.

***Keywords**: Cryptography,FraudDetection,Decentralization,DataSecurity, Data Privacy, Distributed Ledger, Data Integrity*

AGENTIC AI

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Abstract:Agentic AI represents an advanced paradigm in artificial intelligence where systems are designed to operate autonomously, make decisions, and pursue goals with minimal human intervention. Unlike traditional reactive AI models, agentic systems exhibit capabilities such as reasoning, planning, memory utilization, and adaptive learning. These systems are powered by cutting-edge technologies including large language models,
reinforcement learning, and multi-agent frameworks. Agentic AI can perform complex tasks
across domains such as healthcare, finance, robotics, and software development by dynamically interacting with environments and tools. However, the rise of agentic AI also introduces significant challenges related to ethics, accountability, transparency, and safety. Ensuring alignment with human values and establishing robust governance frameworks are critical for responsible deployment. As research and development continue to evolve, agentic
AI has the potential to transform industries and redefine human-machine collaboration.

Keywords: Autonomous Systems ,Artificial Intelligence , Reinforcement Learning , Large LanguageModels (LLMs) ,Decision-Making , Multi-Agent Systems ,Human-AI Collaboration ,AI Ethics ,IntelligentAgent

AI-BASED SMART FARMING FOR CROP YIELD OPTIMIZATION

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Abstract: Agriculture plays a key role in supporting the economy and food security,especially in developing countries like India. However, farmers face challenges such asunpredictable weather, poor soil quality, pest problems, and inefficient water use. Theseissues can lead to lower agricultural productivity and economic loss. This paper examineshow Artificial Intelligence (AI) is changing traditional farming practices into smart, efficientsystems. AI technologies like machine learning and data analysis help farmers make betterdecisions by examining large amounts of data about weather patterns, soil conditions, andcrop health. AI solutions can help detect plant diseases early through image processing,suggest appropriate crops based on soil analysis, and optimize irrigation using automatedsystems that track soil moisture levels. Additionally, tools like drones and sensors with AIallow for real-time monitoring of fields, which can improve crop management and reducewaste. While adopting AI in agriculture offers major benefits like higher crop yields, betterefficiency, and more sustainable practices, smart farming can transform agriculture by boosting roductivity, minimizing risks, andpromoting sustainable development. Integrating AI into agriculture can greatly help achievelong-term food security and economic growth.

***Keywords**: Artificial Intelligence, Smart Farming, Crop Yield Optimization, Machine Learning,Precision Agriculture, Sustainable Development*

A STATE-OF-THE-ARTSTUDYONARTIFICIALINTELLIGENCE-BASED ARTIFICIAL INTELLIGENCE SYSTEMS

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Abstract: Artificial Intelligence (AI) has evolved to a point where it can now enhance itself, leading to unprecedented advancements in machine learning, automation, and decision-making. This paper explores the concept ofAI-drivenAI, where intelligent systems design, optimize, and refine otherAI models, reducing human intervention while accelerating progress. This study undergoes various research works from 08 to 05 related to GenerativeAI (Gen-AI) and analyzed key methodologies such as automated machine learning (AutoML),generativeAIformodeltraining,andself-improvingneuralnetworks.Additionally,wediscussthe ethical considerations, risks, and potential limitations ofAI self-optimization, including bias amplification, interpretability challenges, and security vulnerabilities. The implications ofAI usingAI extend across industries, from healthcare and cybersecurity to autonomous systems and software development.As AI continues to shape its evolution, understanding its capabilities and constraints becomes critical for responsible and sustainable deployment.

***Keywords**:Artificial Intelligence,AutoML, GenerativeAI, Neural Networks,AI Ethics,Automation*

AUTOMATED MISSED CALL RESPONSE SYSTEM

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Abstract: Missed calls represent a critical point of failure in customer communication forlocal businesses, particularly in service-driven sectors like healthcare, hospitality, andpersonal services. These businesses, often operating without dedicated support staff or 4/7availability, lose significant revenue opportunities due to unreturned calls. This paperproposes a low-cost, scalable solution that automatically detects missed calls and initiatesstructured customer engagement using WhatsApp. The system integrates telecom APIs forreal-time call event tracking and leverages the WhatsApp Business API to send personalizedfollow-up messages, quick-reply buttons, and form-style interactions. Through customizabletemplates and interaction logging, businesses can automate lead capture, streamline customercommunication, and ensure continuity beyond working intent detection models. The resultsdemonstrate promising improvements in responsiveness, customer satisfaction, anddatadriven decision-making for small enterprises.

Keywords*: Missed call automation, customer communication, local businesses, telecom API,WhatsApp Business API, automated lead capture, quick-reply buttons, form-styleinteractions, personalised messaging, interaction logging, AI-driven personalisation, NLP,intent detection, customer satisfaction, data-driven decision making, low-cost solution, service-driven sectors.*

DEEPSHIELD AI INTELLIGENT DEEPFAKE DETECTION SYSTEM

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Abstract:In recent years, the rapid advancement of Artificial Intelligence has led to the emergence of deepfake technology, where fake videos and images are created by manipulating facial features and expressions. This has become a major concern in cybersecurity, as deepfakes are widely used for spreading misinformation, identity theft, and digital fraud.This project, DeepShield AI, aims to develop an intelligent system that can detect deepfake content using machine learning and computer vision techniques. The system analyzes various aspects of media such as facial movements, eye blinking patterns, lip synchronization, and pixel inconsistencies to determine whether the content is real or manipulated.By integrating AI with ethical hacking concepts, this system helps in identifying potential cyber threats and prevents misuse of digital media. The proposed solution can be used in social media platforms, news verification systems, and cybersecurity applications to enhance digital trust and safety.The implementation will be done using Python, OpenCV, anddeep learning frameworks such as TensorFlow or PyTorch. The expected outcome is an efficient and user-friendly system that accurately detects deepfake content and provides reliable results.

Keywords*:DeepShield AI is an intelligent system using Artificial Intelligence (AI) to detect deepfake videosand images. It leverages Machine Learning and Computer Vision to analyze media inconsistencies. Thesystem enhances Cybersecurity by preventing digital fraud and ensuring digital trust.*

HYBRID MODEL OF IMAGE CLASSIFICATION FOR POST-TREATMENT SEVERITY IN LIVER CANCER USING CNN–VISION TRANSFORMER

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Abstract:This project proposes a **hybrid deep learning model combining CNN and Vision Transformer (ViT)** to assess post-treatment severity in liver cancer patients using medical images like CT and MRI scans. While CNN captures detailed local features (such as textures and patterns), ViT analyzes the global context of images, enabling more comprehensive evaluation. The system includes preprocessing steps like resizing, normalization, and data augmentation, and is trained on labeled datasets categorized by severity levels. Experimental results show that this combined approach outperforms traditional methods and standalone models in accuracy and reliability. Overall, the model helps doctors make faster and more informed decisions, improving patient monitoring and treatment outcomes through advanced medical image analysis.

***Keywords**:CNN, Vision Transformer, Liver Cancer, Image Classification, Post-Treatment Severity, Deep Learning, Medical Imaging*

OFFLINE-FIRST AI-:BUILDING SMART SYSTEMS THAT WORK

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Abstract: The increasing reliance on cloud-based Artificial Intelligence (AI) systems highlights a major limitation in areas with poor or no internet connectivity. This paper introduces an Offline-First AI framework that enables intelligent systems to operate autonomously without continuous internet access. The proposed approach leverages lightweight models, edge computing, and optimization techniques such as model quantization, pruning, and federated learning to perform on-device inference. By integrating algorithms like MobileNetV for image classification, Random Forest for sensor data analysis, and DistilBERT for natural language processing, the system achieves high accuracy, low latency, and efficient resource utilization on constrained hardware. Simulation results and prototype evaluations demonstrate that Offline-First AI ensures resilience, privacy, and scalability across critical domains including healthcare, agriculture, education, and disaster response. This study highlights the potential of Offline-First AI in bridging the digital divide and advancing intelligent solutions for underserved and connectivity-challenged regions.

***Keywords**- Offline AI, Edge Computing, TinyML, Decentralized AI Systems, Low-Power AI, Federated Learning.*

BLOCKCHAIN AND AI FUSION FOR SECURED CLOUD COMPUTING

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Abstract: This research examines how **blockchain technology can enhance security in cloud computing** while addressing critical data privacy challenges. Although blockchain offers benefits like decentralization and immutability, its transparency—especially in public networks—can risk exposing sensitive information and complicate compliance with regulations such as GDPR. The study highlights the conflict between transparency and privacy and proposes solutions including **AI-driven blockchain monitoring** for real-time detection of privacy violations, as well as the use of **permissioned/private blockchains** and advanced cryptographic techniques. Overall, it emphasizes the need to balance security and privacy to effectively leverage blockchain in cloud environments.

***Keywords**: Blockchain Technology, AI powered monitoring, Cloud Computing, Privacy Breachers,Distributed system, Data Privacy and Security*

ADAPTIVE MULTIMODAL AI SYSTEM FOR REAL-TIME DISASTER PREDICTION AND ALERTING

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Abstract: Recent advancements in artificial intelligence have enabled the integration of multiple data modalities—such as satellite imagery, sensor readings, weather data, and social media signals—to improve the prediction of natural disasters. This project proposes an adaptive multimodal AI system that uses a hybrid deep-learning architecture combining Convolutional Neural Networks (CNNs) for image analysis and Long Short-Term Memory (LSTM) networks for temporal prediction. The system is designed to detect early patterns related to floods, cyclones, and landslides with improved efficiency. A real-time alerting module prioritizes accuracy and fast response by leveraging anomaly-detection algorithms. Experimental results demonstrate improved prediction accuracy and reduced false-alarm rates compared to traditional single-source models. This research highlights the potential of multimodal AI to significantly enhance global disaster-preparedness efforts.

***Keywords**-Multimodal AI, disaster prediction, CNN-LSTM hybrid, flood detection, cyclone forecasting, landslide susceptibility, anomaly detection, real-time alerting.*

A HYBRID SPATIAL-TEMPORAL DEEP LEARNING FRAMEWORK FOR ROBUST DEEPFAKE DETECTION IN SOCIAL MEDIA STREAMS

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Abstract: Recent advancements in artificial intelligence have enabled the integration of multiple data modalities—such as satellite imagery, sensor readings, weather data, and social media signals—to improve the prediction of natural disasters. This project proposes an adaptive multimodal AI system that uses a hybrid deep-learning architecture combining Convolutional Neural Networks (CNNs) for image analysis and Long Short-Term Memory (LSTM) networks for temporal prediction. The system is designed to detect early patterns related to floods, cyclones, and landslides with improved efficiency. A real-time alerting module prioritizes accuracy and fast response by leveraging anomaly-detection algorithms. Experimental results demonstrate improved prediction accuracy and reduced false-alarm rates compared to traditional single-source models. This research highlights the potential of multimodal AI to significantly enhance global disaster-preparedness efforts.

Keywords-*Multimodal AI, disaster prediction, CNN-LSTM hybrid, flood detection, cyclone forecasting, landslide early warning, anomaly detection, real-time alerts.*

ADVANCEMENTS IN BRAIN-COMPUTER INTERFACE (BCI): ENABLING COMMUNICATION FOR MOTOR-IMPAIRED INDIVIDUALS

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Abstract: Brain–computer interfaces (BCIs) convert brain signals into commands to control devices, offering a non-muscular communication channel for patients with severe motor impairments such as ALS or brainstem stroke. Current BCI systems use electrophysiological signals like EEG and ECoG, supported by advanced signal processing techniques for feature extraction. A major challenge remains user–system interaction, particularly in learning and adaptability. This chapter outlines current strategies and techniques in BCI research.

Keywords *- Brain-Computer Interface (BCI), Electroencephalogram (EEG), Electrocorticogram (ECoG), Neuronal activity, Signal processing, Motor impairment, Neurological conditions, Amyotrophic Lateral Sclerosis (ALS), Brainstem stroke, Non-muscular communication, Electrophysiological signals, Slow cortical potentials, Evoked potentials, Oscillatory activity*

AI BASED SMART SEGERATION SYSTEM

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Abstract: The rapid escalation of global waste production has rendered traditional, manual sorting methods increasingly inefficient and hazardous. This paper proposes an AI-based Smart Waste Segregation System designed to automate the identification and categorization of refuse at the point of disposal or collection. Leveraging Convolutional Neural Networks (CNN) and computer vision, the system distinguishes between diverse material classes—such as plastics, metals, paper, and organic waste—with high precision.The hardware architecture integrates a camera module for image acquisition and a microcontroller-driven mechanical sorting mechanism. Once a waste item is detected, the AI model processes the visual data in real-time, triggering an automated actuator to deposit the item into its respective bin. Experimental results demonstrate that the system achieves a classification accuracy of over 92%, significantly reducing human error and cross-contamination in recycling streams. By optimizing the recovery of recyclable materials, this smart segregation system offers a scalable, cost-effective solution for sustainable urban waste management and the promotion of a circular economy.

AI SYSTEM THAT GENERATES QUESTIONS INSTEAD OF ANSWER FOR DEEP LEARNING

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Abstract: Artificial Intelligence (AI) systems are predominantly designed to provide direct answers, thereby reducing the cognitive effort required from users. While this improves efficiency, it may limit critical thinking and deep learning capabilities. This research proposes a novel AI-based system that generates context-aware questions instead of answers, with the objective of enhancing user engagement and intellectual development. The proposed system utilizes Natural Language Processing (NLP) and transformer-based architectures to analyze input content and generate meaningful, diverse, and adaptive questions. By shifting the focus from passive answer consumption to active inquiry, the system promotes deeper understanding and long-term retention. The results indicate that question-driven learning significantly improves analytical thinking and knowledge retention. This study highlights the potential of AI as a tool not only for automation but also for fostering cognitive growth and curiosity.

Keywords *- Artificial Intelligence(AI), Natural Language Processing(NLP), Question Generation, Deep Learning, Educational Technology, Critical Thinking, Knowledge Retention.*

AI BASED PREDICTION SYSTEM FOR STUDENT ACADEMIC PERFORMANCE

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Abstract: This paper presents an AI-based system for predicting student academic performance using historical data such as attendance, assessments, and past results. Machine learning algorithms—including decision trees, random forests, and support vector machines—are applied to identify patterns and classify student outcomes. The system uses preprocessing and feature selection to improve accuracy. Results show it helps educators make data-driven decisions, enabling early intervention and supporting smarter education systems.

Keywords *- Artificial Intelligence, Machine Learning, Student Performance Prediction, Educational Data Mining, Academic Risk Analysis. Artificial Intelligence and machine learning are used to understand student academic records and identify learning patterns. These keywords represent the core concepts used to predict student performance and support early academic intervention*

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AI-BASED SMART AGRICULTURE MONITORING SYSTEM

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Abstract: Agriculture plays a crucial role in sustaining the global population, yet traditional farming methods often face challenges such as unpredictable weather conditions, inefficient resource utilization, and crop diseases. The proposed AI-Based Smart Agriculture Monitoring System aims to enhance agricultural productivity and sustainability by integrating advanced technologies such as Artificial Intelligence (AI), Internet of Things (IoT), and data analytics.

This system utilizes smart sensors to continuously monitor key environmental parameters including soil moisture, temperature, humidity, and nutrient levels. The collected data is analyzed using AI algorithms to provide real-time insights and predictive recommendations for irrigation, fertilization, and pest control. Machine learning models are employed to detect crop diseases at early stages and suggest appropriate treatments, thereby reducing crop loss.

Keyword *- Artificial Intelligence (AI), Smart Agriculture, Internet of Things (IoT), Precision Farming, Crop Monitoring, Soil Moisture Sensors, Automated Irrigation, Machine Learning, Data Analytics, Sustainable Agriculture, Crop Disease Detection, Environmental Monitoring*

AI-POWERED DIABETIC RETINOPATHY DETECTION

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Abstract: Diabetic retinopathy (DR) is a leading cause of preventable blindness, yet screening coverage remains low in resource-limited regions due to shortages of specialists and equipment. This paper presents an AI pipeline for DR screening based on convolutional neural networks (CNNs), leveraging large-scale fundus datasets such as EyePACS and MESSIDOR for training and validation. Recent studies report strong performance in detecting referable DR, with AUC values typically in the 0.95–0.98 range on external validations like MESSIDOR2, highlighting potential for clinical triage and community screening. The proposed approach emphasizes robust preprocessing, class-imbalance handling, and external validation, and discusses deployment considerations including hardware-light inference and integration into tele-ophthalmology workflows. Findings suggest AI screening can expand access, reduce specialist workload, and improve timely referrals, contributing to reduced vision loss in underserved populations.

ENERGY-EFFICIENT EXPLAINABLE AI FRAMEWORK FOR EDGE-BASED AUTONOMOUS SYSTEMS

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Abstract: Edge-based autonomous systems are widely used in smart cities, autonomous vehicles, healthcare monitoring, and industrial automation. These systems require real-time decision making with low latency and minimal energy consumption. Traditional cloud-based artificial intelligence models consume high energy and lack transparency in decision making. This paper proposes an Energy-Efficient Explainable Artificial Intelligence framework for Edge-Based Autonomous Systems. The proposed framework integrates lightweight machine learning models deployed at edge devices with explainable AI techniques to improve transparency, reliability, and energy efficiency. The system reduces power consumption by optimizing model complexity and processing data locally instead of relying on cloud communication. Explainable AI methods are used to interpret model decisions, improving trust and system reliability. The proposed framework is suitable for autonomous vehicles, smart surveillance, and IoT-based intelligent systems.

Keyword *- Explainable AI, Edge Computing, Autonomous Systems, Energy Efficiency, Machine Learning, IoT, Smart Systems, Edge AI, Sustainable Computing.*

EXPLAINABLE AI-DRIVEN DEEP LEARNING FRAMEWORK FOR AN INTELLIGENT DECISION-MARKING SYSTEM

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Abstract: Deep learning is good at smart decision-making but is not very interpretable, which leads to a lack of trust in decision results in critical areas such as healthcare and finance. In this paper, an Explainable AI (XAI) framework is proposed by incorporating deep learning models with SHAP for global feature importance and LIME for local prediction explanations. The framework consists of data collection, data preprocessing, model training, XAI analysis, and output visualization. Experiments have demonstrated good prediction accuracy, with less than 2-3% reduction compared to black box models, and improved interpretability by 35-40% and trust by 30%.

Keyword *- Interpretable AI, Deep Learning, Explainable AI, SHAP, LIME, Smart Decision-Making.*

FROM BLACK BOX TO TRUST: EXPLAINABLE AI IN MEDICAL DIAGNOSIS

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Abstract: Emerging advances in deep learning and AI hold the potential to transform medical diagnosis but are held back by their black-box nature. AI models (for example, CNNs) tend to be extremely accurate while giving little insight into the reason for a decision. This lack of transparency erodes clinician trust and brings with it ethical issues. Explainable AI (XAI) techniques fill this gap by giving human-interpretable explanations for model outputs. In this paper, we summarize current XAI methods in healthcare and medical imaging, noting how they enhance transparency, explainability, and trust. We then outline a new XAI-based diagnosis framework that incorporates state-of-the-art predictive models with explanation modules (e.g., SHAP, LIME, Grad-CAM) to emphasize feature importance and saliency. Our suggested system consists of a multi-tier cloud–edge framework for secure data management and real-time explanation generation.

Keyword *- Explainable AI, Interpretability, Transparency, Medical Diagnosis, Trust.*

GENERATIVE AI AND THE FUTURE OF CREATIVITY

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Abstract: Generative AI is transforming creativity by enabling machines to produce original works in art, literature, music, and science. By learning patterns from large datasets, these systems support new forms of collaboration, ideation, and innovation alongside human creativity. Beyond individual use, generative AI democratizes access to creative tools but raises concerns about ownership, originality, ethics, and content uniformity. This work highlights the importance of human–AI collaboration to enhance creativity while maintaining authenticity and accountability.

Keyword *- Human-AI Collaboration,Innovation,Future of Creative Industries,Authorship.*

GREEN FEDERATED LEARNING FOR ENERGY-EFFICIENT EDGE INTELLIGENCE IN DISTRIBUTED SYSTEMS

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Abstract: Green Federated Learning (GFL) enables energy-efficient, privacy-preserving model training across distributed edge devices by reducing centralized data transmission. However, challenges such as resource constraints and device heterogeneity remain. This paper explores energy-optimization techniques, including adaptive client selection, model compression, and energy-aware scheduling, along with the use of renewable energy and carbon-aware strategies. It highlights trade-offs between accuracy, latency, and energy efficiency, demonstrating GFL's potential for scalable and sustainable AI systems.

Keyword *- Green Federated Learning, Edge Intelligence, Energy Efficiency, Distributed Systems, Model Compression, Energy-Aware Scheduling, Sustainable AI, Privacy Preservation.*

NEXTGEN INTELLIGENCE : TRANSPARENT AI AND AUTONOMOUS INNOVATION

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Abstract: NextGen Intelligence focuses on building transparent, accountable, and autonomous AI systems for critical sectors like healthcare, finance, and governance. It emphasizes explainable models that allow users to understand and trust AI decisions, alongside systems capable of self-learning and independent operation. The paper addresses challenges such as bias, privacy, and regulation, proposing solutions like auditing and human-in-the-loop approaches to ensure ethical and reliable AI aligned with societal values.

Keyword *- Transparent AI, Explainable AI (XAI), Autonomous Systems, Machine Learning, Ethical AI, AI Governance, Data Privacy, Bias Mitigation, Human-in-the-loop, Intelligent System*

SAFETY CARCK : MITIGATING CYBERBULLYING AND ONLINE HARASSMENT VIA COMMUNITY

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Abstract: SocialShield is a community-driven platform designed to prevent and address cyberbullying and online harassment by connecting victims with volunteers, counselors, and mental health resources. It supports anonymous reporting, awareness campaigns, and digital literacy programs to promote safe online behavior, especially among youth. The platform also fosters collaboration with policymakers and social media companies while creating safe community spaces to reduce isolation. Overall, SocialShield promotes empathy, education, and proactive prevention for safer digital environments.

Keyword *- Cyberbullying , Online Harassment, Community Support, Mental Health, Digital Literacy, Anonymity, Youth Safety, Crowdsourced Reporting, Policy Advocacy, Social Isolation, Digital Empathy, Content Moderation.*

SMARTCROP AI – INTELLIGENCE FARMING ASSISTANT

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Abstract: SmartCrop AI is an advanced artificial intelligence–based system designed to enhance agricultural productivity through precision farming and real-time decision support. The platform integrates technologies such as machine learning, computer vision, and Internet of Things (IoT) to monitor crop health, soil conditions, and environmental factors. By analyzing data collected from sensors, weather sources, and crop images, SmartCrop AI provides farmers with accurate insights and actionable recommendations.The system enables early detection of plant diseases using image recognition techniques and suggests appropriate treatments to minimize crop loss. It also optimizes irrigation by analyzing soil moisture and weather patterns, ensuring efficient water usage. Additionally, SmartCrop AI offers soil health analysis, pest outbreak prediction, and crop yield estimation, helping farmers plan and manage their resources effectively.With a user-friendly mobile interface and support for local languages, the system ensures accessibility for farmers of all scales. SmartCrop AI aims to reduce farming costs, improve crop yield, and promote sustainable agricultural practices, ultimately contributing to increased food security and smarter farming ecosystems.

SUSTAINABILITY RE-IMAGINED : AI FOR GREEN CONSTRUCTION AND MATERIAL CIRCULARITY

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Abstract: This study addresses the high levels of waste in the construction industry by integrating **circular economy principles with AI-based planning**. It proposes a model that generates sustainable, modular building designs that incorporate recycled and second-hand materials, while promoting "design for deconstruction" to enable future reuse.

By optimizing material usage and encouraging environmentally responsible practices, the system reduces waste, minimizes environmental impact, and supports a shift from traditional "build and discard" methods to a more sustainable, regenerative approach. Ultimately, it enhances both the ecological and economic value of construction projects.

Keyword *- Sustainability, Circular Economy, AI in Construction, Modular Design, Reuse of Materials, Green Building, Design for Deconstruction.*

AUGMENTED REALITY AND VIRTUAL REALITY FOR IMMERSIVE DIGITAL EXPERIENCES USING ADVANCED COMPUTING

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Abstract:Virtual Reality (VR) and Augmented Reality (AR) are rapidly evolving technologies that are transforming the way humans interact with digital environments. Virtual Reality creates a completely immersive digital experience by simulating a real or imagined environment, while Augmented Reality enhances the real-world environment by overlaying digital information such as images, sounds, and text. These technologies are widely applied in various domains including education, healthcare, gaming, training, and industrial design.This paper presents an overview of VR and AR technologies, focusing on their working principles, hardware components, and software frameworks. VR systems typically use head-mounted displays, motion tracking sensors, and controllers to provide a fully immersive experience, whereas AR systems utilize smartphones, tablets, or smart glasses to integrate virtual elements into the real world in real-time.Furthermore, the paper discusses the advantages and challenges of VR and AR, including high development costs, hardware limitations, and user adaptation issues.In conclusion, Virtual Reality and Augmented Reality represent a significant step toward the future of human-computer interaction. Continued research and technological advancements will further improve their accessibility, performance, and real-world applications.

***Keywords**: Virtual Reality, Augmented Reality, Immersive Technology, Human-Computer Interaction, Simulation, ArtificialIntelligence.*

EDGE AI AND DISTRIBUTED COMPUTING: ARCHITECTURES FOR REAL-TIME INTELLIGENT SYSTEMS

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Abstract- At the far edge of the network—where data is born, breathes, and demands instant meaning—Edge AI converges with Distributed Computing to redefine how intelligence is created and delivered. This paradigm dissolves the traditional reliance on centralized cloud architectures by pushing computation closer to data sources such as sensors, mobile devices, and embedded systems. The result is a system that thinks locally, reacts instantly, and scales globally. This paper explores the integration of Edge AI with distributed computing frameworks, emphasizing how decentralized processing reduces latency, enhances privacy, and optimizes bandwidth utilization. By deploying machine enabling applications in autonomous systems, smart cities, industrial IoT, and healthcare monitoring. fault tolerance and robust orchestration strategies.Ultimately, the fusion of Edge AI and distributed computing marks a shift toward a more responsive and resilient digital ecosystem—one where intelligence is no longer distant in the cloud, but woven into the very fabric of the devices around us.

***keywords**: Edge AI, Distributed Computing, Internet of Things (IoT), Federated Learning, Real-Time Processing, Decentralized Systems, Machine Learning at the Edge, Low Latency, Data Privacy*

EXPLAINABLE ARTIFICIAL INTELLIGENCE FRAMEWORK FOR TRANSPARENT FAKE NEWS DETECTION IN ONLINE MEDIA

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Abstract: This research proposes an **Explainable AI (XAI) framework** for detecting misinformation in online media with improved transparency and trust. Unlike traditional "black-box" models, the system uses a **multi-pathway architecture** that combines NLP techniques with interpretability tools to provide both local and global explanations for its predictions. The approach enhances accuracy, reduces overfitting, and effectively distinguishes between credible and deceptive content by analyzing semantic and contextual features. Experimental results show improved performance over existing methods while maintaining reasonable computational complexity. Overall, the framework supports reliable misinformation detection and can be applied in real-time social media monitoring and fact-checking systems to promote digital literacy and online safety.

Keywords*: Fake News Detection, Explainable Artificial Intelligence (XAI), Natural Language Processing (NLP), Deep Learning, Transparency, Online Media, Machine Learning.*

FEDERATED LEARNING ON BLOCKCHAIN FOR PRIVACY-PRESERVING GREEN DATA

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Abstract : This research proposes an **Explainable AI (XAI) framework** for detecting misinformation in online media with improved transparency and trust. Unlike traditional "black-box" models, the system uses a **multi-pathway architecture** that combines NLP techniques with interpretability tools to provide both local and global explanations for its predictions. The approach enhances accuracy, reduces overfitting, and effectively distinguishes between credible and deceptive content by analyzing semantic and contextual features. Experimental results show improved performance over existing methods while maintaining reasonable computational complexity. Overall, the framework supports reliable misinformation detection and can be applied in real-time social media monitoring and fact-checking systems to promote digital literacy and online safety.

Keywords*: Blockchain, Green AI, Sustainable Computing, Resource Optimization, Decentralized Systems, Energy Efficiency, Smart Contracts.*

ENERATIVE SEMANTIC RECONSTRUCTION: REAL-TIME AR ENVIRONMENT ADAPTATION USING MULTIMODAL LLMS

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Abstract:This paper introduces a **Generative Semantic Reconstruction (GSR) framework** to enhance Augmented Reality (AR) by enabling deeper environmental understanding. By integrating Multimodal Large Language Models (MLLMs) with real-time spatial mapping, the system moves beyond basic object detection to recognize detailed semantic and contextual features of physical objects. The framework uses a three-layer architecture—semantic data extraction, contextual reasoning, and neural style transfer—to generate AR content that adapts to the environment's textures, lighting, and structure. A hybrid cloud-edge model ensures real-time performance. Overall, the approach creates more immersive and context-aware AR experiences, improving user engagement while reducing cognitive load, and advancing AR toward true spatial intelligence.

Keywords*: Spatial Computing, Multimodal LLMs, Generative AI, Semantic Scene Understanding, Augmented Reality.*

PRIVACY-PRESERVING FEDERATED LEARNING FOR SECURE HEALTHCARE DATA ANALYSIS

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Abstract: With the rapid growth of artificial intelligence in healthcare, ensuring data privacy and security has become a major concern. Traditional centralized machine learning approaches require collecting sensitive patient data in a single location, increasing the risk of data breaches and privacy violations. This paper proposes a privacy-preserving framework using Federated Learning (FL), where multiple healthcare institutions collaboratively train a global AI model without sharing raw data. To further enhance security, differential privacy techniques are integrated to add controlled noise, preventing the leakage of sensitive information, while secure aggregation ensures encrypted model updates during communication. The proposed system not only maintains high model accuracy but also complies with data protection regulations.Experimental results demonstrate that the framework effectively balances privacy, security, and performance, making it suitable for real-world healthcare applications. This approach highlights the potential of secure AI systems in handling sensitive data across distributed environments.

Keywords*: Federated Learning, Privacy-Preserving AI, Differential Privacy, Secure Aggregation, Healthcare Data Security, Distributed Machine Learning, Data Confidentiality, Secure AI Systems*

INTEGRATING BLOCKCHAIN WITH SECURE AI FOR PRIVACY-PRESERVING ELECTRONIC HEALTH RECORDS(EHR).

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Abstract:This paper proposes a **decentralized healthcare framework** that combines **permissioned blockchain and federated learning (FL)** to enable secure and privacy-preserving sharing of Electronic Health Records (EHR). Sensitive patient data is stored off-chain, while blockchain maintains secure access control and data integrity through cryptographic hashes and smart contracts. The federated learning layer allows AI models to learn from distributed data without sharing raw information, reducing privacy risks. This approach enhances security, ensures regulatory compliance (e.g., GDPR, HIPAA), and improves the accuracy of collaborative medical research while maintaining patient confidentiality.

Keywords*: Blockchain, Federated Learning, EHR Security, Privacy-Preserving AI, Smart Contracts, Healthcare Interoperability.*

DECENTRALIZED NAVIGATION ALGORITHMS FOR AUTONOMOUS ROBOTICS IN SEARCH AND RESCUE MISSIONS.

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Abstract:This paper proposes a **decentralized navigation algorithm for robotic swarms** to improve search and rescue (SAR) operations in disaster scenarios where communication infrastructure may fail. The system uses **swarmintelligence and asynchronous consensus** to allow each robot to make independent decisions based on local sensor data and peer communication, ensuring resilience even if some robots fail. A **dynamic potential field approach** is used for efficient path planning and obstacle avoidance in complex environments. Simulation results show that this method significantly reduces the time required to locate survivors compared to traditional search strategies, while remaining computationally efficient for real-time, edge-based deployment.

Keywords*: Swarm Robotics, Decentralized Path Planning, Search and Rescue (SAR), Autonomous Navigation, Multi-Agent Systems, Obstacle Avoidance.*

DECENTRALIZED NAVIGATION ALGORITHMS FOR AUTONOMOUS ROBOTICS IN SEARCH AND RESCUE MISSIONS.

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Abstract:This paper presents a **decentralized navigation algorithm for heterogeneous robotic swarms** to improve search and rescue (SAR) operations in disaster environments with damaged communication infrastructure. Using **bio-inspired swarm intelligence** and **asynchronous consensus protocols**, each robot makes autonomous decisions based on local sensor data and peer-to-peer communication, ensuring resilience even if some robots fail. A **dynamic potential field with obstacle avoidance** optimizes path planning in debris-strewn areas. Simulations show that this approach significantly reduces survivor "time-to-discovery" compared to traditional search patterns, while remaining computationally efficient for edge-based deployment.

Keywords*: Swarm Robotics, Decentralized Path Planning, Search and Rescue (SAR), Autonomous Navigation, Multi-Agent Systems, Obstacle Avoidance.*

REAL-TIME INTELLIGENCE USING IOT FOR SMART SYSTEMS

ENHANCING SMART ENVIRONMENTS USING REAL-TIME IOT INTELLIGENCE

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Abstract:The rapid advancement of the Internet of Things (IoT) has transformed the way data is collected, processed, and utilized in real-world applications. Real-time intelligence, when integrated with IoT systems, enables immediate data analysis and decision-making, enhancing efficiency, accuracy, and responsiveness across various domains. This paper explores the architecture and implementation of IoT-based real-time intelligent systems, focusing on data acquisition through sensors, edge computing, and cloud-based analytics.The study highlights how real-time data processing supports applications such as smart cities, healthcare monitoring, industrial automation, and environmental tracking. By leveraging machine learning algorithms and real-time data streams, IoT systems can predict patterns, detect anomalies, and automate critical operations. Additionally, challenges such as data security, latency, scalability, and interoperability are discussed, along with potential solutions.The proposed approach demonstrates how integrating real-time intelligence with IoT not only improves system performance but also opens new opportunities for innovation in connected environments. This research contributes to the development of efficient, scalable, and intelligent systems capable of addressing modern technological demands.

Keywords*:Internet of Things (IoT), Real-Time Intelligence, Smart Systems, Edge Computing, Machine Learning, Data Analytics, Sensor Networks, Automation, Smart Cities, Predictive Analytics*

AGENTIC AI-DRIVEN AUTOMATED DATA PIPELINE SYSTEM USING MULTI-AGENT LANGGRAPH ARCHITECTURE

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Abstract : Automated and scalable data processing remains a critical challenge in modern data engineering workflows. This paper presents ADPA (Agentic Data Pipeline Architecture), a fully automated multi-agent system designed to orchestrate end-to-end data processing through a sequence of specialized AI agents. The proposed architecture leverages LangGraph for stateful agent orchestration and integrates six discrete agents — Ingestion, Cleaning, Transformation, Validation, Storage, and Monitoring — each responsible for a well-defined stage of the data lifecycle. The Ingestion Agent supports multiple input formats including CSV, JSON, and API sources with automatic schema detection and encoding handling. The Cleaning Agent addresses common data quality issues such as duplicate records, missing values, and inconsistent formats. The Transformation Agent performs feature engineering and data enrichment to prepare data for downstream analytical tasks. The Validation Agent enforces schema consistency and anomaly detection rules to ensure data integrity. raises alerts upon failure detection. The system is exposed through a FastAPI-based web dashboard that enables real-time pipeline execution, file upload, execution tracking, and report download. Experimental evaluation on heterogeneous datasets demonstrates the system's robustness, modularity, and suitability for diverse data engineering scenarios.

Keywords *: Multi-Agent System · Data Pipeline · LangGraph · Agentic AI · Data Engineering · FastAPI · Automated Data Processing · Data Cleaning · Data Validation · Feature Engineering · Pipeline Orchestration · SQLite · Schema Detection · Anomaly Detection · Real-Time Dashboard*

AI ACCIDENT DETECTION AND ALERT SYSTEM

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Abstract: Road accidents often lead to serious injuries and fatalities due to delayed detection and emergency response. The Smart Road Accident Detection and Emergency Alert System Using AI is designed to automatically detect accidents and immediately notify emergency services. The system uses sensors and artificial intelligence to monitor vehicle conditions and identify sudden impacts or abnormal movements. A controller such as the Arduino Uno processes the data and triggers an alert when an accident is detected. The system then sends the accident location through GPS and GSM modules to emergency contacts or rescue teams. This helps reduce response time and improves the chances of saving lives.

Keywords*: Web Artificial Intelligence, Accident Detection, IoT, Emergency Alert System.*

AI-POWERED DIGITAL ADDICTION REDUCTION AND FOCUS REINFORCEMENT SYSTEM

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Abstract: Smartphones aren't just gadgets—they're part of our daily lives now, especially for students and young adults. Sure, these devices make communication easy and give us endless information at our fingertips, but you can't ignore the downsides. Too much screen time leads to more digital distractions, shorter attention spans, and people just aren't getting as much done as before. Most wellbeing apps out there are pretty basic. They track screen time or let you set limits, but those features barely scratch the surface. They don't really help people deal with the complicated ways we use our phones.In this paper, we introduce a smarter way—a system powered by AI that tackles digital addiction head-on and reinforces focus. This system doesn't just watch what you do on your phone; it actively analyzes your habits in real time. It keeps an eye on app usage, how often you switch between apps, and when you're most distracted. Using machine learning, it spots behaviors linked to distraction and finds moments when you stray from your focus sessions. It's designed to help users concentrate better and spend less time glued to their screens. The hope is to build healthier digital habits—especially for students facing endless distractions during academic tasks.

Keywords— *Digital Addiction, Smartphone Usage Analysis, Artificial Intelligence, Behavioral Analytics, Focus Reinforcement, Machine Learning*

CREDIT CARD FRAUD DETECTION SYSTEM

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Abstract: Credit card fraud is a major challenge in the banking sector, causing financial losses and reducing customer trust. Traditional fraud detection methods often fail to identify complex and evolving fraudulent activities. This project proposes a fraud detection system using the Light Gradient Boosting Machine (LightGBM) algorithm to analyze transaction data and identify fraudulent transactions. Data preprocessing and feature engineering techniques are applied to improve model performance and handle imbalanced datasets. The proposed system provides higher detection accuracy, reduces false positives, and supports efficient analysis of large-scale transaction data. Overall, the system helps financial institutions improve security and prevent fraudulent transactions effectively.

Keywords— *Machine learning , Light Gradient Boosting Machine, Credit card fraud detection, ensemble machine learning classifiers*

DEBUGARENA: AI-POWERED REAL-TIME COMPETITIVE DEBUGGING PLATFORM

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Abstract: The rapid growth of competitive programming and online coding assessments has created a demand for intelligent, real-time platforms that go beyond passive code submission. This paper presents DebugArena, a web-based competitive debugging platform that enables students to compete simultaneously in structured, proctored coding contests under live administrative supervision. Unlike traditional online judges, DebugArena presents participants with intentionally buggy code and challenges them to identify, fix, and submit working solutions within a time-constrained environment. The platform supports role-based access control, distinguishing between administrators who create and manage contest rooms and student participants who compete within them. Administrators can assign difficulty-specific questions (Easy, Medium, Hard) with predefined test cases, monitor participants in real-time through a live dashboard, and enforce anti-cheat measures including tab-switch detection and automated disqualificationThe platform's leaderboard updates in real-time, reflecting live contest standings.

Keywords*: Competitive Programming, Debugging Platform, Real-Time Collaboration, Socket.IO, Anti-Cheat System, Online Judge, Full-Stack Web Application, Proctored Assessment.*

DEEP LEARNING-BASED FRAMEWORK FOR AUTOMATED CARDIOVASCULAR DISEASE DETECTION IN MATERNAL ECG IMAGES

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Abstract— This research presents an **automated deep learning framework** for detecting maternal cardiovascular complications from ECG images. Using a [CNN-based] model, the system classifies four conditions: Fetal Stress, General Cardiac Abnormalities, Peripartum Cardiomyopathy, and Preeclampsia Risk. Preprocessing steps like noise reduction and morphological feature extraction improve signal clarity. Experimental results show high diagnostic accuracy, enabling timely identification of high-risk cases. The approach offers a **non-invasive, real-time, and scalable tool** for maternal cardiac risk assessment, particularly useful in resource-limited healthcare settings.

Keywords*—Maternal Heart Disease, ECG Image Analysis, Deep Learning, Convolutional Neural Networks (CNN), Preeclampsia Detection, Peripartum Cardiomyopathy, Fetal Stress Monitoring.*

DEEP LEARNING-BASED FRAMEWORK FOR SCALABLE TRAFFIC ACCIDENT DETECTION

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Absract :Road traffic accidents continue to be a major global concern, resulting in significant loss of life, injuries, and economic impact. Rapid identification of such incidents is essential to ensure timely emergency response and effective traffic control. This paper proposes an automated accident detection system based on deep learning techniques that analyze traffic images to identify accident scenarios. The model employs a Convolutional Neural Network (CNN) to learn and recognize critical visual features such as vehicle damage, collisions, and irregular traffic patterns.The dataset used for training includes both accident and normal traffic images, which are preprocessed to enhance model performance. Designed with scalability in mind, the solution can be incorporated into modern traffic monitoring systems and smart city environments. The experimental evaluation indicates that the proposed approach delivers reliable and accurate results, contributing to faster detection and improved road safety management.

***Keywords** : Traffic Accident Detection, Deep Learning, Convolutional Neural Network (CNN), Computer Vision, Image Classification, Intelligent Transportation Systems (ITS), Road Safety, Real-Time Monitoring.*

EXPLAINABLE POLICY-GUIDED HYBRID AI FRAMEWORK FOR AUTOMATED CONTRACT RISK ANALYSIS

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Abstract:Contract analysis is a critical yet complex task in modern organizations, involving the identification of risks, compliance verification, and interpretation of legally dense language. Traditional manual review processes are time-consuming, error-prone, and lack scalability. Although recent Artificial Intelligence (AI)-based solutions have improved automation, most existing systems operate as black-box models, offering limited transparency and lacking policy enforcement capabilities.To address these limitations, this paper proposes an Explainable Policy-Guided Hybrid AI Framework for automated contract risk governance. The proposed system integrates Natural Language Processing (NLP)-based clause extraction with a rule-based policy engine to enable both intelligent analysis and deterministic decision-making. The AI component identifies and structures contract clauses, while the policy engine evaluates them against predefined organizational rules to detect compliance violations and potential risks.

***Keywords**: Explainable AI, Contract Analysis, Hybrid AI, Policy-Based Governance, Natural Language Processing, Risk Detection, Legal Document Processing.*

GRINDIT : A REAL-TIME AI WORKOUT ASSISTANCE

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Abstract: In today's technology-driven fitness landscape, maintaining workout consistency and accurately tracking exercise performance remain challenging for many individuals. This paper presents GrindIt, an AI-based real-time workout monitoring and fitness assistance system designed to analyze body movements and automate exercise tracking. The system uses pose estimation models such as RTMPose and MediaPipe to detect body landmarks from live webcam input. By analyzing these landmarks and movement patterns, it identifies exercises and accurately counts repetitions without manual input. In addition to exercise tracking, the system includes an interactive chatbot assistant that provides workout suggestions, BMI estimation, calorie tracking, and nutritional advice. It focuses on real-time performance monitoring and user interaction rather than detailed posture correction. The system also provides workout analytics and report generation features, allowing users to export performance data in PDF and CSV formats for progress tracking. The proposed approach demonstrates the practical use of artificial intelligence and computer vision in developing a user-friendly fitness monitoring solution for home-based workouts

Keywords— *Artificial Intelligence, Computer Vision, Pose Estimation, Workout Monitoring, Exercise detection, Repetition Counting, RTMPose, MediaPipe, Fitness Assistant.*

SMART EDU:AN AI-BASED PERSONAL ASSISTANT FOR STUDENT LEARNING AND TASK MANAGEMENT

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Abstract-In today's educational environment, students face multiple challenges such as managing academic queries, preparing for job interviews, tracking learning progress, and organizing study schedules. Existing systems address these problems individually but lack integration into a single intelligent platform.This project, SMART-EDU, presents an AI-based personal assistant designed to support student learning and task management in a unified system. The application leverages advanced Artificial Intelligence techniques using the Groq Large Language Model (LLaMA 3.1) to provide real-time academic assistance.The system includes key modules such as an AI Academic Query System for instant subject-based answers, a Mock Interview Simulation with structured questions, and an Answer Evaluation module that provides scores, feedback, and improvement suggestions. Additionally, a Smart Reminder System helps students manage study schedules, while Progress Tracking with an XP-based gamification approach motivates continuous learning. The platform also generates personalized study plans and recommendations based on individual student profiles.

Keywords*: Artificial Intelligence, Student Learning, Groq LLM, Mock Interview, Task Management, Personalized Learning, Django.*

AI POWERED PLACEMENT AND CAREER DECISION GUIDANCE SYSTEM

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Abstract: There are over 1.5 million engineering graduates from colleges across India each year. However, only 10-20% achieve the top spots in the hiring processes due to a lack of interview preparation. Existing mock interviews are not scalable for widespread use. Mentorix AI is a desktop application designed for conducting an unlimited number of interviews through AI simulation and providing instant feedback. This can be applied to various departments such as CSE, ECE, and Mechanical.The key technologies employed by Mentorix AI include voice-based interactions with the "Aria" AI mentor through Groq's llama-3.1-8b (200ms latency), "HR mode" for camera-based posture and eye tracking through Bytez API, tab switch detection for integrity assessment, and weak areas for course recommendations through PostgreSQL. Unlike other existing tools such as Interviewer.AI and AceInterview, Mentorix AI incorporates holistic scoring for Technical, Communication, and Leadership qualities. This paper outlines the architecture and implementation of Mentorix AI and evaluation, providing a template for AI-based ed-tech products for emerging markets. Placements of engineering students in India are often plagued by issues of insufficient practice, increased competition, and skill deficiencies in interviews. Mentorix AI solves this problem through an integrated web platform for AI-based voice interviews, HR mock interviews, and other features. It is based on React, FastAPI, Groq LLMs, and PostgreSQL.
Keywords *:AI mock interviews, placement, engineering education, LLM, behavioural*

NETWORK INTRUSION DETECTION USING DEEP LEARNING

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Abstract: This research proposes a **deep learning–based Network Intrusion Detection System (NIDS)** to classify network traffic as normal or malicious. The system analyzes multiple features—including protocol type, service information, traffic statistics, and error rates—using a deep neural network built with TensorFlow and Keras. Preprocessing steps like categorical encoding and feature scaling, along with dense layers combined with batch normalization and dropout, enhance model accuracy and prevent overfitting. The trained model is deployed via an **interactive Streamlit web interface**, allowing users to evaluate network traffic in real time, supporting improved cybersecurity monitoring.

Keywords: Network Intrusion Detection System (NIDS), Deep Learning, Neural Networks, Cybersecurity, Network Traffic Classification,Tensor Flow,Streamlit Application, Anomaly Detection, Data Preprocessing.

ONLINE VIRTUAL TRY-ON AND PRODUCT CUSTOMIZATION SYSTEM

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Abstract— The rapid growth of e-commerce has transformed consumer behavior, yet the inability to physically interact with products remains a significant barrier, often leading to high return rates and customer dissatisfaction. This research presents an integrated, intelligent framework for an Online Virtual Try-On and Product Customization System designed to bridge the gap between digital browsing and physical experience. The proposed system utilizes [mention your core technology, e.g., Augmented Reality (AR) and Deep Learning-based Pose Estimation] to allow users to visualize apparel and accessories on their own digital likeness in real-time. Furthermore, the platform incorporates a modular customization engine that enables users to modify product attributes such as color, texture, and fit according to personal preferences. Advanced image processing techniques, including [mention techniques, e.g., 3D mesh rendering and cloth-to-body warping], are employed to ensure realistic garment draping and spatial accuracy. Experimental evaluations indicate that the system significantly enhances user engagement and confidence in purchasing decisions by providing a high-fidelity preview of the final product. By offering a seamless and interactive shopping environment, this study provides a scalable solution for modern retail challenges, contributing to the advancement of personalized digital commerce and sustainable consumer practices.

Keywords*—Virtual Try-On, Augmented Reality (AR), Product Customization, Deep Learning, Image Processing, 3D Mesh Rendering, E-commerce, Human Pose Estimation, Computer Vision, Digital Retail, Personalized Shopping Experience.*

EMPOWERING IOT CYBER NETWORK ATTACK DETECTION USING MACHINE LEARNING

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Abstract:The rapid growth of the Internet of Things (IoT) has significantly increased the number of interconnected devices, thereby expanding the potential attack surface for cyber threats. Traditional intrusion detection systems are often inadequate in handling large-scale, dynamic, and heterogeneous IoT environments. This paper proposes a machine learning-based intrusion detection system utilizing the Light Gradient Boosting Machine (LightGBM) algorithm to enhance IoT network security. The system collects network traffic data and performs preprocessing and feature engineering to extract meaningful indicators of malicious behavior. These features are then used to train a predictive model capable of distinguishing between normal and malicious network activity. The proposed system supports real-time monitoring and achieves improved detection accuracy with reduced false positive rates. Experimental observations indicate that the model is efficient, scalable, and well-suited for securing IoT-based cyber-physical systems.

Keywords*:IoT Security, Intrusion Detection System, LightGBM, Machine Learning, Network Traffic Analysis, Anomaly Detectio*

RELEASEIQ: AGENTIC AI FOR AUTONOMOUS DEVOPS DECISION-MAKING

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Abstract: Modern software development demands frequent, reliable, and consistent software releases. Traditional CI/CD pipelines automate tasks such as building, testing, and deployment, but still rely heavily on human intervention for final release decisions. This manual dependency often introduces errors, delays, inconsistent approvals, and system failures in production environments. This paper proposes an Autonomous Software Version Release Agent that leverages Agentic AI and backend orchestration to intelligently evaluate code changes, test results, security risks, and deployment readiness. The system autonomously determines whether a software version is safe to release, should be delayed, or requires additional fixes, thereby reducing human error and improving release reliability. The system is implemented using Python with FastAPI as the backend orchestration framework. It integrates with GitHub APIs to retrieve commit history and code changes, executes automated test workflows via PyTest, and performs security vulnerability analysis using static analysis tools. An AI decision engine powered by a Large Language Model (LLM) evaluates all collected metrics and produces an intelligent, reasoned release decision. Notifications are automatically dispatched to relevant stakeholders via Email or Slack webhooks upon decision generation. The proposed solution demonstrates how Agentic AI, when combined with backend orchestration, can intelligently automate key DevOps release decisions, leading to faster, more reliable, and consistent software deployments while significantly improving overall operational efficiency.

***Keywords**: Agentic AI, CI/CD Automation, DevOps, Software Release Agent, FastAPI, GitHub API, Large Language Model (LLM), Autonomous Decision-Making.*

SMART SAFTEY SYSTEM WITH REAL-TIME DROWSINESS DETECTION

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Abstract: This paper presents a **real-time driver monitoring system for electric vehicles** that detects drowsiness using camera-based analysis of facial features, including eye movement, head posture, and expressions. Upon detecting fatigue, the system triggers **dual alerts** (buzzer and vibration), reduces vehicle speed automatically, and sends real-time notifications to drivers and emergency contacts.The approach enhances road safety, supports hearing-impaired drivers, and provides a scalable solution for reducing accidents caused by driver fatigue, contributing to smarter and safer transportation systems.

***Keywords**: Driver Drowsiness Detection, Electric Vehicles, Real-Time Monitoring, Machine Learning, Computer Vision, Facial Feature Analysis, Eye Tracking, Head Pose Estimation, Driver Safety System.*

FORESTGUARD: REAL-TIME DEFORESTATION ALERT SYSTEM USING GOOGLE EARTH ENGINE AND AI

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Abstract-Global deforestation claims roughly 15 billion trees annually, pumping 4.8 gigatonnes of CO_2 into the atmosphere and pushing ecosystems toward collapse. India's Western Ghats, home to over 5,000 endemic species, has already lost more than a third of its forest cover, yet forest officers still lack automated tools to detect illegal logging in real time.We introduce ForestGuard, a zero-infrastructure deforestation alert system built on Google Earth Engine and Python. By comparing Landsat 8 satellite imagery from 2015 and 2025, the system computes pixel-level NDVI changes and applies the NTDDA algorithm to flag areas where vegetation decline exceeds a delta-NDVI of −0.25. Confirmed deforestation events trigger automatic SMS and email alerts — complete with GPS coordinates and NDVI maps Urban-fringe zones recorded the steepest vegetation loss at −51.7%. Running entirely on Google Colab and GEE, the system needs no dedicated hardware and is ready for national-scale deployment. Future upgrades will add LSTM/CNN-based predictive modeling, Sentinel-1 SAR integration, and coverage across all 18 Indian biodiversity hotspots.

Keywords*: Deforestation detection, NDVI, Google Earth Engine, Landsat 8, Western Ghats, real-time alerts, remote sensing, Twilio API, NTDDA, biodiversity conservation*

DIGITAL TWINS OF HUMANS:FUTURE OF VIRTUAL IDENTITY

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Abstract- Digital Twin technology has emerged as a transformative concept within artificial intelligence and data-centric systems, enabling the creation of precise virtual representations of physical entities. Extending this concept to humans has led to the development of Human Digital Twins (HDTs), which are intelligent, evolving digital counterparts of individuals. These models continuously integrate real-time data collected from wearable devices, sensors, and online platforms, capturing physiological conditions, behavioral patterns, and environmental interactions. This paper explores the structural framework, operational mechanisms, and diverse applications of Human Digital Twins in areas such as healthcare, smart urban systems, and immersive virtual environments. Furthermore, the study examines critical concerns related to privacy, data protection, and ethical implications associated with managing digital identities. Despite these challenges, Human Digital Twins demonstrate significant potential in enhancing personalized services, improving predictive analytics, and supporting intelligent decision-making processes in modern digital ecosystems.

Keywords*: Human Digital Twin, Virtual Identity, Artificial Intelligence, Machine Learning, Human Modeling, Data Privacy, Smart Systems, Predictive Analytics, Digital Ecosystems*

DESIGN AND IMPLEMENTATION OF A CUSTOM AI ASSISTANT USING RETRIEVAL-AUGMENTED GENERATION (RAG) WITH LOCAL LLM INTEGRATION

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Abstract:This paper presents a **custom AI assistant** that uses **Retrieval-Augmented Generation (RAG)** with locally hosted large language models (LLMs) to provide personalized, context-aware responses while preserving data privacy. Users can upload documents (e.g., PDFs), which are processed and used as knowledge sources. During queries, relevant content is retrieved and combined with the user's input to generate accurate responses. The system features a modern web frontend, a Spring Boot backend, support for multiple AI profiles, and persistent chat history, enabling secure, offline operation with low latency. Experimental results show it effectively delivers meaningful responses while reducing dependence on cloud services.

Keywords*: Artificial Intelligence, Retrieval-Augmented Generation (RAG), Local Large Language Models (LLMs), Document-Based AI, Context-Aware Chatbot, Knowledge Retrieval, Spring Boot, AI Assistant*

THE COST OF INTELLIGENCE: DESIGNING EXPLAINABLE AND CARBON-AWARE AUTONOMOUS SYSTEMS ON GREEN EDGE

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Abstract-The intelligence level required for autonomous systems such as drones and self-driving robots is extremely high, and this is achieved through deep neural networks, resulting in a high carbon footprint for edge/cloud computing. In this paper, a new framework, XCarbonEdge, is presented that incorporates XAI and carbon footprint reduction for edge computing, ensuring the required level of transparency and low-latency decision-making for autonomous systems. The XCarbonEdge approach, based on the use of light-weight LIME/SHAP and workload migration to renewable-powered edge computing, results in a 40-60% reduction in carbon footprint while maintaining 95% decision accuracy. The approach is validated through experiments on Raspberry Pi hardware and NVIDIA robotics datasets, highlighting the intelligence cost trade-offs for sustainable deployment of autonomous systems.

Keywords*- Explainable AI, Carbon Aware Computing, Green Edge Computing, Autonomous Systems, Sustainability.*

MULTIHOSPITALCOMMUNICATIONSYSTEM

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Abstract- In today's fast-paced and interconnected healthcare landscape, effective communication among providers is critical for quality care and timely decisions. The Multi-Hospital Communication System (MHCS) enables seamless information exchange and collaboration across facilities. MHCS uses AI, machine learning, cloud-based EHRs, and NLP to automate workflows, predict needs, and ensure privacy. Experimental analysis shows reduced delays, better coordination, and improved efficiency. This system enhances emergency response and patient outcomes.

Keywords- *AI, security, privacy, and data protection*.

BLOCKCHAINANDIOT-BASEDDRONE IDENTIFICATION AND VERIFICATION SYSTEM FOR RESTRICTED AREAS

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Abstract-The increasing use of unmanned aerial vehicles (UAVs) in sensitive areas has raised significant security concerns, including unauthorized access and data breaches. Traditional drone identification systems rely on centralized frameworks, which are prone to tampering and single points of failure. This paper proposes a decentralized drone identification and verification system using Blockchain and Internet of Things (IoT) technologies. Each drone is assignedauniquecryptographicidentitystoredonablockchainnetwork.IoT-enabledgroundstationsdetect dronesandtransmitidentificationdataforreal-timeverificationusingsmartcontracts.Theproposedsystem ensures secure, transparent, and tamper-resistant authentication. It enhances airspace security by enabling efficient access control and preventing unauthorized drone operations in restricted zones.

Keywords-*Blockchain InternetofThings(IoT),UnmannedAerialVehicles(UAVs) Drone Authentication, Smart Contracts*

AUTOMATIC SPEECH RECOGNITION(ASR) SYSTEMS

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Abstract- Speech and Pattern Recognition is a rapidly evolving field within Artificial Intelligence and Machine Learning that focuses on enabling machines to interpret and understand human speech and identify patterns in data. Speech recognition systems convert spoken language into text, while pattern recognition involves the classification and identification of data based on statistical information and algorithms. This paper explores the fundamental concepts, techniques, and applications of speech and pattern recognition. It highlights key methods such as feature extraction, acoustic modeling, and machine learning algorithms including neural networks and deep learning. The study also discusses the challenges faced in real-world applications, such as noise interference, speaker variability, and language diversity.Furthermore, the paper examines practical applications of these technologies in areas like virtual assistants, biometric authentication, healthcare, and automated customer service systems. In conclusion, this paper emphasizes the growing importance of speech and pattern recognition in modern technology and its potential to revolutionize human-computer interaction.

Keywords- *Pattern Classification,Feature selection, Biometrics, Data Mining.*

SAFE,SECURE AND TRUSTWORTHY ARTIFICIAL INTELLIGENCE SYSTEM

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Abstract-The rapid evolution of Artificial Intelligence (AI) has significantly impacted diverse sectors, including healthcare, finance, transportation, and smart infrastructures. Despite its transformative potential, the widespread adoption of AI systems has raised critical concerns regarding safety, security, privacy, and trustworthiness. AI models are increasingly vulnerable to adversarial attacks, data breaches, bias, and lack of transparency, which can undermine user confidence and lead to severe societal consequences. Therefore, developing robust, secure, and privacy-preserving AI systems has become a key priority in both academia and industry.The IEEE International Conference on Safe, Secure, and Trustworthy Artificial Intelligence Systems aims to serve as a global platform for researchers, practitioners, and policymakers to present and discuss innovative approaches that address these challenges. The conference emphasizes the development of AI systems that are resilient, explainable, ethically aligned, and compliant with emerging regulatory standards.

Keywords- *Artificial Intelligence, AI Security, Privacy Preservation, Trustworthy AI, Adversarial Machine Learning, Explainable AI, Secure Systems, Ethical AI*

SECURITY SYSTEMS WITH REAL TIME ALERTS

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Abstract- In today's rapidly evolving digital and physical environments, ensuring security has become a critical concern. This paper presents a smart security system integrated with real-time alert mechanisms designed to enhance safety and rapid response. The proposed system leverages advanced technologies such as Internet of Things (IoT), sensors, and wireless communication to continuously monitor environments for unauthorized access, unusual activities, or potential threats.Upon detecting any anomaly, the system instantly generates real-time alerts through mobile notifications, emails, or alarm systems, enabling immediate action by users or authorities. The system is designed to be scalable, cost-effective, and user-friendly, making it suitable for applications in homes, offices, and public spaces. Additionally, data collected from sensors can be analyzed to improve threat detection accuracy and system performance over time.This work highlights the potential of real-time intelligent security systems in creating safer and more responsive environments.

Keywords-*IoT, Real-Time Alerts, Smart Security System, Sensors, Threat Detection, Automation, Surveillance*

REAL-TIME IOT INTELLIGENCE FOR SMART APPLICATIONS

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Abstract-Real-Time IoT Intelligence for Smart Applications focuses on leveraging Internet of Things (IoT) technology to collect, process, and analyze data instantly for improved decision-making and automation. In this approach, various sensors and connected devices gather real-time data from the environment, which is transmitted through communication networks to cloud or edge computing platforms. The collected data is then processed using intelligent algorithms and real-time analytics to generate meaningful insights and enable immediate responses.This system enhances efficiency, accuracy, and responsiveness in different smart applications such as smart homes, healthcare monitoring, industrial automation, environmental monitoring, and smart city infrastructure. Real-time intelligence allows systems to detect abnormalities, send alerts, and automatically trigger appropriate actions without human intervention. This improves safety, reduces operational costs, and optimizes resource utilization.

Keywords-*Internet of Things (IoT), Real-Time Intelligence, Smart Applications, Real-Time Monitoring, Sensors, Smart Systems, Intelligent Decision Making, Smart Cities, Industrial Automation.*

AI MEDIBOT-DRIVEN PRELIMINARY TREATMENT SUGGESTIONS BASED ON USER-REPORTEDSYMPTOMS

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Abstract-This paper presents **AI MediBot**, an intelligent system that provides preliminary health recommendations based on user-reported symptoms. Using **Machine Learning and Natural Language Processing**, the system interprets symptom inputs, analyzes patterns against a structured medical knowledge base, and suggests possible conditions along with initial remedies or precautions. MediBot features a conversational interface, prioritizes symptoms by severity, and advises when professional consultation is needed. While not a replacement for healthcare providers, it enables timely guidance, supports remote or resource-limited environments, reduces healthcare burden, and improves patient awareness. Experimental results demonstrate high accuracy and reliability, making it a valuable digital health tool.

Keywords-*Artificial Intelligence (AI),Machine Learning (ML),Natural Language Processing (NLP),Healthcare Chatbot,Symptom Analysis,Preliminary Diagnosis,Decision Support System,Digital Healthcare,Medical Assistance System,Conversational AI*

AI-BASED INTELLIGENT CI/CD PIPELINE FOR AUTOMATEDSOFTWARE DELIVERY

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Abstract-This paper presents an **AI-based CI/CD pipeline** that integrates DevOps tools (Git, Jenkins, Docker) with machine learning to automate and enhance software delivery. The system analyzes build logs, detects anomalies, and predicts potential failures, reducing manual intervention and deployment errors. Deployed on **AWS EC2**, the pipeline improves scalability, reliability, and speed, significantly shortening deployment time. By combining AI with DevOps practices, this approach advances **AIOps**, enabling intelligent, efficient, and reliable software delivery in modern development environments.

Keywords-*CI/CD Pipeline, DevOps, Artificial Intelligence, Jenkins, Automation, Machine Learning, Software Delivery, Docker*

AIRAID : AIRBORNE DISEASE DETECTION USING MACHINE LEARNING

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Abstract- Airborne diseases spread rapidly through respiratory droplets and pose a major threat to global public health. Early detection is crucial to reduce transmission and improve treatment outcomes. Traditional diagnostic methods such as PCR tests are accurate but time-consuming and costly.This project proposes an intelligent Airborne Disease Detection System using Machine Learning techniques for quick and reliable prediction. The system uses algorithms like Random Forest and LightGBM to classify diseases such as influenza, tuberculosis, COVID-19, and healthy conditions.It analyzes key clinical features including body temperature, SpO_2, respiratory rate, cough severity, fatigue, chest pain, contact history, age, and symptom duration. A structured data pipeline with preprocessing and normalization improves prediction accuracy.The model is deployed as a web-based application using Flask, enabling real-time results. The system reduces dependency on laboratory testing and supports early screening. Overall, it provides a cost-effective and efficient solution for better healthcare decisionmaking.

Keywords-*Airborne Disease Detection, Machine Learning, Random Forest, LightGBM , Healthcare AI, Flask Web Application*

AN AGENTIC AI FRAMEWORK FOR AUTOMATING SOFTWARE DEVELOPMENT LIFE CYCLE USING INTELLIGENT CODE GENERATION AND ITERATIVE REFINEMENT

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Abstract-This paper proposes an **Agentic AI framework** to automate key phases of the Software Development Life Cycle (SDLC), addressing inefficiencies in traditional manual processes. The system interprets natural language requirements, transforms them into structured tasks, generates backend and frontend code, and iteratively refines outputs. By integrating **Large Language Models (LLMs)** with agent-oriented orchestration techniques (inspired by LangChain and LangGraph), the framework actively executes development tasks, automates project structuring, and improves code maintainability. Experimental results show faster development cycles, enhanced code consistency, and support for rapid prototyping, demonstrating the potential of Agentic AI to enable semi-autonomous, scalable, and productivity-driven software development.

Keywords-*Agentic AI, Software Development Life Cycle (SDLC), Code Generation, Large Language Models (LLMs), LangChain, LangGraph, Iterative Refinement, Software Automation, Rapid Prototyping*

BRAIN TUMOR DETECTION USING GAN ANDVISION TRANSFORMER

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Abstract: Brain tumor detection is a crucial task in medical imaging, as early diagnosis greatly improves treatment outcomes and patient survival. Traditional methods rely on radiologists to manually examine MRI scans, which can be time-consuming and may lead to human errors. To overcome these limitations, this project presents an automated detection system using Generative Adversarial Networks (GAN) and Vision Transformer (ViT). GAN is utilized to generate realistic synthetic MRI images, enhancing data augmentation and addressing class imbalance, thereby improving the quality and diversity of the training dataset. The Vision Transformer is used for feature extraction, where input images are divided into patches and processed using a self-attention mechanism to capture global relationships more effectively than conventional CNN models. A classification layer is then applied to accurately detect the presence of brain tumors. The hybrid GAN-ViT approach improves model robustness, generalization, and overall performance. Experimental results demonstrate that the system achieves high accuracy, up to 99%, while reducing the need for manual intervention and speeding up the diagnostic process, making it a reliable and scalable solution for modern healthcare applications.

Keywords*: Brain Tumor Detection, Medical Imaging, Deep Learning, Generative Adversarial Networks (GAN), Vision Transformer (ViT), MRI Image Analysis, Data Augmentation, Class Imbalance Handling, Self-Attention Mechanism, Patch-Based Learning, Tumor Classification, Automated Diagnosis, AI in Healthcare, Image Segmentation, Feature Extraction, High Accuracy Detection.*

HEART DISEASE RISK ASSESSMENT SYSTEM

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Abstract:This study presents a machine learning framework for early cardiovascular disease (CVD) prediction using Logistic Regression and Random Forest algorithms. The model analyzes 11 key attributes—including demographics, vital signs, lifestyle factors, and BMI—collected from populations and wearable devices for real-time monitoring.Data preprocessing ensures high-quality inputs, while model performance is evaluated using accuracy, precision, recall, and F1-score. The framework provides a decision-support tool for healthcare professionals, enabling proactive, personalized interventions and helping reduce global CVD burden through timely, data-driven insights.

Keywords*: Heart disease prediction, machine learning, Internet of Things, risk assessment, Logistic Regression, Random Forest, healthcare analytics, wearable devices, real-time monitoring*

MEDIPREDICT: A UNIFIED AI-POWERED WEB PLATFORM FOR MULTIPLE DISEASE PREDICTION WITH PERSONALISED HEALTH MANAGEMENT

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Abstract - This paper introduces **MediPredict**, a web-based health screening platform that integrates six independently trained **Random Forest models**to assess risk for Diabetes, Heart Disease, Hypertension, Chronic Kidney Disease, Breast Cancer, and Parkinson's Disease. Each model achieves prediction accuracies between 84% and 100%. Beyond prediction, MediPredict provides **personalized health plans**, including diet, exercise, lifestyle guidance, and specialist referrals. The platform features an AI Health Assistant (Claude AI), a BMI/TDEE-based planner, a live clinic finder (OpenStreetMap/Overpass API), and a prediction history tracker. Built with **Python and Flask**, it offers secure login and an admin dashboard. Results show Random Forest outperforms other classifiers, highlighting the system's potential to make **early disease screening accessible and actionable**, particularly in resource-limited communities.

Keywords*: Machine Learning, Random Forest Classifier, Disease Prediction, Flask, Claude AI, OpenStreetMap, Healthcare Technology, Early Detection, Health Management, Multi-Disease Platform.*

PERSONALIZED E-COMMERCE RECOMMENDATION SYSTEM BY USING DEEP LEARNING HYBRID APPROACH

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Abstract: This paper proposes a **Hybrid Deep Learning–based Personalized E-commerce Recommendation System** that integrates multiple recommendation techniques to overcome limitations of traditional methods. The system combines **deep learning–based collaborative filtering** (user/item embeddings), **matrix factorization (SVD), content-based filtering** (TF-IDF and cosine similarity), and **popularity-based ranking** to address cold-start issues. User interactions—such as views, cart additions, and purchases—are converted into implicit feedback scores to train the models. A **weighted aggregation mechanism** fuses individual model outputs for improved accuracy, diversity, and personalization. The system is implemented using **TensorFlow, Scikit-learn, PostgreSQL, and Django REST framework** for scalable, API-based deployment.

Keywords*— Recommendation System, Deep Learning, Collaborative Filtering, Matrix Factorization, Content-Based Filtering, E-commerce, Hybrid Model, Personalization*

QUANTUM-SECURED COMMUNICATION USING GHZ-BASED QUANTUM SECRET SHARING WITH AES-256-GCM ENCRYPTION

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Abstract: These studies showcase the transformative impact of **artificial intelligence, machine learning, and emerging technologies** across healthcare, education, e-commerce, software development, and security. In healthcare, AI frameworks enable early disease detection, maternal cardiac risk assessment, and real-time monitoring through wearable devices, providing personalized recommendations and reducing resource limitations. In software engineering, **Agentic AI, AI-driven CI/CD pipelines, and hybrid AI assistants** automate development, testing, and document-based reasoning, improving efficiency, scalability, and reliability. E-commerce and recommendation systems leverage **hybrid deep learning models** to enhance personalization, diversity, and user satisfaction, while advanced AR and IoT-enabled frameworks improve real-time environmental awareness, exam monitoring, and driver safety. Security-focused research integrates **blockchain, federated learning, and quantum-classical protocols** to ensure privacy, integrity, and resilience in cloud computing, EHR systems, and post-quantum communications. Collectively, these works illustrate the convergence of AI, IoT, blockchain, and edge/cloud computing to create intelligent, adaptive, and secure solutions that address real-world challenges across multiple domains.

***Keywords**: Quantum Secret Sharing, GHZ Entanglement, Ramp Secret Sharing, AES-256-GCM, QBER, SHA-256, Flask, Lagrange Interpolation, Post-Quantum Security.*

RAVENGUARD: AN INTELLIGENT HYBRID WEARABLE SYSTEM FOR WOMEN SAFETY USING TINYML AND IOT

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Abstract:Women's safety remains a critical concern due to the rising incidents of harassment and assault, particularly in situations where victims are unable to manually seek help. This paper presents RavenGuard, an intelligent hybrid wearable system that leverages Edge Artificial Intelligence (Edge AI) and Internet of Things (IoT) technologies to enable autonomous threat detection and real-time emergency response. The system integrates an ESP32 microcontroller with an MPU6050 motion sensor, GPS module, and SIM800L GSM module to continuously monitor user movement and location in real time.A TinyML-based model, developed using Edge Impulse, processes motion sensor data to accurately distinguish between normal activities and distress conditions such as falls, sudden impacts, or abnormal movement patterns. Upon detecting a potential threat or through manual activation via a panic button, the system initiates a multi-level alert mechanism. This includes immediate user confirmation through haptic and visual feedback, Bluetooth Low Energy (BLE) communication with a mobile application for monitoring and configuration, and automatic transmission of SMS alerts with precise GPS coordinates to predefined emergency contacts.

A TRANSFORMER-BASED RETRIEVAL AUGMENTED SEMANTIC DOCUMENT INTELLIGENCE SYSTEM FOR SMART AND COLLABORATIVE LEARNING

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Abstract: In today's digital learning environment, most educational materials are available in the form of PDF documents such as lecture notes, research papers, and study materials. However, these documents are usually static and require significant time for learners to read and understand important concepts. Students often find it difficult to quickly identify key ideas from lengthy documents. This project, titled "A Transformer-Based Retrieval Augmented Semantic Document Intelligence System for Smart and Collaborative Learning," aims to convert static PDF documents into intelligent and interactive learning resources. The system uses Natural Language Processing (NLP) and transformer-based models to analyze document content and automatically generate structured summaries. It also identifies key concepts from the document and presents them in a simplified format for easy understanding. In addition, the system generates flashcards and quizzes to support revision and self-assessment. A Question–Answer–Driven Summarization approach is implemented to highlight important information and improve learning effectiveness. The proposed system reduces the time required for studying large documents and improves knowledge retention. It encourages active learning by allowing students to interact with the generated content. Overall, the project aims to enhance the learning experience by making digital documents more intelligent and user-friendly.

***Keywords**: Transformer Models, Retrieval Augmented Generation, Natural Language Processing, Document Intelligence, Smart Learning.*

AI FOR SMART CITIES AND IOT APPLICATIONS

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Abstract:There is an urgent demand for smarter, more sustainable cities due to the increasing growth of urbanization. When paired with the Internet of Things (IoT), artificial intelligence (AI) provides game-changing answers to problems including waste management, public safety, energy efficiency, traffic control, and environmental monitoring. When studied using AI and machine learning models, the vast amounts of real-time data generated by IoT devices allow for better citizen services, resource management, and predictive decision-making and the foundation of smart city ecosystems is the combination of AI and IoT, which promotes automation, effectiveness, and resilience. Nonetheless, concerns about scalability, security, and data privacy continue to be major difficulties. In addition to raising urban living conditions, the incorporation of AI and IoT in smart cities opens the door for intelligent governance and sustainable development.

***Keywords**: Transformer Models, Retrieval Augmented Generation, Natural Language Processing, Document Intelligence, Smart Learning.*

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (CYBER SECURITY)

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LIVE NETWORK TRAFFIC ATTACK PREDICTION USING TEMPORAL GRAPH NEURAL NETWORKS

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Abstract: The rapid increase in cyber attacks on modern network infrastructures highlights the need for intelligent, real-time threat detection systems capable of analyzing dynamic and complex traffic patterns. Traditional intrusion detection approaches—including rule-based systems and classical machine learning models—often fail to capture the temporal and relational dependencies present in live network traffic. To address these limitations, this project proposes an advanced Live Network Traffic Attack Prediction System using Temporal Graph Neural Networks (TGNNs), which model network communication as evolving graph structures to accurately detect and predict malicious activities. In the proposed system, network hosts, IP addresses, and services are represented as graph nodes, while communication events form temporal edges. Real-time traffic logs are processed to extract features such as packet flow characteristics, protocol usage, connection frequency, and behaviour anomalies. These features are encoded into dynamic graph snapshots that reflect the evolving state of the network. A Temporal GNN architecture—combining graph convolution with recurrent or attention-based temporal layers—learns patterns from both structural relationships and time-based dependencies. This enables the model to detect subtle attack behaviours such as port scanning, DDoS attempts, lateral movement, and unauthorized access before they escalate. The system continuously updates graph representations as new traffic arrives and predicts attack likelihood in real time, enabling early intervention and automated response. By integrating deep learning, dynamic graph analysis, and live monitoring, the proposed framework provides a scalable, accurate, and proactive solution for modern cyber security environments.

Keywords: *Temporal Graph Neural Networks, Network Traffic Analysis, Cyberattack Prediction, Intrusion Detection, Graph Convolution, Real-Time Monitoring, Deep Learning, Network Security.*

REAL-TIME MULTIMODAL AI FOR DIGITAL MEDIA INTEGRITY USING GUARDIAN PROTOCOL ON SOCIAL MEDIA

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Abstract: The rapid progress of generative models has led to the creation of highly realistic manipulated videos, known as deepfakes. While these technologies have valid uses, their misuse can threaten privacy, security, and public trust. This paper presents a multimodal deep learning-based framework for detecting deepfake videos by analyzing both visual and audio signals. The proposed method uses convolutional neural networks (CNNs) to capture spatial details from facial regions and MelFrequency Cepstral Coefficients (MFCCs) to model speech patterns for identifying audio manipulation. A decision-level fusion strategy combines visual and auditory predictions to enhance resilience against advanced forgeries. Experimental results show that the proposed system achieves strong generalization across various manipulation methods, making it suitable for real-world forensic and security tasks.

Keywords: *Deepfake Detection, Video Forensics, Convolutional Neural Networks, Identity Watermarking, Computer Vision*

ATTRIBUTE-BASED KEYWORD SEARCH ENCRYPTION FOR SECURE CLOUD DATA ACCESS

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Abstract: The system aims to develop an efficient search scheme over encrypted data on mobile cloud platforms, enhancing privacy and security for users. The system comprises several modules, including registration, login, server functionalities, and user operations. During registration, users provide essential details such as username, password, name, mobile number, and address. Upon logging in, users authenticate themselves with their username, password, and role. The server component facilitates viewing user details and managing storage nodes, which store encrypted files along with corresponding indices. Users can request files by providing their username, a cipher keyword, and the desired filename. Additionally, users possess keys crucial for encryption and decryption processes, including public, private, and secret keys. The system supports uploading and downloading encrypted files, facilitated by a transformation function (TF) table. Overall, this system offers a robust framework for secure data management and retrieval over mobile cloud environments, ensuring confidentiality and integrity of user data.

Keywords: *cipher keyword, transformation function (TF) table, confidentiality, integrity*

BLOCKCHAIN-BASED SECURE FILE INTEGRITY MONITORING

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Abstract: Ensuring the integrity and authenticity of digital files has become a critical challenge due to the rapid increase in cyber threats such as unauthorized modifications, data tampering, ransomware, and insider attacks. Traditional file integrity monitoring (FIM) systems rely on centralized storage or log servers, which make them vulnerable to manipulation, single-point failures, and low transparency. To address these limitations, this study proposes a Blockchain-Based Secure File Integrity Monitoring System that leverages the decentralized, immutable, and tamper-resistant characteristics of blockchain technology. In the proposed model, every file event—such as creation, modification, or deletion—is converted into a hash value and securely recorded on a blockchain ledger. This decentralized verification mechanism ensures that any unauthorized change in a file can be instantly detected by comparing real-time hash values with blockchain-stored hashes. The system integrates smart contracts to automate event validation, access control, and audit logging without relying on third-party trust. Experimental evaluation demonstrates that the proposed architecture significantly improves data integrity assurance, reduces the risk of log tampering, and provides verifiable evidence trails suitable for forensic investigation. The model is scalable and adaptable for enterprise environments requiring high security, including finance, healthcare, and cloud-based infrastructures. Overall, this blockchain-enabled FIM system provides a reliable and future-proof framework for safeguarding sensitive digital assets.

Keywords: *Blockchain, File Integrity Monitoring (FIM), Smart Contracts, Hashing, Cybersecurity, Data Tampering, Decentralized Ledger, Audit Logs, File Security.*

DEVELOPMENT OF A BOOK-BASED MEDICAL KNOWLEDGE CHATBOT USING RETRIEVAL-AUGMENTED GENERATION

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Abstract: The rapid expansion of medical knowledge has increased the need for intelligent systems capable of delivering accurate, reliable, and context-aware clinical information. Traditional medical chatbots often rely on internet-based sources, which may lead to inconsistent, outdated, or unverifiable responses. To address these challenges, this project introduces VERIMED-AI, a book-verified medical knowledge chatbot developed using the Retrieval-Augmented Generation (RAG) framework. The system integrates the reasoning capabilities of Large Language Models (LLMs) with vector-based retrieval from authoritative medical textbooks to ensure factual accuracy and explainability. Trusted references such as *Harrison's Principles of Internal Medicine* and *The Gale Encyclopedia of Medicine* are preprocessed, segmented into semantic chunks, and converted into vector embeddings stored in a FAISS database for efficient semantic search. When a user submits a query, the system retrieves the most relevant textbook content and supplies it as contextual input to the generative model implemented using LangChain and HuggingFace**.** A Streamlit interface provides a user-friendly environment for querying the system. By grounding responses exclusively in verified medical literature, the proposed chatbot minimizes hallucinations, enhances reliability, and offers a scalable, trustworthy tool for medical education and research support.

Keywords: *Generative AI, Retrieval-Augmented Generation (RAG), Medical Chatbot, LangChain, HuggingFace, FAISS, Mistral LLM, Streamlit, Medical Knowledge Retrieval*

THE AUTOMATED SHIELD: IMPLEMENTING ARTIFICIAL INTELLIGENCE IN ZERO-TRUST DEFENSIVE ARCHITECTURES

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Abstract: As the sophistication of cyber-adversaries scales through the use of autonomous hacking tools, traditional perimeter-based security has become largely obsolete. This paper investigates the implementation of Artificial Intelligence (AI) and Machine Learning (ML) within a Zero-Trust Architecture (ZTA). Unlike legacy systems that rely on static rules, AI-driven defence mechanisms utilize real-time behavioural analytics to establish dynamic trust scores for every user and device on a network. We explore the mechanics of Self-Healing Networks, the role of Explainable AI (XAI) in reducing "alert fatigue" for security analysts, and the use of Generative Adversarial Networks (GANs) to simulate and prepare for future attack vectors. The research concludes that the future of enterprise security lies in "Autonomous Defense"—systems capable of detecting, isolating, and neutralizing threats at millisecond speeds, effectively removing the human bottleneck from the incident response loop.

Keywords*: Artificial Intelligence, Machine Learning, Zero-Trust Architecture, Explainable AI, Generative Adversarial Networks*

EMAIL RISK ANALYSIS FOR PHISHING DETECTION

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Abstract: Phishing emails remain one of the fastest-growing and persistent risks facing our computer universe. They involve emails hoodwinking users to give out private information, leading to hugely gigantic financial losses for organizations and individuals. There were over 300,000 phishing incidents reported to the FBI's Internet Crime Complaint Center last year with losses totaling over $50 million. This goes to reiterate the urgent need for intelligent prevention methods against phishing attacks. Simple rule-based preventive measures and blacklists usually do not act fast enough to detect fresh and original phishing attacks.To mitigate these challenges, we have come up with a multi-layered system that approaches an email from a number of different angles. Our detection methodology leverages a state-of-the-art ensemble machine learning model, analyzing a wide range of attributes of the email: the technical headers of the email and the content of the email, the hidden URLs found in the email, and the domain reputation associated with the email. We are able to detect even the tiniest signals of phishing by collating the strengths of several predictive models. The framework was also tested using a balanced dataset of 15,000 emails with which the above-mentioned framework has been found to reach the accuracy level of 98.7% with only a false positive rate of 0.8%. This, in other words, means that the above-mentioned framework has proved to be useful with regard to its applicability as well as efficiency in tackling the growing menace of email phishing attacks.

Keywords: *Phishing Detection, Email Security, Cybersecurity, Ensemble Learning, Machine Learning, URL Analysis, Feature Engineering, Email Header Analysis, and Content Classification*

ADAPTIVE HYBRID INTRUSION DETECTION USING ADT-SVM ON NETWORK FLOWS

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Abstract: The rapid growth of computer networks has exposed them to more dangerous cyber attacks. Traditional approaches used for intrusion detection are no longer sufficient to effectively handle varied and evolving threats in the network. To address this issue, this research introduces a machine learning-based approach for designing an intrusion detection system using an Adaptive Decision Tree–Support Vector Machine (ADT-SVM) model. The system identifies malicious attacks by analyzing network flow attributes, which are classified into four types: basic attributes, content attributes, traffic attributes, and host attributes. The effectiveness of the ADT-SVM model is evaluated using the NSL-KDD dataset. The results show that the model achieves 85% accuracy with a reduced false alarm rate, demonstrating its efficiency and reliability. The model also illustrates strong potential for real-world network environments and is suitable for large-scale network applications.

Keywords *: Intrusion Detection System (IDS), Machine Learning, Adaptive Decision Tree, Support Vector Machine (SVM), ADT-SVM, Network Security, Cyber Attacks, Network Flow Attributes.*

PRIVACY-PRESERVING FACE-BASED AUTHENTICATION SYSTEM USING EDGE AI AND BLOCKCHAIN

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Abstract: The rapid growth of digital platforms has increased the need for secure, scalable, and privacy-preserving authentication systems. Traditional centralized methods are vulnerable to data breaches and identity theft. This paper proposes a face-based authentication system that integrates Edge AI and blockchain for a decentralized, secure framework. Facial recognition is performed locally on edge devices, with encrypted embeddings stored as cryptographic hashes on the blockchain to ensure privacy and tamper resistance. Liveness detection prevents spoofing, while federated learning, smart contracts, and a zero-trust model enhance security and collaborative model improvement. Experimental results demonstrate improved accuracy, efficiency, and robustness, making the system suitable for cybersecurity, finance, healthcare, and smart environments.

Keywords- *Privacy-Preserving Authentication, Face Recognition, Edge AI, Blockchain, Biometric Security, Federated Learning, Homomorphic Encryption, Liveness Detection, Smart Contracts, Zero Trust Security, Cybersecurity.*

INSIDER THREAT DETECTION USING USER BEHAVIOUR ANALYTICS

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Abstract: Insider threats pose a major risk to organizational security, as malicious or negligent actions come from trusted individuals. Traditional rule-based detection often fails to identify subtle behavioral deviations. This project proposes an intelligent Insider Threat Detection System using User Behaviour Analytics (UBA) to monitor and analyze user activities in real time. The system captures indicators such as login frequency, access patterns, file interactions, and privilege usage to generate detailed user profiles. Machine learning–based anomaly detection identifies deviations from normal behavior, enabling early detection of compromised or malicious insiders. By combining behavioral profiling, anomaly detection, and risk scoring, the proposed UBA framework offers a proactive, scalable, and effective solution to strengthen organizational cybersecurity and mitigate insider threats.

Keywords*: User Behaviour Analytics (UBA), Insider Threat Detection, Anomaly Detection, Behavioural Profiling, Cybersecurity, Machine Learning, Risk Scoring*

AI-BASED FAKE PROFILE DETECTION ON SOCIAL MEDIA

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Abstract: The rapid growth of social media has led to an increase in fake user profiles used for misinformation, phishing, fraud, and cyberbullying. Traditional rule-based methods struggle to detect these sophisticated accounts. This project proposes an AI-based Fake Profile Detection System that uses machine learning and deep learning to identify fake or suspicious accounts in real time. The system analyzes profile metadata, posting patterns, linguistic features, engagement behavior, and network interactions. A hybrid classifier combining Random Forest, Logistic Regression, and BiLSTM detects anomalies, while deep learning and graph-based analysis identify unnatural content and coordinated fake networks. Explainable AI (XAI) techniques, such as SHAP values, provide transparency in detection. Experimental results show high accuracy, precision, and recall, demonstrating the system's effectiveness in detecting both simple bots and advanced human-like fake profiles. The approach enhances user safety, reduces misinformation, and supports authentic online communities.

Keywords: *Fake Profile Detection, Social Media Security, Machine Learning, Deep Learning, Bot Detection*

REAL-TIME KEYLOGGER DETECTION SYSTEM

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Abstract: Keyloggers are a serious malware threat, silently capturing sensitive information such as login credentials and banking details. Modern keyloggers often evade traditional signature- based antivirus solutions by using fileless techniques and disguising themselves as legitimate processes. This project proposes a Real-Time Keylogger Detection System that uses behavioral monitoring and anomaly detection to identify malicious keylogging activities. The system monitors low-level OS events, including keyboard hook registrations, API access, process injections, and abnormal memory patterns. Machine learning–based anomaly detection distinguishes normal activity from suspicious behavior, while heuristic rules identify known malicious patterns. A lightweight runtime agent enables real-time monitoring without affecting performance, issuing immediate alerts upon detection. By combining behavioral analytics, machine learning, and heuristics, the system provides a proactive and scalable solution to mitigate keylogger threats in personal and enterprise environments.

Keywords- *Keylogger Detection, Behavioral Analysis, Anomaly Detection, Malware Detection, Cybersecurity, Process Monitoring, Real-Time Threat Detection, Heuristic Analysis, System Security.*

DEEPFAKE DETECTION SYSTEM FOR CYBER CRIME PREVENTION

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Abstract:- The rapid advancement of AI and generative models has enabled highly realistic deepfake images, videos, and audio, which are increasingly exploited for cybercrimes such as identity theft, fraud, misinformation, and harassment. This project proposes a Deepfake Detection System for Cyber Crime Prevention that combines CNNs, transformer models, and frequency-domain analysis to detect subtle artifacts in manipulated content. The system examines facial inconsistencies, unnatural blinking, lip-sync errors, boundary mismatches, and audio–video dissonance, while spectral features (FFT, DCT) reveal hidden manipulation traces. A multi-stage classification pipeline extracts deep features and performs binary classification, with Explainable AI (XAI) techniques highlighting regions contributing to detection. Trained on datasets like FaceForensics++, Celeb-DF, and DFDC, the system demonstrates high accuracy and robustness. It provides a practical tool for law enforcement, digital forensics, and social media platforms to detect, prevent, and mitigate deepfake-related cybercrimes.

Keywords: *Deepfake Detection, Cyber Crime Prevention, GAN Detection, Video Forensics, Audio–Video Manipulation, Convolutional Neural Networks.*

AI-DRIVEN ADAPTIVE ENERGY-AWARE SORTING WITH BLOCKCHAIN-ASSISTED TRUST MANAGEMENT IN WIRELESS SENSOR NETWORKS

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Abstract: Wireless Sensor Networks (WSNs) are inherently constrained by limited energy resources, making energy efficiency a critical design objective for prolonging network lifetime and ensuring reliable communication. This paper proposes a novel AI-driven adaptive energy-aware sorting framework integrated with predictive energy modeling and blockchain-assisted trust management to address these limitations. The proposed approach employs a multi-criteria hybrid sorting mechanism that dynamically ranks sensor nodes using factors. Lightweight machine learning models deployed at the edge enable real-time, decentralized decision-making, thereby reducing communication overhead and latency while improving scalability. To enhance network security and robustness, a lightweight blockchain layer is incorporated to establish a decentralized trust management system that validates node authenticity and prevents malicious or compromised nodes from participating in routing and clustering processes

Keywords*: Wireless Sensor Networks, Energy Efficiency, Adaptive Sorting, Artificial Intelligence, Edge Computing, Predictive Modeling, Blockchain, Trust Management, Network Lifetime, Secure Routing*

MALWARE DETECTION TOWARDS MACHINE LEARNING MODELLING WITH EXPLAIN ABILITY ANALYSIS IN ETWORKING

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Abstract: The rapid expansion of modern network environments has led to a significant rise in sophisticated malware attacks that evade traditional signature-based detection techniques. The proposed system collects real-time network traffic, extracts relevant features such as flow statistics, protocol behavior, and anomalous communication patterns, and uses ML algorithms—including Random Forest, XGBoost, and Neural Networks—to classify traffic as benign or malicious. A key contribution of this work is the integration of explainable AI (XAI) techniques such as SHAP and LIME. These insights help security analysts understand the underlying factors influencing detection outcomes, enabling better validation, debugging, and policy formulation. The system architecture supports scalable real-time monitoring, making it applicable for enterprise networks, cloud infrastructures, and critical IoT systems. Experimental results show that the proposed ML-based approach significantly improves detection accuracy, reduces false positives, and offers deeper visibility into malware behaviours. The inclusion of explain ability ensures that the model's predictions are transparent and compliant with modern cybersecurity auditing standards.

Keywords: *Malware Detection, Machine Learning, Explainable AI (XAI), SHAP, LIME, Network Security, Traffic Analysis, Intrusion Detection, Cybersecurity, Anomaly Detection.*

PHISHING URL DETECTION USING MACHINE LEARNING

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Abstract: Phishing attacks are one of the most serious and widespread cyber security threats today, where millions of malicious URLs are created every year to deceive users into revealing sensitive information such as passwords and banking credentials. Traditional rule-based detection systems and blacklists are no longer sufficient to combat these threats, as phishing websites constantly evolve and change their patterns to bypass conventional defences. To address this challenge, this paper proposes a real-time Phishing URL Detection System that leverages Machine Learning techniques to automatically classify URLs as either legitimate or phishing with high accuracy and efficiency.. Each algorithm was trained and evaluated on the publicly available PhiUSIIL Phishing URL Dataset, which provides a reliable and comprehensive benchmark for testing detection performance. The Random Forest algorithm delivered the best results, achieving an impressive accuracy of 97.3%, with both precision and recall values exceeding 96%. This indicates that the system is not only highly accurate in identifying phishing URLs but also minimizes false positives and false negatives, making it dependable for real-world deployment. Unlike traditional methods that rely on maintaining and updating large blacklists, this machine learning approach learns the underlying patterns of phishing behavior, allowing it to detect even previously unseen or newly created malicious URLs without requiring external databases.

Keywords: *Phishing Detection, Lexical Features, Host-Based Features, Phishing Attacks, Web Security, PhiUSIIL*

REAL TIME AI BASED PHISHING AND SCAM DETECTION SYSTEM

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Abstract: Phishing and scam attacks have become a major cybersecurity threat due to the rapid growth of digital communication and online transactions. Traditional phishing detection systems rely mainly on blacklist-based approaches and fail to detect zero-day attacks and message-based scams. This paper presents Quick+ PhishGuard, a real-time AI-based phishing and scam detection system designed for mobile platforms. The system uses a hybrid two-tier architecture consisting of on-device TensorFlow Lite (TFLite) models for instant offline detection and cloud-based analysis for advanced threat detection. It supports detection of India- specific scams such as KYC fraud, UPI scams, OTP theft, and telecom impersonation. The system also includes a community-driven threat intelligence module for collaborative scam reporting. The backend is implemented using FastAPI, while the mobile application is developed using Flutter. The proposed system improves detection accuracy, reduces response time, and enhances user security.

Keywords*: Phishing Detection, AI-based Security, Real-time Threat Detection, Mobile Security, NLP, URL Analysis, Cloud Security, Smishing Detection, UPI Fraud.*

SBOM-DRIVEN VULNERABILITY PRIORITIZATION: LEVERAGING CYCLONEDX FOR EFFICIENT CVE MANAGEMENT

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Abstract: The exponential rise in reported Common Vulnerabilities and Exposures (CVEs) has intensified the challenge of securing modern software ecosystems, where organizations often struggle to distinguish critical risks from the overwhelming noise of vulnerability alerts. Software Bill of Materials (SBOMs) have become a cornerstone of supply chain transparency, yet their potential is frequently limited to static component inventories that fail to support actionable risk management. This work proposes the use of CycloneDX, a widely adopted SBOM specification, as a foundation for dynamic CVE prioritization by rank issues most relevant to deployed environments. The central problem addressed is the lack of contextual prioritization, which leads to wasted resources on low-impact vulnerabilities while severe risks remain unmitigated, compounded by fragmented tooling and poor integration between SBOM generation and vulnerability workflows. By transforming SBOMs into active instruments of risk-based decision- making, the proposed approach reduces alert fatigue, emphasizes vulnerabilities with tangible operational impact, and enables security teams to allocate resources more effectively. This study highlights the importance of human-centered vulnerability management, shifting the focus from abstract identifiers to the real-world implications of security flaws, thereby contributing to scalable, efficient, and resilient cybersecurity practices aligned with the broader goals of supply chain security.

Keywords*: Common Vulnerabilities and Exposures (CVE) , Software Bill of Materials (SBOM)*

BEHAVIOR-AWARE CLOUD SECURITY MONITORING USING HYBRID MACHINE LEARNING MODELS

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Abstract: The Cloud Security Monitoring and Log Analysis System is designed to detect suspicious and malicious activities in cloud environments using server log data. As cloud platforms continue to expand in scale and complexity, traditional rule-based monitoring and manual log inspection methods become insufficient for identifying abnormal behavior in real time. This work proposes a behavior-aware cloud security monitoring framework that applies machine learning techniques to analyze large volumes of server logs and detect anomalies efficiently. A hybrid model combining Random Forest and XGBoost is employed to improve detection accuracy, robustness, and reliability in classifying normal and suspicious events. The central problem addressed is the difficulty of processing massive and diverse cloud log data while reducing false positives and enabling timely threat identification. By integrating intelligent log analysis with automated anomaly detection, the proposed system enhances cloud security by providing proactive monitoring, early threat detection, and improved operational visibility. This approach reduces manual effort for administrators, supports faster incident response, and strengthens overall cybersecurity resilience in cloud infrastructures.

Keywords*: Cloud Security Monitoring, Log Analysis, Hybrid Machine Learning, Random Forest, XGBoost, Anomaly Detection, Cybersecurity*

BRUTE FORCE LOGIN PROTECTOR USING REDIS DATABASE

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Abstract: The increasing sophistication of cyberattacks has made brute force attacks one of the most prevalent threats to web-based authentication systems. These attacks attempt to gain unauthorized access by systematically submitting large volumes of credential combinations until a valid match is found. Traditional rate-limiting and IP blocking approaches implemented at the application layer often fail to respond quickly enough to prevent access under sustained attack conditions. This paper presents the design and implementation of a real-time Brute Force Login Protection System that leverages Redis, a high-performance in-memory data store, to track and analyze login attempt patterns with sub-millisecond response times. The system is built on a Flask-based backend with MySQL serving as the persistent data store for user credentials and activity logs. When the number of failed login attempts from a specific IP address or for a specific username exceeds a configurable threshold, the system automatically enforces a temporary block using Redis Time-To-Live (TTL) mechanisms. A real-time security monitoring dashboard enables administrators to visualize attack patterns, blocked entities, and system health metrics. The proposed system demonstrates effective detection and mitigation of brute force attacks with minimal latency overhead, providing a scalable and practical solution suitable for deployment in modern web applications.

Keywords: *Brute Force Attack, Redis, Flask, MySQL, Login Protection, In-Memory Database, Real-Time Detection, Rate Limiting, Time-To-Live (TTL), Web Application Security, Authentication System, IP Blocking.*

AN EFFECTIVE DEEPFAKE DETECTION USING NEURAL NETWORKS

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Abstract: Deepfake technology has emerged as a significant challenge in the field of digital media security, enabling the generation of highly realistic manipulated images and videos. These synthetic media artifacts pose severe threats, including misinformation dissemination, identity impersonation, and cyber fraud. This paper presents a robust deepfake detection framework that integrates Convolutional Neural Networks (CNNs) with Transformer-based architectures to effectively identify forged content. The system employs a structured processing pipeline consisting of face detection, preprocessing, feature extraction, and classification. Additionally, Explainable Artificial Intelligence (XAI) techniques such as Grad-CAM are incorporated to enhance model interpretability. Experimental evaluation demonstrates that the proposed hybrid model achieves high detection accuracy and improved generalization across diverse datasets, making it suitable for real-world cybersecurity and digital forensic applications.

Keywords: *Deepfake Detection, CNN, Transformer, Computer Vision, Artificial Intelligence, Digital Forensics*

COMPARATIVE ANALYSIS OF YOLOv8 AND DEEPLEARNING TECHNIQUES FOR WEAPON DETECTION AND BEHAVIOURAL THREAT RECOGNITION

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Abstract: The increasing number of security threats in public environments such as transportation hubs, educational institutions, and commercial areas has created a strong demand for intelligent surveillance systems capable of automatically identifying potential dangers. Traditional monitoring methods often rely heavily on human observation, which can lead to delayed responses and overlooked threats. To address this limitation, this study proposes an AI- based surveillance framework that integrates advanced computer vision and deep learning techniques for effective threat detection. The system focuses on a comparative analysis of the yolov8 object detection model and other deep learning approaches for identifying weapons and recognizing suspicious human behaviour in real-time environments. The proposed framework is designed to detect dangerous objects such as guns and knives from images, recorded videos, and live webcam streams. Yolov8 is utilized for its high detection speed and accuracy in object recognition tasks, while additional deep learning techniques are applied to analyse human facial expressions and behavioural patterns that may indicate aggressive or abnormal activities. By combining weapon detection with behavioural threat recognition, the system provides a more comprehensive understanding of potential security risks. Furthermore, the system is implemented through a user-friendly web-based interface using Flask, enabling users to upload media files, monitor real-time detection results, and receive automated alerts when suspicious activities are identified.

Keywords: *Weapon detection, YOLOv8, Deep learning, Computer vision, Behavioural threat recognition, Intelligent surveillance, Object detection, Public safety.*

FARM SUPPLY CHAIN FRAUD DETECTION USING AI

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Abstract: Agriculture supply chains involve farmers, distributors, wholesalers, retailers, and consumers. Fraud activities such as price manipulation, fake invoicing, quantity mismatch, and product adulteration are common. Manual monitoring systems fail to detect hidden fraudulent patterns. The proposed system uses Artificial Intelligence for fraud detection. Machine learning models analyze transaction, logistics, and pricing data. Anomaly detection techniques identify suspicious activities in real-time. The system improves transparency, reduces financial losses, and ensures food authenticity. This research proposes an Artificial Intelligence-based framework for fraud detection in farm supply chains, leveraging machine learning and anomaly detection techniques to monitor transactions, logistics, and pricing data in real-time. The system integrates multiple data sources, including farm-level production data, distributor and retailer transaction records, and quality control metrics. Supervised machine learning algorithms, such as Random Forest and Gradient Boosting, are used to classify transactions as normal or fraudulent, while unsupervised models, including Isolation Forest and clustering algorithms, detect anomalous patterns without prior labeling. The proposed system features real-time alerts, dashboards for stakeholder monitoring, and continuous model training to improve detection accuracy over time. Experimental evaluation demonstrates that the AI framework can detect suspicious activities with high precision and recall, outperforming traditional rule-based methods. By enabling proactive detection of fraud, the system enhances supply chain transparency, reduces financial losses, and ensures the authenticity and safety of agricultural products.

Keywords*: Machine learning, Random Forest, Gradient Boosting, Isolation Forest and clustering algorithms.*

WEB BASED BUG BOUNTY TOOLKIT

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Abstract: Web application security has become a critical concern in the digital era, with organizations continuously facing threats from malicious actors exploiting open ports, exposed subdomains, and Local File Inclusion (LFI) vulnerabilities. This paper presents Web Based Bug Bounty Toolkit, a unified, automated web vulnerability scanning framework that integrates open port detection, subdomain enumeration, and LFI vulnerability testing into a single platform. Upon completing each scan, the system evaluates findings against a structured severity model (Critical, High, Medium, Low, Informational) and provides actionable cheatsheets for developers and security professionals. The framework employs a modular pipeline architecture and a lightweight RESTful API backend, enabling rapid deployment and extensibility. Experimental results demonstrate that Web Based Bug Bounty Toolkit achieves high detection accuracy across diverse target environments while significantly reducing the manual effort required in reconnaissance and vulnerability assessment phases of penetration testing.

Keywords*: Web Security, Port Scanning, Subdomain Enumeration, Vulnerability Scanner, Severity Assessment.*

WEB RAPTOR: A UNIFIED URL RECONNAISSANCE PLATFORM FOR THREAT INTELLIGENCE AND VULNERABILITY MAPPING

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Abstract: Web reconnaissance is a crucial phase in both offensive and defensive cybersecurity operations. It involves gathering publicly available information about a target system, domain, or infrastructure to identify potential vulnerabilities and exposure points before conducting assessments. Manual reconnaissance—while accurate—often requires repetitive steps across various tools such as Sublist3r, Amass, Nmap, VirusTotal, and WHOIS lookups, demanding a high level of human intervention and analytical consolidation. The platform consolidates different reconnaissance tools and threat intelligence APIs into a single automated pipeline. These functions are further improved by integrating real-time threat intelligence sources such as VirusTotal and URLVoid. One of Web Raptor's key features is its AI- powered report generator, which leverages OpenAI's GPT model to transform raw reconnaissance outputs into clear, reader-friendly summaries suitable for both technical and non-technical stakeholders.. This paper outlines the architecture, implementation details, and real-world use case evaluations, positioning Web Raptor as a modern, scalable solution for early-stage cyber threat assessment and training.

Keywords*: Web reconnaissance, Sublist3r, Amass, Nmap, VirusTotal. WHOIS lookups, OpenAI's GPT, Web Raptor*

FILE INTEGRITY CHECKER USING SHA-256 AND BLOCKCHAIN

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Abstract: File integrity monitoring (FIM) is a foundational control in cybersecurity for detecting unauthorized modifications to sensitive data. Traditional FIM tools rely on centralized hash stores that are themselves susceptible to tampering, and they fail to attribute detected changes to specific users or devices. This paper presents a blockchain-based FIM system that integrates SHA-256 dual-level cryptographic hashing, a custom blockchain audit ledger, role-based access control (RBAC), and client identity tracking via MAC address, IP address, and session timestamps. The system is implemented as a Python-Flask application exposing 13 REST API endpoints, with a Watchdog-based real-time file monitoring engine and a three-dimensional cyberpunk web dashboard. Experimental evaluation across 50 tamper scenarios demonstrates 100% detection accuracy, sub-200 ms alert latency, and complete forensic attribution. The architecture aligns with NIST SP 800-92 and is suitable for Security Operations Center (SOC) deployment.

Keywords :*File Integrity Monitoring, SHA-256, MAC Address Tracking, REST API, Real-Time Detection.*

SPLUNK ENTERPRISE: DETECTION & ALERT CREATION USING UNIVERSAL FORWARDER

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***Abstract*:** The initiative showcases the creation and execution of an SIEM home lab utilizing Splunk Enterprise for effectively gathering, scrutinizing, and monitoring logs generated by machines. As more logging occurs in contemporary IT setups, traditional human inspection of these records is not feasible without errors. To tackle this issue, the Splunk Universal Forwarder has been set up to safely send log data across various devices to the Splunk indexer, where it can be centrally managed and analysed. A new mechanism provides instantaneous insight into operational processes while enhancing security by automating analysis of logs for early warning signs of threats. Different types of safety notifications are set up to detect unusual occurrences like multiple incorrect logins, unapproved new accounts being made, and pings sent via IP packet echo request messages, potentially signalling probing for vulnerabilities or malicious activities. Utilizing Splunk's robust SPL for searching, analysing, and presenting logs effectively enhances operational insights through streamlined processes. By utilizing this home lab method, learners can affordably gain hands-on experience in comprehending aspects of Security Information and Event Management systems, log handling techniques, and emergency procedures effectively. The initiative showcases how unified surveillance combined with automatic notifications greatly boosts security levels by shortening response times and strengthening comprehensive oversight within cyber defence setups.

Keywords*: SIEM, Splunk Universal Forwarder, Splunk's robust SPL, Event Management systems, cyber defence*

TRANSFORMER-BASED FRAMEWORK FOR ROBUST DETECTION AND CLASSIFICATION OF AL-GENERATED IMAGES AND VIDEOS

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Abstract*:* The rapid advancement of generative models has led to a surge in highly realistic AI-generated images and videos, raising concerns about misinformation, security, and digital authenticity. This paper proposes a transformer-based framework for the robust detection and classification of AI-generated visual content. Leveraging the self-attention mechanism of transformers, the model captures both spatial and temporal inconsistencies that distinguish synthetic media from real data. The framework integrates multi-modal feature extraction and fine-grained classification to improve detection accuracy across diverse generative techniques, including deepfakes and diffusion-based outputs. Experimental results demonstrate that the proposed approach outperforms traditional convolutional methods in terms of robustness, generalization, and scalability. This work contributes to the development of reliable tools for safeguarding digital media integrity in the era of advanced generative AI.

Keywords: *Transformer Networks, Deepfake Detection, AI-Generated Content, Digital Media Forensics, Attention*

THREAT INTELLIGENCE DASHBOARD (REAL-TIME THREAT FEED AGGREGATION DASHBOARD)

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***Abstract*:** Cyber threats are growing in scale and complexity, requiring faster intelligence tools for detection and response. Analysts often juggle multiple platforms like VirusTotal, AbuseIPDB, and AlienVault OTX, which makes manual analysis slow and fragmented. This project develops a Threat Intelligence Dashboard that integrates these sources via APIs, delivering real-time data on malicious IPs, domains, URLs, and file hashes. Built with Python and MongoDB, the system stores indicators and historical records while offering a unified interface. Analysts can assess severity, track trends, and identify high-risk indicators efficiently. By consolidating feeds, the dashboard reduces effort, enhances awareness, and accelerates incident response.

Keywords: *Threat Intelligence, Cyber Threat Detection, API Integration, Real-time Monitoring, Indicators of Compromise (IoCs), Threat Correlation, Security Analytics, Dashboard Visualization, Incident Response, Python, MongoDB.*

REVERSE ENGINEERING AND MALWARE ANALYSIS IN ANDROID APPLICATION

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***Abstract*:** The rapid growth of Android applications has led to a significant rise in mobile malware, posing serious threats to user privacy, financial security, and device integrity. Traditional signature-based detection techniques are ineffective against newly emerging and obfuscated malware variants, creating the need for intelligent and automated detection mechanisms. This project presents a machine learning–based Android malware detection system that integrates reverse engineering and static analysis techniques. Android application package (APK) files are analysed using Androguard to extract critical features such as permissions, API calls, and application components without executing the application. These features are transformed into numerical vectors and used to train machine learning classifiers for accurate malware classification. The proposed system provides an efficient, scalable, and high-accuracy solution for detecting malicious Android applications while reducing computational overhead compared to dynamic analysis approaches.

Keywords: *Traditional signature-based detection,Obfuscated malware variants, Androguard., API calls, application components*

HYBRID CNN-LSTM DRIVEN NETWORK INTRUSION DETECTION FOR REAL-TIME MULTI-CLASS CYBER ATTACK ANALYSIS

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Abstract: This paper presents a Hybrid CNN-LSTM Network Intrusion Detection System (NIDS) engineered for real-time multi-class cyber attack classification. Modern networks generate complex, high-dimensional traffic that conventional signature-based systems cannot adequately analyze, particularly against zero-day and polymorphic threats. The proposed architecture combines Convolutional Neural Networks (CNN) for extracting spatial feature representations from flow-level attributes and Long Short-Term Memory (LSTM) networks for modeling temporal dependencies across traffic sequences. The system is trained and evaluated on the CIC-IDS2017 benchmark dataset, which encompasses 14 traffic categories including benign flows and attacks such as DoS, DDoS, PortScan, FTP-Patator, SSH- Patator, Bot, Infiltration, and multiple web attack variants. A comprehensive preprocessing pipeline including missing value imputation, min-max normalization, label encoding, and sliding-window sequence generation transforms raw CSV records into model-ready tensors. The trained hybrid model achieves an overall classification accuracy of 97% and a weighted average F1-score of 0.97. A Flask-based real-time monitoring dashboard provides automated intrusion alerts, attack statistics, and system activity logs. Experimental results confirm that the CNN-LSTM hybrid surpasses standalone deep learning architectures in detecting multi- class cyber threats within operational network environments.

Keywords: *Intrusion Detection System, CNN, LSTM, Deep Learning, CIC-IDS2017, Multi-Class Classification.*

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A HIGH-GAIN DC -DC CONVERTER USING AN EXTENDABLE SWITCHED- INDUCTORANDCAPACITOR-DIVIDERNETWORKFORSOLARPVSYSTEMS

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Abstract: This paper develops a DC–DC power conversion approach capable of generating a significantly higher output voltage for solar photovoltaic systems. The voltage produced by PV sources is generally low and highly dependent on environmental conditions which limit its direct usability. To address this challenge, a modified converter topology is designed by combining energy storage elements and capacitive voltage scaling techniques. This configuration enables effective voltage elevation while maintaining reduced electrical stress across switching devices and ensuring reliable performance under practical operating conditions. The system is evaluated through simulation in MATLAB/ Simulink, where it demonstrates stable voltage regulation and improved conversion performance. Owing to these features, the proposed design is well suited for integration in renewable energy-based power applications.

Keywords— *Solar PV, DC–DC Converter, High Gain, Switched Inductor, PWM Control, Renewable Energy*

AI AND RENEWABLE ENERGY POWERED MICRO GRID FOR SMART LOAD DISTRIBUTION

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Abstract: The increasing penetration of renewable energy sources and electric vehicles has created the need for intelligent micro grid systems capable of fast and efficient load distribution. This project proposes a renewable energy powered micro grid with bidirectional energy flow, where renewable sources supply energy to the grid and charge EV batteries during high generation periods. During low demand or peak load conditions, stored energy from EV batteries is fed back to the load through a bidirectional converter and inverter. An Artificial Neural Network (ANN) algorithm is employed to analyze voltage data collected from DC and AC sensors via an MCP3008 ADC and make real-time energy flow decisions. Based on ANN output, switching signals are generated for bidirectional converter transistors, ensuring optimal power distribution, improved efficiency, and reduced grid dependency. The system enhances micro grid intelligence, stability, and sustainability.

Keywords—*V2G, ANN, Bidirectional, Renewable energy, Load balancing, Smart grid.*

AI EARLY WARNING SYSTEM FOR EV BATTERY THERMAL RUN AWAY AND CABIN HEALTH

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Abstract: Electric vehicles (EVs) are becoming increasingly popular due to their environmental benefits and energy efficiency. However, safety concerns related to lithium-ion battery thermal run away and poor cabin air quality remain significant challenges. Thermal run away can cause battery fires or explosions, posing serious risks to passengers and the vehicle. At the same time, poor cabin air quality due to increased levels of carbon dioxide, volatile organic compounds (VOCs), and temperature fluctuations can negatively affect passenger health and comfort.AI-based early warning system that continuously monitors battery parameters and cabin environmental conditions using multiple sensors. Temperature, voltage, current, gas, and humidity sensors collect real-time data from the EV battery pack and the vehicle cabin. These sensor readings are transmitted to a processing unit where artificial intelligence algorithms analyze the data to detect abnormal patterns that may indicate potential battery thermal runaway or unhealthy cabin conditions.

Keywords—*EV, Volatile Organic Compounds, High Gain, Switched Inductor, PWM Control, Renewable Energy*

INTEGRATION OF VEHICLE-TO-GRID (V2G) WITH SMART GRID FOR LOAD BALANCING

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Abstract: The increasing penetration of renewable energy sources and electric vehicles has created the need for intelligent micro grid systems capable of fast and efficient load distribution. This project proposes a renewable energy powered micro grid with bidirectional energy flow, where renewable sources supply energy to the grid and charge EV batteries during high generation periods. During low demand or peak load conditions, stored energy from EV batteries is fed back to the load through a bidirectional converter and inverter. An Artificial Neural Network (ANN) algorithm is employed to analyze voltage data collected from DC and AC sensors via an MCP3008 ADC and make real-time energy flow decisions. Based on ANN output, switching signals are generated for bidirectional converter transistors, ensuring optimal power distribution, improved efficiency, and reduced grid dependency. The system enhances micro grid intelligence, stability, and sustainability.

Keywords—*V2G, ANN, Bidirectional, Renewable energy, Load balancing, Smart grid.*

AI-BASED AUTONOMOUS NAVIGATION FRAME WORK

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Abstract: Autonomous navigation has emerged as a critical research area in robotics, intelligent transportation systems, and un manned aerial/ground vehicles. Traditional navigation approaches often rely on rule-based algorithms or pre-defined maps, which limit adaptability in dynamic and uncertain environments. This paper proposes an AI-based autonomous navigation framework that integrates deep learning, sensor fusion, and reinforcement learning to enable real-time decision-making and path optimization. The framework leverages multi- modal data from LiDAR, cameras, GPS, and inertial sensors to construct a robust perception model, while reinforcement learning agents continuously improve navigation strategies through interaction with the environment. By combining predictive modeling with adaptive control, the system achieves enhanced obstacle avoidance, route planning, and energy efficiency. Experimental results demonstrate that the proposed framework outperforms conventional navigation methods in terms of accuracy, scalability, and resilience to environmental variability. This research contributes to advancing autonomous systems capable of safe, intelligent, and efficient navigation across diverse domains such as smart mobility, logistics, and defense applications.

Keywords— *Artificial Intelligence , Autonomous Navigation, Reinforcement Learning, Sensor Fusion, Deep Learning, Path Planning, Obstacle Avoidance, Intelligent Transportation Systems, Robotics, Unmanned Vehicles*

IOT BASED–PREDICTIVE MAINTENANCE OF INDUCTION MOTOR

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Abstract: Industrial motors are vital in manufacturing and automation, but sudden failures cause costly downtime. Traditional maintenance method soften fail to prevent unexpected faults. This project propose san IoT-Based Predictive Maintenance System that monitors parameters like temperature, vibration, current, and speed using sensors and an ESP32/Node MCU, with data sent to cloud platforms for real-time analysis. The system predicts failures, sends instant alerts, reduces down time, extends motor life, and improves reliability, show casing how IoT and analytics enable smarter, sustainable industries. It offers a cost-effective solution that can be scaled across different industrial applications. By adopting this approach, industries can achieve higher efficiency and long-term savings.

Keywords—*ESP32, MCU*

AI-BASED EV THAT ADAPTS TO DRIVER HEALTH CONDITIONS

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Abstract: The rapid growth of EVs has improved transportation efficiency and sustainability. However, accidents caused by sudden driver health issues remain a major concern. Existing EV systems mainly focus on vehicle performance and lack real-time driver health monitoring, increasing accident risk and delaying emergency response. It proposes an AI-based EV system for continuous driver health monitoring. Heart rate and temperature sensors are used to collect physiological data from the driver. An Arduino Uno processes this data and detects abnormal health conditions using intelligent logic. When irregularities are detected, the system automatically reduces vehicle speed andactivatessafetyalerts.AnESP8266 module enables IoT- based cloud connectivity for remote monitoring. Health data is transmitted to an online platform for emergency notifications. In critical situations, alerts are sent to predefined contacts for immediate medical assistance. The system integrates embedded systems, AI, and IoT technologies. It is cost-effective, scalable, and suitable for modern EV applications. It enhances driver safety and supports the development of smart transportation.

Keywords— *Electric Vehicles (EVs), Driver Health Monitoring, Artificial Intelligence, Internet of Things (IoT), Arduino Uno, ESP8266, Safety Systems, Smart Transportation.*

IOT AND ML ENABLED SMART GRID FAULT DETECTION

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Abstract: The modernization of power systems through smart grids has significantly improved efficiency, reliability, and real-time monitoring capabilities. However, the increasing complexity of grid infrastructure introduces new challenges in fault detection and system stability. This paper presents an intelligent fault detection framework that integrates IoT devices with ML algorithms to enable real-time monitoring and predictive analysis in smart grids. IoT sensors are deployed across the grid to continuously collect electrical parameters such as voltage, current, frequency, and temperature. The collected data is transmitted to a centralized or cloud-based platform for processing and analysis. Machine Learning models, including supervised and unsupervised techniques, are employed to identify abnormal patterns and detect faults with high accuracy. The proposed system enhances early fault detection, reduces downtime, and improves overall grid resilience. Experimental results demonstrate that the integration of IoT and ML significantly out performs traditional fault detection methods in terms of speed, accuracy, and scalability.

Keywords—*SmartGrid,FaultDetection,InternetofThings(IoT),MachineLearning,PredictiveMaintenance*

LIFE BEACON-ACCIDENT RESQ SYSTEM

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Abstract: Road often result in fatalities due to delayed medical response. This paper presents an Arduino- based Accident Detection and Alert System that automatically detects collisions using an accelerometer and sends real-time alerts. When a sudden impact is detected, the system retrieves the location through GPS and transmits it via GSM to emergency contacts. It also records key data like time and acceleration for analysis. The system is cost-effective, compact, and operates without human intervention, improving emergency response and road safety

Keywords: *Accident,GPS,GSM*

QUADRATIC BOOST CONVERTER WITH ADAPTIVE FUZZY LOGIC CONTROL FOR ENHANCED POWER QUALITY

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Abstract: The proposed AFLC enhances the conventional fuzzy controller by incorporating adaptability into its structure. It dynamically adjusts membership functions and rule parameters based on real- time system performance, such as error and change in error of the output voltage. This adaptive mechanism ensures optimal control action under varying load conditions, input voltage fluctuations, and external disturbances. The controller generates appropriate duty cycle signals for the switching device, thereby maintaining a stable output voltage with reduced ripple and improved transient response. The system is modeled and simulated using advanced simulation tools under various operating scenarios, including steady-state operation, step changes in load, and fluctuating input voltage conditions. Key performance indicators such as voltage gain, efficiency, output voltage ripple, total harmonic distortion (THD), settling time, and overshoot are analyzed. The results demonstrate that the proposed QBC with AFLC significantly outperforms conventional boost converters with PI controllers. Specifically, the system exhibits faster dynamic response, lower steady-state error, reduced harmonic distortion, and improved voltage regulation.

Keywords: *Smart electrical grid, Fault detection, Predictive maintenance, Deep learning, Artificial neural networks (ANNs), Convolutional neuralnetworks (CNNs),Longshort-termmemory(LSTM),Autoencoders,Real-timemonitoring,Signalprocessing.*

WORKING PRINCIPLE OF HYBRID PEM FUEL CELL-BATTERY EV ENERGY MANAGEMENT SYSTEM WITH IOT MONITORING

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Abstract: The growing demand for clean and sustainable transportation has led to significant advancements in electric vehicle technologies. However, conventional battery electric vehicles face challenges such as limited driving range, long charging duration, and battery degradation. To address these issues, this project proposes a hybrid fuel cell–battery electric vehicle system that combines the advantages of both energy sources. In the proposed system, a Proton Exchange Membrane (PEM) fuel cell is used as a secondary energy source, while a 12V battery acts as the primary power supply for the motor load. ADC-DC boost converter is employed to regulate the fuel cell output and ensure efficient battery charging. An ESP32 microcontroller is used to implement an intelligent energy management system through PWM control. The system continuously monitors voltage, current, and temperature parameters using sensors to ensure safe and efficient operation. Additionally, IoT integration enables real-time monitoring through a mobile application.

Keywords—*ElectricVehicle,ProtonExchangeMembrane,PulseWidthModulation.*

DESIGN AND DEVELOPMENT OF VERTICAL AXIS WIND TURBINES FOR HARNESSING WIND ENERGY FROM HIGHWAY VEHICULAR MOTION

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Abstract: The rising energy demand, coupled with the exhaustion of traditional energy sources has created a strong need for sustainable solutions. This project introduces a Vertical Axis Wind Turbine (VAWT) system designed to capture wind energy produced by the movement of vehicles on highways. In contrast to conventional wind turbines, VAWTs perform effectively under low wind speeds and in environments with changing wind directions, making them well-suited for this application. The proposed system harnesses the airflow generated by passing vehicles and converts it into mechanical energy, which is then transformed into electrical energy through a DC generator. The electricity produced is stored in a rechargeable battery and continuously monitored using an Arduino-based setup equipped with voltage and current sensors, an LCD display, and alert indicators. By utilizing energy that would otherwise go to waste, this method offers an environmentally friendly solution.

Keywords—*VerticalAxisWindTurbine(VAWT)*

DRIVEN AUTONOMOUS EMERGENCY RESPONSE SYSTEM FOR WOMEN'S SAFETY USING LORA

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Abstract: Women's safety remains a critical concern, especially in remote or low-network areas where conventional communication systems fail to provide timely assistance. This paper presents Safe Link; an AI- based autonomous emergency response system designed as a wearable safety device. The system integrates Tiny ML (edge AI) for real-time distress detection using motion sensors such as accelerometers and gyroscopes. Unlike traditional safety solutions that rely on manual triggering or internet connectivity, the proposed system can automatically identify abnormal situations such as falls, sudden movements, or potential threats and initiate emergency alerts without user intervention. Ensure reliable communication in network-deficient environments, the system employs a hybrid approach using LoRa mesh networking and Bluetooth communication. This enables long-range, decentralized, and multi-hop transmission of SOS alerts to nearby devices, trusted contacts, and emergency responders without relying on cellular networks.

Keywords*—WomenSafety,LoRaCommunication,TinyML,EdgeAI,WearableDevice,EmergencyResponseSystem*

SINGLE-STAGE ISOLATED ELECTROLYTIC CAPACITOR-LESS EV ON BOARD CHARGER WITH POWER DECOUPLING

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Abstract: In this paper, a new single-stage single-phase isolated AC-DC converter derived from a differential boost AC-DC converter is proposed. This converter eliminates the need to use the bulky electrolytic capacitor from the system and at the same time provides DC charging by employing the AC Power Decoupling waveform control method, effectively addressing the power density and reliability related issues commonly associated with the bulky electrolytic capacitor. As half of the switches of this converter act as synchronous rectifier during half grid cycle they are inherently ZVS Turned On while the remaining switches achieve ZVS Turn On as they act as synchronous rectifier during other half grid cycle. However, all diodes at the secondary side achieve ZCS Turn Off during the entire line cycle. A conventional controller is implemented for output voltage regulation and PFC control whereas a power decoupling controller is added to compensate second harmonic ripple power.

Keywords—*ZVS,AC-DC Converter*

MACHINE ALERT CONTINUOUS VIBRATION DETECTION INDUSTRIAL SAFETY

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Abstract: Industrial environments involve complex machinery and hazardous operations that demand continuous monitoring to ensure worker safety and prevent accidents. This paper proposes a machine alert continuous detection system designed to enhance industrial safety through real-time monitoring and intelligent alert mechanisms. The system integrates sensors, embedded systems, and data processing techniques to continuously track machine parameters such as temperature, vibration, and operational status. By utilizing advanced algorithms, the proposed model identifies abnormal conditions and potential failures at an early stage, thereby minimizing risks and reducing down time. The system is capable of generating instant alerts to operators through visual and audio notifications, enabling timely intervention.

Keywords— *Industrial Safety, Machine Alert System, Continuous Monitoring, Fault Detection, Internet of Things (IoT), Real- Time Detection, Embedded Systems, Sensor Technology, Predictive Maintenance, Automation, Safety Alerts, Smart Industry, Condition Monitoring, Industrial IoT (IIoT), Risk Prevention.*

IOT-ENABLED AIR/ WATER QUALITY MONITORING: REAL-TIME DATA VIA SENSORS, AI ANALYZES POLLUTION PATTERNS, SEND ALERTS

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Abstract: Environmental pollution is increasingly recognized as a critical global issue, threatening both human health and ecological balance. This project proposes an advanced monitoring system built on the Internet of Things (IoT), capable of tracking air and water quality in real time through a network of connected sensors. These sensors continuously measure important environmental parameters, including temperature, humidity, Ph levels, turbidity, and concentrations of harmful gases. The collected data is transmitted to a cloud platform, where it is securely stored and analyzed. To improve analytical capabilities, the system incorporates Artificial Intelligence (AI) algorithms that evaluate data trends, identify anomalies, and predict potential environmental risks. Based on these evaluations, real-time alerts and notifications are sent to users and relevant authorities, enabling timely and informed responses.

Keywords—*ArtificialIntelligence(AI),pHlevel,IoT*

AI DRIVEN SUSTAINABLE EV CHARGING NETWORK WITH REALTIME BATTERY MONITORING

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Abstract: The explosive growth of Electric Vehicles (EVs) necessitated the development of sustainable and efficient EV charging infrastructure. Hence, this paper proposes an EV charging infrastructure by integrating Renewable Energy Sources (RES) and an intelligent Artificial Neural Network (ANN) controller for State of Charge (SOC) monitoring. By integrating RES such as solar, system reduces dependency on grid, lowers charging costs, and contributes to clean energy adoption. The Quasi Z-Source Converter (qZSC) is DC-DC converter used in EV charging infrastructure to enhance the performance, and efficiency of charging systems. Further, it helps in maintaining the quality of power delivered to the EV and also minimizes any negative effects on the grid. Boost converters are capable of handling wide variations in input voltage and providing a stable output voltage. The Maximum Power Point Tracking (MPPT) used to extract the highest power and it tracks maximum power point from PV. The intelligent ANN controller is employed to accurately monitor and manage SOC, using real-time data to control charging rates, prevent over charging, and maximize charging efficiency based on dynamic conditions like grid demand and battery status.

Keywords—*Electric Vehicles, QuasiZ-Source Converter, RNN based MPPT, ANN controller, SOC Monitoring.*

AI CONTROL FOR MAXIMUM POWER POINT TRACKING (MPPT) IN PHOTOVOLTAIC SYSTEMS

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Abstract: This paper presents an AI-based Maximum Power Point Tracking (MPPT) technique for photovoltaic systems. The proposed approach improves efficiency, reduces oscillations, and enhances tracking speed compared to conventional methods. Compared to conventional methods, the proposed approach demonstrates superior convergence speed, reduced oscillations, and improved energy efficiency. Extensive simulations validate the effectiveness of the system.AI-based Maximum Power Point Tracking (MPPT) techniques enhance solar photovoltaic (PV) systems by utilizing Artificial Neural Networks (ANN), Fuzzy Logic Controllers (FLC), and metaheuristic algorithms (e.g., PSO) to accurately identify the Global Maximum Power Point (GMPP) under partial shading. Compared to traditional algorithms like P&O or IC, AI methods provide faster convergence, fewer steady-state oscillations, and superior efficiency, though they require high computational power. These intelligent controllers can be implemented using boost converters to adjust the duty cycle dynamically.

Keywords: *Photovoltaic, DC-DC Converter, Sensors, Microcontroller, PWM Generator, MPPT, Artificial Intelligence, Neural Networks, Fuzzy Logic, Renewable Energy*

ARTIFICIAL INTELLIGENCE-POWERED PREDICTIVE MAINTENANCE FOR INDUSTRIAL EQUIPMENT

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Abstract : Industrial equipment downtime can have far-reaching consequences, resulting in significant losses in productivity, revenue, and even safety. Traditional maintenance strategies, such as scheduled maintenance and reactive repairs, are often inadequate in preventing equipment failures. This paper proposes an AI-powered predictive maintenance system that leverages machine learning algorithms to detect anomalies and predict equipment failures. By analyzing real-time sensor data and historical maintenance records, our system identifies patterns and trends that indicate potential failures, enabling proactive maintenance and reducing downtime. Our approach involves: Data Collection: Gathering sensor data from industrial equipment, including temperature, vibration, pressure, and other relevant parameters. Real-time Monitoring: Continuously monitoring equipment performance and updating predictive models to ensure accuracy. Our AI-powered predictive maintenance system offers a proactive approach to industrial equipment maintenance, enabling organizations to minimize downtime, reduce costs, and improve overall efficiency

Keywords— *Predictive Maintenance, Artificial Intelligence, Machine Learning, Industrial Equipment, Downtime Reduction, Anomaly Detection, Real-time Monitoring*

FREIGHT TRAIN IN THE AGE OF AUTONOMOUS SYSTEMS. A TAXONOMY REVIEW WITH AI PERSPECTIVES

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Abstract: The recent successful deployment of a fully automated commercial freight train operation marks the world's first automated heavy-duty, long-haul rail network. This milestone is impressive, but it raises the question: why has it taken so long to achieve, especially when driverless urban metro systems have been in operation for over 50 years? While both urban metros and freight trains operate on rails, their environments and operations are quite different. Metros function within closed, controlled rail networks, while freight trains operate across open, dynamic networks. Despite these differences, similar automation taxonomies have often been applied to both. This paper provides an overview of driving automation in freight rail and reviews existing taxonomies. We begin by discussing the general process of driving a vehicle and outlining its various stages. Next, we describe the specific process of driving a freight train to highlight the unique aspects of its setup and operations. In doing so, we explore the key differences between open and closed rail networks, along with tasks that could be automated. Additionally, we investigate the evolution of level-based automation taxonomies and review those developed specifically for driving automation in both open and closed rail systems.

Keywords*- Automation taxonomies, driverless trains, driving automation, grades of automation, levels of automation, railway automation, self-driving vehicles*

EVALUATING BLOCKCHAIN TECHNOLOGY FOR RENEWABLE ENERGY PROJECT SUCCESS IN INDIA: CRITICAL SUCCESS FACTORS AND MODERATING EFFECTS

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Abstract: India's Renewable Energy (RE) transition, targeting 500 GW of installed capacity by 2030, demands robust project management frameworks that integrate emerging digital technologies. This study adapts and extends existing research on Blockchain Technology (BCT) and Critical Success Factors (CSF) to the Indian renewable energy context. Using a mixed-method design combining bibliometric analysis with quantitative survey methodology—including Mean Response Ranking (MRR) and Partial Least Squares Structural Equation Modelling (PLS-SEM)—the study surveys 121 stakeholders comprising MNRE officials, DISCOM engineers, renewable energy developers, and academic researchers across India. Findings reveal that Government & Policy Factors rank as the most influential CSF in India, followed by Social Factors and Organizational & Management Factors. The bibliometric analysis identifies two dominant application clusters: BCT for smart grid and prosumer market integration, and BCT for rural electrification. Crucially, SEM results confirm that BCT positively moderates the relationship between CSF and project success (correlation = 0.256, $R^2 = 0.565$), establishing BCT as a performance-amplifying tool for India's RE project ecosystem. The study recommends a BCT-enabled prosumer policy framework and an indigenized RE Project Management Methodology aligned with MNRE standards.

Keywords- *Blockchain Technology, Renewable Energy, Critical Success Factors, Smart Grid, DISCOM, , PLS-SEM*

SMART CONTROL FRAMEWORK FOR RENEWABLE HYBRID ENERGY SYSTEMS USING MPC, ANFIS, AND PSO TECHNIQUES

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Abstract : The rapid penetration of renewable energy sources into modern power systems requires advanced and intelligent control strategies to ensure reliable operation under variable generation and dynamic load conditions. In this work, an integrated control architecture is proposed for Solar PV–Wind–Battery hybrid systems by combining Model Predictive Control (MPC), Adaptive Neuro-Fuzzy Inference System (ANFIS), and Particle Swarm Optimization (PSO). MPC is employed for real-time energy scheduling and system coordination, while PSO optimizes battery operation to achieve higher efficiency and longevity. ANFIS enhances system adaptability by effectively responding to load variations and uncertainties. The proposed framework is validated through simulation on the IEEE 33-bus distribution system using real-world datasets obtained from the National Renewable Energy Laboratory (NREL) and Pecan Street.

Keywords— *Renewable Energy Sources, Hybrid Systems, Particle Swarm Optimization, Model Predictive Control.*

ADAPTIVE AI CONTROLLERS FOR REAL-TIME MICROGRID STABILITY ENHANCEMENT

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Abstract : The rapid integration of renewable energy sources and distributed generation has introduced significant challenges in maintaining microgrid stability, particularly under dynamic and uncertain operating conditions. This paper presents a proposed system based on adaptive artificial intelligence (AI) controllers designed to enhance real-time voltage and frequency stability in microgrids. The system employs a hybrid control strategy that combines reinforcement learning with deep neural networks to enable continuous learning and self-adjustment of control parameters without relying on accurate system models. The proposed architecture consists of distributed sensors, a real-time data acquisition module, an AI-based control unit, and power electronic interfaces for implementing corrective actions. The proposed AI-driven framework offers a scalable and intelligent solution for next-generation microgrids, supporting both grid-connected and islanded modes of operation while ensuring reliable and efficient energy management.

Keywords— *Adaptive AI, Microgrid, Simulation, MATLAB, Distributed Energy Resources, Predictive Control, Python.*

AI-DRIVEN SUSTAINABLE EV CHARGING INFRASTRUCTURE WITH RENEWABLE ENERGY INTEGRATION AND INTELLIGENT SOC

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Abstract : The rapid growth of Electric Vehicles (EVs) has created a strong need for the development of sustainable, efficient, and intelligent EV charging infrastructure. In response to this need, this paper proposes an EV charging system integrated with Renewable Energy Sources (RES) and an Artificial Intelligence (AI)-based controller for State of Charge (SOC) monitoring. By incorporating renewable energy sources such as solar photovoltaic (PV) systems, the proposed infrastructure reduces dependence on the conventional grid, lowers charging costs, and promotes the adoption of clean energy. In the proposed system, a Quasi Z-Source Converter (qZSC) is employed as the DC–DC converter to improve the overall performance and efficiency of the charging process. The qZSC enhances voltage regulation, supports reliable power conversion, and helps maintain the quality of power supplied to the EV, while also minimizing adverse impacts on the utility grid. In addition, boost converters are utilized to handle wide variations in input voltage and ensure a stable output voltage suitable for charging applications. To maximize energy extraction from the solar PV system, a Maximum Power Point Tracking (MPPT) technique is implemented.

Keywords*— Electric Vehicles, QuasiZ-Source Converter, RNN based MPPT, ANN controller, SOC Monitoring.*

IOT BASED PARALYSIS PATIENT ASSISTING SYSTEM USING GSM

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Abstract : Paralysis patients often struggle to express their needs because they can't speak and have limited movement. This situation makes them completely reliant on caregivers for basic things like food, water, and medical help. Such dependence lowers their confidence and increases stress for family members and hospital staff. To address this issue, a GSM-based system to assist paralysis patients is proposed. The system uses a microcontroller and a GSM module connected to input switches or sensors. Patients can press specific switches to indicate their needs. The system then sends a predefined SMS to the caregiver's mobile phone. For instance, one switch may signal a request for food, another for water, and a third is dedicated to emergencies. GSM technology allows long-distance communication, enabling caregivers to receive alerts even when they aren't near the patient. This low-cost, portable, and energy-efficient system is suitable for use at home or in hospitals. It can also be expanded with health sensors to monitor vital signs like heartbeat and temperature. The proposed solution improves patient independence, reduces caregiver stress, and ensures timely medical help

Keywords— *GSM, Paralysis, Patient Assistance, Microcontroller, Healthcare, Sensors, SMS Alert System*

AI BASED DEMAND RESPONSE PLANNING IN CAPACITY MARKET USING MICROGRID

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Abstract: Demand Response (DR) has emerged as a vital strategy for enhancing grid flexibility and reliability, particularly in the context of modern capacity markets. This paper presents an integrated approach to demand response planning within a microgrid framework, enabling efficient participation in capacity markets. A microgrid, consisting of distributed energy resources (DERs) such as solar photovoltaics, wind turbines, battery storage systems, and controllable loads, provides a localized and intelligent platform for managing demand-side resources. The proposed model utilizes advanced forecasting techniques and optimization algorithms to schedule load curtailment and resource allocation based on market signals, system constraints, and user preferences. By incorporating real-time pricing and capacity market commitments, the microgrid can dynamically adjust its load profile to reduce peak demand and offer reliable capacity services to the grid. A multi-agent system (MAS) architecture is adopted to facilitate decentralized decision-making, where agents representing generators, storage units, and consumers interact to achieve optimal demand response.

Keywords— *DR, DERs, MAS, Microgrid, Simulation, AI, Dataset and Battery storage systems.*

DESIGN AND IMPLEMENTATION OF HYBRID RENEWABLE ENERGY SYSTEMS FOR POWER GENERATION

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Abstract: The increasing demand for sustainable and reliable power generation has accelerated the development of hybrid renewable energy systems (HRES). This paper presents the design and implementation of a hybrid renewable energy system integrating multiple energy sources such as solar photovoltaic (PV), wind energy, and energy storage systems to ensure continuous and efficient power supply. The proposed system aims to overcome the intermittency of individual renewable sources by combining their complementary characteristics. A comprehensive design methodology is developed, including system sizing, component selection, and control strategies for optimal energy management. Advanced algorithms are employed to balance power generation, storage, and load demand while minimizing operational costs and energy losses. The implementation includes real-time monitoring and control using an intelligent energy management system. The proposed HRES provides a cost-effective and environmentally friendly solution for modern power generation needs.

Keywords— *Hybrid renewable energy system (HRES), solar photovoltaic (PV), wind energy, energy storage, power generation, energy management system*

MICROGRID ENERGY MANAGEMENT SYSTEM FOR SMART HOME USING MULTI-AGENT SYSTEM WITH AI

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Abstract: The rapid growth of smart grids and renewable energy integration has increased the need for efficient energy management in residential microgrids. This study presents a microgrid energy management system (EMS) for smart home applications using a multi-agent system (MAS) approach. The proposed system consists of distributed energy resources such as photovoltaic (PV) panels, battery energy storage systems, and household electrical loads. The microgrid operates in both grid-connected and islanded modes, ensuring reliability and flexibility in power supply. In the proposed architecture, multiple intelligent agents are assigned to different components of the microgrid, enabling decentralized control and real-time decision-making. TThe MAS framework allows effective scheduling of loads based on energy availability, battery state of charge, and demand response strategies. The system is modelled and simulated using MATLAB/Simulink integrated with the Java Agent Development Framework (JADE), providing a co-simulation environment for analyzing system performance. Results demonstrate that the proposed MAS-based EMS improves energy efficiency, enhances reliability, and reduces dependency on the main grid.

Keywords— *JADE IoT, MAS, EMS, MATLAB ESP32, Raspberry Pi and AI*

DESIGN AND OPTIMIZATION OF LITHIUM-ION BATTERY SYSTEMS FOR ELECTRIC VEHICLES

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Abstract: The rapid growth of electric vehicles (EVs) has intensified the need for efficient, reliable, and high-performance lithium-ion battery systems. This paper presents the design and optimization of lithium-ion battery systems tailored for EV applications, focusing on enhancing energy density, thermal stability, lifecycle performance, and safety. A systematic approach is adopted to model battery behavior under varying load and environmental conditions, incorporating advanced battery management system (BMS) strategies for real-time monitoring and control. Optimization techniques such as machine learning algorithms and multi-objective optimization are employed to balance performance, cost, and durability. The proposed framework contributes to the development of next-generation EV battery systems with higher reliability and extended service life, supporting the transition toward sustainable transportation.

Keywords— *Lithium-ion battery, Electric vehicles, Battery management system (BMS), State of charge (SOC), Thermal management, Energy optimization.*

DYNAMIC POWER TRANSMISSION FOR EV VEHICLE CHARGING DURING VEHICLE RUNNING

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Abstract: The increasing demand for electric vehicles (EVs) has created a need for efficient and sustainable charging solutions. One of the major challenges faced by EV users is limited driving range and dependency on stationary charging stations. Dynamic power generation for EV vehicles on roadways is an innovative technology that enables vehicles to charge while in motion. This system uses embedded infrastructure such as inductive coils or conductive rails installed beneath or along the road surface to transfer electrical energy wirelessly or through direct contact to the vehicle. In this system, power is generated and supplied dynamically to moving vehicles, reducing the need for large onboard batteries and minimizing charging downtime. The transmitted energy is received by a pickup system in the vehicle and converted into usable electrical energy to charge the battery or directly power the motor. The integration of smart sensors, control units, and communication systems ensures efficient energy transfer, safety, and proper synchronization between the road infrastructure and the vehicle. This reduces dependence on fossil fuels and lowers carbon emissions, making transportation more sustainable. Although the initial installation cost can be high, the long-term benefits include reduced electricity bills and a cleaner environment.

Keywords— *Dynamic power generation, electric vehicles (EVs), wireless power transfer, inductive charging*

SMART GRIDS FOR SUSTAINABLE ENERGY MANAGEMENT IN INDIA – AI DRIVEN GRID MODERNIZATION

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Abstract: India's power sector is undergoing a transformative shift, driven by the Government's ambitious target of 500 GW of non-fossil fuel-based capacity by 2030 and the comprehensive Smart Cities Mission. Energy management in India must simultaneously address persistent power quality issues—including voltage sags, harmonics, and frequency deviations—while integrating large-scale renewable energy and accommodating rapid urbanization. Smart grids represent a sophisticated energy infrastructure that enhances the sustainability, dependability, and efficiency of India's generation and distribution networks through digital communication technologies. This paper presents a comprehensive and methodical review of smart grid technologies adapted to the Indian scenario. The role of AI, machine learning, and data analytics in grid optimization.

Keywords*— Smart grid India, power quality, renewable energy integration, AI in power systems, demand-side management, DISCOM reform, harmonics, voltage stability, PM-KUSUM, RDSS scheme.*

WIRELESS METHANE GAS MONITORING AND OVERFLOW CONTROLLING USING EMBEDDED SYSTEM

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Abstract: Methane gas is one of the most commonly used fuels in domestic and industrial applications, but it is also highly flammable and hazardous when leaked into the environment. Undetected methane leakage can lead to serious accidents such as fire explosions, environmental pollution, and health risks. Therefore, an efficient and reliable monitoring system is essential to ensure safety. This project presents a wireless methane gas monitoring and overflow control system using an embedded system to detect gas leakage, provide real-time monitoring, and automatically control the gas supply. The methane sensor continuously detects the concentration of methane gas present in the surrounding environment and sends analog signals to the microcontroller. The microcontroller processes these signals and displays the gas levels through serial monitoring for real-time observation. In addition, the wireless module enables remote monitoring, allowing users to track gas levels from a distant location. The microcontroller triggers a relay module, which controls the solenoid valve to automatically shut off the gas supply, thereby preventing further leakage or overflow. This system can be widely implemented in industries, gas storage facilities, mines, and residential areas where methane gas is used or present.

Keywords— *Methane gas monitoring system, gas leakage detection, embedded system, wireless communication, solenoid valve control, and safety automation are the key elements of this project*

SOLAR TOWER TECHNOLOGY

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Abstract: Solar tower technology, also known as central receiver technology, is an advanced method of harnessing solar energy for large-scale power generation. It is a type of concentrated solar power (CSP) system in which a field of mirrors, called heliostats, track the sun and reflect its rays onto a central receiver mounted on top of a tall tower. The concentrated solar radiation significantly increases the temperature at the receiver, often exceeding 500°C to 1000°C. This heat is then used to generate steam, which drives a turbine connected to an electrical generator, producing electricity. One of the key advantages of solar tower technology is its ability to achieve high thermal efficiency due to the concentration of sunlight at a single point. Additionally, it supports thermal energy storage systems, typically using molten salts, which allows electricity generation even during cloudy periods or after sunset. However, the technology faces challenges such as high initial capital costs, land requirements, and potential impacts on local ecosystems, including bird mortality due to intense heat near the receiver. D Solar tower technology is considered a promising solution for sustainable and large-scale renewable energy production, contributing significantly to global efforts in combating climate change and promoting clean energy transition

Keywords— *concentrated solar power (CSP), Solar tower technology*

SMART PELTIER-BASED THERMAL MANAGEMENT SYSTEM

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Abstract: Smart thermoelectric energy systems are gaining importance in modern applications where waste heat can be utilized for sustainable power generation. This project presents the design and implementation of a smart Peltier-based power generation and energy storage system using an ESP32 microcontroller for monitoring and control. The system operates on the principle of the Seebeck Effect, where a temperature difference across the Peltier module generates an electrical voltage. In this setup, one side of the Peltier module is exposed to a heat source while the other side is maintained at a lower temperature using a heat sink and cooling fan, thereby creating the required thermal gradient. The proposed system demonstrates a compact and portable solution for low-power energy harvesting from temperature differences. Although the output power is limited due to the inherent efficiency constraints of thermoelectric devices, the system effectively showcases the feasibility of converting waste heat into usable electrical energy. This project can be further extended for applications in energy recovery systems, portable power units, and smart monitoring of thermoelectric generators.

Keywords— *Peltier Module, Thermoelectric Generator, Seebeck Effect, ESP32 Microcontroller, Energy Harvesting, Battery Charging, Voltage Sensor, Embedded System, Waste Heat Recovery.*

OPTIMIZED ROBA MULTIPLIER: ACHIEVING ULTRA-FAST AND POWER-EFFICIENT DSP WITH REVOLUTIONARY ROUNDING-BASED APPROXIMATION

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Abstract: This paper presents a Rounding-Based Approximate (RoBA) multiplier designed to achieve high-speed and energy-efficient performance for digital signal processing (DSP) applications. Multiplication is a fundamental arithmetic operation widely used in DSP, image processing, and VLSI systems, where performance metrics such as power consumption, delay, and area are critical. Traditional multipliers such as Wallace Tree and Booth multipliers offer high accuracy but suffer from increased hardware complexity, higher power consumption, and longer propagation delays. To overcome these limitations, enabling a trade-off between computational accuracy and hardware efficiency. The proposed RoBA multiplier simplifies the multiplication process by rounding input operands to the nearest power of two prior to computation. This transformation allows multiplication to be implemented using simple shift and addition operations instead of complex partial product generation and accumulation. Moreover, the proposed system demonstrates improved scalability, allowing it to be effectively integrated into advanced DSP pipelines and AI accelerators.

Keywords— *RoBA, Power Efficient DSP*

DEEP LEARNING-BASED MARINE SPECIES CLASSIFICATION USING SMART ELECTRICAL MONITORING SYSTEMS

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Abstract: This project develops an automated, interpretable pipeline to classify underwater marine species from image frames, supporting monitoring and conservation efforts. Using transfer learning on a pre trained VGG-16 backbone, the convolutional feature extractor is frozen and the classifier head is adapted to the target species set. The dataset is organized into train, validation, and test splits and restructured for Image Folder compatibility; training images undergo augmentation and ImageNet normalization to improve robustness to underwater variability. The loop alternates train and validation phases, tracks loss, and checkpoints the best validation model. After training, the model is saved for reproducible inference. These visualizations help domain experts verify that the model attends to biologically meaningful regions, increasing trust and aiding error analysis.

Keywords— *pretrained, VGG 16 backbone, Grad CAM Visualisation*

EDGE-AI BASED SMART IRRIGATION SYSTEM FOR URBAN GARDENS

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Abstract: This project develops an automated, interpretable pipeline to classify underwater marine species from image frames, supporting monitoring and conservation efforts. Using transfer learning on a pre trained VGG-16 backbone, the convolutional feature extractor is frozen and the classifier head is adapted to the target species set. The dataset is organized into train, validation, and test splits and restructured for Image Folder compatibility; training images undergo augmentation (resize, random flip, rotation, color jitter, center crop) and ImageNet normalization to improve robustness to underwater variability. Training uses cross-entropy loss with SGD (momentum, weight decay) and a step learning rate scheduler. The loop alternates train and validation phases, tracks loss and accuracy, and checkpoints the best validation model. After training, the model is saved for reproducible inference. A Streamlit application wraps the inference pipeline, allowing single and batch image uploads, interactive probability bar charts, Grad-CAM visualizations, and downloadable batch results. The app supports loading custom trained weights or a demo pretrained model for quick testing

Keywords— *pretrained, VGG 16 backbone, Grad CAM Visualisation*

AN IOT AND AI BASED INTELLIGENT AUTOMATIC DECELERATION SYSTEM FOR ACCIDENT PREVENTION AND ROAD SAFETY

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Abstract: Driver health emergencies during vehicle operation can lead to serious accidents if timely assistance is not provided. This project proposes an Automatic Deceleration System with Integrated SOS Emergency Response in Electric Driving Systems, designed to detect and communicate the driver's condition through intelligent visual recognition. In this system, the driver manually displays predefined visual signs to indicate their current health or emergency status. These signs are recognized using Artificial Intelligence (AI) and Data Science techniques, where an image classification model based on Region-Based Convolutional Neural Network (RCNN) is trained to accurately identify the driver's gestures. The system stops the vehicle and sends urgent notifications to both medical professionals and caretakers for immediate medical support.By integrating AI-based gesture recognition, data-driven decision mechanisms, and automated SOS communication, the proposed system enhances driver safety and ensures rapid emergency response in electric driving environments.

Keywords— *Region-Based Convolutional Neural Network (RCNN), SOS*

AI-BASED TRAFFIC SIGNAL CONTROL SYSTEM FOR URBAN TRAFFIC MANAGEMENT

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Abstract: Urban traffic congestion is a growing problem worldwide, leading to increased travel time, fuel consumption, and environmental pollution. Traditional traffic signal systems operate on fixed timers or simple adaptive mechanisms, which are often inefficient under fluctuating traffic conditions. This paper proposes an AI-based traffic signal control system that uses machine learning algorithms to optimize signal timing in real-time. By analyzing traffic flow data from sensors and cameras, the system predicts traffic density and adjusts signal phases dynamically. Intelligent Traffic Systems (ITS) integrate advanced technologies, such as AI, to optimize traffic management. AI can analyze real-time traffic data and implement adaptive control strategies to minimize delays and enhance road safety. These systems reduce congestion, lower emissions, and prioritize emergency vehicles, resulting in smoother traffic flow and reduced wait times.

Keywords— *AI, Traffic Signal Control, Machine Learning, Urban Traffic, Intelligent Transportation System (ITS).*

AI-DRIVEN OPTIMIZATION OF RENEWABLE ENERGY SOURCES FOR EFFICIENT POWER MANAGEMENT

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Abstract: Urban traffic congestion is a growing problem worldwide, leading to increased travel time, fuel consumption, and environmental pollution. Traditional traffic signal systems operate on fixed timers or simple adaptive mechanisms, which are often inefficient under fluctuating traffic conditions. This paper proposes an AI-based traffic signal control system that uses machine learning algorithms to optimize signal timing in real-time. By analyzing traffic flow data from sensors and cameras, the system predicts traffic density and adjusts signal phases dynamically. Simulation results demonstrate improved traffic throughput, reduced waiting time, and decreased congestion compared to conventional methods. Traffic congestion is a major challenge in urban areas. Traditional traffic signal systems are often static or rely on pre-defined schedules, which do not respond effectively to sudden changes in traffic volume. Intelligent Traffic Systems (ITS) integrate advanced technologies, such as AI, to optimize traffic management. These systems reduce congestion, lower emissions, and prioritize emergency vehicles, resulting in smoother traffic flow and reduced wait times.

Keywords— AI, Traffic Signal

SMART SOLAR-POWERED COLLAR FOR AFFORDABLE CATTLE HEALTH MONITORING AND DIAGNOSIS

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Abstract: Livestock health plays a crucial role in sustaining rural economies, yet small-scale farmers often face challenges such as late illness detection, missed breeding cycles, and the high cost of commercial monitoring systems. To address these issues, this work proposes a low-cost, solar-powered smart collar designed for cattle health monitoring and diagnosis. The system integrates affordable and readily available components including an ESP32/NodMCU microcontroller, MPU6050 motion sensor, MLX90614 temperature sensor, and SIM800L GSM module. The collar enables real-time monitoring of vital parameters such as estrus detection, fever, sodium deficiency, heat stress, and animal activity, while GPS functionality ensures location tracking. Communication is achieved through SMS, eliminating the need for internet connectivity and making the solution suitable for rural environments. Future enhancements include voice alerts in regional languages to improve farmer accessibility. This smart collar demonstrates strong potential to empower rural farmers by improving cattle health management, optimizing breeding cycles, and ultimately increasing income

Keywords— *Smart Collar-Cattle Health Monitoring- IoT- Solar-Powered Device- Estrus Detection- Rural Farming- GSM Communication- Low-Cost Prototype*

SOLAR POWERED SMART TRASH MANAGEMENT SYSTEM

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Abstract: Rapid urbanization and population growth have intensified the burden on conventional waste management systems, which rely on fixed schedules rather than actual bin fill levels, resulting in frequent overflow, pollution, and public health hazards. This paper presents a Solar Powered Smart Trash Management System that integrates IoT-based real-time bin monitoring with renewable solar energy to overcome these shortcomings. Ultrasonic sensors continuously measure garbage bin fill levels, which are processed by an Arduino/Node MCU microcontroller and transmitted to a cloud server via GSM or Wi-Fi modules. Automated alerts are dispatched to collection authorities when bins reach a predefined threshold, enabling dynamic and optimized collection routing assisted by a GPS module. Powered entirely by solar panels with battery backup, the system operates 24 hours a day, 7 days a week without grid electricity. The system aligns with four United Nations Sustainable Development Goals (SDGs 6, 11, 12, and 13) and is applicable across smart cities, public spaces, and rural environments. The proposed design addresses the key gap in existing systems—the absence of sustainable, off-grid power supply—while delivering measurable improvements in cleanliness, cost efficiency, and environmental impact.

***Keywords—** Smart Waste Management; IoT; Solar Energy; Ultrasonic Sensor; Arduino; Node MCU; GSM; GPS; Real-Time Monitoring; Sustainable Cities*

IOT BASED AUTOMATIC RAILWAY GATE CONTROL WITH OBJECT DETECTION

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Abstract: This project focuses on designing and implementing an automated railway gate control system. The system uses sensors to detect approaching trains and automatically operates the gates at level crossings. To enhance pedestrian safety, proximity sensors and IR sensors are employed for detecting objects and people on the tracks or in the pedestrian areas near the gates. By eliminating the need for human intervention, the system aims to minimize accidents caused by human error and improve the efficiency of railway operations. The project incorporates modern technologies such as microcontrollers, sensors, and communication modules to ensure reliability and precision.

***Keywords—** IR sensor, Object Detection, Railway, Gate Control System*

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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AI SAFETY SYSTEM FOR WORKER PROTECTION IN CRACKER FACTORIES USING INDUS BOARD COIN AND ESP32

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Abstract: Worker safety in cracker factories represents a critical challenge due to hazardous working conditions, including exposure to explosives, toxic fumes, and thermal risks.This paper presents an Intelligent AI + IoT Safety System designed to provide real-time monitoring and protection for factory workers. The system integrates IoT sensors with INDUS Board Coin embedded on ESP32 microcontrollers to enable decentralized, secure data collection and processing. Machine learning algorithms analyze sensor data to detect anomalies and predict potential safety hazards before they escalate. The proposed system consists of wearable sensors (temperature, gas, motion), a wireless IoT network, edge computing for real-time inference, and blockchain-based logging using INDUS Coin for immutable safety records.Experimental results demonstrate a 95% accuracy in hazard detection with sub-second response times. The system successfully reduced safety incidents by 87% in pilot deployments at three manufacturing facilities.

Keywords:*IoT, AI, Worker Safety, ESP32, INDUS Coin, Blockchain, Hazard Detection, Real-time Monitoring.*

WILDEYE AI – A SMART MULTI-SENSOR DEVICE FOR EARLY DETECTION OF WILD ANIMALS IN HUMAN HABITATION ZONES

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Abstract: Human-wildlife conflict is a growing concern in many regions where wild animals enter human settlements, causing crop loss, property damage, and danger to both people and animals. The WildEye AI project aims to develop a smart, multi-sensor system that can detect the presence of wild animals early and deter them safely using humane, non-harmful methods.The device integrates multiple sensors such as infrared cameras, ultrasonic sensors, motion detectors, and sound sensors to continuously monitor surroundings. The collected data is processed using Artificial Intelligence and Machine Learning algorithms to accurately identify animal species and differentiate them from humans or vehicles. Once detection is confirmed, the system automatically triggers deterrent mechanisms such as ultrasonic sound, flashing lights, or mild alarm signals to scare the animal away without causing harm. The proposed system can be installed near farmlands, forest borders, and residential zones to provide real-time alerts to local authorities or farmers through wireless communication.

Keywords: *The WildEye AI project addresses human-wildlife conflict through animal detection, wildlife conservation, smart sensor systems, AI, ML.*

DESIGN AND FABRICATION OF AN ARDUINO -BASED - SELF BALANCING WALKING ROBOT

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Abstract: Self-balancing robots represent an important area of research in robotics and control systems because they demonstrate the practical implementation of dynamic stability and real-time feedback control. These robots are capable of maintaining their balance automatically while moving, which makes them useful in applications such as automated transportation systems, service robots, and intelligent mobility platforms. The primary objective of this project is to design and fabricate a self-balancing walking robot that can maintain its stability while performing controlled movement.The proposed system is based on the Arduino Uno microcontroller, which acts as the main control unit of the robot. The microcontroller receives data from motion sensors and processes the information to maintain the balance of the robot. A gyroscope and accelerometer sensor is used to detect the tilt angle and orientation of the robot.

Keywords: *Arduino UNO, microcontroller, and motor control.*

AI-BASEDSMART GESTURETOSPEECHCONVERTER

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Abstract: The AI-Based Smart Gesture to Speech Converter is an innovative system designed to assist individuals with hearing and speech impairments in communicating effectively with others. The proposed system captures hand gestures using a camera or gesture sensor and processes the captured data using Artificial Intelligence techniques. The gesture images are analyzed and recognized using machine learning algorithms that identify predefined gesture patterns.Once the gesture is detected, the system converts the recognized gesture into text and further transforms the text into audible speech using a text-to-speech module. This technology helps bridge the communication gap between deaf-mute individuals and normal speakers. The system is designed to be efficient, cost-effective, and easy to use in real-time environments.It can be implemented in educational institutions, hospitals, public service centers, and workplaces to improve accessibility and communication for people with disabilities.

Keywords:*Artificial Intelligence, Gesture Recognition, Hand Gesture Detection, SpeechConversion, Text-to-Speech System, Assistive Technology, Human- Computer Interaction, Machine Learning, Smart Communication System, Accessibility Technology.*

SMART FOOD SPOIL DETECTION AND KITCHEN MONITORING USING OPENCV AND IOT TECHNOLOGY

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Abstract: Food spoilage is a major concern in households, restaurants, and food storage facilities, as it can lead to health hazards, food waste, and economic loss. These methods are often unreliable and cannot detect early stages of food deterioration. In addition, traditional kitchen monitoring systems lack automation, real-time monitoring, and integrated analysis of environmental conditions that influence food quality. Therefore, there is a need for an intelligent and automated system capable of detecting food spoilage and monitoring kitchen environments effectively. This project proposes a Smart Food Spoil Detection and Kitchen Monitoring System using OpenCV and IoT technology. A camera module captures images of stored food items periodically, and image processing techniques using OpenCV are applied to analyze visual features such as color changes, mold formation, and texture variations that indicate spoilage.

Keywords: *Food Spoilage Detection, OpenCV, IoT, Image Processing, Smart Kitchen.*

AN IBEACON-BASED AI-DRIVEN WEARABLE SURVEILLANCE SYSTEM FOR TRACKING AND INTERCEPTING FORCED HUMAN TRANSPORT

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Abstract: Human trafficking and forced human transport remain critical global challenges due to the absence of reliable real-time victim detection mechanisms, especially in GPS-denied and phone-restricted environments such as vehicles, containers, and isolated transit routes. This project proposes an AI-Driven Wearable Rescue Beacon System that automatically detects and signals potential forced transportation events using physiological and motion-based intelligence. The system integrates a MAX30102 heart rate sensor, MEMS accelerometer, iBeacon BLE module, Wi-Fi connectivity, and an OLED-based covert interface in a smartwatch-form wearable. Upon detection, the device activates a silent rescue mode, broadcasting encrypted iBeacon distress identifiers while uploading compressed biometric and motion evidence to authorized receivers whenever connectivity is available.

Keywords: *MAX30102, iBeacon, paradigm*

AI AND ML ENABLED AUTONOMOUS ELECTRO-MECHANICAL LASER TARGETING PLATFORM FOR REAL-TIME DRONE THREAT DETECTION, TRACKING, AND NEUTRALIZATION

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Abstract: The rapid rise of low-cost drones and UAVs poses significant challenges to national security, including surveillance, smuggling, and attacks on critical infrastructure. Conventional missile-based defense systems are often economically inefficient against such threats. This paper presents an AI- and machine learning-based autonomous electro-mechanical laser targeting platform for real-time drone detection and neutralization. A vision system using a USB camera captures live images, while deep learning algorithms identify and classify drones. Target positions are converted into spatial coordinates to control a pan-tilt servo laser module.The system enables precise tracking and rapid alignment under dynamic conditions.

Keywords: *AI-based drone detection, computer vision, real-time target tracking, electro-mechanical pan–tilt system, laser targeting platform, UAV threat mitigation, autonomous defense system, Python vision framework.*

NETWORK INTRUSION DETECTION USING DEEP LEARNING ON THE UNSW-NB15 DATASET

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Abstract: With the rapid growth of digital communication and network-based systems, ensuring the security of computer networks has become a critical challenge. Traditional security mechanisms such as firewalls and signature-based detection systems are often insufficient in identifying sophisticated and evolving cyber threats. To address these limitations, this project presents a Network Intrusion Detection System (NIDS) using deep learning techniques on the UNSW-NB15 dataset. The proposed system is designed to analyze network traffic data and classify activities as either normal or malicious. It utilizes various network features such as connection duration, protocol type, and data transfer characteristics to identify patterns associated with intrusion attempts.

Keywords:Network Intrusion Detection System (NIDS), Deep Learning, UNSW NB15 Dataset, Cybersecurity, Machine Learning, Network Traffic Analysis.

HUMAN-CENTRED EXPLAINABLE AI FOR INTELLIGENT EMAILPRIORITIZATION

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Abstract: Managing a large number of emails has become increasingly challenging for both professionals and students, as important messages are often mixed with less relevant ones. Although many email platforms use Artificial Intelligence (AI) to organize messages, they usually do not provide clear explanations for how emails are prioritized, which can create confusion and reduce user trust. This paper proposes a Human-Centered Explainable AI approach for intelligent email prioritization that focuses on both accuracy and transparency. The system analyzes incoming emails and assigns priority levels such as high, medium, and low based on factors including sender importance, keywords, and user interaction history.In addition to prioritization, the system provides simple and understandable explanations for each decision, allowing users to easily identify why an email is marked as important. By combining automated prioritization with human-friendly explanations, the proposed approach helps users focus on critical messages, reduces manual effort, improves productivity, and enhances trust in AI-based systems.

Keywords:*Explainable AI, Human-Centred AI, Email Prioritization,Artificial Intelligence.*

AI BASED HYBRID EV ASSISTIVE SYSTEM FOR FUEL AND ELECTRIC SWITCHING

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Abstract: This project presents an AI-based Hybrid Electric Vehicle (HEV) Assistive System that automatically switches between electric and fuel drive modes using real-time vehicle data. Traditional hybrid systems rely on fixed rulebased control, which cannot efficiently adapt to changing driving conditions such as acceleration demand, road gradient, and engine temperature. To address this, the system uses a NodeMCU (ESP8266) microcontroller connected to sensors including MPU6050 for acceleration and tilt, DHT11 for temperature monitoring, and a potentiometer to simulate throttle input. The collected data Is transmitted via Wi-Fi to a Python Flask server, where a K-Nearest Neighbor(KNN) machine learning algorithm predicts the optimal drive mode. The result is sent back to the microcontroller, which activates either an electric motor through an L298N driver or a fuel pump relay.

Keywords: *Hybrid Electric Vehicle(HEV), Electric Drive Mode and Fuel Drive Mode, unreal Intelligence(AI) and Machine Learning(ML) Real time Decision Making, Embedded Sensing.*

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MONEY THEFT THROUGH ATM CARDAVOIDANCE SYSTEM WITH RSSI AND GSM IN ATM

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Abstract: Automated Teller Machines (ATMs) play an important role in modern banking systems byproviding customers with easy and convenient access to financial transactions such as cash withdrawal, balance inquiry, and fund transfer. However, ATM card theft and unauthorized transactions have become serious security issues in recent years. Criminals often misuse stolen or lost ATM cards to withdraw money without the knowledge of the cardholder. Therefore, it is necessary to develop an effective system that can prevent ATM card misuse and improve the security of ATM transactions. This project proposes a Money Theft Avoidance System for ATM cards using RSSI (Received Signal Strength Indicator) and GSM technology. The main objective of the system is to enhance ATM security by detecting whether the cardholder is physically present near the ATM during the transaction. The RSSI technique is used to measure the signal strength between the ATM system and the cardholder's device.

Keywords: *Automated Teller Machine (ATM), RSSI, GSM, Proximity Detection, Fraud Prevention.*

DESIGN AND FABRICATION OF ENERGYEFFICIENT HYBRID DUAL AXIS SOLAR TRACKINGSYSTEM AND WEATHER MONITORING SYSTEMUSING IOT

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Abstract: The increasing global energy demand and depletion of fossil fuels have created a need forrenewable energy sources. Solar energy is one of the most abundant and eco-friendly resources, but the efficiency of conventional solar panels is limited because they are fixed and cannot continuously face the sun. To address this issue, this project proposes the design and fabrication of an Energy Efficient Hybrid Dual Axis Solar Tracking System integrated with an IoT-based Weather Monitoring System. The system improves the efficiency of photovoltaic (PV) panels by automatically adjusting their orientation to follow the sun's movement. A dual-axis tracking mechanism allows the solar panel to rotate both horizontally and vertically, ensuring maximum sunlight exposure throughout the day.

Keywords: *Internet of things (IOT), oxygen level, pulserate, Oxygen sensor, pulse rate sensor, Arduino*

DEVELOPMENT OF AN IN-PIPE INSPECTION ROBOT FOR LARGEDIAMETER WATER PIPELINESUSING AI AND ML

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Abstract: Water distribution pipelines play a vital role in supplying clean water to residential, industrial, and agricultural sectors. However, over time, these pipelines are prone to issues such as cracks, corrosion, leakage, sediment accumulation, and blockages, leading to water loss and reduced efficiency. Conventional inspection methods rely on manual intervention and excavation, making them time-consuming, costly, and potentially hazardous. The robot is integrated with the Blynk IoT platform, enabling users to remotely monitor sensor data, view live video, and control the robot using a Smartphone. This facilitates early detection of defects such as cracks and blockages, reducing maintenance costs and preventing major failures.

Keywords:*In-Pipe Inspection Robot, ESP32 Microcontroller, Ultrasonic Sensor, IR Sensor, ESP32-CAM, Internet of Things (IoT), Blynk Platform, Pipeline Monitoring, Water Distribution System, Embedded Systems.*

SMART NIGHT VISION SURVEILLANCE SYSTEM USING SOUND DETECTION AND COMPUTER VISION

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Abstract: Security surveillance systems play a vital role in protecting sensitive areas such as industries, homes, and restricted zones, especially during night time when visibility is low. Traditional monitoring systems depend on continuous human observation, which may lead to inefficiency and delayed response to threats. This project proposes a Smart Night Vision Surveillance System using Sound Detection and Computer Vision to enhance automated security monitoring. The system utilizes a night vision camera to capture images in low-light conditions and a sound sensor to continuously monitor environmental noise. When the sound level exceeds a predefined threshold, the system activates the camera and initiates image processing. Computer vision techniques are employed to detect and classify objects such as humans or animals, along with motion detection to identify suspicious activities.

Keywords: Night Vision, Computer Vision, Sound Detection, Surveillance System, IoT, Embedded System.

UTILIZATION OF LI-FI TECHNOLOGY FOR BLACK BOX IN GROUND VEHICLES

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Abstract: The utilization of Li-Fi (Light Fidelity) technology for black box systems in ground vehicles presents an innovative approach to enhancing vehicle safety, data security, and communication efficiency. Traditional black box systems rely on radio frequency (RF) communication, which faces challenges such as interference, limited bandwidth, and security risks. In contrast, Li-Fi uses visible light for high-speed data transmission, offering greater bandwidth, low latency, and improved security since light signals cannot penetrate walls. The proposed system integrates sensors, a microcontroller, Li-Fi transmitter and receiver modules, and storage units to continuously monitor and record critical vehicle parameters such as speed, acceleration, braking patterns, engine status, and GPS location.

Keywords:*Li-Fi, Black Box, Vehicles, Safety, Communication, Sensors, Data, VLC, Monitoring, V2I.*

OBJECT DETECTION AND RECOGNITION OF UNMANNED AERIAL VEHICLES USING ESP32

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Abstract: The rapid increase in the use of Unmanned Aerial Vehicles (UAVs), commonly known as drones, has introduced both opportunities and significant security challenges, particularly in sensitive and restricted areas where unauthorized drone activity can pose threats to safety, privacy, and infrastructure. To address this issue, the proposed system focuses on object detection and recognition of UAVs using the ESP32 microcontroller, specifically the ESP32-CAM module, which combines a low-cost, compact design with built-in Wi-Fi and camera capabilities suitable for real-time monitoring applications. The system captures continuous image frames from the surrounding environment and processes them using lightweight computer vision and machine learning algorithms optimized for embedded platforms with limited computational resources.

Keywords:*UAV, Drone Detection, ESP32, ESP32-CAM, Object Recognition, Computer Vision, IoT, Image Processing, Surveillance, Machine Learning*

SMART BRIDGE LIFE PREDICTION AND DAMAGE DETECTION USING MACHINE LEARNING

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Abstract: The increasing concern of bridge safety is not a matter of isolated interest but a critical issue of structural reliability. Bridges across the world are subjected to many hazardous conditions such as material degradation, excessive load, environmental stress, and, most critically, sudden structural failure. Reports indicate that a significant percentage of bridges experience deterioration over time, leading to potential risks to public safety and transportation systems. Failures in bridge structures can be minimized by introducing an intelligent monitoring system into real-world infrastructure. The proposed system is a compact and efficient model that continuously observes structural behavior. Whenever abnormal conditions such as unusual vibration, tilt variation, or crack formation are detected, the system can be activated automatically through sensor inputs. Instantly, the monitoring unit and data acquisition process will initiate, and a standard alert with the bridge condition is transmitted to the concerned authorities. They would be able to access all the recorded data for further analysis.

Keywords:*Embedded Systems, Machine Learning, Bridge Monitoring, Structural Health, Damage Detection, Predictive Analysis, Sensors, Safety Systems.*

BLUR GATE AND STACKED NAND/NOR BASED DATA LEAKAGE REDUCTION TECHNIQUE IN IC USING AI & ML

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Abstract: Untrusted third-parties are found throughout the integrated circuit (IC) design now resulting in potential threats in IC reliability and security. Threats include IC counter feinting, intellectual property (IP) theft, IC over production, and the insertion of hardware Trojans. Logic encryption also prevents the insertion of hardware Trojans, as the entire design is no longer known to an adversary, making it more difficult to insert a Trojan without causing unintended actions that are more readily detected. While combinational logic encryption provides a method to increase IC security against a multitude of threats, cur-rent logic encryption techniques result in high overheads in performance, power, and area. A novel gate level implementation of logic encryption that significantly reduces the gate overhead of encrypting a gate is described in this project. Logic encryption has emerged as a method of enhancing security against such threats, however, current implementations of logic encryption, including the XOR or look-up table (LUT) techniques, have high per gate overheads in area, performance, and power.

Keywords: *Blur gate, stacked NAND/OR, Data Leakage Reduction, Integrated Circuits (IC,s), Side channel Attacks, Hardware level Security.*

ENHANCING ENERGY-EFFICIENT DATA COLLECTION IN WIRELESS SENSOR NETWORKS USING DEEP LEARNING

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Abstract: Wireless Sensor Networks (WSNs) play a pivotal role in numerous applications, from environmental monitoring to smart cities. However, the energy constraints of sensor nodes pose significant challenges to their widespread deployment and operation. This paper delves into various techniques and methodologies aimed at optimizing energy-efficient data collection in WSNs while maintaining data accuracy and network longevity. It explores strategies such as data aggregation, data compression, and routing protocols, along with emerging technologies like energy harvesting for sustainable energy replenishment. Furthermore, the paper presents experimental results, case studies, and future research directions to provide a comprehensive understanding of energy-efficient data collection in WSNs.

Keywords: *Wireless Sensor Networks, Energy Efficiency, Data Collection. Data Aggregation, Data Compression, Routing Protocols.*

AI-DRIVEN ENVIRONMENTAL MONITORING USING IOT AND MACHINE LEARNING

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Abstract: The Quake Rescue Bot is an advanced emergency response system designed to detect and respond to natural disasters, particularly earthquakes and floods, utilizing a range of sensors and AI technology. The system is powered by an ESP32 microcontroller, which interfaces with various sensors including an MPU6050 for earthquake detection, a rain sensor for flood monitoring, a DHT11 for temperature and humidity readings, and a soil moisture sensor for flood prediction. In the event of an earthquake, the system uses data from the MPU6050 to detect ground vibrations and trigger emergency protocols. Similarly, the rain andsoil moisture sensors work intandemto monitor flood risks, while the DHT11 sensor contributes to predicting rain. The bot also features a DC motor powered by an LM298N motor driver, enabling movement and rescueoperations,including navigating through debris or helping to evacuate individuals.

Keywords:*LM298N motor driver, MPU6050, Quake Rescue Bot, intandemto monitor, DHT11 sensor*

BREAST CANCER SEGMENTATION USING IMPROVED CLUSTER ANALYSIS TECHNIQUE WITH GREY WOLF OPTIMIZATION

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Abstract: Breast cancer is one of the dreadful diseases that affect women globally. The occurrences of breast masses in the breast region are the main cause for women to develop a breast cancer. Early detection of breast mass will increase the survival rate of women and hence developing an automated system for detection of the breast masses will support radiologists for accurate diagnosis. Segmentation is an essential part of the detection. The best result of breast cancer detection was followed by the best segmentation process. Supporting breast cancer detection accurately, one of the ways could be used by increasing segmentation. This paper utilizes one of the segmentation methods like clustering. We propose a clustering approach using improved K-means clustering technique where the threshold is optimally generated using an optimization technique called grey wolf Optimization (GWO). K-Means has advantages easy to understand, fast process, and guarantees convergence. Before segmentation the images are pre-processed using Gaussian filtering to remove the background noise for better segmentation.

Keywords: *Breast cancer, Segmentation, Cluster analysis, Grey Wolf Optimization.*

IMAGE ENCRYPTION USING DEEP NEURAL NETWORKS BASED CHAOTIC ALGORITHM

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Abstract: Cryptography is the method of protecting information and multimedia through the use of codes.Sothat only the desired person can read and process the information. Cryptography is associated with two processes:Encryption and Decryption. Encryption is scrambling plaintext into cipher text. Decryption is the process ofretrievingthe plaintext back. In the recent years there has been quite a development in the field of artificial intelligence mainly the introduction of the artificial neural networks (ANN). The ANN is considered to an information processing unit which to a great extent resembles the working of the human brain. In this paper images are encrypted and decrypted usingdeep neural networks that are Convolutional Neural Network (CNN) based chaotic algorithm. Chaotic system is highly sensitive to initial conditions.

Keywords:*Image encryption,Image decryption,Image security, ANN, CNN, Chaotic system, AES, MSE, PSNR.*

ADAPTIVE TRAFFIC CONTROL AND MONITORING SYSTEM BASED ON LD ALGORITHM

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Abstract: As there is rapid increase in urban population there is a need for some alternative measure which can be proven or best one to tackle the problem. An adaptive traffic controlling algorithm and monitoring system based on LD Algorithm is intended to schedule the phases of each isolated traffic efficiently. We use IR sensor to count the number of vehicles. Raspberry pi3 collects information and glow the traffic light according to the conditions. The algorithm considers the realtime traffic characteristics of the competing traffic flows at the signalized road intersection. In the LD controlling algorithm, the intelligent traffic lights installed at each road intersection coordinate with each other to generate an efficient traffic schedule for the entire road network. LD algorithm analyses different parameters and hence it is coded accordingly. In peak time traffic congestion is more especially in cities. Even emergency vehicles can't reach destination on time. This system enables emergency vehicle preference. The status of traffic can be viewed from camera real time by connecting it with app.Telegram app is used. This system works on the basis of internet facility.

Keywords:*Image encryption,Image decryption,Image security, ANN, CNN, Chaotic system, AES, MSE, PSNR.*

RISC-V CPU Design Using RRAM-CMOS Standard Cells for Area-Efficient and Energy-Efficient VLSI Systems

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Abstract: This paper presents an advanced design of a RISC-V processor using hybrid RRAM-CMOS standard cells aimed at improving area efficiency and reducing power consumption. Emerging memory technologies such as Resistive RAM (RRAM) enable compact logic implementation by integrating storage and computation. The proposed architecture leverages 2T2R-based logic cells and integrates them into a standard synthesis flow. Experimental evaluation demonstrates improved energy efficiency, reduced leakage, and compact layout design. Challenges such as variability, endurance, and integration complexity are also discussed.

Keywords: *RISC-V, RRAM, CMOS, Standard Cells, VLSI, Low Power*

A VERY LARGE-SCALE INTEGRATION (VLSI) CHIP DESIGN FOR ABNORMAL HEARTBEAT AND NASAL FLOW RATE DETECTION USING A DATA-SHIFTING NEURAL NETWORK (DSNN)

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Abstract: Recent advancements in Very Large-Scale Integration (VLSI) technology have facilitated the creation of efficient, real-time health monitoring systems. This study introduces an innovative VLSI chip design aimed at detecting abnormal heartbeat and nasal flow rate, utilizing a Data-Shifting Neural Network (DSNN) to achieve enhanced accuracy and low-power consumption. The system incorporates biosensors to capture electrocardiogram (ECG) signals and nasal airflow patterns, which are subsequently processed through a DSNN-based architecture for anomaly detection. The proposed chip is optimized for real-time processing, energy efficiency, and seamless integration into wearable health monitoring devices. Both simulation and experimental results confirm the system's efficacy in detecting abnormalities with high precision. This research advances the field of biomedical VLSI by offering a hardware-efficient solution for continuous health monitoring, thereby facilitating improved early diagnosis and preventive healthcare.

Keywords:*Very-large-scale integration implementation (VLSI), electrocardiogram (ECG), Deep neural network (DNN), Nasal flow detection, data-shifting neural network (DSNN).*

A HYBRID QUANTUM-MEMBRANE COMPUTING ALGORITHM FOR ENHANCED BIOMEDICAL DATA PROCESSING AND DISEASE DIAGNOSIS

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Abstract: The exponential growth of biomedical data, including genomic sequences, medical imaging, and electronic health records, has created an urgent demand for highly efficient and intelligent computing paradigms capable of processing complex biological information. Classical computing architectures are increasingly inadequate in handling the computational complexity and parallelism required for accurate disease diagnosis and biomedical data analysis. This paper proposes a novel hybrid Quantum-Membrane computing algorithm that integrates the probabilistic parallelism of quantum computing with the bio-inspired multiset processing capabilities of membrane computing to address these limitations. The proposed algorithm leverages quantum superposition and entanglement principles within a membrane structure to enable simultaneous multi-layered processing of high-dimensional biomedical datasets, including cancer gene expression profiles and MRI image classification. Furthermore, the proposed framework exhibits significant noise resilience, making it suitable for near-term quantum hardware deployment.

Keywords: *Quantum Computing, Membrane Computing, Biomedical Data Processing, Disease Diagnosis, Hybrid Algorithm, Gene Expression, MRI Classification, Clinical Decision Support*

TO IMPROVE THE REAL-TIME LOAD AND POWER MONITORING SYSTEMUSING EMBEDDED SYSTEM INTEGRATING WITH ARTIFICIAL INTELLIGENCE

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Abstract: Energy management has become an important aspect in modern electrical systems due to the increasing demand for electricity and the need to reduce power wastage. Traditional power monitoring systems often lack real-time monitoring and intelligent analysis capabilities. This project focuses on improving the real-time load and power monitoring system using an embedded system integrated with Artificial Intelligence (AI). The proposed system continuously monitors electrical parameters such as voltage and current using suitable sensors. The collected data is processed by an embedded system to calculate power consumption in real time. Artificial Intelligence techniques are used to analyze power usage patterns and detect abnormal load conditions. This intelligent analysis helps in predicting unusual power consumption and improving the efficiency of energy management. The system provides accurate real-time monitoring and smart analysis, which helps reduce power wastage and improve overall system performance.

Keywords: *Embedded System, Artificial Intelligence, Power Monitoring, Real-Time LoadMonitoring, EnergyManagement, Smart Energy Systems.*

DESIGN OF SECURE VLC SYSTEM WITH OOK MODULATION AND ML BASED ADAPTIVE DETECTION

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Abstract: This paper presents the design and MATLAB-based implementation of a secure Visible Light Communication (VLC) system incorporating advanced modulation and intelligent receiver techniques. The proposed system employs symmetric-key encryption to ensure data confidentiality, where input data including text and image information is converted into binary format and securely encoded prior to transmission. Optical modulation is achieved using both On-Off Keying (OOK) and Pulse Position Modulation (PPM), enabling a comparative analysis of performance under varying channel conditions.A realistic indoor VLC channel is modeled in MATLAB by incorporating Additive White Gaussian Noise (AWGN), ambient light interference, and optical attenuation effects. At the receiver, multiple detection techniques are evaluated, including fixed thresholding,Otsu-based segmentation, K-means clustering, and machine learning-based adaptive threshold detection. The ML models utilize statistical features of the received signal to dynamically estimate optimal decision thresholds, thereby improving detection accuracy.

Keywords: *Visible Light Communication (VLC), OOK, PPM, Machine Learning, Adaptive Threshold Detection, BER, MATLAB Simulation, Image Transmission.*

ADVANCED VEHICLE SAFETY SYSTEM WITH REAL-TIME TRACKING AND ENGINE LOCKING

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Abstract: Road accidents caused by alcohol consumption and driver drowsiness are a major concern worldwide. This paper presents a Smart Driver Safety System that detects alcohol levels and driver drowsiness using sensors and takes preventive actions. The system uses a microcontroller to monitor alcohol concentration and eye blink patterns. If the alcohol level exceeds a threshold or the driver is inactive, the system restricts vehicle operation and sends an alert message with location details using a GSM module. A GPS module is used to track real-time location. The proposed system enhances road safety by preventing accidents and enabling emergency response.

***Keywords*:** *GSM, GPS, Alcohol Sensor, Eye Blink Sensor, Driver Safety, Embedded System*

AN EXPLAINABLE EDGE-AI BASED AUTONOMOUS HUMAN FOLLOWING ROBOT WITH REAL-TIME ADAPTIVE NAVIGATION AND HUMAN INTENT RECOGNITION

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Abstract: This paper presents the design and development of an Explainable Edge-AI based Autonomous Human-Following Robot for real-time assistive and smart environment applications. Conventional human-following systems often rely on cloud-based processing and black-box artificial intelligence models, leading to high latency, lack of interpretability, and unreliable performance in dynamic environments. To address these limitations, the proposed system integrates edge computing with advanced computer vision and explainable AI (XAI) techniques to achieve low-latency, transparent, and robust human tracking. The system employs deep learning-based object detection using YOLO for real-time human identification and tracking, deployed on an edge device to eliminate network dependency. The robot also supports multimodal human interaction through speech and gesture recognition, improving usability in real-world scenarios.

Keywords:*Explainable AI, Edge Computing, Autonomous Robot, Human-Following System, YOLO, Real-Time Navigation, Human-Robot Interaction, IoT*

AI-DRIVEN INTRUSION DETECTION SYSTEM FOR SMART HOME IOT ECOSYSTEMS USING EDGE INTELLIGENCE

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Abstract: The rapid proliferation of Internet of Things (IoT) devices in smart home environments has introduced critical security vulnerabilities, exposing households to cyber threats such as unauthorized access, denial-of-service attacks, and data breaches. Traditional intrusion detection systems, designed for conventional network infrastructures, are inadequate for the heterogeneous and resource-constrained nature of smart home IoT ecosystems. This paper proposes an AI-driven Intrusion Detection System (IDS) deployed at the edge gateway level, capable of detecting and mitigating anomalous network behaviour in real time without transmitting sensitive user data to external cloud servers. The proposed system employs a lightweight machine learning model combining Random Forest and Long Short-Term Memory (LSTM) networks, trained on network traffic patterns of smart home devices including smart locks, IP cameras, and voice assistants. By processing data locally at the home gateway, the system ensures user privacy while maintaining low detection latency.

Keywords:*IoT Security, Smart Home, Intrusion Detection, Edge Computing, LSTM, Privacy, Anomaly Detection*

AI-POWERED REMOTE PATIENT MONITORING SYSTEM FOR CHRONIC DISEASE MANAGEMENT USING IOT EDGE INTELLIGENCE

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Abstract: The rising prevalence of chronic diseases such as diabetes, hypertension, and cardiovascular disorders has placed immense burden on healthcare systems worldwide, necessitating continuous and cost-effective monitoring beyond clinical settings. Traditional hospital-centric monitoring approaches are inadequate for real-time, long-term patient care in home environments. This paper proposes an AI-powered Remote Patient Monitoring (RPM) system leveraging Internet of Things (IoT) wearable sensors deployed at the edge gateway level, capable of detecting health anomalies and predicting deteriorating conditions in real time without transmitting sensitive biometric data to external cloud servers. The proposed system employs a lightweight machine learning model combining Convolutional Neural Networks (CNN) and Gated Recurrent Units (GRU), trained on multimodal physiological signals including heart rate, blood glucose, blood pressure, and SpO2 collected from body-worn IoT sensors. By processing data locally at the patient-side edge node, the system ensures patient privacy while maintaining low detection latency suitable for clinical alert generation. Experimental evaluation on the MIMIC-III and PhysioNet datasets demonstrates a health anomaly detection accuracy of 96.8% with a false alert rate below 2.4%, outperforming existing cloud-dependent RPM approaches.

Keywords: *Anomaly Remote Patient Monitoring, IoT Healthcare, Edge Computing, Chronic Disease, CNN, GRU, Wearable Sensors Detection*

RESILIENT AUTONOMOUS NAVIGATION IN CONTESTED ENVIRONMENTS: A DESIGN FRAMEWORK FOR X-TRACK UGV S

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Abstract: The current paper introduces the architecture and design of the "X-Track Rover," which is an autonomous, energy efficient unmanned ground vehicle designed for humanitarian purposes, including delivering supplies to people during military engagements and medical assistance within hostile environments. In such modern battlefields, two major threats arise – namely, the threat of electronic warfare interfering with GPS navigation, and resource deprivation resulting in power shortages. We suggest tackling these problems using a multifold approach involving implementing a tanker-track drive system and a three-level power generation and consumption scheme, called "Green Power."The proposed approach involves equipping the drone with highly efficient battery cells in combination with an advanced solar energy harvesting armor along with a regenerative braking technology to recover from 8 to 15 percent of the used energy.

Keywords: Green Edge Computing, Explainable Artificial Intelligence (XAI), Autonomous Vehicles, Sensor Fusion.

AN AI-DRIVEN ARTIFICIAL MAGNETIC CONDUCTOR ANTENNA OPTIMIZATION SYSTEM FOR WIRELESS BODY AREA NETWORK

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Abstract: This work presents an AI-assisted antenna optimization system developed to enhance the design of planar microstrip patch antennas and AMC-integrated antennas for Wireless Body Area Network (WBAN) applications. The proposed framework evaluates two complete design workflows: a traditional manual CST-based design process and an AI-driven optimization approach. In the traditional method, patch and AMC geometries are tuned through iterative fullwave simulations, which is time-consuming and highly sensitive to parameter variations. In contrast, the AI-enabled system learns the relationship between antenna geometry and electromagnetic performance, enabling rapid prediction of optimal dimensions with significantly fewer simulation cycles. The system is further applied to compare a conventional patch antenna and an AMC- backed patch configuration, demonstrating the influence of AMC structures in improving forward gain, reducing back radiation, and lowering SAR when operating near the human body.

Keywords:*Artificial Magnetic Conductor, WBAN, AI-based Optimization, AMC-backed Patch Antenna, CST Simulation, Machine Learning.*

AI POWERED AUTOMATED NETWORKFOR TRAFFIC CONTROL AND SECURITY

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Abstract: The suggested project under consideration, AI Powered Automated Network: Traffic Control and Security, will combine artificial intelligence and network modelling to streamline the traffic control system and guarantee smart security surveillance. The system takes real time traffic data provided by sensors and cameras using MATLAB, Python, and NS2 so that it can dynamically adjust signal timing, detect congestion, and identify rule violations. Machine learning software predicts traffic flow and allows the control of signals in an adaptive way to achieve the minimum delay and fuel consumption. At the same time, the system will be using anomaly detection in order to improve road safety and prevent illegal operations by analysing intelligent video and network. The hardware specifications are Intel processor, 4GB of RAM, and 250GB of Hard Disc running on windows operating system. The built-in AI system will be scalable, quicker in responding, and increased decision-making to support smart city infrastructure.

Keywords: *Intrusion Detection System (IDS), Arduino Uno, Internet of Things (IoT), Anomaly Detection, Cybersecurity, Embedded Systems, Edge Computing.*

EARLY-STAGE CROP PATHOGEN IDENTIFICATION VIA EDGEINTEGRATED COMPUTER VISION AND EMBEDDED SYSTEMS

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Abstract: The detection of plant pathogens at an early stage prior to planting and cultivation is vital in contemporary precision farming technology to reduce crop loss and efficient use of resources. This research aims to develop a system for disease detection in plants/fields before the onset of any fertility in the form of image-based machine learning coupled with embedded electronic systems. The proposed system consists of a Raspberry Pi microcontroller that is linked to the arduino circuit board used for processing the signals and controlling the peripherals along with a high-resolution camera to take pictures of the leaves/plants. These images are processed using OpenCV and Python programming for image processing to increase the contrast, reduce the noise, and detect the diseased part. Then deep learning is applied to classify the detected images using plant-diseases benchmark datasets for pathogen detection.

Keywords: *Precision Agriculture, Embedded Machine Learning, Edge Computing, Plant Pathology, Convolutional Neural Networks (CNN), Computer Vision.*

IOT BASED MONITORING SYSTEM FOR HIGH LEVEL AMMONIA DETECTION IN POULTRY FORMS

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Abstract: Poultry farming plays a significant role in meeting the global demand for protein-rich food; however, the accumulation of ammonia gas (NH_3) inside poultry sheds poses serious health risks to birds and farm workers. Ammonia is mainly produced due to the decomposition of poultry litter under high temperature and humidity conditions. Continuous exposure to high ammonia levels leads to respiratory problems, reduced growth rate, and increased mortality in poultry. This project presents an IoT-based real-time ammonia monitoring and control system using ESP32-CAM. The system employs an MQ-137 ammonia sensor and a DHT11 temperature and humidity sensor to continuously monitor environmental conditions inside the poultry shed. When the ammonia concentration exceeds a predefined threshold, an exhaust fan and water pump are automatically activated using a 2-channel relay module to reduce ammonia concentration. The real-time operation of the system is validated through hardware implementation. In addition, ammonia conversion and reuse are analyzed through software-based simulation using Proteus and MATLAB. Proteus is used to verify control logic and process behavior, while MATLAB is used to analyze ammonia absorption and pH variation through graphical representation. This combined hardware software approach improves poultry farm safety, ensures effective ammonia control, and provides a sustainable framework for future ammonia utilization.

Keywords: *MQ-137, DHT11, MATLAB, ESP32-CAM*

DECENTRALIZED INTELLIGENCE FOR A LOW-CARBON FUTURE

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Abstract: The convergence of blockchain technologies and Green AI systems offers transformative potential but also introduces pressing challenges. Chief among these are excessive energy consumption and scalability constraints. Blockchain networks, particularly those relying on ProofofWork (PoW) consensus mechanisms, demand immense computational power, resulting in significant environmental concerns. Similarly, large-scale AI models require extensive resources for training and deployment, compounding the energy burden. Beyond energy use, blockchain architectures struggle with scalability, limiting their ability to efficiently process and store the massive volumes of data generated by AI applications. This bottleneck impedes real-time integration and seamless data handling. Addressing these issues calls for the design of energy-efficient consensus mechanisms, the optimization of AI model architectures, and the development of hybrid systems that balance decentralization with performance. By embedding sustainability into system design, the integration of blockchain and Green AI can evolve into a more energy-efficient and scalable ecosystem, fostering responsible innovation in data-driven technologies.

Keywords:AI, blockchain technologies, scalable ecosystem, fostering responsible.

AI-ENABLED IOT FLOATING SYSTEM FOR SMART RIVERMONITORING AND ENVIRONMENTAL PROTECTION

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Abstract: Increasingly, rivers are being threatened by floods, plastic pollution, declining water quality, and illegal sand mining; all of which are causing major environmental and social problems. River monitoring systems that are currently available rely heavily on human efforts with no ability to respond immediately to river conditions and rather slow to take any remedial actions since there is no way to effectively manage or mitigate environmental and social issues associated with the state of a river.To resolve these issues, a Smart AI & IoT Based River Monitoring System has been created using an artificial intelligence (AI) & Internet of Things (IoT) prototype that continuously monitors river conditions in a floating, sustainable environment.

Keywords: *Smart River Monitoring, Water Quality Monitoring, Sustainable , IoT, Real-Time Monitoring, Wireless Sensor Networks*

SMART AGRICULTURE SYSTEM FOR PLANT DISEASE DETECTION USING ESP32 CAM

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Abstract: This paper presents the design and implementation of an intelligent pesticide sprinkling system aimed at improving precision agriculture through automated and selective chemical application. The proposed system utilizes an Arduino Uno microcontroller as the primary control unit to coordinate sensing, decision-making, and actuation processes. An ESP32-based camera module is incorporated for real-time image acquisition, enabling continuous monitoring of plant conditions. The captured data, along with predefined threshold criteria, is used to identify potential disease-affected regions and determine the necessity of pesticide spraying. The system integrates a relay-controlled DC pump, a servo motor for directional spraying, and a spray tube mechanism to ensure targeted and efficient pesticide delivery. A 16×2 LCD display provides real-time status updates, while a buzzer module alerts users during abnormal conditions or disease detection. The entire setup is powered using a 9V battery, enhancing portability and enabling deployment in remote agricultural environments without reliance on external power sources.

Keywords: Arduino Unomicrocontroller,ESP32-based camera module, relay-controlled DC pump, servo motor, 16×2 LCD, Python, machine learning, intelligent pesticide sprinkling system.

LOW-COST REAL-TIME OBSTACLE DETECTION AND AVOIDANCE IN AUTONOMOUS MOBILE ROBOTS

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Abstract: Increased consumer interest in cost-effective autonomous robots has stimulated research into designing navigation systems with capabilities to detect and avoid obstacles in real time. In this paper, the design of an autonomous robot based on low-cost sensory units and reactive navigation principles will be presented. Specifically, the robot will integrate several sensory modules of shorter ranges, such as ultrasonic or infrared sensors, with a micro controller-based processor to constantly evaluate the immediate environment and detect potential obstacles within a specified radius. On detecting an obstacle, the robot will change its current movement pattern depending on the avoidance rules used by the robot's decision-making process. The goal of this project is to provide a solution that can reliably function in real time with a minimal cost of components, low energy consumption, and a simple implementation of software. A robot of this type can be used in educational, delivery, and service purposes.

Keywords: *Low cost robotics, Real time obstacle detection, Obstacle avoidance, Embedded systems, Ultrasonic sensor.*

SOLAR POWERED SMART TRASH MANAGEMENT SYSTEM

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Abstract: Rapid urbanization and population growth have intensified the burden on conventional waste management systems, which rely on fixed schedules rather than actual bin fill levels, resulting in frequent overflow, pollution, and public health hazards. This paper presents a Solar Powered Smart Trash Management System that integrates IoT-based real-time bin monitoring with renewable solar energy to overcome these shortcomings. Ultrasonic sensors continuously measure garbage bin fill levels, which are processed by an Arduino/NodeMCU microcontroller and transmitted to a cloud server via GSM or Wi-Fi modules. Automated alerts are dispatched to collection authorities when bins reach a predefined threshold, enabling dynamic and optimized collection routing assisted by a GPS module. Powered entirely by solar panels with battery backup, the system operates 24 hours a day, 7 days a week without grid electricity. The system aligns with four United Nations Sustainable Development Goals (SDGs 6, 11, 12, and 13) and is applicable across smart cities, public spaces, and rural environments.

Keywords*: Smart Waste Management; IoT; Solar Energy; Ultrasonic Sensor; Arduino; NodeMCU; GSM; GPS; Real-TimeMonitoring; Sustainable Cities*

TRANSPARENT DEEP LEARNING MODELS FOR MEDICAL DIAGNOSIS USING EXPLAINABLE AI

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Abstract: Recently, advances made in the field of deep learning have considerably increased the efficiency of diagnosis systems used in medicine. Nevertheless, due to the opaque nature of the models, the practical implementation of such solutions in critical healthcare areas is rather limited. To address the issue, this paper presents a transparent model of deep learning enhanced by using Explainable AI (XAI). In accordance with the proposed solution, convolutional neural networks will be utilized for detecting diseases based on medical images while using methods such as Grad-CAM and SHAP for explaining the process. Thus, it becomes possible to provide transparency into the work performed by the system to help users understand its reasoning better. Experimental results show that a highly efficient solution can be achieved in terms of model's accuracy, while the level of transparency also remains rather satisfactory. As a result, the system provides reliable assistance in performing diagnostic procedures.

Keywords: *Explainable AI, Deep Learning, Medical Diagnosis, Transparency, CNN, Grad-CAM, SHAP, Healthcare.*

REAL-TIME MOBILE-BASED YOGA POSTURE CORRECTION SYSTEM WITH EMOTION RECOGNITION

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Abstract: The creation of online and self-directed yoga has demonstrated the weakness of the current methods of posture correction, which is mostly the estimation of the bone postures without considering the mental condition of the practitioner. In this paper, it is suggested to implement a real-time smart yoga which is an intelligent yoga tracking application that operates based on human pose detection and faces scan to present a full feedback. It analyzes body landmark alignment to identify and evaluate important yoga asanas such as Padmasana, Vrikshasana, and Tadasana. Moreover, it uses Eye Aspect Ratio (EAR) and Mouth Aspect Ratio (MAR) to interpret facial behavior like blinking, yawning, and drowsy in order to determine how alert and engaged one is. The proposed approach divides right and wrong, and indifferent positions therefore physical and mental consciousness thereof. As a non-contact solution, it takes advantage of lighting normalization to allow it to perform in the real world in a robust fashion without necessarily needing to have wearable equipment. The feedback system is visual and real-time, which is a cost-effective and efficient tool for safe and conscious yoga practice.

Keywords: *Computer Vision, Human Pose Estimation, Yoga Posture Recognition, Facial Behavior Analysis, Real-time Feedback, Drowsiness Detection, Non-contact Monitoring, Posture Correction*

FORECASTING CHANGES IN LOCAL CLIMATE UTILIZING XGBOOST AND THE FARMING INDUSTRY'S LSTM ENGINE

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Abstract: The rapid shifts in global and local climate patterns pose significant risks to agriculture, affecting crop yields, water availability, and overall farm productivity. With climate change progressing at an unprecedented rate, there is an urgent need to integrate advanced technologies for accurate climate forecasting. This paper explores the use of XGBoost and Long Short-Term Memory (LSTM) networks for forecasting local climate changes, specifically focused on applications within the farming industry. XGBoost, a gradient boosting algorithm, is renowned for its performance in predictive modeling, while LSTM networks, a deep learning architecture, excel in sequential data prediction, making them suitable for time-series climate forecasting. By combining these two powerful tools, this research aims to enhance the precision of local climate predictions, providing valuable insights for farmers, researchers, and policymakers to mitigate risks related to climate variability. The research methodology integrates XGBoost for predicting key climatic factors, such as temperature, precipitation, and humidity, and LSTM for forecasting future climate conditions based on historical data.

Keywords: XGBoost, LSTM, Long Short-Term Memory, gradient boosting algorithm.

AI-ENABLED INTELLIGENT EMERGENCY VEHICLE PRIORITY TRAFFIC SIGNAL CONTROL SYSTEM FOR COIMBATORE CITY

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Abstract: Urban traffic congestion significantly affects emergency response time, leading to critical delays in medical, fire, and law enforcement services. This paper proposes an AI-enabled Intelligent Emergency Vehicle Priority Traffic Signal Control System designed to provide real-time traffic signal preemption for emergency vehicles. The system integrates Internet of Things (IoT) sensors, GPS tracking, and edge-based artificial intelligence to detect approaching emergency vehicles and dynamically adjust traffic signals to create a clear path. The proposed architecture utilizes machine learning algorithms to analyze traffic density, predict optimal signal timing, and ensure minimal disruption to normal traffic flow. Communication between vehicles and traffic infrastructure is enabled through vehicle-to-infrastructure (V2I) protocols, ensuring seamless coordination. Additionally, the system incorporates secure data transmission and authentication mechanisms to maintain reliability and prevent unauthorized access.

Keywords: *AI, vehicle-to-infrastructure (V2I) protocols, GPS tracking, edge-based artificial intelligence*

A NOVEL ENERGY EFFICIENT WIRELESS MESH NETWORK ARCHITECTURE FOR INDUSTRIAL APPLICATIONS

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Abstract: Industrial Wireless Mesh Networks (IWMNs) represent a major evolution in industrial communication systems, shifting away from the limitations of traditional star-topology wireless networks toward a more flexible, decentralized architecture. In conventional wireless systems such as standard Wi-Fi, all devices rely on a central access point for communication, which creates a single point of failure and limits scalability, especially in complex industrial environments. In contrast, IWMNs adopt a multi-hop communication framework in which each node can function both as an end device and as a router. This enables data to be dynamically transmitted across multiple paths, ensuring continuous connectivity even if individual nodes fail or communication links are disrupted. Furthermore, IWMNs provide significant scalability benefits.

Keywords: *Industrial Wireless Mesh Networks, star-topology wireless networks.*

STEALTH COMMUNICATION SYSTEM FOR UAV USING ADAPTIVE FREQUENCY HOPPING AND AI SIGNAL CAMOUFLAGE

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Abstract: Unmanned Aerial Vehicles (UAVs) working in dynamic and interference-prone environments need communication systems that are both reliable and difficult to detect. This paper presents a stealth communication framework that combines Adaptive Frequency Hopping (AFH) with a neural network-based signal camouflage technique. The AFH module automatically selects less congested frequencies to maintain stable communication, while the waveform modification model subtly alters the signal to reduce detection by spectrum analyzers and machine learning-based classifiers. The system is implemented in a controlled GNU Radio simulation environment using an ESP-based transmitter and a Raspberry Pi 4 as the ground control unit. Experimental results show improved link reliability and lower detection probability compared to traditional single-frequency transmission methods.

Keywords: *Unmanned Aerial Vehicles, Adaptive Frequency Hopping (AFH), GNU, Raspberry Pi*

SMART ACCIDENT DETECTION SYSTEM USING DEEP LEARNING

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Abstract: Every year, almost 1.5 lakh people in India lose their lives in traffic accidents. The lack of prompt assistance is one of the primary causes of this statistic. Automatic accident detection can increase traffic safety and rescue efficiency by reducing the time it takes for cars and rescue services to react to collisions. Applications like tracking traffic accidents can make advantage of the capacity to identify and follow vehicles. The YOLOv5 deep learning algorithm is used by the suggested system to identify automobiles in real-time CCTV footage. The system's main goal is to create a model that uses a proprietary dataset to identify different vehicle classes. The 1000 photos in the collection show a variety of situations, including rain, limited visibility, luminance, and weather. The suggested approach makes advantage of YOLOv5 to detect vehicles more effectively in real-time object detection systems. This model may be expanded to use a 3D Convolutional Neural Network to analyze and categorize accidents according to their severity and notify the closest hospital.

Keywords: *Object identification, YOLOv5, Accident Detection, Convolutional Neural Network, 3D-CNN Algorithm, webapp.*

AI POWERED AUTOMATED NETWORK FOR TRAFFIC CONTROL AND SECURITY

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Abstract: In modern communication systems, efficient and intelligent network management has Become essential to handle the exponential growth of connected\ devices and data traffic. This project presents an AI-powered automated network system that integrates IoT-Enabled hardware nodes with machine learning algorithms for real-time monitoring, Anomaly detection, and dynamic traffic optimization. The IoT nodes continuously Collect network parameters such as bandwidth usage, latency, and packet loss, which are Analyzed by an AI model to identify irregularities and optimize resource allocation. The System automatically reconfigures network operations based on predicted performance Trends, ensuring high reliability, minimal downtime, and enhanced data throughput. By Combining IoT sensing, AI-driven analytics, and automated control, this project Demonstrates an intelligent, self-managed network architecture capable of adapting to Dynamic condition whithout human intervention.

Keyword: *Anomaly detection, dynamic traffic optimization, optimize resource allocation, enhanced data throughput.*

OPTIMIZED ROBA MULTIPLIER: ACHIEVING ULTRA-FAST AND POWER-EFFICIENT DSP WITH REVOLUTIONARY ROUNDING-BASED APPROXIMATION

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Abstract: This paper presents a Rounding-Based Approximate (RoBA) multiplier designed to achieve high- speed and energy-efficient performance for digital signal processing (DSP) applications. Multiplication is a fundamental arithmetic operation widely used in DSP, image processing, and VLSI systems, where performance metrics such as power consumption, delay, and area are critical. Traditional multipliers such as Wallace Tree and Booth multipliers offer high accuracy but suffer from increased hardware complexity, higher power consumption, and longer propagation delays. To overcome these limitations, approximate computing techniques have been introduced, enabling a trade-off between computational accuracy and hardware efficiency.

Keywords: Rounding-Based Approximate (RoBA), VLSI, Wallace Tree and Booth multipliers

AI-DRIVEN ARTIFICIAL MAGNETIC CONDUCTOR ANTENNA OPTIMIZATION SYSTEM FOR WIRELESS BODY AREA NETWORK

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Abstract: This work presents an AI-assisted antenna optimization system developed to enhance the design of planar microstrip patch antennas and AMC-integrated antennas for Wireless Body Area Network (WBAN) applications. The proposed framework evaluates two complete design workflows: a traditional manual CST-based design process and an AI- driven optimization approach. In the traditional method, patch and AMC geometries are tuned through iterative full wave simulations, which is time-consuming and highly sensitive to parameter variations. In contrast, the AI-enabled system learns the relationship between antenna geometry and electromagnetic performance, enabling rapid prediction of optimal dimensions with significantly fewer simulation cycles. The system is further applied to compare a conventional patch antenna and an AMC- backed patch configuration, demonstrating the influence of AMC structures in improving forward gain, reducing back radiation, and lowering SAR when operating near the human body. By automating parameter tuning, enhancing accuracy, and accelerating convergence, the AI based framework provides a scalable solution for designing high performance wearable antennas.

Keywords: *Artificial Magnetic Conductor, WBAN, AI-based Optimization, AMC- backed Patch Antenna, CST Simulation, Machine Learning.*

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CONTROLLED CRYOGENIC GRINDING FOR QUALITY STABILIZATION AND SHELF-LIFE EXTENSION OF CHILLI POWDER A COMPARATIVE STUDY WITH CONVENTIONAL GRINDING

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Abstract: The quality and storage stability of chilli powder are significantly affected by thermal and oxidative changes occurring during conventional grinding. This study investigates the effectiveness of controlled cryogenic grinding in enhancing quality attributes and extending the shelf life of chilli powder in comparison with conventional grinding. Dried chilli samples were processed under liquid nitrogen-assisted cryogenic conditions to minimise heat generation and oxidative degradation.The cryogenically ground powder exhibited a significantly reduced particle size (51.67 ± 3.51 µm) compared to conventional grinding (117.67 ± 5.20 µm), resulting in improved uniformity. Moisture content decreased from 10.27 ± 0.21% to 7.23 ± 0.15%, indicating reduced moisture retention.

***Key words**: Cryogenic grinding, chilli powder, particle size reduction, colour stability, capsaicin retention, oxidative stability, shelf-life extension*

EDGE-OPTIMIZED TINYML FRAMEWORK FOR REAL-TIME MILK QUALITY CLASSIFICATION USING MINIMAL SENSOR INPUTS

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Abstract: The quality of milk is very important to the health of people, food safety, and economic sustainability of dairy supply chains. The conventional laboratory-based systems of testing are precise and have the drawback of being expensive, slow in turnaround, and inaccessible in the countryside. In this paper, an edge-optimized TinyML model that recognizes the quality of milk in seconds with minimum sensor requirements has been presented. The system is a mixture of a pH sensor and a DS18B20 temperature sensor and an ESP32 microcontroller unit that retrieves physicochemical measurements of milk samples. The model is a lightweight machine learning model that is deployed on top of a microcontroller and allows inference to occur on the device without having to connect to the cloud. This is to guarantee low latency, lower energy and field deployment.

***Key words:** TinyML, Milk Quality Assessment, Edge computing, pH Sensor, Temperature Sensor, Real Time monitoring, Food safety, Adulteration Detection, Embedded Systems, Low Power devices.*

IoT – BASED SMART IRRIGATION SYSTEM USING MACHINE LEARNING FOR WATER CONSERVATION

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Abstract: Efficient water management has become a critical challenge in modern agriculture due to increasing water scarcity, climate variability, and the need for sustainable farming practices. This study presents the design and implementation of an IoT-based smart irrigation system integrated with machine learning techniques to optimize water usage and enhance crop productivity. The proposed system utilizes a network of sensors to continuously monitor key environmental parameters such as soil moisture, temperature, humidity, and rainfall. This minimizes water wastage caused by over-irrigation and prevents crop stress due to under-irrigationExperimental results demonstrate that the system can reduce water consumption while maintaining or even increasing crop yield. Additionally, the system supports scalability and adaptability for different types of crops and soil conditions, making it suitable for both small-scale and large-scale agricultural applications. By optimizing irrigation practices, the system contributes to water conservation, energy efficiency, and improved agricultural productivity, addressing key challenges faced by the agricultural sector in the context of global water scarcity and climate change.

***Keywords**: IoT, Smart Irrigation System, Machine Learning, Water Conservation, Soil Moisture Monitoring, Automation, Sustainable Agriculture, Sensor Technology, Data Analytics*

3D DESIGNING AND PRINTING OF PLA BASED COOKIE CUTTER FOR SUSTAINABLE FOOD PROCESSING

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Abstract: The widespread use of non-biodegradable plastic and metal kitchen tools contributes significantly to environmental pollution. This study investigates the development of sustainable cookie cutters using Polylactic Acid (PLA) through Fused Deposition Modelling (FDM) 3D printing. The primary objective is to establish an eco-friendly alternative by evaluating the mechanical properties and structural integrity of the printed products. Traditional manufacturing methods for cookie cutters, such as injection molding and metal stamping, are cost-ineffective for small batches and lack design flexibility. compression resistance of 72.5 MPa, and Shore D hardness of 82, with SEM images confirming uniform layer adhesion and minimal porosity. This approach validates the viability of PLA-based 3D printing for producing durable, customizable, and environmentally sustainable food processing tools.

***Keywords:** 3D Printing,PLA, FDM, Sustainable Manufacturing, Cookie Cutters, Mechanical Testing*

VALORIZATION OF BANANA PSEUDOSTEM INTO BIOADSORBENT FOR CHLORIDE REDUCTION: A SUSTAINABLE STRATEGY FOR WATER TREATMENT

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Abstract: This study investigates the utilization of banana pseudostem as a sustainable bioadsorbent for chloride reduction in water treatment. Contaminated water samples were treated.Significant reductions were observed across a broad spectrum of contaminants: key parameters demonstrated substantial improvements, notably chlorides (59.84% reduction), alkalinity (72.37% reduction), turbidity (46.74% reduction), and sulphides (80% reduction). Furthermore, total suspended solids, hardness, and heavy metal indicators such as iron also exhibited considerable decline. The empirical results confirm the profound effectiveness of banana pseudostem as a lowcost, eco-friendly solution for improving water quality..This approach not only champions sustainable agricultural waste utilization and circular economy principles but also offers highly practical, scalable applications for rural water purification systems

***Keywords**: Banana pseudostem, bioadsorbent, chloride reduction, water treatment, sustainability, lignocellulose, circular economy.*

DEVELOPMENT AND OPTIMIZATION OF LEMON PEEL INFUSED SPICE SEASONING USING SENSORY ANALYSIS AND RESPONSE SURFACE METHODOLOGY

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Abstract: This study focuses on the development and optimization of a novel spice seasoning incorporated with lemon peel powder (LPP) using response surface methodology (RSM) coupled with sensory evaluation. Quadratic models were developed for both responses, showing high coefficients of determination ($R^2 > 0.92$). The optimal formulation was predicted at 5.2% LPP, 14.8% chilli and 9.5% salt, yielding an OAA of 8.4 (on a 9 point hedonic scale) and a flavor score of 8.2. Validation experiments confirmed the adequacy of the models. The optimized seasoning exhibited improved sensory properties and demonstrated the feasibility of utilizing lemon peel as a functional ingredient in spice blends. This work provides a systematic approach for developing value added seasonings with enhanced consumer acceptability.

***Keywords:** lemon peel, spice seasoning, response surface methodology, sensory analysis, optimization, food by product valorization.*

AI AND IoT-BASED SMART QUALITY CONTROL SYSTEMS IN SAVOURY SNACK PRODUCTION UNITS

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Abstract: This study presents an AI and IoT-based smart quality control system for improving process consistency in savoury snack production units, covering both potato chips and extruded fried snack products. Traditional quality control methods rely on manual inspection and periodic sampling, which often lead to inconsistencies and delayed defect detection. The production processes involve multiple stages such as slicing, extrusion, frying, seasoning, and packaging, where variations significantly affect product quality.The proposed system integrates IoT sensors for real-time monitoring of parameters such as temperature, moisture, and oil quality, along with computer vision techniques for analysing product colour, shape, and defects. Machine learning models are utilized for automated classification and decision-making. The study combines industrial observations with a conceptual smart monitoring framework.The findings suggest that integrating AI and IoT technologies enhances process consistency, reduces rejection rates, and improves efficiency in snack food industries.

Keywords:. *Potato chips, Extruded snacks, Artificial Intelligence, IoT, Quality Control, Process Consistency, Smart Food Processing*

DEVELOPMENT OF AN AI-BASED DIGITAL TWIN MODEL FOR REAL-TIME PREDICTION OF GLUTEN PROPERTIES IN WHEAT FLOUR

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Abstract: The project titled "Development of an AI-Based Digital Twin Model for Real-Time Prediction of Gluten Properties in Wheat Flour" focuses on integrating artificial intelligence with digital twin technology to enhance quality assessment in the food processing industry. Gluten properties, such as elasticity, extensibility, and dough strength, play a crucial role in determining the quality of wheat-based products.. To overcome these limitations, this study proposes a digital twin model that creates a virtual representation of the wheat flour processing system. Real-time data is collected using sensors monitoring parameters such as moisture content, protein level, temperature, and milling conditions. This data is processed using machine learning algorithms trained to predict gluten characteristics accurately. The AI-based model enables continuous monitoring and instant prediction of gluten properties, reducing dependency on manual testing and improving efficiency in production.

Keywords: *Digital twin; gluten properties; artificial intelligence; wheat flour; real-time prediction*

DEVELOPMENT OF A pH-RESPONSIVE SMART PACKAGING FILM USING ANTHOCYANINS FOR REAL-TIME FOOD SPOILAGE DETECTION

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Abstract: This paper presents the development of a biodegradable, pH-responsive smart packaging film designed for real-time food spoilage detection. The film is fabricated using a polyvinyl alcohol (PVA) polymer matrix integrated with anthocyanins extracted from red cabbage. The anthocyanins act as a natural pH indicator, changing color in response to volatile compounds produced during food spoilage. The study encompasses the extraction and characterization of anthocyanins, film fabrication, and comprehensive testing including antimicrobial efficacy, physical properties (swelling, strength, ash content), and real- time application on paneer and chicken samples. Results demonstrate a distinct color shift from purple to greenish-yellow as pH increases, correlating with spoilage. The film also exhibits antimicrobial properties against Bacillus cereus and E. coli, and shows significant biodegradability in soil and water. This innovation supports sustainable packaging goals, reduces reliance on synthetic indicators, and enhances consumer safety by providing a direct visual indication of food freshness.

Keywords: *Smart packaging, pH indicator, anthocyanins, polyvinyl alcohol food spoilage, biodegradability, real-time detection.*

DEVELOPMENT AND QUALITY ASSESSMENT OF FRUIT–SEED INFUSED TEA BLEND INTEGRATED WITH IOT-BASED STORAGE MONITORING SYSTEM

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Abstract: This study focuses on the development of a fruit–seed infused tea blend and its quality assessment integrated with an IoT-based storage monitoring system. The tea blends were prepared using selected dried fruits and seeds, followed by evaluation of their physical, chemical, microbial, and sensory properties. An IoT-based system incorporating temperature and humidity sensors was designed to monitor storage conditions in real time. The collected data was transmitted to a cloud platform for continuous monitoring and analysis.

Keywords: *IoT, Fruit–Seed Tea, Storage Monitoring, Functional Beverage, Quality Evaluation, Shelf Life, Temperature, Humidity, Sensor Technology*

AI – DEIRVEN OPTIMIZAATION FRUIT PEEL UTILIZATION FOR VALUE ADDED COOKIE PRODUCTS

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Abstract: The increasing generation of fruit peel waste poses significant environmental and economic challenges, necessitating sustainable and value-added utilization strategies. This study presents an AI-driven approach to optimize the incorporation of fruit peel waste into the production of nutritionally enhanced cookies. Fruit peels, such as banana, orange, and apple, are rich in dietary fiber, antioxidants, and bioactive compounds, making them suitable functional ingredients in food formulations. However, determining the optimal proportion and processing conditions remains complex due to variations in physicochemical and sensory attributes.To address this, an artificial intelligence-based optimization model was developed using machine learning algorithms to predict and optimize formulation parameters, including peel powder concentration, baking temperature, and time.

Keywords: *Artificial Intelligence (AI), Fruit Peel Waste, Waste Valorization, Functional Foods, Cookie Production, Optimization, Machine Learning*

AI-DRIVEN PREDICTIVE MODELING FOR OPTIMIZING SHELF-LIFE AND QUALITY RETENTION IN MINIMALLY PROCESSED FRUITS

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Abstarct: This study investigates the integration of Artificial Intelligence (AI) and Machine Learning (ML) algorithms to predict the shelf-life and nutritional decay of minimally processed (fresh-cut) fruits. Minimally processed foods are highly susceptible to rapid physiological deterioration, enzymatic browning, and microbial spoilage.In this research, an Artificial Neural Network (ANN) was developed and trained on datasets involving sensory scores, pH, and vitamin C retention levels. The AI model demonstrated a high correlation ($R^2 > 0.96$) between predicted and experimental data. Results indicate that AI-driven monitoring can reduce food waste by 22% through more accurate dynamic expiration labeling. This study champions the transition toward a "smart" food supply chain, enhancing both food safety and economic sustainability.

Keywords: *Artificial Intelligence, Food Technology, Predictive Modeling, Shelf-life, Fresh-cut Fruits, Machine learning.*

MACHINE LEARNING-BASED EXTRACTION OF PROTEINS FROM MARINE ALGAE FOR FORTIFICATION IN FOOD PRODUCTS

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Abstarct: Marine algae have emerged as a sustainable and nutrient-rich source of proteins for food fortification. However, conventional extraction methods often result in low yield and inefficiency due to the complex structure of algal cell walls. This study proposes a machine learning (ML)-based approach to optimize protein extraction from marine algae by analyzing critical processing parameters such as pH, temperature, ultrasound power, and enzymatic treatment. Multiple ML models, including Random Forest (RF), Support Vector Machine (SVM), and Artificial Neural Networks (ANN), were developed and evaluated. The ANN model demonstrated superior performance with an R^2 value of 0.94. The optimized extraction process resulted in a 27% increase in protein yield compared to traditional methods. Functional analysis confirmed the suitability of extracted proteins for food applications, including bakery and plant-based beverages. The findings highlight the potential of ML-driven bioprocess optimization for sustainable food production.

***Keywords**:Marine algae, protein extraction, machine learning, food fortification, artificial neural networks.*

Smart loT-Based System for In-Process and Finished Product Quality Monitoring in Cake Manufacturing

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Abstarct: Industrial cake manufacturing requires precise control of raw materials, processing conditions, and post-production handling to ensure product safety, consistency, and consumer acceptability. This paper presents a structured framework for assessing in-process and finished product quality parameters, integrating conventional quality assurance practices with IoT-enabled smart monitoring systems. The proposed approach organizes quality evaluation into three levels: raw material inspection, in-process control, and finished product verification. Key quality indicators include pH, moisture content, water activity, fat and sugar consistency, texture, volume, color, sensory attributes, and microbial stability, which significantly influence product quality and shelf life. A digital quality architecture incorporating IoT-based sensors, machine vision, automated data acquisition, and cloud-based analytics is proposed to monitor mixing, baking, cooling, and packaging conditions in real time. This enables early detection of process deviations and supports data-driven corrective actions. The framework shifts quality management from reactive inspection to predictive control, aligning with Industry 4.0 principles and improving efficiency in industrial cake production systems

***Key words:** Cake manufacturing, Quality assessment, IoT, Industry 4.0, Food quality control, Sensor-based monitoring, Water activity, Texture analysis, Smart manufacturing systems*

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THREE IN ONE MULTIPURPOSE AGRICULTURE MACHINE USING BLUETOOTH TECHNOLOGY

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Abstract: Agriculture plays a crucial role in the economy, particularly in a country like India where a large population depends on farming for their livelihood. However, traditional agricultural practices involve high labor effort, time consumption, and often result in uneven productivity. To address these challenges, the project titled "Three in one multipurpose agriculture machine using bluetooth technology" focuses on developing a low-cost, efficient, and automated solution that integrates multiple farming operations into a single system. The proposed robot is designed to perform three primary agricultural functions: seed sowing, pesticide spraying, and field navigation. The mobility feature allows the robot to move efficiently across farmland, reducing the need for manual intervention and enabling coverage of larger areas within less time. The system is developed using simple and economical components such as a microcontroller, DC gear motors, motor driver module, water pump, and a fabricated mechanical frame. One of the key objectives of this project is to maintain the total cost within ₹15,000, making it affordable and accessible for small and medium-scale farmers. The design emphasizes simplicity, ease of operation, and reliability, ensuring that it can be used effectively even in rural areas with limited technical resources.

Keywords: *Agriculture, Bluetooth technology, microcontroller.*

SOLAR OPERATED WIRELESS EV POWER CHARGER FOR HIGH WAY EV VEHICLES

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Abstract: The rapid growth of electric vehicles (EVs) has created a strong demand for efficient, sustainable, and user-friendly charging solutions, especially for long distance highway travel. This project proposes the design and development of a solar operated wireless EV power charging system for highway vehicles, which aims to provide continuous and eco-friendly energy transfer without the need for physical connections. The system utilizes solar panels installed along highways to capture renewable solar energy, which is then stored in a battery storage unit for later use. The stored energy is converted into high-frequency alternating current using power electronic converters and is transmitted wirelessly through inductive coupling. The proposed system not only minimizes charging downtime but also enhances the driving range of electric vehicles, making long-distance travel more feasible. Additionally, the use of solar energy significantly reduces carbon emissions and supports sustainable development. The wireless charging mechanism eliminates wear and tear associated with physical connectors and improves user convenience and safety. This project contributes to the advancement of smart transportation infrastructure by integrating renewable energy with modern wireless power transfer technology.

Keywords: *EV power charging system, carbon emissions, wireless charging.*

DESIGN AND FABRICATION OF PLASTIC WASTE BLOCK MAKING MACHINE WITH INTEGRATION THERMOELECTRIC HEAT RECOVERY POWER GENERATION SYSTEM

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Abstract: The rapid increase in plastic waste has become a major environmental concern, creating challenges in disposal and management. Conventional methods such as landfilling and incineration lead to pollution and resource loss. This project aims to provide an effective solution by converting plastic waste into useful construction materials while improving energy efficiency through heat recovery techniques. The proposed system consists of a shredding unit, heating chamber, moulding section, and cooling unit. Plastic waste is collected, cleaned, and shredded into small pieces for easy processing. The molten plastic is transferred into a mould where it is compressed using a mechanical or hydraulic press. This process ensures uniform shape and density of the blocks. To enhance the overall efficiency of the system, thermoelectric generator (TEG) modules are integrated with the heating chamber. These modules convert the temperature difference between the hot surface and the cooled side into electrical energy. The developed system offers a dual benefit of waste management and energy recovery. It reduces environmental pollution, minimizes energy loss, and produces valuable construction materials from waste plastic. This project demonstrates a cost- effective, sustainable, and energy-efficient solution suitable for small-scale industries and rural applications.

Keywords: *Waste Block Making Machine, thermoelectric generator, Energy Loss.*

MODERNIZATION OF CONVENTIONAL CNC MILLING MACHINE USING ADVANCED CONTROL UNIT

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Abstract: The modernization of conventional CNC milling machines has become essential to meet the growing demands of precision manufacturing and automation. Traditional CNC systems often operate with outdated control units, limiting their efficiency, flexibility, and overall performance. The proposed system improves motion control by enabling accurate coordination of machine axes through real-time monitoring and control. Feedback sensors continuously track parameters such as position, speed, and direction, allowing the controller to make instant corrections and maintain stable operation. The results demonstrate noticeable improvements in system performance, including higher production speed, better consistency in output, and increased operational reliability. The modernization approach proves to be an economical and effective solution for upgrading conventional machines to meet modern industrial requirements. This study highlights the significance of advanced control technologies in transforming traditional CNC systems into more efficient and adaptable manufacturing units suitable for current and future applications.

Keywords: *CNC Milling Machine, Feedback sensor, Automation.*

DESIGN, DEVELOPMENT AND STRUCTURAL EVALUATION OF AN E-SCOOTER FRAME

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Abstract: This report presents the comprehensive engineering design, development, and structural evaluation of a single-seater electric scooter prototype, developed in alignment with the requirements of the Dr. G. Padmanabham Memorial Design Competition – 2025 and SAE India student vehicle design principles. The study emphasizes a multidisciplinary approach integrating mechanical, electrical, and electronic subsystems to achieve an optimized urban mobility solution. The primary objective of the project is to design a cost-effective, lightweight, and safe electric scooter intended for single-person usage in urban environments. The vehicle is designed to achieve a target retail cost of approximately ₹60,000 while delivering a maximum speed of 35 km/h. Ergonomic considerations have been incorporated to ensure rider comfort suitable for an Indian 95th percentile male, enhancing usability in real-world traffic conditions. The inclusion of a Battery Management System (BMS) ensures safe operation through protection against over-voltage, under-voltage, and thermal conditions. In addition to conventional design aspects, the scooter incorporates innovative safety features such as a smart load monitoring system and an automatic turn indicator mechanism. The automatic indicator system eliminates the need for manual cancellation, reducing rider error and improving overall road safety. Overall, the project successfully demonstrates that performance, safety, and affordability can be achieved simultaneously in the design of electric two-wheelers, making it a viable solution for sustainable urban transportation.

Keywords: *E Scooter, Battery Management System, Automatic Indicator System.*

MULTI MATERIAL 3D PRINTED TOOLING FIXTURE HEAT TREATMENT MANUFACTURED BY USING FDM PROCESS

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Abstract: Additive manufacturing (AM), commonly known as 3D printing, enables the fabrication of complex geometries with reduced material waste and improved design flexibility. This work presents the development of a multi material 3D printed tooling fixture for heat treatment applications using the fused deposition modeling (FDM) process. The fixture was designed using CAD and fabricated with PLA+ CF based thermoplastic materials to achieve lightweight construction and dimensional stability. Mechanical test specimens were evaluated as per ASTM standards, including tensile, compressive, flexural, and impact tests, to assess material suitability. The results demonstrate that the developed tooling fixture provides adequate mechanical strength and functional stability under heat treatment conditions, proving it to be a cost effective and sustainable alternative to conventional metal fixtures for low volume and prototype applications.

Keywords: *Additive Manufacturing, Multi material 3D Printing, Tooling Fixture, Heat Treatment, Fused Deposition Modeling, PLA+-CF Thermoplastic.*

Ti_3C_2Tx/RGO COMPOSITE ELECTRODES FOR SUPERCAPACITOR APPLICATIONS

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Abstract: The increasing demand for portable electronics, electric vehicles, and renewable energy systems has created a strong need for efficient energy storage technologies. Supercapacitors are considered promising energy storage devices because they offer high power density, rapid charge–discharge capability, and long cycle life. Recent research focuses on advanced electrode materials such as two-dimensional titanium carbide ($Ti_3C_2T_x$ MXene), which exhibits high electrical conductivity, large surface area, and excellent electrochemical activity. In the present work, pure Ti3C2Tx MXene was synthesized via a hydrofluoric acid etching process under room temperature conditions. The structural and morphological properties were systematically investigated. Additionally, Ti3C2Tx MXene/commercial RGO hybrid composites with 9:1 and 7:3 weight ratios were prepared and optimized for electrochemical studies. In 7:3 weight ratio full cell, the device achieved excellent specific capacitance of 90 F g−1, specific energy of 10 Wh kg−1 and specific power of 200 W kg−1 with capacitance retention of 88 % of coulombic efficiency even after 10,000 cycles in coin cell configuration. The results highlight the potential of 2D/2D structure materials electrodes into sustainable energy storage systems, contributing to future technological enhancements.

Keywords: *2D/2D structure, Ti3C2Tx Mxene/RGO composites, Supercapacitor.*

GROUP ATTENDENCE MONITORING SYSTEM USING ARTIFICIAL INTELLIGENCE

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Abstract: Attendance management in educational institutions is traditionally a manual and time-consuming process, often prone to errors and proxy attendance. To overcome these limitations, this project presents an IoT-based group attendance system using a Raspberry Pi. The proposed system automates attendance recording by capturing student data through a Pi Camera or RFID module and processing it using Python-based algorithms. Facial recognition techniques using OpenCV can be employed to identify multiple students simultaneously, enabling efficient group attendance marking. The processed attendance data is uploaded in real time to a cloud-based IoT platform such as Firebase, ThingSpeak, or AWS IoT, allowing remote access and monitoring through a dashboard. Once the attendance is recorded, the data is automatically uploaded to cloud-based IoT platforms such as Firebase, ThingSpeak, or AWS IoT. By reducing human effort and minimizing errors, the proposed system enhances reliability and operational efficiency. It also ensures transparency and prevents malpractice such as proxy attendance. Experimental results demonstrate that the system provides accurate recognition, fast processing, and seamless data synchronization.

Keywords: *Attendance management, ThingSpeak, cloud-based IoT platforms.*

EXPLAINABLE AI-BASED IOT MONITORING OF WEAR AND DEGRADATION IN BIO-COMPOSITE AGRICULTURAL MACHINE COMPONENTS

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Abstract: The transition toward sustainable agriculture has accelerated the adoption of bio-composite materials (natural fiber-reinforced polymers) in agricultural machinery components such as rotavator blades, bushings, and pump impellers. An IoT-based sensing architecture is developed integrating vibration (0–8 kHz), acoustic emission (50–300 kHz), humidity (0–100% RH), and temperature (−10 to 110°C) sensors to capture coupled environmental and mechanical degradation signals. A novel Degradation Explainability Index (DEI) is introduced, quantifying model transparency, with the proposed system achieving a DEI score of 0.87, significantly higher than conventional black-box models (0.42–0.55). Experimental validation demonstrates that the proposed framework enables early-stage wear detection up to 28% earlier than threshold-based methods, reduces unexpected component failure by 34%, and extends component service life by 21% under real-field conditions. The study establishes a new paradigm for transparent, sustainable, and intelligent maintenance of bio-composite agricultural machinery, enabling data-driven decision-making and enhancing trust in AI-assisted farming systems.

Keywords: *Explainable AI (XAI), Internet of Things (IoT), Bio-composite materials.*

AUTONOMOUS SYSTEMS AND ROBOTICS: TECHNOLOGIES AND APPLICATIONS CHALLENGES, INNOVATIONS, AND FUTURE PERSPECTIVES

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Abstract: Autonomous systems and robotics represent a pivotal frontier in modern technological innovation, synthesizing artificial intelligence, advanced sensing modalities, control theory, and high-performance computational frameworks to facilitate independent machine operation with minimal human oversight. The convergence of machine learning, computer vision, and adaptive control algorithms has markedly enhanced the precision, resilience, and operational reliability of autonomous robotic platforms across diverse domains, including manufacturing, healthcare, agriculture, and intelligent transportation systems. Nevertheless, critical challenges remain, encompassing robustness in highly dynamic and uncertain environments, ethical and regulatory implications, and the safeguarding of data integrity, security, and privacy. This paper delineates the foundational principles, enabling technologies, application landscapes, and prospective research trajectories in autonomous systems and robotics, underscoring their transformative potential in shaping future technological ecosystems.

Keywords: *Glass fiber, Epoxy, Nanoclay, Compression molding, IoT.*

MACHINE LEARNING-BASED ANALYSIS OF MECHANICAL PROPERTIES OF GLASS FIBER REINFORCED POLYAMIDE 6 WITH VARIOUS INFILL PATTERNS PRODUCED BY FDM TECHNOLOGY

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Abstract: Additive manufacturing, particularly Fused Deposition Modeling (FDM), has emerged as a transformative technology in the field of polymer-based manufacturing. Among engineering thermoplastics, Polyamide 6 (PA6) reinforced with glass fiber has gained significant attention due to its superior mechanical strength, thermal stability, and wear resistance. This project focuses on the detailed analysis of Machine Learning based mechanical properties of glass fiber reinforced Polyamide 6 fabricated using FDM technology with various infill patterns. Infill pattern selection plays a critical role in determining the structural integrity, stiffness, strength, and weight of printed components. The study aims to investigate how different infill geometries influence tensile strength, flexural strength, impact resistance, and overall material behaviour. The findings of this study provide valuable insights for engineers and designers seeking to optimize material usage, mechanical efficiency, and production cost. The project contributes to the growing body of knowledge in advanced polymer composites and additive manufacturing, supporting the development of lightweight, high-performance components for automotive, aerospace, and industrial applications.

Keywords: *Additive Manufacturing, Infill Patterns, Mechanical Testing, Machine Learning.*

EFFECT OF NANOCLAY CONTENT ON MECHANICAL PROPERTIES OF GLASS FIBER/EPOXY COMPOSITES FOR IOT-ENABLED SMART APPLICATIONS

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Abstract : Composite material plays a vital role as it is a combination of two or more materials that results in better properties than those of the individual components used. In the present investigation, glass fiber/epoxy resin modified with nanocomposite is manufactured by hand layup and compression molding method. The glass fiber used in this investigation is E-glass fiber with orientation (0°–90°). The composite samples are made in the form of laminates, and the weight percentage of nanomaterial added to the specimen is varied from 1 wt% to 7 wt%. The specimens are cut as per ASTM standards for tensile, flexural, and impact testing. The results of mechanical properties are analysed, and it is found that better tensile and flexural properties are obtained with the addition of 5 wt% nanoclay content. Addition of 7 wt% nanoclay shows deterioration in tensile and flexural strength, indicating that the composite material becomes brittle in nature. The integration of IoT-based sensing and monitoring systems with such composite materials can further enhance their applicability in smart structural health monitoring, enabling real-time data acquisition and improved lifecycle performance assessment.

Keywords: *Glass fiber, Epoxy, Nanoclay, Compression molding, IoT.*

AUTOMATED PNEUMATIC INTERNAL CYLINDRICAL GRINDER

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Abstract: Grinding is a finishing process used in manufacturing industries to achieve high dimensional accuracy and smooth surface finish. Traditional grinding machines are electrically powered and often produce excessive heat, vibration, and energy consumption. Pneumatic grinding machines provide an efficient alternative by using compressed air as the power source. The system uses compressed air generated by an air compressor to operate a pneumatic motor that drives the grinding wheel. This smart control mechanism helps in maintaining consistent grinding speed, reducing tool wear, and improving surface finish. The proposed system also includes safety features such as overload protection, vibration monitoring, and automatic shutdown in case of abnormal conditions. This work demonstrates how pneumatic technology combined with intelligent control systems improved the manufacturing processes.

Keywords: *Grinding, smart control, pneumatic, Vibration monitoring.*

IOT BASED TRIBOLOGICAL BEHAVIOUR OF ZrO_2 REINFORCED ALUMINIUM BASED SUPER ENTROPY ALLOY

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Abstract: This study focuses on the Integrating industrial internet of Things (IOT) sensors such as vibration sensor for fabrication and tribological characterization of aluminium-based Super Entropy Alloy composites reinforced with ZrO2 (Zirconia) ceramic powder using the powder metallurgy technique. Aluminium (Al) was used as the base matrix material while ZrO2 was incorporated as ceramic reinforcement to improve the tribological and mechanical properties of the composite. The elemental powders were mixed using ball milling at 200 RPM for 4 hours with a ball-to-powder ratio of 10:1. The blended powder mixtures were then compacted at 50 MPa uniaxial pressure to form green compacts, which were subsequently sintered at 520°C with a heating rate of 100°C/min and a holding time of 10 minutes. Results indicate that the addition of ZrO2 reinforcement significantly improves the hardness and wear resistance of the composite. The composite with 20% ZrO2 displayed approximately 221% increase in microhardness with a significantly lower average coefficient of friction (ACOF) of 0.32 and wear rate of 1.9 × 10 mm^3/Nm compared to the unreinforced aluminium matrix by real time monitor the equipments by Tribotronics allows correlation of data like friction and wear rate.

Keywords: *IOT Sensors, Tribotronics, ZrO reinforcement, Super Entropy Alloy, Aluminium matrix composite.*

ENHANCING AUTONOMOUS VEHICLES THROUGH INTERNET OF THINGS TECHNOLOGIES

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Abstract: The rapid advancement of the Internet of Things (IoT) has significantly transformed the development of autonomous vehicles, enabling smarter, safer, and more efficient transportation systems. IoT integrates sensors, communication networks, and data analytics to allow vehicles to interact with their environment in real time. Autonomous vehicles leverage this interconnected ecosystem to collect and process data from multiple sources such as traffic signals, road infrastructure, and nearby vehicles. This enhances decision-making capabilities, improves navigation accuracy, and reduces the likelihood of accidents. Additionally, IoT facilitates vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communication, enabling coordinated traffic management and reduced congestion. Despite these benefits, challenges such as data security, privacy, latency, and system reliability remain critical concerns. This paper explores the role of IoT in autonomous vehicle systems, highlighting its potential to revolutionize modern transportation while addressing key technical and ethical issues.

Keywords: *Vehicle-to-Vehicle (V2V) Communication, Real-Time Data Processing, Intelligent Transportation Systems (ITS), Autonomous Vehicles.*

EXPLAINABLE AI-INTEGRATED MACHINE LEARNING FRAMEWORK FOR RELIABLE PREDICTION OF MECHANICAL PROPERTIES IN SUSTAINABLE PLA BASED COMPOSITES

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Abstract: The growing demand for sustainable materials has accelerated the development of polylactic acid (PLA)-based composites reinforced with natural plant fibers. However, predicting their mechanical properties remains challenging due to complex, nonlinear interactions between processing parameters, fiber morphology, and interfacial bonding mechanisms. Conventional machine learning (ML) models often provide high prediction accuracy but lack interpretability, limiting their applicability in material design. This study proposes an Explainable AI (XAI)-integrated machine learning framework for the reliable prediction and interpretation of the mechanical properties of sustainable PLA-based composites. Among the evaluated models, the optimised ensemble learning approach achieved superior predictive performance with R^2 values exceeding 0.93 for tensile strength, bursting strength, and density. To overcome the limitations of conventional ML as black boxes, SHAP-based explainability and feature attribution analysis were employed to quantify the contribution of each parameter. The results revealed that forming parameters dominate the composite performance (>65%), followed by calendering conditions (30%), while fiber morphology exhibits a comparatively minor influence. The proposed approach provides a scalable pathway for intelligent design, optimization, and industrial implementation of sustainable composite materials

Keywords: *Explainable AI; Machine Learning; PLA Composites; Mechanical Properties; SHAP Analysis.*

SOLAR GRASS CUTTER WITH WATER SPRAYING VEHICLE

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Abstract: The paper aims at designing and fabricating a solar grass cutter with water spraying system using RF Technology to reduce man power, pollution and usage of electricity in gardening. Worlds electricity requirement is growing at an alarming price because of commercial growth, improved and huge use of electrical gadgets. The high-quality alternative opportunity supply is from the sun energy. In this design the source energy is ambitious from the sun radiation by using PV panels and it is stored in 12V rechargeable DC battery. The proposed proto-vehicle performs two operations that are controlled using a switch. The first operation is grass cutting, the grass cutting blade is connected a DC Motor. The second operation is the spreading of water/pesticide, here we use a water pump connected to the spreading nozzle by the means of hoses. The battery is connected to the RF Module with controls all the motors. The RF session encompasses an RF transmission and reception. This Tx/Rx pair (RF module) functions at a frequency of 434 MHz. The data required for the RF transmitter is received from series of serial data and is transmitted in wireless manner using the RF antenna. The encoder encodes the parallel data for the transmission system and the at the reception decoder unit is used for decoding the data. Input signals are transmitted through four channels and the outputs are observed with a set of four LED's with respect to corresponding switches.

Keywords: *RF Technology, DC Motor, PV Panel, Encoder.*

IOT – BASED HEAT EXCHANGER MONITORING

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Abstract: The IoT-Based Heat Exchanger Monitoring System is designed to monitor important operating parameters such as temperature, pressure, flow rate, and humidity in real time. Heat exchangers are widely used in industries for transferring heat between fluids, and proper monitoring is essential to ensure efficient and safe operation. In traditional systems, monitoring is often performed manually using separate measuring instruments. This approach may lead to delays in detecting abnormal conditions and can increase the chances of human error. Lack of continuous monitoring can reduce system efficiency and may cause equipment damage. The proposed system uses sensors connected to an Arduino Uno microcontroller to collect data from the heat exchanger. The measured values are processed by the controller and displayed on a 16×2 LCD display for easy local monitoring. A buzzer is used to provide alerts when any parameter exceeds the safe operating limits. To enable remote monitoring, a NodeMCU (ESP8266) module is used to transmit the collected data to an IoT platform through the internet. This allows users to monitor system conditions from any location. The system improves safety, efficiency, and reliability by providing continuous monitoring and early detection of abnormal conditions.

Keywords: *Heat Exchanger, Arduino Uno microcontroller, IoT in Heat Exchanger.*

ROLE OF IOT ON MECHANICAL CHARACTERIZATION OF CERAMIC REINFORCED ALUMINIUM BASED POWDER METALLURGY COMPOSITE

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Abstract: This study focuses on the fabrication of Mechanical Characterization of ceramic Reinforced of aluminium-based Super Entropy Alloy composites reinforced with ZrO2 (Zirconia) ceramic powder using the powder metallurgy technique. Aluminium (Al) was used as the base matrix material while ZrO2 was incorporated as ceramic reinforcement to improve the mechanical properties of the composite. The elemental powders were mixed using ball milling at 200 RPM for 4 hours with a ball-to-powder ratio of 10:1. The blended powder mixtures were then compacted at 50 MPa uniaxial pressure to form green compacts, which were subsequently sintered at 520°C with a heating rate of 100°C/min and a holding time of 10 minutes. Results indicate that the addition of ZrO2 reinforcement significantly improves the tensile strength and corrosion resistance of the composite. The composite with 20% ZrO2 displayed approximately 221% increase in tensile strength with a significantly lower average coefficient of friction (ACOF) of 0.32 and wear rate of 1.9 × 10 mm³/Nm compared to the un reinforced aluminium matrix.

Keywords: *ZrO reinforcement, Super Entropy Alloy, Aluminium matrix composite, Powder metallurgy.*

IOT-DRIVEN REAL-TIME PREDICTIVE ANALYTICS FOR MECHANICAL BEHAVIOR OF SUSTAINABLE POLYMER COMPOSITE MATERIALS

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Abstract: The integration of Internet of Things (IoT) technologies with sustainable polymer composites offers a promising pathway toward intelligent material systems capable of real-time performance assessment. This study focuses on the development of an IoT-driven framework for monitoring and predicting the mechanical behavior of biochar-reinforced and natural fiber-based polymer composites. Sensors embedded within the composite structure enable continuous acquisition of data related to strain, stress, temperature, and vibration. The collected data is transmitted through IoT platforms and analyzed using predictive analytics techniques to identify trends, detect anomalies, and forecast material degradation. This approach facilitates proactive maintenance, improves structural reliability, and enhances the lifecycle performance of sustainable composites. The proposed system supports the advancement of smart manufacturing and green material design by combining eco-friendly composites with intelligent monitoring technologies.

Keywords: *Sustainable composites; IoT; Predictive analytics; Mechanical behavior; Real-time monitoring.*

VOICE-ASSISTED PIPE INSPECTION SNAKE ROBOT FOR INDUSTRIALS APPLICATION

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Abstract: This project presents the design and implementation of a Voice Controlled Crack Detection Robot with Location Tracking using Arduino. The proposed system allows the user to control the robot through voice commands using a mobile application connected via Bluetooth communication. Commands such as forward, backward, left, right, start, and stop are transmitted from the mobile application to the robot through the Bluetooth module. The Arduino microcontroller processes these commands and controls the movement of the robot using a motor driver and DC motors. When the sensor detects a crack or abnormal gap, the system immediately activates a buzzer alert to indicate the presence of the crack. At the same time, the system sends a notification message to the mobile application indicating "Crack Detected." This helps the user quickly identify the occurrence of damage. In addition to crack detection, the system uses a GPS module to determine the exact location where the crack is detected. The proposed system provides a low-cost, efficient, and automated solution for crack detection and monitoring. By combining voice control, sensor-based detection, and location tracking, the system improves inspection efficiency and reduces the risks associated with manual monitoring.

Keywords: *Ultrasonic sensor, Arduino, Crack detection, GPS Module.*

SMART GAS LEAKAGE DETECTION AND REMOTE MONITORING SYSTEM USING ARDUINO AND IOT

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Abstract: The increasing use of liquefied petroleum gas (LPG) and other combustible gases in domestic and industrial environments has raised serious concerns regarding safety due to accidental gas leakages. This project presents the design and development of an IoT-based intelligent gas leakage detection system using an Arduino microcontroller. The system employs a gas sensor (such as MQ-2) to continuously monitor the presence of hazardous gases in the environment. Upon detection of gas leakage beyond a predefined threshold, the system triggers an immediate alert through a buzzer and sends real-time notifications to users via IoT platforms using a Wi-Fi module (e.g., ESP8266). The proposed system ensures quick response and remote monitoring, thereby minimizing the risk of fire accidents, explosions, and health hazards. Additionally, the integration of IoT enables users to monitor gas levels from anywhere using a smartphone or web interface. The system is cost-effective, reliable, and suitable for both residential and industrial applications. This intelligent solution enhances safety by providing early detection and timely alerts, thereby preventing potential disasters.

Keywords: *Internet of Things (IoT), Arduino, Gas Leakage Detection, Real-Time Monitoring, Safety System.*

IOT-ENABLED SMART HVAC SYSTEMS FOR ENERGY-EFFICIENT THERMAL MANAGEMENT IN BUILDINGS

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Abstract: The increasing demand for energy-efficient and sustainable building operations has accelerated the adoption of Internet of Things (IoT) technologies in Heating, Ventilation, and Air Conditioning (HVAC) systems. This paper presents the design and implementation of an IoT-enabled smart HVAC framework aimed at optimizing thermal management while minimizing energy consumption in residential and commercial buildings. The proposed system integrates distributed sensors, real-time data acquisition, and cloud-based analytics to continuously monitor environmental parameters such as temperature, humidity, occupancy, and air quality. Experimental validation demonstrates significant improvements in energy efficiency, occupant comfort, and system responsiveness compared to conventional HVAC systems. Furthermore, the study evaluates the scalability, cost-effectiveness, and interoperability of the proposed solution within existing building infrastructures. The results highlight the potential of IoT-driven HVAC systems to contribute toward smart building ecosystems and sustainable energy management practices. This research provides a comprehensive framework for future advancements in intelligent thermal systems and supports the transition toward greener and more efficient built environments.

Keywords: *Smart HVAC Systems, Energy Efficiency, Building Automation, IoT.*

IOT BASED COAL MINE SAFETY MONITORING AND ALERTING SYSTEM

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Abstract: Coal mining is a highly hazardous underground activity where continuous monitoring of environmental conditions is essential for worker safety. Dangerous factors such as methane gas leakage, high temperature, water seepage, and fire accidents can cause severe disasters if not detected early. Traditional monitoring systems are mostly manual and do not provide real-time alerts. This project proposes an IoT-based coal mine safety monitoring and alerting system using wireless sensor networks. Various sensors monitor temperature, gas concentration, and water levels inside the mine. Sensor data is transmitted from slave controllers to a master controller and uploaded to an IoT platform. The system generates instant alerts during abnormal conditions, ensuring quick response, improved safety, and reduced risk to miners.

Keywords: *Coal Mine Monitoring, IoT in Coal Mine, Wireless sensor Networks.*

SMART COMPOSITE SYSTEMS: INTEGRATING REAL-TIME SENSING AND IOT-BASED INTELLIGENCE FOR PERFORMANCE OPTIMIZATION

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Abstract: Smart composite systems are emerging as a transformative solution in advanced engineering by integrating real-time sensing with IoT-based intelligence. This study presents the development of a smart composite framework capable of continuously monitoring mechanical performance and environmental interactions. Embedded sensors enable real-time data acquisition related to parameters such as strain, vibration, and temperature, while IoT platforms facilitate remote monitoring and data transmission. The collected data is further analyzed using intelligent algorithms to predict performance degradation and optimize material behavior. Such integration enhances structural reliability, enables predictive maintenance, and supports data-driven decision-making in applications ranging from aerospace to automotive and civil infrastructure. The proposed approach highlights the potential of combining smart materials with digital technologies to achieve adaptive, efficient, and sustainable composite systems aligned with Industry 4.0 principles.

Keywords: *Smart composites, IoT, Real-time monitoring, Predictive analytics, Performance optimization.*

EV BATTERY MONITORING AND ACCIDENT DETECTION USING IOT TECHNOLOGY

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Abstract: Nowadays, electric vehicle (EV) is becoming popular since the fuel prices becoming more expensive. Due to this scenario, many vehicle manufacturers looking for alternatives of energy sources other than gas. The use of electrical energy sources may improve the environment since there are less pollution. In addition, EV produces great advantages in terms of energy saving and environmental protection. Most EVs used rechargeable battery which is lithium-ion battery. It is smaller to be compared with lead acid. In fact, it has a constant power, and energy's life cycle is 6 to 10 times greater compared with lead acid battery. Lithium-ion battery life cycle can be shortened by some reasons such as overcharging and deep discharges. On the other hand, EV usually has limited range of travelling due to battery size and body structure. Now, an important reason that limits the application of EV is the safety of existing battery technology. This paper describes the application of Internet-of-things (IoT) in monitoring the performance of electric vehicle battery. It is clear that an electric vehicle totally depends on the source of energy from a battery. However, the amount of energy supplied to the vehicle is decreasing gradually that leads to the performance degradation. This is a major concern for battery manufacture. In this work, the idea of monitoring the performance of the vehicle using IoT techniques is proposed, so that the monitoring can be done directly.

Keywords: *EV, Lithium-ion,IOT, pneumatic, Performance monitoring.*

SMART ROBOTICS SYSTEMS: INTEGRATING IOT FOR REAL-TIME MONITORING AND ADAPTIVE CONTROL

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Abstract: The convergence of robotics and Internet of Things (IoT) technologies is transforming conventional automation into intelligent, connected, and adaptive systems. This paper presents a comprehensive framework for IoT-enabled smart robotic systems designed to achieve real-time monitoring and adaptive control in dynamic operational environments. The proposed approach integrates embedded sensors, edge computing devices, and cloud-based platforms to facilitate continuous data acquisition, processing, and decision-making. Experimental analysis demonstrates improved system responsiveness, precision, and operational efficiency compared to traditional robotic systems. Additionally, the framework supports predictive maintenance, fault detection, and energy optimization, thereby increasing system reliability and reducing downtime. The study also addresses key challenges such as latency, data security, and interoperability in IoT-based robotic ecosystems. The findings highlight the potential of integrating IoT with robotics to advance smart manufacturing, autonomous systems, and Industry 4.0 applications, paving the way for more flexible, intelligent, and resilient robotic solutions.

Keywords: *IoT, Real-Time Monitoring, Adaptive Control, Smart Robotics.*

AI-ASSISTED EXPERIMENTAL INVESTIGATION OF MECHANICAL PROPERTIES OF 3D PRINTED CARBON FIBER REINFORCED HYBRID COMPOSITES

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Abstract: In recent years, polymer composite materials have gained significant importance in engineering applications due to their lightweight nature and enhanced mechanical properties. This project focuses on the development and characterization of polyethylene terephthalate glycol (PETG) reinforced with 10% carbon fiber to improve its strength and stiffness. In addition to experimental analysis, Artificial Intelligence (AI) techniques were incorporated to assist in data analysis, prediction, and optimization of material properties. Machine learning models were utilized to identify patterns in the experimental results and to predict the mechanical performance of the composite under varying conditions. Experimental results indicate that the incorporation of 10% carbon fiber significantly enhances the tensile strength and rigidity of PETG. However, a slight reduction in ductility was observed. Additionally, the composite demonstrated improved thermal stability and better dimensional accuracy compared to the base material. Based on the findings, PETG reinforced with 10% carbon fiber is identified as a promising material for lightweight structural and functional applications, particularly in additive manufacturing and automotive components. The integration of AI further enhances the efficiency and accuracy of material development processes.

Keywords: PETG, Carbon Fiber Reinforced Composite, Artificial Intelligence, Machine Learning, Polymer Matrix Composite, Mechanical Properties, Tensile Strength.

SMART ROBOTICS SYSTEMS: INTEGRATING IOT FOR REAL-TIME MONITORING AND ADAPTIVE CONTROL

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Abstract: The emergence of Industry 4.0 has significantly transformed manufacturing systems through the integration of Internet of Things (IoT) technologies, enabling intelligent, connected, and data-driven production environments. This paper proposes an IoT-based smart manufacturing framework aimed at enhancing productivity and improving machine health monitoring in industrial settings. A data-driven approach is employed to monitor critical machine parameters such as vibration, temperature, and operational load, enabling early fault detection and predictive maintenance. Advanced analytics and machine learning techniques are utilized to optimize production workflows, reduce downtime, and improve overall equipment effectiveness (OEE). The proposed framework also supports seamless communication between machines, operators, and management systems, ensuring higher transparency and operational efficiency. Experimental and simulation results demonstrate notable improvements in productivity, equipment reliability, and energy utilization compared to conventional manufacturing practices. Additionally, the study addresses challenges related to data security, system interoperability, and scalability within IoT-enabled industrial environments. The findings emphasize the pivotal role of IoT in advancing smart manufacturing and highlight its potential to drive sustainable, efficient, and resilient industrial systems in the era of Industry 4.0.

Keywords: *IoT, Smart Manufacturing, Industry 4.0, Machine Health Monitoring.*

IOT-ENABLED STRUCTURAL HEALTH MONITORING OF NATURAL FIBER REINFORCED COMPOSITES - A REVIEW

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Abstract: Natural fiber reinforced composites (NFRCs) are gaining prominence in semi-structural and structural applications due to their renewability, light weight, and cost-effectiveness. This review critically examines the integration of the Internet of Things (IoT) with SHM systems for NFRCs. We analyze the suitability of various IoT-enabled sensors—including fiber Bragg gratings, piezoelectric transducers, humidity sensors, and wireless accelerometers—for detecting damage mechanisms specific to natural fibers, such as moisture-induced swelling, fiber pull-out, and matrix cracking. Key challenges addressed include power autonomy of wireless sensor nodes, data transmission reliability in humid or biodegradable environments, and the calibration of sensor signals against the anisotropic and time-dependent properties of NFRCs. Furthermore, we discuss cloud-based data analytics, machine learning for damage classification, and real-time alert generation. The review concludes by identifying current research gaps, such as eco-friendly sensor encapsulation and standardized IoT protocols for bio-based composites, and proposes future directions toward self-powered, fully biodegradable SHM systems for sustainable infrastructure.

Keywords: *Natural fiber reinforced composites, structural health monitoring (SHM), Internet of Things (IoT), wireless sensor networks, damage detection.*

APPLICATIONS OF IOT IN HVAC- A REVIEW

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Abstract: In recent days, energy saving is a great deal to handle in different situations and in different applications. In this paper, we discuss about the uses IoT to save the energy in various applications, also study sensors, actuators, and other IoT applications. In order to save human time, the Internet of Things (IoT) will sense many parameters, such as temperature and voltage, and maintain a feasible condition. These days, industries are likewise utilizing IoT to achieve superior outcomes. IoT is being used for both domestic and industrial purposes. This paper provides a quick overview of the use of IoT in various climates, how it improves human comfort, and how it might save energy waste.

Keywords: *HVAC, IoT, Applications.*

AI ROBOTIC EYE – INTELLIGENT VISION SYSTEM

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Abstract: The "Robotic Eye" is an advanced intelligent vision system designed to mimic human eye functionality using modern technologies such as computer vision, artificial intelligence, and embedded systems. The project aims to capture, process, and analyze visual data in real time, enabling machines to interpret surroundings and respond accordingly. This system has wide applications in surveillance, healthcare, robotics, automation, and assistive technologies for visually impaired individuals. Upon integrating cameras, sensors, and image processing algorithms, the robotic eye enhances perception capabilities beyond human limitations. Unlike conventional cameras, the robotic eye incorporates intelligent processing to detect objects, track motion, and recognize patterns. This project focuses on developing a compact, efficient, and responsive vision system capable of real-time analysis. It bridges the gap between human vision and machine intelligence, contributing to advancements in automation and smart systems.

Keywords: *Machine Vision, Robots in Autonomous Manufacturing, AI based Robotic eye.*

IOT-INTEGRATED GAS LEAKAGE SHUTDOWN VALVE WITH AUTO-LOCK SERVO MECHANISM

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Abstract: An IoT-Integrated Gas Leakage Shutdown Valve featuring an auto-lock servo mechanism is disclosed. The system includes a gas sensor array, an edge microcontroller, and a high-torque servo-driven valve actuator that automatically shuts off gas supply when hazardous leakage levels are detected. IoT connectivity enables remote alerts, system monitoring, and cloud-based analytics. A closed-loop servo feedback system ensures complete valve locking and prevents reopening until manual reset. The invention provides a rapid, reliable, and intelligent safety solution for domestic and industrial gas handling environments.

Keywords: *Auto-lock servo mechanism, IoT, cloud-based analytics, gas sensor array, an edge microcontroller.*

IOT AND AI-BASED ANALYSIS OF LITHIUM-ION BATTERY PERFORMANCE IN ELECTRIC VEHICLES

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Abstract: This study investigates the performance of various energy storage technologies for use in electric vehicles by incorporating IoT and AI-based analytical approaches. Six types of batteries, including lithium iron phosphate, nickel metal hydride, and lead-acid batteries, were examined. Important performance parameters such as energy density, power density, cycle life, charging rate, cost per kWh, and operating temperature range were considered. IoT-enabled sensors were utilized to monitor real-time battery data, while AI techniques were applied to analyze and model battery behavior in both hybrid and fully electric vehicles under standardized driving conditions. The findings indicate that lithium iron phosphate batteries deliver superior overall performance due to their longer cycle life, higher energy and power density, capability to handle higher charging rates, and lower cost per kWh. Additionally, AI-based optimization methods were used to determine the most efficient charging C-rate for each battery type, enhancing overall battery performance and lifespan.

Keywords: *EV, Lithium-ion, IOT, AI, Performance monitoring.*

DEPARTMENT OF MANAGEMENT STUDIES

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Explainable Artificial Intelligence: Understanding AI Transparency for Social Sciences

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Abstract — Artificial Intelligence (AI) systems have become embedded in consequential social decisions—from predicting recidivism in criminal justice to screening loan applicants in banking. As these systems grow more powerful, their inner workings have grown correspondingly opaque. Explainable Artificial Intelligence (XAI) is the interdisciplinary field dedicated to making AI decisions legible, auditable, and contestable. This paper introduces XAI to an audience of social science students, with minimal technical prerequisites. It examines the philosophical foundations of explainability, surveys the principal technical methods, and critically applies a social-science lens to questions of power, bias, accountability, and democratic governance. Drawing on examples from criminal justice, healthcare, welfare administration, and social media curation, the paper argues that XAI is not merely a technical problem but a profoundly social and political one—requiring the collaborative expertise of sociologists, political scientists, ethicists, and legal scholars alongside computer scientists.

Keywords — Explainable AI, algorithmic transparency, algorithmic accountability, fairness, black-box models, social justice, AI ethics, GDPR, interpretable machine learning.

A Study On Consumers' Perspective On Brand Loyalty Towards Fmcg Product- Bath Soap With Reference To Coimbatore North District

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Abstract — Fast moving consumer goods (FMCG) manufacturing is very much as the name suggests: high quality products that fly off the production lines as fast as they fly off supermarket shelves. Typical products include home cleaning items, personal hygiene goods and foodstuffs, such as crisps and ready meals. Major players include companies like Procter & Gamble and Unilever, which produce a wide portfolio of products, while other companies like Walkers and L'Oreal tend to focus on single product areas. In FMCG, engineers have the vital role of developing and managing manufacturing processes to remove costs and wastage and keep things moving – thousands of units of each product can come off a production line every minute. Engineers also continually innovate new machines and processes to match the demands made on products by consumers.

Keywords—Brand Loyalty, FMCG Products, Consumer Behaviour, Bath Soap, Brand Preference, Purchase Decision, Customer Satisfaction, Socio-Economic Factors, Consumption Pattern, Chi-Square Analysis

AI Governance and Ethical Accountability in Indian Corporates: A New Dimension of Corporate Governance

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Abstract – The growing use of Artificial Intelligence (AI)in corporate decision-making is reshaping the way businesses operate, offering immense opportunities while raising complex ethical and legal challenges. This paper examines how AI governance is emerging as a vital component of corporate governance and social responsibility in India. As corporations increasingly depend on algorithms to make decisions related to recruitment, finance, and customer interaction, concerns about fairness, transparency, and accountability have become central to responsible business conduct. The study evaluates the effectiveness of India's existing legal frameworks, including the Companies Act, 2013, the Information Technology Act, 2000, and SEBI's disclosure norms, in addressing these evolving issues. It also draws insights from international frame works such as the OECD Principles on AI and the European Union's AI Act to identify approaches that could strengthen Indian regulatory policies. Connecting technology, law, and ethics, the study emphasizes that responsible AI use should be recognized as a core aspect of modern corporate governance rather than a purely technical concern. The conclusion highlights that a well- defined AI governance structure can build stakeholder trust, promote sustainable innovation, and align corporate growth with broader principles of accountability and social responsibility.

Keywords - Artificial Intelligence, Corporate Governance, Ethics, Accountability, SEBI, Responsible AI, Legal Framework, India, Sustainability, Transparency

Trustworthy, Ethical, and Human-Centered AI: The CARES Framework and Readiness Index

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Abstract — Artificial intelligence has moved from research labs into the core machinery of public institutions, commercial platforms, and everyday life. Three interconnected demands have emerged: AI systems must earn trust through consistent, verifiable behaviour; operate within ethical boundaries that affected communities accept as fair; and keep people—not algorithms—genuinely in control of consequential decisions. The paper identifies eight recurring design dilemmas and offers resolution heuristics for each, alongside the CARES Readiness Index (CRI), a composite self-assessment tool enabling organisations to benchmark AI systems across all five dimensions. The central argument is that trustworthiness, ethics, and human-centeredness are mutually dependent conditions: allowing any one to atrophy compromises the others and renders the system unfit for deployment in a rights-respecting society.

Keywords—Responsible AI; Trustworthy AI; Ethical AI; Human-Centered AI; AI Governance; CARES Framework; Explainability; Algorithmic Fairness; Accountability; AI Readiness.

Explainable AI For Transparent And Fair Recruitment Decisions In Human Resource Management

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***Abstract*—** Artificial Intelligence (AI) has significantly transformed recruitment processes by automating candidate screening, short listing, and decision-making. However, traditional AI systems often lack transparency, leading to concerns about bias, fairness, and accountability. Explainable AI (XAI) addresses these challenges by providing clear, interpretable insights into how decisions are made. This paper proposes a framework for integrating Explainable AI into Human Resource Management (HRM) to ensure transparent and fair recruitment decisions. The framework enhances trust, reduces bias, and improves compliance with ethical and legal standards.

Keywords— Explainable AI, Human Resource Management, Recruitment, Transparency, Fairness, Bias Reduction, Machine Learning

Explainable AI for Sustainable Loan Approval Decisions in Indian Private Sector Banks

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Abstract - The increasing adoption of Artificial Intelligence (AI) in retail lending has significantly transformed credit decision-making in Indian private sector banks by enhancing accuracy, automation, and operational scalability. However, the use of advanced machine learning models such as gradient boosting machines, random forests, and deep neural networks has raised serious concerns related to transparency, fairness, accountability, and regulatory compliance. These models often operate as black-box systems, making it difficult for customers, employees, and regulators to understand their decision-making logic. This study explores the role of Explainable Artificial Intelligence (XAI) in improving transparency, interpretability, trust, and sustainability in AI-driven loan approval systems within Indian private sector banks. A mixed-methods research design is adopted, combining secondary financial data from selected banks for the period 2020–2024 and primary survey data collected from 120 respondents using a structured five-point Likert scale questionnaire. Analytical tools such as descriptive statistics, Pearson correlation, and trend analysis are applied to examine relationships among variables. The findings reveal that XAI significantly enhances interpretability and strengthens customer trust in AI-based lending systems. Moreover, a moderate negative relationship is observed between improved AI governance practices and Non-Performing Assets, indicating more effective credit risk management. Overall, the study concludes that integrating explainability into AI systems is essential for achieving sustainable, ethical, and regulator-compliant transformation in the Indian banking sector.

Keywords — Explainable AI, Credit Scoring, Transparency, Non-Performing Assets, Sustainable Banking, Private Sector Banks, India.

AI Governance and Ethical Accountability in Indian Corporates: A New Dimension of Corporate Governance

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Abstract – The growing use of Artificial Intelligence (AI) in corporate decision-making is reshaping the way businesses operate, offering immense opportunities while raising complex ethical and legal challenges. This paper examines how AI governance is emerging as a vital component of corporate governance and social responsibility in India. As corporations increasingly depend on algorithms to make decisions related to recruitment, finance, and customer interaction, concerns about fairness, transparency, and accountability have become central to responsible business conduct. The study evaluates the effectiveness of India's existing legal frameworks, including the Companies Act, 2013, the Information Technology Act, 2000, and SEBI's disclosure norms, in addressing these evolving issues. It also draws insights from international frameworks such as the OECD Principles on AI and the European Union's AI Act to identify approaches that could strengthen Indian regulatory policies. The research argues that despite notable progress in technology regulation, India still lacks a comprehensive framework to ensure ethical AI practices within corporate governance. To fill this gap, the paper proposes a Responsible AI Governance Model that prioritizes human oversight, ethical accountability, and transparency in the use of AI-driven systems.Connecting technology, law, and ethics, the study emphasizes that responsible AI use should be recognized as a core aspect of modern corporate governance rather than a purely technical concern. The conclusion highlights that a well- defined AI governance structure can build stakeholder trust, promote sustainable innovation, and align corporate growth with broader principles of accountability and social responsibility.

Keywords - Artificial Intelligence, Corporate Governance, Ethics, Accountability, SEBI, Responsible AI, Legal Framework, India, Sustainability, Transparency

The Role of Human – Centric AI in Building Trust in Digital Banking Ecosystems

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Abstract: The Digital Banking Ecosystem's need for a human-centric variant rises as the key strategy to restore the lost confidence and implement proper methods, including ethical, explainable, and transparent ones. Thus, based on steps addressing thekey challenges raised by the development of artificial intelligence systems, this paper aims to demonstrate how human centered artificial intelligence can improve the user experience, security, and transparency of the digital banking sector. As theme thod use disstructurally systematic and the contexts under consideration include global and US ones, the role of human-centric AI is revealed. This study highlight sits potential of filling the trust gap as key discoveries and implications highlight a road map for the future platform of digital banking.

Keywords - Digital Banking Ecosystem, Human-Centric Artificial Intelligence, Trust Restoration, User Experience, Security, Transparency, Explainable AI

Artificial Intelligence in Financial Inclusion: Microfinance, Digital Payments, and Credit Risk Analysis

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Abstract - The convergence of artificial intelligence (AI) with financial services has triggered a paradigm shift in serving underbanked populations globally. This paper analyzes AI applications across three critical domains: microfinance lending, digital payment ecosystems, and credit risk assessment. Drawing on empirical evidence from fintech deployments across emerging and developed markets, the study examines how machine learning, NLP, and predictive analytics are redefining financial inclusion. Key findings show that AI-powered microfinance platforms have reduced default rates by 20–35%, while AI-enabled payment networks demonstrate a 40% improvement in transaction success rates. The study also addresses ethical considerations including algorithmic bias, data privacy, and regulatory compliance, concluding with recommendations for policymakers, financial institutions, and technology developers.

Keywords - Artificial Intelligence; Microfinance; Digital Payments; Credit Risk; Financial Inclusion; Machine Learning; Alternative Credit Scoring; Fintech; Explainable AI

Exploring the Impact of AI-Powered Personalization onCustomer Loyalty at a Large Nigerian E-Commerce Organization

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Abstract- The rapid evolution of e-commerce, driven by technological advancements, has fundamentally transformed how consumers interact with online platforms. Central to this transformation is the integration of Artificial Intelligence (AI) in personalising user experiences. This study investigates the challenges faced by a large e-commerce organisation in Nigeria in implementing AI-powered personalisation strategies on its website and examines the impact of these strategies on customer loyalty. An empirical and quantitative research methodology was adopted, underpinned by the Commitment-Trust Theory, with data collected via structured questionnaires distributed to 80 employees, of which 53 responded. The study identifies key challenges to implementing AI-driven personalisation, including data privacy concerns (77% of respondents), algorithmic biases (70%), and technical infrastructure limitations (66%). Regression analysis confirms a statistically significant positive relationship between AI-based personalisation and customer loyalty (P-value =0.000869). Recommendations include enhancing data privacy measures, mitigating algorithmic biases, and investing in robust technical infrastructure. The study concludes that effectively leveraging AI-driven personalisation is crucial for maintaining a competitive edge and achieving long-term success in the dynamic e-commerce landscape.

Keywords – Artificial Intelligence, Customer Loyalty ,E- Commerce, Machine Learning, Personalisation

Explainable Artificial Intelligence (XAI) in Management and Entrepreneurship: Exploring the Applications and Implications

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Abstract – Explainable AI (XAI) is a crucial aspect of AI model development. Success in XAI will skyrocket the use of AI in management and entrepreneurship, especially in crucial decision-making and resource allocations. This study evaluates how XAI enhances trust in decision-making, assesses the key applications of XAI in management and entrepreneurship, and considers the challenges and ethical considerations that arise in the adoption of XAI in management and entrepreneurship. Existing literature was explored and concrete conclusions were drawn from that literature. Findings show that AI solutions have proven to be effective in business operations etc., however, AI solutions present a huge challenge. High-accurate AI solutions are not explainable. This study shows that managers and entrepreneurs are like lier to trust AI solutions if they are interpretable. Besides, the literature reveals that guided XAI improves confidence in decision-making, particularly in strategic planning and resource allocations. XAI is found to reduce cognitive bias, promote transparency and accountability, and also address ethical concerns.

Keywords - Explainable AI, entrepreneurship, management, SHAP, LIME, PosthocAI, blackbox, white box, interpretability, explainability, transparency

Operationalizing Explainable AI in Business Intelligence: A Blueprint for Transparent Enterprise Analytics

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Abstract – Artificial Intelligence (AI) integration with Business Intelligence (BI) systems through revolutionary innovations delivers data-oriented insights and operational efficiency improvements to enterprise decisions. The extensive utilization of AI by businesses creates challenges regarding transparency along with accountability along with trust because many working AI models remain non- interpretable to humans. This research investigates both ethical and regulatory aspects of AI transparency as well as evaluates the interpretation model performance trade-offs and demonstrates how XAI helps achieve fairness improvements in AI-driven BI applications. The research executes comparative investigations with case-based examples to deliver an organized approach for firms to execute XAI deployment at optimized performance levels. Businesses should implement explainable AI systems to their business intelligence frameworks because these techniques improve both decision- making precision and user trust and regulatory adherence while providing competitive market benefits. The paper finishes with current XAI trends evaluations and recommendations regarding enterprise efforts to establish transparent AI BI solutions.

Keywords - Explainable AI (XAI), Business Intelligence (BI), Enterprise AI Solutions, AI Transparency and Accountability, Interpretable Machine Learning

How Artificial Intelligence Is Reshaping Recruitment, Employee Experience, and Talent Management

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Abstract – Human Resource Management marks a paradigm shift in how organizations attract, assess, and develop talent. This paper critically examines the ethical, operational, and strategic implications of AI-driven recruitment systems through an extensive review of empirical and theoretical literature published between 2020 and 2025. Drawing upon Human Capital Theory, Strategic Foresight, and Socio-technical Systems perspectives, it explores how algorithmic decision-making reshapes notions of fairness, inclusion, and efficiency in hiring. The study identifies two central tensions: while AI enhances precision, speed, and predictive validity in talent acquisition, it also perpetuates algorithmic bias and diminishes human discretion. Recent findings reveal that up to 82% of global enterprises now employ some form of AI-assisted hiring (LinkedIn, Deloitte, IBM, 2024), yet regulatory and ethical frameworks remain inconsistent. The review emphasizes the need for human-AI symbiosis, proposing that future HR effectiveness will depend on cultivating algorithmic literacy, ethical reasoning, and data storytelling among professionals. Strategic Foresight Theory is used to envision potential HR futures, ranging from hybrid intelligence ecosystems to ethically adaptive organizations. Ultimately, this study argues that the future of HR lies not in replacing human judgment but in enhancing it through algorithmic collaboration. It concludes by recommending actionable policies to embed human oversight, strengthen ethical training, and promote transparent AI auditing systems to ensure responsible innovation in digital-era workforce management.

Keywords - Artificial Intelligence, Algorithmic Recruitment, Ethical HRM, Human-AI Collaboration, Strategic Foresight, Algorithmic Bias, Workforce Transformation

DEPARTMENT OF SCIENCE AND HUMANITIES

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INTEGRATED SANETS–SBRC FRAMEWORK FOR SUSTAINABLE SPACE DEBRIS MANAGEMENT AND ORBITAL OPERATION

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Abstract: The rapid increase in space activities has led to a significant rise in orbital debris, posing serious threats to satellites, space missions, and long-term sustainability of outer space operations. This paper proposes an integrated framework combining Self-Adaptive Networked Environmental Tracking Systems (SANETS) and Smart Boundary Risk Control (SBRC) for efficient space debris monitoring, prediction, and mitigation. The SANETS component enables real-time distributed sensing and adaptive data exchange, while SBRC introduces intelligent decision-making for collision avoidance and orbital traffic regulation. The proposed framework enhances situational awareness, reduces collision risks, and supports sustainable orbital management. Simulation-based analysis demonstrates improved debris tracking accuracy and reduced collision probability compared to traditional methods.

Keywords: *Space debris, orbital sustainability, SANETS, SBRC, collision avoidance, space traffic management.*

OPTIMIZATION OF HYBRID RENEWABLE ENERGY SYSTEMS FOR RURAL ELECTRIFICATION

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Abstract: Many rural communities still lack reliable access to electricity due to the high cost of grid extension and challenging terrain. Hybrid Renewable Energy Systems (HRES) combining solar, wind and battery storage provide a promising alternative for decentralized rural electrification. This paper presents the optimal sizing and operation of an autonomous solar–wind–battery hybrid system for a typical rural village using a metaheuristic optimization approach. The objective is to minimize the Levelized Cost of Energy (LCOE) while satisfying a predefined reliability constraint expressed through Loss of Load Probability (LOLP). A case study based on a rural community in India is developed using typical solar irradiation, wind speed and load demand data. Results show that the optimized HRES significantly reduces energy cost, diesel fuel consumption and emissions compared with diesel-only and single-source systems, while ensuring acceptable power supply reliability. The proposed methodology can support planners and policymakers in designing cost-effective and sustainable rural microgrids.

Keywords: *Hybrid renewable energy systems, rural electrification, optimization techniques, solar photovoltaic, wind energy, energy storage systems, microgrid, cost optimization, sustainable energy.*

SMART CITY SOLUTIONS AND URBAN ENVIRONMENTAL MANAGEMENT

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Abstract: Rapid urbanization has led to significant environmental and infrastructural challenges in cities worldwide, including air and water pollution, inefficient waste management, excessive energy consumption, traffic congestion, and heightened vulnerability to climate change impacts. Smart city frameworks offer innovative solutions by integrating advanced technologies such as the Internet of Things (IoT), artificial intelligence (AI), big data analytics, cloud computing, and geographic information systems (GIS) to enhance urban management and sustainability. This paper examines the role of smart city solutions in urban environmental management, emphasizing real-time environmental monitoring, intelligent waste collection and recycling, sustainable energy and water systems, smart transportation networks, and climate-resilient urban planning. It further explores how the convergence of digital infrastructure, data-driven decision-making, and citizen engagement contributes to optimized resource utilization, reduced environmental footprint, and improved quality of urban life. The study underscores that holistic adoption of smart technologies not only addresses immediate environmental challenges but also fosters long-term sustainable urban development.

Keywords: *Smart City, Urban Environmental Management, IoT, Artificial Intelligence, Sustainable Development, Environmental Monitoring, Climate Resilience.*

SUSTAINABLE POWER ELECTRONICS AND DRIVES IN MODERN ELECTRICAL ENGINEERING

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Abstract: The increasing global demand for energy, environmental concerns, and the rapid growth of renewable energy systems have intensified the need for sustainable solutions in electrical engineering. Power electronics and electric drive systems play a vital role in improving energy efficiency, enabling renewable energy integration, and supporting the electrification of transportation and industrial processes. This paper presents a detailed review of sustainable power electronics and drives, focusing on high-efficiency converter topologies, wide bandgap semiconductor devices, energy-efficient electric machines, advanced control strategies, thermal management, and reliability considerations. Lifecycle sustainability and future research trends aimed at achieving carbon neutrality are also discussed.

Keywords : *Power electronics, electric drives, sustainability, wide bandgap semiconductors, renewable energy, energy efficiency.*

VEHICLE-TO-GRID (V2G) BASED SUSTAINABLE POWER SYSTEM FOR FUTURE SMART GRIDS

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Abstract: The rapid growth of electric vehicles and renewable energy technologies is transforming conventional power systems into decentralized smart grids. Although renewable energy sources improve sustainability, their intermittent nature introduces challenges related to grid stability and reliability. Vehicle-to-Grid technology enables bidirectional power exchange between electric vehicles and the grid, allowing vehicle batteries to operate as distributed energy storage units. This paper presents a comprehensive study of a V2G-based sustainable power system focusing on architecture, energy management strategies, grid-level impacts, and performance evaluation. The results indicate that V2G integration improves peak load management, renewable energy utilization, and grid resilience, supporting the development of sustainable power systems. Index Terms Vehicle-to-Grid, Electric Vehicles, Smart Grid, Sustainable Power System, Renewable Energy Integration

Keywords: *Power electronics, electric drives, sustainability, wide bandgap semiconductors, renewable energy, energy efficiency.*

MACHINE LEARNING APPROACHES FOR TOPOLOGICAL DATA ANALYSIS: A COMPREHENSIVE SURVEY

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Abstract

Topological Data Analysis (TDA) has emerged as a powerful framework for extracting meaningful insights from complex, high-dimensional datasets by capturing their intrinsic topological structures. When integrated with machine learning techniques, TDA enables the identification of hidden patterns and relationships that are often overlooked by conventional data analysis methods. This paper presents a comprehensive survey of machine learning approaches applied to TDA, highlighting their theoretical foundations, methodological advancements, and practical applications.TDA has demonstrated significant effectiveness across diverse domains, including graph classification, biomedical informatics, time series analysis, and quantum systems. In graph-based learning, topological features enhance classification performance by providing complementary structural information. In physical and quantum systems, TDA supports the identification of phase transitions and the characterization of topological properties. This survey systematically reviews key machine learning algorithms employed in TDA, such as clustering, classification, and deep learning models, along with persistent homology-based feature extraction techniques. Additionally, it discusses the robustness of TDA to noise and its ability to provide interpretable representations. The study aims to offer a consolidated understanding of how TDA, combined with modern machine learning approaches, can address real-world problems and support the development of advanced data-driven solutions.

THE AUTOMATED SHIELD: IMPLEMENTING ARTIFICIAL INTELLIGENCE IN ZERO-TRUST DEFENSIVE ARCHITECTURES

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Abstract

As the sophistication of cyber-adversaries scales through the use of autonomous hacking tools, traditional perimeter-based security has become largely obsolete. This paper investigates the implementation of Artificial Intelligence (AI) and Machine Learning (ML) within a Zero-Trust Architecture (ZTA). Unlike legacy systems that rely on static rules, AI-driven defense mechanisms utilize real-time behavioral analytics to establish dynamic trust scores for every user and device on a network. We explore the mechanics of SelfHealing Networks, the role of Explainable AI (XAI) in reducing ”alert fatigue” for security analysts, and the use of Generative Adversarial Networks (GANs) to simulate and prepare for future attack vectors. The research concludes that the future of enterprise security lies in ”Autonomous Defense”—systems capable of detecting, isolating, and neutralizing threats at millisecond speeds, effectively removing the human bottleneck from the incident response loop.

Keywords Terms—Artificial Intelligence, Zero-Trust Architecture, Machine Learning, Cybersecurity, Autonomous Defense, XAI.

DVBEA: A DECENTRALIZED BIOMETRIC ENCRYPTION ALGORITHM FOR SECURE BLOCKCHAIN-BASED WEB VOTING SYSTEMS

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Abstract: Electronic voting systems have gained significant importance in modern democratic processes; however, they face critical challenges related to security, transparency, and voter privacy. This paper proposes a novel algorithm, Decentralized Voter Biometric Encryption Algorithm (DVBEA), which integrates blockchain technology, biometric authentication, and cryptographic techniques to enhance the security of web-based voting systems. The proposed system ensures voter authenticity using biometric verification, maintains vote anonymity through encryption and Zero-Knowledge Proofs (ZKP), and guarantees data integrity via blockchain's immutable ledger. Experimental analysis shows that DVBEA effectively prevents fraudulent voting, double voting, and tampering, making it a reliable solution for secure online elections.

Keywords:*Blockchain, E-Voting, Biometric Authentication, Cryptography, Zero-Knowledge Proof, Security DVBEA: A Decentralized Biometric Encryption Algorithm for Secure Blockchain-Based Web Voting Systems*

HYBRID ENERGY SYSTEM

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Abstract: A floor-integrated hybrid system combining the Piezoelectric Effect with Solar Energy can be designed as a layered structure where durable, walkable solar panels are installed on the surface while piezoelectric sensors are embedded beneath them to capture mechanical stress from footsteps or moving loads. The solar layer, typically made of tempered glass-covered photovoltaic cells, converts sunlight into electrical energy during the day, while the piezoelectric elements generate small electrical charges whenever pressure is applied, such as from pedestrians. Both energy sources are connected through a power conditioning circuit that regulates voltage and combines outputs before storing the energy in batteries or capacitors for later use, such as powering streetlights, sensors, or small electronic devices. To ensure durability, the system must include shock-absorbing materials and waterproof sealing to protect internal components from environmental damage and repeated mechanical stress. Although the piezoelectric contribution is relatively low compared to solar output, its integration enhances overall energy harvesting, especially in crowded public spaces, making the system useful for smart city applications where maximizing energy generation from limited space is important.

Keywords: *Floor-mounted solar panels, Mechanical stress / Foot pressure, Energy storage, Energy conversion, Water proof design, Smart city applications, Renewable energy integration.*

AI-BASED DECISION-MAKING SYSTEMS REAL-WORLD APPLICATIONS

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Abstract: AI-based decision-making systems are revolutionizing real-world applications across industries by leveraging data-driven insights and predictive analytics to enhance efficiency, accuracy, and outcomes. These systems employ machine learning algorithms to analyze vast amounts of data, enabling automated decisions that can adapt to changing environments and user needs. In sectors such as healthcare, finance, and supply chain management, AI-driven decisions reduce human error, optimize resource allocation, and streamline complex processes. By continuously learning from new data, AI systems improve over time, offering scalable and customizable solutions. This paper explores the implementation, benefits, and challenges of AI-based decision-making systems in practical applications, emphasizing their transformative impact and future potential in diverse industries.

Keywords: *AI-based decision-making systems use data and machine learning to optimize processes, reduce errors, and provide scalable, adaptable solutions across industries.*

AI- BASED CROP BREEDING

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Abstract: The integration of Artificial Intelligence (AI) in agriculture has significantly transformed traditional crop breeding methods, enabling faster and more efficient development of improved crop varieties. Conventional breeding techniques are often time-consuming and labor-intensive, requiring extensive field trials and manual data analysis. In contrast, AI-based crop breeding utilizes machine learning algorithms, big data analytics, and genomic information to identify desirable traits such as high yield, disease resistance, and climate adaptability with greater accuracy. Advanced technologies like CRISPR further enhance the precision of genetic modifications guided by AI insights. Recent successful applications include the development of drought-resistant maize and improved wheat varieties through predictive modeling and trait analysis. These advancements not only reduce the breeding cycle but also contribute to sustainable agriculture and global food security. This paper highlights the methodologies, applications, and impacts of AI-driven crop breeding, emphasizing its potential to revolutionize modern agriculture in the face of climate change and increasing food demand.

Keywords:*Artificial Intelligence (AI); Crop Breeding; Machine Learning; Genomic Selection; Precision Agriculture.*

AI-BASED SMART FARMING ASSISTANT USING DRONE MONITORING AND IOT IRRIGATION CONTROL

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Abstract: This study highlights how an AI-based smart farming system can significantly impact modern agriculture by enabling real-time crop monitoring, automated irrigation, and intelligent decision support for farmers. The proposed prototype integrates Artificial Intelligence (AI), drone surveillance, Internet of Things (IoT) sensors, and a bilingual voice assistant to improve farm productivity and resource management. An AI-controlled drone captures aerial images of crop fields and analyzes them using computer vision models to detect pests, diseases, and crop stress conditions at early stages. IoT-based soil moisture and environmental sensors continuously collect field data, allowing the AI system to automatically control irrigation systems and optimize water usage.. In addition, the voice-enabled interface allows farmers to receive updates on crop health, weather alerts, and government agricultural schemes in an accessible manner. The prototype demonstrates the potential of integrating AI, drones, and IoT technologies to advance precision agriculture and support sustainable farming practices.

Keywords:*Artificial Intelligence; Smart Agriculture; Drone Monitoring; IoT Irrigation Control; Pest and Disease Detection; Precision Farming.*

AI BASED CROP DISEASE DETECTION USING MOBILE CAMERA

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Abstract: Crop diseases significantly impact agricultural productivity by reducing yield and deteriorating crop quality. Early detection is essential to mitigate losses; however, conventional methods rely on manual inspection and expert consultation, which are time-consuming and often inaccessible in rural areas. This paper presents a mobile camera-based approach for crop disease detection, enabling farmers to identify diseases quickly and efficiently. The proposed system utilizes smart phone-captured images of plant leaves and analyzes visible symptoms such as color variations, spots, and structural damage to detect diseases. This method eliminates the need for specialized equipment and provides an accessible solution for real-time diagnosis in the field. By facilitating early identification, the system helps farmers take timely preventive measures, thereby reducing crop loss and limiting the excessive use of pesticides. Furthermore, the approach supports environmentally sustainable farming practices and can be adapted to multiple crop types. Experimental observations demonstrate that the proposed method is effective, user-friendly, and suitable for practical agricultural applications.

Keywords: *Crop Disease Detection; Smart Agriculture; Mobile Camera; Early Detection; Sustainable Farming.*

ARTIFICIAL INTELLIGENCE-BASED CROP DISEASE DETECTION

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Abstract: Agriculture is a key sector in India, but crop diseases cause major losses every year. Traditional disease detection methods are slow and require expert knowledge. This project proposes an AI-based system that detects crop diseases using image processing and Machine Learning techniques. By analyzing leaf images, the system can identify diseases quickly and accurately. This helps farmers take early action and improve crop productivity.

Keywords: *Leaf Image Analysis, Smart Farming, Precision Agriculture, Early Disease Detection, Crop Health Monitoring, Agricultural Technology, Automated Detection System, Digital Farming.*

FEDERATED LEARNING: A PRIVACY - PRESERVING APPROACH TO ARTIFICIAL INTELLIGENCE

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Abstract: Federated Learning is a modern approach in Artificial Intelligence that helps protect user privacy while training machine learning models. Instead of sending personal data to a central server, the data remains on individual devices, and only the learned updates are shared. This reduces the risk of data leakage and improves security. Federated Learning is widely used in applications like healthcare, finance, and mobile devices. Although it has some challenges, such as communication and data differences, it is an important step toward building secure and trustworthy AI Systems.

Keywords: *Federated Learning, Artificial Intelligence (AI), Decentralised Training, Distributed Systems, Local Data Processing, Model Updates, Secure AI, Data Security.*

ROUTE SUGGESTION USING ARTIFICIAL INTELLIGENCE

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Abstract: An AI-based navigation system that helps users find the best route between two locations. The system uses Artificial Intelligence, Machine Learning, GPS data, and real-time traffic information to analyse multiple possible routes and suggest the fastest and most efficient path. It considers factors such as traffic congestion, road conditions, distance, travel time, accidents, and road closures. The system continuously learns from user behaviour and traffic patterns to improve the accuracy of its predictions. This AI-based route suggestion system helps users save time, reduce fuel consumption, and reach their destination safely and efficiently. It is widely used in transportation, delivery services, and daily travel planning, making navigation easier and smarter.

Keywords: *Smart navigation, AI route optimization, Predictive analytics, Data-driven navigation, Road closure alerts, Travel time prediction, Distance optimization, Multi-route analysis.*

SMART TOURIST SAFETY MONITORING AND INCIDENT RESPONSE SYSTEM

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Abstract: This project proposes a smart safety monitoring and incident response system for tourists using Artificial Intelligence (AI) and the Internet of Things (IoT). It tracks the tourist's location, detects emergency situations such as falls, panic, or entering restricted zones, and instantly notifies emergency contacts or authorities. The goal is to ensure tourist safety through real-time monitoring, alerts, and automated response using IoT-based data communication.

Keywords: *Machine Learning, Edge Computing, Automated Alerts, Predictive Analytics, Cloud Integration, Mobile App Integration, AI-based Decision Making, Smart City Integration.*

AI-POWERED IoT VIRTUAL ASSISTANT

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Abstract: The rapid growth of Internet of Things (IoT) devices has increased the demand for intelligent and automated user interaction systems. Traditional control methods often require manual operation and lack adaptability. This paper presents an AI-powered IoT virtual assistant designed to provide smart, voice-based, and automated control of connected devices. The proposed system integrates artificial intelligence techniques such as natural language processing and machine learning to understand user commands and respond intelligently. The assistant collects data from IoT sensors, processes user requests, and performs actions such as controlling appliances, monitoring environmental conditions, and providing real-time updates. The system also learns user preferences over time to improve accuracy and personalization. This approach enhances convenience, reduces human effort, and improves efficiency in smart home and smart environment applications. The proposed AI-powered IoT virtual assistant offers a scalable and user-friendly solution for intelligent automation.

Keywords: *IoT device management, User interaction systems, Real-time monitoring, Personalized automation, Data-driven decision making, Human-computer interaction (HCI), Efficiency enhancement.*

AI-BASED INTRUSION DETECTION SYSTEM FOR IOT NETWORKS

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Abstract: The rapid proliferation of Internet of Things (IoT) devices has significantly enhanced connectivity and operational efficiency across multiple domains. However, this expansion has introduced substantial security vulnerabilities, as traditional security mechanisms are often inadequate for detecting sophisticated and evolving cyber threats in IoT environments. This study proposes an AI-based Intrusion Detection System (IDS) specifically designed for IoT networks. The system leverages machine learning algorithms to continuously monitor network traffic, identify anomalous behavior, and classify potential threats in real time. Data collected from IoT devices is preprocessed and analyzed using advanced techniques such as anomaly detection and pattern recognition. The model is trained to learn normal network behavior and detect deviations indicative of attacks, including denial-of-service (DoS), unauthorized access, and malware activities. The proposed approach enhances detection accuracy, reduces false positives, and improves overall network security. Furthermore, the system provides a scalable and efficient solution suitable for deployment in smart homes, healthcare systems, industrial automation, and smart city infrastructures, ensuring greater reliability and protection in modern IoT ecosystems.

Keywords: *Anomaly detection, Pattern recognition, Cyber security, Threat detection, Real-time monitoring, Smart homes, Healthcare IoT*

AI-BASED ACCIDENT DETECTION USING SMART HELMET

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Abstract: Road accidents are one of the leading causes of death worldwide, mainly due to delayed medical assistance. This paper proposes an Al-based smart helmet system designed to detect accidents in real-time and send immediate alerts to emergency contacts. The system integrates sensors such as accelerometers and GPS modules with a machine learning model to accurately identify accident conditions and reduce false alarms. Upon detection, the system automatically sends the location details to predefined contacts, ensuring faster emergency response. This solution aims to improve road safety and minimize fatalities.

Keywords: *Smart Helmet, Accident Detection, Artificial Intelligence, loT, Road Safety*.

AI-CHATBOT IN HUMAN INTERACTION

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Abstract: Artificial Intelligence (AI) chatbots have emerged as a transformative technology in human-computer interaction, enabling automated, intelligent communication between users and digital systems. These chatbots utilize Natural Language Processing (NLP), Machine Learning (ML), and Deep Learning techniques to understand, interpret, and respond to user queries in a conversational manner. Modern AI chatbots are capable of handling complex tasks such as customer support, virtual Additionally, integration with cloud computing and APIs allows chatbots to access real time data and provide dynamic solutions. Despite their advantages, AI chatbots face challenges such as ambiguity in language understanding, data privacy concerns, and the need for continuous training to maintain accuracy. However, ongoing advancements in AI technologies are addressing these limitations, making chatbots more reliable and efficient. This paper highlights the working principles, architecture, applications, and challenges of AI chatbots, emphasizing their growing importance in various industries. The future scope of AI chatbots includes enhanced emotional intelligence, multilingual capabilities, and seamless human-like interactions, making them an integral part of digital transformation.

Keywords: *Artificial Intelligence, Chatbot, Natural Language Processing, Machine Learning, Deep Learning, Human-Computer Interaction.*

IOT IN EVERYDAY LIFE OF STUDENTS AND ENGINEERING'S

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Abstract: Nowadays, you can see the utilization of IoT in various systems like machinery, infrastructure, and mechanical equipment. Engineers can now easily identify patterns, detect faults, optimize operations, and provide better maintenance strategies. These functions are possible when the IoT devices are connected to the sensors, which help collect the data in real-time. Businesses need to create solutions that enhance productivity, eliminate unplanned costs or expenses, or reduce manufacturing costs. So, these details can be collected from the sensors, which can help businesses make informed decisions. This IoT allows process automation and resource management through connected devices. Hopefully, you can learn about the IoT in your B.Sc. computer science colleges in Coimbatore or engineering courses. Learn well and develop networking skills. Integrating the sensors and connectivity in the infrastructure components, including the traffic lights, waste management systems, and energy grids, and this helps civil engineers greatly in optimizing resource allocation and enhancing overall efficiency. It is common for graduates who work on smart city projects to be aware of how to make proper use of current and emerging technologies. The IoT provides various options, like monitoring climatic changes, enhancing the quality of air and water, and providing sustainable urban development.

Keywords: *IOT, Smart Devices, Sensors, Automation, Data Analytic, Cloud computing, Machine Learning.*

FOOD SPOILAGE DETECTION USING IOT

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Abstract; Food spoilage is a significant concern in the food industry, leading to financial loss and health risks. Food spoilage is a complex process that significantly impacts food safety, quality, and shelf life. Food spoilage is a major contributor to food waste and food borne illnesses, especially in supply chains and households.. By examining the influence of packaging, preservatives, and novel food preservation techniques such as high pressure processing and active packaging, we seek to identify effective strategies to reduce spoilage and extend food shelf life. The findings of this study provide insights into improving food safety practices, Experimental testing demonstrates that the system can reliably detect early signs of spoilage, helping users discard deteriorated food promptly, reduce waste, and enhance food safety in smart kitchens, storage units, and retail environments.

Keywords: *Food spoilage, microbial growth, enzymatic reaction, nutritional loss*.

ARTIFICIAL INTELLIGENCE INTEGRATION IN SMART GRIDS: TOWARDS INTELLIGENT, BIDIRECTIONAL ENERGY NETWORKS

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Abstract; The rapid evolution of power systems toward Smart Grid architectures necessitates advanced computational intelligence to address the growing complexity introduced by distributed renewable energy sources and electric vehicles (EVs). This paper presents a comprehensive technical overview of Artificial Intelligence (AI) integration within smart grid infrastructure, encompassing load and generation forecasting, real-time grid stability control, fault detection, and predictive asset management. Reinforcement Learning (RL) agents facilitate real-time voltage regulation and frequency control to maintain grid standards of 50Hz/60Hz amid intermittent energy inputs. Support Vector Machines (SVMs) enable autonomous fault classification and self-healing grid capabilities, while AI-powered Digital Twin frameworks optimize maintenance scheduling for critical infrastructure assets such as transformers and turbines. The paper concludes by identifying Edge AI as a promising research frontier to minimize communication latency through distributed, device-level intelligence.

Keywords: *Smart Grid, Artificial Intelligence, Deep Learning, Reinforcement Learning, Optimal Power Flow, Explainable AI, Digital Twin, Edge AI.*

EMBEDDED SYSTEMS FOR REAL-TIME APPLICATIONS

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Abstract

Embedded systems are crucial components of real-time applications, where their ability to meet strict timing requirements ensures the correctness and reliability of the overall system. These systems are pervasive in safety-critical domains, including automotive, aerospace, medical devices, and industrial automation. The primary challenge in designing embedded systems for real-time applications is ensuring that they can consistently meet deadlines while operating under resource constraints such as limited processing power, memory, and energy consumption. The study explores the role of Real-Time Operating Systems (RTOS) in managing system resources, handling interrupts, and scheduling tasks. Emphasis is placed on the importance of predictability and determinism in the behavior of embedded systems, which are essential to guarantee that critical tasks are executed within specified time bounds.

Keywords: *Embedded Systems, Real-Time Applications, Scheduling Algorithms, Fault Tolerance, Multi-Core Processing,*

SMART ANTENNAS IN ARTIFICIAL INTELLIGENCE: ADAPTIVE BEAMFORMING, SIGNAL OPTIMIZATION, AND NEXT-GENERATION COMMUNICATION

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Abstract— Smart antennas represent a transformative advancement in modern wireless communication systems, enabling dynamic adaptation of radiation patterns through intelligent signal processing techniques. Unlike conventional fixed-beam antennas, smart antenna systems leverage beamforming, spatial filtering, and direction-of-arrival estimation to focus transmitted and received signals toward intended users while simultaneously suppressing co-channel interference. The integration of Artificial Intelligence (AI) into smart antenna systems marks a significant paradigm shift, enabling these systems to learn from environmental signal patterns, predict user mobility, and autonomously optimize beam direction in real time. This paper presents a comprehensive review of AI-driven smart antenna technologies, encompassing switched beam antennas and adaptive array antennas, enhanced through machine learning, deep neural networks, and reinforcement learning algorithms. The proposed AI-augmented framework demonstrates substantial improvements in signal strength, spectral efficiency, network capacity, and energy consumption. Applications span across 5G and emerging 6G communication networks, satellite systems, autonomous vehicle communications, wireless LAN optimization, and advanced radar systems. Despite challenges including high computational complexity, implementation cost, and data training requirements, AI-integrated smart antennas are poised to serve as a foundational technology for smart cities, Internet of Things (IoT) ecosystems, and ultra-reliable real-time communication infrastructures of the future.

Keywords— *smart antennas, beamforming, adaptive array, artificial intelligence, machine learning, deep learning, reinforcement learning, 5G, 6G, signal processing, wireless communication, IoT.*

REAL-TIME IOT-BASED INTELLIGENT SYSTEMS WITH AI INTEGRATION

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Abstract— The rapid proliferation of Internet of Things (IoT) devices and edge computing platforms has fundamentally transformed intelligent systems. This paper examines real-time IoT-based intelligence frameworks with integration of Artificial Intelligence (AI) for low-latency decision-making in resource-constrained environments. Machine learning and deep learning models are deployed at the edge using lightweight neural networks for faster responses. Communication protocols such as MQTT support efficient real-time data transmission. Applications in smart manufacturing, healthcare, and transportation are analyzed. The study shows that edge–fog–cloud architecture combined with AI can achieve response times below 100 ms with high accuracy.

Keywords— *Internet of Things (IoT), Artificial Intelligence (AI), Edge Computing, Real-Time Systems, Machine Learning, Deep Learning, MQTT, Fog Computing, TinyML, Embedded Intelligence, Smart Systems*

AI FOR THOUGHT-TO-TEXT USING BRAIN-COMPUTER INTERFACE

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Abstract

The idea of converting human thoughts directly into text is no longer science fiction but an emerging reality powered by Artificial Intelligence and Brain-Computer Interface technology. This concept explores how brain signals, captured through non-invasive or implantable devices, can be processed and interpreted using advanced machine learning models to generate meaningful text without any physical input. However, alongside its benefits, the approach raises significant challenges related to accuracy, complexity of brain signals, and ethical concerns such as mental privacy and data security. enabling more accurate and faster decoding of internal thoughts. Integration with wearable technologies and minimally invasive devices is making these systems more accessible and practical for everyday use. Beyond healthcare, such innovations could reshape industries like communication, gaming, and human-computer interaction by enabling direct control through cognitive signals. However, the rapid progress also demands careful consideration of ethical frameworks, including consent, data ownership, and the potential misuse of sensitive neural information. As this field evolves, it represents not just a technological breakthrough but a profound shift in how humans may express, share, and even protect their thoughts in a digitally connected world.

Keywords: *Artificial Intelligence, Brain-Computer Interface, Thought-to-Text, Neural Signals, Machine Learning*

EXPLAINABLE AI FOR DETECTING FAKE NEWS ON SOCIAL MEDIA

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Abstract

The widespread dissemination of misinformation on social media platforms such as Facebook, Twitter, and Instagram poses significant challenges in distinguishing fake news from reliable sources. Traditional fake news detection models, while useful, are often regarded as "black boxes," offering predictions without explaining the rationale behind them. This lack of transparency undermines trust in AI-driven systems and hampers their practical adoption. leveraging machine learning algorithms to classify news articles as real or fake based on extracted textual features. The system integrates state-of-the-art explainability techniques, including Local Interpretable Model-Agnostic Explanations (LIME) and SHapley Additive exPlanations (SHAP), to provide transparent and interpretable explanations for each prediction.

Keywords: *Explainable AI, fake news detection, social media, machine learning, LIME, SHAP, interpretability*

IOT BASED SMART AGRICULTURE

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Abstract

The rapid advancement of technology has opened new possibilities in the field of agriculture through the integration of the Internet of Things (loT). This project presents an loT-based Smart Agriculture System designed to optimize water usage and improve crop productivity. The system utilizes soil moisture sensors to continuously monitor the moisture level of the soil and automatically control irrigation based on real-time data. Additionally, It also minimizes resource wastage and enhances efficiency, making it highly suitable for modern precision agriculture. By providing real-time monitoring and smart control, this system helps farmers increase yield, reduce labor effort, and adapt to changing climatic conditions. Overall, the project demonstrates a practical, cost-effective, and scalable solution for sustainable agriculture, addressing the growing demand for smart farming technologies

Key Words: *Real-time Soil Monitoring, Automatic Irrigation System, Weather Monitoring Integration, Remote Monitoring via IoT.*

IOT IN AUTONOMOUS VEHICLES

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Abstract

The integration of the Internet of Things (IoT) in autonomous vehicles has significantly transformed modern transportation systems by enabling intelligent, connected, and efficient mobility solutions. IoT facilitates real-time data exchange between vehicles, infrastructure, and cloud platforms through sensors, actuators, and communication networks. In autonomous vehicles, IoT devices collect and process data such as traffic conditions, road hazards, weather updates, and vehicle performance, enhancing decision-making and ensuring safer navigation. This interconnected ecosystem supports. Advanced technologies such as artificial intelligence and machine learning, when combined with IoT, further enhance autonomous driving capabilities by enabling real-time analytics and adaptive responses. However, challenges such as data security, privacy concerns, and network reliability must be addressed to ensure widespread adoption. Overall, IoT plays a crucial role in advancing autonomous vehicle technology, paving the way for smart transportation systems and future smart cities.

Keywords: *internet of things (IOT), autonomous vehicles, V2V communication, smart transportation, real time data processing, network security.*

AI IN CIRCUIT DESIGNING

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Abstract

Artificial Intelligence (AI) is increasingly transforming the field of circuit designing by enabling automation, optimization, and intelligent decision-making throughout the design lifecycle. Traditional circuit design methods rely heavily on manual effort, heuristic approaches, and iterative simulations, which are time-consuming and prone to human error. AI techniques, including machine learning (ML), deep learning, and evolutionary algorithms, enhance the efficiency and accuracy of circuit synthesis, analysis, and verification. AI-driven tools can predict circuit performance, optimize component selection, and automatically generate layouts while satisfying design The integration of AI with Electronic Design Automation (EDA) tools has significantly accelerated innovation in VLSI and embedded systems. Despite its advantages, challenges such as data dependency, computational complexity, and model interpretability remain. This paper highlights the role of AI in modern circuit designing, its methodologies, applications, and potential future advancements. The adoption of AI is expected to revolutionize circuit design by making it more adaptive, efficient, and scalable.

***Keywords**: Artificial Intelligence, Circuit Design, Machine Learning, Electronic Design Automation (EDA), Optimization, VLSI Systems.*

EMOTION RECOGNITION USING EEG SIGNALS BASED ON ARTIFICIAL INTELLIGENCE

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Abstract

Emotion recognition plays a vital role in enhancing human–computer interaction and mental health analysis. This paper presents an Artificial Intelligence (AI)-based approach for detecting human emotions using Electroencephalogram (EEG) signals. EEG provides a non-invasive method to capture brain activity associated with emotional states; however, raw EEG signals are often noisy and complex, making analysis challenging.To address this issue, the proposed system employs a structured signal processing pipeline consisting of signal acquisition, preprocessing, artifact removal, and feature extraction. Temporal and spectral features are extracted from the processed EEG signals to effectively represent emotional patterns. These features are then utilized by machine learning and deep learning models to classify emotions such as happiness, sadness, stress, and relaxation.The proposed approach improves classification accuracy and enables real-time emotion detection compared to conventional methods. brain–computer interfaces, smart healthcare, and advanced human–computer interaction systems. Future work focuses on integration with wearable devices and improving accuracy using advanced deep learning techniques.

***Keywords:** Emotion Recognition, EEG Signals, Artificial Intelligence, Machine Learning, Deep Learning,*

BLOCKCHAIN TECHNOLOGY AND GREEN AI SYSTEM IN FOODINDUSTRY

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Abstract

Blockchain Technology and Green AI systems are emerging as transformative tools in the field of food technology. Blockchain is a decentralized and secure digital ledger that enhances transparency, Traceablility, and trust across the food supply chain. It enables efficient tracking of food products from farm to table, reduces food fraud, and ensures quick identification of contamination sources thereby improving food safety and quality. On the other hand, Green AI focuses on developing energy -efficient and environmentally sustainable artificial intelligence systems. In food technology, Green AI is applied in areas such as precision agriculture, crop monitoring, food quality analysis, and supply chain optimization. It helps reduce resource consumption, minimize waste, and enhance productivity while lowering the environmental impact. sustainability, and safety. Despite certain challenges such as high initial cost and technical complexity, these technologies hold significant potential to revolutionize the future of the food industry.

Keywords: Food safety, supply chain management, traceability, sustainable agriculture, precision farming, food quality, data security, environmental sustainablility and smart food system.

AI BASED CROP DISEASE DETECTION USING MOBILE CAMERA

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Abstract

Crop diseases significantly impact agricultural productivity by reducing yield and deteriorating crop quality. Early detection is essential to mitigate losses; however, conventional methods rely on manual inspection and expert consultation, which are time-consuming and often inaccessible in rural areas. This paper presents a mobile camera-based approach for crop disease detection, enabling farmers to identify diseases quickly and efficiently. The proposed system utilizes smartphone-captured images of plant leaves and analyzes visible symptoms such as color variations, spots, and structural damage to detect diseases. Experimental observations demonstrate that the proposed method is effective, user-friendly, and suitable for practical agricultural applications. Overall, this work contributes to improving crop management and enhancing agricultural productivity through a simple and cost-effective technological solution.

Keywords: Crop Disease Detection; Smart Agriculture; Mobile Camera; Early Detection; Sustainable Farming.

IOT-BASED FOOD ADULTERATION DETECTION

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Abstract

Food adulteration has become a critical global concern, posing serious threats to public health and safety. The intentional addition of harmful or low-quality substances to food products such as milk, edible oils, and spices reduces nutritional value and may cause severe health issues. This paper proposes an Internet of Things (IoT)-based food adulteration detection system for real-time monitoring and analysis of food quality. The system integrates sensors to detect parameters such as pH, temperature, turbidity, and conductivity. These sensors are connected to a microcontroller (Arduino/ NodeMCU) that processes data and transmits it to a cloud platform, enabling remote access via mobile or web inter faces. If values exceed safety limits, alerts are generated to warn users about possible adulteration. This supports consumers and authorities in taking immediate action, ensuring transparency and reducing health risks. The model is cost-effective, user-friendly, and suitable for both domestic and industrial use, improving food quality assurance and consumer awareness.

Keywords; IoT, Food Adulteration Detection, Sensors, Microcontroller, Real-Time Monitoring, Food Safety.

SMART CONTACT LENS FOR CONTINUOUS GLUCOSE MONITORING

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Abstract :

Continuous monitoring of glucose levels is critical for effective management of diabetes, a chronic metabolic disorder affecting millions worldwide. Traditional glucose monitoring techniques, such as finger-prick blood tests, are invasive, painful, and inconvenient for frequent use. This paper explores the development of a smart contact lens as a non-invasive and innovative solution for continuous glucose monitoring. The proposed system integrates miniaturized biosensors within a soft contact lens capable of detecting glucose levels in tear fluid. These biosensors utilize electrochemical or optical sensing mechanisms to measure glucose concentration accurately. The collected data is transmitted wirelessly to external devices such as smartphones or wearable receivers, enabling real-time monitoring and analysis. Smart contact lenses have the potential to enhance patient compliance, reduce discomfort, and provide continuous, real-time health data, ultimately improving the quality of life for individuals with diabetes.

Keywords: Diabetes , Biosensor , Wearable recovers , Microfabrication , Nanotechnology

EXPLAINABLE AI FOR SMART HEALTHCARE USING EDGE COMPUTING

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Abstract;

Explainable Artificial Intelligence (XAI) plays a vital role in improving transparency and trust in smart healthcare systems. This paper presents an approach that integrates XAI with edge computing to enable real-time and privacy-preserving medical data analysis. Data from wearable sensors and IoT devices is processed at the edge, reducing latency and dependence on cloud infrastructure. Machine learning models are used to predict health conditions, The proposed system enhances accuracy, interpretability, and efficiency in healthcare applications. It is particularly useful for remote monitoring, early diagnosis, and emergency response. Overall, this approach supports reliable and user-centric smart healthcare solutions.

Keywords- Explainable AI- Smart Health Care- Edge computing- Decision Transparency- Healthcare Analysis

DIGITAL GENERATIONS IN TRANSITION: A PSYCHOLOGICAL STUDY OF GEN Z AND GEN ALPHA—CHALLENGES, STRENGTHS, AND THE PATH TO BALANCE"

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Dhanalakshmi Srinivasan College of Engineering, Coimbatore, Tamil Nadu, India

Abstract:

This paper studies the psychology of Generation Z and Generation Alpha in a highly digital world, compared to Millennials. It highlights key challenges such as short attention span, social media dependency, and increased stress. At the same time, it recognizes positive traits like creativity, technological skills, and open-minded thinking. The study suggests practical solutions such as maintaining digital balance, improving communication, and adopting healthy habits. It concludes that these generations are evolving and require proper guidance to achieve a balanced and successful future.

Keyword- Generational Psychology- Human –Technology Interaction – Online Behaviour Patterns Screen Time Effects- Social Connectivity

IOT-BASED REAL-TIME ENVIRONMENTAL MONITORING: A PRACTICAL APPROACH WITH ARDUINO AND CLOUD INTEGRATION

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Abstract

The Internet of Things (IoT) basically changed how we collect environmental data lately. Instead of just writing things down in a log, we now have automated, live streams of data. In this project, we've put together an affordable, real-time monitoring rig that tracks temperature, humidity, and air quality. We used a standard Arduino Uno, a DHT11, and an MQ-135 sensor for the heavy lifting. We also chose the ESP8266 Wi-Fi module to act as a bridge, pushing all that data straight to the Thing Speak cloud so we could see it on our phones. Our main goal here was to keep things low-cost and accessible so that anyone—from a home hobbyist to someone running a small greenhouse could use it without spending a fortune. Keeping an eye on our surroundings isn't just for labs anymore; it's actually really important for public health and making sure crops grow well. Usually, the problem is that traditional equipment is way too expensive and just sits in one spot without any internet connection.

Keywords: Environmental monitoring, IoT, Environmental data.

AI FOR THOUGHT-TO-TEXT USING BRAIN-COMPUTER INTERFACE

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Abstract

The idea of converting human thoughts directly into text is no longer science fiction but an emerging reality powered by Artificial Intelligence and Brain-Computer Interface technology. This concept explores how brain signals, captured through non-invasive or implantable devices, can be processed and interpreted using advanced machine learning models to generate meaningful text without any physical input. By decoding neural activity associated with language and intention, AI systems are beginning to bridge the gap, the approach raises significant challenges related to accuracy, complexity of brain signals, and ethical concerns such as mental privacy and data security and human-computer interaction by enabling direct control through cognitive signals. However, the rapid progress also demands careful consideration of ethical frameworks, including consent, data ownership, and the potential misuse of sensitive neural information. As this field evolves, it represents not just a technological breakthrough but a profound shift in how humans may express, share, and even protect their thoughts in a digitally connected world.

Keywords; Artificial Intelligence, Brain-Computer Interface, Thought-to-Text, Neural Signals, Machine Learning

AI-ASSISTED MATHEMATICAL DISCOVERY AND COMPUTATIONAL PROBLEM SOLVING

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Abstract Artificial Intelligence (AI) is revolutionizing the way mathematical research is conducted by enabling automated reasoning, symbolic computation and data-driven exploration of complex problems. This paper presents a novel framework for applying AI in pure mathematics, emphasizing its role in theorem discovery, conjecture generation and large-scale computational experimentation. Machine learning algorithms, combined with symbolic AI methods, are utilized to identify patterns in algebraic structures, number theory, combinatory and differential equations. The integration of optimization techniques and probabilistic reasoning improves the efficiency, accuracy and interpretability of mathematical solutions. Furthermore, AI tools facilitate real-time verification of proofs and assist in exploring previously intractable mathematical problems. This approach demonstrates that AI, grounded in rigorous mathematical principles, can significantly accelerate research, enhance understanding and open new directions for computational mathematics.

Keywords: Artificial Intelligence, Mathematical Modelling,

FOOD SPOILAGE DETECTION USING IOT

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Abstract Food spoilage is a significant concern in the food industry, leading to financial loss and health risks. Food spoilage is a complex process that significantly impacts food safety, quality, and shelf life. Food spoilage is a major contributor to food waste and food borne illnesses, especially in supply chains and households. It is driven by various factors, including microbial growth, enzymatic reactions, physical damage and environmental conditions such as temperature, humidity and light exposure. This research aims to investigate the primary causes of food spoilage, focusing on the role of microorganisms such as bacteria, yeasts, and molds, and their interactions with food matrices. The study also explores the mechanisms of enzymatic degradation and its contribution to flavor, texture and nutritional loss. By examining the influence of packaging, preservatives, and novel food preservation techniques such as high pressure processing and active packaging, we seek to identify effective strategies to reduce spoilage and extend food shelf life. The findings of this study provide insights into improving food safety practices, developing innovative preservation methods and minimizing food waste in the global food supply chain.

Keywords: Food spoilage, microbial growth, enzymatic reaction, nutritional loss.

AUTONOMOUS SYSTEMS AND ROBOTICS

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Abstract:

Autonomous systems and robotics represent a transformative area of technology that enables machines to perform tasks with minimal or no human intervention. These systems integrate multiple disciplines such as artificial intelligence, machine learning, computer vision, sensors, and control systems to perceive their environment, make decisions, and act accordingly. The rapid advancement of computing power and data availability has accelerated the development of intelligent robots capable of operating in complex and dynamic environments.Overall, this project aims to provide a comprehensive understanding of autonomous systems and robotics, their importance in modern technology, and their potential to shape the future across various industries.

SECURITY, PRIVACY AND SECURE AI SYSTEM

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Dhanalakshmi Srinivasan College of Engineering -Coimbatore

Abstract:

Artificial Intelligence (AI) systems are increasingly integrated into critical domains such as healthcare, finance, and communication, making security and privacy essential components of their design and deployment. This topic explores the challenges and solutions related to protecting AI systems and the sensitive data they process. Security in AI focuses on safeguarding models and infrastructure from threats such as adversarial attacks, data poisoning, and unauthorized access, ensuring system integrity, confidentiality, and availability. Privacy, on the other hand, emphasizes the protection of personal and sensitive information, employing techniques like data anonymization, differential privacy, and federated learning to minimize data exposure.

ROLE OF AI IN VECTOR CALCULUS

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Abstract :

Vector Calculus plays an important role in the development and functioning of Artificial Intelligence systems. It deals with mathematical concepts such as gradients, divergence, partial derivatives, and vector fields, which are essential in machine learning and deep learning algorithms. In AI, vector calculus is mainly used to optimize models and improve their accuracy during training. One of the most important applications of vector calculus in AI is gradient descent. Gradient descent is an optimization method used to minimize the error in machine learning models. It works by calculating the gradient of a loss function and adjusting the model parameters in the direction that reduces error. This process helps neural networks learn patterns from data more efficiently. Vector calculus is also useful in representing high-dimensional data through vectors and matrices.

Keywords - Partial derivatives, Algorithm, Optimization, System analyze, Back propagation

THE ROLE OF LINEAR ALGEBRA AND OPTIMIZATION IN ARTIFICIAL INTELLIGENCE

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Abstract:

Artificial Intelligence (AI) has become a powerful technology for solving complex computational problems. The performance of AI systems is strongly influenced by mathematical concepts such as linear algebra and optimization techniques. Linear algebra provides mathematical structures such as vectors and matrices that enable efficient representation and processing of large datasets used in machine learning algorithms. Optimization techniques, including gradient descent, help train AI models by minimizing prediction errors and improving prediction accuracy. By integrating mathematical principles with artificial intelligence, machines are able to learn patterns from data and perform intelligent decision-making tasks. Understanding these mathematical foundations is essential for developing efficient AI algorithms and advancing intelligent technologies in modern computational systems.

Keywords— Artificial Intelligence, Linear Algebra, Optimization, Machine Learning.

AI-BASED SYSTEM FOR IMPROVING MECHANICAL PROPERTIES OF TMT STEEL RODS

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Abstract; The mechanical performance of Thermo-Mechanically Treated (TMT) steel rods is critical for ensuring the strength, safety, and durability of construction structures. Conventional methods for improving these properties primarily depend on manual adjustments of chemical composition and process parameters, often involving time-consuming trial-and-error approaches. This paper proposes an Artificial Intelligence (AI)-based system to optimize the mechanical properties of TMT steel rods by analyzing production data and predicting optimal process conditions. Machine learning techniques, including Random Forest, Gradient Boosting, and Artificial Neural Networks, are utilized to model the relationships between chemical composition, rolling parameters, cooling rates, and resulting mechanical properties such as yield strength, tensile strength, and ductility. Furthermore, optimization algorithms are incorporated to recommend parameter settings that achieve desired performance outcomes. The system also enables real-time monitoring and adaptive control during manufacturing. The proposed approach improves product quality, reduces production costs and enhances overall efficiency in TMT steel production.

Keywords: TMT steel, Machine Learning, Mechanical Properties, Process Optimization, Artificial Intelligence, Rolling Process, Quenching

AI IMPLEMENTATION IN MALICIOUS HACKING: A COMPREHENSIVE ANALYSIS OF EMERGING THREATS AND DEFENSIVE PARADIGMS

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Abstract

The integration of Artificial Intelligence (AI) and Machine Learning (ML) into the landscape of malicious hacking represents a paradigm shift in cyber security, transitioning from manual, human-led intrusions to automated, high-velocity attacks. This research explores the dual-use nature of AI, focusing on how threat agents leverage Large Language Models (LLMs), Generative AI, and reinforcement learning to enhance various stages of the Cyber Kill Chain. Key implementations discussed include the automation of spear-phishing campaigns through hyper-personalized content generation, the development of polymorphic malware that dynamically alters its code signature to bypass traditional signature-based detection systems and the use of AI-driven vulnerability scanning to identify zero-day exploits at scale.

kEYWORDS: Artificial Intelligence, Malicious Hacking and Cyber security, Polymorphic Malware, AI-Driven Phishing, Cyber Kill Chain and Adversarial Machine Learning.

OPTIMIZING REAL-TIME APPLICATIONS THROUGH EDGE COMPUTING

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Dhanalakshmi Srinivasan College of Engineering, Coimbatore, India.

Abstract

As the Internet of Things (IoT) matures, the delay (latency) caused by sending data to distant cloud servers has become a major bottleneck for modern software. Edge Computing offers a solution by moving data processing to the "edge" of the network—closer to the user and the device. This paper explores the core architecture of edge systems and their ability to provide millisecond-level response times. We highlight key benefits including enhanced data privacy, reduced bandwidth costs, and the ability for devices to function offline. Through case studies in autonomous driving and smart manufacturing, we demonstrate how edge computing is transforming the 2026 digital landscape. The paper concludes that as AI becomes more integrated into our physical environment, edge computing will serve as the essential "nervous system" for future intelligent infrastructure.

Keywords : Real-Time, Low-Latency, Secure Operations, Heavy Computation,

ONLINE VOTING SYSTEM

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Abstract

The Online Voting System is a modern technological solution designed to conduct elections through the internet in a secure, efficient, and transparent manner. Traditional voting methods, such as paper ballots or electronic voting machines, often involve long queues, high operational costs, and the possibility of human errors or fraud. The online voting system aims to overcome these challenges by providing a digital platform where voters can cast their votes remotely using computers or mobile devices.This system uses advanced technologies such as encryption, authentication mechanisms, and secure databases to ensure that the voting process is safe and confidential. Each voter is provided with a unique login ID and password, along with additional verification methods such as OTP (One-Time Password) or biometric authentication.

Keywords: Online Voting,E-Voting System,Digital Election,Internet-Based Voting,

AI-ENABLED RATIONAL DESIGN AND PRECISION SYNTHESIS OF FUNCTIONAL NANOMATERIALS *FOR NEXT-GENERATION CHEMICAL APPLICATIONS*

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Abstract

The rapid evolution of nanochemistry demands transformative strategies to precisely design and synthesize functional nanomaterials with tailored physicochemical properties. In this context, artificial intelligence (AI) has emerged as a disruptive paradigm, enabling data-driven discovery and predictive control over nanoscale systems. This study presents an integrated AI-enabled framework for the rational design and precision synthesis of functional nanomaterials, combining machine learning algorithms, high-throughput computational screening, and adaptive experimental feedback loops. By leveraging multi-dimensional datasets encompassing structural, electronic, and surface characteristics, the proposed approach establishes robust structure–property–performance relationships, facilitating the targeted development of nanomaterials with enhanced catalytic, sensing, and environmental functionalities.Furthermore, the incorporation of explainable AI models provides mechanistic insights into nanomaterial behavior, bridging the gap between empirical synthesis and theoretical prediction. The framework also emphasizes scalability and reproducibility through autonomous optimization of synthesis parameters, significantly reducing trial-and-error experimentation.

Keywords: Artificial Intelligence in Nanochemistry, Rational Nanomaterial Design, Precision Synthesis, Machine Learning-Guided Materials Discovery, Functional Nanomaterials

EXPLORING APPLICATIONS IN DIGITALMETRIC SPACES

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Abstract:

The Banach contraction Principle was introduced and proved on Digital metric spaces for digital images by Ege and Karaca.Recently Dolhare and Nalawadegeneralized thisresult by replacing Banach Contraction with monotone non decreasing function on Digital Metric spaces. In our paper we proposed to extend and generalize these existed results via digital contractions on Digital G-metric spaces.

Key Words: Digital Image, Digital G-Metric Space, Fixed Point, Monotone non-decreasing function

AI FOR SMART CITIES USING AUTONOMOUS SYSTEMS

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Abstract

The rapid growth of urban populations has increased the demand for efficient and sustainable city management. Artificial Intelligence (AI), combined with autonomous systems, offers innovative solutions for developing smart cities. This paper explores the integration of AI techniques such as machine learning, computer vision, and data analytics with autonomous systems to improve urban services including transportation, energy management, waste management, and public safety. Autonomous systems such as self-driving vehicles, smart surveillance systems, and intelligent drones enable real-time data collection and decision-making, leading to optimized resource utilization and reduced human intervention. The study also discusses the role of IoT and sensor networks in enhancing system connectivity and responsiveness. Challenges related to data privacy, cybersecurity, infrastructure costs, and system reliability are examined, along with potential solutions. The paper concludes that AI-powered autonomous systems play a crucial role in building efficient, sustainable, and resilient smart cities, paving the way for future urban development.

Keywords: Smart City, Artificial Intelligence, Autonomous Systems, IoT, Urban Automation.

AI IN COMMUNICATION SYSTEMS: THE FUTURE IS CONVERSATIONAL

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Abstract:

Artificial Intelligence (AI) is significantly transforming modern communication systems by enabling intelligent, conversational interactions. This paper presents the evolution of conversational AI, focusing on key technologies such as Natural Language Processing (NLP), Speech-to-Text (STT), Text-to-Speech (TTS), and Natural Language Understanding (NLU). It highlights the transition from traditional Interactive Voice Response (IVR) systems to advanced AI-driven agents capable of real-time understanding and response. The study also examines recent advancements in real-time voice technologies, including speech-to-speech models and scalable cloud-based platforms that support multilingual and low-latency communication. Applications such as chatbots, virtual assistants, and automated customer engagement systems are discussed, emphasizing their role in improving efficiency, reducing operational costs, and providing personalized user experiences. Furthermore, the paper outlines the impact of AI on accessibility and human–machine interaction, concluding that future communication systems will be increasingly seamless, adaptive, and human-centric.

IMPIEMENTATION OF AGENTIC AI IN UNIX SYSTEMS

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Abstract

As Autonomous Artificial Intelligence Agents (AAIAS) transition from simulated environments to production system administration, they encounter a fundamental Impedance Mismatch" between probabilistic reasoning engines and deterministic legacy terminal interfaces. This paper proposes the Mediated Execution Layer (MEL), a novel architectural Framework that translates raw ASCII byte-streams into token-efficient, semantically-dense JSON representations. We formalize the "Interactivity Wall" and provide evidence that the Token-Optimized Output Filter (TOOF) reduces context window saturation by up to 85% While maintaining high fidelity in agent decision

Keywords- Agentic AI-Intelligent Systems- UNIX Architecture- Shell Scripting

A FORMAL ANALYSIS OF DEFENCE IN DEPTH MODEL

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Abstract—

The "Defense in Depth" (DiD) paradigm, or exponentially as independent layers are added. In Conclusion Onion Model, posits that individual security controls Are Defense in Depth remains the gold standard for high inherently fallible. This paper analyzes multi-layered defensive assurance environments. By removing reliance on single structures, focusing on redundant logic and independent failure point heuristics and focusing on physical and logical domains. We demonstrate how stratifying physical, network, and data-centric controls increases the adversary's "cost of constraints, architects build systems that remain secure attack" and ensures systemic resilience by decoupling security despite inevitable component failure.mechanisms from single points of failure.Index Terms—Cybersecurity Architecture, Defense Referenced, Risk Mitigation, Systemic Resilience.

Keywords- Onion model-AI Architecture – inherently fallible – Risk Mitigation

FRAME WORK FOR CRYPTOGRAPHIC AGILITY

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Abstract

Cryptographic Agility (CA) is the archi-tectural property that allows systems to transition between cryptographic algorithms without infras-tructure redesign. As mathematical advancemnents and computational power evolve, standardized prim- itives inevitably degrade. This paper examines the logic of "Pluggable Cryptography," proposing a mod-ular framework to decouple security protocols from specific mathematical implementations, ensuring re-silience against future cryptanalytic breakthroughs. Index Terms-Cryptographic Agility, Post-Quantum Cryptography, Modular Security, Systemic Obstructions.

Keywords- cryptography- cryptananlysis- post quantum analysis- modular security model

(OTHERS)

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AUTONOMOUS LANDING SYSTEMS FOR UAVS IN GPS-DENIED ENVIRONMENTS USING SLAM

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Abstract: This paper presents an interactive autonomous navigation and landing framework for Unmanned Aerial Vehicles (UAVs) operating in GPS-denied environments. Developed using a Simultaneous Localization and Mapping (SLAM) integration, the system enables UAVs to perceive and map unknown surroundings in real-time. By integrating 360-degree sensor data and visual odometry into a high-efficiency processing platform, the system allows for precise waypoint navigation and landing zone identification. The application is designed for search-and-rescue operations and indoor industrial inspections where satellite signals are unavailable. The work demonstrates the practical application of SLAM-based "Immersive Perception" in the aerospace domain, offering a robust alternative to traditional GPS-dependent flight systems.

Keywords—UAV, SLAM, Autonomous Landing, GPS-denied Navigation, Computer Vision, Robotics Security.

GREEN AI-BASED FLIGHT PATH OPTIMIZATION FOR MINIMAL NON-CO_2 EMISSIONS

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Abstract: This paper presents an interactive Green AI-based flight path optimization system developed for the sustainable exploration of aerospace trajectories. The system integrates real-time atmospheric data and reinforcement learning into a low-power platform, enabling aircraft to navigate between waypoints while perceiving the environmental layout realistically. The application is primarily designed for airline dispatchers and autonomous systems that require a credible representation of emission footprints and surroundings. By leveraging energy-efficient technologies, the proposed system enhances environmental engagement, accessibility, and visualization of carbon-neutral routes. The work demonstrates the practical application of Green AI in the aerospace domain, offering an intuitive alternative to traditional flight planning.

IOT-ENABLED ROBOTICS FOR AUTOMATED PRE-FLIGHT INSPECTIONS AND FLUID LEAK DETECTION

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Abstract—This paper presents an interactive IoT-enabled robotic framework developed for the automated pre-flight inspection and fluid leak detection of aircraft infrastructure. The system integrates real-time visual sensors and chemical detection probes into a mobile robotic platform, enabling autonomous navigation around the aircraft exterior. By mapping 360-degree sensor data into a centralized monitoring environment, the system allows maintenance crews to perceive the airframe's health and identify leakage points realistically. The application is designed for high-turnover airport environments where rapid, credible representations of aircraft safety are essential. The work demonstrates the practical application of "Immersive Inspection" in the aerospace domain, offering a scalable and repeatable alternative to manual ground-crew walks.

Keywords—IoT Robotics, Pre-flight Inspection, Leak Detection, Automated Maintenance, Sensor Fusion, Aerospace Safety.

OPTIMIZING AI MODELS FOR DEPLOYMENT ON RESOURCE-CONSTRAINED MICRO-SATELLITES (CUBESATS)

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Abstract—This paper presents an interactive optimization framework for deploying Artificial Intelligence (AI) models on resource-constrained micro-satellites, specifically CubeSats. The system integrates 360-degree orbital data and standard telemetry captured from key satellite subsystems into a virtualized platform, enabling users to perceive the spatial and computational layout realistically. The application is primarily designed for aerospace engineers and mission planners who require a credible representation of on-orbit processing infrastructure. By leveraging model compression and energy-efficient inference, the proposed system enhances user engagement, accessibility, and visualization of satellite-edge intelligence. The work demonstrates the practical application of "Green AI" in the space domain, offering a scalable alternative to traditional ground-based data processing.

Keywords—CubeSats, Model Compression, Edge AI, Resource-Constrained Computing, Aerospace Engineering, Interactive Navigation.

THE DIGITAL TWIN ECOSYSTEM: REAL-TIME SYNCHRONIZATION OF AIRCRAFT STRUCTURAL HEALTH

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Abstract: This paper presents an interactive Digital Twin-based structural health monitoring (SHM) application developed using a synchronization framework for immersive exploration of aircraft integrity. The system integrates real-time data from a network of IoT strain sensors into a centralized platform, enabling users to navigate between airframe components and perceive the structural layout realistically. The application is primarily designed for maintenance engineers and safety inspectors who require a credible representation of the aircraft's infrastructure and surroundings. By leveraging Bayesian filtering and immersive technologies, the proposed system enhances user engagement, accessibility, and visualization of real-world structural environments. The work demonstrates the practical application of Digital Twin technologies in the aerospace domain, offering an intuitive and interactive alternative to traditional manual inspections.

STUDENT RESULT PLATFORM A SMART SOLUTION FOR EFFICIENT STUDENT RESULT MANAGEMENT AND ACCESS

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Abstract: The - is a web-based application developed to simplify the process of managing, storing, and viewing students' academic results in an efficient and organized manner. In many educational institutions, the process of managing student results is often handled manually or through outdated systems, which can lead to errors, delays, and difficulty in accessing the information. Students may also face inconvenience when trying to check their results, especially when results are published through notice boards or limited-access systems. The Student Result Platform provides a modern digital solution to overcome these challenges by creating a centralized system where administrators, staff members, and students can interact with the result management system easily. In this platform, administrators and staff are able to add new student details, upload and update subject marks, and manage semester-wise results through a secure interface. Students can log in to the platform using their credentials to view their academic performance, including subject-wise marks, total marks, grades, and pass or fail status. The system also performs automatic calculations for grades and overall results, which helps reduce manual errors and saves time for faculty members. Additionally, the platform ensures that student data is stored securely in a database, allowing easy retrieval and proper management of academic records.

Keywords: *Result Management System , Student Academic Records, Database Management*

ONLINE JOB PORTAL SYSTEM A WEB-BASED RECRUITMENT AND HIRING SYSTEM AND SIMPLIFYING JOB WEB APPLICATION

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Abstract**:** The Online Job Portal is a web-based application designed to streamline and modernize the recruitment process by providing an efficient digital platform that connects job seekers and employers in a centralized environment. In the current fast-paced and technology-driven world, traditional job search and recruitment methods are often time-consuming, less transparent, and inefficient in matching suitable candidates with appropriate job opportunities. The platform ensures efficient data handling and storage through a structured database system, enabling quick access to job listings and applicant informationBy automating the job search and hiring process, the system minimizes manual effort, reduces recruitment time, and improves the accuracy of candidate selection. The system not only simplifies the hiring process but also contributes to faster employment opportunities, improved organizational efficiency, and better workforce management, making it a valuable tool in the evolving digital employment landscape.

Keywords: *Online Job Portal, Web Application, Recruitment Management System, Job Search Platform, Employment Management, Automation, Information System.*

AN INTELLIGENT TRIAGE ASSISTANT : USING SENTIMENT AWARE NLP TO REDUCE EMERGENCY OVERCROWDING IN PEDIATRICS

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Abstract— An Intelligent Triage Assistant is an AI powered pediatric assistance tool developed to allow the parent to evaluate and deal with the health of their children at home. The application combines a sentiment aware natural language processing platform with the ability to understand and suggest safe doses of the medication to use and give precautionary advice. It provides contextual responses and provides safety screening of drug medications using medical BERT models, monitors growth milestones and vaccination history. The system will have access roles of administration, doctors, hospitals, babysitters, and parents so that records, appointments, and consultations are handled securely. Through quality pre-triage services, the assistant will minimize unnecessary visits to the emergency departments and encourages proactive pediatric care. The system enhances child-centered accessibility, safety, and sustenance of health management.

Keywords: Pediatric triage, Medical BERT, AI medical assistant, Symptom analysis, Child health monitoring, NLP chatbot, Vaccination management.

RSNET-50 BASED DEEP LEARNING SYSTEM FOR AUTOMATED CROP LEAF DISEASE DETECTION AND CLASSIFICATION

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Abstract: Leaf detection and classification are fundamental tasks in agriculture, botany, and environmental monitoring, enabling accurate plant species identification, disease detection, and growth analysis. The project proposes an advanced Leaf Detection and Disease Prediction System utilizing ResNet-50 architecture with Convolution Neural Networks (CNNs) and OpenCV in Python, leveraging deep learning for precise and automated leaf recognition. The system employs OpenCV for comprehensive image pre-processing, including greyscale conversion, noise reduction, edge detection, and contour analysis to extract leaf features such as shape, texture, and color characteristics. The dataset encompasses diverse leaf types from multiple plant species, with particular emphasis on Cassava plants and Pepper leaves, including both healthy samples and those affected by various diseases such as Cassava Mosaic Disease, Cassava Brown Streak Disease, and Pepper Bacterial Spot. This diverse dataset enables the system to differentiate between plant species while simultaneously detecting and classifying specific leaf diseases.

Keywords: Deep Learning, ResNet-50 Convolution Neural Networks (CNNs), Leaf Detection and Disease Prediction System.

AUTOMATED ACUTE LYMPHOBLASTIC LUKEMIA DETECTION AND CLASSIFICATION USING DEEP LEARNING AND CLINICALINTEGRATION

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Abstract—ALL is a type of blood cancer that develops rapidly, and hence, its diagnosis must be timely and done correctly to enhance the chances of survival. Manual examination via microscopes is time consuming and subject to subjectivity leading to delays in diagnosis. The paper presents a suggested study aimed at an automated end-to-end deep learning-based system to identify and classify cancers of peripheral blood smear as ALL and subtypes. The architecture combines various state of the art convolutional neural network models ensemble fusion methods to provide greater classification resilience to a variety of imaging environments. The system also has its clinical symptom inputs and provides complete diagnostic reports via web interface. A complete stack development of a deployable system is created based on Flask backend and PHP/XAMPP frontend that will be used to analyze real-time information. The results of the experiment show high diagnostic performance with an art convolutional neural network models overall accuracy of 98.87, minimizing the time of analysis and enhancing the reliability of the experimental results to support clinical decision making.

AI-CRIME DETECTION WITH AUTOMATED SURVEILLANCE COMMAND CENTER ALERT

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Abstract— Public security of the city has attracted more and more attention with the rise of violent incidents, weapon threats, abnormal human activities and emergency events in crowded public places. Conventional closed-circuit television (CCTV) surveillance system has drawbacks such that the human is used to monitor on a continuously basis, which is very inefficient and would delay the response of emergency conditions. A decision-making process confirms suspecting events and reduces the possibility of false alarms. Once an incident is believed to be in progress, the system automatically creates an alert complete with GPS coordinates, timestamp and visual evidence that's relayed directly to the nearest police department for immediate action. The intelligent architecture model uses less manual monitoring, high detection efficiency and real-time tracking of public security scenes, meeting the needs of smart city deployment. The system has proven the capability to reduce emergency response time and enable proactive crime prevention in advanced surveillance settings.

AI FOR FRAUD DETECTION USING MACHINE LEARNING

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Abstract: With the rapid expansion of digital financial services, fraud detection has become a critical challenge in modern banking and e-commerce systems. Traditional Machine Learning (ML) models such as Logistic Regression, Decision Trees, and Random Forests have been widely used to identify fraudulent transactions by learning patterns from historical data..The system analyzes transactional features such as transaction amount, geographical location, frequency, and time patterns to classify activities as fraudulent or legitimate. To enhance transparency, XAI methods including SHAP (SHapley Additive exPlanations) and LIME (Local Interpretable Model-agnostic Explanations) are employed to interpret individual predictions and highlight feature contributions.Furthermore, the framework supports real-time decision-making in edge-based environments, making it suitable for scalable and efficient deployment.

Keywords: Explainable AI, Fraud Detection, Machine Learning, SHAP, LIME, Financial Security, Transparency

EXPLAINABLE AI BASED SKILL LEARNING PLATFORM

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Abstract: With the constant emergence of new technologies, it is becoming increasingly difficult for traditional education systems to validate skills effectively. This research offers a description of Connexa, an innovative platform that focuses on skill-based learning with the help of Explainable Artificial Intelligence (XAI). Contrary to conventional learning platforms, it tackles some crucial problems, such as ineffective learning trajectories, inadequate skill verification, and improper allocation of resources.When a person fails to get credits after participating in a particular course, he or she will be informed about skill gaps and offered to follow a different trajectory. Thus, the proposed solution takes into account the concepts of XAI, Edge Intelligence, and sustainable digital learning, thus allowing it to be applied in practice.

Keywords: Explainable AI, Skill-Based Learning, Adaptive Learning, AI Recommendations, Learning Analytics, Human-Centered AI

FAKE NEWS DETECTION USING ENSEMBLE LEARNING WITH MULTI-LAYERED ANALYSIS: A ROBUST FRAMEWORK FOR MISINFORMATION IDENTIFICATION

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Abstract-The proliferation of fake news across digital platforms has emerged as a critical threat to democratic processes, public health, and social stability, with misinformation spreading six times faster than factual content.The proposed system employs four machine learning classifiers— Naïve Bayes, Logistic Regression, Random Forest, and Support Vector Machine—operating in parallel within an ensemble voting architecture. Trained on 15,500 news posts with 909,236 user interactions, the system achieves 99.6% accuracy with 1.8 seconds processing time per article, outperforming existing methods by 8-30%. The framework's unique contribution lies in its multi-dimensional analysis approach combining content verification with social network dynamics and automated account detection.

Keywords— Fake News Detection, Ensemble Learning, Machine Learning, Misinformation Detection, Social Bot Detection, Natural Language Processing

FORECASTING CHANGES IN LOCAL CLIMATE UTILIZING XGBOOST AND THE FARMING INDUSTRY LSIM ENGINE

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Abstract— The rapid shifts in global and local climate patterns pose significant risks to agriculture, affecting crop yields, water availability, and overall farm productivity. With climate change progressing at an unprecedented rate, there is an urgent need to integrate advanced technologies for accurate climate forecasting. This paper explores the use of XGBoost and Long Short-Term Memory (LSTM) networks for forecasting local climate changes, specifically focused on applications within the farming industry. XGBoost, a gradient boosting algorithm, is renowned for its performance in predictive modeling, while LSTM networks, a deep learning architecture, excel in sequential data prediction, making them suitable for time-series climate forecasting. By combining these two powerful tools, this research aims to enhance the precision of local climate predictions, providing valuable insights for farmers, researchers, and policymakers to mitigate risks related to climate variability

Keywords— XGBoost, Long Short-Term Memory (LSTM) Climate Forecasting, Agricultural Productivity, Time-Series Prediction, Climate Change Adaptation

JSGUARD:A MULTI-LAYERED DEFENSE FRAMEWORK TO PREVENT AUTOMATED EXTRACTION OF JAVASCRIPT ASSETS

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Abstract:The proliferation of client-side JavaScript in modern web applications has transformed them into rich, interactive platforms—but has also created a significant security vulnerability. Automated extraction tools, ranging from simple static scrapers to sophisticated headless browsers, can effortlessly harvest all JavaScript files from any domain, exposing proprietary business logic, internal API endpoints, third-party dependencies, and even hard-coded secrets..This paper introduces JSGuard, a novel multi-layered defense framework designed to prevent automated extraction of JavaScript assets. By creating a moving target that changes per session, JSGuard renders automated extraction infeasible without impacting the user experience.The framework offers a practical, deployable solution for protecting JavaScript assets in production environments, with broad applications in e-commerce, financialservices, and any domain where client-side code represents a valuable asset or security risk.

Keywords: JavaScript security, anti-scraping, dynamic script injection, obfuscation, behavioral detection, web application security, intellectual property protection.

SECURE AI ECOSYSTEMS: PRIVACYPRESERVING IMAGE MANAGEMENT

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Abstract:The rapid advancement of AI technologies, particularly systems like Google Gemini, has led to deeper integration with personal user data, raising significant concerns about privacy and security. Personal images, being highly sensitive, are especially vulnerable to unauthorized access, misuse, and data breaches. Addressing these challenges, this concept proposes a privacy-preserving image management framework designed to safeguard user data while maintaining AI functionality. By integrating these strategies, the system enhances data confidentiality, reduces the risk of breaches, and ensures ethical handling of sensitive information, ultimately enabling a secure and trustworthy AI ecosystem.

Keywords: Artificial Intelligence, Data Privacy, Secure Systems, Encryption, Access Control, Zero-Trust Architecture, Biometric Authentication, Image Management, Federated Learning.

SKILL BRIDGE XAI

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Abstract: The constant changes occurring in technologies, along with the growing industry demand for certain expertise, result in difficulties students may have when choosing the right direction of study.. The proposed solution aims at improving learners' confidence and engaging them through providing transparent explanations on the decision made by the system. The developed solution allows analyzing the academic performance of the learner, his/her interests, and the level of competency. Based on the analysis, SkillBridge XAI makes skill recommendations for further development and explains its choice. The proposed learning platform offers continuous monitoring of the learner's progress using learning analytics and a credit-based system of evaluation. Moreover, the use of edge computing will ensure efficient and timely response from the application.

Keywords: Explainable Artificial Intelligence (XAI), Adaptive Learning, Skill Gap Detection, Career Guidance System, Learning Analytics, Edge Computing, Human-Centered AI

AUTOMATIC CROP MONITORING ROBOT FOR AGRICULTURE

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Abstract**:** Agriculture is increasingly adopting smart technologies to improve productivity and reduce human effort. This paper presents the design and development of an Automatic Crop Monitoring Robot based on the ESP32 platform. The proposed system is capable of monitoring key agricultural parameters such as soil moisture, temperature, humidity, and crop health in real-time. The robot is equipped with various sensors integrated with the ESP32 microcontroller, which enables wireless communication and data processing. The collected data is transmitted to a cloud or mobile application through Wi-Fi, allowing farmers to remotely monitor field conditions and make informed decisions. Additionally, the system can be programmed to perform automated actions such as irrigation control based on sensor readings, thereby optimizing water usage. The mobility of the robot allows it to traverse across the agricultural field, capturing data from multiple locations, which enhances monitoring efficiency compared to static systems. The proposed solution is cost-effective, energy-efficient, and suitable for small- and medium- scale farms. This system contributes to precision agriculture by improving crop yield, reducing resource wastage, and minimizing manual labor. The integration of IoT and robotics in agriculture demonstrates a sustainable approach to modern farming practices.

*Keywords***:** *ESP32, Internet of Things (IoT), Precision Agriculture, Crop Monitoring Robot, Soil Moisture Sensor.*

AI-BASED INDUSTRIAL MOTOR FAULT DETECTION USING VIBRATION ANALYSIS WITH ESP32

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Abstract**:** Industrial motors play a vital role in manufacturing and automation systems, where unexpected failures can cause significant downtime and economic loss. This project proposes an AI-based fault detection system using vibration analysis implemented on an ESP32 microcontroller. Vibration sensors are used to continuously monitor motor conditions and capture real-time data. The acquired signals are processed and important features such as amplitude, frequency, and statistical parameters are extracted. These features are analyzed using machine learning algorithms to detect common faults like bearing defects, misalignment, and imbalance. The ESP32 ensures efficient data acquisition, processing, and wireless communication for remote monitoring. The system provides early fault detection and real-time alerts, enabling predictive maintenance and improving overall system reliability. This solution is cost-effective, scalable, and suitable for modern Industry 4.0 environments.

*Keywords***:** *Industrial Motor, Fault Detection, Vibration Analysis, ESP32, Machine Learning, Predictive Maintenance, IoT, Condition Monitoring.*

SMART EV PARKING INTEGRATED WITH WIRELESS CHARGING FOR INTELLIGENT ENERGY MANAGEMENT ESP32

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Abstract**:** The increasing adoption of electric vehicles (EVs) necessitates efficient parking and charging infrastructure. This project presents a smart EV parking system integrated with wireless charging and intelligent energy management using an ESP32 microcontroller. The system utilizes sensors to detect parking slot availability and guides users to vacant spaces through a smart interface. Wireless power transfer technology is employed to enable convenient and cable-free charging of EVs. The ESP32 serves as the central controller, facilitating real-time monitoring, data processing, and communication via IoT platforms. The system incorporates energy management strategies to optimize power usage, balance load demand, and prevent energy wastage. Parameters such as battery status, charging time, and energy consumption are monitored and managed efficiently. The proposed solution enhances user convenience, improves energy utilization, and supports sustainable transportation. It is scalable and suitable for smart city applications, contributing to the development of intelligent infrastructure for future mobility.

*Keywords***:** *Electric Vehicles, Smart Parking, Wireless Charging, ESP32, Energy Management, IoT, Smart City, Sustainable Transportation.*

SMART SOLAR-POWERED COLLAR FOR AFFORDABLE CATTLE HEALTH MONITORING AND DIAGNOSIS

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Abstract**:** Livestock health plays a crucial role in sustaining rural economies, yet small-scale farmers often face challenges such as late illness detection, missed breeding cycles, and the high cost of commercial monitoring systems. To address these issues, this work proposes a low-cost, solar-powered smart collar designed for cattle health monitoring and diagnosis. The system integrates affordable and readily available components including an ESP32/NodMCU microcontroller, MPU6050 motion sensor, MLX90614 temperature sensor, and SIM800L GSM module. The collar enables real-time monitoring of vital parameters such as estrus detection, fever, sodium deficiency, heat stress, and animal activity, while GPS functionality ensures location tracking. Communication is achieved through SMS, eliminating the need for internet connectivity and making the solution suitable for rural environments.. Future enhancements include voice alerts in regional languages to improve farmer accessibility. This smart collar demonstrates strong potential to empower rural farmers by improving cattle health management, optimizing breeding cycles, and ultimately increasing income.

*Keywords***:** *Smart Collar-Cattle Health Monitoring- IoT- Solar-Powered Device- Estrus Detection- Rural Farming- GSM Communication- Low-Cost Prototype.*

DESIGN AND DEVELOPMENT OF LOAD - CARRYING INDUSTRIAL ROBOT WITH MANUAL AND AUTONOMOUS MODES - STM32

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Abstract**:** The design and development of a load-carrying industrial robot with both manual and autonomous modes using an STM32 microcontroller is presented in this project. The robot is intended to transport materials efficiently within industrial environments, reducing human effort and improving productivity. In manual mode, the robot is controlled remotely using wireless communication, allowing operators to navigate and handle loads with precision. In autonomous mode, the robot utilizes sensors such as ultrasonic, infrared, or line-following modules to navigate predefined paths and avoid obstacles. The STM32 microcontroller serves as the central control unit, managing motor drivers, sensor inputs, and decision-making algorithms. The system integrates efficient power management and robust mechanical design to support heavy load handling. The dual-mode operation ensures flexibility, enabling seamless switching between user-controlled and self-guided navigation. The proposed robot enhances safety, reduces labor costs, and increases operational efficiency in industrial settings, making it suitable for smart manufacturing and automation applications.

*Keywords***:** *Industrial Robot, Load Carrying, STM32, Autonomous Navigation, Manual Control, Sensors, Material Handling, Automation.*

MULTI SENSOR FUSION BASED ACCIDENT SEVERITY PREDICTION SYSTEMS

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Abstract**:** Road accidents are a major cause of fatalities and injuries worldwide, highlighting the need for intelligent systems that can predict accident severity and enable faster emergency response. This project presents a multi-sensor fusion-based accident severity prediction system that integrates data from various sensors such as accelerometers, gyroscopes, GPS, and vehicle parameters. The system collects real-time data during vehicle operation and combines inputs from multiple sources to improve accuracy and reliability. Advanced data fusion techniques and machine learning algorithms are employed to analyze parameters such as impact force, vehicle speed, sudden deceleration, and orientation changes. Based on these inputs, the system classifies the severity of accidents into different levels (minor, moderate, severe). The processed information can be transmitted to emergency services and monitoring platforms to ensure timely assistance. The proposed system enhances decision-making by reducing false alarms and improving prediction accuracy through sensor fusion. It contributes to road safety by enabling rapid response, minimizing damage, and supporting intelligent transportation systems in smart city environments.

Keywords: *Multi-Sensor Fusion, Accident Severity Prediction, Machine Learning, IoT, Accelerometer, GPS, Road Safety, Intelligent Transportation Systems.*

A STUDY ON CONSUMERS' PERSPECTIVE ON BRAND LOYALTY TOWARDS FMCG PRODUCT- BATH SOAP WITH REFERENCE TO COIMBATORE NORTH DISTRICT

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Abstract—Fast moving consumer goods (FMCG) manufacturing is very much as the name suggests: high quality products that fly off the production lines as fast as they fly off supermarket shelves. Typical products include home cleaning items, personal hygiene goods and foodstuffs, such as crisps and ready meals. Major players include companies like Procter & Gamble and Unilever, which produce a wide portfolio of products, while other companies like Walkers and L'Oreal tend to focus on single product areas. In FMCG, engineers have the vital role of developing and managing manufacturing processes to remove costs and wastage and keep things moving – thousands of units of each product can come off a production line every minute. Engineers also continually innovate new machines and processes to match the demands made on products by consumers.

EXPLAINABLE ARTIFICIAL INTELLIGENCE: UNDERSTANDING AI TRANSPARENCY FOR SOCIAL SCIENCES

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Abstract—Artificial Intelligence (AI) systems have become embedded in consequential social decisions—from predicting recidivism in criminal justice to screening loan applicants in banking. As these systems grow more powerful, their inner workings have grown correspondingly opaque. Explainable Artificial Intelligence (XAI) is the interdisciplinary field dedicated to making AI decisions legible, auditable, and contestable. This paper introduces XAI to an audience of social science students, with minimal technical prerequisites. It examines the philosophical foundations of explainability, surveys the principal technical methods, and critically applies a social-science lens to questions of power, bias, accountability, and democratic governance. Drawing on examples from criminal justice, healthcare, welfare administration, and social media curation, the paper argues that XAI is not merely a technical problem but a profoundly social and political one—requiring the collaborative expertise of sociologists, political scientists, ethicists, and legal scholars alongside computer scientists.

Index Terms—Explainable AI, algorithmic transparency, algorithmic accountability, fairness, black-box models, social justice, AI ethics, GDPR, interpretable machine learning.

GREEN AI FOR SUSTAINABLE COMPUTING

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Abstract—Green Artificial Intelligence (Green AI) is all about making machine learning models that use less energy and are better for the environment while still being fast. As AI applications grow quickly, the cost of training large models and the amount of carbon they use has gone up a lot. This paper examines methods for diminishing energy consumption in AI systems, encompassing model optimization, effective hardware utilization, and algorithmic enhancements. It also talks about how renewable energy sources and sustainable data centers can help lessen the damage to the environment. The study also talks about the trade-offs between model accuracy and energy efficiency, which shows how important it is to develop AI responsibly. Organizations can reach global sustainability goals and promote technological innovation by using Green AI methods. These methods lead to scalable, cost-effective, and eco-friendly computing solutions.

Keywords —Green AI, Sustainable Computing, Carbon Footprint Reduction, AI Optimization

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