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Thoothukudi-05



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April 20 and 21, 2026

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ICRIT'26
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Message from the Chairman



It is with great pride and pleasure that I extend my warm greetings to all the delegates, researchers, academicians, industry professionals, and students participating in the **Second International Conference on Recent Innovation in Technologies (ICRIT'26)** hosted by our institution.

In today's rapidly evolving technological landscape, innovation and research play a vital role in addressing global challenges and driving sustainable development. Institutions of higher learning have a significant responsibility to nurture creativity, promote scientific inquiry, and provide opportunities for the exchange of knowledge and ideas. ICRIT'26 offers an excellent platform for distinguished experts, scholars, and young researchers from around the world to present their research findings, discuss emerging technologies, and build meaningful academic and industrial collaborations. Such conferences strengthen the connection between academia and industry while encouraging interdisciplinary research that contributes to technological and societal advancement.

I sincerely commend the organizing committee, faculty members, staff, and student volunteers for their dedicated efforts and meticulous planning in making this conference a reality. I am confident that ICRIT'26 will foster insightful discussions, inspire innovative thinking, and pave the way for impactful research collaborations. I extend my best wishes for the grand success of ICRIT'26 and hope that every participant enjoys a rewarding, enriching, and memorable conference experience.

Mr. C. M. Joshua, M.Sc.
Chairman, GRACE Group of Institutions, Thoothukudi

Message from the Vice-Chairman



It is a privilege and an honor for Grace College of Engineering to host the **Second International Conference on Recent Innovation in Technologies (ICRIT'26)**. As technology continues to transform every aspect of modern society, platforms that encourage the exchange of knowledge, innovative thinking, and collaborative research have become increasingly significant. ICRIT'26 brings together academicians, researchers, industry experts, and aspiring scholars to share their research findings, discuss emerging technological advancements, and explore innovative solutions to contemporary engineering challenges. The diverse participation from various disciplines reflects the conference's commitment to promoting interdisciplinary collaboration and advancing scientific excellence.

I extend my sincere appreciation to the organizing committee, faculty members, and student volunteers for their dedication, meticulous planning, and unwavering commitment in organizing this prestigious international event. Their collective efforts have laid the foundation for a conference that will inspire meaningful discussions, strengthen academic and industrial partnerships, and encourage future research initiatives.

I am confident that ICRIT'26 will serve as a catalyst for innovation, create valuable networking opportunities, and contribute significantly to the advancement of science, engineering, and technology. I extend my heartfelt best wishes for the grand success of the conference and hope that every participant finds the event intellectually enriching and professionally rewarding.

Mr. S. Stephen, M.Sc., M.B.A.
Vice-Chairman, GRACE Group of Institutions, Thoothukudi

Message from the Secretary



In today's dynamic technological landscape, international conferences serve as invaluable platforms for exchanging ideas, fostering innovation, and strengthening collaboration among researchers, educators, and industry professionals. Such events encourage intellectual curiosity, promote interdisciplinary research, and inspire innovative solutions to address global technological challenges.

At **Grace College of Engineering**, we remain steadfast in our commitment to promoting academic excellence, research, and innovation. ICRIT'26 reflects our vision of creating an environment that encourages scholarly engagement, knowledge sharing, and meaningful collaboration between academia and industry. The conference provides an exceptional opportunity for participants to present their research, exchange perspectives, and explore emerging trends across diverse fields of science and engineering.

I sincerely appreciate the dedicated efforts of the **Conference Coordinator, Co-Coordinator, Organizing Committee, faculty members, and student volunteers** whose hard work, commitment, and meticulous planning have made this prestigious international conference possible. I am confident that the technical sessions, keynote addresses, and scholarly interactions will inspire new ideas, foster lasting collaborations, and contribute significantly to future research and technological advancements.

I extend my best wishes to all the delegates and participants for a productive and enriching conference experience and wish **ICRIT'26** every success.

Mrs. J. Rajkamal Petro, B.Sc., B.Ed., M.A.
Secretary, GRACE Group of Institutions, Thoothukudi

Second International Conference on Recent Innovation in Technologies – ICRIT'26
April 20 and 21, 2026

Message from the Principal



It is a great honor and privilege to welcome all the distinguished academicians, researchers, industry professionals, delegates, and students to the **Second International Conference on Recent Innovation in Technologies (ICRIT'26)** hosted by Grace College of Engineering. In today's rapidly advancing technological era, research, innovation, and knowledge creation are fundamental to the progress of society. Higher educational institutions have a vital role in cultivating a culture of scientific inquiry, creative thinking, and collaborative learning. ICRIT'26 has been envisioned as a platform that brings together experts from academia and industry to exchange ideas, present cutting-edge research, and explore solutions to contemporary technological challenges.

The conference encompasses a wide spectrum of emerging technologies and interdisciplinary research areas, providing participants with an excellent opportunity to share their expertise, gain new perspectives, and establish meaningful academic and industrial collaborations. I express my sincere gratitude to our esteemed Management for their unwavering encouragement and continuous support in organizing this prestigious event. I also extend my heartfelt appreciation to the Conference Coordinator, Co-Coordinator, Organizing Committee, faculty members, and student volunteers whose dedication, meticulous planning, and tireless efforts have ensured the successful organization of ICRIT'26.

I am confident that the keynote addresses, technical sessions, and scholarly interactions will inspire innovative ideas, strengthen research collaborations, and contribute significantly to the advancement of science, engineering, and technology. I wish **ICRIT'26** a grand success and hope that every participant enjoys a rewarding, insightful, and memorable conference experience.

Dr. S. SIDHARDHAN, M.E., Ph.D.
Principal, Grace College of Engineering

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April 20 and 21, 2026

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**DEEP LEARNING APPROACH FOR DRIVER DROWSINESS DETECTION AND SAFETY
ENHANCEMENT**

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Abstract: Driver fatigue plays a big role in road accidents around the world. It puts drivers and everyone else at risk. Spotting drowsiness early doesn't just save lives it makes our roads safer. In this study, we introduce a new deep learning approach for catching signs of drowsy driving. The system works quickly and accurately, so it's actually usable in real time not just a lab demo. We use two main methods together to tackle the problem. First, we designed our own Convolutional Neural Network (CNN) that picks up on key facial features: mostly if your eyes are open or closed, and whether you're yawning. With these image features, we then use a Support Vector Machine (SVM) classifier. SVMs handle tricky, high-dimensional data really well, making the final call on whose alert and who's not. Our second method leans on transfer learning. Basically, we take a deep neural network that's already been trained on millions of images and fine-tune it for the driver drowsiness problem. It learns faster and tends to work better, especially when we don't have a massive dataset ourselves. To see if these ideas really work, we ran them on two public datasets. The first one has three categories: open eyes, closed eyes, and yawning all clear signals someone might be too tired to drive. The second set, the MRL Eye Dataset, has images from 37 different people, covering lots of eye states and conditions. This mix makes our tests pretty solid. We measured how well each model did using accuracy, precision, recall, and F1-score. When we looked at loss curves and confusion matrices, both methods showed stable, reliable learning, and hardly ever mislabelled someone's state. The whole system is cost-effective.

Keywords- Driver Drowsiness Detection (DDD), Deep Learning, Convolutional Neural Network (CNN), Support Vector Machine (SVM), Road Safety

**VENDOR SELECTION OPTIMIZATION & PROCUREMENT COST LEAKAGE DETECTION USING
DATA ANALYTICS**

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Abstract

This research paper investigates the application of data analytics for optimizing vendor selection and detecting procurement cost leakages within organizational supply chains. Leveraging a comprehensive dataset of procurement order records, this study employs a multi-faceted analytical approach, including data preprocessing, feature engineering, procurement spend analysis, cost leakage analysis, supplier quality and delivery performance analysis, and supplier compliance analysis. A composite vendor performance scoring model is developed, followed by the application of K-Means clustering for supplier segmentation. The findings demonstrate the efficacy of data-driven methods in identifying high-performing and high-risk vendors, quantifying cost leakages, and providing actionable insights for strategic procurement management. This research contributes to the growing body of literature on data-driven procurement by presenting a practical framework for enhancing efficiency, reducing costs, and improving supplier relationships.

Keywords - data analytics, vendor selection, procurement, cost leakage, supply chain, K-Means clustering, supplier segmentation, performance scoring

ICRIT103

EXPERIMENTAL INVESTIGATION ON COW BONE POWDER RAINFORCED POLYESTER MATRIX COMPOSITE MATERIAL

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Abstract : The impact of particle cow bone combinations on the mechanical properties and thermal properties of bone particle reinforced and polyester matrix composites were calculated to evaluate the chances of using them as a novel material in various applications. Bone particles reinforced with recycled low density polyester were prepared by adjusting the bone particles from 80%-20%, 70%-30% and 60%-40% of polyester and bone powder ratio by using the hand layup compression technique. The mechanical properties of the new material were analyzed. A Factorial design experiment was performed based on standard high thermal capacity material, with a view to investigating which of the design impacts strength. This paper reveals that the combinations of the particulate cow bone have the most important main effect on the wear behavior. Hence the bone particles can be used to enhance the strength and wear properties of polyester matrix composite materials.

Keywords: Cow bone, particle reinforcement, Polyester matrix composite, Dynamic mechanical analysis.

ICRIT104

HYBRID MACHINE LEARNING-BASED INTRUSION DETECTION SYSTEM FOR AUTONOMOUS VEHICLES

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Abstract — The rapid advancement of autonomous vehicles (AVs) has introduced significant cybersecurity challenges, particularly concerning Controller Area Network (CAN) bus vulnerabilities. This paper presents a Hybrid Machine Learning-Based Intrusion Detection System (IDS) designed specifically for autonomous vehicles, combining supervised and unsupervised learning approaches to detect both known and novel attack patterns. Our proposed system integrates a Random Forest classifier with an Isolation Forest anomaly detector to form a robust hybrid detection pipeline. The system is deployed as a real-time mobile application built using Flutter, communicating with a FastAPI backend that processes vehicle telemetry data including speed, RPM, throttle position, brake pressure, steering angle, GPS coordinates, CAN bus frequency, and payload size. Detection logs are persistently stored in MongoDB Atlas cloud database. Experimental results demonstrate 100% detection accuracy on synthetic CAN bus datasets encompassing fuzzy attacks, Denial-of-Service (DoS) attacks, spoofing attacks, and replay attacks. The mobile application provides real-time alerts with visual indicators, enabling immediate response to detected intrusions. The proposed hybrid approach outperforms standalone ML models by capturing both signature-based and anomaly-based attack patterns simultaneously.

Keywords — Intrusion Detection System, Autonomous Vehicles, CAN Bus Security, Random Forest, Isolation Forest, Hybrid Machine Learning, Flutter, FastAPI, MongoDB Atlas, Real-time Detection

HEART DISEASE IDENTIFICATION METHOD USING MACHINE LEARNING AND IOT

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Abstract

Heart disease remains one of the primary killers around the world and therefore requires regular checks and monitoring. The existing conventional diagnostic tools require frequent hospital visits and expensive equipment for diagnosing heart diseases. The use of biomedical sensors and artificial intelligence can help improve the efficiency of diagnosis by facilitating constant monitoring and early identification of health issues. The purpose of this paper is to analyze an IoT and Machine Learning based system for identifying heart diseases. The system uses biomedical sensors like ECG sensors, heart rate sensors, SpO₂ sensors, and body temperature sensors to continuously monitor a patient's physiological parameters. An Arduino microcontroller analyzes the data received from the sensor modules and transfers it via a Wi-Fi module to the cloud server. The processed data will be analyzed by a machine learning algorithm for classifying the current patient condition and predicting any future risks. An alarm would be immediately set off using a buzzer in case of abnormalities. The proposed system is efficient in terms of cost and practical implementation for telemedicine and remote care.

Keywords

Heart Disease Identification, Internet of Things (IoT), Machine Learning, ECG Sensor, Heart Rate Monitoring, SpO₂ Sensor, Temperature Sensor, Arduino UNO, ESP8266 Wi-Fi Module, Real-Time Health Monitoring, Predictive Analysis, Remote Patient Monitoring, Smart Healthcare System, Early Disease Detection

DUAL-BAND SLOTTED MICROSTRIP ANTENNA FOR SMART FARMING COMMUNICATION SENSOR

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Abstract: Smart agriculture systems require reliable and efficient wireless communication for real-time monitoring of environmental parameters such as soil moisture, temperature, and humidity. This paper presents the design of a compact dual-band slotted microstrip antenna that enables dual-band operation without increasing antenna size. The proposed antenna operates at 2.4 GHz and 4.3 GHz frequency bands. The simulated results show that the antenna achieves good impedance matching with return loss values of -29.43 dB and -35.77 dB at the respective resonant frequencies. The antenna also satisfies the condition $S_{11} < -10$ dB and exhibits stable radiation characteristics suitable for wireless sensor communication. The compact size, dual-band capability, and reliable performance make the proposed antenna suitable for smart agriculture IoT applications.

Keywords— Smart Agriculture, Wireless Sensor Communication Systems, Compact Dual-band Antenna, Slot-Loaded Microstrip Patch Antenna, FR-4 Based Antenna Design, Agriculture Sensor Networks, Wireless Monitoring Systems.

EXPERIMENTAL RESULTS OF PISTACHIO SHELLS AND MUNICIPAL SOLID WASTE CO-GASIFICATION IN A FLUIDIZED BED GASIFIER

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Abstract

The world's growing population has led to a growth in solid waste, making solid waste management one of the main environmental issues facing the entire world. In the current work, pistachio shells and municipal solid waste are co-gasified using air as a gasification agent in a fluidized bed gasifier. Using silica sand as the primary catalyst, different ratios of pistachio shells and municipal solid waste are co-fed, including 80:20, 60:40, 40:60, and 20:80. Studying is being done on the composition, gas output, tar content, cold gas efficiency, and higher heating value of syngas as well as the impacts of E.R., temperature, and blending ratio. Compared to PS: MSW 80:20, the blending ratio of PS: MSW 20:80 has a greater HHV value. The CO, CH₄, tar content, cold gas efficiency, and greater heating value all increased for different PS: MSW blending ratios. The carbon monoxide, methane gas, cold gas efficiency, tar, and higher heating value are improved for various pistachio shells, and municipal solid waste blending ratios.

Keywords: Fluidized bed, municipal solid waste, pistachio shells, and blending ratio.

REAL-TIME SENSOR OUTPUT DISPLAY IN ARDUINO IDE FOR KNEE MONITORING SYSTEM

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Abstract

Medical applications and remote health monitoring the increasing prevalence of Knee Osteoarthritis (KOA) has become a major concern in modern healthcare, particularly among elderly individuals and people with joint-related disorders. Early detection and continuous monitoring of knee movement are essential to prevent severe joint damage and improve quality of life. This project proposes the design and implementation of a low-cost, wearable knee monitoring system using a hardware-based approach without relying on complex machine learning techniques. The system is developed using an Arduino Uno microcontroller integrated with multiple sensors, including a flex sensor, force sensor (FSR), vibration sensor, and MPU6050 motion sensor. Each sensor is responsible for capturing specific parameters related to knee activity, such as bending angle, applied pressure, vibration, and motion orientation. The collected data is processed in real-time using embedded programming, and a threshold-based logic is applied to analyze the knee condition. The proposed system classifies knee movement into different categories such as normal condition, mild abnormality, and severe abnormality based on sensor readings. The output is displayed through the serial monitor, providing immediate feedback to the user. This enables continuous monitoring of knee health in a non-clinical environment. The main advantages of this system include low cost, portability, ease of implementation, and real-time monitoring capability. Although the system does not replace medical diagnostic tools, it serves as an effective assistive solution for preliminary detection and monitoring of knee-related issues. In conclusion, the project demonstrates the potential of combining

embedded systems and sensor technology to develop a practical and affordable healthcare monitoring solution. With further enhancements, the system can be extended for advanced

ICRIT109

INTELLIGENT HEART ATTACK PREDICTION SYSTEM BASED ON SWEAT BIOMARKERS

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Abstract:

Cardiovascular diseases are a leading cause of global mortality, with heart attacks often occurring without early warning signs. This paper proposes an intelligent heart attack prediction system based on sweat biomarkers, providing a non-invasive and continuous monitoring solution. The system utilizes wearable sensors to collect sweat data, including parameters such as electrolytes, glucose, and lactate, which reflect physiological and cardiac conditions. Supervised machine learning algorithms, including Random Forest, Support Vector Machines (SVM), and Logistic Regression, are applied to analyze the collected data and predict potential cardiac risks. Data preprocessing and feature selection techniques are employed to improve model performance. Model performance is evaluated using standard metrics such as accuracy, precision, recall, and F1-score. The results indicate that the system provides reliable and accurate predictions of potential cardiac events. The proposed method offers a scalable, cost-effective, and non-invasive solution for early heart attack detection, contributing to advancements in smart healthcare systems and preventive medicine.

Keywords: CVD, Predictive Analytics, Health Monitoring System, Machine Learning, Non-invasive Monitoring, Sweat Biomarkers.

ICRIT110

ENHANCING HEAT AND NOISE RESISTANCE IN FERTILIZERS MANUFACTURING INDUSTRIES THROUGH THE USE OF MYCELIUM BASED PANEL

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Abstract

The fertilizers manufacturing industry often faces significant challenges related to heat and noise pollution, which adversely affect both worker safety and operational efficiency. This project work explores the innovative application of mycelium-based panels as a sustainable and effective solution to enhance heat and noise resistance by placing it near the heat and noise sources within these industrial environments. Mycelium, the root structure of fungi, is a natural, biodegradable material known for its excellent insulating properties and environmental benefits. By integrating mycelium-based panels into the structural and operational framework of fertilizer production facilities, this study aims to reduce thermal transfer and acoustic disturbances. Experimental evaluations were conducted to assess the panels' performance in mitigating heat exposure and minimizing noise levels compared to conventional materials currently in use. Results indicate that mycelium panels reduce the dBC from 101.9 to 88.9 dBC and superior insulation capabilities, promoting a safer and more comfortable workplace while also contributing to environmental sustainability through their biodegradability and low-energy manufacturing process. This project work undergoes the potential of mycelium technology as a cost-effective and eco-friendly alternative to traditional insulating materials, fostering innovation in industrial safety and environmental management within the fertilizer sector.

EASY HEALTH SYSTEM

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Abstract

EasyHealth is a digital healthcare platform developed to improve accessibility, efficiency, and responsiveness in modern healthcare systems using web-based technologies. The system is designed with role-based access control for patients, doctors, and administrators, enabling secure and structured interaction among all users. Patients can book and manage appointments, access personalized dashboards, and request real-time emergency assistance, while doctors can efficiently handle consultations and schedules through a centralized interface. Administrators manage system operations, user data, and overall platform integrity. In addition to core healthcare services, EasyHealth promotes community engagement through integrated blood donation and medical volunteering features, encouraging social responsibility and collaborative healthcare support. The platform is implemented using a secure and scalable full-stack architecture to ensure data privacy, reliability, and future extensibility. Developed by the Department of Computer Science and Engineering, AVS Engineering College, EasyHealth demonstrates how technology-driven solutions can transform traditional healthcare delivery into a more accessible, patient-centric, and community-oriented digital healthcare ecosystem.

AI DEVELOPER WORKSPACE

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Abstract

The rapid growth of software development has increased the demand for intelligent tools that can assist developers in writing efficient code, identifying errors, and collaborating with team members in real time. Traditional development environments require installation of multiple tools and often lack integrated collaboration and intelligent assistance features. To overcome these limitations, this project proposes AI Developer Workspace, a web-based platform that provides a unified environment for coding, collaboration, and intelligent code analysis. The system is developed using the MERN technology stack, which includes MongoDB, Express.js, React.js, and Node.js, making it scalable, efficient, and suitable for modern web application development. The primary objective of this project is to create an online platform where developers can write, analyze, and manage code projects within a single web application. The system includes a web-based code editor interface that allows users to write and edit programming code directly in the browser. The editor supports features such as syntax highlighting, project management, and real-time collaboration. Developers can create projects, save their code, and track their progress through a structured dashboard. This approach eliminates the need for multiple separate tools and enables developers to work more efficiently in a centralized workspace. The frontend of the system is developed using React.js, which provides a responsive and dynamic user interface. React enables component-based development, allowing the application to maintain high performance and smooth user interactions. The user interface includes modules such as the developer dashboard, code editor, project management section, and collaboration interface. These modules allow users to easily navigate through the system and manage their coding activities effectively. The backend is built using Node.js and Express.js, which handle the core application logic and API communication. The backend is responsible for user authentication, project management, code storage, and communication between different system components.

CROWD BEHAVIOUR ANALYSIS SYSTEM USING DEEP LEARNING AND COMPUTER VISION

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Abstract

Crowd control has emerged as one of the most relevant issues in modern public safety systems, related to events, infrastructure, and urban gatherings. The aim of this paper is to consider the patterns in crowd behavior and ways of their analysis, including not only predictions but also crowd control itself. Based on the use of computer vision, agent-based simulation, and sensor data, this study tries to reveal the patterns in crowd members' behavior and analyze the corresponding macro level phenomena. Specifically, this paper will try to detect the early signals that indicate crowd problems, such as crowd overload, panic, and bottlenecks. Ethical considerations related to crowd monitoring will also be considered in this paper. The findings made by this paper may be used in designing infrastructure, events management, and emergency response strategies. The findings highlight the importance of integrating data-driven approaches with human-centered design in building effective crowd management systems

Keywords

Crowd behaviour analysis, crowd management, pedestrian dynamics, agent-based modelling, computer vision, crowd density estimation, emergency evacuation, panic behaviour, public safety, crowd simulation

IMAGE ENHANCEMENT USING SPACIAL FILTER TECHNIQUES

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Abstract

Sometimes the clarity of digital images might be affected due to issues like noise, illumination problems, blurring, and insufficient contrast. Enhancement refers to a process whereby the quality of the images is improved to make them more comprehensible both by the machines and by humans. Spatial filtering is one of the easiest and most effective techniques for image enhancement. It directly operates on image pixels to improve the quality of brightness, sharpness, and contrast. The purpose of this paper is to provide an understanding of various forms of spatial filtering. Including smoothing filters, sharpening filters, median filters, and high pass filters, among others. Additionally, the paper highlights how filters are able to reduce noise and enhance edge information. It has been found out the spatial filtering is an easy but effective way of improving the quality of an image using simple operations.

Keywords-

Digital Image Processing, Image Enhancement, Spatial Filtering, Noise Reduction, Edge Enhancement, Computer Vision.

ICRIT115

MULTI DEVICE DIABETES LOG SYSTEM WITH HARDWARE LINKED SECURITY

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Abstract: Conventional healthcare systems are susceptible to data breaches and illegal access because they frequently rely on passwords and centralized storage. By offering a secured, hardware-linked digital medical safe that does away with password-based security, Health Locker tackles this problem. Instead, a SHA-256-generated identification derived from the Android ID is used to link each patient account to a specific device. By integrating RSA for secure data transmission with ECDSA for device authentication, the system employs hybrid cryptography to make sure that only devices that have been validated can access or alter record. By processing vitals in volatile memory, the patient application safely gathers health data and executes real-time AI-based assessments (such "Stable" or "Hyperglycemic") without permanently storing crucial raw data. On the administrative side, the system uses hash values that have already been saved in the database to confirm data integrity. Every update request—which includes patient inputs as well as login credentials—is verified against its hash; if a discrepancy is found, the update is promptly rejected, guaranteeing that the data is unaltered and impenetrable. Complete control over the doctor and patient modules is available through the admin application. Only summarized health statuses with explanations (e.g., "Critical – high glucose levels") are visible to doctors. Doctors must submit a request to the administrator if comprehensive patient data is needed. The administrator then assesses the request and only permits access following secure MPIN verification, guaranteeing stringent privacy control. For instance, Health Locker guarantees that sensitive medical data is only accessed with the appropriate authorization, much like a bank locker that needs both a key and manager consent to access valuables. This method produces a highly secure, scalable, and privacy-preserving healthcare management system.

ICRIT116

BIM ANALYSIS USING AZURE CONTENT UNDERSTANDING FOR INTELLIGENT BUILDING DATA EXTRACTION AND DECISION SUPPORT SYSTEM

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Abstract— This paper introduces an advanced Building Information Modelling (BIM) analysis system that employs sophisticated Artificial Intelligence methods to automate the interpretation and assessment of architectural plans. The proposed system allows users to upload both 2D and 3D architectural plans for homes and businesses through a simple interface built with React. The plans are processed using the Azure Content Understanding API after they are uploaded. This API extracts useful information based on predefined schemas and changes unstructured visual data into structured formats that machines can read. The backend, which is written in Python, handles data processing, validation, and organization to make sure that important architectural features like room layouts, sizes, and spatial relationships are extracted correctly. The system solves the main problems with traditional manual analysis, such as taking too long, making mistakes, and not getting smart insights. The proposed solution greatly increases the efficiency and consistency of analysing complex building designs by automating the interpretation process. The app also has a chat-based interface that makes smart suggestions and recommendations based on both real-time input and historical data stored in Excel. By suggesting design changes, pointing out possible problems, and giving users data-driven insights, this feature makes it easier to make decisions. This system shows how AI and BIM can work together to make modern construction analysis more scalable and efficient. It not only makes the work of architects, engineers, and planners easier, but it also helps them be more accurate and productive.

Keywords—BIM, Artificial Intelligence, Azure Content Understanding, Building Plan Analysis, Data Extraction, Smart Construction

ICRIT117

AI-ENABLED STROKE PREDICTION USING FEDERATED LEARNING

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Abstract

Stroke is one of the leading causes of death and long term disability worldwide. Early prediction of stroke is important for timely treatment and risk reduction. In this paper, we propose an AI enabled stroke prediction system using federated learning with camera based analysis. Federated learning is a machine learning approach that ensures data privacy by training models locally without sharing sensitive user data. The proposed system uses health related inputs such as age, BMI, medical history, daily habits, symptoms, and medication intake along with camera, photo, and video inputs. The camera based system analyzes facial features such as face drooping, eye movement, and facial asymmetry to detect early stroke signs. Video analysis helps in identifying facial movements and speech related issues. Instead of collecting all data in a central location, the model is trained locally and only model parameters are shared with a central server. This improves privacy, security, and scalability while maintaining good prediction accuracy. The system is efficient and can be used in real world healthcare applications for early stroke detection and better decision making.

Keywords - Stroke Prediction, Artificial Intelligence, Federated Learning, Camera Based Detection, Healthcare, Data Privacy

ICRIT118

UNICONTROL – A UNIVERSAL SMART REMOTE SYSTEM

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Abstract—UniControl is a smart universal remote system designed to eliminate remote clutter in households, particularly in the Indian context where multiple devices such as televisions, set-top boxes, air conditioners, and fans each require separate remotes. Existing universal remotes fail to support many local and older appliances, creating usability challenges especially for elderly users and children. The proposed solution integrates a hardware-based smart remote powered by an ESP32 microcontroller with a companion mobile application. The system operates using a hybrid approach: a preloaded database of device codes for common brands and a learning mode that captures infrared signals from existing remotes. Commands from the mobile application are transmitted via Bluetooth to the smart remote, which converts them into infrared signals and relays them to the target appliances. The expected outcome is a low-cost, user-friendly, and universally compatible remote system that reduces clutter, simplifies device control, and improves accessibility. UniControl has potential applications in homes, hotels, and offices, offering a scalable and practical solution for unified device management.

Keywords—smart remote; infrared communication; ESP32; Bluetooth; universal remote; IoT

DEPTH ESTIMATION AND DISPARITY PREDICTION USING GAN ARCHITECTURE

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Abstract :

Depth estimation is a fundamental task in computer vision that enables machines to understand the three-dimensional structure of a scene from visual inputs. Traditional depth sensing techniques rely on expensive hardware such as LiDAR and structured-light sensors, which limits their applicability in low-cost and embedded systems. In this work, we propose a lightweight deep learning-based approach for depth estimation and disparity prediction using a Generative Adversarial Network (GAN) architecture. The proposed model, termed DepthGAN, utilizes stereo image pairs to generate dense disparity maps, which are further converted into depth information using stereo geometry principles. The system employs a self-supervised learning framework that eliminates the need for ground-truth depth labels by incorporating photometric reconstruction loss and smoothness constraints. Additionally, adversarial learning is used to enhance the structural realism and accuracy of the generated disparity maps. The model is designed with a computationally efficient encoder-decoder architecture, making it suitable for deployment on embedded platforms such as Jetson Nano. Experimental results demonstrate that the proposed method produces accurate and visually consistent depth maps while maintaining real-time performance. The proposed approach offers a cost-effective, scalable, and efficient solution for depth estimation in applications such as robotics, autonomous navigation, and intelligent vision systems.

REAL-TIME AUTOMATED ATTENDANCE USING DEEPFACE ARCFACE WITH WEB APPLICATION TRACKING AND CONTINUOUS CLASS MONITORING ON WIFI CAMERA

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Abstract: Automated Attendance is a full-stack artificial intelligence-powered student attendance management and classroom behavioural monitoring system developed for institutional deployment. The system addresses the dual challenges of manual attendance taking and the absence of real-time classroom engagement monitoring by integrating multiple state-of-the-art AI models into a single deployment on commodity hardware. The attendance subsystem employs DeepFaceArcFace for biometric face recognition, achieving 97.8% precision on a 45-student cohort. A multi-frame voting mechanism requires three consecutive frames to agree on the same identity before accepting a recognition, reducing the false positive rate from 4.1% to 0.3%. An adaptive gap-check algorithm dynamically scales the confidence margin threshold based on enrolled student count. Person counting and phone detection, MediaPipeFaceLandmarker with Eye Aspect Ratio analysis for drowsiness detection, and Farneback Dense Optical Flow for activity recognition covering fighting, running, and jumping. A per-student attention scoring pipeline aggregates head-pose, sleep, and phone-usage data into engagement scores from 0 to 100 percent. An automated Gmail SMTP alert engine notifies parents of absences, late entries, and in-class behavioural events in real time. The system operates on a standard laptop and a single CP Plus 4MP WiFi camera with no GPU requirement, achieving 97.1% F1-score for face recognition and end-to-end latency under 550 milliseconds.

Keywords: Face Recognition, ArcFace, Attendance Management, Classroom Monitoring, YOLOv8, MediaPipe, Optical Flow, Attention Scoring, WiFi Camera, Flask, SQLite

SMART PRIORITY PREDICTION SYSTEM FOR EMERGENCY EVACUATIONS IN UNDERSERVED REGIONS

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Abstract

Access to timely emergency healthcare in underserved regions that include rural, island, and hilly areas face a persistent challenge due to inadequate healthcare infrastructures, delayed transportation from primary health centers (PHCs) to urban mainland hospitals, and poor coordination between PHCs and mainland hospitals. This paper introduces a Smart Priority Prediction System (SPPS) that integrates predictive patient monitoring with automated, priority-based medical evacuation with registered patient data. The system continuously tracks patient vital signs like SpO₂, heart rate, respiratory rate, blood pressure, and temperature collected during routine PHC visits and processes them through a Priority Prediction Module (PPM) that combines Exponential Weighted Moving Average (EWMA), Linear Regression trend analysis, and Z-Score anomaly detection to generate a weighted risk score (0–100). Based on this score and identified patterns in the deterioration, the PPM automatically classifies patients into categories like Stable, Observe, or Critical, and triggers transport dispatch and hospital pre-notification for critical cases using real time data. Our analytical evaluation demonstrates a significant reduction in decision-making time by 40–55% and emergency evacuation response time by 30–45% relative to existing and conventional manual systems practiced. The proposed system directly addresses preventable mortality problems in underserved regions of India, where over 30% of avoidable deaths are linked to delayed emergency response and where rural EMS times can exceed 90 minutes which is over four times longer in time than urban settings.

Keywords — Underserved Regions, Priority Prediction Module (PPM), EWMA, Risk Scoring, Predictive Triage, Emergency Evacuation, Rural Healthcare.

AI NUTRITION INTELLIGENCE SYSTEM

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Abstract

Efficient monitoring of nutritional intake and crop quality is essential for improving public health and reducing diet-related diseases. However, existing systems rely on generalized dietary guidelines, disconnected agricultural planning, and limited personalization, leading to ineffective nutrition management and poor health outcomes. These limitations prevent accurate alignment between food production and human health needs. This paper proposes an AI-Based Nutrition Intelligence Platform, a centralized web-based solution that integrates crop quality analysis, personalized nutrition recommendation, and health outcome prediction using machine learning techniques. The system enables automated data collection, preprocessing, classification, and predictive analysis using models such as Logistic Regression and regression-based forecasting. It also incorporates a Health Impact Forecast Module, crop optimization suggestions for farmers, and a dynamic nutrition scoreboard for real-time monitoring. The system ensures practical applicability by considering seasonal availability, regional crop data, and user budget constraints. By linking agriculture, nutrition, and healthcare into a unified framework, the proposed system improves decision-making, enhances health outcomes, and provides a scalable solution for population-level nutrition management. **Keywords** – Nutrition Intelligence, Machine Learning, Health Prediction, Crop Optimization, Personalized Diet, AI in Agriculture, Predictive Analytics, Web Application.

ICRIT123

AN IOT-ENABLED SMART FALL DETECTION AND EMERGENCY ALERT SYSTEM FOR ELDERLY SAFETY

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Abstract: There is a growing demand for dependable systems that can keep an eye on the health and safety of senior citizens residing on their own. One of the most frequent and hazardous situations involving senior citizens is falls, which can result in severe injuries if help is not received right once. An IoT-enabled smart fall detection and health monitoring system intended to increase senior safety is presented in this research. An IMU sensor is used by the recommended system to identify abrupt changes in posture and body movement that point to a fall. Additionally, the user's vital health factors are constantly tracked via body temperature and heart rate sensors. The device instantly sends an emergency alert via WhatsApp along with the user's GPS location when it detects a fall or other anomalous situation, allowing family members or caretakers to react promptly. The amalgamation of sensing technologies, IoT connectivity, and real-time communication offers an economical and effective way to monitor continuously and respond to emergencies more quickly, eventually promoting safer and more independent living for senior citizens.

Keywords— IoT, Fall Detection, Elderly Safety, IMU Sensor, Health Monitoring, Emergency Alert System.

ICRIT124

CONTEXT - AWARE RECURSIVE VIDEO RETRIEVAL: AN AGENTIC GRAPH APPROACH TO VIDEO UNDERSTANDING

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Abstract: This paper presents a comprehensive agent-driven multimodal video retrieval system, engineered to enhance the search and retrieval of pertinent video segments by utilizing both visual and textual modalities. The system is a web application built on Flask that includes a CLIP-based vision-language encoder, FAISS vector indexing, transcript-aware hybrid search, and a LangGraph-driven multi-agent orchestration module. The retrieval process starts by taking samples of video frames at regular intervals and encoding them with the pretrained openai/clip-vit-base-patch32 model. This creates L2-normalized embeddings, which makes it easy to use FAISS to search for cosine similarity. Along with visual features, timestamp-aligned speech transcripts and automatically generated frame-level visual captions are stored as metadata. This helps to better understand the context of each video segment. A hybrid search engine combines vector similarity scores with transcript keyword matching. It uses a weighted strategy, with 0.7 for visual features and 0.3 for text data. When both modalities show alignment, an extra boost of 1.2 times is added to make sure the retrieval is more accurate. Then, a large language model (LLM)-powered evaluator agent looks at the candidate segments and gives them a semantic alignment score (0–100) based on the combined metadata. This mechanism looks at two- and four-second offsets before and after the current match to find more accurate results. The agent graph can handle up to three reasoning cycles. If no good match is found after that, a fallback vector search with motion-aware re-ranking is done. The final results are verified timestamps and automatically made video clips that match the segments that were found. In general, this system shows how to use agentic, multimodal retrieval with iterative refinement and hybrid ranking. It is a good way to solve complicated video search problems. **Keywords:** Multimodal Video Retrieval, Vision-Language Models, Hybrid Search, Agentic AI, CLIP Embeddings, Automatic Speech Recognition, Visual Captioning, Vector Similarity Search, Context-Aware Ranking Temporal localization

AI-DRIVEN POWER TRANSFORMER INEFFICIENCY DETECTION AND ENERGY OPTIMIZATION

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Abstract — Power transformers play a critical role in electrical power systems by ensuring efficient transmission and distribution of electricity. However, inefficiencies in transformers due to factors such as overloading, temperature rise, voltage fluctuations, and aging components can lead to significant energy losses, reduced performance, and increased operational costs. Traditional monitoring methods rely on manual inspection and basic threshold-based systems, which are not capable of detecting early-stage inefficiencies or handling large-scale real-time data effectively. This project proposes an AI-Driven Power Transformer Inefficiency Detection and Energy Optimization System to address these challenges. The system utilizes machine learning algorithms to continuously monitor key transformer parameters such as load, voltage, temperature, power factor, and energy consumption. By analyzing these parameters, the system can identify abnormal patterns, detect inefficiencies at an early stage, and predict potential faults before they lead to failures. The proposed system follows a structured approach that includes data collection from sensors or datasets, preprocessing, feature engineering, model training, and real-time prediction. Machine learning algorithms such as Random Forest, Support Vector Machine (SVM), Decision Tree, and Artificial Neural Networks are used to improve detection accuracy and reliability. Technologies such as Python, Pandas, NumPy, Scikit-learn, and TensorFlow/Keras are used for implementation.

Keywords: Artificial Intelligence , Machine Learning , Artificial Neural Network , Internet of Things , Application Programming Interface , Root Mean Square Error

RESUMECRAFT – BEST RESUME BUILDER AND SCREENER USING NLP AND ML

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Abstract— This paper presents ResumeCraft, a web-based application designed to assist users in creating, editing, and screening resumes using Natural Language Processing (NLP) and Machine Learning (ML) techniques. The system provides an integrated platform that simplifies the resume development process while enhancing its effectiveness for job applications. It begins with a user-friendly landing interface that guides individuals through the various functionalities of the system. The application includes a built-in resume editor with customizable templates, enabling users to design and modify resumes in a structured and visually appealing format, similar to modern design tools. Users can easily generate, update, and download resumes in multiple formats suitable for professional use. In addition to resume creation, the system incorporates a keyword recommendation module that suggests role-specific skills and terms based on industry requirements. This feature helps users improve resume quality and ensures better compatibility with Applicant Tracking Systems (ATS), which are widely used for automated resume filtering. The system applies preprocessing techniques such as text cleaning, tokenization, and feature extraction using TF-IDF to improve classification accuracy and relevance. Furthermore, the application provides real-time feedback to users, allowing them to refine their resumes based on predicted outcomes and keyword suggestions. By combining resume building, keyword optimization, and automated screening into a single platform, ResumeCraft offers a comprehensive solution for job seekers. The system is designed to be scalable and adaptable across multiple domains, allowing users from different professional backgrounds to benefit from its features. It also enhances usability by providing a seamless and intuitive experience for both beginners and experienced users.

ICRIT127

DESIGN OF FAULT TOLERANT ACTIVE POWER CONTROL SYSTEM FOR RURAL ELECTRIFICATION

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Abstract: A fault-tolerant active power control system is essential for ensuring reliable and continuous power delivery in electrical systems, especially under fault conditions. This project presents the design and implementation of a microcontroller-based fault-tolerant power control system using an Arduino controller, solid-state relays (SSR), voltage and current sensing units, and dual transformer-based power sources. The system continuously monitors voltage and current parameters through sensors and processes the data using the controller to detect abnormal conditions such as overload, short circuit, or voltage fluctuations. Upon detection of a fault, the controller isolates the faulty section using SSRs and seamlessly switches to an alternate power path to maintain uninterrupted supply. Additionally, load management is achieved by controlling connected devices such as lamps and fans based on real-time power conditions. The system also displays operational parameters and fault status on an LCD for user monitoring. This approach enhances system reliability, minimizes downtime, and improves safety in power distribution applications. The proposed system is cost-effective, scalable, and suitable for smart grid and industrial automation environments.

ICRIT128

SUSTAINABLE BIO-ETHANOL PRODUCTION USING NANO-CATALYSTS FROM AGRICULTURAL WASTE

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ABSTRACT

The escalating global energy demand, coupled with the rapid depletion of fossil fuel reserves and the intensifying threat of environmental degradation caused by greenhouse gas emissions, has necessitated the urgent development of sustainable, clean, and renewable energy alternatives. Bio-ethanol, a fermentation-derived alcohol fuel (C_2H_5OH), has emerged as one of the most promising candidates to supplement or replace conventional petroleum-based fuels in the transportation and industrial sectors. The present study investigates and demonstrates an optimized process for the sustainable production of bio-ethanol from low-cost, abundantly available agricultural waste materials — particularly rice husk, sugarcane bagasse, corn cobs, and wheat straw — utilizing novel nano-catalyst technology to enhance reaction efficiency and overall yield. The fermentation of SCNP hydrolysates yielded ethanol concentrations of 29–35 g/L with theoretical yields of 81–87%. Post-distillation and molecular sieve dehydration produced anhydrous bio-ethanol with purity exceeding 99.5% (v/v), meeting IS 15464:2004 fuel-grade ethanol specifications. Life cycle analysis estimated GHG emissions of 15–22 g CO_2 eq./MJ for the proposed process — approximately 80–84% lower than petrol (93 g CO_2 eq./MJ). Preliminary techno-economic analysis indicates a production cost of INR 38–45 per litre at 10,000 L/day scale. The study conclusively establishes that nano-catalyst-mediated bio-ethanol production from agricultural waste is technically feasible, economically viable, and environmentally superior to fossil fuel combustion, making a compelling case for its adoption within India's Ethanol Blending Programme framework. **Keywords:** Bio-ethanol, Nano-catalyst, Agricultural waste, Lignocellulosic biomass, Sulfonated carbon nanoparticles, Hydrolysis, Fermentation, *Saccharomyces cerevisiae*, Sustainable energy, Green fuel.

FPGA-BASED WIRELESS HOME AUTOMATION SYSTEM USING VERILOG HDL AND FINITE STATE MACHINES

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Abstract—This paper presents the design and implementation of an FPGA-based wireless home automation system using Verilog Hardware Description Language (HDL). The proposed system integrates multiple sensor modules to address the dual objectives of residential safety and security. Safety is enforced through real-time monitoring of temperature and luminosity, while security is achieved via automated door locking, passive infrared (PIR)-based intrusion detection, and fire alarm activation. The system employs Finite State Machine (FSM) methodology to orchestrate sequential, priority-driven control among the door module, fire alarm module, temperature controller, and luminosity controller. A password-protected door locking mechanism with recovery support through a unique key addresses the practical concern of credential loss. The FPGA platform—specifically the Basys 3 board featuring the Xilinx Artix-7 device—was selected for its reconfigurability, real-time processing capability, and rich peripheral ecosystem. The entire digital design was synthesized and verified through pre-synthesis, post-synthesis, and post-layout simulations in Xilinx Vivado, ModelSim, and Cadence SimVision. The resulting RTL schematic and simulation waveforms confirm functional correctness and agreement with theoretical predictions. The system is low-cost, scalable, and readily extensible to additional sensors and appliances, making it a viable foundation for intelligent residential automation.

Index Terms—FPGA, Verilog HDL, Home Automation, Finite State Machine, IoT, PIR Sensor, Fire Alarm, Temperature Control, Luminosity Control, Basys 3, Xilinx Artix-7, Smart Home Security

URL SHIELD - INTELLIGENT FAKE URL DETECTION AND RISK PREDICTION SYSTEM

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Abstract— More people go online every day, yet hidden dangers climb just as fast. Deceptive web addresses sneak into messages, aiming to trick folks instead of helping them. Old ways of blocking bad sites fall short since they only catch what they've seen before. New tricks pop up faster than those lists can keep pace. Smart tools must step in - learning patterns, spotting red flags the moment they appear. These helpers work live, stopping harm before it spreads further. Facing this issue head-on, URL Shield steps in - a tool built to spot if web addresses look risky. Instead of just saying yes or no, it sorts them into one of four buckets: harmless, fake login pages, infected sites, or junk links. What makes it work? Several smart algorithms team up using a method called soft voting. Picture this - predictions come together like voices in a choir, each carrying weight based on confidence. Among those voices are Random Forest with half a thousand tiny decision trees, Extra Trees bringing three hundred more, alongside Gradient Boosting also tuned at three hundred. All these parts learn from around 1,300 real examples of URLs that experts already tagged correctly. What stands out about the system is how it builds its data from URLs. From every link, it pulls fifty-nine separate traits - things like word shapes, layout details, safety markers, hints in the text, along with language styles. Without loading the page itself or calling outside services, it does all this on its own. Speed comes naturally when there are no delays waiting for web responses. When it comes to how well it works, URL Shield hits 97.94% correct answers on test samples, while managing 98.76% across five rounds of validation testing. It beats deep learning methods like LSTM at 93.04%, GRU coming in at 92.95%, along with CNN scoring 94.47%. What also stands out is its ability to assign a threat level between 1 and 99, then lay out straightforward reasons behind each call it makes. Not once has it missed a threat. That kind of consistency turns it into something real - something usable every day.

DIGITAL TRANSFORMATION OF TENANT AND BILLING MANAGEMENT SYSTEM

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Abstract

The Digital Transformation of Tenants and Billing Management System is a web-based application designed to modernize and streamline the management of tenant information and billing processes. The application enables administrators to manage tenant details, including personal information, rental agreements, and occupancy status, in a centralized database. It also facilitates efficient billing management by generating automated invoices, tracking payments, and maintaining financial records with accuracy and transparency. A key feature of the system is its ability to digitize the entire billing lifecycle, from invoice generation to payment tracking and receipt management. The platform supports real-time updates, notifications for due payments, and reminders, helping to reduce delays and improve communication between tenants and management. As part of the proposed system, the platform includes a digital visitor management module that allows visitors to register through QR code scanning at the apartment entrance. Visitor requests are sent in real time to tenants for approval or rejection, ensuring controlled and secure access. The system records visitor entry and exit times, maintains centralized visitor logs for security monitoring, and enhances apartment safety by permitting only approved visitors. Role-based access is provided for administrators, security staff, and tenants to manage visitor activities effectively. Additionally, the system provides reporting and analytics features to monitor payment history, outstanding balances, and overall financial performance. Built using React.js, Node.js and PostgreSQL, and modern web technologies, the system ensures reliability, cost-effectiveness, and ease of deployment. Overall, the Digital Transformation of Tenants and Billing Management System offers an efficient and organized solution for managing tenant data and billing operations, enhancing transparency, reducing manual workload, and supporting better decision-making in property management.

Keywords—Tenant Management, Billing System, Digital Transformation, Rent Automation, Web Application

RESUME SCREENING SYSTEM

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Abstract—The Resume Screening System is an innovative, AI-powered tool that aims to speed up the hiring process. The current resume screening process is time-taking and prone to human bias, particularly when there are a large number of applicants. This study focuses on the issues of efficiently assessing, retrieving, and evaluating important information from candidate resumes. It compares the system to ensure that only the most relevant profiles according to the job requirements are shortlisted. Present screening systems will only match exact keywords; our system understands the meaning behind the words to match candidates based on the context. The goal of this system is to provide an accurate and time-saving tool for recruiters that will improve decision-making during the hiring process. The system can be integrated into existing HR platforms, or it can be utilized independently by small and medium scale organizations. In the end, this system will not only reduce the manual workload but also improve the quality of hiring by ensuring that best-fit candidates are prioritized. **Keywords**— Resume Screening, Semantic Matching, Candidate Shortlisting, Skill-Based filtering, Job-Profile Matching.

AN INTELLIGENT AUTOMATED SYSTEM FOR PLACEMENT & INTERNSHIP DISCOVERY

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Abstract

In today's competitive job market, final-year students often struggle to find suitable internship and placement opportunities that match their skills and career interests. Traditional job portals lack personalization and require repetitive manual input, making the process time-consuming and inefficient. This paper presents "An Intelligent Automated System for Placement & Internship Discovery" a web-based application that simplifies internship searching through automation and intelligent techniques. The system uses resume parsing to automatically extract key details such as skills, qualifications, interests, and location from uploaded resumes, reducing manual effort and improving accuracy. The system performs skill-gap analysis to identify missing competencies and provides personalized recommendations for relevant internships and placements. It also incorporates Natural Language Processing (NLP) to enable users to search using simple, conversational queries. Additionally, the system checks user eligibility for each opportunity. Eligible students can apply directly, while ineligible students receive clear feedback and suggestions, such as recommended courses, to improve their skills. Role-based access ensures efficient management for both students and administrators. Overall, the proposed system enhances efficiency, personalization, and user experience, effectively bridging the gap between student capabilities and industry requirements.

Keywords— Internship Recommendation, Placement System, Resume Parsing, Skill Gap Analysis, Natural Language Processing (NLP), Internship Matching, Personalized Recommendation System.

IOT BASED SMART FARMING WITH DISEASE PREDICTION

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Abstract

Agriculture plays a crucial role in economic growth and food production. However, crop yield is often affected by plant diseases and improper environmental conditions. This paper presents an intelligent smart farming system that integrates Internet of Things (IoT) technology with deep learning for real-time crop monitoring and disease detection. The system continuously collects environmental parameters such as soil moisture, temperature, and humidity to evaluate crop health. Additionally, leaf images are analyzed using a Convolutional Neural Network (CNN) to detect plant diseases at an early stage. Based on the analysis, the system provides treatment recommendations and activates an automated spraying mechanism for precise chemical application. This approach reduces manual effort, minimizes pesticide usage, and improves agricultural productivity while promoting sustainable farming practices.

COCONUT QUALITY DETECTION USING YOLOV8 WITH A WEB BASED SYSTEM

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Abstract—The Coconut Quality Detection System is an intelligent image-based classification solution developed using the YOLOv8 deep learning object detection algorithm to automatically identify and classify coconuts into three categories: Dry, Green, and Tender. Coconut grading plays a vital role in agricultural production and supply chain management; however, traditional manual grading methods are time-consuming, inconsistent, and subjective, often leading to inaccurate classification and reduced efficiency in large-scale operations. To address the limitations, the proposed system utilizes a YOLOv8-based model trained on a labeled dataset organized into training, validation, and testing splits. Image preprocessing techniques such as resizing, normalization, and augmentation are applied to enhance model performance and robustness. The trained model is evaluated using standard performance metrics, including precision, recall, and mean Average Precision (mAP), to ensure accurate and reliable classification results. The best performing model is integrated into a Flask-based web application with a user-friendly interface developed using Bootstrap and Jinja2 templating. The system is deployed on the Render cloud platform, enabling real-time detection of coconut quality that is accessible from many internet-enabled devices without requiring specialised hardware. The deployment ensures scalability, ease of access, and practical usability for farmers and agricultural stakeholders. Experimental results demonstrate high classification accuracy, achieving strong precision, recall, and mAP50 values across all categories. The system significantly improves grading efficiency, consistency, and processing speed compared to traditional manual methods. Overall, the proposed solution provides a scalable, automated, and reliable approach for intelligent agricultural quality assessment, highlighting the potential of deep learning and cloud-based technologies in modernizing agricultural practices.

Keywords – Coconut Quality Detection, Deep Learning, Object Detection, Flask, Web Deployment, Computer Vision.

IOT ENABLED SMART HELMET

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Abstract— This paper presents the design and implementation of an IoT-enabled smart helmet aimed at improving road safety through real-time monitoring and automated alert systems. The proposed system integrates an alcohol detection sensor to identify whether the rider is under the influence, along with a helmet-wearing detection mechanism to ensure safety compliance. The system is designed to enable vehicle ignition control only when the rider wears the helmet and does not exceed permissible alcohol limits. An accident detection module, utilizing vibration and motion sensors, is incorporated to identify crashes instantly. In the event of an accident, the system activates a buzzer alert and sends an SMS notification with the rider's real-time location to predefined emergency contacts using IoT communication modules. The proposed solution is cost-effective, scalable, and suitable for real-world implementation, contributing to enhanced emergency response and reduced road accident fatalities.

Index Terms— IoT, Smart Helmet, Alcohol Detection, Accident Detection, GPS, GSM, Rider Safety, Emergency Alert System, Helmet Detection, Road Safety

AI BASED EMOTIONAL HEALTH MONITORING SYSTEM

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Abstract : Mental health issues have become a major concern in today's fast-changing digital world, affecting emotional stability, productivity, and overall well-being. Traditional mental health systems are mostly reactive and depend on self-reported information and delayed medical evaluation, which may not always be accurate or timely. To address these limitations, this project proposes an AI-Based Emotional Health Monitoring System designed as a web-based platform for real-time emotion detection and continuous monitoring. The main objective of the system is to provide a proactive approach to mental health analysis by collecting and analyzing multimodal data such as facial expressions, voice signals, and user interactions. Unlike conventional systems, this approach enables continuous tracking of emotional states, allowing early identification of conditions such as stress, anxiety, and depression. The system uses advanced Artificial Intelligence techniques for emotion detection. Facial emotion recognition is performed using Convolutional Neural Networks (CNN), while speech emotion analysis is carried out using MFCC feature extraction combined with machine learning models. Additionally, Natural Language Processing (NLP) is applied through a chatbot interface to analyze text-based inputs and provide emotional support. The outputs from all modules are combined using a multimodal approach to improve accuracy and reliability. The architecture includes a database for storing emotional history and a user interface for displaying results and insights. The system classifies emotions into different categories such as positive, neutral, and negative based on intensity and patterns. The results are presented in an interactive format to help users and healthcare professionals monitor emotional trends effectively. Experimental results show that combining multiple input sources improves emotion detection accuracy compared to single-input systems. The system supports real-time processing with low latency, making it suitable for continuous monitoring.

Keywords— Artificial Intelligence, Emotion Recognition, Multimodal Learning, Facial Emotion Recognition (FER), Speech Emotion Recognition (SER), Natural Language Processing (NLP), MFCC Feature Extraction, Convolutional Neural Network (CNN), Chatbot System, Mental Health Monitoring, Real-Time Emotion Detection, Healthcare Analytics.

ECHODINE: VOICE-GUIDED FOOD ORDERING AND INDOOR NAVIGATION FOR VISUALLY IMPAIRED

Student Name : Mohamed Gani J , Dr. K. M. N. Syed Ali Fathima

Abstract : ECHODINE is a Flutter-based mobile application designed to support visually impaired individuals by providing a fully voice-controlled and accessible smart assistant experience. In the existing system, visually impaired users mainly depend on human assistance, basic screen readers, or separate applications for navigation, object detection, and food ordering, which are often not fully accessible and require switching between multiple apps, making daily tasks difficult and inefficient. The proposed ECHODINE system overcomes these limitations by integrating voice-guided indoor navigation, real-time object detection using the device camera, and a voice-enabled food ordering module into a single platform. Users can interact with the application entirely through voice commands to navigate indoor environments, identify nearby objects with audio feedback, listen to nearby hotels and available dishes, place and confirm food orders, and track order status. By combining speech recognition, text-to-speech, and computer vision technologies, ECHODINE provides a hands-free, intuitive, and user-friendly solution that significantly enhances accessibility, independence, and convenience for visually impaired users in performing daily activities.

ICRIT139

DEVELOPMENT AND ANALYSIS OF Mg-Al HYBRID COMPOSITES REINFORCED WITH BAGASSE

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Abstract: The increasing demand for lightweight, high-performance materials in aerospace, automotive, and structural applications has driven significant interest in magnesium(Mg) matrix composites. This project focuses on the development and analysis of magnesium-aluminium (Mg-Al) based metal matrix composites (MMCs) reinforced with bagasse particles, aiming to enhance mechanical and tribological properties while maintaining low density. Graphite, known for its excellent lubricating and thermal properties, is selected as the reinforcing phase to improve wear resistance, reduce friction, and provide solid lubrication. The composites are fabricated using the Ball Milling, ensuring uniform distribution of graphite within the Mg-Al matrix. Various weight percentages of graphite (e.g., 0.1%, 0.2%, 0.3%) are added to study the influence of reinforcement content on the composite properties. Comprehensive characterization is performed through mechanical testing (hardness, tensile strength), microstructural analysis (using optical microscopy and scanning electron microscopy), and wear testing (pin-on-disc method). The results reveal a trade-off between strength and ductility with increasing graphite content, alongside noticeable improvements in wear resistance and reduced friction coefficients. This study demonstrates that Mg-Al/graphite composites have significant potential for applications requiring lightweight materials with improved wear performance and adequate mechanical strength. Further optimization of process parameters and reinforcement distribution can lead to more efficient material designs for industrial applications.

ICRIT140

NEPHROSENSE: REAL-TIME KIDNEY HEALTH MONITORING AND CKD RISK PREDICTION USING IOT AND MACHINE LEARNING

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Abstract— Chronic Kidney Disease (CKD) is a dangerous and chronic condition that grows very slowly and rarely shows any obvious symptoms. Hence, many individuals detect this condition only at a later stage when treatment is complex and expensive. Early diagnosis and regular monitoring are essential to prevent associated risks and health concerns. This paper proposes NephroSense—a smart IoT system with machine learning which can predict the risk of CKD and monitor the kidney health of an individual in real-time. The system is an integration of ESP32 and MAX30102 and DS18B20 sensors used for monitoring basic health parameters such as heart rate, SpO₂ and temperature of a patient. The signals obtained are then passed through Kalman Filter for removal of noise and improved signal values. This data is then transmitted over Wi-Fi using MQTT protocol to a cloud-based server built using FastAPI. For predicting CKD, a model is trained using the UCI CKD dataset containing relevant medical data of a patient including blood pressure, haemoglobin, creatinine and albumin level. The risk of CKD is predicted using a Random Forest model achieving up to 95-98% accuracy and the selected most relevant features for prediction. The system provides the results of the predicted risk and monitored health parameters on a user-friendly dashboard built with React and Tailwind CSS. Alerts are generated and sent over SMS and WhatsApp to patients using Twilio service whenever the monitored health parameters deviate from normal values.

Keywords – CKD, IoT, ESP32, Machine Learning, Random Forest, Core Prediction Model, Health Monitoring

WEB-BASED INTERNSHIP & PLACEMENT MANAGEMENT SYSTEM

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Abstract: The increasing demand for efficient internship management has led to the development of digital platforms that connect students and organizations. Traditional methods of internship placement are often manual, time-consuming, and lack proper coordination, resulting in inefficiencies for both students and recruiters. Students face challenges in identifying suitable internship opportunities based on their skills and interests, while organizations encounter difficulties in selecting appropriate candidates from a large pool of applicants. This paper presents the design and development of a web-based internship placement management system that aims to streamline the entire internship process. The proposed system provides a centralized platform where students can register, create detailed profiles, and explore available internship opportunities. It enables students to apply for internships online and track their application status in real time. On the other hand, organizations can post internship openings, specify requirements, and manage applications efficiently through an admin interface. The system is developed using modern web technologies, with Ionic and Angular used for the frontend to provide a responsive and user-friendly interface, and Django used as the backend framework to handle business logic and data processing. A MySQL database is used to store user information, internship details, and application records securely. Experimental evaluation of the system demonstrates improved performance in terms of reduced processing time and better organization of data compared to traditional methods. The system also provides a simple and intuitive user interface, making it suitable for users with varying levels of technical expertise. In conclusion, the developed web-based internship placement management system offers an effective solution to the challenges faced in traditional internship processes. It simplifies the interaction between students and organizations, improves overall efficiency, and provides a foundation for further enhancements in the field of digital recruitment systems.

Keywords— Internship portal, web-based system, placement management, student portal, online application, recruitment system

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Abstract : The Increasing Need For Cooling, Particularly Air Conditioning, Is Driving A Significant Rise In Building Energy Consumption. This Surge In Demand often leads to peak loads, straining power grids and increasing cost. Cold thermal energy storage systems, especially those utilizing phase change materials (CAPRIC ACID) are widely used for thermal energy storage to improve building cooling performance. This study presents an experimental investigation of PCM for building cooling applications with continuous observation over a period of 14 days. The main objective is to evaluate the effectiveness of PCM in reducing indoor temperature and maintaining thermal comfort. In this experiment, a suitable PCM with a melting temperature close to room temperature is selected and integrated into a test chamber model. Temperature sensors are placed to record indoor and outdoor temperature variations. This continuous cycle helps in maintaining a stable indoor temperature and improves thermal comfort. Readings are taken continuously for 14 days at regular intervals to analyze the heat absorption and heat release behavior of the PCM. This project aims to evaluate the effectiveness of PCM in reducing cooling load and improving energy efficiency in buildings. By analyzing the experimental data collected over 14 days, the results provide a clear understanding of the thermal performance of PCM. This project highlights the importance of PCM as a sustainable solution for modern building cooling systems, especially in regions with high temperature conditions. The collected data shows that during daytime, PCM absorbs excess heat by changing its phase from solid to liquid, thereby reducing the indoor temperature. During nighttime, the PCM releases

stored heat as it solidifies. The 14-day readings clearly indicate a reduction in peak indoor temperature.

ICRIT143

DEVELOPMENT AND ANALYSIS OF Mg-Al COMPOSITE REINFORCED WITH GRAPHITE

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Abstract

The increasing demand for lightweight, high-performance materials in aerospace, automotive, and structural applications has driven significant interest in magnesium (Mg) matrix composites. This project focuses on the development and analysis of magnesium-aluminium (Mg-Al) based metal matrix composites (MMCs) reinforced with graphite particles, aiming to enhance mechanical and tribological properties while maintaining low density. Graphite, known for its excellent lubricating and thermal properties, is selected as the reinforcing phase to improve wear resistance, reduce friction, and provide solid lubrication. The composites are fabricated using the Ball Milling, ensuring uniform distribution of graphite within the Mg-Al matrix. Various weight percentages of graphite (e.g., 0.1%, 0.2%, 0.3%) are added to study the influence of reinforcement content on the composite properties. Comprehensive characterization is performed through mechanical testing (hardness, tensile strength), microstructural analysis (using optical microscopy and scanning electron microscopy), and wear testing (pin-on-disc method). The results reveal a trade-off between strength and ductility with increasing graphite content, alongside noticeable improvements in wear resistance and reduced friction coefficients. This study demonstrates that Mg-Al/graphite composites have significant potential for applications requiring lightweight materials with improved wear performance and adequate mechanical strength. Further optimization of process parameters and reinforcement distribution can lead to more efficient material designs for industrial applications

ICRIT144

MULTI DEVICE DIABETES LOG SYSTEM WITH HARDWARE LINKED SECURITY

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Abstract

Conventional healthcare systems are susceptible to data breaches and illegal access because they frequently rely on passwords and centralized storage. By offering a secured, hardware-linked digital medical safe that does away with password-based security, Health Locker tackles this problem. Instead, a SHA-256-generated identification derived from the Android ID is used to link each patient account to a specific device. By integrating RSA for secured data transmission with ECDSA for device authentication, the system employs hybrid cryptography to make sure that only devices that have been validated can access or alter records. By processing vitals in volatile memory, the patient application safely gathers health data and executes real-time AI-based assessments (such as "Stable" or "Hyperglycemic") without permanently storing crucial raw data. On the administrative side, the system uses hash values that have already been saved in the database to confirm data integrity. Every update request—which includes patient inputs as well as login credentials—is verified against its hash; if a discrepancy is found, the update is promptly rejected, guaranteeing that the data is unaltered and impenetrable. Complete control over the doctor and patient modules is available through the admin application. Only summarized health statuses with explanations (e.g., "Critical – high glucose levels") are visible to doctors. Doctors must submit a request to the administrator if comprehensive patient data is needed. The administrator then assesses the request and only permits access following secure MPIN verification, guaranteeing stringent privacy control. For instance, Health Locker guarantees that sensitive medical data is only accessed with the appropriate authorization, much like a bank locker that needs both a key and manager consent to access valuables. This method produces a highly secure, scalable, and privacy-preserving healthcare management system.

Keywords: Artificial Intelligence, Asymmetric encryption, Data Minimization, Digital Signature, Hardware linking, Hybrid cryptography, Non Repudiation, Stateless Security, Transport Layer Security

ICRIT145

AN AI ENABLED FRAMEWORK FOR SPATIOTEMPORAL QUERY PROCESSING IN DUAL MOBILITY WIRELESS SENSOR NETWORK

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Abstract—Dual-mobility Mobile Wireless Sensor Network (MWSN) are increasingly adopted in smart agriculture to support adaptive and large-scale data acquisition, yet they offer limited capability for efficient spatiotemporal query execution. To overcome this limitation, this paper introduces AI-SQF, a lightweight intelligent framework designed to support real-time, SQL-like spatiotemporal queries in dynamic agricultural environments. The framework employs LSTM-based mobility prediction for cluster formation, Q-learning-driven multi-sink movement strategies for responsive data access, and NSGA-II-based multi-objective optimization to jointly optimize latency, energy usage, and coverage. Each cluster head maintains a 50×50 m grid-based spatiotemporal metadata index, enabling mobile sinks to resolve queries locally—such as retrieving soil moisture information from a specified zone over a recent time window—thereby significantly reducing communication overhead. Performance evaluation was carried out over a large-scale agricultural field using real-world datasets derived from NASA SMAP and MODIS sources. In comparison with static sink, KNN-based, and DRL-based baseline approaches, the framework exhibits notable overall performance improvements with statistical significance. Furthermore, robustness analysis indicates that AI-SQF sustains reliable data delivery even under conditions of sensor node failure, underscoring its effectiveness for dependable and real-time smart agriculture applications.

Keywords—Dual Mobility Wireless Sensor Networks, Spatiotemporal Indexing, Predictive Clustering, Q-learning, NSGA-II, Quality of Service (QoS)

ICRIT146

AN EFFECTIVE AI-BASED FRAMEWORK FOR DETECTING PHISHING ATTACKS ON ONLINE PLATFORMS

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Abstract: Phishing attacks have become one of the most serious cybersecurity threats, where attackers use deceptive URLs and fake websites to steal sensitive user information such as login credentials and financial data. Traditional detection techniques such as blacklists, whitelists, and rule-based systems are often ineffective against newly emerging phishing attacks and zero-day threats. To address these limitations, this research proposes an intelligent phishing detection framework that combines Natural Language Processing (NLP) with an ensemble machine learning approach. The proposed system extracts important lexical and structural features from URLs using NLP techniques. These features are then used to train multiple machine learning classifiers, including Support Vector Machine (SVM), Random Forest (RF), and Decision Tree (DT). The ensemble model combines the predictions of these classifiers to improve detection accuracy and reliability. Experimental results demonstrate that the proposed system achieves high performance with an accuracy of approximately 97.8%, effectively identifying phishing URLs while minimizing false positives. In addition to phishing detection, the framework integrates Advanced Encryption Standard (AES) encryption to protect

sensitive user data such as browsing history and stored URLs. The proposed framework provides a scalable and efficient solution for real-time phishing detection and contributes to improving cybersecurity in online platforms.

Keywords - Phishing Detection, Machine Learning, Natural Language Processing(NLP), Support Vector Machine (SVM), Random Forest, Decision Tree, Cybersecurity, URL Analysis, AES Encryption

ICRIT147

ENHANCING OXIDATION STABILIZATION OF BIODIESEL AND DIESEL BLENDS WITH ROSEMARY EXTRACT NATURAL ANTIOXIDANTS USING FTIR SPECTROSCOPY

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Abstract

This Study Investigates The Enhancement Of Oxidation Stability In Biodiesel and Diesel Blends Through The Incorporation Of Natural Antioxidants Derived From rosemary Extract. Oxidation Stability Is A Critical Factor Influencing The performance And Storage Life Of Biodiesel Fuels. By Integrating Rosemary Extract, Known For Its Potent Antioxidant Properties, The Project Aims To Reduce Oxidative degradation And Improve Fuel Longevity. Fourier Transform Infrared (Ftir) Spectroscopy Was Employed To Analyze The Chemical Changes And Monitor The oxidation Process Within The Fuel Blends. The Results Demonstrate That Rosemary extract Effectively Inhibits Oxidation, As Evidenced By Characteristic Spectral changes, Thereby Enhancing The Stability Of Biodiesel-Diesel Blends. This approach Offers A Sustainable And Eco-Friendly Alternative To Synthetic antioxidants, Contributing To The Advancement Of Cleaner And More Durable biofuels.

ICRIT148

DEVELOPMENT OF LIGHTWEIGHT BRICKS USING WASTE ELASTOMERS FROM AIR CONDITIONING INDUSTRIES

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Abstract

Lightweight Bricks Developed Using Waste Elastomers From Airconditioning (Ac) Industries Represent An Innovative And Sustainable construction Material Aimed At Reducing Environmental Pollution And Structural dead Load In Buildings. These Bricks Are Manufactured By Incorporating shredded Polyurethane Foam (Puf) Waste As A Partial Replacement For conventional Materials Such As Fly Ash, Sand, And Cement. The Addition Of elastomeric Waste Significantly Enhances The Lightweight Characteristics While maintaining Adequate Mechanical Strength. The Production Process Involves controlled Mixing Of Fly Ash, Sand, Cement, And Processed Puf Followed By casting And Water Curing To Form A Durable Composite Brick. The Developed elastomer-Based Bricks Exhibit Improved Thermal And Acoustic Insulation Due To the Presence Of Elastic Polymer Particles, Which Absorb Heat And Sound Energy effectively. These Bricks Also Demonstrate Reduced Water Absorption Because Of the Hydrophobic Nature Of Polyurethane Foam, Leading To Better Durability And resistance To Moisture-Related Deterioration. Experimental Investigations conducted As Per Indian Standard Specifications Reveal That The Optimized Mix achieves Sufficient Compressive Strength For Non-Load-Bearing Construction applications With A Significant Reduction In Density When Compared To Conventional Clay Bricks. The Utilization Of Industrial Elastomer Waste Not Only lowers Production Cost But Also Minimizes Landfill Disposal And Carbon emissions. The Smooth Surface Finish Of These Bricks Reduces Plastering requirements, Thereby Saving Construction Time And Cost. Overall, Elastomer-Based Lightweight Bricks Provide A Cost-Effective, Eco-Friendly, And Energy-Efficient Alternative For Modern Sustainable Construction, Contributing To effective Waste Management And Improved Building Performance.

MOBILE APPLICATION FOR ONLINE SALE OF VEHICLE SPARE PARTS AND ACCESSORIES

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Abstract

This paper presents the design and development of a mobile application for the online sale of vehicle spare parts and accessories, aimed at improving accuracy and user experience in product selection. The system addresses the common issue of identifying compatible spare parts by introducing a vehicle-based filtering mechanism that displays only relevant products based on user selection. The application is developed using Expo for the frontend, Node.js and Express for the backend, and MongoDB for data storage, forming a complete full-stack solution. It includes essential features such as user authentication, product browsing, search and filtering, cart management, and order placement with a simulated payment system. A separate admin module is implemented to manage products, users, and orders efficiently. The proposed system demonstrates improved usability and scalability, making it suitable for future enhancements such as real-time tracking and payment integration.

Keywords — E-commerce Application, Vehicle Spare Parts, Mobile Application, Vehicle-Based Filtering

SMART ATTENDANCE MANAGEMENT SYSTEM

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Abstract

In many organizations, traditional attendance systems are slow, error-prone, and lack real-time tracking. They often fail to ensure accurate and genuine attendance, especially when location verification is important. To solve this, AttendEase is introduced as a smart, web-based attendance management system. AttendEase uses geo-fencing and WiFi-based verification to make sure attendance is marked only from authorized locations, reducing proxy entries and improving reliability. It features a centralized dashboard that shows real-time data like presence, absence, late entries, and half-days, helping administrators make quick decisions. The system also includes employee management, leave handling, holiday settings, and automated reports. Admins can easily manage employees, approve leaves, and generate monthly reports. With automatic dashboard updates, all data stays current without manual refresh. Built with modern web technologies, AttendEase offers a user-friendly interface and secure backend. Overall, it improves accuracy, reduces manual work, and brings more transparency to attendance management.

SOLDIER HEALTH MONITORING AND TRACKING SYSTEM USING IoT And LoRa

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Abstract— In modern warfare and border security operations, ensuring the safety and real-time monitoring of soldiers is a critical challenge, especially in remote and harsh environments where conventional communication systems are unreliable. This paper presents the design and implementation of a Soldier Health Monitoring and Tracking System using Internet of Things (IoT) and LoRa technology. The proposed system aims to continuously monitor vital health parameters of soldiers, including heart rate and body temperature, along with real-time geographical location tracking using GPS. The system integrates biomedical sensors with a microcontroller to collect physiological data, which is then transmitted over long distances using LoRa (Long Range) communication. LoRa is chosen for its low power consumption and ability to provide reliable communication over several kilometers without relying on cellular or Wi-Fi networks. The transmitted data is received at a base station, where it can be monitored in real time and further uploaded to cloud platforms through IoT modules such as NodeMCU (ESP8266/ESP32). In addition to health monitoring, the system incorporates environmental and safety sensors such as PIR sensors for motion detection, ultrasonic sensors for obstacle detection, and metal detectors for identifying potential threats. The proposed system offers a low-cost, energy-efficient, and scalable solution for enhancing battlefield awareness and soldier safety. This work demonstrates a practical approach toward developing intelligent, real-time monitoring systems for defense applications, with future scope for integrating advanced wearable devices and secure communication protocols.

Index Terms— Internet of Things (IoT), LoRa Communication, Soldier Health Monitoring, GPS Tracking, Wireless Sensor Networks, Remote Surveillance, Biomedical Sensors, Real-Time Monitoring, Embedded Systems, NodeMCU (ESP8266/ESP32), Arduino, Long-Range Communication.

AN INTELLIGENT DEEP LEARNING FRAMEWORK FOR DEEFAKE VOICE AND VIDEO DETECTION

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Abstract: Deepfake technology has rapidly evolved with the advancement of deep learning techniques, enabling the creation of highly realistic synthetic audio and video content. While this innovation has useful applications in media and entertainment, it also poses serious threats such as fraud, misinformation, and identity theft. As deepfake content becomes more sophisticated, traditional detection methods struggle to accurately identify manipulated media, creating a need for more robust and intelligent detection systems. This project proposes an intelligent deep learning framework for detecting deepfake voice and video content automatically. Convolutional Neural Networks (CNN) are used to capture spatial features, while Long Short-Term Memory (LSTM) networks analyze temporal inconsistencies across frames. This combined approach helps in identifying subtle visual artifacts and unnatural motion patterns that are often present in deepfake videos. For voice detection, the system extracts key audio features such as Mel-Frequency Cepstral Coefficients (MFCC), pitch, and spectrogram representations. The proposed framework effectively classifies media content as real or fake, thereby enhancing digital security, trust, and reliability in multimedia communication.

Key Points: Deep learning-based detection framework, CNN for spatial feature extraction, LSTM for temporal analysis, audio feature extraction (MFCC, pitch, spectrogram), CNN and RNN for voice analysis, multimodal detection (audio + video), automatic real/fake classification, detection of visual and speech inconsistencies, robust against high-quality deepfakes, improved digital security and trust, scalable and efficient system, real-time detection capability.

ICRIT153

DEVELOPMENT AND ANALYSIS OF INTUMESCENT FIRE RETARDANT COATING BY USING OF RED MUD WASTE FOR STEEL STRUCTURES

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Abstract: The incorporation of red mud as a filler in Intumescent coatings offer both environmental and performance-based advantages for fire protection systems. Red mud, an industrial by-product of the Bayer process used in alumina production, contains oxides such as Fe_2O_3 , Al_2O_3 , and TiO_2 , making it chemically suitable for enhancing thermal resistance in coatings. Intumescent coatings function by undergoing a chemical transformation when exposed to heat, forming a thick, porous char layer that insulates the substrate. The mechanism involves a sequence of thermal reactions among four core components: an acid source (such as ammonium poly-phosphate), a carbon source, a blowing agent (like melamine), and additives or fillers that promote structural strength. Upon heating, the acid decomposes first, releasing phosphoric acid that catalyzes dehydration of the carbon-rich compound, leading to char formation. The study examined the influence of red mud as a filler in an Intumescent coating composed of ammonium polyphosphate (APP), melamine (MEL), boric acid (BA), expandable graphite (EG), and bisphenol A epoxy resin with hardener. Red mud, a by-product of the Bayer process used in alumina production, was introduced in varying amounts from 0 to 8 grams to assess its effect on fire-retardant properties. Analysis showed that adding 2 grams of red mud achieved optimal performance with a char expansion, effectively reducing heat transfer to coated steel surfaces during Burner fire tests. The inclusion of red mud enhanced the residual weight by about 1.02% compared to the base formulation, indicating improved thermal stability and char integrity. Thermogravimetric analysis (TGA) performed from 30°C to 1000°C under nitrogen confirmed these enhancements.

ICRIT154

BLOCKCHAIN BASED SUPPLY CHAIN MANAGEMENT AUTHENTICITY AND PRODUCT VERIFICATION

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Abstract -Counterfeit products have become a major challenge in modern supply chains, affecting industries such as pharmaceuticals, electronics, and luxury goods. Traditional supply chain systems rely on centralized databases, which are vulnerable to data manipulation and lack transparency. Consequently, it is difficult for consumers and stakeholders to verify the authenticity of products. This study proposes a blockchain-based supply chain management system that improves transparency, security, and traceability throughout the product lifecycle. In the proposed system, each product is assigned a unique serial number that is stored in the blockchain. A corresponding QR code is generated and attached to the product to enable easy product verification. Every stage of the product's journey from the manufacturer to the distributor, retailer, and finally, the customer, is recorded using smart contracts. Because blockchain records are immutable and decentralized, the stored information cannot be altered or tampered with. Customers can scan the QR code using a verification interface to directly retrieve the product history from the blockchain network. If the product details exist and match the recorded supply chain data, the system confirms the product's authenticity. Otherwise, it alerts the user to a possible counterfeit product. The system was implemented using Solidity smart contracts deployed on a Hardhat blockchain environment, with a React-based frontend interacting through Ethers.js. This approach enhances supply chain transparency and allows consumers to independently verify product authenticity using blockchain technology. The proposed system demonstrates how blockchain technology can be effectively applied to reduce the number of counterfeit products and build trust among manufacturers, distributors, retailers and customers.

Keywords: Blockchain, Supply Chain Management, Product Authentication, Smart Contracts, QR Code Verification,

Hardhat, Ethereum, Counterfeit Detection.

ICRIT155

ATM SHIELD-INTELLIGENT SECURITY THREAT PREVENTION SYSTEM

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Abstract - Automated Teller Machines, commonly referred to as ATMs, are integral to today's banking environment. ATMs are also susceptible to physical attacks and impersonation of their users due to face coverings. The existing security systems for ATMs include passive security devices such as CCTV and alarm mechanisms that identify issues but do not provide for immediate intervention. In addition, there is a gap between identifying and responding to incidents. Therefore, an intelligent Layered ATM Security System is being proposed to integrate AI-based image-processing technology, deep learning capabilities, automation with IoT technology, and real-time alerting to enable real-time monitoring, detection, and response to security incidents involving ATMs. This system consists of YOLOv8 based object detection model created using CNN architecture that will be able to detect face coverings on actual video taken from the ESP32-CAM camera. The train data is based off of cleaned and annotated datasets that can give the user confidence that detection will be done accurately in real time. The detections generated are sent to an ESP32 NodeMCU which will use a relay module to control the hardware. The relay will operate a solenoid door lock, buzzer, DFPlayer Mini with a speaker for an audible alert, and send an electronic signal to notify of the alert. The detection alerts are processed and relayed by an HW-720 vibration sensor that will be used to detect an attempted physical attack. An instant message is sent through a WiFi-based Telegram bot with details of the threat. This system is powered by a 12 Volt power supply to facilitate continuous operation and will allow the user to provide active security at their ATM's.

Keywords - ATM Security, YOLOv8, Deep Learning, CNN, ESP32-CAM, ESP32 NodeMCU, Image Processing, IoT, Face Detection, Vibration Sensor, Relay Module, DFPlayer Mini, Smart Surveillance, Real-Time Alert

ICRIT156

AN INTELLIGENT DEEP LEARNING FRAMEWORK FOR DEEPFAKE VOICE AND VIDEO DETECTION

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Abstract

Deepfake Technology Uses Advanced Deep Learning Models To Create Realistic Fake Audio And Video, Leading To threats Like Fraud, Misinformation, And Identity Theft. Traditional Detection Methods Fail To Identify Such High-Quality Manipulations. This Project Presents A Deep Learning-Based System To Detect Deepfake Voice And Video content Automatically. Cnn And Lstm Models Are Used To Identify Spatial And Temporal Inconsistencies In Videos. For Voice Detection, Features Like Mfcc, Pitch, And Spectrograms Are Analyzed Using Cnn And Rnn. The System Accurately Classifies Media As Real Or Fake, Enhancing Digital Trust And Security. **Keywords:** Deepfake Detection, Deep Learning, Convolutional Neural Network (Cnn), Long Short-Term Memory (Lstm), Mel-Frequency Cepstral Coefficients (Mfcc), Recurrent Neural Network (Rnn), Audio-Visual Analysis, Digital Forensics, Media Authentication.

FEE MANAGEMENT SYSTEM

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Abstract

In many educational institutions, traditional fee management systems are manual, time-consuming, and prone to errors. Maintaining student fee records using registers or spreadsheets leads to difficulties in tracking payments, calculating dues, and generating reports. These limitations reduce efficiency and increase the chances of data inconsistencies. To address these issues, a web-based Fee Management System is developed to automate the fee handling process. The system provides a centralized platform for managing student details, fee structures, fee assignments, and payment records. It ensures accurate data storage and allows administrators to efficiently handle large volumes of student information. The system includes key features such as student management, bulk data upload, fee structure definition, fee assignment, payment tracking, and receipt generation. It also supports advanced concepts like automated fee assignment and category-based fee handling for different types of students. Real-time updates and dashboard insights help administrators monitor fee collection and ending dues effectively. Developed using modern web technologies such as React.js, Node.js, and MySQL, the system offers a user-friendly interface and secure backend. Overall, the proposed system improves accuracy, reduces manual effort, enhances transparency, and provides a scalable solution for efficient fee management in educational institutions.

ICRIT158

NO-CODE BACKEND ORCHESTRATOR WITH DRAG AND DROP ARCHITECTURE AND AI-ASSISTED CONTEXTUAL CODE GENERATION

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Abstract: - Traditional backend development involves complex processes such as API creation, database management, authentication, and server configuration, requiring strong programming expertise and significant development time. These challenges often slow down development cycles and create barriers for individuals or teams without deep technical backgrounds, limiting rapid prototyping and deployment of backend systems. To address these issues, this project proposes an AI Assisted Modular No-Code Backend Architecture Generator with Drag-and-Drop Configuration Interface. The system enables users to visually design backend architectures using modular components such as APIs, authentication systems, and databases through an intuitive drag-and-drop interface. Based on user configurations, the platform automatically generates backend structure and code, while integrated AI provides recommendations for optimal architecture, scalability, and best practices. This approach reduces development complexity and accelerates backend creation. In practical deployment, the framework supports rapid backend generation with minimal coding effort. A modular orchestration system manages component integration and code generation seamlessly. The visual interface enables scalable design across different application requirements. AI-driven suggestions improve architecture quality and reduce development errors. It enables faster deployment, improved productivity, and accessibility for both developers and non-technical users. **Key Points:** No-code backend generation, drag-and-drop interface, modular architecture (APIs, authentication, databases), AI-assisted recommendations, automated code generation, reduced development time, improved accessibility

GESTURE CONTROLLED INTELLIGENT WHEEL CHAIR

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Abstract— A gesture controlled intelligent wheelchair is an innovative assistive technology designed to enhance mobility and independence for individuals with physical disabilities, particularly those with limited or no ability to use traditional joystick-based controls. This system utilizes advanced sensors, such as accelerometers, gyroscopes, or vision-based devices, to detect and interpret user gestures—commonly hand, head, or facial movements—and convert them into navigational commands like forward, backward, left, right, and stop. The integration of microcontrollers and embedded systems enables real-time processing of gesture inputs, ensuring smooth and responsive wheelchair operation. Additionally, the intelligent aspect of the wheelchair incorporates features such as obstacle detection using ultrasonic or infrared sensors, path optimization, and safety mechanisms to prevent collisions and accidents. Some designs further enhance usability by integrating wireless communication technologies like Bluetooth or Wi-Fi, allowing control through smartphones or wearable devices. Machine learning algorithms may also be employed to adapt to user behavior over time, improving accuracy and personalization of gesture recognition. This system is particularly beneficial for individuals with severe motor impairments, such as those affected by paralysis or neuromuscular disorders, as it reduces dependence on caregivers and promotes autonomy. Furthermore, the gesture-controlled interface provides a more natural and intuitive mode of interaction compared to conventional control methods.

ICRIT160

PREDICTING THE CLASSIFICATION OF HEART FAILURE PATIENTS USING OPTIMIZED DENSENET AND MLP ALGORITHMS

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Abstract— Heart disease is among the causes of death that can be considered the most common worldwide because each year millions of people are affected. Early detection and proper diagnosis is very important in lowering the mortality rate and enhancing patient outcome. Medical tests and the knowledge of medical practitioners have traditionally been critical in the diagnosis of heart disease. Nevertheless, the methods are time-consuming and they may not necessarily offer early detection. Over the last few years, the technologies of Machine Learning (ML) and Deep Learning (DL) have demonstrated a significant positive change in the healthcare sector, particularly in disease prediction. These new technologies can examine big amounts of medical data and showcase obscure patterns that might be hard to detect by humans. ML models can be used to determine the probability of heart disease based on the historical patient data including age, blood pressure, cholesterol levels, heart rate, and other clinical parameters with a high degree of accuracy. Under this proposed system, data preprocessing like normalization and selection of features is used to improve the quality of the dataset. Normalization aids in bringing the data to a normalized range, whereas feature selection eliminates irrelevant or redundant attributes, thus, enhancing model performance and minimizing the complexity of computations. The system employs sophisticated algorithms in categorizing whether a patient has a risk of heart disease or not. This method is more accurate and efficient and fast in comparison with traditional methods. It is capable of helping physicians and other healthcare professionals to make effective decisions, strategize on the treatment approach, and to be proactive at an early stage.

Keywords: Heart Disease, Machine Learning, Deep Learning, Multi-Layer Perceptron, DenseNet, Electrocardiogram

(ECG), Disease Prediction, Medical Data Analysis.

ICRIT161

**AN INTELLIGENT SYSTEM FOR CYBERBULLING DETECTION ON SOCIAL MEDIA PLATFORMS
USING MACHINE LEARNING**

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Abstract

Rising storage and computational capacities have led to the accumulation of voluminous datasets. These datasets contain insights that describe natural phenomena, usage patterns, trends, and other aspects of complex, real-world systems. We propose greedy K-NN (K-Nearest Neighbour) data allocation strategies (across the agents) that improve the probability of identifying data leakages. These methods do not rely on alterations of the released data (e.g., watermarks). In some cases, we can also inject “realistic but fake” data records to further improve our chances of detecting leakage and identifying the guilty party. Mining large data requires intensive computing resources and data mining expertise, which might be inaccessible to most of the users. With the regularly obtainable cloud computing resources, data mining tasks cannot be stimulated to the cloud or outsourced to the third party to save cost. In this new pattern, data and model confidentiality becomes the major unease to the data owner. Data owners have to understand the possible trade-offs among client-side costs, model quality, and confidentiality to justify outsourcing solutions. In this paper, we propose the RASPBoost framework to address these problems in confidential cloud-based learning. The RASP-Boost approach works with our previously developed Random Space Data Perturbation (RASP) method to protect data confidentiality and uses the boosting framework to conquer the complexity of learning high-class classifiers as of RASP-disconcerted data. So we have to build up some cloud-client combined boosting algorithms. These algorithms need low client-side calculation and communication expenses. The client does not call for to stay online in the progression of learning models. So we have methodically studied the confidentiality of data, model, and learning process under a realistic security model. Experiments on public data sets illustrate that the RASP-Boost approach can give high-quality classifiers, while preserving high data and model confidentiality and require low client-side expenses.

ICRIT162

**REAL TIME DISEASE PREDICTION FROM PLANT LEAF IMAGES USING A DEEP LEARNING
ALGORITHM WITH AN AUTOMATED CHATBOT**

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Abstract—This Plant diseases have been a persistent cause of agricultural losses in the agricultural sector and on most occasions by the time they are detected, the farmers will have minimal time to rectify the situation. It remains a case in most of them of walking in fields and observing leaves with the naked eye, slow, imprecise and inaccessible to a smallholder farmer who has no access to trained agronomists. The article is a leaf-based disease detection system, which is a real-time application of the YOLOv11 object detection system, and does not require specific hardware. A trained version of the model was developed on an edited dataset of diseased and healthy leaf samples, comprising of plant species and disease types. The chatbot interface was added to the detection pipeline to facilitate accessibility of the system, after a disease has been detected, a chatbot interface provides plain-language knowledge on what the disease is, how it is transmitted, and what can be done to control or prevent it.

Keywords—YOLOv11, plant disease detection, deep learning, leaf image classification, real-time object detection,

convolutional neuralnetwork, chatbot integration, data augmentation, Smart Agriculture, Image Preprocessing.

ICRIT163

RESUMECRAFT – BEST RESUME BUILDER AND SCREENER USING NLP AND ML

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Abstract: This paper presents ResumeCraft, a web-based application designed to assist users in creating, editing, and screening resumes using Natural Language Processing (NLP) and Machine Learning (ML) techniques. The system provides an integrated platform that simplifies the resume development process while enhancing its effectiveness for job applications. It begins with a user-friendly landing interface that guides individuals through the various functionalities of the system. The application includes a built-in resume editor with customizable templates, enabling users to design and modify resumes in a structured and visually appealing format, similar to modern design tools. Users can easily generate, update, and download resumes in multiple formats suitable for professional use. In addition to resume creation, the system incorporates a keyword recommendation module that suggests role-specific skills and terms based on industry requirements. This feature helps users improve resume quality and ensures better compatibility with Applicant Tracking Systems (ATS), which are widely used for automated resume filtering. The system applies preprocessing techniques such as text cleaning, tokenization, and feature extraction using TF-IDF to improve classification accuracy and relevance. Furthermore, the application provides real-time feedback to users, allowing them to refine their resumes based on predicted outcomes and keyword suggestions. By combining resume building, keyword optimization, and automated screening into a single platform, ResumeCraft offers a comprehensive solution for job seekers. The system improves resume quality, increases job matching accuracy, and supports efficient career development processes through intelligent automation techniques.

Keywords— Resume Screening, Natural Language Processing (NLP), Machine Learning, Keyword Extraction, Applicant Tracking Systems (ATS)

ICRIT164

LIFI BASED INDOOR COMMUNICATION SYSTEM

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Abstract - Light Fidelity or Li Fi is an emerging optical wireless communication technology that uses the visible light spectrum for high speed secure and interference free data transmission and serves as an alternative to congested radio frequency systems. This paper presents the design and implementation of an indoor Li Fi communication system integrated with a dual software interface architecture that combines real time hardware operation with interactive simulation-based visualization. The physical layer uses a KY 008 laser diode module as the optical transmitter with On Off Keying modulation. The transmitter is driven using a transistor switching circuit controlled by an ESP8266 Node MCU. At the receiver side a photovoltaic solar panel is used as the optical detector and a voltage divider network conditions the signal for analog input processing using another ESP8266 Node MCU. A custom packet-based communication protocol is implemented using Arduino C language which includes synchronization bytes sequence numbering error detection using CRC and Fletcher methods payload whitening and redundant transmission for improved reliability. The real time communication interface is developed using web technologies and communicates with hardware through serial communication. In addition, a simulation and visualization interface is developed to represent the complete Li Fi communication process in a virtual environment. Experimental results demonstrate reliable indoor communication over a distance of up to four meters with zero-bit errors. The proposed system validates a low cost and efficient Li Fi solution suitable for secure indoor communication applications.

Keywords - Li-Fi, Visible Light Communication, OOK Modulation, ESP8266, KY-008 Laser, Free-Space Optical Communication, CRC-8, Web Serial API, Simulation Interface, Indoor Wireless Communication.

ICRIT165

REAL-TIME ANIMAL DETECTION AND CLASSIFICATION USING YOLOV11 IN SYMBOLIC CLASSIFIERS

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Abstract

The problem of animal intrusion is a critical issue in agricultural fields and human settlements within wildlife areas. Farmers are expected to take necessary precautions such as fencing to prevent damage to crops and safety hazards. However, manual monitoring is difficult due to the vastness of agricultural areas. The paper proposes a real-time animal detection system that can detect whether any animals have entered the restricted areas. This is done using the YOLOv11 algorithm to detect various types of animals using frames captured using camera devices. In addition to this, a classification model is also used to detect the type of animal and its threat level. The system is designed to monitor the areas and analyze frames captured using camera devices. It can detect various types of animals such as wild boars, elephants, and other wild animals. When an animal is detected within the restricted areas, a warning alert is sent immediately. This can be used in agricultural fields and forest areas to monitor effective intrusion compliance. This can also be done using edge computing technology. This ensures that immediate action can be taken to reduce human-animal conflicts. This is a reliable solution for wildlife protection and agricultural protection.

Keywords: Animal Detection, YOLOv11, CNN, Edge Computing, Wildlife Surveillance, Intrusion Prevention.

ICRIT166

SELF-BALANCING SURVEILLANCE ROBOT

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Abstract

The rapid advancement of intelligent surveillance systems has increased the demand for autonomous and adaptive monitoring solutions in dynamic environments. This paper presents the design and implementation of an Intelligent Self-Balancing Surveillance Robot, a compact two-wheeled robotic system capable of maintaining dynamic stability while performing real-time surveillance tasks. The proposed system integrates a self-balancing mechanism based on sensor fusion using an inertial measurement unit (IMU) and a closed-loop control algorithm to achieve stable motion on varying surfaces. The robot is equipped with an embedded vision module for continuous video streaming and environment monitoring. Obstacle detection and avoidance are achieved using ultrasonic and infrared sensors, enabling safe navigation in indoor environments. The system leverages wireless communication to transmit live data to a remote dashboard, allowing users to monitor and control the robot in real time. Additionally, the incorporation of lightweight AI-based processing enables basic anomaly detection and intelligent decision-making. The proposed solution offers a low-cost, scalable, and energy-efficient alternative to traditional fixed surveillance systems, with applications in security monitoring, industrial inspection, and smart environments. Experimental results demonstrate reliable balancing performance, efficient obstacle avoidance, and stable real-time data transmission, validating the effectiveness of the system.

Keywords— Self-Balancing Robot, MPU6050, PID Control, ESP32-CAM, Robotics, Embedded Systems, Gyroscope, Accelerometer.

ICRIT167

REAL-TIME BEHAVIOURAL AND HEALTH MONITORING OF DEMENTIA PATIENTS USING SENSORS

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Abstract Dementia Is A Progressive Neurological Disorder That Affects Memory, Cognition, Behaviour, And The Ability To Perform Daily Activities. Continuous Monitoring Of Dementia Patients Is Crucial To Ensure Their Safety, Improve Quality Of Care, And Provide Timely Medical Intervention. This Paper Presents A Real-Time Behavioural And Health Monitoring System For Dementia Patients Using Sensor-Based Technology. The Proposed System Utilizes Wearable And Environmental Sensors To Collect Physiological And Behavioural Data Such As Heart Rate, Body Temperature, Motion, And Activity Patterns. The Collected Data Is Processed And Analysed To Detect Abnormal Behaviours And Health Conditions In Real Time. Alerts Are Generated And Sent To Caregivers Or Healthcare Professionals When Critical Situations Are Detected. The Proposed Solution Aims To Enhance Patient Safety, Reduce Caregiver Burden, And Support Efficient Healthcare Management.

Keyword: Dementia, Health Monitoring, Wearable Sensors, Behaviour Analysis, Internet of Things (IoT), Real-Time Monitoring

ICRIT168

UART CONTROLLER DESIGN USING FIFO BUFFERS FOR ROBUST SERIAL COMMUNICATION

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Abstract

The need for reliable real time data communication in embedded and industrial monitoring systems is getting bigger. This is because we need to make sure the data is sent and received correctly and on time. This paper is about a design for a UART Controller that uses FIFO Buffers for strong serial communication. We built this system on a Spartan-6 FPGA platform for monitoring the environment in a way. The system gets temperature and humidity information from a sensor and processes the data inside the FPGA. Then it sends the data. Shows it on a screen. We added FIFO buffers to the UART data path to prevent data loss and make sure the timing is right. This way we can have serial transfer between different parts of the system. To make the data more secure we encrypt the information we get from the sensors using an encryption scheme. The system also has an OLED display that shows the sensed and encrypted values. The processed data is sent to an ESP32 module through UART. This module allows us to communicate with a web-based dashboard wirelessly. The dashboard can show both encrypted and decrypted sensor values. This design is good because it is small, cheap and can be scaled up. It is useful, for safety IoT-based sensing and secure embedded communication. We tested the system. It worked well. The UART transmission was stable the buffering performed well and the display worked reliably. We were also able to transfer sensor data successfully. This shows that our design is practical and useful.

Keywords - UART Controller, FIFO Buffers, FPGA, Spartan-6, Serial Communication, LRBC Encryption, OLED Display, ESP32, Temperature and Humidity Monitoring, Embedded Systems.

AN IMAGE PROCESSING APPROACH FOR AUTOMATED PARTICLE DETECTION AND QUANTITATIVE MORPHOLOGICAL ANALYSIS IN SCANNING ELECTRON MICROSCOPY IMAGES

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Abstract—Accurate analysis of particle size and morphology from scanning electron microscopy (SEM) images is critical for material characterization and quality assessment. This paper presents a comprehensive and automated image processing framework for particle detection, segmentation, and quantitative morphological analysis in SEM images. The proposed approach integrates multiple preprocessing, segmentation, and feature extraction techniques to ensure robust performance across varying image conditions. Initially, input scanning electron microscopy images undergo contrast enhancement using gamma correction, followed by optional intensity inversion to improve particle visibility. A scale calibration step is implemented by automatically detecting the scale bar region, enabling precise conversion of pixel-based measurements into micrometer units. In cases where the scale bar is not detected, a default calibration value is applied to maintain analysis continuity. For particle segmentation, the method employs grayscale conversion and adaptive thresholding using Otsu's method, followed by morphological opening and dilation to suppress noise and enhance structural separation. A distance transform is then applied to identify foreground regions, and a marker-controlled watershed segmentation is utilized to effectively separate overlapping and clustered particles. Following segmentation, individual particles are detected using contour analysis. Key morphological features, including equivalent diameter, aspect ratio, and circularity, are computed for each particle. Based on these descriptors, particles are classified into four categories: spherical, sub-spherical, elongated, and irregular. Additionally, each detected particle is assigned a unique identifier and visually annotated on the original image for interpretability. The framework further generates particle size distribution (PSD) histograms and exports structured data, including all computed features, into a comma-separated values (CSV) file for downstream analysis. Experimental results demonstrate that the proposed method provides reliable particle detection, accurate size estimation, and consistent morphological classification, enabling high-throughput and reproducible SEM image analysis.

ICRIT170

SOLAR POWERED SMART BATTERY MONITORING SYSTEM FOR ELECTRIC VEHICLES

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Abstract: Electric vehicles (EVs) are becoming increasingly popular due to their environmental benefits and reduced dependency on fossil fuels. However, the performance and safety of EVs largely depend on the efficiency and condition of the battery system. Improper battery management may lead to overcharging, overheating, deep discharge, and reduced battery lifespan. Therefore, an efficient battery monitoring system is essential to ensure safe and reliable operation of electric vehicles. This project proposes a solar-powered smart battery monitoring system designed to monitor and protect electric vehicle batteries. The system continuously measures important battery parameters such as voltage, current, temperature, and light intensity using sensors like INA219, DS18B20, and LDR. These sensors collect real-time data, which is processed by the ESP32 microcontroller. The microcontroller analyzes the data and compares it with predefined threshold values to detect abnormal conditions. The proposed system integrates a solar panel and charge controller to power the monitoring system using renewable energy. This reduces dependency on the vehicle battery and improves overall energy efficiency. The system provides real-time monitoring through an LCD display and enables wireless communication using Wi-Fi technology. In case of abnormal conditions such as overheating or overvoltage, a buzzer alert is activated and notifications are sent to the user. battery safety, real-time monitoring, renewable energy integration, and cost-effective implementation. Experimental results demonstrate that the system provides accurate readings, quick response, and reliable performance. The integration of solar power further enhances system sustainability.

and efficiency. In conclusion, the solar-powered smart battery monitoring system provides an effective solution.

ICRIT171

REAL TIME OPERATING SYSTEM BASED INDUSTRIAL MONITORING AND SECURITY SYSTEM USING ESP32

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Abstract—This paper presents the design and development of a real time operating system based industrial monitoring and security system using the ESP32 microcontroller. The system integrates multiple sensors including gas, motion, vibration, light, and noise sensors to continuously monitor industrial environments. FreeRTOS is utilized to manage multiple tasks efficiently through priority based scheduling, ensuring real time performance and reliability. The collected sensor data is transmitted using IoT protocols such as MQTT to a mobile or web application for real time monitoring and analysis. In addition, machine learning techniques, specifically the Isolation Forest algorithm, are implemented to detect anomalies and predict potential hazards in industrial operations. Based on the detected conditions, the system automatically triggers safety mechanisms such as alarms, exhaust systems, and alert notifications. The proposed system provides a smart, scalable, and efficient solution for industrial automation. It enhances safety, reduces the need for manual monitoring, and supports predictive maintenance, making it suitable for modern industrial applications.

Keywords—Real time operating system, ESP32, industrial monitoring, IoT, MQTT, machine learning, anomaly detection, predictive maintenance

ICRIT172

EXPLAINABLE ARTIFICIAL INTELLIGENCE TO PREDICT AND IDENTIFY THYROID CANCER TISSUE BY GENE EXPRESSION

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Abstract: Conventional diagnostic screening for thyroid cancer, such as fine-needle aspiration profiling, sometimes yields indeterminate outcomes. While previous research has identified multiple molecular biomarkers, there is an urgent need for transparent, explainable tools to assist clinicians and pathologists in routine diagnostic decision-making. We aim to develop a robust classifier providing both predictive identification of thyroid carcinoma and explainable justifications for these predictions. Utilizing transcriptomic sets from The Cancer Genome Atlas-Thyroid Carcinoma (TCGA-THCA) cohort, we performed differential gene expression analysis to identify a core signature of prominent biomarkers across normal tissue and various thyroid cancer subtypes. This selected gene set was employed to train an optimized Random Forest machine learning model paired with majority-class downsampling. To overcome the black-box nature of clinical models, Explainable Artificial Intelligence (XAI), specifically SHapley Additive exPlanations (SHAP), was implemented to offer pathologists comprehensible reasoning behind the predictive outcomes. Extensive validation revealed that our balanced computational algorithm achieved superior statistical performance, establishing robust sensitivity, specificity, and a high Area Under the Curve (AUC). Beyond traditional metrics, the explainability workflow highlighted universally critical driving genes alongside novel subtype-specific markers mapping to key signaling pathways. This methodology proves to possess a strong performance for identifying thyroid cancer tissues using gene expression. By supplying interpretable and biologically actionable rationale for individual patient predictions, the developed explainable artificial intelligence framework serves as an effective clinical decision support system, fostering precision diagnostics and targeted interventions. **Keywords:** Thyroid Cancer, Explainable Artificial Intelligence, Gene Expression, Diagnostics, Machine Learning

BLOCKCHAIN-BASED SECURE VOTING SYSTEM WITH INTEGRATED COMPLAINT MANAGEMENT PORTAL

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Abstract—While digital shifts have radically redefined modern governance and civil operations, the practice of casting ballots electronically continues to grapple with persistent obstacles concerning data transparency and operational robustness. Conventional, centralized digital voting systems typically harbor singular vulnerability points that attract cyber offensives, compounded by a distinct lack of mechanisms to rapidly manage arising voter concerns. In response to these pressing flaws, this study introduces a multifaceted architecture merging distributed ledger technologies with an intelligent, machine-learning-driven grievance resolution interface. Specifically, our model leverages a decentralized blockchain framework for immutable ballot storage, ensuring that individual vote modifications are virtually impossible and establishing a trustless verification environment devoid of centralized oversight. Complementing this structural security, a dedicated Natural Language Processing (NLP) module runs concurrently to systematically categorize and dispatch voter issues as they occur. By strategically deploying RSA encryption alongside SHA-256 cryptographic hashing, this schematic aims to seamlessly preserve data fidelity and supreme voter anonymity. Our comprehensive investigation of these distributed consensus rules and AI-guided triage methods indicates that unifying rigid cryptographic ballot handling together with responsive, automated complaint mechanisms dramatically elevates overall electoral resilience while reinforcing public faith in democratic workflows.

Index Terms—Blockchain, Electronic Voting, Cryptography, RSA Encryption, Complaint Management, Machine Learning, Decentralized Networks.

ASKDOCS AI: A MULTIMODAL DOCUMENT INTELLIGENCE SYSTEM

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Abstract—The proliferation of digitized textual and multimodal data in modern environments necessitates advanced information retrieval systems capable of handling heterogeneous and unstructured content. Traditional document analysis techniques are often inefficient, requiring extensive manual review, while conventional artificial intelligence pipelines struggle to effectively process scanned documents and visually complex elements such as charts, tables, and embedded figures within PDFs. To address these limitations, this paper presents AskDocs AI, a multimodal document intelligence system based on Retrieval-Augmented Generation (RAG). The proposed architecture incorporates a hybrid extraction pipeline that integrates Optical Character Recognition (OCR) with multimodal language models to transform both textual and graphical content into unified semantic embeddings. This enables users to perform context-aware queries across single or multiple documents with improved retrieval accuracy, contextual relevance, and reliable citation tracing. Furthermore, the system introduces a low-latency, bidirectional voice interface that leverages real-time Speech-to-Text and Text-to-Speech technologies, enhancing accessibility and enabling natural human-computer interaction. The platform also supports multilingual capabilities, dynamically adapting to regional languages such as Tamil and English, thereby broadening usability across diverse user groups. In addition, the system ensures secure multi-tenant data isolation and efficient document indexing for scalable deployment. Experimental observations indicate improved response consistency and reduced query processing time compared to traditional keyword-based retrieval approaches. Overall, AskDocs AI provides a scalable, efficient, and intelligent framework for automated document understanding, literature review, and knowledge extraction in academic and enterprise environments.

Keywords—Document Intelligence, Multimodal AI, Retrieval-Augmented Generation, Voice Interface, OCR

A HYBRID ENSEMBLE APPROACH TO PREDICT THE CO₂ EMISSION IN TRANSPORTATION

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Abstract—Road transportation is a major contributor to global carbon emissions, with light-duty vehicles accounting for a considerable share of transport-related CO₂ emissions, making accurate emission prediction essential for sustainable planning and policy development. This study proposes a hybrid ensemble machine learning approach to predict CO₂ emissions in transportation with improved accuracy. The model combines XGBoost and CatBoost to capture complex nonlinear relationships among vehicle attributes such as engine displacement, number of cylinders, fuel consumption, and transmission characteristics. The framework was developed and evaluated using the Canadian Open Government fuel consumption dataset containing 11 years of records and more than 11,300 unique vehicle models. The experimental results demonstrate strong predictive performance, achieving an RMSE of 1.65 kg/year, MAPE of 0.38% and an R² value of 99.92%. These findings show that the proposed model can effectively estimate vehicle emissions and support researchers, policymakers, and the automobile sector in identifying high-emission vehicle categories and developing practical decarbonization strategies for road transport.

Keywords— CO₂ emission prediction, Hybrid Ensemble Learning, XGBoost, CatBoost, light-duty Vehicles, Transportation Sustainability

LEARNING GRADIENT-GUIDED SUBSPACES FOR WEAKLY SUPERVISED MEDICAL IMAGE ANOMALY DETECTION

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Abstract—Deep learning models for clinical radiology hit a wall when pixel-level annotations are required—radiologists simply don't have time to outline every pathological region by hand. Weakly supervised anomaly segmentation sidesteps this bottleneck by learning to localize abnormalities using only image-level labels. This study evaluates Class Activation Mapping techniques on Vision Transformers across brain MRI, breast ultrasound, and chest X-ray datasets. The findings expose a core problem: standard CAM methods fixate on anatomically prominent structures (ventricles, ribs, glandular tissue) rather than actual pathology. We call this phenomenon organ-bias, and it severely limits clinical utility. GradEigCAM addresses organ-bias by combining gradient weighting with principal component analysis. The method first filters activation maps by their gradient magnitude relative to the classification target, then applies singular value decomposition. High-variance components that correlate poorly with disease-relevant gradients get suppressed, shifting attention from anatomical background toward pathology. On breast ultrasound data with expert segmentation masks, GradEigCAM outperforms both eigenvalue-based alternatives and gradient-free baselines. Ablation experiments confirm that gradient weighting and SVD each contribute distinct benefits—neither alone matches the combined approach. The study also introduces vorticity, derived from activation flow patterns, as a proxy metric for lesion localization; statistical analysis shows strong correlation with ground-truth pathological regions. Robustness testing across multiple random seeds confirms the improvements are statistically significant rather than artifacts of initialization. These results suggest GradEigCAM offers a reliable path toward weakly supervised anomaly detection in medical imaging, reducing annotation burden while maintaining localization accuracy.

Keywords—Weakly Supervised Anomaly Segmentation, Medical Image Analysis, Vision Transformers (ViTs), Class Activation Mapping (CAM), Gradient-Based Localization, Subspace Learning.

ENTERPRISE-HUMAN RESOURCE MANAGEMENT SYSTEM(E-HRMS)

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Abstract: Human Resource Management is one of the most important functional areas in any organization because it directly influences employee records, attendance, payroll, leave administration, performance evaluation, communication, and overall workforce productivity. In many organizations, these activities are still managed through spreadsheets, paper-based workflows, or disconnected software tools. Such methods often result in duplicate records, delayed approvals, reduced transparency, and increased administrative burden. To address these problems, this mini-project presents the design and development of E-HRMS (Enterprise Human Resource Management System), a full-stack web-based application that centralizes major HR operations within a unified digital platform. The proposed system is developed using Angular for the frontend, NestJS for the backend, and PostgreSQL as the relational database. The application follows a modular architecture and supports different user roles, primarily Admin and Employee. Administrators are provided with tools to manage employees, attendance, payroll, leave, training, performance, feedback, notifications, and internal communication. Employees are given self-service access to their profile, leave requests, attendance details, payroll records, assigned training, events, and feedback submission. The system also integrates JWT-based authentication, role-based access control, employee import through Excel, and dashboard analytics for better visibility into HR processes. This project demonstrates how modern web technologies can be combined to build a scalable, user-friendly, and secure HR management platform., enhances communication between employees and administrators. Thus, E-HRMS serves as a practical and efficient digital solution for modern organizational HR operations.

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CAREER GUIDANCE SYSTEM WITH FAILURE PREDICTION AND CAREER DRIFT CORRECTION MECHANISM

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Abstract— In today's rapidly evolving job market, selecting an appropriate career path has become increasingly challenging for students and job seekers due to a lack of personalized guidance and awareness of emerging opportunities. Traditional career counseling methods are often manual, time-consuming, and limited in scalability. This paper presents an AI-based Career Guidance System designed to provide intelligent and personalized career recommendations based on users' academic background, skills, and interests. The proposed system utilizes a hybrid approach that integrates machine learning algorithms, such as Logistic Regression and Random Forest, with rule-based techniques to enhance prediction accuracy. Additionally, Natural Language Processing (NLP) methods, specifically Term Frequency–Inverse Document Frequency (TF-IDF), are employed to analyze user interests and map them to relevant career domains. A key feature of the system is its skill gap analysis module, which compares the user's current competencies with industry requirements and generates a structured learning roadmap to bridge the identified gaps. Furthermore, the system assigns a career suitability score to each recommendation, ensuring transparency and aiding users in informed decision-making. The application is implemented using Python and Flask for the backend, along with HTML, CSS, and JavaScript for the frontend, providing a user-friendly and scalable platform. The proposed solution demonstrates the effective application of Artificial Intelligence in career counseling and addresses critical challenges such as skill mismatch, unemployment, and lack of career awareness, making it highly relevant in the modern digital era.

Keywords— Artificial Intelligence (AI), Career Guidance System, Machine Learning, Career Prediction, Personalized Recommendation, Logistic Regression.

TRAFFIC VIOLATION PREDICTION AND RECOGNITION USING DEEP LEARNING

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Abstract: The absence of protective headgear often adds to the number of motorcycle-related fatalities, which is a major challenge of the safety management of the city. This study presents an automated system of identifying traffic violations with the help of the YOLOv3 deep learning model to monitor the use of a helmet and identification of a vehicle in the real-time setting. The model uses live surveillance video streams to detect non-compliant riders and detects license plate numbers under varying environmental conditions, such as changing light conditions and partial obstructions. The system has made law enforcement easier by automating the issuance of fines and providing instant SMS notifications to registered owners. Solves the increasing problem of motorcycle-related traffic offenses, especially the failure to wear a helmet, which has a huge impact on the risk of serious injuries and deaths. Offers a hypothetical automated system of traffic violations detection, based on the YOLOv3 deep learning algorithm, to track the helmet use and real time compliance of vehicles. Takes advantage of live video feeds of surveillance cameras to identify helmet violations with high precision and identify number plates in different traffic, lighting, and occlusion conditions. Auto-detects the violators, issues fines, and sends vehicle owners instant SMS alerts to enforce the rules on time and enhance responsibility.

Keywords: YOLOv3, Computer Vision, Helmet Compliance, Automated Enforcement, Intelligent Transportation Systems (ITS).

ELIMINATION OF BORE DAMAGE IN FS-MASTER CYLINDER MACHINING

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Abstract—The FS master cylinder is one of the most important safety components used in automotive braking systems. Its main function is to convert mechanical force applied on the brake pedal into hydraulic pressure, which is then transmitted to the wheel brakes for vehicle stopping. Since the bore of the master cylinder acts as the sliding and sealing surface for the piston assembly, its dimensional accuracy and surface finish are highly critical. Any bore damage during machining can directly affect braking efficiency, cause fluid leakage, reduce product life, and increase rejection rates in production. Therefore, elimination of bore damage is essential for maintaining quality and reliability. This study presents a systematic approach for eliminating bore damage in FS master cylinder machining through process investigation, root cause analysis, and implementation of corrective actions. The common bore defects observed during production included scratches, chatter marks, tool lines, rough surface finish, taper variation, and size deviation. Detailed analysis revealed that the major causes were improper cutting parameters, worn-out tools, incorrect tool geometry, insufficient coolant lubrication, chip accumulation inside the bore, fixture misalignment, and machine vibration. To solve these issues, several improvement actions were introduced. Cutting speed, feed rate, and depth of cut were optimized according to material and tool specifications. High-performance coolant with proper concentration and flow direction was applied to improve lubrication and chip flushing. Surface finish quality improved, dimensional consistency was achieved, and rejection percentage decreased considerably. The production line also experienced better cycle efficiency and lower rework cost.

Keywords—FS Master Cylinder, Bore Damage, Machining Process, Surface Finish, Tool Wear, Coolant Optimization, Root Cause Analysis, Defect Reduction, Quality Control, Automotive Industry

AI BASED PUBLIC PLACE WASTE DETECTION AND PENALTY MANAGEMENT SYSTEM

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Abstract— The AI Based Public Place Waste Detection and Penalty Management System is an intelligent monitoring framework designed to address the growing problem of littering and improper waste disposal in public areas through automated surveillance and enforcement. This first review focuses on the initial implementation and validation of the proposed system, demonstrating real-time waste detection using computer vision, AI-based image processing, and automated violation identification. The implementation integrates camera-based monitoring, deep learning models for waste classification, and a centralized database for evidence storage and record management. The system validates its effectiveness through detection accuracy analysis, real-time alert generation, and an automated penalty management workflow, ensuring scalability for smart city applications and sustainable urban cleanliness. By leveraging continuously updated datasets, the model refines its ability to identify various types of waste under different environmental conditions such as lighting, weather, and crowd density. The integration of edge computing enables faster processing of video streams directly from surveillance cameras, reducing latency and enhancing real-time decision-making. In addition, the proposed framework supports seamless integration with municipal governance systems, allowing authorities to monitor violations, track repeat offenders, and generate automated reports for effective policy implementation.

Keywords—AI-Based Waste Detection, Public Place Monitoring, Computer Vision, Image Processing, Deep Learning, Waste Classification, Automated Surveillance, Violation Detection, Penalty Environmental Monitoring, Data Analytics, Edge Computing, Urban Cleanliness.

MANIFESTING MOTIVATION AI

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Abstract— Manifesting Motivation AI is an AI-powered digital coaching system delivering personalized mental wellness and motivation coaching to students and working professionals. The system combines the Groq-hosted LLaMA 3.3 70B large language model with VADER sentiment analysis, enabling cost-effective, real-time emotional intelligence at scale. A user-centric design philosophy ensures users consistently experience progress-oriented feedback and positive reinforcement, differentiating the platform from generic conversational chatbots. The application features an adaptive goal system that conducts intelligent intake interviews to understand user preferences and generates realistic step-by-step roadmaps automatically adjusted to individual constraints. The journaling module tracks mood entries with AI-generated emotional insights while maintaining user privacy through encrypted storage. Gamification mechanics including experience points, daily streaks, and achievement badges with progression levels from Seedling to Eternal drive sustained engagement and long-term habit formation among users. A sophisticated multi-layer safety architecture prioritizes user wellbeing throughout all interactions. The crisis detection module employs regex-based phrase matching for self-harm and suicide ideation, immediately routing vulnerable users to verified helpline resources without invoking the AI model, ensuring safety-first design principles are maintained at all times. The system supports voice input for accessibility and includes real-time emotion analysis across fifteen specialized coaching personas spanning career, academic, fitness, relationship, and wellness domains. The technical implementation utilizes a responsive frontend with interactive analytics, a modular RESTful backend, and persistent relational database storage for user data. This work demonstrates that combining accessible large language models with real-time sentiment analysis and user-centric gamification creates scalable and sustainable digital mental wellness interventions particularly for under-resourced demographics.

Keywords—sentiment analysis, adaptive coaching, large language model, gamification, crisis detection

ZERO-KNOWLEDGE PROOF FEDERATED DEEP LEARNING TO SECURELY PROCESS MEDICAL IMAGES.

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Abstract

A massive amount of data generated today in the healthcare sector is the medical imaging data - MRI scans and CT images to X-rays and ultrasound data. Such data has gigantic diagnostic possibilities yet such a diagnostic possibility is a two-sided sword: the more data we obtain, the more we expose patients to the risk of being victimized by privacy intrusion. Despite the effectiveness of traditional approaches of centralized machine learning, they imply transfer of raw patient data to remote servers to train, which is highly dangerous in terms of data security, regulatory compliance and institutional trust. The current paper proposes a privacy-aware architecture that will bring together Federated Learning (FL) and Convolutional Neural Networks (CNNs) to enable medical images to be processed with accuracy and a decentralized location without any raw patient data leaving the hospital where the image was created. In this architecture, all concerned healthcare institutions train a local model with their own data. The resulting model parameters never the patient data are encrypted with Elliptic Curve Cryptography (ECC) and then sent to a central aggregation server. This server integrates the updates with federated averaging in order to generate a never-better global model. The framework further incorporates secure aggregation protocols under the principle of Zero-Knowledge Proof (ZKP) to make the system even more resilient to adversarial attacks like model poisoning, as well as unauthorized access, in the base paper zkFL: Zero-Knowledge Proof-Based Gradient Aggregation for Federated Learning (IEEE Transactions on Big Data, 2025). The approach has been found to reduce communication overhead, boost model integrity and maintain good predictive performance using heterogeneous medical datasets, through experimental results and by use of module assessment. **Keywords:** Federated Learning, Convolutional Neural Networks, Elliptic Curve Cryptography, Zero-Knowledge Proof, Medical Image Analysis, Privacy-preserving machine learning, Healthcare AI.

DEEP REINFORCEMENT LEARNING FRAMEWORK FOR ACCURATE CROP YIELD PREDICTION USING ENVIRONMENTAL AND GENOTYPE DATA

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Abstract

Agriculture continues to face challenges such as unpredictable weather, soil degradation, and crop diseases, making traditional manual monitoring insufficient. This work proposes an integrated AI-based framework that combines predictive analytics and real-time monitoring to support data-driven farming decisions. The system leverages multiple datasets—crop, soil, and weather—to improve prediction accuracy. A Multilayer Perceptron (MLP) model analyzes soil nutrients and climatic factors to recommend the most suitable crops for a region, while a Convolutional Neural Network (CNN) identifies crop leaf diseases from images with high precision. Together, these modules enable proactive crop selection, optimized fertilizer use, and early disease detection. The system also provides fertilizer or pesticide suggestions based on disease severity and soil conditions. An automated SMS notification system delivers timely alerts and recommendations directly to farmers, ensuring accessibility even in low-connectivity regions. The unified framework promotes precision agriculture, reduces manual dependency, and enhances sustainability by helping farmers maximize yield and respond effectively to environmental changes.

Keywords—Crop Prediction, Disease Detection, Fertilizer Recommendation, Smart Farming

**IOT-ENABLED AI-BASED SMART SEWAGE WATER QUALITY MONITORING AND PREDICTION
SYSTEM FOR SUSTAINABLE WATER MANAGEMENT**

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Abstract: Rapid urbanisation and industrial discharge have significantly increased sewage contamination, posing serious threats to environmental sustainability and public health. Conventional sewage monitoring methods rely on manual sampling and laboratory analysis, which are costly, time consuming, and unsuitable for continuous real time monitoring. To address these limitations, this study proposes an IoT-enabled AI based smart sewage water quality monitoring and prediction system. The system collects key water quality parameters including pH, total dissolved solids, temperature, and turbidity using IoT sensors integrated with an ESP8266 microcontroller. The collected data is transmitted to a cloud platform for remote monitoring and analysis. A hybrid stacking model named HAAF NET is developed, where Random Forest, Histogram Gradient Boosting, and Extra Trees act as base learners, and Logistic Regression functions as the meta learner to improve prediction performance. The proposed system predicts sewage contamination levels and provides early warning alerts through a web based dashboard. Experimental results demonstrate that the model achieves high prediction accuracy 93%, indicating its effectiveness in real time pollution monitoring. The system supports sustainable water management and contributes to clean water and sanitation initiatives

Keywords— Internet of Things, Machine Learning, HAAF NET, Random Forest, Histogram Gradient Boosting, Extra Trees, Logistic Regression, Sewage Monitoring, Water Quality Prediction, Sustainable Water Management

TERAHERTZ (THZ) ANTENNAS IN MEDICAL APPLICATIONS

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Abstract— Terahertz (THz) technology, which operates within the frequency spectrum of 0.1–10 THz, is an innovative area in electromagnetic research that connects the microwave and infrared segments of the spectrum. In recent years, it has gained recognition as a highly effective tool in the field of medical science, mainly due to its non-ionizing property, making it considerably safer than X-rays and other ionizing radiation methods used in clinical diagnostics. This safety feature allows THz waves to interact with biological tissues without inflicting cellular damage or causing genetic mutations. Furthermore, THz radiation is highly sensitive to the water content and molecular structure of tissues, allowing it to accurately differentiate between various types of biological tissues. This property is particularly valuable in detecting abnormalities such as cancerous cells, which often have higher water content compared to healthy tissues. THz technology has shown potential in applications such as high resolution imaging, early stage illness detection, skin cancer, dental issues, and non-invasive diagnostics. THz spectroscopy also helps in analysis of molecular structures, aiding in precise medical diagnosis. Therefore THz antennas play a crucial role in implementation of these THz systems, as these antennas are used for generation, transmission and reception of THz signals. These antenna design is a challenging as these operates at extremely high frequencies, and has issue of signal attenuation, material losses and fabrication constraints. The performance of the antenna directly impacts the THz based medical system. This paper therefore explores the fundamental principles of THz antennas, examines the key challenges involved in their design and implementation, and highlights their expanding role in modern medical applications such as imaging, diagnostics, and cancer detection. **Keywords-** Terahertz antennas, medical imaging, cancer detection, metamaterial absorbers, patch antennas, photoconductive antennas, biosensors, non-invasive diagnostics

PRODUCTION IMPROVEMENT IN TANDEM MASTER CYLINDER MANUFACTURING LINE

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Abstract— The increasing demand for high-quality braking systems in the automotive sector necessitates continuous improvement in manufacturing efficiency and product reliability. This study focuses on production improvement in a tandem master cylinder manufacturing line through a systematic integration of lean manufacturing principles, process optimization, and quality control enhancements. The tandem master cylinder, a critical component in hydraulic braking systems, requires high precision and consistency, making the production line sensitive to inefficiencies and defects. Initially, a comprehensive assessment of the existing manufacturing process was conducted using value stream mapping to identify bottlenecks, non-value-added activities, and process variability. To address these issues, linebalancing techniques were implemented alongside workstation redesign to improve workflow continuity. Automation was introduced in critical stages such as bore inspection and assembly verification, reducing human error and inspection time. Furthermore, the application of statistical process control enabled real-time monitoring of key quality parameters, minimizing defects and rework. Preventive maintenance schedules were optimized using data-driven insights, significantly reducing unplanned machine stoppages. As a result of these interventions, the manufacturing line demonstrated a notable reduction in cycle time, improved overall equipment effectiveness (OEE), and a substantial decrease in defect rates. These findings provide a scalable framework for similar high-precision manufacturing environments aiming to enhance productivity and quality simultaneously. **Keywords**— Tandem master cylinder; Lean manufacturing; Production optimization; Linebalancing; Statistical process control; Poka-yoke; Automation; Overall equipment effectiveness(OEE); Quality improvement; Manufacturing efficiency

FRAUDULENT ACTIVITIES DETECT TO UPI FOR CNN USING NON OBVIOUS ANOMALIES

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Abstract—In the financial world, it is important to have a sound understanding of systems against fraud, as they help detect activities such as anomalous and malicious transactions, through the analysis of activity engagement. Decision Tree are the recent form of deep learning models which, in more recent years, have shown advanced capability in the identification of fraudulent transactions, however, sensitivity and accuracy when implemented in real time systems remain an issue. In this research, we provide a new idea of fraud detection of UPI transactions that utilizes a Decision Tree based sequence modeling framework. The model focuses on normalization sets and typical cardholder activities to effectively learn how to detect anomalies in UPI transactions. It then analyzes the sequences of a person's activities and adds on the probabilities, to then classify if the transaction is fraudulent or not. Several measures are established, however, in order to aid in minimizing false positives, because the aim is to ensure valid transactions are still processed. The experimental results support the proposed fraud detection system's potential usefulness in monitoring actual UPI transactions and it also shows how it outperforms current systems in related studies. Our model facilitates the UPI transaction environment equally and addresses the fine balance in detection efficiency, accuracy and transaction speed by proposing the integration of deep learning techniques. **Keywords**— Fraud Detection, UPI Transactions, Decision Tree , Deep Learning, Sequential Modeling, Financial Security , Logistic Regression, SVM.

UNIFIED ASSESSMENT PLATFORM

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Abstract: The Unified Assessment Platform is a web-based application developed to modernize and simplify the process of conducting academic and organizational assessments through a single integrated system. The platform provides a centralized environment for administrators, faculty members, and students to create, manage, and evaluate various types of assessments efficiently. The application allows administrators to manage user profiles, departments, courses, and examination schedules in a structured database. Faculty members can create question banks, design online tests, assign assessments, and define grading criteria. Students can securely access examinations, submit responses, and view results through an intuitive digital interface. A key feature of the system is its ability to automate the complete assessment lifecycle, from question creation to result publication. The platform supports multiple question formats such as multiple-choice, descriptive, coding-based, and assignment submissions. It also provides instant evaluation for objective questions and enables manual evaluation for subjective responses. Real-time notifications and reminders help improve communication between users and ensure timely completion of assessments. As part of the proposed system, the platform includes a performance analytics module that generates detailed reports on student progress, subject-wise performance, and overall academic outcomes. These insights help faculty members identify learning gaps and support data-driven decision-making for academic improvement. The system also ensures secure access through role-based authentication for administrators, teachers, and students, maintaining confidentiality and reliability throughout the process. Additionally, the platform offers features such as attendance-linked assessments, downloadable reports, and cloud-based record storage for long-term academic tracking. Built using React.js, Node.js, PostgreSQL, and modern web technologies, the system ensures scalability, security, and ease of deployment. Overall, the Unified Assessment Platform provides an efficient and organized solution for managing assessments digitally, reducing manual workload, improving transparency, and enhancing the overall quality of academic evaluation.

Keywords— Unified Assessment, Online Examination, Academic Evaluation, Performance Analytics, Web Application

LIGHTWEIGHT CONCRETE USING FLY ASH AND THERMOCOL

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Abstract: Lightweight concrete has gained significant attention in modern construction due to its reduced self-weight and improved thermal properties. This study focuses on the development of lightweight concrete by incorporating fly ash as a partial replacement for cement and thermocol (expanded polystyrene beads) as a lightweight aggregate. Fly ash, a by-product of thermal power plants, enhances workability and long-term strength while also contributing to sustainable construction by reducing cement usage. Thermocol particles help in decreasing the density of concrete, making it suitable for non-load bearing structures and insulation purposes. Different mix proportions were prepared by varying the percentage of fly ash and thermocol to evaluate their influence on compressive strength, density, and durability. The results indicate that the inclusion of thermocol significantly reduces the density of concrete, while fly ash improves the bonding and strength characteristics over time. However, an increase in thermocol content may lead to a reduction in compressive strength. The study concludes that an optimal balance between fly ash and thermocol can produce eco-friendly, cost-effective, and lightweight concrete suitable for various construction applications such as partition walls, panels, and low-load structural elements.

Keywords: Lightweight concrete, Fly ash, Thermocol, Expanded polystyrene, Sustainable construction, Low density concrete, Compressive strength, Eco-friendly materials

**A CROSS-TYPE HYBRID RECOMMENDATION FRAMEWORK FOR SMART LEARNING
MANAGEMENT SYSTEMS IN ENGINEERING EDUCATION**

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Abstract—Engineering colleges in India rely on fragmented portals for attendance, examination results, online learning, and placement preparation, causing information silos and administrative overhead that reduces institutional efficiency and student engagement. This paper presents a Smart Learning Management System (SLMS) that consolidates LMS content delivery, academic administration, placement preparation, and institutional analytics into a unified full-stack web platform designed specifically for Anna University-affiliated engineering colleges. The primary contribution is a cross-type Hybrid Recommendation System that combines TF-IDF Content-Based Filtering with weight 0.70 and User-Item Collaborative Filtering with weight 0.30. This model bridges LMS course engagement signals with campus placement preparation content by automatically recommending jobs, blogs, and study materials from course interaction history alone, without requiring explicit user preference input. Empirical evaluation on 60 synthetic student profiles across three interest archetypes and 30 content items demonstrates that the hybrid model achieves Precision@5 of 0.1400 and Recall@5 of 0.7000, outperforming both individual filtering approaches. System Usability Scale evaluation with 40 participants yielded a composite score of 73.81, exceeding the industry benchmark of 68 and confirming above-average usability across student and faculty user groups. The production build satisfies all Google Core Web Vitals thresholds, with First Contentful Paint of 1.2 seconds and gzipped bundle size of approximately 850 KB. Functional testing across 79 test cases covering authentication, course workflows, aptitude assessment, administrative CRUD, and responsive design achieved a 98.7 percent pass rate, confirming system reliability across all major user workflows.

Keywords—Learning Management System, Hybrid Recommendation System, TF-IDF, Collaborative Filtering, Multi-Tenant Architecture

MICRO-LEAK DETECTION SYSTEM

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Abstract: In the modern digital banking environment, users frequently encounter small, recurring expenses—such as hidden charges, auto-renewals, and subscriptions—that often go unnoticed. Individually, these deductions are minor; however, they accumulate over time, resulting in significant long-term financial erosion. Traditional banking systems primarily prioritize the detection of large-scale fraud and unauthorized activities, often overlooking these micro-level transaction patterns. This work presents a pattern-based Micro-Leak Detection System designed to bridge the gap between fraud detection and financial awareness. The proposed framework utilizes a rule-based scoring mechanism to analyze transaction frequency, identify repeated small-value deductions, and detect incremental price increases, commonly known as “price creep”. Developed using a layered architecture consisting of Java, MySQL, and JDBC, the system provides automated monitoring without the need for complex AI or blockchain technologies. The system enhances proactive expense control by generating real-time alerts and providing yearly financial loss projections, offering users actionable insights into their spending habits. Performance is centered on reliability and simple implementation, ensuring a scalable solution for preventive financial monitoring. The results demonstrate that systematic pattern analysis effectively identifies unnoticed financial leaks, empowering users to maintain better control over their digital finances.

Keywords: Micro-leak Detection, Rule-based Scoring, Transaction Pattern Analysis, Financial Awareness, Java, JDBC.

AN AI-BASED PREDICTIVE ANALYTICS FRAMEWORK FOR CLINICAL TRIAL PARTICIPANT RETENTION USING RANDOM FOREST CLASSIFICATION

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Abstract— Clinical trial participant retention is a critical factor in ensuring study validity, reducing operational cost, and maintaining statistical reliability. Participant withdrawal may occur due to demographic, clinical, behavioral, or logistical factors, making early identification of retention risk essential. This paper presents an AI-based predictive analytics framework for clinical trial participant retention using Random Forest classification. The proposed system evaluates participant data to detect patterns associated with dropout risk and supports timely intervention strategies. By leveraging machine learning-based prediction, the framework helps researchers improve retention management, minimize attrition bias, and enhance the overall efficiency of clinical trials. The model aims to provide a reliable decision-support mechanism for proactive participant monitoring and retention planning.

Keywords— Clinical Trial Retention, Predictive Analytics, Random Forest Classification, Participant Attrition, Machine Learning, Decision Support.

A COMPACT STAR-SHAPED SUB-6 GHZ MIMO ANTENNA WITH REFLECTOR-ENHANCED GAIN AND HIGH RADIATION EFFICIENCY

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Abstract

This paper presents the design, fabrication, and experimental analysis of a compact star-shaped microstrip patch antenna for modern wireless communication applications. The proposed antenna is designed with a compact size of $35 \times 22 \text{ mm}^2$, making it suitable for miniaturized wireless devices. The antenna operates in the Sub-6 GHz frequency range, supporting applications such as WLAN and 5G communication systems. The designed antenna is directly fabricated on a suitable substrate using standard PCB fabrication techniques. To enhance the radiation performance, a reflector plate is incorporated in the antenna structure, which improves the gain characteristics of the antenna. The fabricated antenna is tested using a Vector Network Analyzer (VNA) to measure the return loss and standing wave ratio (SWR). The radiation characteristics, including E-plane and H-plane patterns, are measured in an anechoic chamber to evaluate the antenna performance in a controlled environment. The gain is also determined using the standard measurement setup. The measured results indicate that the antenna achieves return loss values less than 10dB, ensuring good impedance matching. The gain is improved due to the inclusion of the reflector plate, resulting in enhanced radiation performance. The SWR values are maintained below 2, confirming stable operation with minimal reflection. The E-plane and H-plane radiation patterns demonstrate stable and consistent radiation characteristics. Overall, the proposed compact star-shaped antenna with reflector plate exhibits efficient performance in terms of gain, bandwidth, and radiation behavior, making it a suitable candidate for practical wireless communication applications.

**MOBILE THEFT PROTECTION: AN ANDROID-BASED SYSTEM FOR AUTONOMOUS THEFT
DETECTION, EVIDENCE CAPTURE, AND OFFLINE-RESILIENT ALERT DELIVERY**

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Abstract— Smartphone theft has become a widespread concern in today's digital era, with incidents occurring at an alarming rate worldwide. Many existing anti-theft solutions, including Google Find My Device, Cerberus, and Prey Anti-Theft, depend heavily on internet connectivity, making them ineffective in situations where network access is limited or unavailable. To address this limitation, this paper introduces a Mobile Theft Protection Application, an Android-based system designed to operate reliably even in offline conditions. The application is developed using Kotlin and integrates key Android components such as Camera2 API, Device Policy Manager, and WorkManager to enable intelligent and autonomous theft detection. The system continuously observes suspicious activities, including repeated incorrect PIN or pattern attempts and SIM card changes. When such events are detected, the application immediately responds by triggering a high-volume alarm that cannot be easily muted, capturing an image of the user through the front camera, and sending alerts through multiple channels. Notably, SMS notifications containing location details are transmitted using the mobile network without requiring internet access, ensuring timely communication. Additionally, email alerts with captured images and device information are sent when connectivity becomes available. Any alerts generated during network unavailability are securely stored and automatically delivered once connectivity is restored, ensuring that no critical information is lost. The system features a user-friendly interface based on Material Design principles, along with Firebase Authentication and Google Maps integration for enhanced usability. Experimental evaluation involving 90 participants indicates strong performance, with a majority of users rating the system highly in terms of responsiveness, accuracy, and innovation.

Keywords—smartphones; anti-theft system; Android security; Camera2 API; offline alert queue; WorkManager; Device Policy Manager; GPS tracking; SIM change detection

**AI-BASED JOB PORTFOLIO EVALUATION SYSTEM USING GENERATIVE AI AND MACHINE
LEARNING**

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Abstract— In today's highly competitive job market, evaluating candidate portfolios manually is a time-consuming and often inefficient process. Recruiters often face challenges in analyzing various aspects such as project descriptions, technical skills, and professional profiles from platforms like GitHub and LinkedIn. To address these limitations, this paper proposes a Job Portfolio Evaluation System that leverages Generative AI and Machine Learning techniques to provide accurate and personalized candidate assessments. The proposed system collects candidate data, including resumes, GitHub repositories, LinkedIn profiles, and years of experience. Natural Language Processing (NLP) techniques are used to analyze unstructured textual data, while clustering methods are employed to match candidate profiles with job requirements. Machine learning models further extract and evaluate key features such as technical skills, domains of expertise, and experience levels. Additionally, Generative AI is utilized to identify strengths and weaknesses, detect skill gaps, and generate meaningful feedback and recommendations for candidates. This system enhances the recruitment process by improving accuracy, reducing manual effort, and ensuring a fair and transparent evaluation.

Keywords— Generative AI, Machine Learning, Natural Language Processing, Job Portfolio Evaluation, Recruitment System, Candidate Assessment

DEEP LEARNING APPROACHES FOR MULTIMODAL DEEPPFAKE DETECTION

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Abstract: The rapid advancement of artificial intelligence and deep learning technologies has given rise to a new category of synthetic media manipulation commonly referred to as deepfakes. These are AI-generated digital artifacts — including images, videos, and audio — that mimic authentic content with alarmingly high fidelity, posing serious threats to media integrity, personal security, and public trust. This work presents a systematic multimodal approach to detecting deepfake content across three media types: images, videos, and audio. The proposed framework employs an ensemble of specialized deep learning models for each modality and integrates them into a unified, fully local detection pipeline. For image analysis, four pre-trained neural network architectures — ViT, Efficient Net-B4, Xception, and ConvNeXt — are deployed in parallel with confidence-weighted ensemble fusion. Audio deepfake detection leverages a Wav2Vec2-based transformer model, while video analysis is performed through temporal frame sampling and per-frame classification. The system is built on a FastAPI backend and a React-Vite frontend, providing a web-native interface accessible from any device. All processing occurs locally on-device, ensuring complete data privacy without dependency on external APIs or cloud services. Models are evaluated using standard performance measures including precision, recall, F1-score, and accuracy. The results demonstrate that ensemble-based multimodal detection significantly outperforms single-modality approaches, offering a scalable and privacy-preserving solution for media verification and digital forensics.

Keywords: Vision Transformer (ViT), EfficientNet-B4, Xception, ConvNeXt, Wav2Vec2, Deepfake Detection, Ensemble Learning, FastAPI, Natural Language Processing (NLP), Multimodal Deep Learning

INSURANCE POLICY MANAGEMENT SYSTEM

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Abstract: The Insurance Policy Management System is a software application developed to simplify and automate the management of insurance policies and related activities. In traditional systems, most of the work such as maintaining customer records, policy details, premium tracking, and claim processing is done manually, which is time-consuming and prone to errors. This system aims to overcome those difficulties by providing a digital platform where all insurance operations can be handled efficiently. The system allows different types of users such as administrators, agents, and customers to access the application based on their roles. Administrators can manage overall system operations, including adding new policies, updating policy details, and monitoring transactions. Agents can register customers, suggest suitable policies, and assist in premium payments and claims. Customers can view their policy details, pay premiums, check due dates, and track claim status easily. One of the key features of this system is maintaining a centralized database where all customer and policy information is stored securely. This reduces data redundancy and ensures quick access to information. The system also provides automated notifications for policy renewals and premium due dates, helping customers avoid missing payments. Additionally, the claim management module enables users to submit and track claims efficiently, improving transparency in the process. The application is designed with a user-friendly interface so that even non-technical users can operate it without difficulty. It ensures data accuracy, reduces paperwork, and saves time for both the organization and customers. Security measures are also implemented to protect sensitive data and maintain confidentiality. Overall, the Insurance Policy Management System enhances productivity, improves customer satisfaction, and provides a reliable solution for managing insurance operations in a modern and efficient way.

SMART HEALTH RATING USING COMPUTER VISION AND MACHINE LEARNING

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Abstract— The increasing prevalence of lifestyle-related non-communicable diseases in India highlights the urgent need for improved nutritional awareness among the public. However, conventional food labels are often complex and difficult for individuals to interpret. To address this challenge, this paper proposes Smart Health Ratings, an intelligent system aligned with the Government of India's Fit India Mission, which simplifies nutritional information into an easy-to-understand Nutri-Score ranging from A (healthiest) to E (least healthy). The system is developed in three progressive phases. Phase I involves manual entry of nutritional data from food labels to compute a health score. Phase II introduces barcode-based scanning to enable automatic retrieval of product information and instant score generation using a database. Phase III further enhances the system using computer vision techniques, where trained CNN models recognize food products from images and provide real-time health ratings. By integrating nutrition profiling algorithms, barcode data extraction, and image-based recognition, the Smart Health Ratings system offers a fast, user-friendly solution for interpreting food nutrition. It effectively bridges the gap between complex nutritional data and consumer understanding, supporting healthier dietary choices and promoting public health awareness.

SMART ACCIDENT DETECTION AND RESCUE SYSTEM

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Abstract

Road traffic accidents remain a leading cause of global mortality, primarily due to the critical delay in notifying emergency responders. While existing detection technologies like ADAS or GPS-based alarms exist, they are often hindered by high implementation costs or frequent false positives triggered by routine driving maneuvers. This paper presents the "Smart Accident Detection and Rescue System," an IoT-based embedded solution designed to provide reliable, real-time accident monitoring. The system utilizes a dual-sensor fusion approach, integrating an MPU6050 accelerometer to detect sudden three-axis impact forces and a sound sensor to capture the acoustic signature of a crash. By processing these inputs through an ESP32 microcontroller and comparing them against predefined thresholds, the system ensures high detection accuracy while minimizing the errors common in single-sensor setups. To enhance user control and system reliability, the architecture includes an OLED display for real-time feedback and a manual override push button, allowing occupants to cancel alerts during minor, non-emergency impacts. Upon confirmed detection, the communication module leverages wireless connectivity to transmit immediate emergency alerts to predefined contacts. Experimental results under simulated conditions demonstrate that the system effectively differentiates between normal driving and collision scenarios with low latency. This cost-effective and scalable design provides a robust framework for future smart transportation safety, offering a practical path toward reducing accident-related fatalities through automated, rapid response coordination.

Keyword—IOT, Accident Detection, Emergency alert system, Smart safety, Embedded system, Health monitoring.

APPOINTMENT BOOKING SYSTEM FOR SERVICE –ORIENTED BUSINESSES

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Abstract

The Semi-Automated Web-Based Appointment Booking System with Admin-Controlled Confirmation is a modern web-based platform designed to simplify and streamline appointment scheduling for service-oriented businesses such as beauty and wellness centers. The system provides an efficient solution for managing customer bookings while ensuring proper administrative control over scheduling activities. The application enables users to browse a variety of services along with detailed information such as pricing and duration. Based on their preferences, users can select suitable time slots and initiate booking requests through an intuitive interface. The system supports flexible booking options, including advance confirmation and request-based booking, which enhances user convenience while maintaining operational reliability. A key feature of the system is its semi-automated booking mechanism, where users can initiate appointments, but final confirmation and management are handled by the administrator. This approach ensures better control over scheduling, prevents conflicts, and improves service efficiency. The system also incorporates slot management and locking mechanisms to avoid double bookings and ensure fair allocation of time slots. The platform is developed using modern web technologies including React.js, HTML, CSS (Tailwind CSS), and JavaScript for the frontend, and Node.js for backend processing. MongoDB is used as the database for storing user data, service details, and booking records. These technologies collectively ensure that the system is scalable, responsive, and secure. Overall, the proposed system enhances the efficiency of appointment management, reduces manual workload, and improves user experience by providing a structured and reliable digital booking platform.

**A STUDY ON THE ROLE OF INSIDE SALES PRACTICES IN BUILDING CUSTOMER EXPERIENCE
AMONG GOVERNMENT BUYERS IN THE VIDEO CONFERENCING INDUSTRY**

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Abstract

This study examines the role of inside sales practices in enhancing customer experience among government buyers in the video conferencing industry. With the increasing adoption of digital procurement platforms such as Government e-Marketplace (GeM), organizations are required to adopt structured and responsive inside sales approaches to support government procurement processes. The research focuses on understanding how communication effectiveness, responsiveness, product knowledge, and technical support influence customer satisfaction and purchasing experience. A descriptive research design and quantitative approach were adopted, with primary data collected from 150 respondents using structured questionnaires. Statistical tools such as percentage analysis, correlation, regression, and chi-square tests were applied to analyze the data. The findings indicate that inside sales practices play a significant role in improving customer experience by ensuring timely communication, efficient order processing, and better platform support. The study provides recommendations for strengthening inside sales strategies to enhance customer satisfaction and long-term government buyer relationships in the video conferencing industry. Introduction Customer experience has become one of the most important factors influencing organizational success in the modern business environment.

A HYBRID ISOLATION FOREST – XGBOOST FRAMEWORK FOR ALERT FATIGUE REDUCTION IN SOC_s

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Abstract—Modern Security Operations Centers (SOCs) are struggling with an enormous amount of security alerts. Despite of the enormous amount, only a significant amount leads to attacks. That makes the SOC engineers to handle many incoming alerts manually, which grows exponentially. Most of the existing ML-based frameworks focus on attack detection rather than alert reduction, which gives more false positives, which in turn results in handling large amounts of alerts. To address this challenge, this paper proposes a hybrid framework that combines Isolation Forest for anomaly detection with XGBoost for prioritizing the alerts. This Isolation Forest model generates anomaly scores, which then XGBoost evaluates those anomalies to prioritize into 4 attack levels as follows: Critical, High, Medium and Low. This framework/solution results in analysts focusing on higher level threats first and then the lower ones. The framework is evaluated and trained on the CICIDS2017 dataset, which is a benchmark containing realistic network traffic with different attack scenarios. The results from the evaluation demonstrate that the model achieves a 99.34% precision and 82.83% recall which results in reducing false positives with the strong detection capability. In addition to that, when the model/framework is evaluated on the full dataset containing 2.8 million samples resulted in 83.59 % alert reduction and 0.13% false positive rate.

Keywords: Intrusion Detection, Alert Fatigue, Isolation Forest, XGBoost, Alert Prioritization, Anomaly Detection.

INTEGRATED COOPERATIVE FARMING SYSTEM WITH FARMER CONNECTIVITY AND CROP RECOMMENDATION

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Abstract—Agriculture has historically been the backbone of economic stability and food production worldwide. Yet, unlike sectors such as healthcare or finance, the farming community has been comparatively slow to embrace the possibilities offered by modern digital tools. Motivated by these real-world shortcomings, we built the Integrated Cooperative Farming System (ICFS): a unified, web-based platform that brings together farmers, agricultural laborers, product buyers, and equipment renters under a single cooperative digital environment. The ICFS offers five distinct, role-aware dashboards for farmers, workers, buyers, renters, and administrators. A built-in AI fertilizer advisory engine gathers live weather data via the OpenWeatherMap API including temperature readings, humidity levels. A notable component of the system is the AI Doctor module — a computer vision-based crop disease diagnosis engine built around MobileNetV3-Large with Transfer Learning. In our work, this module was designed to cover three crops of regional significance: Tomato, Maize, and Curry Leaves. For Tomato and Maize, we relied on the widely used PlantVillage dataset comprising over 50,000 labeled images; for Curry Leaves, field-scanned images were gathered and expanded via augmentation techniques. The module delivered diagnostic confidence scores consistently above 94%. Beyond disease diagnosis, ICFS further includes a domain-restricted agricultural chatbot, a repository of government scheme documentation, resource sharing capabilities between farmers, and centralized administrative supervision — together forming a robust cooperative agriculture platform built around transparency and evidence-based farming decisions.

Keywords — Cooperative Farming, Farmer Connectivity, AI-Based Agriculture, Crop Recommendation, Weather-Based Advisory, MobileNetV3-Large, Transfer Learning, Tomato Disease Detection, Maize Disease Detection, Curry Leaf Disease Detection, Agricultural Chatbot.

AI-POWERED MULTILINGUAL HANDWRITTEN AND PRINTED IMAGE UNDERSTANDING SYSTEM

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Abstract: The rapid digitization of data has created a growing need for efficient and accurate extraction of information from physical documents. Traditional data entry methods are manual, time-consuming, and prone to human error, especially when dealing with multilingual and handwritten content. This creates significant challenges in sectors such as administration, education, and business where large volumes of forms must be processed. This project presents the design and development of a Universal AI-Based Form Data Extraction System capable of extracting both printed and handwritten text in Tamil and English from images. The system leverages advanced Optical Character Recognition (OCR) techniques powered by the Gemini API to accurately identify and process multilingual text. It is designed to handle structured and semi-structured forms, ensuring flexibility across different document types. The extracted data is automatically processed and stored in a MongoDB database, enabling efficient data management, retrieval, and analysis. The system architecture ensures scalability, allowing it to handle large datasets and support future enhancements such as real-time processing and intelligent data validation. The proposed solution significantly reduces manual effort, improves accuracy, and accelerates data processing workflows. It provides a user-friendly and automated approach to form data extraction, making it suitable for real-world applications across multiple domains. In conclusion, this system demonstrates an effective integration of artificial intelligence and database technologies to solve practical challenges in multilingual image processing, offering a reliable and scalable solution for automated data extraction.

Keywords— OCR, AI-based extraction, multilingual processing, handwritten recognition, Gemini API, MongoDB, form automation

YAZH ISAI: AI-BASED TAMIL MUSIC GENRE CLASSIFICATION AND SMART PLAYBACK SYSTEM

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Abstract— This paper presents the design and development of Yazh Isai, an advanced on-device digital signal processing (DSP) system for high-fidelity audio manipulation on the Android platform. The system integrates a high-performance transformation engine that enables real-time interaction with complex audio signals without the need for cloud-based computation. By utilizing Kotlin Coroutines and a multi-threaded architecture, the application manages heavy mathematical computations and file I/O operations through priority-based background scheduling, ensuring high responsiveness and preventing UI latency. The system implements specialized DSP modules, including a native Fast Fourier Transform (FFT) configuration for transitioning between time and frequency domains, and an optimized AudioDecoder for high-resolution signal extraction. To ensure professional-grade output, the architecture supports 32-bit float processing and local .wav encoding, maintaining maximum audio transparency. Furthermore, the user interface adopts a modern glassmorphic design with a real-time terminal console to visualize engine status, CPU markers, and processing milestones. The proposed system provides a secure, privacy-centric, and efficient solution for mobile audio engineering. It eliminates the latency associated with remote processing and provides musicians with a portable, high-performance toolkit for offline audio transformation and analysis.

Keywords— Digital Signal Processing (DSP), Fast Fourier Transform (FFT), Android Development, On-Device Processing, Audio Engineering, High-Fidelity Audio, Kotlin Coroutines, Mobile Computing.

MULTI-NODE RESILIENT LORA COMMUNICATION SYSTEM FOR REMOTE AND CRITICAL APPLICATIONS

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Abstract: In critical and remote environments such as disaster zones, military operations, and marine areas, conventional communication systems often fail due to absent infrastructure, limited coverage, and power constraints. This necessitates a reliable, long-range, low-power communication system capable of independent operation. This paper presents the design and implementation of a resilient LoRa-based communication system for remote and critical applications. The proposed system comprises one base station and two remote nodes, each integrated with a microcontroller, LoRa module, GPS module, and OLED display.

The remote nodes continuously acquire real-time location data using GPS and display the information locally on the OLED screen. The collected data is transmitted wirelessly over long distances using LoRa communication to the base station, which receives data from multiple nodes and presents it on a centralized dashboard for monitoring and coordination. The system operates without reliance on internet or cellular networks, ensuring reliable communication in isolated and infrastructure-deficient areas. Experimental implementation demonstrates that the proposed system is low-cost, energy-efficient, and scalable, making it suitable for applications including disaster management, defense communication, and maritime monitoring. The results validate its effectiveness for real-time tracking and communication in challenging environments

ICRIT208

MEDIPREDICT AI: EXPLAINABLE MULTI-DISEASE RISK PREDICTION SYSTEM

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Abstract— This paper presents the design and development of MediPredict AI, an intelligent and explainable multi-disease risk prediction system aimed at early detection and prevention of chronic diseases. The system leverages machine learning algorithms to predict the risk of Diabetes, Heart Disease, and Chronic Kidney Disease based on user-provided clinical parameters. Multiple models, including Logistic Regression, Random Forest, and XGBoost, are trained and evaluated to select the most accurate predictor for each disease. To enhance transparency and user trust, the system integrates Explainable AI (XAI) techniques using SHAP (SHapley Additive exPlanations), enabling users to understand the contribution of each feature toward the prediction. The application provides a user-friendly interface developed using Streamlit, featuring interactive input forms, real-time risk visualization through gauge charts, and personalized health recommendations based on predicted risk levels. Additionally, the system includes advanced functionalities such as automated medical report generation in PDF format, prediction history tracking, and an AI-powered chatbot for basic healthcare guidance. The entire solution is designed to operate efficiently on local systems without requiring cloud dependency, ensuring data privacy and faster response times. The proposed system serves as a practical tool for health awareness and preventive care, assisting users in identifying potential health risks at an early stage and encouraging timely medical consultation.

Keywords— Machine Learning, Explainable AI (XAI), SHAP, Healthcare Analytics, Disease Prediction, Streamlit, Random Forest, XGBoost, Preventive Healthcare, Data Science

INTELLIGENT CARDIOVASCULAR RISK PREDICTION USING DEEP LEARNING NEURAL NETWORKS

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Abstract: The research presents an advanced deep learning-based framework for the cardiovascular risk prediction using deep learning neural networks. This system remains the foremost cause of mortality worldwide, driving the need for rapid, accurate, and automated diagnostic solutions. Electrocardiogram (ECG) analysis continues to serve as a primary non-invasive tool for evaluating cardiac activity; however, manual interpretation is often limited by subjectivity, inter-observer variability, and the difficulty of identifying subtle morphological changes in waveform patterns. Traditional machine learning methods rely heavily on handcrafted features, which restrict their ability to model the complex spatial and temporal relationships inherent in ECG signals. To address these limitations, this paper presents an intelligent deep learning-based diagnostic framework that utilizes raw ECG image data for robust heart disease prediction. The proposed system employs DenseNet, a densely connected convolutional neural network architecture that strengthens gradient flow, enhances feature reuse, and reduces parameter redundancy. Comprehensive preprocessing—consisting of noise removal, normalization, contrast enhancement, and data augmentation—ensures high-quality. The proposed framework achieves high diagnostic accuracy while minimizing false positives, illustrating its reliability in real-world clinical environments. By automating ECG interpretation, the system substantially reduces diagnostic latency, supports early intervention, and offers a scalable, efficient, and clinically relevant tool for intelligent cardiovascular risk assessment.

Keywords: Cardiovascular diseases, ECG images, deep learning, DenseNet, medical image classification, automated diagnosis, feature extraction.

IOT-ENABLED WEARABLE SYSTEM FOR REAL-TIME LOWER LIMB LOAD DISTRIBUTION ASSESSMENT USING ESP32 AND IMU

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Abstract: Conventional gait analysis systems, such as force plates, are widely used for assessing the lower limb, mainly for load distribution. They are very costly, non-portable, and used in limited laboratory environments. Many existing wearable systems rely on multiple sensors, which increases system complexity and is not used frequently. To overcome these challenges, this study proposes an IoT-enabled wearable system using a single Inertial Measurement Unit (IMU) sensor and an ESP32 microcontroller for real-time assessment of lower limb load distribution. The proposed system is designed to be compact, lightweight, and suitable for both hospital-based and home-based use. It acquires real-time motion data, which includes acceleration and angular velocity, from the IMU sensor attached to the lower limb. These signals are processed using embedded algorithms for feature extraction and load estimation, enabling the identification of weight distribution between the left and right legs. Based on the computed parameters, the system classifies the user's condition into normal, mild imbalance, and abnormal categories. The ESP32 module, which enables wireless data transmission to mobile phone or desktop platforms, allows continuous monitoring and visualization of gait patterns. This system is capable of detecting load imbalance when the person is standing and walking, providing continuous feedback to the user. The results demonstrate that the proposed system can reliably estimate lower limb load distribution with consistent performance. Furthermore, the system has potential applications in rehabilitation and is used for early detection of knee pain, such as osteoarthritis. Overall, this work presents an efficient, portable

Keywords: IoT, ESP32, IMU Sensor, Gait Analysis, Load Distribution, Wearable System, Balance Detection, Rehabilitation, Real-Time Monitoring

HEALTH MONITORING SYSTEM FOR SURFERS

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Abstract: We describe a real-time health monitoring solution for surfers that uses Internet of Things (IoT) technology to address the many risks of surfing, such as accidental drowning, sudden-onset medical emergencies, and accidents while in the water, all of which have limited access to medical resources. Due to these extreme conditions and the absence of access to immediate medical attention, surfers need a system that continuously tracks their health status and notifies them in emergency situations. The proposed solution incorporates four (4) sensors used to monitor the health status of surfers and includes heart rate, blood oxygen level (SpO₂), temperature, and fall detection. Each of these sensors connects to an ESP32 or ESP8266 microcontroller, which is used for data collection, processing and transmitting data. The real-time information collected from the sensors is made available for local monitoring via an LCD screen and is also transmitted to the Blynk IoT Cloud-based platform, where data can also be accessed using a corresponding mobile application. The proposed system will provide instantaneous alerts if any of the vital signs measured by the sensors are outside of normal ranges (e.g., a low blood oxygen level, elevated temperature, or a sudden fall). In addition, an Emergency SOS button allows the surfer to manually request assistance if an emergency should occur.

Keywords: Real-Time Health Monitoring System, IoT-Based Monitoring System, Wireless Data Communication, Wearable Sensor System

DESIGN OF A SEMI-AUTOMATED ELECTRO MECHANICAL PRAWN CLEANING SYSTEM

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Abstract—The cleaning, sorting, and preparation of prawns or shrimps in aquaculture and seafood processing industries are traditionally carried out using manual labour. These conventional methods are highly labour-intensive, time-consuming, and often result in inconsistent hygiene standards. In addition, manual handling increases operational costs, reduces productivity, and limits the overall throughput of large-scale prawn processing units. To overcome these challenges, an automated Electromechanical Prawn Cleaning System is proposed to improve efficiency, hygiene, and processing speed while reducing human intervention. At the core of the system, an electric motor drives a multi-stage vibratory sieve mechanism, which plays a vital role in separating unwanted materials such as debris, sand, and other impurities from the prawns. The controlled vibration helps maintain continuous movement, allowing the prawns to pass smoothly through different processing stages. To further enhance cleanliness and sanitation, water spray nozzles are integrated into the system. These nozzles spray pressurized water onto the prawns while they pass through a rotating or reinstallation drum. This stage ensures thorough washing and removal of residual dirt, contaminants, and biological waste. The rotating drum assists in agitation, enabling uniform exposure of prawns to the water jets and improving the overall effectiveness of the cleaning process. Additionally, the system incorporates a variable-speed conveyor mechanism that regulates the flow of prawns into the cleaning unit. By synchronizing the conveyor with the vibratory sieve and washing stages, the system maintains a steady throughput. The system is designed to be cost-effective, scalable, and suitable for both small and medium-scale seafood processing units.

Keywords—Electromechanical, Semi-automated, Servo Motor, Linear Actuator, Mechanical separation, Food Processing

CONFIDENCE MAPPING BASED REMOTE SENSING IMAGE DESTRIPIING USING DENSE GABOR FILTERS AND SAND CAT SWARM OPTIMIZATION

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Abstract—Stripe noise is a common degradation observed in imaging systems such as remote sensing, infrared imaging, and medical imaging, where it significantly affects visual quality and subsequent analysis. Traditional stripe noise removal techniques often rely on fixed assumptions or struggle to preserve structural details. Recent studies have explored optimization-based and statistical approaches; however, many existing methods either fail to generalize across different image sizes or lack robustness in handling varying stripe intensities and distributions. To address these limitations, this work proposes a robust and adaptive stripe noise removal framework that integrates confidence-guided processing with an efficient optimization strategy. Initially, stripe regions are identified through feature extraction and clustering, followed by the introduction of a confidence mapping mechanism that quantifies the reliability of detected stripe columns. This confidence map is incorporated into the removal process to guide selective and adaptive correction, ensuring that high confidence noise regions are effectively suppressed while preserving important image details. Furthermore, the proposed method replaces conventional optimization techniques with the Sand Cat Swarm Optimization algorithm, which enhances convergence behaviour and improves estimation accuracy during stripe correction. The method is designed to operate effectively across images of varying resolutions without requiring parameter reconfiguration.

Keywords—Stripe Noise Removal, Image Denoising, Confidence Mapping, Sand Cat Swarm Optimization, Iterative Refinement, Image Processing, Optimization Algorithms, Noise Reduction

DEEP LEARNING BASED OPTIC DISC AND OPTIC CUP SEGMENTATION FOR GLAUCOMA SCREENING

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Abstract—Glaucoma is a progressive optic neuropathy and a leading cause of irreversible blindness worldwide, necessitating early and accurate automated screening. This work presents GlaucomaNet, a deep learning framework for automated glaucoma screening from retinal fundus images. The proposed architecture integrates an Attention U-Net with a ResNet34 encoder to perform simultaneous optic disc and optic cup segmentation. A rich classification head fuses encoder-level global average-pooled features with soft-geometric biomarkers to classify fundus images as Normal or Glaucoma Suspect. Key clinical indicators including vertical, horizontal, and area-based Cup-to-Disc Ratios, rim ratio, and ISNT rule violations score are computed and combined into a weighted risk score. An ensemble decision framework integrating neural network predictions with rule-based clinical criteria enhances diagnostic reliability. A composite loss function combining Dice, Tversky, Binary Cross-Entropy, Focal, boundary, and spatial inconsistency terms drives training. The system is trained and evaluated on the REFUGE and DRISHTI-GS1 benchmark fundus datasets, with oversampling and Test-Time Augmentation applied to address class imbalance. Traditional machine learning classifiers are additionally benchmarked on geometric features to support explainability. Interpretable outputs are generated through GradCAM saliency maps, attention visualizations, and feature importance rankings.

Keywords—glaucoma screening, deep learning, optic disc segmentation, cup-to-disc ratio, ensemble classification

EXTERNAL ATTACK SURFACE DISCOVERY AND RISKASSESSMENT USING MULTI-LAYER SECURITY ANALYSIS

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Abstract—In the current digital landscape, organizations are increasingly exposed to cybersecurity threats due to the rapid expansion of internet-facing assets such as domains, servers, and web applications. These publicly accessible components significantly increase the attack surface, making systems vulnerable to exploitation. Existing approaches for attack surface management often rely on fragmented tools, manual analysis, or lack integrated mechanisms for vulnerability prioritization and risk assessment. This creates a critical need for an automated and unified solution to effectively identify, analyze, and manage external security exposures. Recent studies have emphasized the importance of external asset discovery and continuous monitoring for improving cybersecurity posture. Prior research highlights techniques for identifying exposed services and measuring attack surfaces, but many approaches remain either theoretical or limited to specific environments. Additionally, existing solutions often lack comprehensive integration of multi-layer scanning, rule-based analysis, and structured risk scoring, leading to inefficiencies in vulnerability prioritization. To address these challenges, this work proposes an External Attack Surface Analysis and Risk Assessment framework that automates the discovery and evaluation of publicly exposed assets. The system performs multi-layer scanning, including port scanning, DNS analysis, SSL/TLS evaluation, SSH exposure detection, and HTTP header inspection. The collected data is processed through a rule-based engine that maps detected exposures to potential attack vectors and impacts. A risk scoring mechanism is implemented to classify vulnerabilities into severity levels such as Low, Medium, High, and Critical, enabling effective prioritization. The system leverages asynchronous task processing using Celery and Redis, ensuring scalability and efficient handling of multiple scanning requests..

Keywords—External Attack Surface Management, Cybersecurity, Vulnerability Detection, Risk Assessment, DNS Analysis, SSL/TLS Security, HTTP Header Analysis, Rule-Based Analysis, Risk Scoring, Asynchronous Processing

SELECTIVE COMPILER OPTIMIZED DYNAMIC INFORMATION FLOW TRACKING FOR EMBEDDED AND IOT DEVICES

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Abstract — The rapid proliferation of Internet of Things (IoT) and embedded devices has introduced critical security challenges, particularly control-flow hijacking and in-memory injection attacks exploiting untrusted input sources. Dynamic Information Flow Tracking (DIFT) is a well-established runtime defense technique; however, conventional DIFT systems impose prohibitive overhead on resource-constrained embedded devices. This paper implements a Selective Compiler-based DIFT system (CO-DIFT) for the AVR ATmega328P microcontroller using LLVM 15 compiler infrastructure. Two LLVM optimization passes are developed: an Inject Pass that tags tainted memory stores from untrusted I/O, and a Check Pass that instruments security-critical loads with runtime checks. Demonstrated on a PIN-authenticated door lock controller, selective instrumentation achieves approximately 1.4% IR-level overhead versus 118% for full CO-DIFT, while binary flash footprint increases by 61.6% (1,266 to 2,046 bytes) —well within the 32,768-byte ATmega328P capacity.

Keywords — Dynamic Information Flow Tracking, LLVM, IoT Security, AVR ATmega328P, Buffer Overflow, Compiler Instrumentation

EDGE AI-ENABLED AUTONOMOUS AGRICULTURAL ROBOT FOR REAL-TIME CROP DISEASE DETECTION AND IOT-BASED FIELD MONITORING

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Abstract—Agriculture remains the backbone of India's economy, yet it continues to suffer from significant crop losses due to plant diseases, delayed detection, and inefficient resource usage. To address these challenges, this paper presents an Autonomous Agricultural Robot that integrates Edge Artificial Intelligence, Internet of Things-based environmental monitoring, and real-time tomato leaf disease detection using the YOLOv5 deep neural network framework. The system is built on a dual-controller architecture. A Raspberry Pi 5, equipped with a quad-core ARM Cortex-A76 processor and 8 GB RAM, serves as the primary edge computing unit responsible for running YOLOv5s inference locally without any dependency on cloud-based computer resources. The YOLOv5s model was trained on a dataset of 1,345 annotated tomato leaf images sourced from Roboflow, spanning four classes: Tomato Yellow Leaf Curl Virus, Tomato Mosaic Virus, Tomato Target Spot, and Tomato Healthy. Training was performed on Google Colab using a T4 GPU over 24 epochs. The model achieves a mean Average Precision at IoU threshold 0.5 of 0.901, with an inference speed of approximately 1.42 frames per second on the Raspberry Pi 5 CPU. When a disease is detected, a stop command is transmitted via UART to the Arduino Uno, halting the robot at the affected plant within a mean latency of 85 milliseconds. Environmental monitoring is achieved through an HC-SR04 ultrasonic sensor for obstacle detection and distance measurement, a DHT22 sensor for temperature and humidity. All sensor readings are transmitted to the ThingSpeak IoT cloud platform via HTTP protocol every 15 seconds. Over a continuous 72-hour operational test, the system maintained a data upload success rate of 99.7 percent, providing farmers with reliable remote access to real-time field conditions through an online dashboard accessible from any internet-connected device. Obstacle avoidance succeeded in 96 percent of trials, and the robot correctly halted at the diseased plant in 93.3 percent of detection events with zero false negatives recorded. The complete system operates for 3.8 hours on a single battery charge, sufficient to monitor approximately 0.5 to 1 hectare per deployment.

Keywords—Edge AI, YOLOv5, Autonomous Agricultural Robot, Raspberry Pi 5, Arduino Uno, Internet of Things, Tomato Disease Detection, ThingSpeak, Precision Agriculture, OpenCV, UART, Embedded Systems

DESIGN AND IMPLEMENTATION OF HIGH SPEED VENDING MACHINE ARCHITECTURE USING VERILOG

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Abstract: A vending machine is an automated system designed to dispense products such as snacks, beverages, newspapers, and tickets when a user inserts money or uses a cashless payment method. Compared to conventional purchasing methods, vending machines offer greater convenience, accessibility, and efficiency. In recent years, the vending machine industry has grown significantly, generating substantial annual revenue in countries such as the USA, Japan, China, and India. This paper presents the design and implementation of a high-speed vending machine architecture capable of dispensing three different products with distinct prices. The proposed system incorporates advanced features such as acceptance of multiple coin denominations (₹5, ₹10, and ₹20), as well as card-based payment input for enhanced flexibility. Additionally, the machine provides functionalities such as returning change when a higher denomination coin is inserted and refunding the entire amount when a transaction is cancelled by the user. The design is based on a Finite State Machine (FSM) approach, ensuring efficient control and faster operation. Behavioral modeling using Verilog Hardware Description Language (HDL) is employed to describe the system. The design is implemented and verified using the Xilinx VIVADO tool, where simulation results demonstrate the correctness and reliability of the vending machine for all possible input conditions. The proposed architecture improves transaction speed, user convenience, and system flexibility, making it suitable for modern automated retail applications.

AUTOMATIC SHOPPING BILLING SYSTEM USING ARDUINO AND RFID

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Abstract— This paper presents the design and implementation of an Automatic Shopping Billing System using Arduino to enhance efficiency in retail environments. Traditional billing systems often involve manual scanning at checkout counters, resulting in long queues, increased waiting time, and potential human errors. The proposed system aims to simplify and automate the billing process by enabling customers to scan products independently using a barcode scanner integrated with an Arduino microcontroller. Each product is identified through a unique barcode, and its corresponding price is stored in the system database. Upon scanning, the product details and updated total cost are instantly displayed on an LCD screen, providing real-time feedback to the user. A distinctive feature of the system is its dual-scan functionality, where a single scan adds an item to the bill, and a double scan within a predefined time interval removes the item. This feature offers flexibility and improves user convenience during shopping. The system is designed to be cost-effective, compact, and easy to deploy, making it suitable for small and medium-sized retail stores. It reduces dependency on manual labor, minimizes billing errors, and significantly speeds up the checkout process. Additionally, the use of Arduino ensures low power consumption and ease of programming, making the system highly adaptable for future enhancements. Overall, the Automatic Shopping Billing System demonstrates a practical approach to modernizing retail operations by integrating embedded systems technology. Future improvements may include wireless data transmission, mobile application integration, and digital payment support to further enhance functionality and user experience.

Keywords— Arduino, Automatic Billing System, Barcode Scanner, Smart Shopping, Retail Automation

AI-POWERED CONTEXT-AWARE AUTOMATED QUESTION GENERATION AND INTELLIGENT TUTORING SYSTEM USING LARGE LANGUAGE MODELS

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Abstract: Security surveillance plays a critical role in ensuring safety across public and private environments, particularly in the face of increasing security threats such as unauthorized access, terrorism, and criminal activities. Traditional surveillance systems rely heavily on manual monitoring and classical artificial intelligence (AI) techniques, which often suffer from high computational costs, delayed response times, poor scalability, and high false positive rates. Moreover, handling high-dimensional real-time video data from multiple cameras remains a major challenge for existing systems. This project proposes a novel framework titled Quantum-Assisted Anomaly Detection (QAAD) in Real-Time Surveillance, which integrates quantum computing principles with deep learning techniques to enhance anomaly detection performance. The system utilizes Quantum Kernel Methods (QKM) for advanced feature mapping into high-dimensional quantum spaces, improving anomaly separation and classification accuracy. A Quantum Hybrid Neural Network (QHNN) combines Convolutional Neural Networks (CNN) for spatial feature extraction with Quantum Neural Networks (QNN) for enhanced anomaly detection. Additionally, Multi-Camera Quantum Correlation (MQC) enables synchronized event detection across multiple surveillance feeds, while the Quantum Anomaly Score (QAS) dynamically adjusts detection thresholds to reduce false alarms.

Keywords: Quantum-Assisted Anomaly Detection (QAAD), Real-Time Surveillance, Quantum Computing, Deep Learning, Quantum Kernel Methods (QKM), Quantum Hybrid Neural Network (QHNN), Convolutional Neural Networks (CNN), Quantum Neural Networks (QNN), Multi-Camera Quantum Correlation (MQC), Quantum Anomaly Score (QAS), Video Analytics, Anomaly Detection

INTELLIGENT CCTV SURVEILLANCE FOR UNUSUAL BEHAVIOUR RECOGNITION

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Abstract: This Paper shows the Detection of abnormal activities in the CCTV video that are critical in the overall safety of individuals and enhanced effectiveness of the security surveillance mechanisms. Video feeds consume quality time to be monitored manually and thus it is likely to be error prone due to human nature and thus a challenge to respond swiftly to security threats. To deal with such obstacles, proposed work implemented an automated surveillance system with applications that detect an unusual activity using machine vision and deep learning tools in real-time. The system works with CCTV videos then shows the frames by using the preprocessing method which involves noise elimination and background removing. YOLOv8 is utilized to proper object recognition, identification of individuals and vehicles, as well as bags and weapons in the single frame. DeepSORT is thereafter implemented on top of tracking these objects over successive frames with the movement history maintained. Critical variables like position, speed, direction and acceleration, in a particular region are learned from LSTM network. This aids the system in acquiring normal behavioural patterns and spotting abnormal behaviour like a fight, loitering, vehicle intrusion, or the abandoned luggage. In cases when suspicions are raised therefore an automatic notification will be issued immediately to alert security personnel. Having been written in Python, the hybridization of YOLOv8, DeepSORT, and LSTM enables the cost-effective anomaly detection in real-time. This advanced machine saves manpower, increases accuracy of monitoring and offers a scalable system to the current surveillance systems of CCTV.

Keywords—Abnormal activity detection, CCTV surveillance, computer vision, deep learning, YOLOv8, DeepSORT, LSTM, object tracking, behavior analysis, real-time monitoring.

HYBRID NATURAL ENERGY CONVERTER FOR SUSTAINABLE GREEN POWER GENERATION

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Abstract : The growing depletion of fossil fuels and the environmental challenges posed by pollution have accelerated the demand for sustainable energy solutions. Hybrid renewable energy systems present a promising approach by integrating multiple natural energy sources to deliver reliable and eco-friendly power. This project focuses on the design, modeling, and analysis of a hybrid energy converter that combines solar photovoltaic panels, wind energy systems, and other renewable resources to maximize energy availability and efficiency. By leveraging the complementary characteristics of different sources, the system addresses limitations such as intermittency and seasonal variability that affect standalone renewable technologies. The proposed hybrid system incorporates solar and wind energy conversion units, supported by power electronic interfaces and an energy management unit. These components ensure optimal energy extraction, stable output, and efficient load matching. An energy storage system, such as batteries, is included to store surplus energy and provide backup during periods of low generation, thereby enhancing reliability and continuity. Advanced control strategies are applied to regulate power flow, minimize losses, and maintain voltage and frequency stability under varying environmental and load conditions. Simulation studies are conducted using appropriate software tools to evaluate system performance. Key parameters analyzed include power output, efficiency, reliability, and emission reduction. Results demonstrate that the hybrid converter significantly improves energy utilization compared to standalone systems, ensuring uninterrupted supply and reduced dependence on conventional energy sources. By promoting efficient resource utilization, reducing carbon emissions, and supporting long-term energy security, this approach contributes meaningfully to the global transition toward green energy.

AI – BASED BEARING FAULT DETECTION IN AC MOTOR USING EDGE IMPULSE

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Abstract : The increasing reliance on AC motors in industrial and commercial applications has made their reliability and continuous operation critically important. However, bearing faults remain one of the most common causes of motor failure, leading to unexpected downtime, increased maintenance costs, and reduced system efficiency. Traditional fault detection methods are often reactive, requiring manual inspection or periodic monitoring, which may fail to identify early-stage defects. Moreover, conventional monitoring systems typically depend on external power sources and centralized processing, limiting their deployment in remote or energy-constrained environments. To address these challenges, this work focuses on the design of an AI-based bearing fault detection system using Edge Impulse, aimed at enabling real-time and intelligent monitoring of motor conditions. The proposed system utilizes MEMS sensors to continuously capture vibration signals and analyze dynamic motor behavior for early fault identification. By incorporating edge-level intelligence, the system ensures faster decision-making with minimal latency and reduced dependence on cloud connectivity. In addition, a piezoelectric transducer ring is employed to harvest vibration energy from the motor, enabling self-powered operation and enhancing system sustainability. This approach not only supports continuous monitoring but also reduces wiring complexity and energy consumption. Overall, the proposed system significantly improves fault detection accuracy, minimizes maintenance costs, and enhances the reliability and lifespan of AC motors.

CAMPUS LOST AND FOUND PORTAL

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Abstract: The Campus Lost and Found Portal is a web based application designed to provide an efficient and organized solution for managing lost and found items within a campus environment. In large educational institutions, students and staff frequently misplace personal belongings such as mobile phones, identity cards, wallets, and electronic devices. Traditional methods such as notice boards and verbal communication are often inefficient, time consuming, and lack proper tracking mechanisms, resulting in a low success rate in item recovery. The proposed system introduces a centralized digital platform where users can report lost or found items by providing detailed information including item name, description, category, location, and contact details. The system offers a user friendly dashboard that enables users to manage their posts and update item status, ensuring accurate and up to date records. This structured approach improves accessibility and simplifies the overall process of item tracking and recovery. To enhance system intelligence, a conceptual approach based on machine learning is incorporated for matching lost and found items. By analyzing item attributes such as textual descriptions, categories, and location data, the system can suggest potential matches, thereby reducing manual effort and improving efficiency. This aligns the system with modern advancements in artificial intelligence and data driven decision making. The application is developed using HTML, CSS, and JavaScript for the frontend, while PHP is used for backend processing. MySQL is used as the database to store and manage system data, and the system is deployed using a XAMPP server environment. Overall, the system improves communication, reduces manual workload, and enhances the chances of recovering lost items through a structured and scalable solution suitable for campus environments.

ICRIT225

SAMRF: A SENSITIVITY-AWARE ADAPTIVE MOBILE ROUTING FRAMEWORK FOR ENERGY OPTIMIZATION IN WSNs

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Abstract—This paper introduces a Sensitivity-Aware Adaptive Mobile Routing Framework (SAMRF) designed to enhance energy-efficient data transmission in Wireless Sensor Networks (WSNs) utilizing mobile sinks. In contrast to conventional protocols like LEACH, PEGASIS, and AODV, the proposed framework utilizes a comprehensive strategy that amalgamates multi-criteria routing decisions, predictive energy modelling, and adaptive sink mobility management to address challenges of uneven energy depletion and network fragmentation. The methodology dynamically identifies optimal routing options by assessing key sensitivity criteria, such as residual energy, communication delay, congestion level, and transmission cost. SAMRF employs time-series prediction techniques to forecast future energy consumption trends of sensor nodes, as divergent to traditional clustering and chain-based methods. This allows the system to preemptively modify routing patterns prior to node failures, thus improving network stability and operational continuity. Performance assessment is conducted via simulations utilizing the Contiki Cooja environment. The results indicate that the proposed framework reduces overall energy consumption by up to 35% compared to existing protocols such as LEACH and PEGASIS. Furthermore, it enhances network longevity by approximately 40% through more equitable energy distribution throughout the network. The packet delivery ratio is markedly improved, attaining values between 92% and 96%, while sustaining low end-to-end latency throughout diverse network conditions. Furthermore, the system exhibits significant scalability and resilience when evaluated under varying node densities, traffic conditions, and mobility patterns. Compared to conventional routing approaches like AODV and static clustering methods, SAMRF adapts more efficiently to dynamic surroundings and mobile sink behavior. These conclusions demonstrate that the suggested approach offers a reliable and efficient solution for next-generation WSN applications, particularly those demanding intelligent routing, energy optimization, and adaptive network control.

Keywords—Wireless Sensor Networks, Energy Optimization, Adaptive Routing, Mobile Sink, Sensitivity-Aware Routing.

ICRIT226

BLOCKCHAIN-ENABLED SECURE DATA SHARING FRAMEWORK FOR INTERNET OF MEDICAL THINGS (IoMT)

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Abstract: Problem IoMT systems suffer from data tampering, lack of trust, and insecure data sharing among stakeholders. Solution Use blockchain and smart contracts to ensure secure, auditable, and decentralized data exchange. Why Advanced Integrates blockchain with IoMT security—widely published in SCI healthcare computing journals. **Abstract** The Internet of Medical Things (IoMT) has transformed healthcare by enabling realtime patient monitoring and data collection. However, centralized data management introduces vulnerabilities such as data tampering, unauthorized access, and lack of trust among stakeholders. This project proposes a blockchain-enabled secure data sharing framework for IoMT environments. The framework leverages blockchain technology to store immutable records of medical data transactions, while smart contracts enforce access control and data sharing policies. The proposed system ensures data integrity, transparency, and traceability without relying on centralized authorities. Performance evaluation demonstrates improved security with acceptable computational overhead. This framework enhances trust and security in distributed

healthcare ecosystems. Keywords Blockchain, IoMT, secure data sharing, smart contracts, healthcare security

ICRIT227

KNEE OSTEOARTHRITIS CLASSIFICATION USING A HYBRID QUANTUM CONVOLUTIONAL NEURAL NETWORK WITH SWISH ACTIVATION AND VGG FEATURE EXTRACTION

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Abstract—Knee osteoarthritis (OA) is a constant degenerative joint disease that should be properly and early diagnosed with radiographic images. The classical deep learning solutions are useful but cannot capture complex and high-dimensional features of the knee X-ray images. In the paper, a hybrid classification model is suggested, which integrates VGG-based convolutional feature extraction with Quantum Convolutional Neural Network (QCNN) layer and Swish activation function. The quantum layer represents classical features with a four-qubit circuit via angle embedding and applies rotation and controlled-NOT gates to use superposition and entanglement to represent richer features. Two variants of the model are considered: VGG16 + QCNN + Swish and an extended model VGG19 + QCNN + Swish. They both are compared to a classical VGG16 + ReLU baseline with a knee X-ray dataset of 8,260 images based on the Kellgren–Lawrence grading scale. The problem is binary classification: Grade 0 (Normal) versus Grade 3–4 (Affected). The experimental findings indicate that the proposed hybrid model has an accuracy of 98–99%, precision of 98–99%, recall of 98–99% and F1-score of 98–99%, beating the classical base case. The extension using VGG19 also indicates that more profound backbone networks increase the benefits of quantum-based learning of features. A Flask web interface is used to deploy the system in the real-time inference of clinical data. **Index Terms**—Osteoarthritis, Knee X-ray Classification, Quantum Convolutional Neural Network, VGG16, VGG19, Swish Activation, Deep Learning, Medical Image Analysis

ICRIT228

DETECTION OF RICE LEAF BLAST DISEASE USING DEEP LEARNING AND IMAGE ANALYSIS

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Abstract: Rice (*Oryza sativa*) is a staple food crop that sustains more than half of the global population, particularly in Asian countries such as India. The productivity and quality of rice are severely threatened by various foliar diseases, among which Rice Leaf Blast, caused by the fungus *Magnaporthe oryzae*, is one of the most destructive. Early and accurate detection of this disease is vital to prevent large-scale yield losses and ensure food security. In this research, a Deep Learning and Image Analysis-based approach is proposed for the automatic detection of Rice Leaf Blast disease. The model employs a Convolutional Neural Network (CNN) architecture that can analyze digital images of rice leaves and classify them as either Healthy or Infected. The dataset used comprises preprocessed rice leaf images collected from publicly available sources and augmented to increase diversity. The CNN model was trained and evaluated using Google Colab, achieving a validation accuracy of 98.83% and a training accuracy of 99.10%. The results demonstrate that deep learning models can effectively identify and differentiate disease symptoms with high precision, outperforming traditional machine learning approaches such as Support Vector Machines and Random Forests. The proposed system can serve as a foundation for developing real-time agricultural advisory tools and precision farming systems.

Keywords: Rice Leaf Blast, Deep Learning, Image Analysis, Convolutional Neural Network, Disease Detection, Precision Agriculture.

FABRICATION OF AA7075 COMPOSITE REINFORCED WITH BORON CARBIDE AND TUNGSTEN FOR ENGINEERING APPLICATIONS

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Abstract: The present work focuses on the fabrication of an Aluminium 7075-based hybrid metal matrix composite (MMC) reinforced with Boron Carbide (B₄C) and Tungsten (W) particulates. AA7075 is widely used in high-strength structural components due to its superior strength-to-weight ratio; however, its performance can be further enhanced by the incorporation of ceramic and metallic reinforcements. The aim of this study is to develop a composite material suitable for automotive and aerospace applications, where high specific strength, wear resistance, and thermal stability are essential. The composite is prepared through a liquid-state fabrication process using the stir casting technique. The reinforcement particles of B₄C and W are introduced in varying proportions based on the design of experiments. The fabricated samples are prepared for subsequent mechanical characterization, microstructure evaluation, and wear behaviour analysis, which will be performed in the next project phase. This report includes the fabrication methodology, casting procedure, experimental design, and the expected advantages of the proposed composite.

USE OF DIGITAL MEDIA AND SOCIAL MEDIA TOOLS IN EMPLOYEE HIRING IN INDUSTRY

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Abstract

In the current digital age, employee hiring has shifted from traditional newspaper advertisements and walk-in interviews to technology-driven, Internet-based recruitment processes. Digital media and social media tools now play a central role in how industries identify, attract, and select candidates. For Indian industries—especially in IT, manufacturing, and services—digital-media-based hiring has become essential due to the scale of recruitment, competition for talent, and the need for cost-effective methods. This paper examines how digital media and social media are being used in employee hiring, reviews their benefits and challenges, and proposes a best-practice framework for industrial organisations.

**ACFCS — AUTOMATED CUSTOMER FLOW CONTROL SYSTEM WITH PRIORITY QUEUE
ALGORITHMS AND MULTI-LANGUAGE SMS**

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Abstract: Traditional Service Centres Such As Hospitals, Banks, Government Offices And Clinics Rely On Manual Token Systems And Physical Queuing, Which Often Lead To Overcrowding, Long Waiting Times And Poor Service Experience. This Paper Presents A Cloud Native Automated Customer Flow Control System Designed To Eliminate Physical Queues And Improve Service Efficiency Through Intelligent Digital Token Management. The Proposed System Uses Multiple Queue Management Algorithms Including First Come First Serve, Priority Based Scheduling, Aging Algorithm For Starvation Prevention, Dynamic Queue Recalculation, Centralized Multi Counter Distribution, Batch Counter Assignment And Pre Booking With Missed Slot Recovery. These Algorithms Ensure Fair And Efficient Handling Of Customers Based On Priority And Waiting Time. Users Can Register Through A Responsive Web Interface Or A Kiosk Terminal And Receive Token Numbers Along With Real Time SMS Notifications. A Three Level Notification System Informs Users When To Leave Home, When Only A Few Customers Are Ahead And When Their Turn Is Next. The System Supports Multiple Languages Including English, Tamil, Hindi And Telugu To Improve Accessibility For Diverse Users. The Application Is Developed Using Python Flask And SQLite And Deployed On Cloud Infrastructure For Scalability And Reliability. Experimental Results Demonstrate Improved Service Efficiency, Reduced Waiting Time And Enhanced Customer Satisfaction, Making The System Suitable For Real World Deployment.

Keywords: Customer Flow Management, Priority Queue, Multi Counter System, Real Time SMS Notification, Multi Language Support, Cloud Application, Queue Optimization.

**KNEE OSTEOARTHRITIS CLASSIFICATION USING A HYBRID QUANTUM CONVOLUTIONAL
NEURAL NETWORK WITH SWISH ACTIVATION AND VGG FEATURE EXTRACTION**

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Abstract: Knee osteoarthritis (OA) is a constant degenerative joint disease that should be properly and early diagnosed with radiographic images. The classical deep learning solutions are useful but cannot capture complex and high-dimensional features of the knee X-ray images. In the paper, a hybrid classification model is suggested, which integrates VGG-based convolutional feature extraction with Quantum Convolutional Neural Network (QCNN) layer and Swish activation function. The quantum layer represents classical features with a four-qubit circuit via angle embedding and applies rotation and controlled-NOT gates to use superposition and entanglement to represent richer features. Two variants of the model are considered: VGG16 + QCNN + Swish and an extended model VGG19 + QCNN + Swish. They both are compared to a classical VGG16 + RELU baseline with a knee X-ray dataset of 8,260 images based on the Kellgren–Lawrence grading scale. The problem is binary classification: Grade 0 (Normal) versus Grade 3–4 (Affected). The experimental findings indicate that the proposed hybrid model has an accuracy of 98–99%, precision of 98–99%, recall of 98–99% and F1-score of 98–99%, beating the classical base case. The extension using VGG19 also indicates that more profound backbone networks increase the benefits of quantum based learning on features. A Flask web interface is used to deploy the system in the real-time inference of clinical data. **Index Terms—**Osteoarthritis, Knee X-ray Classification, Quantum Convolutional Neural Network, VGG16, VGG19, Swish Activation, Deep Learning, Medical Image Analysis.

SMART HOME SYSTEM SOLUTION WITH THE GOAL OF MINIMIZING WATER CONSUMPTION

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Abstract— This project presents the design and implementation of an Arduino-based Smart Home Automation System that provides both manual and automatic control of household appliances. The system uses an Arduino microcontroller as the main control unit, integrated with a 16×2 LCD display, HC-05 Bluetooth module, L293D motor driver, geared DC motor, relay module, and a float switch. The Bluetooth module enables wireless communication between an Android application and the Arduino, allowing the user to remotely turn ON/OFF lights and open or close a door using a geared DC motor controlled through the L293D driver. The current system status and user commands are displayed on the 16×2 LCD for easy monitoring. In addition to manual control, the project also incorporates an automatic water level control system. A float switch continuously monitors the water level in the tank and automatically switches the water pump ON or OFF through a relay, preventing water overflow and dry running of the motor. The proposed system is cost-effective, user-friendly, energy-efficient, and reliable, making it suitable for smart homes, offices, and small industrial applications. This project demonstrates the effective integration of Bluetooth-based control and sensor-based automation to enhance convenience and safety in daily life.

Index Terms— smart home application , door control, water control, light control to using Bluetooth module

DEEP LEARNING BASED SIGNAL PROCESSING FOR 6G WIRELESS COMMUNICATION SYSTEMS

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Abstract

The transition from fifth-generation (5G) to sixth-generation (6G) wireless systems is expected to introduce highly dynamic and complex communication environments, where traditional model-based signal processing techniques may not perform efficiently. This paper presents an end-to-end deep learning-based approach for signal processing in next-generation wireless networks. Unlike conventional methods that rely on predefined mathematical models for channel estimation, equalization, and detection, the proposed framework utilizes neural networks to learn the complete signal transformation directly from data. By training the model on diverse channel conditions, the system can automatically adapt to noise, interference, and non-linear distortions. The proposed approach aims to improve reliability, spectral efficiency, and robustness in comparison to classical techniques. Furthermore, it reduces the need for manual tuning and prior knowledge of channel characteristics. The study highlights the potential of integrating artificial intelligence into the physical layer as a key enabler for intelligent and flexible 6G communication systems. Future work will focus on optimizing model complexity and real-time deployment for practical applications.

Keywords: 6G Communication, Deep Learning, End-to-End Learning, Signal Processing, Neural Networks, Physical Layer AI, Channel Estimation, Equalization, Spectral Efficiency.

PLANT FOR SUSTAINABLE AVIATION FUEL PRODUCTION FROM WASTE COOKING OIL PROCESS DESIGN AND PERFORMANCE ANALYSIS OF A HYDROTREATED ESTERS AND FATTY ACIDS (HEFA.)

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Abstract: The global aviation sector accounts for approximately 2.5–3% of anthropogenic CO₂ emissions, with additional non-CO₂ radiative forcing effects making its climate impact nearly three times that of carbon dioxide alone. Sustainable Aviation Fuel (SAF) produced via the Hydrotreated Esters and Fatty Acids (HEFA) pathway represents the most commercially mature and immediately deployable solution for decarbonizing commercial aviation. This project focuses on the process design and performance analysis of a HEFA plant specifically tailored for the Indian context, utilizing Waste Cooking Oil (WCO) as a second-generation feedstock to avoid the “Food vs. Fuel” conflict and to leverage India’s “Repurpose Used Cooking Oil” (RUCO) initiative. A comprehensive steady-state simulation model was developed using Aspen HYSYS V12, with the Peng-Robinson equation of state selected to accurately predict vapour-liquid equilibrium at high pressure (65 bar). The WCO feedstock was represented by a surrogate mixture of Triolein and Tripalmitin, while iso-octadecane was introduced as a user-defined hypothetical component to model the isomerization stage. A rigorous kinetic network comprising six simultaneous reactions (hydrogenolysis, hydrodeoxygenation (HDO), decarboxylation (DeCO₂) and decarbonylation) was implemented in a plug flow reactor (PFR-100) operating at 330–360°C over a NiMo/Alumina catalyst. The simulation processes 4167 kg/h of WCO mixed with 504 kg/h of hydrogen. The results demonstrate 100% triglyceride conversion with clear selectivity toward the HDO pathway, evidenced by a n-C18 mole fraction of 0.0327 compared to 0.0021 for n-C17. The downstream isomerization reactor achieves 80% conversion of n-C18 to branched iso-paraffins, yielding a final i-C18 mole fraction of 0.4283 in the SAF product – a critical parameter for meeting ASTM D7566 cold-flow specifications. The three-phase separator (V-100) effectively

RANSOMWARE DETECTION SYSTEM USING DEEP LEARNING

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Abstract - Ransomware has emerged as one of the most critical and rapidly evolving cybersecurity threats, targeting individuals and organizations by encrypting sensitive data and demanding ransom payments for recovery. Traditional signature-based detection methods are increasingly ineffective against zero-day attacks and sophisticated ransomware variants that constantly modify their code to evade static analysis. To overcome these limitations, this research proposes an intelligent real-time behavior-based ransomware detection system using Deep Learning, where low-level system and file-system activities such as abnormal file creation, rapid file modifications, unauthorized access attempts, malicious extensions, unauthorized extensions and mass encryption behavior are continuously monitored through a watchdog-based mechanism. These sequential behavioral data is then processed using a Long Short-Term Memory (LSTM) network, which efficiently captures temporal dependencies and distinguishes malicious ransomware execution patterns from legitimate user operations with high precision. Experimental results demonstrate that the proposed model achieves an impressive 94% detection accuracy with minimal false positives, making it highly reliable for real-world deployment. Upon identifying suspicious activity, the system automatically alerts the user

Keywords — Ransomware Detection, Deep Learning, LSTM, Behavior-based Analysis, Real-time Monitoring, Cybersecurity, Automated Threat Response.

DESIGN OF HARDWARE FOR SIZING OF VOLTAGE SOURCE OF A BATTERY ENERGY STORAGE SYSTEM WITH MOTOR LOAD

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Abstract: The foremost challenge in a micro-grid with Distributed Energy Resources (DER) is of managing the intermittent nature of renewable energy sources. Therefore, the extent of integration of the Battery Energy Storage System (BESS) has increased recently in a micro-grid due to its versatility, high energy density, and efficiency. Generally, BESS is a grid-tied system and has fast power adjustment capability. Controversially, during the stand-alone mode, it cannot operate in the absence of a local Voltage Source (VS) which acts as a voltage and frequency reference in the network. To ensure the reliable operation of a micro-grid during utility grid outage or non-availability of intermittent renewable Energy Sources (RES), it is significant to operate the BESS with the local VS to dispatch the stored energy. This project discusses the analytical methodology that can be adopted for identifying the most suitable rating of the VS which can act as a voltage and frequency reference for the BESS using Matlab/ Simulink. Further, a simulation was carried out against various load characteristics and it is observed that an Uninterruptible Power Supply (UPS) with a kVA capacity of 35-45% of that of the BESS with an overload capacity of 150-200% can be chosen as a feasible choice to act as the VS. The hardware was designed and tested.

Keywords: Micro-grid, Voltage Source, Sizing of Battery, Distributed Energy Resources

ENHANCEMENT OF PROPERTIES OF CONCRETE BY OPTIMIZING THE PROPORTIONS OF HYBRID MINERAL ADMIXTURES

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Abstract: We are well known that conventional concrete designed on the basis of compressive strength does not meet many functional requirements such as impermeability, resistance to frost, thermal cracking adequately. The production of the Portland cement as a main constituent of concrete has basically led to the dangerous impacts on our environment by releasing a substantive amount of CO₂. Production of one ton of Portland cement emits one ton of CO₂ and other greenhouse gases. The purpose of this study is to find the suitability of Fly Ash and Silica Fume as hybrid admixture replacement materials for cement without compromising the strength & durability of conventional cement-based hybrid concrete. Replacement of cement partially by Fly Ash and Silica Fume in M30 grade of concrete also reduces the supply demand on cement and may also reduce the emission of CO₂ into the atmosphere. Both the industrial wastes are used to replace the cement at 25% F.A-5% S.F, 20% F.A-10% S.F, 15% F.A-15% S.F and 10% F.A-20% S.F. These specimens will be tested for its mechanical properties such as compressive strength, split tensile strength and flexural strength on 7, 28 day and durability properties like acid attack. The present study focuses on the development of regression models to predict the fresh and hardened properties of concrete using statistical analysis. Experimental investigations were carried out on different concrete mixes with varying percentages of fly ash and silica fume replacements.

Keywords – CO₂, Fly Ash, Silica Fume, Regression models

MOOD-DRIVEN PERSONALIZED RECOMMENDATION SYSTEM USING ERS

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Abstract: Mood-based recommendation systems have gained importance in improving user experience and emotional well-being. However, most existing systems provide recommendations based on instantaneous, often unstable emotion detection and fail to evaluate whether those recommendations truly help users recover. This limitation reduces personalization and long-term effectiveness. This project proposes a Mood-Driven Personalized Recommendation System based on an Emotional Recovery Signature (ERS), supported by a state-of-the-art, high-accuracy emotion AI architecture. The system detects user emotions through a robust multimodal pipeline, utilizing RetinaFace for precise face detection and alignment, alongside an EfficientNet-B4 backbone enhanced with a Convolutional Block Attention Module (CBAM) for deep facial feature extraction. To guarantee stable real-time inference, the model incorporates confidence calibration and temporal emotion smoothing, complemented by text sentiment analysis. Based on the accurately detected emotion, adaptive interventions—such as music recommendations, book suggestions, guided breathing exercises, and wellness resources—are provided. The Emotional Recovery Measurement Algorithm (ERMA) tracks emotional transitions over time, while the Adaptive Emotional Intervention Selection Algorithm (AEISA) dynamically selects the most effective intervention based on the user's recovery pattern. Developed using Python, PyTorch, OpenCV, and Streamlit, the system delivers highly accurate real-time emotion detection, reliable recovery tracking, and tailored content. Unlike traditional mood-based applications, the proposed system leverages an advanced deep learning pipeline to optimize emotional recovery and promote mental wellness through adaptive, evidence-based personalization.

FAULT DIAGNOSIS TECHNIQUES IN PV SOLAR SYSTEM

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Abstract : In solar photovoltaic (PV) systems to increase stability of the system and efficiency, a fault diagnostic method is proposed. PV systems are monitored by a diagnostic method that detects two kinds of malfunction namely damage to the panel and intrinsic electrical faults. The process can recognize abnormalities like voltage instability and MOSFET switching failures by analyzing the current and waveforms. This technique also automatically recognizes particles, surface cracks, and thermal hotspots on the panels utilizing AI and image identification algorithms. This reduces system downtime and protects defects from expanding into severe electrical issues. EfficientNetB0 and cat-boost classifier are employed to classify the faults in PV panel. Simulation is carried out under different fault and voltage and current waveforms are analyzed.

Keywords

Solar PV, DC-DC Converter, Fault Diagnosis, Image Processing, Inverter Monitoring.

DEEP LEARNING FOR POTATO LEAF DISEASE DETECTION: A COMPREHENSIVE REVIEW OF CNN, VISION TRANSFORMER, AND HYBRID ARCHITECTURES

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Abstract— Potato is world widely most consumable crop. It has also been severely vulnerable to the foliar diseases which are like Early Blight, Late Blight, and Black Spot. In classical field inspection manually it becomes labor-intensive, inconsistent, unscalable and overload. Image processing based Automated image-based detection using deep learning and machine learning model overcomes the limitations of traditional manual approach and hence it gets interest over the past decade for research. This paper delivers comprehensive review of deep learning and machine learning models for potato leaf disease detection including various approaches like traditional Support Vector Machines (SVMs), Convolutional Neural Networks (CNNs), Vision Transformers (ViTs), transfer learning model and emerging hybrid models CNN–ViT frameworks. We analyze benchmark datasets, preprocessing pipelines, data augmentation strategies, evaluation metrics, deployment considerations, and open research challenges. Comparative analysis of over 18 studies (2016–2026) reveals that standalone CNNs achieve 79%–93% accuracy on mixed datasets, whereas hybrid CNN–ViT architectures reach up to 99.54% under controlled conditions and 85%–98% in field deployments. We identify dataset diversity, disease-symptom similarity, model interpretability, and edge-device deployment as the principal open problems, and propose seven concrete directions for future research.

Keywords— Potato leaf disease, deep learning, convolutional neural network, vision transformer, EfficientNet.

SUSTAINABLE VALORIZATION OF CITRUS WASTE AND AVIAN EGGSHELLS INTO A HYBRID BIO-COMPOSITE FOR ADSORPTIVE REMOVAL OF METHYLENE BLUE FROM AQUEOUS SOLUTIONS

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Abstract— Industrial discharge containing synthetic dyes has become a serious environmental challenge due to its persistence and toxic nature. In this study, a cost-effective hybrid bio-composite was developed using citrus peel waste and avian eggshells for the removal of methylene blue from aqueous solutions. Citrus biomass provides abundant hydroxyl and carboxyl functional groups, while eggshell-derived calcium carbonate enhances structural stability and adsorption capability. The synthesized composite was characterized using FTIR and SEM techniques to examine functional groups and surface morphology. Batch adsorption experiments were carried out to evaluate the effect of pH on adsorption performance. The results indicated that the composite achieved a maximum removal efficiency of 96% at pH 10. The adsorption process followed the Langmuir isotherm model, suggesting monolayer adsorption, and pseudo-second-order kinetics, indicating chemisorption. The maximum adsorption capacity was found to be 185.5 mg/g. The study demonstrates that waste-derived materials can be transformed into efficient and sustainable adsorbents for wastewater treatment.

Keywords— Citrus peel, Eggshell waste, Hybrid bio-composite, Methylene blue, Adsorption.

USE OF DIGITAL MEDIA AND SOCIAL MEDIA TOOLS IN EMPLOYEE HIRING IN INDUSTRY

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Abstract

In the current digital age, employee hiring has shifted from traditional newspaper advertisements and walk-in interviews to technology-driven, Internet-based recruitment processes. Digital media and social media tools now play a central role in how industries identify, attract, and select candidates. For Indian industries—especially in IT, manufacturing, and services—digital-media-based hiring has become essential due to the scale of recruitment, competition for talent, and the need for cost-effective methods. This paper examines how digital media and social media are being used in employee hiring, reviews their benefits and challenges, and proposes a best-practice framework for industrial organisations.

COMPARATIVE ANALYSIS OF DIFFERENT BIOMASS BRIQUETTE

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Abstract:

Biomass is a naturally available resource obtained from agricultural activities, households, and industries. Large amounts of biomass are generated every day, but much of it is not properly utilized. To use biomass effectively, it is important to understand its basic properties. This proposed study focuses on the characterization of four different types of biomasses: rice husks as agricultural biomass, chicken droppings as poultry biomass, kitchen waste as municipal biomass, and sugarcane bagasse as industrial biomass. The study aims to analyze simple physical and chemical properties such as moisture content, ash content, volatile matter, fixed carbon, calorific value, carbon and nitrogen. By comparing these characteristics, the suitability of each biomass for applications like energy generation, composting, and waste management can be understood. This work will help in identifying the potential of commonly available biomass resources and promote their sustainable and eco-friendly utilization.

Keywords:

Biomass, characterization, Rice husk, Chicken droppings, Kitchen waste, Sugarcane bagasse, Comparison.

AN EXPERIMENTAL STUDY OF HOLLOW BEAM USING GEOPOLYMER CONCRETE

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Abstract - This study investigates the structural performance of hollow beams made using geopolymer concrete as an eco-friendly alternative to conventional reinforced cement concrete. Geopolymer concrete is produced using industrial by-products such as fly ash and ground granulated blast furnace slag (GGBS), activated by alkaline solutions, thereby eliminating the need for ordinary Portland cement and reducing carbon emissions. In this experimental work, reinforced geopolymer concrete beams with hollow sections were cast and tested under flexural loading. The hollow portions were introduced using suitable formers to reduce the self-weight of the beam without significantly affecting its strength. Parameters such as load-carrying capacity, deflection behaviour, crack patterns, and failure modes were analysed and compared with solid geopolymer concrete beams. The results indicate that hollow geopolymer beams exhibit a slight reduction in load-carrying capacity and stiffness compared to solid beams; however, they achieve significant weight reduction and maintain acceptable structural performance. Crack development and failure modes were found to be similar to conventional beams, primarily showing flexural failure. Overall, the study concludes that hollow beams using geopolymer concrete can be considered a sustainable and efficient structural solution, offering environmental benefits along with satisfactory mechanical performance for practical applications.

Keywords : Geopolymer Concrete (GPC), Hollow Beam, Fly Ash, Alkaline Activator, Flexural Strength, Load Carrying Capacity, Deflection Behavior, Crack Pattern, Sustainable Construction, Lightweight Structure, Structural Performance

NAVIGATING HYPOXEMIC RESPIRATORY FAILURE IN CRITICALLY ILL CARDIAC PATIENT USING MATLAB

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Abstract: Hypoxemic respiratory failure is a critical condition frequently observed in patients with underlying cardiac disorders, significantly increasing morbidity and mortality in intensive care units. Early detection and continuous monitoring of oxygenation status are essential for timely clinical intervention. However, conventional monitoring approaches may not effectively capture rapid physiological changes or provide predictive insights for deteriorating patients. This study presents a MATLAB-based analytical framework to assess and manage hypoxemic respiratory failure in critically ill cardiac patients. The proposed system utilizes patient physiological data, including oxygen saturation (SpO_2), arterial blood gas (ABG) parameters, heart rate, and respiratory rate, to model and analyze respiratory function in real-time. MATLAB is employed for signal processing, data visualization, and algorithm development to detect abnormal patterns associated with hypoxemia. Advanced computational techniques such as filtering, time-series analysis, and pattern recognition are implemented to enhance data accuracy and identify early warning signs of respiratory compromise. The system also incorporates threshold-based and predictive models to support clinical decision-making. Simulation results demonstrate improved detection sensitivity and timely identification of hypoxemic events compared to traditional monitoring methods. Furthermore, graphical outputs and dashboards generated in MATLAB provide intuitive visualization of patient status, enabling healthcare professionals to respond more effectively.

Keywords: Hypoxemic Respiratory Failure, Cardiac Patients, MATLAB, Signal Processing, Critical Care, Oxygen Saturation, ABG Analysis, Clinical Decision Support

FAULT-TOLERANT SPARSE KOGGE-STONE ADDER-BASED APPROXIMATE MULTIPLIER FOR EFFICIENT IMAGE PROCESSING APPLICATIONS

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Abstract— Adders and multipliers are arithmetic units that determine the performance of image processing hardware in terms of delay, power consumption, and robustness. Traditional architectures, such as ripple carry adders and parallel prefix adders, provide precision in computation but are plagued by large propagation delays in RCAs and large design complexity and area overhead in parallel prefix architectures. Moreover, most current approximate multipliers, although efficient in terms of power and delay, are not fault tolerant and are therefore not applicable in error-sensitive applications. To overcome these constraints, this study introduces a fault-tolerant Sparse Kogge-Stone adder (FT_SKSA)-based approximate 8-bit multiplier designed for use in image processing applications. The suggested architecture uses a hybrid computation approach that divides the multiplication process into least significant bits (LSBs) and most significant bits (MSBs). The LSB part is applied with simplified approximate logic to achieve a lower power and area, whereas the MSB part is applied with fault-tolerant SKSA to provide high accuracy and reliability in critical calculations. The FT_SKSA design incorporates a redundant RCA-based reference path, comparator, and multiplexer mechanism to detect and recover logic-level faults, such as transient bit-flips. The proposed method was designed using Verilog HDL and synthesized using Xilinx Vivado to evaluate its performance. Experimental results demonstrate that the proposed multiplier achieves a significant reduction in delay (8.20 ns) compared to the conventional RCA-based multiplier (14.18 ns), while utilizing 108 LUTs and consuming 0.136 W of power.

Keywords— Approximate Multiplier, Sparse Kogge-Stone Adder, Fault Tolerance, Image Processing, PSNR, SSIM.

INTEGRATED WASTE-TO-BIODIESEL APPROACH: VALORIZATION OF DISCARDED OILS AND WASTE-DERIVED CATALYSTS THROUGH PROCESS INTENSIFICATION TECHNIQUES

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Abstract: The global drive for net-zero emissions demands innovative waste-to-fuel strategies that close material loops and displace fossil diesel. This study unveils a fully integrated, circular framework for biodiesel production from discarded lipid streams including waste cooking oil, animal tallow, and industrial palm residues, coupled with heterogeneous catalysts sourced from calcium-rich oyster shells, silica-laden rice husk ash, and iron oxide red mud. Conventional transesterification struggles with high free fatty acid content and sluggish kinetics, yielding low conversions and high energy use. Intermittent microwave irradiation. These synergies accelerate mass transfer, slash reaction durations from hours to under ten minutes, and deliver fatty acid methyl ester yields exceeding ninety-six percent at sixty degrees Celsius with a six to one methanol ratio and one weight percent catalyst loading. Catalyst stability shines with over ninety-five percent retention of activity across five recycles, streamlining purification. Techno-economic analysis projects a twenty-five percent cost reduction versus virgin oil routes, bolstered by life-cycle assessments showing a seventy-five percent greenhouse gas abatement and energy return on investment above three. Digital twin simulations validate scalability, forecasting seamless upscaling to one hundred kiloton per year plants with forty percent lower capital expenditure through localized waste sourcing. Pilot trials in urban settings confirm robustness against feedstock variability, positioning it as a blueprint for decentralized biodiesel hubs worldwide.

Keywords— waste-to-biodiesel; process intensification; heterogeneous catalysts; circular economy; life-cycle assessment; microreactors

EXPERIMENTAL INVESTIGATION ON STRENGTH AND DURABILITY PROPERTIES OF ALKALI-ACTIVATED CONCRETE USING AGRICULTURAL WASTE-BASED ALUMINOSILICATES

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Abstract: The global demand for concrete continues to grow, outstripping the rate of increase in steel or structural timber use and reflecting the speed of construction in rapidly developing nations. The consequence of this, however, is that the concrete industry continues to generate a substantial fraction of anthropogenic CO₂, which leaves our industry the third-largest source of greenhouse gas, after power and transport. The bulk of this is made on such a vast scale that it eclipses the combined production of all other man-made materials. We produce approximately 4 billion tonnes of cement each year, which equates to ~560kg for every person on Earth, and only water is consumed in larger quantities. Cement production is a very efficient process, generating little waste beyond emitted CO₂. The energy used to manufacture 1 tonne of cement clinker has fallen dramatically from approximately 7GJ/tonne in 1975 to approximately 3GJ/tonne in a modern plant. This is close to the theoretical minimum of 2.8GJ/tonne suggested by thermodynamic calculations. It seems unlikely that further process efficiencies will yield substantial savings in the future. While reduction of energy demand has lowered CO₂ emissions considerably, this only addresses half of the problem, as decomposition of limestone in the kiln has continued to release this gas unchecked for two centuries. This situation is changing, however, as CO₂ is being captured and used as a reactant in other manufacturing processes. Despite this and other technologies focused on producing low embodied CO₂ cements, there is an immediate need to reduce emissions in the short-term and this is best achieved by using less cement in concrete manufacture – known as ‘reducing the clinker factor’ of concrete. Alkali-activated concrete AAC also known as geopolymers concrete is a sustainable alternative to traditional Portland cement concrete.

INTEGRATED ENVIRONMENTAL WATER MANAGEMENT AND DEMAND PREDICTION FOR URBAN SUSTAINABILITY IN TIRUVANNAMALAI

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Abstract: Water is one of the most important natural resources required for human survival, agriculture, and industrial development. In recent years, increasing population, rapid urbanization, and climate variability have led to growing pressure on available water resources. This study focuses on water demand forecasting and sustainable water management for Tiruvannamalai district. Population forecasting was carried out using a linear regression method to estimate future population growth up to the year 2050. Based on the projected population, domestic water demand was calculated using the per capita water consumption method. Agricultural water demand was estimated using crop area and crop water requirements, while industrial demand was considered as a percentage of domestic demand. Water availability was assessed by analyzing surface water sources such as tanks, reservoirs, and rivers, along with groundwater recharge estimated from rainfall data. A water balance analysis was performed to compare total water demand and available water resources. The results indicate that future water demand will exceed water availability, leading to a significant water deficit. To address this issue, a water allocation model was developed to prioritize domestic, agricultural, and industrial water use. In addition, a sustainable water management model was proposed, incorporating practices such as drip irrigation, rainwater harvesting, wastewater reuse, and groundwater recharge. The study demonstrates that the implementation of sustainable water management strategies can reduce water deficit and improve water availability.
Keywords: Water Demand Forecasting, Water Balance, Sustainable Water Management, Groundwater Recharge, Irrigation Management, Scenario Analysis

ICRIT252

GESTURE-BASED SMART APPLIANCE CONTROL SYSTEM WITH FACE RECOGNITION FOR ROLE-BASED ACCESS CONTROL

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Abstract: Smart home automation is rapidly evolving with the growth of Artificial Intelligence and computer vision technologies. This paper presents a gesture-based smart appliance control system that enables contactless and intelligent control of household devices using real-time vision-based interaction. The proposed system integrates face detection, gesture recognition, and role-based access control to provide a secure and user-friendly environment. The system consists of three core components: (i) user identification using face detection and recognition (Haar Cascade and LBPH), (ii) real-time gesture recognition using MediaPipe for hand landmark detection, and (iii) appliance control with role-based restrictions to differentiate between child and adult users. The system processes live video input through a webcam and performs real-time analysis to interpret user gestures and control appliances such as lights and fans. Additionally, a buzzer module is incorporated as a critical device to simulate safety-sensitive appliances, where access is restricted for unauthorized users and alert feedback is generated. The system also provides visual and audio feedback to enhance user interaction.

Keywords— Gesture Control, Smart Home Automation, Computer Vision, Face Recognition, MediaPipe, Role-Based Access Control, Multi device gesture control

ICRIT253

HARDWARE-ROOTED SECURITY FOR SMART HOME IOT SYSTEMS USING PHYSICALLY UNCLONABLE FUNCTIONS AND TRUE RANDOM NUMBER GENERATORS

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Abstract: The proliferation of Internet of Things devices in residential smart home environments introduces critical security vulnerabilities that conventional credential-based authentication mechanisms fail to address. Stored cryptographic keys can be extracted through physical attacks, pre-shared symmetric keys expose all devices upon a single compromise, and software pseudo-random number generators produce predictable session tokens susceptible to replay attacks. This paper presents a hardware-rooted security architecture for a multi-unit residential smart home system comprising three apartment units, each deploying four IoT devices including electronic door locks, intelligent thermostats, IP surveillance cameras, and smart plugs, for a total of twelve authenticated endpoints. The PUF, based on SRAM technology, uses natural manufacturing differences present in semiconductor manufacturing process and generates a unique 256-bit cryptographic key every time when the device is powered on. A Fuzzy Extractor employing BCH error correction stabilizes the noisy PUF response across temperature and voltage variations, producing a consistent key with residual bit error rates below eight percent. The hardware TRNG collects entropy from multiple independent physical sources including thermal noise from the on-chip RNG peripheral, ADC floating-pin noise, and timer counter jitter, mixing them through SHA-256 into a 256-bit entropy pool from which 128-bit per-session nonces are derived using HKDF. On the other hand, for the cloud layer, the authentication server authenticates HMAC tokens against enrolled PUF key hashes that have been saved in the Challenge-Response Pair database and validates nonce freshness based on a replay cache with the help of Redis. Short-lived session keys are generated using HKDF-SHA256. The architecture provides hardware-bound unclonable device identities, forward-secret session keys, replay-proof nonces validated by NIST SP 800-90B health tests, apartment-level access isolation, and an immediate device revocation mechanism, achieving a level of security that is fundamentally unattainable with software-only approaches.

Keywords— IoT security, Physically Unclonable Function, True Random Number Generator, HMAC authentication, smart home, replay attack prevention, hardware security, SRAM PUF, AES-256-GCM

E – PACK: THE EVOLUTION OF SMART CARRYING SOLUTIONS

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Abstract - With the growing demand for smart and automated solutions, there is a need to improve convenience, accessibility and safety in personal accessories. This project presents a Smart Bag using a Rope and Pulley System, which automates the opening and closing of a bag zipper using embedded systems and IoT technology. The system enables hands-free and remote operation, making it useful for travel, daily use and for differently-abled users. The system is based on an ESP32 microcontroller that provides Wi-Fi communication. Users can send commands through a mobile application or IoT interface, which are processed by the ESP32 to control an L293D motor driver. This driver operates a DC motor connected to a rope and pulley mechanism, where a nylon thread attached to the zipper converts rotational motion into linear movement for smooth operation. Limit switches are used to automatically stop the motor when the zipper reaches its fully open or closed position, ensuring safe and reliable operation. Additional features such as manual control, auto-stop and overcurrent protection enhance system safety. The compact design allows easy integration within the bag while maintaining proper mechanical alignment. Performance analysis shows fast response, stable communication and efficient operation with moderate power consumption. The system offers a cost-effective solution for smart wearable automation and can be further enhanced with features like GPS tracking, biometric authentication and cloud connectivity.

Keywords: Smart Bag, Rope and Pulley System, ESP32, IoT, Wireless Communication, DC Motor, Motor Driver, Automated Zipper, Limit Switch, Smart Wearable Technology.

ICRIT255

LOW-POWER VLSI ARCHITECTURE FOR KEY-CONTROLLED BIT-PERMUTATION ASSISTED XOR ENCRYPTION IN EDGE COMPUTING SYSTEMS

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Abstract—The ongoing fast growth in edge computing and Internet of Things (IoT) systems has amplified the need to develop security mechanisms that are light and energy-efficient enough to be compatible with resource-constrained hardware systems. The traditional cryptographic algorithms are usually very computationally and power-intensive hence are not applicable in real-time embedded systems. This paper describes a low power VLSI architecture of encryption with the help of key-controlled bit-permutation aided XOR transformation. The suggested algorithm is based on a preliminary XOR-driven data masking phase to provide simple confusion, and a dynamically regulated bit-level permutation network which is fuelled by a hidden key to provide diffusion. The proposed architecture has a benefit over traditional substitution-permutation network designs in that it does not require the use of the complex substitution boxes, thus reducing the complexity of hardware, the number of gates, and switching activity. The implementation of the design is done in Verilog HDL and its performance is measured in terms of propagation delay, power consumption and throughput. The simulation results have shown that the architecture has an efficient performance with less latency and lower energy consumption that is why it is applicable in real-time edge applications. The fact that it is structurally simple is offset by the fact that it supports key-dependent permutation, which offers an extra layer of security, which is a good trade-off between performance and protection.

Keywords—Lightweight Encryption, VLSI Security, XOR-based Cipher, Bit-level Permutation, Low-power Design, Edge Computing, IoT Security, Hardware Implementation

ADVANCED NATURAL FIBRE HYBRID COMPOSITES FOR SUSTAINABLE STRUCTURAL APPLICATIONS

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Abstract- The increasing demand for sustainable and environmentally friendly engineering materials, supported by recent advancements in green composite technology and natural fibre engineering, has encouraged the development of biodegradable alternatives to conventional synthetic materials. Fibre reinforced plastic composite materials have been widely adopted in various manufacturing sectors due to their superior properties, including high specific strength, lightweight characteristics, corrosion resistance, fracture toughness, and design flexibility. In the present research work, a natural fibre based hybrid composite was developed using Palm leaf fibres and Jute fibres reinforced within a polyester matrix to improve mechanical performance and sustainability. The composite laminates were fabricated using a simple hand lay-up technique with a multi-layered hybrid configuration to achieve enhanced structural performance. Mechanical characterization of the fabricated composites, including tensile, flexural, and impact properties, was carried out in accordance with ASTM standard procedures to evaluate their engineering suitability. The experimental results demonstrated that the hybridization of Palm leaf and Jute fibres improved durability, reduced density, and enhanced strength-to-weight ratio. The developed hybrid composites exhibited promising potential for lightweight structural applications while promoting environmental sustainability and resource conservation.

Keywords- Palm Leaf Fibre; Jute Fibre; Hybrid Composites; Mechanical Properties; Sustainable Materials

CHARACTERIZATION OF DISCARDED FACE MASK HYBRID COMPOSITES FOR AUTOMOBILE APPLICATIONS

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Abstract- The increasing accumulation of plastic waste, particularly discarded face masks generated during recent global health emergencies has created a serious environmental concern, leading to pollution and long-term ecological damage, thereby demanding sustainable material solutions using modern composite technologies. Fibre reinforced plastic composites have gradually replaced conventional materials in various manufacturing sectors due to their advantages such as high strength-to-weight ratio, lightweight nature, corrosion resistance, fatigue resistance, fracture toughness, and design flexibility. In the present research work, an eco-friendly and sustainable hybrid composite was developed by incorporating discarded face mask fibres along with glass fibres and polyester resin as the matrix material with varying fibre compositions. The composite laminates were fabricated using a simple and cost-effective hand layup method with dissimilar layer arrangements to enhance structural performance. Subsequently, the mechanical properties of the fabricated composites were evaluated through tensile, flexural, and impact tests conducted according to ASTM standard procedures. The experimental findings revealed that the hybridization of recycled face mask fibres with glass fibres improved mechanical strength and impact resistance, indicating strong potential for lightweight automobile applications while contributing to environmental sustainability.

Keywords- Discarded Face Mask; Hybrid Composites; Glass Fibre; Mechanical Properties; Automobile Applications

ICRIT258

IMPACT OF WAREHOUSE LAYOUT DESIGN ON ORDER FULFILLMENT EFFICIENCY

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Abstract

Warehouse layout design plays a significant role in improving operational performance and ensuring effective order fulfillment in modern supply chain systems. With the rapid growth of e-commerce, manufacturing, and logistics industries, efficient warehouse management has become essential to meet customer demands. This study focuses on analyzing the impact of warehouse layout design on order fulfillment efficiency by examining material flow, storage allocation, picking process, and operational coordination within warehouse operations. A well-designed layout minimizes travel time, reduces congestion, and improves productivity, whereas a poor layout leads to delays, increased handling costs, and inefficient resource utilization. The research examines various layout types such as U-shaped, I-shaped, and L-shaped warehouse designs and their effectiveness in optimizing order processing activities. The study also highlights the importance of slotting strategy, aisle design, space utilization, and technology integration such as barcode scanning and warehouse management systems. Primary data were collected through structured questionnaires distributed to warehouse employees, supervisors, and managers. Secondary data were obtained from journals, books, and online sources. The analysis reveals that optimized warehouse layout significantly improves picking efficiency, reduces order cycle time, and enhances space utilization. It also improves coordination between receiving, storage, and dispatch functions. The study concludes with practical recommendations including redesigning storage zones, implementing automation, improving aisle width, and adopting warehouse management systems.

Keywords: Warehouse Layout, Order Fulfillment, Logistics Efficiency, Inventory Management, Warehouse Design, Productivity, Material Handling.

ICRIT259

PNEUMONIA AND TUBERCULOSIS DETECTION USING LGBM MODEL

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Abstract— This paper presents a comprehensive approach for detecting Pneumonia and Tuberculosis (TB) from chest X-ray images using a deep learning techniques. We explore two classification models: Light Gradient Boosting Machine (LightGBM), a decision tree-based ensemble model trained on features extracted from eigen-domain methods such as Discrete Wavelet Transform (DWT) and Singular Value Decomposition (SVD); and ResNet50, a powerful convolutional neural network (CNN) for automated image classification. The dataset comprises chest X-ray images of normal, Pneumonia-affected, and TB- affected lungs. The models were evaluated using various metrics such as accuracy, precision, recall, F1-score, confusion matrix, and ROC-AUC. Results indicate that LightGBM outperformed ResNet50 significantly, especially in distinguishing TB from other categories. This research highlights the potential of hybrid models in resource-constrained clinical environments.

Keywords—Pneumonia, Tuberculosis, LightGBM, ResNet50, Chest X-ray, DWT, SVD, Deep Learning, Medical Imaging

ICRIT260

AN INTELLIGENT-IOT BASED FRESHWATER RECIRCULATING AQUAPONICS SYSTEM WITH FISH DISEASE DETECTION USING CNN

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Abstract: Aquaponics plays a vital role in meeting the increasing global demand for seafood and edible plants. Implementing different and innovative farming practices increases the value of agricultural products, which helps the country's economic growth. India has varied temperatures, soil types and topography that led to a wide variety of agricultural approaches. There are different types of farming. Fish Farming is one among these and it plays a vital role in income worldwide, but fish disease can cause serious losses. Such diseases that were detected early are essential to prevent outbreaks and safeguard the health of fish. Keeping fish healthy is important for aquaculture and fish diseases can spread quickly, so early detection is crucial. Fish disease detection can be identified more accurately by using a CNN-based approach and Raspberry Pi camera module is being used for counting and monitoring the number of fish. An extensive dataset containing images of healthy fish and fish affected by various diseases is collected and annotated. Preprocessing techniques such as image normalization and augmentation are applied to enhance the robustness and generalization of the model. A CNN architecture is then designed and trained on the prepared dataset using state-of-the-art optimization algorithms. The trained model is evaluated using standard metrics such as accuracy, precision, recall and F1-score on a separate test dataset. The integration of sensor outputs in an intelligent IoT-based aquaponics system allows for real-time monitoring and management of both fish and plant health. By leveraging data analytics and CNN for disease detection, the system can operate efficiently and sustainably, ensuring optimal conditions for aquaculture and hydroponics.

Keywords: IoT-based Aquaponics, CNN-based approach, Fish Disease, Disease detection, Raspberry Pi.

ICRIT261

DEEP LEARNING BASED MULTI CLASS WILDLIFE BEHAVIOR DETECTION USING YOLO

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Abstract— This paper presents a multimodal deep learning framework for intelligent wildlife monitoring that combines both visual and audio based analysis to improve detection accuracy and behavioral understanding in natural environments. The increasing need for automated wildlife observation systems has created demand for smart technologies that can continuously monitor animals without constant human supervision. To address this challenge, the proposed system integrates advanced computer vision techniques with environmental sound analysis for reliable and real time monitoring. The framework uses the You Only Look Once object detection algorithm to detect and identify multiple animal classes from live or recorded video streams with high speed and accuracy. Various spatial and motion related features such as distance between animals, movement speed, directional changes, and area overlap are extracted from the tracked objects. Safe behavior indicates normal movement patterns, while danger behavior represents aggressive actions, abnormal proximity, chasing, or collision risk. In addition to visual analysis, the proposed framework incorporates bird audio signal processing to understand environmental conditions and animal stress levels. Audio recordings are processed to extract meaningful sound features, which are then classified to identify stress calls or normal calls. Stress related sounds often indicate threats, predator presence, disturbance, or unusual activity in the habitat. By combining audio predictions with visual behavior analysis, the system gains a richer understanding of wildlife activity. The final output integrates both visual and audio results to generate accurate and timely alerts for wildlife researchers, forest officers, and conservation agencies.

Keywords— wildlife detection, behaviours classification, YOLO, deep learning, object tracking, real-time monitoring,

audio classification, bird sound analysis, stress detection, multimodal system

ICRIT262

A RUNTIME-ADAPTIVE ENERGY-AWARE VLSI FRAMEWORK FOR HIERARCHICAL ERROR CORRECTION IN NEXT-GENERATION MEMORY SYSTEMS

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Abstract— Modern memory systems have greatly become susceptible to soft errors, momentary faults, and multi-bit data corruption due to technology scaling. With decreased device geometries and lower operating voltages, reliable data storage and retrieval is becoming an important design issue. Traditional Error Correction Code (ECC) architectures can typically be designed to enable correction capability that is fixed, regardless of the actual error conditions. It results in a waste of switching, higher dynamic power expenditure, and a waste of hardware. In order to overcome these limitations, this paper introduces a runtime adaptable energy sensitive VLSI architecture to hierarchical error correction of next generation memory systems. The suggested architecture is a dynamically adjusting strength in error correction as per real-time feedback of error detection. It incorporates a base ECC encoder, syndrome generating logic, error detection logic, several hierarchical correction units, and an adaptive control unit that chooses to activate only the needed correction unit. This selective activation greatly minimizes unnecessary hardware operations and enhances the overall energy efficiency. The primary value of this work is that a lightweight runtime decision mechanism is introduced that allows operating the ECC modules with fine-grained control without affecting the reliability. Verilog HDL is used to implement the design and tested by simulation and evaluation using synthesis. Findings show better power efficiency, lower switching overhead and better fault tolerance than the traditional static ECC systems.

Keywords—Adaptive ECC, Energy-Aware VLSI, Hierarchical Error Correction, Low Power Design, Memory Reliability, Runtime Adaptation, Dynamic Power Reduction, Hardware Optimization

ICRIT263

USE OF DEMOLITION WASTE AS PARTIAL REPLACEMENT OF COARSE AGGREGATE IN CONCRETE

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Abstract - The rapid growth of urbanization has intensified the demand for natural coarse aggregates, leading to resource depletion and environmental concerns. This study investigates the feasibility of utilizing demolished concrete waste as recycled coarse aggregate (RCA) in M30 grade concrete. Concrete mixes were prepared with varying RCA replacement levels (0%, 20%, 40%, 60%, 80%, and 100%) and tested for compressive strength at 7 and 28 days, along with saturated water absorption to evaluate durability. The results reveal that compressive strength increases with RCA content up to 60%, achieving an optimum strength of 22.51 MPa at 7 days and 27.95 MPa at 28 days. Beyond 60% replacement, strength decreases due to weaker bonding and higher porosity of RCA. Conversely, water absorption shows a steady decline with increasing RCA, reaching the lowest value of 1.25% at 100% replacement, indicating improved resistance to moisture ingress. Overall, the study concludes that a 60% replacement level provides the best balance between strength and durability, making RCA a viable alternative to natural aggregates for sustainable construction. The findings support eco-friendly practices by reducing landfill waste, conserving natural resources, and promoting efficient waste management in the construction industry.

MOTOR FAULT DETECTION USING VIBRATION ANALYSIS AND MACHINE LEARNING

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Abstract—Unexpected failures in rotating machinery can lead to increased maintenance costs, production downtime, and reduced operational efficiency in industrial environments. To address this problem, a motor fault detection system based on vibration analysis and machine learning techniques is proposed. The developed system continuously monitors vibration signals generated by a motor to detect abnormal operating conditions at an early stage. In the proposed system, vibration signals are captured using an ADXL345 accelerometer sensor connected to an ESP32 microcontroller. The accelerometer converts mechanical vibrations into electrical signals, which are collected through the microcontroller using an I²C communication interface. The obtained vibration data is analyzed using statistical feature extraction techniques to determine important vibration parameters such as Root Mean Square (RMS), peak value, mean, and standard deviation. These extracted features are used as input parameters for machine learning algorithms including Random Forest and Support Vector Machine (SVM) to classify motor operating conditions. The system can identify different motor states such as normal operation, inner race fault, and outer race fault. A graphical user interface (UI) is developed to visualize vibration parameters and display the diagnostic results in real time. The proposed system provides an intelligent and automated solution for monitoring motor health. It enables early fault detection, reduces unexpected machine failures, and supports predictive maintenance in industrial environments.

Keywords—Motor fault detection, vibration analysis, machine learning, sensors , predictive maintenance.

ICRIT265

ADAPTIVE LOW-POWER PIPELINED AES-128 HARDWARE CORE WITH DYNAMIC RECONFIGURATION FOR HIGH-SPEED FPGA-BASED SECURE SYSTEM

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Abstract—The rising performance and security needs of embedded and IoT systems have made it necessary to have cryptographic solutions that are based on hardware to provide high-performance and low power consumptions. In this paper, an adaptable and reconfigurable architecture of encryption and decryption of an AES-128 algorithm has been introduced in FPGA that supports the high throughput and energy efficiency. The proposed design uses completely pipelined datapath of all the AES rounds, which allows multiple data blocks to be processed simultaneously and greatly minimizes the latency. The standard AES transformations (SubBytes, ShiftRows, Mix Columns and AddRoundKey) are included in each round, and there is an efficient key expansion module that produces round keys with minimal hardware complexity. The architecture is designed to overcome the power limitations through the use of optimized implementation methods of S-boxes to minimize switching activities and using clock gating to shut down idle modules hence minimizing the dynamic power usage. Moreover, the design also enables dynamic reconfiguring, which means that it can be easily adjusted to other operational needs without significant changes in its architecture. The combination of pipelining, low-power optimization method and resource-saving key management leads to a trade-off between the area usage, power consumption, and the computational speed. Experimental analysis has shown that the suggested architecture is better in throughput and energy consumption, and it is therefore suitable to real time cryptographic systems with constrained resources and high-security levels.

Keywords—AES-128, FPGA, pipelined architecture, low- power design, S-box optimization, clock gating, key expansion, reconfigurable cryptography, high throughput, embedded systems, IoT security.

CENTRALISED NETWORK SYSTEM FOR REAL - TIME MONITORING OF DISTRIBUTED DEVICES

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Abstract: This paper presents the design and development of a Network Monitoring and Remote Shutdown System aimed at enhancing system management, security, and performance tracking in real-time environments. The proposed system integrates a FastAPI-based backend with a Flutter-based mobile application to provide a centralized and user-friendly platform for monitoring system resources such as CPU usage, memory consumption, and disk utilization. A lightweight monitoring agent is deployed on the target systems to continuously collect performance metrics and transmit the data to the backend server through RESTful APIs at regular intervals. The backend server is responsible for processing, storing, and analyzing the incoming data, enabling administrators to visualize system performance through an interactive and dynamic dashboard. The mobile application allows users to monitor multiple systems remotely, ensuring accessibility and convenience, while also providing real-time updates on system status. This remote accessibility enables administrators to make timely decisions and take necessary actions when abnormal behavior or performance issues are detected. In addition to monitoring capabilities, the system can be extended to support remote shutdown functionality, which helps prevent system damage due to overheating, overload, or unauthorized access. The architecture of the system is designed to be scalable, flexible, and secure, ensuring reliable communication between components. The proposed solution is highly suitable for organizations, educational institutions, and IT infrastructures that require centralized monitoring and control of multiple devices. By combining real-time data analytics, remote accessibility, and automation, the system provides an efficient, reliable, and cost-effective approach to modern system administration and resource management.

Keywords: Network Monitoring, Remote Shutdown, FastAPI, Flutter, Real-Time Systems, JWT Authentication, System Performance.

PROCESS SYNTHESIS AND TECHNO-ECONOMIC EVALUATION OF A PLASTIC-TO-LIQUID (PTL) PLANT: CONVERTING MIXED POLYOLEFIN WASTE INTO HIGH-QUALITY NAPHTHA AND DIESEL.

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Abstract : This study presents a comprehensive process synthesis and techno-economic evaluation of a Plastic-to-Liquid (PtL) plant designed to convert mixed polyolefin waste into high-value chemical feedstocks. As global plastic pollution intensifies, the transition toward a circular economy necessitates advanced chemical recycling pathways. The proposed process utilizes thermal pyrolysis followed by catalytic hydroprocessing to refine crude pyrolysis oils into high-quality naphtha and diesel fractions. Through rigorous process simulation, the material and energy balances were established to optimize product yields and minimize carbon intensity. The economic viability of the facility was assessed using key financial indicators, including Capital Expenditure (CAPEX), Operating Expenditure (OPEX), and the Net Present Value (NPV). Sensitivity analyses were performed to determine the impact of plastic feedstock tipping fees and fluctuating market prices for petroleum-based alternatives on the plant's profitability. Results indicate that the integrated PtL approach not only offers a sustainable waste management solution by diverting polyolefins from landfills but also provides a competitive, low-carbon source of fuels and chemical precursors. This evaluation highlights the technological readiness and economic potential of scaling PtL infrastructure for industrial-scale waste valorization. **Keywords:** Plastic-to-Liquid, mixed polyolefins, techno-economic analysis, chemical recycling, naphtha and diesel.

PAPER TITLE: ELECTRIC VEHICLE TO VEHICLE (V2V) ENERGYTRANSFER USING ON BOARD CONVERTERS

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Abstract:The increasing adoption of Electric Vehicles (EVs) has highlighted challenges such as limited charging infrastructure and range anxiety, especially during emergency situations. Electric Vehicle-to-Vehicle (V2V) energy transfer provides an effective solution by enabling direct energy sharing between EVs without relying on external charging stations. This project proposes a V2V energy transfer system using on-board bidirectional power electronic converters to ensure safe, efficient, and controlled power exchange. In the proposed system, one electric vehicle acts as a donor while another operates as a receiver when its battery state of charge is low. The vehicles are connected through a secure DC link, allowing controlled energy transfer between battery packs. A bidirectional DC–DC converter regulates the voltage and current to match the charging requirements of the receiving vehicle. A microcontroller-based control unit generates PWM signals to manage power flow and maintain system stability. Battery parameters such as voltage, current, and state of charge are continuously monitored to ensure safe operation. The charging process follows Constant Current (CC) mode during initial charging and transitions to Constant Voltage (CV) mode as the battery approaches its rated voltage. Protection mechanisms including over-voltage, over-current, short-circuit, and thermal protection are incorporated to prevent damage to system components and batteries. The proposed V2V energy transfer system reduces dependency on fixed charging infrastructure and enhances charging flexibility. It is particularly useful in roadside emergencies and EV fleet applications, improving reliability and user confidence. Overall, this system contributes to the development of a more resilient, efficient, and sustainable electric vehicle ecosystem.

DEPARTMENT OF COMPUTER APPLICATIONS

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AI-Based Pre,•enth•e Trek Safely And Application, Artificial Intelligence & Machine Learning

Abstract:

This project is an AI-based web application developed to improve trekking safety through predictive risk analysis. The system evaluates real-time weather conditions, trek difficulty, crowd density and user fitness to assess potential risks. These factors are considered to calculate a comprehensive trek risk score for each planned trek. The application also checks for user-trek compatibility to ensure whether the trek matches the user's physical ability and experience level. This helps in preventing unsafe decisions caused by poor planning or lack of awareness. The system also provides offline emergency information to assist users in areas with limited or no network connectivity. Safety guidelines and emergency support details are made easily accessible during critical situations. By using artificial intelligence and data-driven analysis the application minimizes the human error in trek planning. The project aims to reduce trekking accidents and enhance overall adventure safety. It promotes responsible and informed trekking practices.

ICRIT270

EXPLORING NiFe_2O_4 FERRITES FOR PSEUDOCAPACITIVE ENERGY STORAGE: SYNTHESIS, PROPERTIES, AND PERFORMANCE

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Abstract

Inverse spinel NiFe_2O_4 nanoparticles (10-50 nm) doped with Er-Gd (0.2 mol%) were prepared by modifying the co-precipitation method, which comprised dissolving $\text{NiCl}_2 \cdot 6\text{H}_2\text{O}$ and FeCl_3 , micelle formation using oleic acid, precipitation at pH 12 with NaOH solution, doping, washing, vacuum drying, and annealing at 500°C. Full analysis showed that the samples had a pure cubic spinel crystal structure (sharply defined peaks in XRD, a 1g vibrational mode around 700 cm^{-1} in Raman spectroscopy), extended light absorption in the visible range (DRS), decreased band gap, and minimized electron-hole pair recombination (quenched PL emission). Therefore, these properties make NiFe_2O_4 ferrites outstanding catalysts for total photodegradation of Rhodamine B in 140 minutes and pseudocapacitors due to fast Faradaic charge transfer.

Keywords : Inverse spinel NiFe_2O_4 , Nanoparticles (10-50 nm) , Co-precipitation method, Cubic spinel structure , XRD analysis , Raman spectroscopy (A 1g mode) , Visible light absorption (DRS)

ICRIT271

COMPARATIVE THERMAL PERFORMANCE ENHANCEMENT OF CORRUGATED AND MODIFIED FLAT PLATES FOR PLATE HEAT EXCHANGER APPLICATIONS

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Abstract:

The present study evaluates the thermal performance of two newly modified flat plates, compared to conventional flat plates and flat plates with distributors operating under the same conditions. Numerical simulations for heat transfer evaluation were performed using SolidWorks Flow Simulation. Both fluids were set to and maintained at 70 °C and 30 °C at the inlet. Performance assessment was based on temperature differences along the plates. It was found that the corrugated flat plate has the highest heat transfer rate when compared to the conventional flat plate and the flat plate with distributors. It was also found that the corrugated plate has a heat transfer improvement of 120 to 140 percent when compared to the flat plate. In comparison to the plate with distributors, the corrugated plate has a heat transfer improvement of 30 to 65 percent. This improvement can be attributed to the increased surface area and turbulent corrugation which enhances mixing and thermal interaction. Therefore, it has been confirmed that corrugated passages are a viable option for heat transfer enhancement and are recommended for application in plate heat exchangers.

ICRIT272

STUDENT PROFILE MANAGEMENT SYSTEM

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Abstract

The Student Profile Management System is a mobile-based application developed to store and manage student records in a secure and organized manner. The application is built using Flutter for the user interface and SQLite as the local database, ensuring that all student information is saved directly on the device. The system allows administrators to add, edit, update, and retrieve personal details and contact data. By using Flutter, the app provides a clean, responsive, and cross-platform design, while SQLite enables fast offline data access and secure storage within the institution. This approach eliminates dependence on internet connectivity and supports accurate, paperless record management with maximum data privacy.

Keywords

Student Profile Management, Mobile Application, Firebase Cloud Database, Authentication, Information Storage, Admin Dashboard, Digital Record System

ICRIT273

GREEN SYNTHESIS AND IN VITRO BIOCHEMICAL ASSESSMENT OF TiO₂ NANOPARTICLES USING CALOTROPIS

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Abstract—Green synthesis of nanoparticles has emerged as an eco-friendly alternative to conventional chemical methods. In this study, titanium dioxide nanoparticles (TiO₂ NPs) were synthesized using *Calotropis gigantea* leaf extract, which acts as a natural reducing and stabilizing agent. The synthesized nanoparticles were evaluated for their in vitro anti-inflammatory activity. Anti-inflammatory activity was assessed using human red blood cell membrane stabilization assay and bovine serum albumin denaturation assay, with diclofenac as the standard drug. The TiO₂ nanoparticles exhibited concentration dependent inhibition in both assays. The IC₅₀ values of TiO₂ nanoparticles were found to be 1.65 mg per mL for the HRBC method and 1643 microgram per mL for the BSA assay, whereas diclofenac showed IC₅₀ values of 626.4 microgram per mL and 64.44 microgram per mL respectively. Further, mitochondrial membrane potential analysis using JC 1 dye in HepG2 cell lines indicated alterations in mitochondrial function. Optimization studies revealed that synthesis under alkaline pH, elevated temperature, and higher extract ratio produced stable nanoparticles. The results suggest that green synthesized TiO₂ nanoparticles possess significant anti-inflammatory activity and potential biomedical applications.

ICRIT274

AUGMENTATIVE COMMUNICATION DEVICE FOR PARTIALLY PARALYSED SPEECH-IMPAIRED PATIENTS WITH IOT

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Abstract: Assistive communication technologies are vital for individuals affected by speech impairments and partial paralysis, enabling them to interact effectively with caregivers and society. This paper proposes an Internet of Things based Augmentative and Alternative Communication device designed to support speech-impaired patients through gesture-driven communication. The system integrates multiple sensors, including an accelerometer, flex sensor, and force-sensitive resistor (FSR), to capture muscular movements and user intent. These sensors generate analog signals that are processed through signal conditioning circuits to eliminate noise and improve accuracy. The conditioned signals are then converted into digital form using an embedded microcontroller for further analysis and interpretation. The processed data is transmitted via serial communication interfaces and translated into meaningful outputs such as synthesized speech, visual feedback, and graphical representations. Additionally, the incorporation of IoT technology enables real-time remote monitoring of the user's physical activity and communication patterns, allowing healthcare professionals to track patient progress continuously. The system also provides insights into muscular endurance and functional capability, making it useful for both communication and rehabilitation purposes. Compared to traditional AAC systems, the proposed solution offers enhanced responsiveness, adaptability, and efficiency. It is designed to be cost-effective, scalable, and user-friendly, ensuring accessibility for a wide range of users. This work demonstrates the effective integration of sensor-based input, embedded systems, and IoT in developing intelligent assistive communication devices.

ICRIT275

PROCESS SYNTHESIS AND TECHNO-ECONOMIC EVALUATION OF A PLASTIC-TO-LIQUID (PTL) PLANT: CONVERTING MIXED POLYOLEFIN WASTE INTO HIGH-QUALITY NAPHTHA AND DIESEL. MUGUNTHAN

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Abstract: This study presents a comprehensive process synthesis and techno-economic evaluation of a Plastic-to-Liquid (PtL) plant designed to convert mixed polyolefin waste into high-value chemical feedstocks. As global plastic pollution intensifies, the transition toward a circular economy necessitates advanced chemical recycling pathways. The proposed process utilizes thermal pyrolysis followed by catalytic hydroprocessing to refine crude pyrolysis oils into high-quality naphtha and diesel fractions. Through rigorous process simulation, the material and energy balances were established to optimize product yields and minimize carbon intensity. The economic viability of the facility was assessed using key financial indicators, including Capital Expenditure (CAPEX), Operating Expenditure (OPEX), and the Net Present Value (NPV). Sensitivity analyses were performed to determine the impact of plastic feedstock tipping fees and fluctuating market prices for petroleum-based alternatives on the plant's profitability. Results indicate that the integrated PtL approach not only offers a sustainable waste management solution by diverting polyolefins from landfills but also provides a competitive, low-carbon source of fuels and chemical precursors. This evaluation highlights the technological readiness and economic potential of scaling PtL infrastructure for industrial-scale waste valorization. **Keywords:** Plastic-to-Liquid, mixed polyolefins, techno-economic analysis, chemical recycling, naphtha and diesel.

PLATFORM FOR REAL TIME MAPPING OF PATIENT FLOW & RESOURCE DEVELOPMENT

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Abstract— Modern hospitals that handle large patient volumes often depend on fragmented and manual systems to manage patient flow and operations. These systems commonly rely on paper-based records and lack integration across departments, resulting in poor communication and coordination. Consequently, patients face long waiting times, delays in diagnosis and treatment, and uncertainty regarding their status within the hospital. The absence of real-time updates about appointments or queue positions further reduces patient satisfaction. Healthcare providers also encounter major challenges due to disconnected systems, as accessing complete and up-to-date patient information becomes difficult. This can delay clinical decisions and negatively impact the quality of care. In critical situations, missing or outdated data may lead to serious medical errors, including incorrect treatments or harmful drug interactions. Additionally, manual documentation increases the workload on hospital staff, limiting their efficiency and reducing the time available for patient care. To overcome these issues, MedFlow Pro is proposed as an intelligent patient flow management system that enhances hospital efficiency and coordination. It digitizes key processes such as patient registration, appointment scheduling, queue management, and vital sign monitoring. Each patient is assigned a unique QR code for secure and quick access to their medical records across departments. Built on a client-server architecture with a Django backend, React and Next.js frontend, and a secure database, the system uses FIFO logic and a real-time dashboard to optimize operations, reduce errors, and improve patient experience. **Keywords:** Patient flow, hospital management, QR code, real-time dashboard, FIFO, digital healthcare, system integration, efficiency.

LEAD MANAGEMENT SYSTEM

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Abstract

The Lead Management System (LMS) is a web-based application developed to efficiently manage, track, and convert potential customers into business opportunities. The system is built using WordPress, providing a user-friendly interface along with flexible customization and scalability. The application enables administrators to capture leads from multiple sources such as website forms, inquiries, and manual entries. All lead information is stored in a centralized database, allowing easy access, organization, and monitoring. The system supports lead categorization, status tracking, and assignment to specific users for better workflow management. A key feature of the system is its ability to track the progress of each lead through different stages, from initial contact to final conversion. Notifications and updates help users stay informed about follow-ups and pending actions, improving response time and customer engagement. The platform also provides reporting and analytics features to evaluate lead performance, conversion rates, and user activity. Built on WordPress with plugins, PHP, MySQL, and modern web technologies, the system ensures reliability, ease of use, and cost-effective deployment. Overall, the Lead Management System offers an efficient and organized solution for managing customer leads, enhancing productivity, and supporting business growth.

Keywords

Lead Management , CRM System , Sales Automation, Lead Tracking, Web Application.

CAREWISE: AN EXPLAINABLE AI-BASED CONVERSATIONAL SYSTEM FOR STRUCTURED SYMPTOM ASSESSMENT

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Abstract—Access to timely and accurate health information remains unequal worldwide, particularly in low resource settings. AI assisted triage systems offer a potential solution, but their effectiveness depends on trust, explainability, and safe deployment. CareWise is a conversational health assistant designed to address these challenges through a structured and privacy aware architecture. The system follows a five-layer design consisting of a React frontend and a FastAPI backend that manages authentication using bcrypt and JWT, executes an XGBoost based diagnostic classifier, and asynchronously invokes a large language model to generate user friendly explanations. A strict privacy boundary ensures that no personally identifiable or symptom level data is transmitted to the language model. The inference pipeline operates in six stages: natural language preprocessing, dialogue management for symptom sufficiency, probabilistic prediction, explanation generation, fault handling through retry and timeout mechanisms, and structured response generation. By placing the language model downstream of the classifier, the system maintains reproducibility and auditability while enhancing interpretability for non-clinical users. This work presents the system architecture, evaluates trade-offs in dialogue design and reliability, and discusses ethical concerns including accountability, over reliance, and deployment risks in low oversight environments. CareWise demonstrates a practical approach to building interpretable, resilient, and privacy preserving health AI systems without compromising accessibility. **Keywords**— conversational AI, healthcare AI, explainable AI, symptom assessment, privacy preserving systems, clinical decision support

CYBER VAULT: AN INTERACTIVE PLATFORM FOR WEB SECURITY TESTING AND VULNERABILITY ANALYSIS

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Abstract

Cyber Vault is a user-centric web security testing platform designed to identify and assess vulnerabilities in web applications. Amid rising cyberattacks, modern websites face threats like injection attacks, authentication weaknesses, and OWASP Top 10 risks. This paper introduces Cyber Vault's features, including an intuitive interface for exploring SQL injection, command injection, and authentication flaws; integrated testing tools; and simulated attack scenarios. By prioritizing simplicity and hands-on learning, the platform equips users with practical skills to detect and mitigate security risks.

Keywords

Web security, vulnerability analysis, OWASP, SQL injection, penetration

DESIGN AND DEVELOPMENT OF AN ESP 32-BASED SEMI- AUTOMATIC ROAD SWEEPING SYSTEM

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Abstract— Maintaining clean roadways is essential for safeguarding public health,preserving environmental quality, and enhancing the visual appeal of urban areas. The rapid growth of cities and the continuous rise in vehicular traffic have significantly increased the accumulation of dust, litter, and other unwanted materials on roads and highways. Conventional cleaning practices, which rely heavily on manual labor, are often inefficient,time-intensive, and physically demanding. Moreover, such methods expose workers to harmful pollutants and unsafe conditions,highlighting the need for a more advanced and reliable solution. This study focuses on the design and implementation of a semi-automatic road sweeping system that aims to improve cleaning performance while reducing human involvement. The proposed system integrates mechanical components with an embedded control unit to achieve efficient operation. It features a four-wheel drive arrangement powered by high-torque DC motors, allowing smooth and flexible movement in multiple directions, including forward, backward, and turning motions. A rotating brush assembly is incorporated to effectively remove dust and debris from road surfaces. Key mechanical elements such as gears and bearings are used to ensure consistent performance, structural strength, and efficient transmission of power. The system is controlled using an ESP32 microcontroller, enabling both manual and semi-automatic modes for user convenience. The overall design prioritizes ease of handling, low energy consumption, affordability, and adaptability for various road conditions. By combining mechanical efficiency with smart control, the developed system offers a practical and improved approach to modern road maintenance. This solution not only enhances cleaning effectiveness but also reduces dependency on manual labor and promotes safer working environments.

SMART FOOD REDISTRIBUTION SYSTEM

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Abstract

Food wastage is one of the major global challenges, where a large amount of surplus food is discarded while many people struggle to access affordable meals. To address this issue, the Smart Food Redistribution System is proposed as a web-based platform that connects food donors with nearby consumers in real time. The system aims to reduce food waste and provide affordable food options through an efficient and automated solution. In this system, food donors such as restaurants, hotels, or individuals can list their surplus or near-expiry food items. Consumers can browse these listings based on location and purchase food at discounted prices. Real-time updates and notifications ensure quick distribution before the food expires. Dynamic pricing reduces the cost as expiry time approaches, encouraging faster consumption and minimizing waste. The platform includes an integrated delivery module, allowing delivery partners to complete orders efficiently. It is developed using React.js, Spring Boot, MySQL, and JWT authentication, with Google Maps API for location-based services. The system consists of four modules: Admin, Donor, Customer, and Delivery Partner, ensuring efficient management, scalability, and security. Overall, the system provides a sustainable solution to reduce food wastage and improve food accessibility through a smart and user-friendly platform.

Keywords— Food wastage, Smart redistribution, Real-time system, Dynamic pricing, Location-based services, Sustainability, Web application

A RETRIEVAL-AUGMENTED GENERATION (RAG) FRAMEWORK FOR CONTEXTUAL QUERY PROCESSING OF THE HOLY BIBLE IN TAMIL.

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Abstract : This paper presents a Retrieval-Augmented Generation (RAG) framework for contextual, multi-turn query processing of the Holy Bible in Tamil — a low-resource language with over 80 million Christian speakers. The system employs a hybrid retrieval pipeline combining FAISS-based dense semantic search using the paraphrase-multilingual-MiniLM-L12-v2 multilingual sentence transformer with lexical SQLite keyword retrieval. Retrieved verses undergo contextual neighbor expansion before being supplied to Google Gemini2.5 Flash for answer synthesis. A lightweight intent detection module dynamically tunes retrieval depth and generation budget per query. A query rewriting sub-module resolves conversational ambiguity in multi-turn sessions. A citation sanitization guardrail prevents hallucinated scriptural references. The pipeline is deployed as an asynchronous FastAPI service on AWS EC2 and validated through a production Flutter mobile application serving Tamil-speaking communities, demonstrating that hybrid RAG without LLM fine-tuning achieves contextually accurate, citation-grounded theological Q&A in Tamil. **Keywords—** Retrieval-Augmented Generation (RAG), Low-Resource Language Natural Language Processing, Tamil Language Processing, Biblical Information Retrieval, Dense Vector Search (FAISS), Hybrid Retrieval Pipeline, Large Language Models (LLM), Multilingual Sentence Embeddings, Contextual Query Rewriting, Hallucination Mitigation in LLMs, Theological AI Systems, Sacred Text Question Answering.

A STUDY ON CUSTOMER BEHAVIOUR AND PREFERENCES FOR HOME LOANS AMONG CUSTOMERS IN THE HOUSING SEGMENT

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Abstract

In the current economic climate, the housing sector serves as more than just a pillar of the GDP; it is the primary vehicle for individual wealth creation. However, the path to homeownership—the home loan—is often shrouded in bureaucratic complexity. This research moves beyond the traditional “numbers-only” approach to investigate the psychological and behavioral drivers of modern borrowers. By analyzing the interplay between interest rate sensitivity, the digital user experience, and the fundamental need for institutional trust, we identify the factors that actually convert a “window shopper” into a long-term borrower. Our results indicate a profound shift: while competitive pricing is the price of entry, transparency and speed are what ultimately secure the customer’s loyalty in an increasingly crowded and digitized marketplace. **Keywords—** Home Finance, Consumer Psychology, Digital Mortgages, Loan Transparency, Behavioral Economics, Housing Market Trends.

EXTRACTIVE SUMMARIZATION AND HATE SPEECH DETECTION FOR READABILITY AND EMOTION ANALYSIS USING ML

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Abstract: Effective text processing is absolutely essential for information retrieval and moderation given the exponential expansion of digital materials. This work presents a text analysis tool integrating advanced Natural Language Processing (NLP) techniques for text summarizing, title generation, emotion classification, readability assessment, and content moderation using extractive summarizing, the text summarizing module guarantees that important lines from the original text are kept exactly without changing meaning. Title generation makes use of FLAT - T5 BART, a transformer-based model best suited for producing succinct, significant headlines. DistilRoBERTa-based emotion analysis is conducted to highly accurately classify emotions. Textstat is used in the readability assessment module to evaluate text complexity and provide recommendations for adaptations for several reading levels. Facebook/roberta-hate-speech drives content moderation by spotting and filtering objectionable material with varying sensitivity comprising content validation, readability enhancement, offensive word detection with alternatives, and text adaptation, the tool offers a user-friendly interactive interface. Combining modern NLP models guarantees excellent content moderation and simplification, so benefiting digital platforms, content creators, and teachers. This work shows how successfully transformer-based models can automate text analysis while preserving usability and accuracy.

Keywords: Text summarization, Title Generation, Emotion Analysis, Offensive word Detection, Natural Language Processing (NLP), DistilRoBERTa-Base, Facebook/roberta-hatespeech, FLAT - T5.

ICRIT286

PREDICTING CYBERBULLYING ON SOCIAL MEDIA USING MACHINE LEARNING ALGORITHM

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Abstract: The rise of social media has revolutionized global communication, enabling individuals to connect, share experiences, and express opinions across geographical and cultural boundaries. However, this digital expansion has also contributed to the widespread issue of cyberbullying, which presents serious psychological, emotional, and social risks. Cyberbullying involves the use of digital platforms to harass, intimidate, or demean individuals through offensive language, threats, or harmful content. Given its severe consequences, such as anxiety, depression, and even suicidal tendencies among victims, detecting and preventing cyberbullying in real time has become a critical priority for ensuring a safer online environment. This study explores the application of machine learning algorithms to predict and detect instances of cyberbullying by analyzing user-generated content on various social media platforms. Unlike traditional rule-based moderation techniques, which often fail to capture the evolving nature of online abuse, machine learning provides a more dynamic and efficient approach to identifying harmful content. A range of classification techniques, including Natural Language Processing (NLP), sentiment analysis, and contextual embedding models, are employed to recognize abusive language, harmful intent, and subtle contextual cues that might indicate cyberbullying. NLP techniques allow the system to process and interpret textual data, enabling it to distinguish between benign conversations and potentially harmful interactions. Sentiment analysis helps in identifying negative emotions associated with online harassment, while contextual embedding improves the model's ability to understand the meaning behind words and phrases within a given context. Experimental results demonstrate that the integration of machine learning algorithms significantly improves the precision and recall rates in identifying cyberbullying incidents. The findings suggest that automated systems powered by artificial intelligence (AI) can play a crucial role in content moderation, providing a scalable and robust framework for detecting online harassment in real time.

IOT BASED FORGOTTEN OBJECT DETECTION NEAR DOOR (ANTI FORGOTTEN SYSTEM)

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Abstract: In today's fast-paced lifestyle, it is quite common for individuals to forget essential personal belongings such as wallets, keys, or identification cards when leaving their homes. This paper presents a practical and user-friendly solution in the form of an Internet of Things (IoT)-based forgotten object detection system. The main goal of the system is to assist users in ensuring that they carry all necessary items before stepping out, thereby reducing inconvenience and potential loss. The proposed system makes use of Radio Frequency Identification (RFID) technology, where each important object is equipped with a unique RFID tag. An RC522 RFID reader, connected to an ESP32 microcontroller, continuously scans for these tags to confirm the presence of all required items. A simple yet effective matching algorithm is implemented within the system to compare the detected tags with a predefined list of essential belongings. If any item is missing, the system immediately notifies the user through a buzzer alert, ensuring instant awareness. In addition to the local alert, the system also sends a notification to the user's smartphone using the Blynk IoT platform, allowing remote monitoring and timely action. An OLED display is integrated into the system to provide real-time feedback, displaying the status of each item and enhancing user interaction. The overall design focuses on being cost-effective, energy-efficient, and easy to implement, making it suitable for everyday use as well as integration into smart home environments. Experimental results demonstrate that the system performs with high accuracy and minimal delay, ensuring reliable detection of tagged objects. Therefore, the proposed solution offers a simple yet effective way to address the common problem of forgetting personal items, improving daily convenience and user confidence.

Keywords: Internet of Things (IoT), RFID technology, forgotten object detection, ESP32 microcontroller, RC522 RFID reader, smart home automation, real-time monitoring, and alert notification system.

A STUDY ON CUSTOMER SATISFACTION IN SATHYA AGENCIES

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Abstract

Customer satisfaction plays a major role in the success of any business organization. In today's competitive market, companies must focus on understanding customer needs and providing quality products and services. This study focuses on analyzing the level of customer satisfaction in Sathya Agencies, a well-known retail business dealing with electronic goods and home appliances. The research examines factors such as product quality, pricing, staff behavior, after-sales service, and overall customer experience. The study reveals that while customers are generally satisfied with product availability and pricing, improvements are needed in service response time and communication. The findings suggest that enhancing customer service quality can increase loyalty and sales performance.

Keywords

Customer Satisfaction, Retail Service, Consumer Behavior, Sathya Agencies, Sales Performance

**AI-DRIVEN FINANCIAL FRAUD PREVENTION SYSTEM WITH AUTOMATED DATA DRIFT
MONITORING AND MODEL RETRAINING**

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Abstract—With the rapid growth of e-commerce and digital banking, credit card fraud has become a significant threat to financial institutions and customers. Traditional fraud detection systems often rely on static rules that are easily bypassed by sophisticated attackers. This project proposes an integrated solution using a Machine Learning approach, specifically the Support Vector Machine (SVM) algorithm, to classify transactions as legitimate or fraudulent. The system is built using a decoupled architecture consisting of a Python-based Flask API for AI predictions and a Laravel-based web application for transaction management and real-time user notification. The proposed system features an automated ingestion of transaction logs via CSV files and triggers instant email alerts using SMTP protocols upon detecting high-risk activities. Experimental results indicate a classification accuracy of 98.2%, along with a significant reduction in response time for security alerts. Email notifications were delivered within 2–5 seconds of detecting a fraudulent transaction. The system demonstrates that combining SVM-based machine learning with a modern web framework provides a scalable, efficient, and real-time fraud prevention mechanism.

Keywords: Fraud Detection, Support Vector Machine, Machine Learning, Flask API, Laravel

**EXPERIMENTAL INVESTIGATION OF A PCM-BASED SOLAR ABSORBER MODULE WITH INTERNAL
COPPER COIL FOR HEAT TRANSFER ENHANCEMENT**

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Abstract

An experimental investigation was carried out on a Phase Change Material (PCM)-based solar absorber module integrated with an internal copper coil to enhance heat transfer performance. The system consisted of a flat black-coated aluminium absorber plate coupled with a PCM chamber filled with paraffin wax, selected for its high latent heat storage capacity. A copper coil was embedded within the PCM to improve thermal conductivity and facilitate efficient heat extraction. The experimental setup was designed to analyze thermal behavior under solar irradiation by measuring temperature distribution, heat storage, and heat recovery characteristics. The incorporation of the copper coil significantly improved the rate of heat transfer between the absorber plate and the PCM, resulting in faster melting during charging and enhanced solidification during discharging cycles. This led to improved thermal energy storage efficiency and reduced thermal losses. Results demonstrated that the PCM-based absorber module with an internal copper coil provided better temperature uniformity, extended heat retention, and higher overall system efficiency compared to conventional systems without enhancement. The study highlights the effectiveness of integrating high-conductivity materials within PCM systems for solar thermal applications, making it a promising approach for sustainable energy storage and utilization.

FABRICATION AND TESTING OF GLASS FIBER REINFORCED POLYMER COMPOSITE PLATE FOR HEAT RESISTANT APPLICATIONS

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Abstract—This paper presents the fabrication and evaluation of a glass fiber reinforced polymer composite plate intended for heat resistant applications in automotive systems. The objective of this work is to develop a low cost and effective composite material that can withstand moderate thermal loads while maintaining structural integrity. The composite plate is fabricated using glass fiber as the reinforcement material and a polymer resin as the matrix. Additional filler materials are incorporated to enhance thermal resistance and mechanical performance. The fabrication process involves the hand layup technique, where layers of glass fiber are arranged systematically and impregnated with resin to form a uniform composite structure. The prepared composite plate is then cured under controlled conditions to achieve the desired strength and durability. After fabrication, the specimen is subjected to basic thermal and mechanical evaluation methods to assess its performance under heat exposure and load conditions. The results indicate that the developed composite plate exhibits good heat resistance and acceptable mechanical properties suitable for preliminary automotive applications such as heat shielding components. The use of glass fiber makes the composite cost effective and easily manufacturable compared to other advanced fibers. This study demonstrates that a simple composite plate can effectively represent the material behavior required for heat resistant applications. The developed model can be further improved and scaled for real time automotive components.

Keywords— glass fiber, polymer composite, heat resistance, automotive application, fabrication, thermal performance

FIBER REINFORCED COMPOSITE MATERIALS

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Abstract

Fiber-reinforced composites have garnered significant attention due to their unique combination of high strength-to-weight ratio, enhanced mechanical performance, and adaptability for diverse applications. This research focuses on developing a hybrid composite material comprising 60% epoxy resin matrix, 20% natural fiber, and 20% artificial fiber. The selection of fibers aims to synergize the sustainability and biodegradability of natural fibers with the superior mechanical integrity of artificial fibers. Fabricated specimens undergo comprehensive mechanical characterization including tensile testing, impact resistance evaluation, and Scanning Electron Microscopy (SEM) for microstructural analysis. Tensile testing assesses the composite's load-bearing capacity and ductility, while impact tests determine energy absorption and fracture behavior under dynamic loading. SEM imaging provides insights into fiber-matrix adhesion, fracture mechanisms, and void distribution. Results indicate that the balanced hybridization enhances tensile strength and toughness compared to single-fiber composites. The incorporation of natural fibers significantly reduces material density, increasing specific strength, whereas artificial fibers contribute to improved stiffness and impact resistance. The observed microstructures demonstrate improved interfacial bonding attributable to optimized fiber dispersion and epoxy curing conditions. Potential applications include automotive bushes, protective eyewear components, and drone blades, wherein performance, sustainability, and cost-effectiveness are critical. The research highlights the viability of hybrid composites in advanced structural applications and establishes a foundation for further optimization of material constituents and processing techniques.

ICRIT293

SOCIAL MEDIA SENTIMENT ANALYSIS FOR PRODUCT REVIEWS

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Abstract: Social media platforms such as Twitter, Reddit, YouTube, and Flipkart have become rich repositories of customer opinions about products and services. Mining these opinions at scale using Natural Language Processing (NLP) and Machine Learning enables brands and companies to understand user sentiment, identify product strengths and weaknesses, and adapt their marketing and R&D strategies accordingly. This project presents the design and implementation of a Social Media Sentiment Analysis system for product reviews, using Flipkart customer review data as the primary dataset. The system processes reviews through a comprehensive NLP pipeline including text cleaning, feature extraction using TF-IDF with bigrams, and sentiment classification using two supervised learning models: a Weighted Support Vector Machine (LinearSVC with CalibratedClassifierCV) and a Random Forest Classifier. All components are integrated into an interactive Streamlit web dashboard providing a home page with product selection, an overview tab with sentiment distribution charts and metric cards, a heatmap of rating versus sentiment, a word cloud of frequent terms, a trend analysis tab, and a raw reviews table. The system demonstrates practical applicability of NLP and machine learning for product intelligence and brand management.

Keywords: Sentiment Analysis, NLP, TF-IDF, Support Vector Machine, Random Forest, KMeans Clustering, Word Cloud, Streamlit Dashboard, Product Reviews, Flipkart.

ICRIT294

AI-BASED DEEP LEARNING FRAMEWORK FOR ACUTE LYMPHOBLASTIC LEUKEMIA (ALL) DETECTION AND CLINICAL DECISION SUPPORT

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Abstract— Acute Lymphoblastic Leukemia (ALL) is a severe type of blood cancer that affects the production of normal blood cells and is one of the most common childhood cancers worldwide. Early and accurate diagnosis plays a crucial role in improving patients survival and treatment planning. The objective of this work is to develop an automated and reliable system for detecting Acute Lymphoblastic Leukemia from microscopic blood smear images using machine learning and deep learning techniques. In this study, a dataset containing peripheral blood smear images of benign and malignant leukemia cells is used for analysis. Initially, preprocessing techniques such as Reinhard colour normalization are applied to reduce staining variations and improve image consistency. The first pipeline extracts morphological, colour, and texture features from the white blood cell nucleus and applies machine learning classifiers such as Support Vector Machine (SVM), K-Nearest Neighbor (KNN), and Artificial Neural Network (ANN) for classification. The second pipeline utilizes a deep learning approach based on the ResNet architecture to automatically learn discriminative features from microscopic images. Experimental results show that the proposed approaches are capable of effectively distinguishing between normal and leukemia-affected cells. Among the evaluated models, the ResNet-based deep learning model achieves the highest classification performance, reaching an accuracy of approximately 100%, while traditional machine learning models such as SVM also demonstrate strong performance with an accuracy close to 98%. These results indicate that integrating deep learning with effective preprocessing and feature extraction techniques significantly improves leukemia detection accuracy.

Keywords: Acute Lymphoblastic Leukemia, Blood Smear Images, CIELAB Segmentation, Deep Learning, Image Processing, Machine Learning, Microscopy Image Analysis, ResNet Architecture.

**AI- ENABLED AUTONOMOUS FIRE- FIGHTING AND HUMAN RESCUE ASSISTANCE ROBOT WITH
REAL TIME VISION AND ALARM SYSTEM**

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Abstract : Fire accidents pose significant risks to human life and property, especially in environments where direct human intervention is dangerous. This paper presents the design and implementation of a semi-autonomous fire fighting and human rescue assistance robot aimed at reducing human exposure in hazardous conditions. The proposed system integrates flame sensors for real time fire detection and an ESP32 CAM module for live visual monitoring. An ESP32 microcontroller serves as the central control unit, processing sensor inputs and executing movement through DC motors controlled by a motor driver. Upon detecting fire, the system automatically activates a water spraying mechanism and triggers an audible alarm to alert nearby individuals. The robot can be remotely monitored and manually guided, enabling safe navigation in smoke filled and high temperature environments. The developed system provides a cost effective and reliable solution for early fire detection, rapid response, and basic rescue assistance. It improves operational safety and reduces response time compared to conventional manual firefighting approaches. This work demonstrates the practical application of embedded systems and robotics in enhancing fire safety and emergency response operations.

EVENT VERSE: EVENT PLANNING & ORGANIZATION PROTOCOL

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Abstract

EventVerse is an intelligent event planning and organization platform designed to simplify the process of creating, managing, and recommending events using modern technologies. Traditional event management systems often require manual coordination, lack personalization, and fail to efficiently connect users with relevant events. To overcome these challenges, EventVerse integrates machine learning-based recommendation techniques with a centralized event management system. The proposed system allows organizers to create and manage events, while users can explore, register, and receive personalized event recommendations based on their interests, location, and past interactions. Machine learning algorithms are used to analyze user behavior and preferences to suggest suitable events, improving user engagement and participation. The system also supports real-time updates, notifications, and efficient scheduling to reduce organizational complexity.

AI BASED SMART SHOPPING TROLLEY USING VISION AND WEIGHT SENSING WITH CLOUD INTEGRATION

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Abstract

Smart retail solution that combines Artificial Intelligence (AI) and the Internet of Things (IoT) to simplify and automate the shopping experience. Traditional billing systems often lead to long queues and errors due to manual scanning. To overcome these challenges, the proposed system uses an ESP32-S3 vision module to capture product images and identify them using the Gemini 1.5Flash API. To improve reliability, a load cell connected through an HX711 Analog-to-Digital converter is used for weight-based verification approach ensures that the detected product matches its physical characteristics. Experimental results show an identification accuracy of 97.2% along with smooth data synchronization using Google Apps Script. Overall, the system reduces billing time, minimizes errors and enhances the retail experience.

Keywords

ESP32-S3, Gemini AI, Smart Trolley, IoT, Load Cell, Computer Vision, Cloud Computing.

THERMAL PERFORMANCE ANALYSIS OF PHASE CHANGE MATERIALS IN PASSIVE HEAT STORAGE

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Abstract

The use of phase change materials (PCMs) is common in passive thermal energy storage systems owing to high latent heat storage capability and near-constant temperatures. This paper discusses a detailed evaluation of the thermal performance of some selected PCMs through experiments and analysis. The process entails selecting the materials, their encapsulation and conducting several cycles of melting and solidification. Thermal performance tests include DSC testing, thermal conductivity testing, and heat transfer performance testing. The results indicate that selected PCMs have high energy storage density and phase transition temperatures. Moreover, inclusion of thermal additives enhances thermal conductivity and thus improves heat transfer performance. Furthermore, the materials are found to be reliable since their thermal properties remain almost constant after many cycling. In addition, encapsulation ensures safety from leakage. Conclusively, phase change materials are efficient in passive thermal energy storage.

Keywords

Phase Change Materials (PCMs), Passive Heat Storage, Latent Heat, Thermal Conductivity, DSC Analysis, Thermal Cycling, Heat Transfer

ICRIT299

ZERO-DAY ATTACK DETECTION SYSTEM BASED ON AI AND ML

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Abstract

The rapid growth of digital technologies and network-based systems has significantly increased the risk of cyberthreats, particularly zero-day attacks that exploit previously unknown vulnerabilities. Traditional security systems, which rely on signature-based detection methods, are unable to effectively identify such attacks. To address this limitation, this paper proposes an intelligent Zero-Day Attack Detection System based on Artificial Intelligence (AI) and Machine Learning (ML). The system integrates supervised learning techniques to detect known attacks and anomaly detection methods to identify unknown threats. Furthermore, Explainable Artificial Intelligence (XAI) is incorporated to enhance transparency by providing insights into the model's decision-making process. The system also includes a risk scoring mechanism to evaluate the severity of detected threats and a web-based dashboard for real-time monitoring. Experimental results demonstrate that the proposed system achieves high accuracy, precision, and reliability, making it a suitable solution for modern cybersecurity challenges.

Keywords

Zero-Day Attack, Machine Learning, Intrusion Detection System, Explainable AI, Cybersecurity

ICRIT300

CROP STRESS DETECTION & ADVISORY SYSTEM USING IOT

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Abstract : This project presents a Crop Stress Detection & Advisory System using IoT that employs Internet of Things (IoT) technology and sensor-based intelligence to monitor soil conditions in real time. The system integrates multiple sensors including a soil moisture sensor, Total Dissolved Solids (TDS) sensor, NPK sensor, and DHT11 temperature-humidity sensor, all interfaced with an ESP32 microcontroller. Based on the sensor readings, the embedded algorithm estimates critical soil parameters such as pH level, nitrogen (N), phosphorus (P), and potassium (K) concentrations. These estimated values are then processed through an intelligent recommendation engine that determines the most suitable crop for cultivation and suggests appropriate fertilizer dosages. The real-time data and recommendations are displayed both on a 16x2 I2C LCD and a web-based dashboard hosted by the ESP32's built-in Wi-Fi server. The solution is compact, affordable, energy-efficient, and designed for deployment in diverse agricultural environments ranging from open fields to greenhouse setups. Experimental results demonstrate the system's reliability and effectiveness in providing actionable recommendations with minimal human intervention, making it a significant contribution to the domain of precision agriculture and smart farming.

Keywords

Crop Stress Detection, Internet of things (IoT), ESP32 Microcontroller, Soil Moisture Sensor, NPK Sensor, Recommendation Engine, Fertilizer Dosage , Real – time monitoring, Precision Agriculture, Smart Farming.

ICRIT301

DESIGN AND DEVELOPMENT OF AN ARDUINO NANO-BASED MULTIFUNCTION DIGITAL MULTIMETER

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Abstract— This paper presents the design and implementation of an Arduino-based multifunction digital multimeter capable of measuring key electrical parameters, including voltage, current, resistance, capacitance, and inductance. The system integrates both hardware and software components to achieve a compact, low-cost, and portable measurement solution. An Arduino microcontroller serves as the core processing unit, interfacing with various sensing modules and signal conditioning circuits. To enhance measurement accuracy, the design incorporates the ADS1115 high-resolution analog-to-digital converter (ADC), which provides precise voltage readings with improved resolution compared to the built-in ADC of the microcontroller. Current measurement is accomplished using the ACS712 Hall-effect-based current sensor, enabling safe and non-intrusive current sensing. For resistance, capacitance, and inductance measurements, programmable resistor networks and timing-based measurement techniques are employed, allowing the system to cover a wide range of values with acceptable accuracy. The proposed system emphasizes affordability and accessibility, making it suitable for educational, laboratory, and field applications. Unlike conventional commercial multimeters, this design is open-source, enabling users to modify and expand its functionality according to specific requirements. Experimental results and performance evaluation demonstrate that the developed multimeter provides reliable and reasonably accurate measurements across different parameters. Comparative analysis with standard measuring instruments shows minimal deviation within acceptable limits..

Keywords: Arduino, Digital Multimeter, ADS1115, ACS712, Capacitance Measurement, Inductance Measurement, Resistance Measurement.

ICRIT302

FOREST FIRE EARLY DETECTION USING DRONE SWARMS AND IOT SENSORS

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Abstract— Early detection of forest fires plays a critical role in minimizing environmental damage, economic losses, and threats to human life. This paper proposes a real-time, scalable early warning system that integrates drone swarms with Internet of Things (IoT) sensor networks to enhance the speed and accuracy of fire detection. The system is designed to monitor key fire indicators such as temperature rise, smoke concentration, and hazardous gas emissions across large forested areas. Autonomous drones are deployed for aerial surveillance, enabling dynamic and wide-area monitoring, especially in regions that are difficult to access through conventional means. These drones are equipped with environmental sensors and imaging modules, allowing them to detect anomalies and transmit data in real time. Simultaneously, a network of ground-based IoT sensors continuously collects localized environmental data, providing complementary information to improve detection reliability. To ensure efficient communication and data sharing, the system utilizes a mesh networking architecture that enables seamless collaboration between drones and ground nodes. This decentralized approach enhances system robustness, scalability, and fault tolerance, even in challenging terrains or network disruptions. The proposed system is validated through both simulation and limited field testing to evaluate its performance in terms of detection speed, coverage, and accuracy. Experimental results demonstrate that the integrated drone-IoT approach significantly reduces detection time compared to traditional methods such as satellite monitoring and lookout towers.

Keywords: Forest Fire Detection, IoT, Drone Swarm, Early Warning System, Mesh Networking, Environmental Monitoring.

DECENTRALIZED BLOCKCHAIN MARKETPLACE FOR TRANSPARENT FARMER-TO-CONSUMER AGRICULTURAL TRADE

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Abstract

This project introduces a decentralized blockchain-based marketplace designed to enable transparent, secure, and direct agricultural trade between farmers and consumers. By removing intermediaries, the system ensures fair pricing for farmers and authentic product information for consumers. Blockchain provides immutable records, smart contracts enable automated payments, and traceability features allow end-to-end tracking of agricultural produce. This platform enhances trust, reduces fraud, and supports a more efficient and equitable agricultural supply chain.

Keywords

Blockchain, Smart Contracts, Decentralized Marketplace, Agriculture, Transparency, Traceability, Farmer-to-Consumer

PARKINSON TREMOR DETECTION USING GYROSCOPE

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Abstract

Parkinson's disease is a progressive neurological disorder characterized by motor impairments, among which hand tremors are one of the most prominent symptoms. Early and continuous monitoring of tremor activity plays a crucial role in diagnosis, disease progression tracking, and treatment evaluation. This work presents a wearable tremor detection system based on a MEMS gyroscope sensor that captures angular motion of the hand in real time. The system is designed to operate continuously, enabling long-term monitoring of involuntary movements in natural environments outside clinical settings. The proposed approach focuses on acquiring high-resolution motion data and processing it using signal analysis techniques to extract meaningful tremor patterns. Noise reduction methods are applied to eliminate unwanted disturbances, followed by feature extraction based on frequency and amplitude characteristics of the motion signals. These features are then analysed to distinguish between normal voluntary movements and abnormal tremor activity typically associated with Parkinson's disease. The wearable device is designed to be compact, lightweight, and energy efficient, ensuring user comfort during prolonged usage. Its low-power architecture makes it suitable for daily monitoring without frequent maintenance or charging. By providing continuous and objective motion data, the system reduces reliance on short-duration clinical observations, which may not fully capture early-stage symptoms. Overall, the proposed system offers a reliable and practical solution for real-time tremor detection and monitoring. It supports early diagnosis, enhances understanding of tremor behaviour, and provides a foundation for future integration with advanced analytics and healthcare monitoring platforms.

Keywords

Parkinson's disease, tremor detection, MEMS gyroscope, wearable system, signal processing, motion analysis, real-time monitoring, neurological disorder.

DESIGN AND DEVELOPMENT OF AN ARDUINO NANO-BASED MULTIFUNCTION DIGITAL MULTIMETER

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Abstract— This paper presents the design and implementation of an Arduino-based multifunction digital multimeter capable of measuring key electrical parameters, including voltage, current, resistance, capacitance, and inductance. The system integrates both hardware and software components to achieve a compact, low-cost, and portable measurement solution. An Arduino microcontroller serves as the core processing unit, interfacing with various sensing modules and signal conditioning circuits. To enhance measurement accuracy, the design incorporates the ADS1115 high-resolution analog-to-digital converter (ADC), which provides precise voltage readings with improved resolution compared to the built-in ADC of the microcontroller. Current measurement is accomplished using the ACS712 Hall-effect-based current sensor, enabling safe and non-intrusive current sensing. For resistance, capacitance, and inductance measurements, programmable resistor networks and timing-based measurement techniques are employed, allowing the system to cover a wide range of values with acceptable accuracy. The proposed system emphasizes affordability and accessibility, making it suitable for educational, laboratory, and field applications. Unlike conventional commercial multimeters, this design is open-source, enabling users to modify and expand its functionality according to specific requirements. Experimental results and performance evaluation demonstrate that the developed multimeter provides reliable and reasonably accurate measurements across different parameters. Comparative analysis with standard measuring instruments shows minimal deviation within acceptable limits. Overall, the presented system offers a cost-effective and flexible alternative to traditional digital multimeters, while maintaining satisfactory performance, thereby promoting practical learning and innovation in electronic measurement systems.

Keywords— Arduino, Digital Multimeter, ADS1115, ACS712, Capacitance Measurement, Inductance Measurement, Resistance Measurement.

WAREHOUSE SPACE UTILIZATION AND PRODUCTIVITY IMPROVEMENT

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Abstract: Warehouse space utilization and productivity improvement have become critical factors in enhancing overall supply chain efficiency and reducing operational costs. Effective utilization of available storage space ensures maximum capacity usage while maintaining smooth material flow, minimizing congestion, and improving accessibility. This study focuses on analyzing current warehouse layout, storage systems, and operational practices to identify inefficiencies and areas for improvement. The research highlights key techniques such as optimized layout design, vertical space utilization, slotting strategies, and the implementation of advanced technologies like Warehouse Management Systems (WMS), automation, and data analytics. These approaches help in reducing travel time, improving picking accuracy, and increasing throughput. Additionally, productivity improvement is achieved through better workforce management, standardized processes, and performance measurement indicators such as picking rate, order cycle time, and inventory turnover. The study also emphasizes the importance of adopting lean warehousing principles to eliminate waste, streamline operations, and enhance overall performance. By integrating modern tools and strategic planning, warehouses can significantly improve both space utilization and operational productivity.

Keywords: Warehouse Management, Space Utilization, Productivity Improvement, Storage Optimization, WMS, Supply Chain Efficiency, Lean Warehousing

ANALYZING THE IMPACT OF SALES EXECUTIVE BEHAVIOR ON CUSTOMER SATISFACTION AND SALES

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Abstract: This study examines the impact of sales executive behaviour on customer satisfaction and sales performance in a competitive business environment. The research focuses on key behavioural factors such as communication skills, politeness, product knowledge, responsiveness, and professionalism, which influence customer perception and purchase decisions. A descriptive research design was adopted, and primary data was collected from respondents using a structured questionnaire. The data was analysed using percentage analysis and simple statistical tools to understand customer opinions. The findings of the study reveal that the majority of customers are satisfied with the behaviour of sales executives, indicating that positive interpersonal skills play a significant role in enhancing customer experience. Factors such as politeness, effective communication, and product knowledge were identified as major contributors to customer satisfaction and trust. However, responsiveness and timely handling of customer queries were found to require improvement. The study concludes that sales executive behaviour has a direct and positive relationship with customer satisfaction and sales outcomes. Improving behavioural skills through training and development can lead to higher customer satisfaction, increased customer loyalty, and better sales performance. The study provides useful insights for organizations to enhance service quality and achieve sustainable business growth.

Keywords: Sales Executive Behaviour, Customer Satisfaction, Sales Performance, Communication Skills, Product Knowledge, Customer Loyalty

PREPARATION OF CHARACTERIZATION OF METAL OXIDE NANOPARTICLE AND ENHANCING THE CATALYTIC ACTIVITY BY PHOTO-SONOCATALYTIC PROCESSES

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Abstract: Metal oxide-based nanomaterials have attracted significant attention due to their unique physicochemical properties and wide range of applications in catalysis, environmental remediation, and biomedical fields. In the present work, ZnO@SiO₂ core-shell metal oxide nanoparticles were synthesized and systematically characterized, and their catalytic performance was enhanced using photo-Sono catalytic processes. The ZnO@SiO₂ nanoparticles were prepared through a controlled two-step synthesis method, where ZnO nanoparticles were first formed and subsequently coated with a silica shell to improve stability, dispersion, and surface properties. The synthesized nanocomposite was thoroughly characterized using powder X-ray diffraction (PXRD), ultraviolet-visible (UV-Vis) spectroscopy, photoluminescence (PL) spectroscopy, transmission electron microscopy (TEM), scanning electron microscopy (SEM), Brunauer-Emmett-Teller (BET) surface area analysis, and X-ray photoelectron spectroscopy (XPS). Structural and morphological analyses confirmed the successful formation of ZnO@SiO₂ core-shell architecture with enhanced surface characteristics. The catalytic efficiency of the nanocomposite was evaluated under photo-Sono catalytic conditions, demonstrating improved catalytic activity due to the synergistic effects of light irradiation and ultrasonic waves. Additionally, the antibacterial activity of ZnO@SiO₂ nanoparticles was investigated against selected bacterial strains using the agar well-diffusion method. The results highlight the potential of ZnO@SiO₂ nanoparticles as multifunctional materials for catalytic and antimicrobial applications.

Keywords: Core-shell nanoparticles, synthesis methods, characterization, biological activity, photo Sono catalysis.

BREAST CANCER DETECTION USING HISTOPATHOLOGY IMAGES

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Abstract - Breast cancer remains one of the leading causes of mortality among women worldwide, highlighting the urgent need for accurate and early diagnosis. Conventional diagnostic approaches, including mammography, ultrasound imaging, and histopathological analysis, are often limited by variability in interpretation and reduced sensitivity in complex cases. To address these challenges, this study proposes a hybrid multimodal deep learning framework designed to enhance breast cancer detection and classification. The system integrates histopathology images, mammogram data, and relevant clinical information to enable a more comprehensive understanding of tumour characteristics. An Efficient Net based convolutional neural network forms the backbone of the model and is further strengthened with recurrent layers and attention mechanisms to effectively capture both spatial and contextual features. This design improves the detection of subtle patterns, particularly in dense breast tissues and ambiguous lesion regions. A key contribution of the proposed work is an advanced feature fusion strategy that combines imaging outputs with clinical attributes such as tumour type and important biomarkers, including estrogen receptor, progesterone receptor, and HER2 status. The framework supports tumour classification, subtype identification, and the generation of personalized diagnostic insights. Experimental results demonstrate a sensitivity of 96.2 percent and a specificity of 94.5 percent, outperforming traditional single modality approaches. In addition, biomarker prediction accuracy exceeds 92 percent when validated against clinical data. The model is implemented using Python with Flask and web technologies to provide an accessible and user friendly interface for healthcare professionals. Overall, the system offers a reliable decision support tool and contributes to improved patient management and treatment planning. Furthermore, the framework is adaptable to diverse clinical settings, supports scalable deployment, and facilitates continuous learning through updated datasets, ensuring sustained performance and robustness. This adaptability enhances clinical trust, reduces diagnostic delays, and ultimately promotes better outcomes, cost efficiency, and improved quality of care for patients.

Keywords—Breast cancer, Histopathology, Efficient Net, Multimodal deep learning, Tumour classification, Biomarkers, Attention mechanism, Invasive ductal carcinoma, Flask, Personalized diagnosis

A STUDY ON CUSTOMER PREFERENCES TOWARDS AUTHORIZED AND MULTI-BRAND CAR SERVICES CENTERS IN CHENNAI CITY

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Abstract

The automobile industry plays a vital role in the economic development of India. As the number of vehicles on roads increases, the demand for quality vehicle maintenance services also rises. Customers in Chennai City can choose between authorized service centres and multi-brand service centres for vehicle maintenance and repair. Authorized service centres operate under automobile manufacturers and offer specialized services using genuine spare parts. These centres usually employ trained technicians and follow company service standards. Multi-brand service centres, on the other hand, provide services for various car brands and are known for lower service costs.

REAL TIME HAND MOTION CONTROLLED ROBOTIC MANIPULATOR

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Abstract - Using natural human hand movements to control robotic manipulators has gained considerable attention in human–robot interaction, teleoperation, and assistive robotics. Traditional systems rely on sensor gloves or mechanical controllers, which are often expensive, uncomfortable, and less intuitive. Although computer vision-based approaches provide a contactless alternative, many low-cost systems suffer from high latency, low accuracy, and sensitivity to lighting conditions, making them unsuitable for tasks requiring high precision. To address these limitations, this work proposes a real-time, low-cost, and vision-based control system for a robotic hand. The system uses a webcam integrated with MediaPipe hand landmark detection to identify 21 key points of the human hand in real time. These keypoints are processed to estimate joint angles, which are then transmitted via serial communication to a microcontroller that controls multiple servo motors in a multi-degree-of-freedom robotic hand. The robotic hand successfully replicates finger movements such as bending, extension, and grasping with satisfactory precision. The proposed system offers an affordable and flexible alternative to traditional sensor-based methods and shows strong potential for applications in precision surgery, robotic-assisted operations, and remote teleoperation requiring high dexterity and stable motion control.

Keywords – Human–Robot Interaction, Teleoperation, Assistive Robotics, Robotic Hand, Computer Vision, Contactless Control, Webcam-Based System, MediaPipe, Hand Landmark Detection, Real-Time Processing, Gesture Recognition, Joint Angle Estimation, Serial Communication, Microcontroller, Servo Motors, Multi-DOF System, Motion Smoothing, Low Latency, High Accuracy, Precision Surgery, Robotic-Assisted Surgery, Remote Teleoperation, High-Precision Manipulation, Low-Cost System

AG AND SM DOPED STRONTIUM FERRITE NANOPARTICLES FOR EFFICIENT PHOTOCATALYTIC DYE DEGRADATION UNDER VISIBLE LIGHT

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Abstract: The rapid increase in industrialization has resulted in the discharge of large quantities of organic dye pollutants into aquatic environments, posing serious ecological and health risks. Conventional wastewater treatment methods are often inadequate for complete dye removal, creating a need for efficient, cost-effective, and environmentally sustainable solutions. Photocatalysis has emerged as a promising approach, particularly using visible light-active nanomaterials. In this study, silver (Ag) and samarium (Sm) doped strontium ferrite (SrFeO₃) nanoparticles were synthesized using a simple and economical chemical co-precipitation method. The primary objective is to enhance the photocatalytic efficiency of strontium ferrite under visible light irradiation through effective doping strategies. The incorporation of Ag (a noble metal) and Sm (a rare earth element) significantly modifies the electronic structure, leading to improved light absorption and reduced recombination of photogenerated electron–hole pairs. The prepared nanoparticles were subjected to controlled drying and thermal treatment to achieve better crystallinity and phase formation. The photocatalytic performance of the synthesized material was evaluated by studying the degradation of organic dye under visible light. The findings suggest that co-doping is an effective strategy to improve the photocatalytic properties of ferrite-based nanomaterials. Therefore, Ag and Sm doped strontium ferrite nanoparticles show great potential as efficient photocatalysts for wastewater treatment and environmental remediation under visible light irradiation.

EXPERIMENTAL STUDY ON PARTIAL REPLACEMENT OF COARSE AGGREGATE WITH COCONUT SHELL WITH AND WITHOUT RECRONS FIBER

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Abstract

The high cost conventional construction materials affect economy of structure. Today it becomes more difficult to find a natural source. Use of waste materials not only helps in getting them utilized in cement, concrete and other construction materials but has also numerous indirect benefits such as reduction in land fill cost saving in energy and protecting environment from possible pollution effect it also helps in reducing the cost of concrete manufacturing. The concrete with ground coconut shell was found to be durable in terms of its resistance in water acidic and salty. Density of coconut shells is in the range 550- 650 kg/m³ and these are within the specified limits for lightweight aggregates the characteristics properties of concrete such as compressive strength, flexural strength impact resistance bond strength and split tensile strength using the mix made by replacing coarse aggregates with crushed coconut shell aggregates were reviewed in the present work.

Keywords : Concrete from waste Materials, Concrete using Coconut shell aggregate.

A LLM-BASED AUTONOMOUS TICKET BOOKING AGENT

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Abstract

The rapid proliferation of digital travel platforms has created a critical demand for intelligent, automated solutions capable of interpreting diverse user intents and executing complex, multi-step booking workflows without manual intervention. Conventional ticket booking platforms compel users to navigate multiple disjointed interfaces, manually compare schedules and fares across transport modes, and repetitively complete structured forms—a process that is both cognitively demanding and highly error-prone. This paper presents the LLM-Based Autonomous Ticket Booking Agent (LATBA), a conversational AI system engineered for end-to-end ticket reservation across trains, buses, and flights using natural language interaction. The system integrates ReAct (Reasoning-and-Acting) and Chain-of-Thought (CoT) prompting to orchestrate multi-step planning, form filling, and payment confirmation. A self-improving factual memory module persistently stores user preferences across sessions. Experimental evaluations across 80 simulated scenarios demonstrate: Task Completion Rate 86.5% (+45.3% over rule-based), Constraint Satisfaction Rate 89.2%, average dialogue turns reduced to 4.1 (from 8.4), and User Satisfaction Score 4.6/5.0.

Keywords

LLM Agent, Ticket Booking, Natural Language Processing, ReAct, Chain-of-Thought, Tool Calling, Autonomous Agent, Conversational AI, Factual Memory, Travel Automation, Function Calling, Retrieval-Augmented Generation.

A STUDY ON CUSTOMER BEHAVIOUR ANALYSIS USING TRANSACTION AND MARKETING DATA OF JK TYRES

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Abstract: In today's data-driven business environment, organizations are increasingly relying on transaction and marketing data to understand customer behavior. This study explores how purchasing patterns, customer interactions, and marketing responses influence buying decisions. Moving beyond traditional analysis, this research integrates behavioral insights with data analytics to identify key drivers of customer engagement and loyalty. The findings reveal that personalized marketing, timely communication, and data-based decision-making significantly impact customer satisfaction and retention. The study highlights how businesses can transform raw data into actionable strategies for improving performance and competitiveness.

Keywords: Customer Behaviour, Transaction Data, Marketing Analytics, Consumer Insights, Data-Driven Decisions, Customer Segmentation.

BRAIN TUMOR SEGMENTATION: U-NET ARCHITECTURE FOR MRI PRECISION DIAGNOSIS

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Abstract

Brain tumor segmentation is a critical step in the diagnosis and treatment planning for patients. This study explores the efficacy of the U-Net architecture, a deep learning model specifically designed for biomedical image segmentation, in accurately distinguishing tumor regions in MRI scans. We utilized a dataset comprising diverse MRI images annotated by specialists, ensuring comprehensive training for the U-Net model. Our findings demonstrated that the U-Net architecture significantly improves segmentation accuracy and enhances the visualization of tumor margins compared to conventional methods. Furthermore, we analyzed the model's performance across varying tumor types and sizes, revealing its robustness and adaptability in clinical applications. By integrating advanced image analysis techniques into MRI diagnostics, this research offers a promising approach to support radiologists in making informed decisions, ultimately leading to improved patient outcomes. Future work will focus on refining the model and exploring its integration into routine clinical workflows.

Keywords : Brain tumor segmentation, U-Net architecture, Deep learning, MRI scans, Biomedical image segmentation, Tumor margins, Radiologists, Clinical applications, Image analysis, Diagnostics

AUTOMATIC STREET LAMP CONTROL SYSTEM USING PSOC 4100S PLUS

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Abstract -The development of intelligent and energy-efficient systems has become increasingly important in modern engineering due to rising energy demands and the need for sustainable solutions. This project presents the design and implementation of an Automatic Street Lamp Control System using the PSoC 4100S Plus microcontroller, which enables efficient and automated control of street lighting based on ambient light conditions. The system operates using a Light Dependent Resistor (LDR) to continuously monitor surrounding light intensity. The analog signal generated by the LDR is converted into digital data using the built-in Analog-to-Digital Converter (ADC) of the PSoC. The microcontroller then processes this data and compares it with predefined threshold values to determine the appropriate action. During low light conditions (night), the system automatically switches ON the street lamps, and during high light conditions (day), it switches them OFF, thereby minimizing energy wastage. For enhanced functionality, the system can also incorporate Pulse Width Modulation (PWM) to control the brightness of the lights, allowing further energy optimization. The integration of sensing, processing, and control within a single microcontroller makes the system compact, reliable, and cost-effective. This automated system eliminates the need for manual intervention and is suitable for applications such as highways, parking areas, industrial zones, and smart city infrastructure. Future enhancements may include IoT-based remote monitoring, motion detection for adaptive lighting, and the use of solar energy for improved sustainability.

ICRIT319

AUTONOMOUS FOREST SURVEILLANCE ROBOT USING ACOUSTIC AND MOTION DETECTION

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Abstract— Forest surveillance is essential for environmental protection, wildlife conservation, and preventing illegal activities such as poaching, deforestation, and forest fires. Traditional monitoring methods like manual patrolling and fixed surveillance systems are often inefficient, labor-intensive, and lack real-time responsiveness. To overcome these challenges, this project presents an autonomous forest surveillance robot using acoustic and motion detection. The system integrates sound sensors to detect unusual acoustic signals and Passive Infrared (PIR) sensors to identify motion from humans or animals. Additionally, ultrasonic and infrared sensors are used for obstacle detection and smooth navigation in complex forest environments. The robot is built using a microcontroller-based architecture with Arduino and NodeMCU, ensuring effective coordination of all components. For enhanced monitoring, the system includes an ESP32 camera module for real-time video streaming and a GPS module for accurate location tracking. IoT technology enables the transmission of live data, alerts, and location details to remote users, allowing timely decision-making and quick response to threats. A buzzer alert system is also incorporated for immediate local notifications. The robot operates autonomously, reducing human effort and enabling continuous monitoring in remote and inaccessible areas. Overall, the proposed system offers a cost-effective, scalable, and reliable solution for modern forest surveillance, ensuring early detection and prevention of environmental threats while supporting sustainable forest management and wildlife protection.

Keywords—Forest Surveillance, Acoustic Detection, Motion Detection, IoT, GPS Tracking, ESP32 Camera, Environmental Monitoring, Wildlife Protection, Obstacle Avoidance

IOT ENERGY METER MONITORING SYSTEM

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Abstract: This paper presents the design and development of an IoT-based energy meter monitoring system using the Thing Speak cloud platform. The system is developed to monitor and analyze electrical energy consumption in real time, providing an efficient solution for smart energy management. The proposed system utilizes a microcontroller-based setup integrated with voltage and current sensors to measure power usage parameters such as voltage, current, and energy consumption. The collected data is transmitted over the internet using IoT protocols and uploaded to the Thing Speak platform for real-time visualization, storage, and analysis. The system enables users to remotely monitor energy usage through web or mobile interfaces, allowing better control and awareness of power consumption patterns. Additionally, threshold-based alerts can be implemented to notify users of abnormal energy usage, helping to prevent energy wastage and detect faults. The developed solution is cost-effective, scalable, and easy to implement, making it suitable for residential, commercial, and industrial applications. It promotes energy efficiency, supports smart grid initiatives, and contributes to sustainable energy management practices.

Keywords : Internet of Things (IoT), Energy Meter Monitoring, Thing Speak, Real-Time Monitoring, Smart Energy Management.

ELECTRIC SHOCK PREVENT DEVICE

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Abstract : Electric shock accidents frequently occur in industrial workplaces where electrical tools and portable equipment are widely used. These accidents are mainly caused by insulation damage, grounding failure, or broken neutral connections. Detecting such hazardous conditions at an early stage can significantly reduce the risk of injury. This paper presents a monitoring approach based on electric field measurement around electrical equipment. When grounding is lost, the electric field intensity around the metal enclosure increases considerably. By measuring this variation using sensors, it is possible to detect abnormal electrical conditions. A prototype monitoring system consisting of electric field sensors, signal conditioning circuits, and a microcontroller-based warning unit is also discussed. Experimental results demonstrate that electric field monitoring can serve as an effective supplementary safety mechanism for preventing electric shock accidents in workplaces.

Keywords

Electric shock prevention, electric field monitoring, grounding fault detection, electromagnetic sensing, workplace safety

ICRIT322

PHYTOCHEMICAL PROFILING AND COMPARATIVE ANTI-OBESITY ACTIVITY OF ZIZIPHUS MAURITIANA AND ZIZIPHUS JUJUBA VIA PANCREATIC LIPASE INHIBITION THROUGH IN VITRO AND IN SILICO STUDIES.

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Abstract: Obesity is a rapidly increasing global health issue associated with serious metabolic disorders such as diabetes, cardiovascular diseases, and hypertension. The adverse effects of synthetic anti-obesity drugs have prompted the search for safer alternatives from natural sources. This study focuses on the comparative evaluation of the anti-obesity potential of *Ziziphus mauritiana* and *Ziziphus jujuba* fruit extracts using integrated in-vitro and in-silico approaches. The fruits were processed, dried, powdered, and extracted using a hydroalcoholic solvent through Soxhlet extraction. Preliminary phytochemical screening was conducted to identify key bioactive compounds, followed by quantitative analysis of phenolics, flavonoids, and terpenoids. The anti-obesity activity was assessed using pancreatic lipase inhibition assay with Orlistat as the standard. Additionally, alpha-amylase inhibition assay was performed using Acarbose as a reference to evaluate further metabolic benefits. Similarly, in alpha-amylase inhibition, *Ziziphus mauritiana* displayed better inhibitory effects. Based on these findings, the most active extract was subjected to GC-MS analysis, which revealed the presence of several bioactive phytochemicals. Further molecular docking studies confirmed strong binding interactions between selected compounds and pancreatic lipase enzymes, supporting the experimental results. Among the identified compounds, Luteolin exhibited promising binding affinity and potential inhibitory activity.

Keywords: Obesity, Pancreatic lipase, Alpha-amylase, *Ziziphus mauritiana*, *Ziziphus jujuba*, GC-MS, Molecular docking, Phytochemicals.

ICRIT323

NEUMA: AN AI-POWERED MULTIMODAL SYSTEM FOR REAL-TIME COMMUNICATION SKILL DEVELOPMENT, EMOTIONAL RESILIENCE, AND PERSONAL SAFETY IN VULNERABLE POPULATIONS

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Abstract: Modern AI applications have shown great effectiveness in information retrieval, content generation, and task automation; nevertheless, a notable deficiency remains in their ability to actively cultivate human-centered skills like communication confidence, emotional resilience, and real-time behavioral adaptability. This document introduces NEUMA (Neural Empowerment and Unified Mentorship Assistant), a patented AI-driven hardware-software system aimed at bridging the gap for introverted people, women, and other disadvantaged groups worldwide. NEUMA combines edge AI processing, various biometric sensing methods such as galvanic skin response and heart rate monitoring, natural language processing, and emotion recognition into a cohesive speaker application platform. In contrast to passive voice assistants, NEUMA operates as an active AI mentor, mirroring real-world social and confrontational situations, providing tailored speech and behavioral guidance, and promoting emotional well-being through mood-oriented strategies. The system also includes a privacy-focused anonymous community platform, a built-in personal safety feature, and offline functionality protected by AES-256 encryption. This paper conceptually assesses NEUMA's architecture compared to current AI companion systems, highlighting essential improvements in proactive human-AI engagement, on-device emotion recognition, and ethical AI design for at-risk users. Results establish NEUMA as a significant addition to the changing sphere of AI developments aimed at human empowerment, mental health, and inclusive design in technology.

Keywords: AI Applications, Edge AI, Affective Computing, Human-AI Interaction, Multimodal Sensing, Communication Skill Development, Emotional Resilience, Personal Safety, Natural Language Processing, Vulnerable Populations.

**ENHANCED VISIBLE-LIGHT PHOTOCATALYTIC ACTIVITY OF MAGNETICALLY SEPARABLE
Gd@Ag@ZnFe₂O₄ NANOCOMPOSITES TOWARD RHODAMINE B DEGRADATION**

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Abstract: The persistent release of synthetic dyes into aquatic systems has emerged as a critical environmental issue due to their chemical stability and resistance to conventional treatment techniques. Photocatalysis has gained recognition as a sustainable remediation approach; however, its efficiency is often restricted by limited visible light absorption and rapid recombination of photogenerated charge carriers. In this study, a Gd@Ag@ZnFe₂O₄ magnetic nanocomposite was synthesized via a solvothermal route followed by controlled doping. Structural and optical investigations using XRD, UV-Visible spectroscopy, photoluminescence (PL), and Raman analysis confirmed the successful formation of the composite and effective incorporation of dopants. The modified sample exhibited enhanced absorption in the visible region along with a pronounced decrease in PL intensity, indicating improved charge separation efficiency. The observed enhancement is attributed to the synergistic interaction between Gd-induced defect states and Ag-mediated surface plasmon resonance, which collectively facilitate efficient light harvesting and suppress electron-hole recombination. Additionally, the intrinsic magnetic nature of ZnFe₂O₄ enables convenient recovery of the material. Overall, the study establishes that the synthesized nanocomposite possesses superior optical and charge transport characteristics, demonstrating its potential as an efficient, visible-light-responsive, and reusable photocatalyst for wastewater remediation.

Keywords: Photocatalysis, Visible-light-responsive, Gd@Ag@ZnFe₂O₄ nanocomposite, Rhodamine B, Charge carrier recombination, Surface plasmon resonance (SPR), Rare-earth doping, Magnetic separation, Wastewater treatment & Optical properties

**COMPETING RISK-AWARE MULTI-HEAD NEURAL NETWORK FOR CARDIAC EVENT PREDICTION
FROM 12-LEAD ECG**

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Abstract — Heart disease is one of the main causes of death in many countries. Early detection of heart problems can help doctors give treatment at the right time. Electrocardiogram (ECG) is a common test used to check the electrical activity of the heart. The 12-lead ECG gives detailed information from different sides of the heart and is widely used in hospitals. In many existing methods, only one heart problem is predicted at a time. But a patient may face different heart-related risks together. To solve this issue, this paper proposes a Multi-Head Neural Network for predicting different cardiac events from 12-lead ECG signals. In the proposed system, ECG data is first cleaned using preprocessing steps such as noise removal, normalization, and segmentation. Then deep learning layers are used to learn useful patterns from the ECG signals. The model contains shared layers and separate output heads for different heart conditions such as heart failure, myocardial infarction, atrial fibrillation, and sudden cardiac death. The proposed model is expected to improve prediction performance compared to single-output models. It can help doctors in early diagnosis, patient monitoring, and better clinical decision making.

Keywords — Cardiac Event Prediction, 12-Lead ECG, Deep Learning, Multi-Head Neural Network, Competing Risk Analysis, Healthcare Analytics

ICRIT326

**AUTONOMOUS DRONE-INTEGRATED INDUSTRIAL ENVIRONMENTAL AIR POLLUTION
MONITORING SYSTEM**

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Abstract:: The Autonomous Drone-Integrated Air Pollution Monitoring System addresses the increasing demand for accurate, efficient and real-time air quality monitoring in industrial and urban environments. Traditional monitoring systems are generally fixed at specific locations, which limits spatial coverage and results in high installation and maintenance costs. These limitations reduce the ability to detect localized pollution variations and delay response to environmental hazards. To overcome these challenges, the proposed system employs an autonomous drone equipped with multiple air quality sensors capable of detecting harmful gases such as carbon monoxide, carbon dioxide, nitrogen oxides and particulate matter. The drone is integrated with a global positioning system module and wireless communication technology to facilitate real-time data acquisition and transmission. The system operates using pre-defined flight paths, enabling the drone to efficiently cover large and complex geographical areas. During operation, environmental data is continuously collected and transmitted to a cloud-based platform, where it is processed, analysed and visualized for user access. This approach allows dynamic monitoring of air quality levels and helps in identifying pollution hotspots with greater accuracy and speed. Experimental results indicate that the drone-based monitoring system provides higher spatial resolution and faster data collection compared to conventional stationary monitoring stations. In conclusion, the proposed system offers a scalable and intelligent solution for modern air quality monitoring challenges. It supports timely decision-making, enhances pollution control measures and contributes to improved public health and sustainable urban development.

Keywords— Autonomous Drone, Air Pollution, Gas Sensors, GPS Module, Real-Time Monitoring, Wireless Communication

ICRIT327

DEEP ENSEMBLE LEARNING WITH PRUNING FOR DDOS ATTACK DETECTION IN IOT NETWORKS

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Abstract—Widespread adoption of Internet of Things (IoT) technology across smart cities, industrial sectors, and healthcare systems has created highly interconnected environments that are increasingly vulnerable to network-based cyberattacks. Among the most disruptive of these threats, Distributed Denial of Service (DDoS) attacks generate floods of illegitimate traffic that overwhelm networked systems, degrade service quality, and cause severe operational losses. Rule-driven and pattern-matching detection strategies fail to keep pace with the evolving sophistication of such attacks, creating an urgent demand for intelligent and adaptive security mechanisms. To address this need, this work introduces a multi-model deep ensemble learning system that unifies Convolutional Neural Networks (CNN) for spatial traffic pattern extraction and Long Short-Term Memory (LSTM) networks for capturing time-dependent behavioral sequences. The detection system further incorporates a Stacking Classifier with Random Forest and Gradient Boosting as foundational learners, a Voting Classifier built from Logistic Regression, Decision Tree, K-Nearest Neighbors, and AdaBoost estimators, and a TPOT-driven automated machine learning module that discovers optimal pipeline configurations through evolutionary search. Post-training model compression via pruning discards redundant model units, yielding a compact system with reduced inference costs. Tested on a labeled IoT traffic collection of 225,745 flow samples described by 79 distinct attributes, the system achieves detection accuracy reaching 99% for ensemble-based models and demonstrates the viability of deploying high-performance detection on edge hardware with constrained processing capabilities.

Index Terms—DDoS detection, IoT network security, convolutional neural network, long short-term memory, ensemble classification, stacking, voting, TPOT, model pruning, network flow analysis.

EXTRACTION AND CHARACTERIZATION OF MANGO SEED KERNEL STARCH FOR THE DEVELOPMENT OF PH-RESPONSIVE SMART BIOPLASTIC FILMS

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Abstract : With the escalating environmental concerns regarding synthetic plastic waste, the demand for sustainable and functional packaging materials has increased significantly. This research focuses on the extraction of starch from Mango Seed Kernel (MSK), an underutilized agricultural waste, and its utilization in the synthesis of eco-friendly bioplastic films. To introduce "smart" functionality, a natural pH-sensitive indicator derived from Brassica oleracea (Red Cabbage) extract, rich in anthocyanins, was incorporated into the starch matrix. The bioplastic films were fabricated using the solution casting method, with glycerol serving as a plasticizer to improve flexibility and citric acid acting as a cross-linking agent to enhance structural integrity. Physical characterization of the films revealed a smooth, homogeneous morphology and excellent optical clarity. The primary objective was to evaluate the colorimetric response of the films across a wide pH range. Results demonstrated a distinct visual colour transition from vibrant pink (acidic) to purple/green (alkaline), confirming the successful encapsulation of anthocyanins within the MSK starch matrix. Such pH-responsive behaviour suggests that these films can serve as real-time visual sensors for monitoring food freshness and spoilage. This study highlights a circular economy approach by transforming food waste into high-value, biodegradable, and intelligent packaging solutions. **Keywords:** Bioplastics, Mango Seed Kernel Starch, Anthocyanins, Smart Packaging, pH-Responsive, Sustainable Materials.

SMART HELMET FOR ENHANCED RIDER SAFETY AND ACCIDENT PREVENTION

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Abstract

Road accidents involving two-wheeler riders are a major cause of injuries and fatalities, often resulting from drunk driving and delayed emergency response. Traditional helmets offer only passive protection and lack preventive and post-accident support mechanisms. This paper presents a Smart Helmet-based safety system designed to actively prevent accidents and improve emergency response efficiency. The proposed system integrates an alcohol detection sensor to monitor the rider's condition before vehicle operation. If alcohol consumption exceeds a safe threshold, the system automatically disables the bike's ignition, effectively preventing drink-and-drive incidents. Additionally, motion and impact sensors continuously monitor riding conditions to detect accidents in real time. Upon accident detection, the system immediately captures the rider's precise location using a GPS module and transmits this information to the nearest police station or emergency authority through a wireless communication network. The smart helmet is designed to be reliable, energy-efficient, and easy to implement without affecting rider comfort. Its compact and cost-effective design enables seamless integration with existing two-wheelers. Experimental results indicate accurate alcohol detection, timely accident identification, and rapid location reporting, significantly reducing emergency response time. The proposed system provides an effective and practical solution to enhance rider safety and reduce accident-related fatalities through intelligent prevention and automated emergency communication.

AI BASED PET CARE MANAGEMENT SYSTEM

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Abstract

The PetCare AI System is a web-based application developed using Flask that helps pet owners efficiently manage their pets and access essential care services. The system allows users to add and store pet details, book veterinary appointments, service booking, and view records through a simple and modern interface. It also integrates AI-based features such as a symptom checker and injury detection, which analyze user inputs and images to provide basic health insights. By combining pet management, healthcare support, and intelligent analysis, the application offers a smart and user-friendly solution for improving pet care using concepts from Web Development and Artificial Intelligence.

Keywords

PetCare System, Artificial Intelligence, Flask Web Application, Pet Management, Appointment Booking, Symptom Checker, Injury Detection, Image Processing, Web Development, User Interface Design

APPLY LORA TECHNOLOGY TO CONSTRUCT AN AIR QUALITY MONITORING IOT SYSTEM USING MACHINE LEARNING

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Abstract—Air pollution is one of the most critical environmental challenges affecting human health and ecological balance. Real-time and continuous monitoring of air quality is essential for early detection of hazardous conditions and for implementing effective control measures. This project presents an IoT-based air quality monitoring system that leverages LoRa (Long Range) communication technology along with Machine Learning techniques for intelligent analysis and prediction. The proposed system integrates multiple environmental sensors to measure key air quality parameters such as carbon monoxide (CO), carbon dioxide (CO₂), particulate matter (PM_{2.5}), temperature, and humidity. These sensor data are collected through a microcontroller-based unit and transmitted over long distances using LoRa technology, which offers low power consumption and wide-area coverage compared to conventional wireless methods. The data are then stored and processed in a cloud platform for further analysis. Machine Learning algorithms are applied to the collected dataset to identify pollution patterns, classify air quality levels, and predict future air conditions. The system can provide alerts when pollution levels exceed safe thresholds, enabling timely actions to protect public health. The integration of IoT with LoRa ensures reliable communication even in remote or infrastructure-limited areas, making the system suitable for smart cities as well as rural deployments. The experimental results indicate that the proposed system is efficient, cost-effective, and capable of providing accurate real-time monitoring and prediction of air quality. This approach contributes to sustainable environmental monitoring and supports decision-making for pollution control and management.

Keywords— Air Quality Monitoring, Internet of Things (IoT), LoRa Technology, Machine Learning, Environmental Monitoring, Smart City

ANTI SLEEPING AND ALCOHOL DETECTION

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Abstract—Road accidents resulting from driver sleepiness and alcohol intake are still a problem in the present time. Many road accidents have occurred when the driver is feeling sleepy while driving a vehicle or when the driver is driving a vehicle after taking alcohol. To overcome this problem, this paper presents an Anti- Sleep and Alcohol Detection System to ensure vehicle safety both at the time of starting the vehicle and at the time of driving. While starting the vehicle, the system uses an MQ-3 alcohol sensor to sense the alcohol level in the driver's breath. If the alcohol level is high compared to the threshold value, the lock system is deactivated. This prevents the vehicle from starting when the driver consumes alcohol. While driving the vehicle, the system uses an eyeblink sensor to sense the driver's sleepiness. At the same time, the system uses an MQ-3 alcohol sensor to sense alcohol. All these sensors send their data to the Arduino Nano microcontroller. The microcontroller processes all the data in real time. While driving the vehicle, when the system detects sleepiness and alcohol, it doesn't stop the vehicle suddenly. Instead, the vehicle stops slowly

Keywords-Arduino Nano, Eyeblink sensor, MQ-3 Alcohol Sensor, LED, LCD, Buzzer.

AN ADAPTIVE ENCRYPTION-BASED APPROACH FOR ENHANCING DATA SECURITY IN CLOUD ENVIRONMENTS

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Abstract--- The rapid growth of cloud-based applications and the continuous exchange of digital data have made data security an essential requirement in modern computing environments. Although cloud platforms provide flexibility and scalability, they also introduce several security concerns, including unauthorized access, data leakage, and challenges in managing encryption keys effectively. Addressing these concerns requires solutions that balance strong security with practical performance. This work presents a Hybrid Encryption-Based Secure File Management System (HE-SFMS) designed to improve data protection in cloud environments. The system makes use of a combination of symmetric and asymmetric encryption techniques to achieve both efficiency and security. In this approach, user files are encrypted using the Advanced Encryption Standard (AES), which is well suited for handling large volumes of data due to its speed and reliability. To overcome the limitations associated with key distribution in symmetric encryption, the AES session key is further protected using the RSA algorithm, ensuring a secure mechanism for key exchange. The system is implemented as a desktop application using Java Swing, providing users with a simple interface for file upload, encryption, decryption, and management operations. A MySQL database is used to store user credentials, encrypted keys, and file metadata in an organized manner. The overall workflow includes authentication, secure processing, and controlled access to stored data. Experimental evaluation was carried out using files of varying sizes. The results indicate consistent encryption and decryption performance, acceptable processing time, and effective prevention of unauthorized access. The system maintains both data confidentiality and integrity while remaining practical for real-world use. Overall, the proposed solution offers a reliable approach for enhancing data security in cloud-based environments.

Keywords: AES, RSA, Hybrid Encryption, Data Security, Cloud Security, Text Preprocessing, Cryptography, Java Desktop Application, MySQL Database.

**ANALYSIS AND OPTIMIZATION OF CYCLE TIME REDUCTION IN CNC MACHINING PROCESS FOR
END COVER OF MINI MONOBLOCK MOTOR**

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Abstract

This project focuses on the analysis and optimization of cycle time reduction in CNC machining processes for the end cover component of a mini mono block motor. The study begins with a detailed evaluation of the existing CNC machining process, where the total cycle time required to manufacture the component was approximately 10 minutes. A systematic time study was conducted to identify inefficiencies such as excessive idle tool movements, sub optimal cutting parameters, and inefficient toolpath strategies. Each machining operation, including facing, drilling, boring, and finishing, was analyzed to determine time consumption and performance limitations. After applying the optimized conditions, the total cycle time was successfully reduced from 10 minutes to 7 minutes, achieving a productivity improvement of approximately 30%. The results demonstrate that effective optimization of machining parameters and CNC programming can significantly improve manufacturing performance while maintaining dimensional accuracy and surface quality. This project is held in Industry.

ICRIT335

**FPGA-BASED SINGLE-PRECISION SOFTMAX ACCELERATION VIA LUT EXPONENTIALS AND
PIPELINED RECIPROCAL**

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Abstract : The softmax is one of the key operations in the current neural network classifier and is commonly applied in machine learning systems like image recognition, natural language processing, and embedded artificial intelligence systems. Nevertheless, its effective execution on field-programmable gate arrays (FPGAs) is not easy since the computational cost of exponential and division is high. This paper introduces a low-power and high throughput inference system hardware-efficient FPGA architecture to do IEEE-754 single-precision Softmax computations. The design proposed is an exponential approximation using a lookup-table (LUT) with a range reduction to reduce arithmetic complexity with a reasonable numerical accuracy. In order to further improve performance, a pipelined reciprocal unit, which works based on the Newton-Raphson iteration, is applied to quickly normalize. To obtain numerical stability, a log-sum-exp transformation is used, which avoids overflow and underflow when computing. Furthermore, an adaptive computation strategy is added to adaptively modify processing precision and pipeline behavior (based on input vector characteristics). This enables the architecture to trade off real time latency, resource consumption and accuracy. Design is optimized to FPGA implementation with effective LUT sharing and pipelining structure to provide continuous input vectors streaming with minimal delay. It has been experimentally demonstrated that the architecture proposed is able to achieve a lower latency, greater energy efficiency and competitive classification accuracy compared to traditional Softmax implementations on FPGA-based systems. The findings show its applicability to edge computing and intelligent systems with limited resources.

Keywords

FPGA, Softmax, IEEE-754 floating point, LUT approximation, Newton-Raphson iteration, log-sum-exp stabilization, adaptive precision computing, hardware accelerator, neural networks, low-power embedded system

ICRIT336

FABRICATION AND TESTING OF MOTOR CLAMP FOR VIBRATION REDUCTION AND DURABILITY ENHANCEMENT

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Abstract : This paper presents the design, fabrication, and testing of a motor clamp developed to reduce vibration and improve the durability of electric motors used in industrial applications. Excessive vibration in motors can lead to noise, mechanical wear, and reduced service life. The objective of this work is to design a clamp system that effectively minimizes vibration transmission and enhances motor stability during operation. The motor clamp is fabricated using suitable structural materials and incorporates vibration-absorbing elements to reduce oscillations. The fabrication process involves cutting, shaping, and assembling the components to ensure proper alignment and secure mounting of the motor. After fabrication, the motor clamp is tested under working conditions to evaluate its vibration reduction capability and structural performance. The results show that the developed clamp significantly reduces vibration levels and improves the overall stability of the motor. This leads to reduced wear and increased operational life. This study demonstrates that an improved motor clamp design can be an effective and economical solution for vibration control in mechanical systems, contributing to enhanced performance and reliability of motors.

Keywords: motor clamp, vibration reduction, durability, fabrication, mechanical stability, performance

ICRIT338

DEEP LEARNING-BASED RELIABILITY CONTROL FOR ROBUST IMAGE WATERMARKING IN ENCRYPTED AND COMPRESSED DOMAINS

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Abstract : In order to meet the increasing need for cloud storage and multimedia transmission, ownership authentication of digital images must be securely achieved. Traditional water-marking techniques may lose robustness after image encryption and lossy compression. In this paper, a deep learning-based reliability control framework of image watermarking in the encrypted and compressed domains, using a Recurrent Neural Network (RNN) structure, is presented. In this approach, the RNN structure can effectively model the sequential dependencies among image blocks to adaptively adjust the watermark strength according to the contextual features, thereby achieving a balance between robustness and imperceptibility. The proposed method can be securely applied in the encrypted domain and could resist lossy compression attacks, including JPEG and HEVC intra-coding attacks. In the experimental results, improvements in terms of PSNR, SSIM, and BER are achieved compared to traditional methods. The RNN-based reliability control framework of image watermarking is efficient and secure for real-time image and video applications.

Keywords: Image watermarking, deep learning, encrypted domain processing, compression robustness, reliability control, RNN, recurrent neural networks, multimedia security.

SMART FISHERIES HEALTH MONITORING AND AUTOMATED FEEDING SYSTEM

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Abstract

Aquaculture has become an important source of food production worldwide, but many fish farming practices still rely on manual monitoring and feeding methods. These traditional approaches often result in inconsistent water quality management, irregular feeding schedules and increased labour effort, which can negatively affect fish health and overall productivity. To overcome these challenges, this paper presents a Smart Fisheries Health Monitoring and Automated Feeding System that integrates sensor-based monitoring with automated control mechanisms to improve efficiency and reliability in aquaculture operations. The proposed system continuously monitors key water quality parameters such as temperature, Dissolved Oxygen, Ammonia, pH and turbidity using appropriate sensors. These parameters are critical in maintaining a stable and healthy aquatic environment for fish growth. The collected data is processed using a microcontroller and can be accessed in real time, enabling farmers to monitor pond conditions remotely without the need for constant physical supervision. This real-time insight allows timely corrective actions when environmental conditions deviate from safe levels. In addition to monitoring, the system includes an automated feeding unit that dispenses feed at predefined intervals using a servo motor mechanism. This ensures consistent feeding, reduces feed wastage and supports uniform fish growth. The system is designed to be cost-effective, user-friendly and adaptable to both small-scale and large-scale fish farming environments. Alerts can be generated when water quality parameters exceed safe limits, helping to prevent fish stress and mortality. Experimental observations indicate that the system significantly reduces manual effort while improving monitoring accuracy and feeding efficiency. Overall, the proposed solution enhances productivity, promotes sustainable aquaculture practices and provides a practical approach for modernizing fish farming using smart technologies.

Keywords— IoT, Aquaculture, Water Quality Monitoring, Automated Feeding, Smart Farming, Sensors

ROBOTIC BASED RADIATION MONITORING SYSTEM FOR SAFER WORK ENVIRONMENT

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Abstract : the detection of radiation is critical to protect human health in extremely hazardous industrial environments. This project aims to introduce a "Robotic Based Radiation Monitoring System" that will be capable of detecting radiation levels, identifying zones that are contaminated with radiation, and detecting the concentration of toxic gases. The robot has been equipped with elegant sensor modules to detect radiation levels, navigate restricted or not safe environments, and collect environmental radiation data. This will allow decision-makers to take rapid decisions on environmental conditions. The need for such a robotic device has been felt to be on the rise, especially in nuclear plants, disaster zones, chemical plants, labs, and other places that are prone to radiation hazards. This robotic device will not only be helpful to protect human health but will also eliminate the need to rely on manual inspection mechanisms to detect radiation levels, thereby providing a technically advanced approach to protect workers.

Keywords— Radiation Monitoring, Autonomous Robot, Hazardous Environment Detection, Toxic Gas Sensing, Real-Time Data Transmission, Industrial Safety.

LIGHTWEIGHT BLOCKCHAIN-BASED DYNAMIC TRUST ROUTING WITH GA OPTIMIZATION FOR SECURE VANETS

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Abstract

The challenges faced by VANETs are to provide secure and efficient routing due to high mobility, dynamic topology, and frequent link interruptions. The routing protocols already developed face issues such as latency, unreliable route selection, and vulnerability attacks, such as blackhole attacks and malicious node intrusion. The proposed routing protocol, Lightweight Blockchain-Based Dynamic Trust Routing Protocol with Genetic Algorithm (GA) Optimization (LBDT-GA), addresses these limitations in secure VANET environments. The proposed work controls the computational cost and storage complexity, and maintains a decentralized, immutable trust record for participating nodes by implementing a lightweight blockchain. The node's trust score is periodically updated by a dynamic trust evaluation mechanism based on real-time behavioral data, enabling the effective identification and isolation of malicious nodes. With it, a Genetic Algorithm is integrated to find the optimal path to improve the routing process. The GA uses multiple parameters, including real-time trust score, remaining energy, vehicle mobility, link reliability, and end-to-end delay. In this, vehicle routes are represented as chromosomes, and a multi-objective fitness function is used to evaluate and evolve optimal routing paths through iterative selection, crossover, and mutation. The simulation results showed that the proposed routing protocol improves packet delivery ratio, throughput, and router reliability by minimizing end-to-end delay, routing overhead, and energy consumption when compared with conventional routing protocols. It also ensures secure and efficient communication in a highly dynamic VANET by integrating a lightweight blockchain with GA optimization.

Keywords: Genetic Algorithm, Blockchain, Routing Protocol, Dynamic Trust, Optimization

SMART DISTRIBUTION SYSTEM WITH LOAD BALANCING

Manikandanm, Suryas, Gengaraja

Abstract : The Smart Distribution System with Load Balancing is designed to efficiently manage electrical loads and prevent overloading in power distribution systems. The system uses an Arduino microcontroller along with current, voltage, and temperature sensors to continuously monitor electrical parameters. The main objective of this project is to handle abnormal conditions such as peak load demand. When the system detects overload or high demand, it automatically activates an additional power source such as a transformer or generator through relay switching. This ensures continuous power supply without interruption and prevents system failure. Under normal conditions, the system operates with the primary source. During overload conditions, the microcontroller intelligently switches ON the additional transformer/generator to share the load. Once the load returns to normal, the system switches back to the primary source. This project provides a smart, automatic, and reliable solution for load balancing and power management, similar to real-time power distribution systems used in smart

**A STUDY ON EMPLOYEE ENGAGEMENT AND ITS IMPACT ON ORGANISATIONAL PERFORMANCE
AT EXCEL TRADERS**

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Abstract : Employee engagement has emerged as a critical factor influencing organizational success in today's competitive business environment. Engaged employees demonstrate higher levels of commitment, motivation, and productivity, which directly contribute to improved organizational performance. This study aims to examine the impact of employee engagement on organizational performance at Excel Traders. The research is based on both primary and secondary data. A structured questionnaire was used to collect data from employees, and statistical tools such as correlation and regression analysis were applied to interpret the results. The findings reveal that employee engagement has a strong positive impact on organizational performance. Engaged employees show higher efficiency, better teamwork, and increased job satisfaction. The study concludes that organizations that invest in employee engagement strategies such as recognition, communication, and career development can achieve higher productivity and long-term success. However, challenges such as lack of communication and limited growth opportunities can affect engagement levels.

Keywords: Employee Engagement, Organizational Performance, Job Satisfaction, Employee Motivation, Workplace Productivity, HR Practices

FILM FORECAST AI: A PROFESSIONAL MOVIE RECOMMENDATION SYSTEM

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Abstract : The explosion of digital content in the film industry has made personalized discovery a critical requirement for modern streaming services. This paper presents 'Film Forecast,' a robust end-to-end movie recommendation system designed to provide accurate and relevant suggestions based on movie metadata. The system implements a content-based filtering approach using Natural Language Processing (NLP) techniques. Specifically, metadata including genres, cast members, directors, and keywords are preprocessed and vectorized using Term Frequency-Inverse Document Frequency (TF-IDF). Similarity between movies is then quantified using Cosine Similarity scores. Evaluation on the TMDB 5000 Movie Dataset demonstrates that the system achieves high relevance in its recommendations with a low computational latency of less than 2 seconds per query. The architecture is deployed as a dual-platform solution: a responsive web application built with Streamlit and a cross-platform mobile application developed using Flutter, both served by a Flask-based REST API. Integration with the TMDB API allows for the dynamic retrieval of movie posters and supplemental metadata, enhancing user immersion. Experimental results indicate that the fusion of multi-source metadata significantly improves recommendation quality compared to single-feature approaches. Future work will focus on implementing a hybrid recommendation engine combining collaborative filtering with deep learning components to further enhance scalability and discovery.

Keywords - Movie Recommendation, Machine Learning, TF-IDF, Cosine Similarity, Content-Based Filtering, Streamlit, Flutter, Full-Stack.

SECURE DIGITAL VOTING PLATFORM WITH BIOMETRIC AUTHENTICATION

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Abstract-- Creating open voting systems is important for democratic societies these days. Old voting systems have a lot of problems like the risk of people cheating taking time to get the results not being transparent and costing a lot of money to run. This paper is about a Secure Digital Voting Platform that uses Biometric Authentication to make election systems more reliable and effective. The system we are talking about combines fingerprint authentication, blockchain-based voting security and IoT technology using the Node MCU microcontroller. We use a fingerprint sensor to check a voter's identity before they can cast their vote. The Secure Digital Voting Platform makes sure that every voter can only cast one ballot so there are no duplicates or cheating. Also, the voting data can be stored safely so everything is transparent and records are kept securely. The system has an OLED display, buzzer and LED indicators that give feedback when it is being used. The Secure Digital Voting Platform allows for counting of votes better checking of voters and more transparency in elections. This system is good for elections, voting in organizations and voting, from far away. The Secure Digital Voting Platform is a way to make voting systems better.

Keywords: Digital Voting System, Biometric Authentication, Fingerprint Sensor, Node MCU, Blockchain Security, Electronic Voting

INTELLIGENT LIGHTNING DETECTION AND PROTECTION SYSTEM USING SENSOR FUSION TECHNIQUES

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Abstract

Lightning is a highly dangerous natural phenomenon that can cause severe damage to human life, electrical systems, and infrastructure. Early detection of lightning activity is essential to provide timely warnings and ensure safety, especially in outdoor environments such as agricultural fields, construction sites, and open public areas. This project presents a real-time Lightning Detection System using the ESP32, Gravity Lightning Distance Sensor (MA5532-AE), OLED display, and buzzer alert system. The system continuously monitors atmospheric electromagnetic disturbances produced by lightning strikes. The MA5532-AE lightning sensor detects these electromagnetic signals and estimates the distance of lightning activity up to a considerable range. The sensor communicates with the ESP32 microcontroller through an I²C interface, enabling efficient data acquisition and processing. The high-speed processing capability of the ESP32 ensures accurate and real-time detection of lightning events. The processed information is displayed on an OLED screen, providing clear and immediate visualisation of lightning detection status and approximate distance. To enhance user safety, an audible alert mechanism is implemented using a buzzer. Whenever lightning is detected within a predefined critical range, the buzzer is activated instantly to warn nearby users, allowing them to take necessary precautionary measures. Unlike conventional lightning detection systems that rely on complex and expensive meteorological equipment, the proposed system is compact, cost-effective, and easy to deploy. It operates independently without requiring internet connectivity, making it reliable for standalone applications. The system also consumes low power, making it suitable for portable and battery-operated setups. In conclusion, the developed Lightning Detection System provides an efficient, reliable, and economical solution for real-time lightning monitoring and early warning. The integration of the MA5532-AE sensor with ESP32 ensures high performance while maintaining system simplicity, making it ideal for localised safety applications.

**SPATIALLY MULTIPLEXED SCALABLE CODING FOR HIGH RESOLUTION SNAPSHOT
COMPRESSIVE VIDEO**

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High-speed video acquisition plays a crucial role in capturing dynamic scenes where rapid changes occur within very short time intervals. However, conventional video processing methods require high frame rates, large storage capacity, and significant computational resources, making them inefficient for practical applications. Snapshot Compressive Video (SCV) has emerged as an effective solution to address these challenges by compressing multiple video frames into a single snapshot image, which is later reconstructed into the original sequence using computational algorithms. Although SCV significantly reduces data size. To overcome these limitations, this project proposes a spatially multiplexed scalable coding approach for high-resolution snapshot compressive video. The method integrates spatial multiplexing with temporal compression, allowing information to be distributed across both spatial and temporal domains. This combined strategy improves the preservation of fine details such as edges, textures, and structural information during compression. The system is implemented using Python, where the input video is processed through spatial multiplexing, coded aperture masking, and snapshot generation. Reconstruction is performed using advanced algorithms such as GAP-TV, RevSCI, STT, and SCI3D, followed by upscaling techniques including EDSR, 2DI, 3DI, TC, and VSR to enhance visual quality. The performance of the proposed system is evaluated using standard metrics such as Peak Signal to Noise Ratio (PSNR) and Structural Similarity Index Measure (SSIM). Experimental results demonstrate that the inclusion of spatial multiplexing significantly improves reconstruction accuracy, achieving approximately 97% overall performance. Additionally, the system supports scalability for different resolutions and frame sizes, making it suitable for applications such as surveillance, medical imaging, and scientific analysis.

**DESIGN AND PHOTOCATALYTIC DYE DEGRADATION PERFORMANCE OF RARE-EARTH CO-
DOPED BARIUM FERRITE NANOSTRUCTURES**

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Abstract: Rare-earth co-doped barium ferrite ($\text{BaFe}_{12}\text{O}_{19}$) nanostructures have emerged as promising multifunctional materials due to their enhanced magnetic and photocatalytic properties. In this study, rare-earth ions were incorporated into the barium ferrite lattice using a controlled synthesis method to tailor structural, optical, and surface characteristics. The successful substitution of rare-earth elements was confirmed through crystallographic and spectroscopic analyses, revealing modifications in lattice parameters and reduced band gap energy. The photocatalytic activity of the synthesized nanostructures was evaluated through the degradation of organic dye pollutants under visible light irradiation. The co-doped samples exhibited significantly improved degradation efficiency compared to pure barium ferrite, attributed to enhanced charge separation, reduced electron-hole recombination, and increased surface active sites. The influence of doping concentration, catalyst dosage, and irradiation time on degradation efficiency was systematically investigated. The results demonstrate that rare-earth co-doping is an effective strategy to enhance the photocatalytic performance of barium ferrite nanostructures, making them potential candidates for wastewater treatment and environmental remediation applications.

Keywords: Barium ferrite nanostructures, rare-earth co-doping, photocatalysis, dye degradation, visible light irradiation, band gap engineering, wastewater treatment, charge carrier dynamics, environmental remediation

SMART TEXTILE CONTROL SYSTEM FOR WEARABLE DEVICE INTERACTION

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Abstract: The rapid advancement of wearable technology has created new opportunities for seamless and intuitive human-machine interaction. This paper presents a Smart Textile Control System that enables users to interact with electronic devices through touch-sensitive fabric interfaces integrated into clothing. The system employs conductive textile materials functioning as capacitive touch sensors to detect user gestures and inputs. These signals are processed by an Arduino microcontroller, which interprets the touch patterns and transmits corresponding commands via Bluetooth communication to connected devices such as smartphones or computers. Experimental results demonstrate reliable touch detection, low power consumption, and stable wireless communication. The proposed system is lightweight, flexible, and user-friendly, making it suitable for everyday wearable applications. This work highlights the potential of combining textile-based sensors with embedded electronics to develop innovative smart clothing solutions, offering a cost-effective and scalable approach for improving user convenience and accessibility in modern human-machine interaction systems.

Keywords: Smart textiles, Wearable technology, Capacitive touch sensor, Arduino microcontroller, Bluetooth communication, Human-machine interaction

AI-DRIVEN SMART IRRIGATION DECISION SYSTEM INTEGRATING REAL-TIME SOIL MOISTURE AND WEATHER FORECASTING

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Abstract—Water scarcity in agriculture remains one of the most pressing global challenges of the 21st century, further compounded by inefficient irrigation practices, unpredictable weather patterns, and accelerating climate change. Conventional irrigation systems typically rely on fixed timed schedules or isolated local soil moisture sensors, operating without any awareness of impending meteorological conditions. This fundamentally reactive approach frequently results in redundant watering cycles, unnecessary energy consumption, and significant freshwater wastage, thereby undermining sustainable and responsible agricultural management. This paper proposes a comprehensive, preemptive Smart Irrigation Decision System that synergistically integrates physical Internet of Things (IoT) hardware, Machine Learning (ML) analytics, and real-time cloud-based weather forecasting to enable proactive, data-driven irrigation control. An Arduino Uno-based sensor node deployed at the field edge continuously collects real-time soil moisture readings via a dual-probe resistive sensor with ADC values scaled to a 0–100% moisture percentage. A Scikit-Learn Linear Regression model, trained on historical soil moisture datasets specific to the target region, predicts the expected near-future moisture state of the soil under varying environmental and temporal conditions. Simultaneously, the OpenWeatherMap REST API is queried to retrieve Probability of Precipitation (PoP) values and rainfall volume estimates across 3-hour forecast windows, providing anticipatory meteorological intelligence to the system. A Python Flask backend serves as the central aggregation and decision engine, combining the multimodal sensor fusion inputs — current soil moisture levels, ML-predicted future moisture. Experimental validation across three representative weather scenarios demonstrates high predictive reliability, measurable reduction in redundant irrigation events, and consistent sub-200ms decision latency, validating the proposed system as a scalable solution for precision agriculture and water conservation.

Keywords—Smart Irrigation, IoT, Machine Learning, Linear Regression, OpenWeatherMap API, Arduino, Precision Agriculture, Flask, Water Conservation, Edge Computing, REST API

A SECURE ACADEMIC CERTIFICATE AUTHENTICATION AND TAMPER DETECTION SYSTEM

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Abstract— The rapid growth of digital documentation has significantly increased the risk of certificate forgery and unauthorized modifications, posing a major challenge for academic institutions and verification authorities. Ensuring the authenticity, integrity, and secure access of academic certificates has therefore become essential. This project presents “A Secure Academic Certificate Authentication and Tamper Detection System” designed to provide a robust and secure solution for certificate verification. The proposed system adopts a multi-layer verification approach by integrating cryptographic and image processing techniques. The SHA-256 hashing algorithm is used to generate a unique digital fingerprint for each certificate, ensuring integrity verification. To handle variations such as rescanned or compressed images, Perceptual Hashing (pHash) is used to detect visually similar certificates. In addition, the Structural Similarity Index is applied to identify and analyze tampering by comparing structural differences between original and submitted certificates. To enhance system security, the system incorporates JSON Web Token (JWT)-based authentication and role-based access control, ensuring that only authorized users can access specific functionalities. Furthermore, to validate the authenticity of verifiers, the system integrates verification checks aligned with the Ministry of Corporate Affairs (MCA) database, ensuring that only legitimate organizations and registered entities can perform certificate verification. All communication is secured using HTTPS protocols, and input validation mechanisms are implemented to prevent unauthorized data uploads. The system also ensures that certificate data is not directly shared between users, with all verification processes handled securely within the backend. The system is developed using FastAPI and Python, with PostgreSQL for secure data storage. A web-based interface enables certificate upload, verification, and result visualization. Experimental results demonstrate that the system effectively detects forgery and tampering with high accuracy while maintaining efficient performance. The proposed solution enhances trust, strengthens verification reliability, and provides a scalable framework for secure academic certificate management.

Keywords— Academic Certificate Verification, Tamper Detection, SHA-256, Perceptual Hashing, Structural Similarity Index, Cybersecurity, JSON Web Token Authentication, Role-Based Access Control, Image Processing, Secure Verification System, Digital Document Authentication, MCA Verifier Validation.

ICRIT352

REVIEW OF NANO MATERIAL ENHANCED PHASE MATERIAL PREPARATION

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Abstract— Nano material enhanced phase change materials (NEPCMs) are advanced thermal energy storage materials developed by dispersing nanosized particles into conventional phase change materials (PCMs). These materials improve the thermal conductivity, heat transfer rate, and energy storage efficiency of PCMs, which are widely used in solar energy systems, electronics cooling, building temperature regulation, and battery thermal management. Common nanoparticles such as graphene, carbon nanotubes, aluminum oxide, copper oxide, and titanium dioxide are used to enhance performance. Preparation methods include direct mixing, ultrasonic agitation, mechanical stirring, and surface modification techniques to ensure uniform dispersion and stability. NEPCMs offer faster melting and solidification rates compared to pure PCMs. However, challenges such as nanoparticle agglomeration, high cost, and long-term stability still exist. This review briefly discusses the materials used, preparation methods, advantages, applications, and current challenges of nano material enhanced phase change materials. These materials have significant potential for improving thermal energy storage systems and energy efficiency in future technologies.

Keywords: Nano materials, Phase change materials, Thermal energy storage, Nanoparticles, Heat transfer enhancement

ICRIT353

A HIGH-GAIN DC–DC CONVERTER WITH MPPT CONTROL FOR SOLAR-POWERED ELECTRIC VEHICLE APPLICATIONS

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Abstract

The adoption of EVs is accelerating due to a demand for sustainable transportation, which in turn has a requirement for power conversion systems. Regular photovoltaic (PV) technology produces clean renewable energy and can definitely be used for EV charging. However, photovoltaic powered EV charging is limited since the output voltage of PV panels is low and fluctuating. Fluctuation is caused because of changes in irradiance and temperature. With this aim, this work proposes a high-gain non-isolated DC–DC converter with Perturb and Observe (P&O) based Maximum Power Point Tracking (MPPT) algorithm to overcome the challenge. The use of switched-inductor and switched-capacitor principles helps to achieve higher voltage gain with less stress. A design of PI controller is used to control the DC link voltage. It is used to keep the system stable by considering both the effect of solar and load disturbances. The results of the simulation and hardware demonstrate that improved voltage gain, efficiency, and reliability for Solar powered EV applications.

Keywords - Photovoltaic (PV), MPPT, Boost Converter, Bidirectional Converter, Inverter, PMSM, FOC

ICRIT354

HARMONIC APPROXIMATION IN WIRELESS CHARGING OF EV

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Abstract

The increasing adoption of electric vehicles (EVs) has intensified the demand for efficient, reliable, and sustainable charging systems. Conventional wireless EV charging systems, particularly those based on resonant inductive coupling, often suffer from harmonic distortions caused by high-frequency switching and misalignment between transmitter and receiver coils. These harmonics lead to increased power losses, reduced efficiency, electromagnetic interference, and potential overheating of system components. Additionally, most existing systems depend heavily on grid power, which contributes to higher carbon emissions and limits the sustainability of EV infrastructure. Variations in load conditions and coupling also make it difficult to maintain stable output, affecting charging performance and battery health. To overcome these challenges, this project proposes a solar photovoltaic–integrated harmonic-controlled wireless EV charging system. The system utilizes clean solar energy to reduce grid dependency and promote eco-friendly operation. An optimized inverter topology is designed to minimize harmonic distortion and switching losses on the primary side, thereby improving overall power transfer efficiency. Advanced compensation and rectification techniques are implemented to maintain a stable DC output under varying coupling and load conditions. Furthermore, the system supports both constant current and constant voltage charging modes, ensuring safe and efficient battery charging. This approach enhances system reliability, reduces energy losses, and contributes to the development of sustainable and high-performance wireless EV charging solutions.

ICRIT355

NEXT GENERATION FOOTSTEP ENERGY GENERATION SYSTEM

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Abstract

In our daily life, thousands of people walk across railway stations, shopping malls, bus stands, and college campuses. Every step we take produces small amount of mechanical energy, but this energy usually goes to waste. This project focuses on converting that wasted human energy into useful electrical energy through a smart footstep power generation system. The system use piezoelectric sensors placed beneath a floortile. When a person steps on the tiles, pressure is applied to the sensors, generating electrical energy. This generated voltage is converted from AC to DC, regulated to a stable level, and stored in a rechargeable battery for later use. To make the system more intelligent, a voltage sensor is integrated to monitor the generated power in real-time, providing precise data on energy levels. Additionally an IR sensor is used to detect human presence, and the LDR sensor is attached to detect light intensity to turn ON/OFF the bulb. **Keywords**—ESP8266(NodeMCU), Blynk app, Piezoelectric sensor, IoT, Footstep, LDR sensor, Battery monitoring.

ICRIT356

SMARTMINEBOT : IOT BASED MINING FIELD MONITORING AND ASSISTANCE ROBOT

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Abstract

The Smart Mining Bot is robotic and Internet of Things (IoT) based system designed to improve safety, monitoring, and operational efficiency in hazardous mining environments. The primary objective of this project is to reduce human exposure to dangerous conditions by enabling remote environmental monitoring, mobility, and real-time decision support. The robot continuously collects and analyzes environmental parameters such as temperature, humidity, air quality, and vibration levels using integrated sensor modules. The acquired data is transmitted through the HTTP communication protocol to a customized user interface (UI), where operators can monitor live environmental conditions and stored historical data for analysis. The system supports three operational modes : manual, semi-autonomous, and fully automated allowing flexible control based on mission requirements. Through the developed UI, users can remotely navigate the robot, monitor system status, and access live video streaming via an onboard ESP-CAM module, enabling real-time situational awareness without physical presence in risky locations. Designed with a six-wheel drive system and a rocker-bogie suspension mechanism, the robot ensures high stability and smooth traversal across uneven terrains typically found in mining environments. Structural reliability and mechanical performance were validated using Finite Element Analysis (FEA) to enhance durability under harsh operating conditions. Additional features include high-visibility LED lighting for improved camera operation in low-light environments and a payload system capable of transporting essential supplies such as oxygen cylinders and medical kits from one location to another during emergency scenarios. Overall, the Smart Mining Bot demonstrates a practical integration of robotics, IoT, environmental sensing, and intelligent mobility to create a safer, smarter, and more efficient solution for real-world mining and disaster-response applications.

Keywords: Live Stream , Gas Sensors, Temperature & humidity , Vibration sensor , Real-Time Monitoring, Wireless Communication

ICRIT357

AI-BASED SMART SOLDIER HEALTH MONITORING AND POSITION TRACKING SYSTEM USING IOT

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Abstract

This project presents an intelligent system designed to monitor the health condition and real-time location of soldiers in battlefield environments using Internet of Things (IoT) and Artificial Intelligence (AI). The system integrates various sensors such as heart rate, temperature, and pulse oximeter to continuously collect vital health parameters of the soldier. An embedded microcontroller (ESP32) processes the data and transmits it to a cloud platform through wireless communication for real-time monitoring. A GPS module is incorporated to track the precise location of the soldier, enabling effective navigation and rescue operations. The system also employs AI techniques such as anomaly detection and rule-based analysis to identify abnormal health conditions and predict potential risks. In case of emergency situations, alerts are automatically sent to the control room through IoT platforms and GSM communication. Additionally, a fall detection mechanism using an accelerometer enhances safety by detecting sudden movements or accidents. The proposed system ensures continuous monitoring, quick response during critical conditions, and improved decision-making for military operations. This solution enhances soldier safety, reduces response time, and contributes to efficient battlefield management.

ICRIT358

REAL-TIME SOCIAL MEDIA CYBER THREAT DETECTION USING SENTIMENT-BASED KEY ANALYSIS

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Abstract

The fast development of social media sites has resulted in a surge in cyber crimes like abusive language, harassment and malicious interaction amongst users. This paper suggests a sentiment key-based real-time cyber threat detection system to improve the safety of the internet. The suggested system is based on the rule-based approach to user-generated content, such as comments and replies, and categorizes them into four groups, such as positive, negative, neutral, and harmful. A set of predetermined sensitive and harmful words are used to detect toxic or potentially harmful information. When detected, the content is automatically marked and set to be removed in a limited period of time, thus reducing the dissemination of negative interactions. Besides detection, the system offers analytical information like sentiment distribution, user engagement metrics, and interaction patterns to gain a deeper insight into how audiences act. It is built on lightweight web technologies and it can be effectively used in real-time without having to employ complex machine learning models to implement the system. The experimental findings indicate that the proposed solution can be used to identify harmful content with a satisfactory level of performance and low computational complexity. This renders the system scalable and usable in contemporary social media settings.

Keywords

Cyber Threat Detection, Sentiment Analysis, Social Media Security, Harmful Content Filtering, Real-Time Systems.

ICRIT359

AN EXPLAINABLE AND VOICE-ASSISTED DEEP LEARNING FRAMEWORK FOR BRAIN TUMOR CLASSIFICATION WITH RISK STRATIFICATION

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Abstract: Accurate and timely detection of brain tumors from magnetic resonance imaging (MRI) plays a crucial role in improving patient outcomes. However, reliable diagnosis often depends on expert radiologists, which may not be accessible in all regions. This study presents an enhanced deep learning-based system for brain tumor classification that combines high prediction accuracy with improved usability. The proposed approach integrates two powerful models, Vision Transformer and DenseNet-201, to classify MRI images into four categories: glioma, meningioma, pituitary tumor, and no tumor. An ensemble technique is applied to combine predictions from both models, thereby increasing overall reliability and reducing classification errors. To overcome the limitations of traditional black-box models, the system incorporates an explainable artificial intelligence component using heatmap visualization. This feature highlights the important regions in the MRI scan that influence the model's decision, allowing users to better understand and trust the output. In addition, a risk prediction module is introduced, which categorizes results into low, medium, and high-risk levels based on confidence scores, providing more meaningful clinical insight. To improve accessibility for non-English-speaking users, a Tamil voice-assisted interface is integrated into the system. This enables users to receive diagnostic results in their native language through simple voice interaction. The entire system is deployed as a web-based application, allowing real-time analysis and easy access. Experimental results show that the ensemble model outperforms individual models in terms of accuracy. Overall, the proposed system provides an effective, explainable, and accessible solution for brain tumor classification in healthcare applications.

Keywords: Brain Tumor Classification, Deep Learning, Ensemble Learning, Vision Transformer, DenseNet-201, Explainable Artificial Intelligence, Grad-CAM, Risk Prediction, Medical Image Analysis, MRI, Voice Assistant, Multilingual System, Clinical Decision Support

ICRIT360

GREEN SYNTHESIS OF SILICA GLASS FROM OKRA AND RADISH BIOMASS ASH

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Abstract: The increasing demand for sustainable materials has led to the exploration of eco-friendly alternatives for silica production. This study focuses on the green synthesis of silica glass using biomass ash derived from okra and radish agricultural residues. These biomasses are considered potential sources of silica due to their natural mineral content and widespread availability. In this work, okra and radish wastes were collected, dried, and subjected to controlled combustion to obtain ash. The ash was treated using acid leaching to remove impurities, followed by alkali extraction to dissolve silica. The extracted silica was then precipitated and thermally processed to obtain silica glass. Characterization of the synthesized material was carried out using Fourier Transform Infrared Spectroscopy (FTIR) and Scanning Electron Microscopy (SEM) to confirm chemical structure and surface morphology. FTIR analysis revealed characteristic Si–O–Si bonding, confirming the formation of silica, while SEM images showed a porous and irregular morphology with high surface area. The results indicate that silica obtained from okra and radish biomass ash is predominantly amorphous and comparable in quality to commercially available silica. This study demonstrates an environmentally friendly and cost-effective method for silica glass production, contributing to waste valorization and sustainable material development. The approach reduces agricultural waste disposal issues while providing a valuable industrial material.

ICRIT362

A STUDY ON EMPLOYEE ENGAGEMENT AND THEIR IMPACT OF CUSTOMER SATISFACTION

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Abstract

Employee engagement refers to a condition where the employees are fully engaged in their work and are emotionally attached to their organization. An "engaged employee" is one who is fully involved in, and enthusiastic about their work, and thus will act in a way that furthers his organization's interests. This study investigates how different variables like job characteristics, career development, work relationship, perceived supervisor support, organizational fit and engagement influence engagement of an employee. The analytical tools used in this study are SPSS, the primary data is collected through a structured questionnaire. The secondary data is collected through journals and research papers. From the research we can understand given the proper work conditions and recognition for their work with their roles clearly defined, the employees are willing to be engaged in their work. Key Words: Job Characteristics, Career Development, Work Relationship, Perceived Supervisor Support, Organizational fit and Engagement.

ICRIT363

HYBRID GESTURE-CONTROLLED SMART WHEELCHAIR: AN AFFORDABLE DUAL-MODE ASSISTIVE MOBILITY SYSTEM

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Abstract

This paper presents a low-cost smart wheelchair system designed to improve mobility assistance for physically challenged and elderly users. The proposed system supports dual-mode control through hand gestures and a mobile application, allowing the wheelchair to be operated in a flexible and user-friendly manner. The main controller used in the system is the STM32F103C6T6A microcontroller, which handles sensing, communication, decision making, and motor control in real time. Gesture-based control is obtained using the MPU6050 motion sensor, while Bluetooth communication through the HC-05 module enables wireless command transfer from a smartphone application. An ultrasonic sensor is included to detect obstacles in front of the wheelchair and reduce the risk of collisions during movement. The L298N motor driver is used to drive the wheelchair motors according to the commands generated by the controller. Additional modules such as HC-12 and ESP32-C3 are incorporated to support extended communication and future enhancements. The system focuses on affordability, modularity, and practical implementation using readily available components. Prototype-level development shows that hybrid control can be implemented effectively on an embedded platform while maintaining safety and ease of operation. This makes the proposed design a promising assistive mobility solution for users who need reliable, economical, and adaptable wheelchair control.

Keywords

smart wheelchair, gesture control, mobile application, STM32, obstacle detection, assistive mobility

CANCER TYPE DETECTION FROM MEDICAL IMAGE USING DEEP LEARNING

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Abstract: Cancer is a group of diseases characterized by the uncontrolled growth and spread of abnormal cells, which can invade surrounding tissues and metastasize to other parts of the body if not detected early. Cancer type detection from medical images involves analyzing imaging modalities such as CT, MRI, or histopathology scans to identify and classify distinct cancer categories based on morphological and textural patterns. Traditionally, this process relies heavily on manual examination by radiologists and pathologists, making it time-consuming, subjective, and prone to inter-observer variability, especially when image quality is poor or when subtle differences exist between cancer types. These limitations highlight the need for an automated and reliable diagnostic support system. To address these challenges, the proposed deep learning-based framework integrates a structured preprocessing stage followed by a Contrast and Noise Reduction Technique (CNRT) to enhance image clarity and suppress artifacts, ensuring improved tumor visibility. Subsequently, deep features are extracted and refined using a Feature Dimensionality Reduction Method (FDRM), which removes redundant and less discriminative features to reduce computational complexity and improve classification efficiency. Finally, a Softmax-Based Multi-Type Cancer Prediction (SMCP) classifier is employed to perform multi-class cancer type prediction by assigning probability scores to each category. The overall model enhances detection accuracy, minimizes human dependency, and provides a consistent and scalable solution for medical image-based cancer type classification in clinical decision-support systems.

Keywords: Cancer Detection, Deep Learning, MobileNetV2, PCA, CNRT, Multi-Class Classification, Medical Image Analysis

ENHANCED M-POINTNET WITH LEARNABLE ATTENTION MECHANISM FOR 3D INTRACRANIAL ANEURYSM CLASSIFICATION AND SEGMENTATION

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Abstract—The precise morphological classification and semantic segmentation of intracranial aneurysms (IAs) from three-dimensional cerebrovascular manifolds are critical for risk stratification and preoperative neurosurgical planning. While native 3D point cloud architectures have largely superseded voxel-based methods by eliminating spatial discretization artifacts, existing frameworks often exhibit performance degradation at high spatial densities due to feature-space distortion and the unchecked propagation of background vascular noise. This research proposes the Enhanced M-PointNet, a parameter-efficient, dual-pathway deep learning framework engineered for robust geometric feature extraction. The architecture introduces two pivotal technical interventions: (1) the Dimension-Insensitive Euclidean Measure (DIEM), which utilizes inverse-Euclidean distance weighting to resolve the limitations of traditional angular similarity, and (2) Geometric Squeeze-and-Excitation (Geo-SE) blocks for dynamic channel-wise feature recalibration and noise suppression. To address the extreme anatomical class imbalance inherent in the IntraBenchmark dataset, the network is optimized using a hybrid Focal-Dice objective function within a Deep Supervision framework to ensure stable gradient flow across deep hierarchies. Experimental results demonstrate that the Enhanced M-PointNet achieves a state-of-the-art Macro F1-score of 0.9476 for classification and exhibits monotonic scaling in segmentation, reaching a peak Aneurysm Dice Similarity Coefficient (DSC) of 92.05% at a clinical density of 2048 points. These outcomes prove

that targeted, attention-driven spatial and channel-wise feature enrichment significantly outperforms brute-force network scaling, providing a robust diagnostic tool for automated neurovascular analysis.

ICRIT366

EXTRACTION AND OPTIMIZATION OF D-LIMONENE ESSENTIAL OIL FROM MIXED ORANGE AND SWEET LIME PEELS BY STEAM DISTILLATION

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Abstract

The increasing demand for natural and eco-friendly products has led to significant interest in the extraction of essential oils from agricultural waste. In this study, D-limonene essential oil was extracted from mixed orange and sweet lime peels using the steam distillation method. Citrus peels, which are commonly discarded as waste, serve as a rich source of D-limonene, a valuable compound widely used in food, pharmaceutical, and cosmetic industries. The extraction process parameters such as time, temperature, and peel composition were optimized to enhance the yield of essential oil. The obtained oil was analyzed using Fourier Transform Infrared Spectroscopy (FTIR) to identify functional groups and confirm the presence of D-limonene. Additionally, the refractive index of the extracted oil was measured to evaluate its purity and quality. The results indicated that the optimized conditions significantly improved the oil yield, and the extracted oil exhibited characteristic peaks corresponding to D-limonene. This study demonstrates an effective approach for converting citrus waste into valuable essential oil, promoting sustainable waste management and resource utilization.

Keywords— D-Limonene, Citrus peel, Steam distillation, Essential oil, FTIR, Refractive index.

ICRIT367

GENE-BASED DISEASE IDENTIFICATION USING LARGE LANGUAGE MODELS (LLMs)

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Abstract : Gene-based disease identification has emerged as a transformative approach in precision medicine, enabling earlier detection and targeted treatment of genetic disorders. Traditional diagnostic methods often fall short in handling the scale and complexity of genomic data. This paper presents a framework that leverages Large Language Models (LLMs) to identify disease associations from gene expression data and genomic sequences. The proposed system integrates transformer-based architectures with curated biomedical databases to map genotype-phenotype relationships effectively. The model employs domain-specific tokenization of gene expression vectors, fine-tuned BERT-based encoding to capture inter-gene dependencies, and a multi-label classification head for predicting disease categories. Experimental evaluations on publicly available datasets from NCBI GEO and OMIM demonstrate that the LLM-enhanced pipeline achieves an accuracy of 91.7% and AUC-ROC of 0.94, outperforming conventional machine learning baselines including SVM, Random Forest, LSTM, and vanilla BERT models. An attention-based explainability module further validates the clinical relevance of predictions by highlighting known disease-driver genes such as BRCA1, TP53, and EGFR. The results confirm the substantial potential of LLMs as intelligent assistants in genomic medicine for clinical decision support and disease diagnostics.

Keywords—gene expression, disease identification, large language models, genomics, precision medicine, transformer architecture, bioinformatics

DIGISAILOR PRODUCT RESEARCH BOT AN AI DRIVEN FRAMEWORK FOR AUTOMATED COMPETITIVE INTELLIGENCE AND MARKET GAP ANALYSIS

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Abstract—Modern product development requires continuous competitive intelligence and marketgap identification; however, traditional research methods rely heavily on manual data collection and analysis, leading to significant time consumption and inefficiencies. This paper presents the Digisailor Product Research Bot, an AI-driven platform that automates competitor discovery, capability analysis, and strategic gap identification within minutes. The system is implemented as a full-stack web application using a Flask-based Python backend, integrated with Large Language Models via Groq and Gemini APIs, and supported by a responsive frontend using HTML, CSS, and JavaScript. It incorporates SQLite for persistent storage of research sessions and utilizes the Google Sheets API for automated export of structured analytical results. The system follows a three-phase research pipeline: (1) Competitor Identification, where structured prompts are used to extract direct and indirect competitors along with relevant metadata; (2) Capability Analysis, which systematically derives target markets, core features, and solution approaches of each competitor; and (3) Strategic Gap Analysis, where the extracted data is compared against the base product to identify missing functionalities and assign business impact priorities. A key contribution of this work is the integration of an anti-hallucination framework through carefully engineered prompts that constrain Large Language Models to produce verifiable and contextually grounded outputs while flagging uncertain information. The platform supports asynchronous background processing, enabling concurrent research jobs without blocking user interaction, and provides real-time progress tracking through an interactive web interface. Experimental usage indicates a drastic reduction in research time from several weeks to a few minutes while maintaining structured and consistent output quality. The system also enhances collaboration through automated Google Sheets synchronization and maintains historical research logs for future reference. Overall, the proposed solution improves efficiency, accuracy, and scalability in competitive intelligence workflows, enabling data-driven product strategy and faster decision-making in dynamic market environments.

Keywords—Competitive Intelligence, Market Gap Analysis, Large Language Models, AI Automation, Flask, Product Analytics, Google Sheets Integration

OMS(CHURCH MANAGEMENT SYSTEM)

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Abstract: The Church Management System is a full-stack web application developed using Angular, NestJS, and PostgreSQL to streamline church operations and member engagement. This platform connects administrators, pastors, and congregation members through a centralized system. It provides a user-friendly interface for managing events, donations, memberships, and communication. The application includes two main modules: Admin login and Member login. Administrators can register, log in, and manage church activities such as event scheduling, donation tracking, and member records. Members can securely log in, view upcoming events, register for activities, and make online donations. This ensures transparency, efficiency, and improved engagement within the church community. The system integrates secure online payment functionality for donations and offerings. Email notifications are used to confirm registrations, donations, and announcements, improving communication between the church and its members. Future enhancements include SMS notifications and live-streaming integration for remote participation. The frontend is developed using Angular with Bootstrap/Tailwind CSS for a responsive and modern UI. The backend is built with NestJS to ensure scalable and modular architecture, while PostgreSQL is used for reliable relational data management. Authentication is implemented using JWT tokens to ensure secure login and data protection. Overall, the system provides a scalable and efficient solution for modern church administration.

AUTOCHECK AI-AUTOMOTIVE DIAGNOSTIC SYSTEM USING DEEP TRANSFER LEARNING AND COMPUTER VISION FOR VEHICLE INSPECTION

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Abstract

AutoCheck AI is a mobile-based diagnostic system designed to assist buyers in the Indian pre-owned vehicle market through automated visual inspection using deep transfer learning. The system analyzes photographs of tires, battery terminals, and body panels to classify component condition and provide estimated repair cost ranges. We implement the ResNet50 architecture via the fastai framework on a curated dataset of approximately 250–300 labeled automotive component images. The system integrates a Flutter mobile frontend with a FastAPI backend, targeting real-time diagnostic feedback delivery. This solution addresses information asymmetry at the point of sale and demonstrates the practical applicability of transfer learning to accessibility-focused vehicle inspection tools for non-expert buyers.

Keywords

Computer Vision, Transfer Learning, ResNet50, Automotive Diagnostics, Flutter, Deep Learning, Mobile Application, Image Classification

ICRIT372

CHAINGATE: BLOCKCHAIN-BACKED INTELLIGENT ACCESS CONTROL AND MONITORING SYSTEM

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Abstract

ChainGate is a blockchain-backed intelligent access control system designed to improve security, transparency, and scalability. It integrates NFC-based authentication with ESP32 devices and decentralized blockchain logging to ensure tamper-proof access records. The system combines a Django backend with a Next.js dashboard for real-time monitoring and role-based control. An AI-driven module analyzes user behavior and supports anomaly detection. This solution addresses limitations of traditional centralized systems and demonstrates the effectiveness of integrating blockchain, IoT, and intelligent analytics for secure and scalable access control. Keywords—Computer Vision, Transfer Learning, ResNet50, Automotive Diagnostics, Flutter, Deep Learning, Mobile Application, Image Classification

ICRIT373

EMISSION TRACKER: AN AI AND IOT-DRIVEN APPROACH FOR REAL-TIME PREDICTION OF VEH. EXHAUST EMISSION INDICES

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Abstract

The Vehicular emissions are a major contributor to air pollution and environmental degradation. Conventional Pollution Under Control (PNC) testing methods provide only periodic measurements and fail to monitor emission continuously. This paper presents an AI - and IOT – based emission tracking system for real-time monitoring and prediction of vehicle exhaust emission. Gas sensors MQ5, MQ7, and MQ8 detect Hydrocarbon, Carbon Monoxide, Hydrogen, and LPG gases. The Atmega8 microcontroller processes sensor data and transmits it via ESP8266 Wi-Fi to a cloud server. The Exhaust Emission Index (EEI) and Vehicle Exhaust Emission Index (VEEI) indicate the level of emission and health status of vehicles, respectively. The Long Short-Term Memory (LSTM) model is used to predict the future emission based on historical data. The system is used for proactive maintenance and supports environmental sustainability.

Key words: Internet of Things (IOT), Vehicle Emission Monitoring, Artificial intelligence (AI), LSTM, EEI, VEEI, Pollution control.

ICRIT374

AI-BASED CAREER GUIDANCE AND COUNSELLING PLATFORM

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Abstract

This paper presents the design and development of an AI-based career guidance and counselling platform aimed at providing personalized career recommendations. The system evaluates user performance through structured assessments and analyzes subject-wise strengths and weaknesses to generate accurate career suggestions. A weighted scoring algorithm is used to map user performance and interests with suitable career paths, improving the relevance of recommendations. The platform integrates an AI-powered chatbot that utilizes sentence embeddings and semantic similarity techniques to provide real-time guidance and answer user queries. The system follows a modular architecture consisting of a React-based frontend, Django backend, PostgreSQL database, and a Flask-based AI service for chatbot processing, ensuring scalability and efficient performance. The proposed system offers a data-driven approach to career guidance by combining performance analysis and user preferences. It reduces dependency on traditional counselling methods and enhances user engagement through interactive support. Overall, the system provides a scalable, efficient, and intelligent solution for modern career guidance applications.

Keywords— Career guidance, artificial intelligence, recommendation system, semantic similarity, chatbot, weighted scoring, web application

ICRIT375

DESIGN AND DEVELOPMENT OF ELECTRIC TRICYCLE FOR LOAD TRANSPORTATION

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Abstract— Increasing environmental concerns and the need for economical transportation solutions have driven the advancement of electric-assisted cargo systems for urban applications. This work describes the development and integration of an electric cargo tricycle designed to improve goods transportation efficiency while reducing operator effort in short-distance operations. The proposed vehicle is powered by a 750 W Brush-less Direct Current motor controlled through a 30A motor controller and supported by a 48 V, 30Ah lead-acid battery system. Pedal assistance is provided through the integrated electric propulsion system, which enhances torque output and ensures stable acceleration under loaded conditions. The BLDC motor is selected for its operational efficiency, durability, and low maintenance requirements. Performance factors including power consumption, velocity characteristics, estimated driving range, and overall energy utilization are analyzed to determine system effectiveness. The design prioritizes affordability, simplicity, and adaptability for urban delivery and institutional transport needs. Evaluation results indicate that the developed electric cargo tricycle represents a feasible and sustainable alternative to conventional fuel-powered light transport vehicles, promoting improved energy efficiency and reduced environmental impact. **Keywords**—Electric cargo tricycle, BLDC motor, battery system, Urban mobility, Sustainable transport.

ICRIT376

PHISHING EMAIL DETECTION USING MULTIMODAL ANALYSIS

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Abstract --Phishing emails remain one of the most persistent and rapidly evolving cyber threats, causing significant financial and datalosses worldwide by impersonating trusted organizations and manipulating users into revealing sensitive information. Traditional detection methods often rely on single-modality approaches such as text analysis, blacklist filtering, or rule-based detection, which are insufficient against modern phishing attacks that continuously evolve with obfuscation techniques and social engineering strategies. This paper presents PhishGuard, a multimodal phishing email detection framework that integrates header analysis, natural language processing (NLP)-based content analysis, URL feature engineering, image-based forensic inspection, and a context-aware fusion engine to provide comprehensive threat detection. The system is trained and evaluated on a combined dataset of 114,494 emails from the SpamAssassin public corpus and the MeAJOR dataset, consisting of 64,742 legitimate and 49,752 phishing emails. Each module employs specialized machine learning models including logistic regression for header analysis using sender metadata, TF-IDF-based Naïve Bayes for detecting suspicious language patterns, Random Forest for URL analysis with entropy and structural features, and Random Forest image classification using color histograms, edge gradients, and spatial statistics. A context-aware weighted fusion engine combines predictions using three adaptive trust modes: header-dominant for typosquat senders, URL-dominant for trusted senders, and text-dominant for unknown senders, ensuring robust decision-making across diverse phishing scenarios. The system is deployed as a real-time REST API with an interactive web dashboard that provides dataset insights, per-email score breakdowns, and live prediction capabilities with interpretable explanations. Experimental results demonstrate that PhishGuard achieves 92.62% accuracy with an ROC-AUC of 0.9766, outperforming single-modality baselines and improving detection reliability. The proposed framework offers a scalable, intelligent, and adaptive solution capable of detecting emerging phishing techniques, making it suitable for enterprise email gateways, cloud-based security systems, and individual user protection environments.

Keywords-Phishing detection, machine learning, email security, text analysis, URL analysis, image analysis, multimodal system, cyber security

ICRIT377

REGRESSION-BASED DYNAMIC PRICING AND ROUTE OPTIMIZATION FOR DIRECT FARMER-TO-CONSUMER AGRICULTURAL DELIVERY

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Abstract-- Agricultural marketing systems often involve multiple intermediaries between farmers and consumers. While these intermediaries support distribution, they frequently reduce the share of revenue received by farmers and increase the final market price for consumers. Recent developments in digital platforms have created opportunities for direct farmer-to-consumer transactions; however, many existing systems still depend on static pricing mechanisms and basic delivery planning. This study proposes a web-based agricultural distribution platform that integrates price prediction with delivery route optimization. Historical crop price data obtained from the Agricultural Produce Market Committee (APMC) and Agmarknet databases are used to train regression-based forecasting models. The dataset contains approximately 5,000 to 20,000 market records covering crop type, market location, historical price trends, seasonal factors, arrival quantity, and weather information. Machine learning models implemented using the Python scikit-learn ecosystem, along with XGBoost and Prophet forecasting techniques, are used to estimate market price variations. These predicted prices are utilized to support adaptive product pricing within the platform. To improve delivery efficiency, the system incorporates Dijkstra's shortest path algorithm for route optimization and introduces a location-based order clustering approach that groups nearby orders into a single delivery plan. Experimental evaluation using historical market data indicates that the proposed system can support more responsive pricing decisions while improving delivery efficiency for farmer-to-consumer distribution.

Keywords— Dynamic Pricing, Agricultural E-commerce, Price Prediction, Route Optimization, Dijkstra Algorithm, Order Clustering, Farmer-to-Consumer Systems.

ICRIT378

AN INTELLIGENT AI-BASED FARMER SUPPORT SYSTEM FOR SMART AGRICULTURE

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Abstract— Smallholder farming communities across India are routinely deprived of timely agronomic guidance due to language barriers, geographic remoteness, and the prohibitive cost of professional consultation. This paper presents an intelligent AI-based farmer support system for smart agriculture, a multimodal intelligent web platform that addresses these gaps through four integrated AI-driven services: automated crop disease diagnosis using a convolutional neural network trained on the PlantVillage dataset, a bilingual Tamil–English conversational assistant, machine-learning-based soil moisture prediction using a Random Forest model, and rule-based weather farming recommendations. The system couples a reactive web application framework with cloud-hosted large language models, a dedicated Python machine learning microservice, and real-time weather data to deliver context-aware advisory responses. A bidirectional translation layer ensures uniform accessibility in both Tamil and English throughout every module. The paper describes the conceptual architecture, functional design, and farmer-oriented user experience of the system, and outlines a future roadmap encompassing IoT integration, mobile deployment, and offline AI capability.

Keywords— multimodal agricultural advisory, crop disease detection, PlantVillage dataset, convolutional neural network, Random Forest, soil moisture prediction, bilingual NLP, Tamil–English translation, large language models, weather recommendation, farmer decision support

ICRIT379

REAL TIME MISINFORMATION PROPAGATION PREDICTION ON ENCRYPTED SOCIAL PLATFORMS

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Abstract

The rapid spread of misinformation across encrypted social media platforms has emerged as a critical threat to public discourse, democratic processes, and social stability. Traditional content moderation approaches are rendered ineffective in end-to-end encrypted environments, where message content cannot be directly inspected. This project proposes a real-time misinformation propagation prediction system that operates without breaching user privacy or decrypting message content. The proposed framework integrates machine learning algorithms, natural language processing (NLP) techniques, and graph-based network topology analysis to detect and forecast the spread of false information. By analyzing metadata signals such as message frequency, forwarding patterns, propagation velocity, user interaction graphs, and behavioral anomalies, the system constructs a dynamic propagation model capable of identifying suspicious information flows in real time. A graph-based propagation model tracks how content spreads across network nodes, while a predictive engine estimates the likelihood and potential reach of misinformation before it achieves viral scale. The system is evaluated on standard benchmark datasets and demonstrates high precision and recall in early-stage detection. The results confirm that the proposed approach offers an effective, scalable, and privacy-preserving solution for platform moderators, cybersecurity analysts, and policy enforcement agencies.

Keywords

Misinformation Detection, Encrypted Social Platforms, Real-Time Prediction, Machine Learning, Natural Language Processing, Network Propagation, Metadata Analysis, Privacy Preservation, Graph-Based Modelling, Behavioral Anomaly Detection.

ICRIT381

ANALYSIS OF HUMAN HAIR FOLLICLES IN SCALPS USING AIML & IMAGE PROCESSING

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Abstract

Stress, pollution, modern lifestyle difficulties, and bad hair care routines are all responsible for the rise in hair and scalp diseases. Avoiding serious hair loss and damage to the scalp depends on an early and accurate diagnosis, but regular clinical evaluation is frequently expensive, subjective, and time-consuming. This study suggests an automated approach which utilizes deep learning and artificial intelligence to recognize and classify human scalp and hair diseases. To improve scalp images, the system uses image preprocessing techniques such as noise reduction, image sharpening, and Contrast Limited Adaptive Histogram Equalization (CLAHE). A lightweight Convolutional Neural Network utilizing MobileNetV2 is being used for efficient and accurate classification. A publicly available Kaggle dataset having a variety of scalp condition groups is used for learning and evaluating the algorithm. The research results attain a classification accuracy of 99.8%, confirming the efficacy of the proposed methodology. The tool demonstrates significant potential for early diagnosis, dermatological guidance, and telemedicine applications.

SMART AGRICULTURE MONITORING AND AUTOMATED IRRIGATION SYSTEM

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Abstract

Smart Agricultural Monitoring System is an innovative solution that integrates modern technologies like Internet of Things (IoT), sensors, and automation to improve agricultural productivity and efficiency. Traditional farming methods rely heavily on manual monitoring, which is time-consuming and less accurate. This system uses sensors to monitor environmental conditions such as soil moisture, temperature, humidity, and water levels in real time. The collected data is transmitted to a centralized system where farmers can analyze it using mobile or web applications. Automated irrigation systems can be triggered based on soil moisture levels, ensuring optimal water usage and reducing wastage. The system promotes sustainable farming practices by enabling precise resource management.

Keywords

Smart Agriculture, IoT, Sensors, Automation, Precision Farming, Sustainable Agriculture

AI CHATBOT SYSTEM FOR SUPPORTING DEPRESSION TREATMENT AND CONTINUOUS MENTAL HEALTH CARE

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Abstract

The increasing prevalence of mental health disorders, particularly depression, highlights the urgent need for accessible, continuous, and effective support systems. Traditional mental health treatments often face challenges such as incomplete symptom alleviation, patient attrition, and lack of consistent follow-up care. This report proposes the development of an AI-powered chatbot system designed to support depression treatment and ensure continuous mental health care. By leveraging Artificial Intelligence (AI), Natural Language Processing (NLP), and Machine Learning (ML), the chatbot can provide real-time emotional support, monitor user behavior, and deliver personalized interventions. The system aims to enhance patient engagement, reduce dropout rates.

PROCESS DESIGN AND OPTIMIZATION FOR BIOPESTICIDE PRODUCTION FROM BIOWASTE MATERIALS

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Abstract

The excessive use of chemical pesticides has led to significant environmental pollution and adverse effects on human health. This study focuses on the development of an eco-friendly biopesticide using biowaste materials. Agricultural wastes such as sugarcane bagasse and neem cake were utilized as cost-effective substrates for microbial growth. *Bacillus* species were cultured in nutrient broth and inoculated into sterilized raw materials under controlled conditions. Key process parameters including temperature, pH, and incubation time were optimized to enhance microbial activity and maximize product yield. The produced biopesticide exhibited effective pest control properties and demonstrated environmental safety. This approach not only reduces agricultural waste but also provides a sustainable and economical alternative to conventional chemical pesticides. The study highlights the potential of biowaste-based biopesticide production as a scalable solution for sustainable agriculture.

Keywords

Bacillus subtilis, Solid-State Fermentation, Sugarcane Bagasse, Biopesticide, Optimization, Waste-to-Wealth

TRAFFIC VIOLATION DETECTION AND PREDICTION SYSTEM USING YOLOV8

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Abstract

The rise in road accidents and traffic violations necessitates efficient automated monitoring systems. This paper presents a YOLOv8-based traffic violation detection and prediction system to identify no-helmet riding, triple riding, and hit-and-run incidents using real-time surveillance data. The model enables fast and accurate detection of vehicles and rider behaviors. Additionally, a prediction module analyzes historical data to identify potential risk patterns. The proposed system reduces manual monitoring, improves enforcement efficiency, and enhances road safety, demonstrating reliable performance under varying traffic conditions. By enabling proactive interventions, such as automatically generating and sending challans to individuals who commit traffic violations, the proposed solution not only strengthens law enforcement but also contributes to the development of smarter and safer transportation systems.

Keywords

YOLOv8, Traffic Violation Detection, Deep Learning, Computer Vision, Hit-and-Run Detection, Road Safety

TEXTILE-INTEGRATED WEARABLE DEVICE FOR REAL-TIME HEALTH MONITORING USING IOT AND AI

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Abstract

Continuous health monitoring is often limited by bulky devices, irregular measurements, and delays in identifying abnormal conditions, which restrict timely medical intervention. To address these challenges, a textile-integrated wearable system has been developed for real-time tracking of vital signs. The system is designed to be lightweight, flexible, and comfortable, allowing users to wear it continuously without inconvenience. This approach ensures seamless health monitoring in daily life while improving the reliability of collected data. The wearable integrates multiple sensors to capture essential physiological parameters. Body temperature is measured using the DS18B20 sensor, while heart rate and blood oxygen saturation (SpO₂) are monitored using the MAX30100 sensor. ECG signals are obtained through the AD8232 module, and respiration rate is detected using a flex sensor. These components work together to provide a comprehensive overview of the user's health status in real time. An ESP32 microcontroller serves as the core unit, collecting sensor data and transmitting it to an IoT-based cloud platform, ThingSpeak. This enables real-time visualization through a web dashboard, allowing both users and healthcare professionals to monitor health parameters remotely. The system ensures continuous data availability and supports quick response during abnormal conditions. Additionally, a PC-based Python environment is used to implement machine learning algorithms for data analysis. These models detect anomalies, identify trends, and predict potential health risks, enabling early warning and preventive care. By combining IoT and AI, the system enhances healthcare decision-making. Overall, the textile-integrated design provides a practical and efficient solution for continuous, personalized, and real-time health monitoring. **Keywords**— Textile-Integrated Wearable IoT Monitoring ESP32, Machine Learning, Real-Time Tracking

SMART HELMET FOR ENHANCED RIDER SAFETY AND ACCIDENT PREVENTION

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Abstract : Road accidents involving two-wheeler riders are a major cause of injuries and fatalities, often resulting from drunk driving and delayed emergency response. Traditional helmets offer only passive protection and lack preventive and post-accident support mechanisms. This paper presents a Smart Helmet—based safety system designed to actively prevent accidents and improve emergency response efficiency. The proposed system integrates an alcohol detection sensor to monitor the rider's condition before vehicle operation. If alcohol consumption exceeds a safe threshold, the system automatically disables the bike's ignition, effectively preventing drink-and-drive incidents. Additionally, motion and impact sensors continuously monitor riding conditions to detect accidents in real time. Upon accident detection, the system immediately captures the rider's precise location using a GPS module and transmits this information to the nearest police station or emergency authority through a wireless communication network. The smart helmet is designed to be reliable, energy-efficient, and easy to implement without affecting rider comfort. Its compact and cost-effective design enables seamless integration with existing two-wheelers. Experimental results indicate accurate alcohol detection, timely accident identification, and rapid location reporting, significantly reducing emergency response time. The proposed system provides an effective and practical solution to enhance rider safety and reduce accident-related fatalities through intelligent prevention and automated emergency communication.

**SPATIALLY MULTIPLEXED SCALABLE CODING FOR HIGH RESOLUTION SNAPSHOT
COMPRESSIVE VIDEO**

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Abstract— High-speed video acquisition plays a crucial role in capturing dynamic scenes where rapid changes occur within very shorttime intervals. However, conventional video processing methods require high frame rates, large storage capacity, and significantcomputational resources, making them inefficient for practical applications. Snapshot Compressive Video (SCV) has emerged as aneffective solution to address these challenges by compressing multiple video frames into a single snapshot image, which is laterreconstructed into the original sequence using computational algorithms. Although SCV significantly reduces data size and improves efficiency, traditional approaches mainly rely on temporal compression, often leading to loss of spatial details and reducedreconstruction quality. The method integrates spatial multiplexing with temporal compression, allowinginformation to be distributed across both spatial and temporal domains.The system is implemented using Python, where theinput video is processed through spatial multiplexing, coded aperture masking, and snapshot generation. Reconstruction isperformed using advanced algorithms such as GAP-TV, RevSCI, STT, and SCI3D, followed by upscaling techniques includingEDSR, 2DI, 3DI, TC, and VSR to enhance visual quality. The performance of the proposed system is evaluated using standardmetrics such as Peak Signal to Noise Ratio (PSNR) and Structural Similarity Index Measure (SSIM). Experimental resultsdemonstrate that the inclusion of spatial multiplexing significantly improves reconstruction accuracy, achieving approximately 97%overall performance. The proposed method provides better clarity, reduced distortion, and enhanced detail preservation compared toconventional approaches.

Keywords— Snapshot Compressive Video (SCV), Spatial Multiplexing, Temporal Compression, High-Resolution Video Processing, Coded ApertureMasking, GAP-TV Reconstruction, RevSCI, SCI3D, Video Super Resolution (VSR), Peak Signal-to-Noise Ratio (PSNR), Structural SimilarityIndex (SSIM).

ICRIT389

**DESIGN AND IMPLEMENTATION OF AN ARDUINO – BASED HOME AUTOMATION SYSTEM USING
LDR AND PIR SENSOR**

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Abstract: This research presents an Intelligent Energy Management System designed tominimize electricity wastage in institutional environments using an Arduino Nanomicrocontroller. The system features a dual-layer control logic: a Light Dependent Resistor(LDR) for autonomous day/night detection and a distributed network of PIR sensors forgranular, zone-wise occupancy monitoring.Unlike traditional manual systems, this prototype independently controls five specific cabinareas, ensuring that lights and fans are active only when both human presence is detectedand ambient light is insufficient. A potentiometer-based hardware interface allows forrealtime adjustment of the inactivity timer, while an I2C LCD provides continuous statusupdates. The implementation demonstrates a cost-effective and reliable solution forreducing energy overheads, making it highly suitable for Smart Campus applications and sustainable building automation.

Keywords: Arduino Nano, PIR Sensor, LDR, Energy Management, Occupancy Detection,Staff Room Automation, Relay Control

XR-BASED TACTICAL SUPPORT SYSTEM USING EDGE-AI FOR REAL-TIME THREAT DETECTION

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Abstract

This paper presents an Extended Reality (XR)-based tactical support system integrated with Edge-AI for real-time threat detection and monitoring. The system is designed to assist personnel in high-risk environments by providing immediate situational awareness and rapid response mechanisms. It combines multiple sensors such as vibration sensors, PIR sensors, and camera modules with microcontrollers like ESP8266 to enable real-time data acquisition and processing. The captured data is analyzed locally to reduce latency and eliminate dependency on cloud-based processing. Alerts are generated through visual and audio interfaces including OLED display, LCD, LED, and buzzer. Wireless communication ensures data transmission between field units and base stations. The system is compact, portable, and energy-efficient, making it suitable for applications in defense, industrial safety, and surveillance.

Keywords

Extended Reality (XR), Edge-AI, ESP8266, IoT, Real-time Monitoring, Threat Detection, Embedded Systems

FIT TRACK-PERSONAL FITNESS & HEALTH MONITORING APP

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Abstract

In today's modern lifestyle, many people face increasing health issues due to lack of physical activity, improper diet, irregular routines, and poor fitness monitoring. The growing dependence on technology and sedentary habits has significantly reduced daily physical movement, leading to problems such as obesity, stress, and lifestyle-related diseases. Due to limited awareness, busy schedules, and lack of proper tracking systems, individuals often fail to monitor their health effectively or stay consistent with fitness goals. To address these challenges, the proposed "Fit Track – Personal Fitness & Health Monitoring System" is a web-based application designed to help users monitor and improve their daily fitness activities in a simple and organized manner. The system enables users to calculate their Body Mass Index (BMI), store personal health data such as weight, height, and age, track workout routines, and analyze their fitness progress over time using interactive visual charts and dashboards. The application is developed using modern technologies such as Spring Boot for backend processing, MySQL for secure data storage, and Chart.js for graphical representation of data. These technologies ensure efficient data management, accuracy, and a user-friendly interface. One of the key features of the system is an AI-powered voice assistant, which allows users to interact with the application using voice commands. This feature is especially useful during workouts, as users can receive guidance, updates, and feedback without manually accessing the system. Additionally, the system provides basic health suggestions based on BMI results, helping users make informed decisions about their lifestyle. Overall, the Fit Track system aims to promote healthier living by combining technology, convenience, and smart monitoring.

AI BASED HELMET FOR ACCIDENT RESCUE SYSTEM

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Abstract

This paper presents an AI-based smart helmet system designed to improve road safety and provide rapid accident rescue. The proposed system integrates multiple sensors such as alcohol sensor, accelerometer, and drowsiness sensor with a microcontroller unit. The system ensures that the bike ignition starts only when the rider wears a helmet and is not under the influence of alcohol. In case of an accident, the accelerometer detects abnormal motion and automatically sends an alert message along with GPS location to emergency contacts using GSM technology. The system also supports real-time monitoring and enhances rider safety by preventing accidents and enabling faster medical assistance. This solution contributes to reducing fatalities caused by delayed rescue operations.

DEVELOPMENT OF AN SVM-BASED FAULT CLASSIFICATION MODEL FOR WIND TURBINES

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Abstract

This project, titled “Windmill Monitoring using SVM: Use Support Vector Machines (SVM) to classify windmill conditions (Healthy vs. Faulty)”, focuses on developing an intelligent machine learning system to monitor the operational health of wind turbines. The system uses important parameters such as wind speed, blade angle, gearbox temperature, generator temperature, motor torque, and generated power to determine whether a windmill is operating normally or experiencing faults. The data is first preprocessed using scaling to improve performance and reduce dimensionality. A Support Vector Machine (SVM) model is then trained and optimized using GridSearchCV to achieve high classification accuracy. The model performance is evaluated using metrics such as accuracy, hinge loss, confusion matrix, ROC curve, and Precision-Recall analysis. All trained models and plots are saved for future use and deployment. This approach provides a reliable and automated solution for early fault detection, helping to reduce maintenance costs, prevent unexpected failures, and improve the overall efficiency and lifespan of wind energy systems.

MOTOR FAULT DETECTION USING VIBRATION ANALYSIS AND MACHINE LEARNING

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Abstract— Unexpected failures in rotating machinery can lead to increased maintenance costs, production downtime, and reduced operational efficiency in industrial environments. To address this problem, a motor fault detection system based on vibration analysis and machine learning techniques is proposed. The developed system continuously monitors vibration signals generated by a motor to detect abnormal operating conditions at an early stage. In the proposed system, vibration signals are captured using an ADXL345 accelerometer sensor connected to an ESP32 microcontroller. The accelerometer converts mechanical vibrations into electrical signals, which are collected through the microcontroller using an I²C communication interface. The obtained vibration data is analyzed using statistical feature extraction techniques to determine important vibration parameters such as Root Mean Square (RMS), peak value, mean, and standard deviation. These extracted features are used as input parameters for machine learning algorithms including Random Forest and Support Vector Machine (SVM) to classify motor operating conditions. The system can identify different motor states such as normal operation, inner race fault, and outer race fault. A graphical user interface (UI) is developed to visualize vibration parameters and display the diagnostic results in real time. The proposed system provides an intelligent and automated solution for monitoring motor health. It enables early fault detection, reduces unexpected machine failures, and supports predictive maintenance in industrial environments.

Keywords— Motor Fault Detection, Machine Learning, Vibration Analysis, Predictive Maintenance

**AI BASED BATTERY HEALTH MONITORING AND THERMAL MANAGEMENT
SYSTEM FOR EV SYSTEM**

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Abstract: The rapid growth of electric vehicles (EVs) has increased the need for efficient battery management systems that ensure safety, reliability, and long operational life. Batteries are the core component of EVs, and their performance is highly influenced by factors such as temperature, charging cycles, and usage patterns. Traditional battery management systems (BMS) rely on fixed algorithms and limited sensing, which often fail to accurately predict battery degradation or prevent thermal issues. To overcome these limitations, an AI-based Battery Health Monitoring and Thermal Management System is proposed. This system integrates advanced sensors, data acquisition modules, and artificial intelligence techniques to continuously monitor key battery parameters such as voltage, current, temperature, and state of charge (SOC). The collected data is processed using machine learning models to estimate the State of Health (SOH) of the battery with high accuracy. AI algorithms can identify patterns and anomalies in real time, enabling early detection of faults such as overheating, internal short circuits, or capacity fading. Thermal management is a critical aspect of EV battery performance. Excessive heat can degrade battery life and even lead to hazardous situations like thermal runaway. The proposed system uses AI models to predict temperature rise under different operating conditions and dynamically control cooling mechanisms such as fans, liquid cooling systems, or heat sinks. By maintaining an optimal temperature range, the system enhances battery efficiency and safety.

REAL-TIME SECURITY OPERATIONS CENTER FOR CRITICAL INFRASTRUCTURE PROTECTION

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Abstract

The increasing complexity and frequency of cyber threats demand robust and real-time monitoring systems, especially for critical infrastructure environments. This paper presents a Real-Time Security Operations Center (SOC) system designed to enhance cybersecurity through continuous log monitoring and automated threat mitigation. The system collects and analyzes system-generated logs to identify malicious activities such as brute-force attacks, unauthorized access attempts, and privilege escalation. A rule-based detection mechanism is employed to classify threats into multiple severity levels, enabling efficient prioritization and response. Automated mitigation strategies, including alert generation and IP blocking, are triggered to reduce response time and limit potential damage. Additionally, a centralized web-based dashboard provides real-time visualization, enabling administrators to monitor system status and security events effectively. The proposed system demonstrates a lightweight yet efficient approach to implementing SOC functionalities in a controlled environment.

AUTOMATIC POWER FACTOR CORRECTION SYSTEM (REAL TIME)

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Abstract

This project presents the design and implementation of a real- time automatic powerfactor correction (APFC) system aimed at improving the efficiency of electrical powerusage in industrial and domestic loads. Power factor degradation, mainly caused byinductive loads such as motors and transformers, leads to increased losses, voltagedrops, and higher electricity costs. The proposed system continuously monitors thepower factor using sensors and a microcontroller-based control unit. Based on real-time measurements, it automatically switches capacitor banks through relays tocompensate for reactive power and maintain the power factor close to unity. Thisdynamic correction reduces energy losses, enhances system stability, and minimizespenalty charges imposed by utility providers. The system is cost- effective, reliable, andadaptable to varying load conditions, making it suitable for modern smart powermanagement applications.

**PHYSICAL HEALTHCARE MODEL FOR CONTINUOUS VITAL SIGNTRACKING AND LIVE LOCATION
DETECTION OF DEMENTIAPATIENTS**

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Abstract

The increasing number of elderly people suffering from dementia has created a need for continuous monitoring systems to ensure their safety and well-being. Dementia patients often experience memory loss, confusion, and disorientation, leading to wandering and health risks. This paper proposes a physical healthcare smart wearable watch model for continuous vital sign monitoring and live location tracking. The system integrates sensors such as heart rate, SpO₂, and MEMS accelerometer with a microcontroller to continuously monitor physiological parameters. A GPS module enables real-time location tracking, while IoT communication ensures data transmission to caregivers. The proposed model enhances patient safety, reduces caregiver burden, and supports real-time health monitoring.

QUANTUM BATTERY TECHNOLOGY FOR ULTRA-FAST ENERGY STORAGE

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Abstract

Quantum battery technology is an emerging energy storage concept based on principles of Quantum Mechanics. Unlike conventional batteries that depend on electrochemical reactions, quantum batteries store energy in discrete quantum states of systems such as atoms or qubits. By exploiting phenomena like Quantum Entanglement and Quantum Superposition, these devices enable collective charging, where multiple units absorb energy simultaneously, significantly reducing charging time. Quantum batteries offer advantages such as ultra-fast charging, high energy efficiency, and minimal thermal losses. They also exhibit improved lifespan due to the absence of chemical degradation. However, practical implementation faces challenges including decoherence, system stability, and scalability. Advances in Nanotechnology and quantum control are essential to overcome these issues. With continued research, quantum batteries have the potential to revolutionize applications in electric vehicles, portable electronics, and renewable energy systems.

COMPARISON OF MACHINE LEARNING METHODS IN PREDICTION OF ANOMALY IN POWER GRID

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Abstract

The data obtained by Smart grid usually has fault creatable values in specified sensor creating thelagging in robust nature and detecting methods automatically. For ornamental industrial effectiveness andto monitor equipment health, the combination of Advanced Metering Infrastructure (AMI) gives electricalparameters with more resolute one. This paper evaluates several models of machine learning such asRandom Forest, LightGBM) and Support Vector Machines (SVM) through a real time dataset acquiredfrom Manufactory Company which creates anomaly with the rate of contamination of 5%. The resultsobtained after simulation using algorithms, gives average F1 Score nearly 0,25 somewhat smash theanother machine learning methods with improved accuracy. Precision values ranges from 0.07 to 0.2showing the presence of increased false positives in confusion matrix. Improved optimization is done indifferentiating true positive and false negative.

BLOCKCHAIN-BASED DECENTRALIZED CLOUDSTORAGE WITH PRIVACY-PRESERVING ACCESSCONTROL USING IPFS AND ECC

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Abstract

The rapid expansion of digital services has intensified the need for secure and privacy-preservingaccess control mechanisms. Traditional centralized authorization systems depend on a single authority tomanage user authentication and store sensitive information, making them highly vulnerable to data breaches,unauthorized access, and privacy violations. These systems often lack transparency and require users to placecomplete trust in third-party service providers. To address these limitations, the proposed system introduces adecentralized access control framework that eliminates reliance on centralized entities while enhancing datasecurity and user privacy. The system leverages blockchain technology and distributed ledger mechanisms tocreate a trustless and tamper-resistant environment where users retain full control over their data and accesspermissions. Advanced cryptographic techniques, including symmetric encryption and proxy re-encryption, areemployed to ensure that only authorized users can access encrypted resources. Additionally, the InterPlanetaryFile System (IPFS) is integrated to provide decentralized storage, improving data availability and eliminatingsingle points of failure. Zero-knowledge proofs further enhance privacy by enabling users to verify access rightswithout revealing sensitive information. Overall, the proposed solution offers a scalable, secure, and transparentapproach to decentralized data sharing and access control.

**INTERVIEWBO: MULTIMODAL INTELLIGENCE SYSTEM FOR END-TO-END RECRUITMENT
PROCESS AUTOMATION AND SKILL INTERPRETATION**

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Abstract

InterviewBo is an AI-powered recruitment platform designed to automate the end-to-end hiring process while improving fairness, efficiency, and accuracy in candidate evaluation. The system integrates Sentence-BERT (SBERT) for semantic resume-job matching, Gradient Boosting Classifier (GBC) for aptitude assessment, and Code2Vec for programming skill evaluation. In the final stage, a fine-tuned T5 model generates personalized interview questions through a virtual HR avatar. Candidate responses are analyzed using MFCC with BiLSTM for speech evaluation and a Spatiotemporal Attention Network for facial behavior analysis. By combining multimodal AI techniques, the system enables objective performance profiling and supports data-driven hiring decisions while reducing human bias and recruitment time.

**PERFORMANCE ANALYSIS OF PI CONTROLLED TRIPLE LIFT CONVERTER USING INDUCTOR
CURRENT TRACKING ALGORITHM**

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Abstract

The growing use of renewable energy sources, particularly solar power, has increased the need for efficient power conversion techniques due to their low and varying output voltage. This project focuses on the performance analysis of a PI-controlled triple lift DC-DC converter integrated with an inductor current tracking algorithm. The triple lift converter is selected for its ability to achieve high voltage gain without the use of bulky transformers, making it suitable for compact and efficient energy systems. In this work, a multi-source configuration is considered, which includes a DC supply, a battery, and a solar panel. To ensure maximum power extraction from the solar source, a Maximum Power Point Tracking (MPPT) technique is implemented. In addition, a Constant Current-Constant Voltage (CCCV) method is used to provide safe and effective battery charging. The overall system is controlled using an FPGA, which enables fast and precise switching control. A closed-loop control strategy is employed to maintain a stable output voltage. The output is continuously monitored and compared with a reference value, and the resulting error is processed through a Proportional-Integral (PI) controller. The controller generates a reference current, which is further regulated using an inductor current tracking algorithm to improve dynamic response and reduce fluctuations. Pulse Width Modulation (PWM) is used to control the switching operation of the converter. The system performance is analysed under both open-loop and closed-loop conditions for different input voltages and duty cycles. The results indicate that the closed-loop configuration provides improved voltage regulation, reduced ripple, and better overall stability compared to the open-loop system. This demonstrates the effectiveness of the proposed control strategy for renewable energy applications.

CYBER SHADOWS: NEUTRALIZING SECURITY THREATS WITH AI AND TARGETED POLICY MEASURES

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Abstract: In today's digital era, the frequency and sophistication of cyber threats are increasing at an alarming rate, posing serious challenges to data security and network reliability. Conventional cyber threat monitoring systems that rely on rule-based or signature-based approaches often fail to detect new and evolving attacks due to their static nature. To overcome these limitations, this project proposes an intelligent Cyber Threat Intelligence Monitoring System that integrates Convolutional Neural Networks (CNN) and Long Short-Term Memory (LSTM) models. The CNN component efficiently extracts spatial patterns from cyber threat data, identifying anomalies in traffic flow, malicious URLs, and abnormal system behavior. Meanwhile, the LSTM component captures temporal dependencies and evolving sequences of threat patterns, enabling the system to recognize emerging or previously unseen attacks. The proposed hybrid CNN-LSTM model is trained using a Cyber Threat Monitoring dataset, which includes diverse threat indicators such as phishing domains, malware traces, and other network-based anomalies. The system follows a structured pipeline involving data acquisition, preprocessing, feature extraction, and classification, allowing for accurate detection and prediction of cyber threats. By combining the strengths of CNN's spatial analysis and LSTM's temporal learning, the model achieves a deeper understanding of both static and dynamic threat characteristics. Evaluation through metrics such as accuracy, precision, recall, and F1-score demonstrates the system's superior performance compared to traditional machine learning-based monitoring tools.

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A MULTI-LAYER IMAGE CYBER SECURITY MODEL USING CONTROLLED RECONSTRUCTION FOR SECURE DATA TRANSMISSION

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Abstract: Cyber Secure transmission of sensitive information has become a critical requirement in modern cyber and defense communication systems. Conventional encryption techniques provide strong protection; however, they remain vulnerable when attackers gain access to encryption keys or intercept encrypted files. To address this limitation, this paper proposes a Multi-Security Image Cyber Model designed for highly confidential data transmission environments such as military communication networks. The proposed framework introduces a multi-image based security architecture where a set of five cover images is initially collected and processed. From this set, three images are dynamically selected using a controlled selection mechanism to reduce predictability. Sensitive data is then embedded within the selected images using a matrix-based embedding structure. The system generates a single reconstruction password at a predefined reference point, which acts as the unified key required to combine the three images and recover the hidden information. Unlike conventional methods that rely on a single encrypted carrier, the proposed model distributes security parameters across multiple images and integrates them through a tri-component reconstruction process. Even if an adversary intercepts the transmitted images or partially discovers the authentication key, reconstructing the original confidential data remains extremely difficult because the security structure depends on the correct image combination and reconstruction point. The proposed approach offers enhanced resistance against brute-force attacks, interception threats, and unauthorized decoding, while maintaining efficient transmission performance. The architecture demonstrates a flexible and robust security model suitable for applications requiring high confidentiality, controlled reconstruction, and multi-layer cyber protection.

AI-BASED REAL-TIME ANIMAL DETECTION AND ALERT SYSTEM FOR NIGHTTIME ROAD SAFETY

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Abstract

Unexpected animal crossings on the road are a serious risk, especially at night when visibility is poor. The suggested solution includes an intelligent animal identification and alert framework with the goal of improving road safety through ongoing monitoring in order to address this issue. The system makes use of a high-resolution night-vision camera to record traffic in real time, allowing for round-the-clock monitoring under difficult circumstances. Even in dim or hazy conditions, deep learning methods like You Only Look Once (YOLO) and Convolutional Neural Networks (CNN) are used to reliably identify animals. The device lowers the chance of collisions by instantly sending out alarm signals to warn oncoming cars upon detection. This automated method reduces human interaction and offers a scalable solution appropriate for rural and highway roads. The integration of AI-based vision technology with real-time detection ensures rapid response and efficient performance. The suggested solution seeks to greatly lower animal-related traffic accidents and increase nighttime driving safety by fusing automation, deep learning, and proactive alert systems.

IOT-BASED SMART HOME POWER MANAGEMENT WITH FAULT DETECTION AND AUTO BACKUP SWITCHING

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Abstract

The rapid proliferation of smart devices and IoT technologies has transformed conventional homes into intelligent living spaces. This paper presents the design and implementation of an IoT-Based Smart Home Power Management System with integrated Fault Detection and Automatic Backup Power Switching. The proposed system employs a microcontroller (Arduino Uno) interfaced with an ACS712 Hall-effect current sensor, a ZMPT101B voltage sensor, dual relay modules, and an ESP8266 Wi-Fi module. The system continuously monitors real-time electrical parameters — voltage, current, and power — of the household supply. A software-based fault detection algorithm identifies anomalies including overcurrent ($I > 15A$), overvoltage ($V > 260V$), undervoltage, and complete mains failure ($V < 180V$). Upon detection of any fault condition, the system immediately trips the primary relay to isolate the mains supply, activates an audible buzzer alert, and — in the event of a mains failure — automatically engages a secondary relay to connect a backup inverter or battery source within 20 milliseconds, ensuring uninterrupted power to critical loads. All sensor data is transmitted to the ThingSpeak IoT cloud platform via the ESP8266 module for real-time remote monitoring and historical analysis. A 16×2 LCD display provides local status visualization. The system was simulated using Circuit Designer and validated through hardware testing. Results demonstrate accurate fault detection, reliable automatic backup switching, and successful cloud data transmission, establishing the system as a cost-effective and scalable solution for residential smart energy management.

DESIGN AND DEVELOPMENT OF ELECTRIC TRICYCLE FOR LOAD TRANSPORTATION

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Abstract

Increasing environmental concerns and the need for economical transportation solutions have driven the advancement of electric-assisted cargo systems for urban applications. This work describes the development and integration of an electric cargo tricycle designed to improve goods transportation efficiency while reducing operator effort in short-distance operations. The proposed vehicle is powered by a 750 W Brush-less Direct Current motor controlled through a 30A motor controller and supported by a 48 V, 30Ah lead-acid battery system. Pedal assistance is provided through the integrated electric propulsion system, which enhances torque output and ensures stable acceleration under loaded conditions. The LDC motor is selected for its operational efficiency, durability, and low maintenance requirements. Performance factors including power consumption, velocity characteristics, estimated driving range, and overall energy utilization are analyzed to determine system effectiveness. The design prioritizes affordability, simplicity, and adaptability for urban delivery and institutional transport needs. Evaluation results indicate that the developed electric cargo tricycle represents a feasible and sustainable alternative to conventional fuel-powered light transport vehicles, promoting improved energy efficiency and reduced environmental impact.

SOCIO-ANALYSER: AN EXPLAINABLE AI FRAMEWORK FOR DEEPFAKE AND SYNTHETIC MEDIA FORENSICS

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Abstract: The rapid growth of synthetic media generation technologies has introduced significant challenges to digital trust, information authenticity, and cybersecurity. Deepfake videos, created using advanced artificial intelligence techniques, can manipulate facial expressions and speech with high realism, making them difficult to detect through conventional methods. This paper presents Socio-Analyser, an explainable artificial intelligence framework designed for detecting deepfake and synthetic media in video content through a hybrid deep learning approach. The proposed system integrates spatial feature extraction using ResNeXt architecture with temporal sequence modeling using Long Short-Term Memory networks to effectively capture both frame-level inconsistencies and temporal anomalies across video sequences. The framework performs a complete end-to-end analysis pipeline, including video input, frame extraction, face detection, preprocessing, feature learning, classification, and result visualization. Unlike traditional detection systems that focus only on classification accuracy, Socio-Analyser emphasizes interpretability by generating visual explanations such as heatmaps and confidence scores, enabling forensic analysts to understand the decision-making process of the model. The system is designed with a modular architecture that supports scalability and adaptability to evolving deepfake generation techniques. Experimental evaluation on standard benchmark datasets demonstrates that the proposed approach achieves reliable detection performance while maintaining consistency across diverse manipulated video samples. The implementation also supports real-time analysis through a web-based interface, making it practical for applications in media verification, digital forensics, and cybersecurity investigations. The results indicate that combining spatial and temporal learning with explainable outputs significantly enhances the effectiveness of deepfake detection systems. The proposed framework provides a strong foundation for future advancements in multimodal analysis, real-time deployment, and large-scale forensic monitoring systems.

DESIGN AND FABRICATION OF FIXTURE WORK FOR THE BONNET IN THE CNC

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Abstract:This project focuses on the engineering and fabrication of a specialized Mechanical Work-Holding Fixture designed to ensure high repeatability and stability during machining operations on cylindrical components. The fixture assembly comprises a substantial base plate, a vertical mounting block, and a primary adjustment mechanism utilizing a long-lead threaded rod for horizontal travel. The design incorporates a critical V-block style clamping architecture (seen in the physical prototype) which facilitates the precise centring of the workpiece relative to the tool path. To achieve the required tolerances, the system utilizes a combination of primary and secondary locators, including a stepped bushing and threaded adjustment screws that provide fine-tuned alignment along the transverse axis. The integration of high-strength M10 and M18 fasteners ensures that the assembly can withstand significant cutting forces without vibration or displacement. This project demonstrates the application of geometric dimensioning and tolerancing (GD&T) principles to create a robust industrial solution that minimizes setup time and enhances the accuracy of repetitive machining cycles, ultimately improving manufacturing throughput and part quality. The design is based on standard fixture design concepts, particularly the 3-2-1 locating principle, which restricts all degrees of freedom of the component. The developed fixture improves dimensional accuracy, reduces vibration during cutting, and minimizes setup time. Practical machining trials confirmed improved surface finish, consistent quality, and enhanced productivity.

HIGH-GAIN DC-DC CONVERTER WITH ML BASED MPPT PV SYSTEM

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Abstract:The growing dependence on renewable energy sources has necessitated the development of efficient and intelligent power conversion techniques for photovoltaic (PV) systems. In this paper, a high-gain DC–DC converter integrated with a Machine Learning (ML)-based Maximum Power Point Tracking (MPPT) algorithm is proposed to enhance energy extraction under low and variable irradiance conditions. Conventional DC–DC converters exhibit limitations such as low voltage gain, narrow operating range, and increased switching losses, particularly under low input voltage conditions. In addition, traditional MPPT techniques, including Perturb and Observe (P&O) and Incremental Conductance, suffer from slow convergence and steady-state oscillations, resulting in reduced tracking efficiency. To address these challenges, the proposed system employs a high step-up DC–DC converter topology designed to achieve substantial voltage boosting with reduced component stress and improved efficiency. An Artificial Neural Network (ANN)-based MPPT controller is developed to enable fast, accurate, and adaptive tracking of the maximum power point. The proposed ML framework utilizes sensor-acquired data, which undergo preprocessing and feature extraction before being used to train the ANN model. The trained model is deployed on an embedded platform (ATmega328) for real-time implementation, ensuring intelligent control under nonlinear and dynamically varying environmental conditions. The key contribution of this work lies in the integration of a high-gain converter with an ML-driven MPPT strategy, resulting in improved dynamic response, reduced power losses, and enhanced overall system reliability. Simulation and experimental results demonstrate that the proposed approach outperforms conventional MPPT methods in terms of tracking speed, accuracy, and efficiency. The developed system is well-suited for applications

such as standalone PV systems, solar battery charging, and rural electrification, where reliable and efficient energy conversion is critical.

ICRIT 418

ENHANCED ACCURACY CREDIT CARD FRAUD DETECTION USING CNN-LSTM MODEL

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Abstract

Credit card fraud detection has become a critical concern for financial institutions, as fraudulent transactions can result in substantial monetary losses and diminished customer trust. The rise of online transactions and digital payments has increased both the volume and complexity of fraud attempts, making traditional detection methods, such as rule-based systems and basic statistical models, increasingly inadequate. These conventional approaches often fail to identify sophisticated fraud patterns, generate high false positives, and require frequent manual updates to remain effective. To address these challenges, this project proposes an advanced fraud detection system that leverages a hybrid deep learning framework combining Convolutional Neural Networks (CNN) and Long Short-Term Memory (LSTM) networks. The CNN component is designed to automatically extract significant spatial features from transaction data, while the LSTM network captures sequential and temporal dependencies, enabling the system to detect evolving fraudulent behaviors over time. The proposed system involves comprehensive preprocessing and transformation of a large-scale credit card transaction dataset, ensuring that the data is clean, normalized, and suitable for deep learning applications. Feature engineering is applied to enhance the model's ability to distinguish between legitimate and fraudulent transactions. The hybrid CNN-LSTM model is trained and evaluated using performance metrics such as accuracy, precision, recall, and F1-score, ensuring high reliability and robustness. By integrating spatial and temporal analysis, the system provides improved fraud detection accuracy, reduced false positives, and real-time transaction monitoring capabilities.

ICRIT 419

DESIGN AND FABRICATION OF RADIATOR COOLING FAN USING FRP COMPOSITE MATERIAL

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Abstract

This project focuses on the design and fabrication of a radiator cooling fan using Fiber Reinforced Plastic (FRP) composite material. The main objective is to develop a lightweight, cost-effective, and efficient fan capable of operating at speeds up to 3500 RPM. The composite material used consists of unsaturated polyester resin as the matrix and glass fiber as reinforcement, with Methyl Ethyl Ketone Peroxide (MEKP) acting as a catalyst for curing. The fan blades are fabricated using the hand lay-up method, which is simple, economical, and suitable for small-scale production. The design ensures proper blade thickness, angle, and balance to withstand centrifugal forces and minimize vibration during operation. The use of FRP provides advantages such as corrosion resistance, reduced weight, and adequate mechanical strength compared to conventional metallic materials. The fabricated fan is tested for rotational stability, structural integrity, and performance under varying speeds. Results indicate that the FRP composite fan can safely operate within the desired range when proper manufacturing techniques and curing processes are followed. This project demonstrates the feasibility of using low-cost composite materials in automotive cooling applications and highlights the importance of material selection, fabrication quality, and dynamic balancing in achieving reliable performance.

AI BASED SMART CIVIC COMPLAINT MANAGEMENT SYSTEM

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Abstract

Rapid urbanization has significantly increased civic infrastructure challenges such as waste management inefficiencies, water leakages, road damages, and sanitation issues. Conventional civic complaint management systems rely heavily on manual processes, leading to delayed responses, inefficient classification, lack of transparency, and poor coordination between citizens and municipal authorities. To overcome these limitations, this paper proposes an AI-Based Smart Civic Complaint Management System that leverages Artificial Intelligence (AI), Machine Learning (ML), Natural Language Processing (NLP), and image processing techniques to automate and optimize the complaint handling process. The proposed system enables citizens to submit complaints through a digital platform using text descriptions, images, and location details. NLP techniques are employed to preprocess textual data, and Machine Learning algorithms such as TF-IDF with Logistic Regression are used for accurate complaint classification. A duplicate detection mechanism based on cosine similarity is incorporated to identify and eliminate redundant complaints. Predictive analytics techniques are also utilized to analyze historical data and forecast recurring civic issues, enabling proactive governance. The system enhances operational efficiency, reduces administrative workload, improves transparency through real-time tracking, and strengthens citizen engagement. It provides a scalable and intelligent solution for smart city applications, contributing to effective urban management and improved public service delivery.

ICRIT 421

PNEUMONIA DETECTION FROM CHEST X-RAY IMAGES

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Abstract

The research presents an advanced deep learning-based framework for the automated detection and classification of Pneumonia and Tuberculosis from chest X-ray images. The system leverages the ResNet architecture integrated with transfer learning to improve diagnostic accuracy and minimize computational time. By using pre-trained models, the framework effectively extracts deep features from X-ray images and distinguishes between Normal, Pneumonia, and Tuberculosis cases. The approach is further strengthened through extensive image preprocessing and data augmentation techniques such as normalization, rotation, and flipping, which enhance model generalization and robustness against variations in the dataset. Comprehensive evaluations are conducted using performance metrics including accuracy, precision, recall, F1-score, and confusion matrix analysis, confirming the reliability of the model for clinical use. The experimental outcomes reveal that the proposed system delivers high diagnostic precision and significantly reduces the dependency on manual interpretation. By offering explainable insights through attention mapping and saliency visualization, the framework improves interpretability and supports faster, data-driven clinical decisions. This study highlights the transformative potential of deep learning in medical imaging, promoting early disease detection, improved patient care, and enhanced healthcare efficiency across both advanced and resource-limited medical environments. The system demonstrates scalability for future integration with hospital databases and telemedicine platforms. Its adaptability ensures continued performance improvement with the inclusion of larger and more diverse medical datasets.

AI-DRIVEN VISUAL INSPECTION SYSTEM FOR PCB DEFECT DETECTION USING YOLOV8

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Abstract: Printed Circuit Board (PCB) inspection is a critical stage in electronics manufacturing, as even minor defects can lead to product malfunction and reduced system reliability. Conventional inspection techniques mainly rely on manual inspection or rule-based machine vision systems, which are often time-consuming, inconsistent, and prone to human error. To overcome these limitations, this paper presents an AI-driven automated PCB defect detection system using the YOLOv8 deep learning model, implemented through a web-based inspection platform. In the proposed approach, PCB images are uploaded through a web interface and processed using computer vision techniques such as image resizing, normalization, and enhancement to improve detection performance. The trained YOLOv8 model analyzes the input images and detects six common PCB defects, namely open circuits, short circuits, spur, mouse bite, spurious copper, and missing holes. The system not only classifies the defect type but also accurately localizes its position on the PCB image in near real time. The developed web-based interface enables users to upload PCB images and view inspection results easily without requiring specialized software, making the system user-friendly and flexible. Experimental results demonstrate that the proposed system achieves higher detection accuracy, reduces inspection time, and improves reliability compared to traditional manual inspection methods, making it suitable for industrial quality control and automated manufacturing applications.

A QUANTUM-ENHANCED ARTIFICIAL NEURAL NETWORK FOR EFFICIENT MEDICAL IMAGE COMPRESSION WITH SUPER-RESOLUTION ENHANCEMENT

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Abstract: Medical imaging modalities generate large volumes of data, posing critical challenges for storage and transmission in clinical environments. Traditional compression techniques such as JPEG and Deep Convolutional Autoencoders (DCAE) reduce file sizes but often sacrifice diagnostic information. This paper presents a Quantum-Enhanced Artificial Neural Network (QANN) pipeline for efficient medical image compression. The system integrates a Qiskit-based quantum feature extraction module with a Keras convolutional encoder-decoder trained on a COVID-19 chest X-ray dataset of 900 images (128×128 pixels, 80/20 train-test split). Quantum features are extracted per image using a variational quantum circuit, then used as input to a five-layer convolutional decoder trained for 40 epochs with Adam optimiser and MSE loss. Experimental results on held-out test images demonstrate that the proposed QANN achieves a compression ratio of 75% (reducing a 123,144-byte original to 6,580 bytes), outperforming the DCAE baseline at 71% (11,426 bytes). On structural quality, QANN achieves an SSIM of 0.77 versus 0.61 for DCAE, confirming better structural fidelity at higher compression. A post-reconstruction super-resolution module further enhances perceptual sharpness of decompressed images. The proposed system is well-suited to telemedicine and bandwidth-constrained healthcare applications. **Index Terms**—Quantum computing, medical image compression, quantum neural network, QANN, Qiskit, COVID-19 X-ray, SSIM, deep learning, super-resolution, variational quantum circuits.

A MULTI LAYER IMAGE CYBER SECURITY MODEL USING CONTROLLED RECONSTRUCTION FOR SECURE DATA TRANSMISSION

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Abstract: Cyber Secure transmission of sensitive information has become a critical requirement in modern cyber and defense communication systems. Conventional encryption techniques provide strong protection; however, they remain vulnerable when attackers gain access to encryption keys or intercept encrypted files. To address this limitation, this paper proposes a Multi-Security Image Cyber Model designed for highly confidential data transmission environments such as military communication networks. The proposed framework introduces a multi-image based security architecture where a set of five cover images is initially collected and processed. From this set, three images are dynamically selected using a controlled selection mechanism to reduce predictability. Sensitive data is then embedded within the selected images using a matrix-based embedding structure. The system generates a single reconstruction password at a predefined reference point, which acts as the unified key required to combine the three images and recover the hidden information. Unlike conventional methods that rely on a single encrypted carrier, the proposed model distributes security parameters across multiple images and integrates them through a tri-component reconstruction process. Even if an adversary intercepts the transmitted images or partially discovers the authentication key, reconstructing the original confidential data remains extremely difficult because the security structure depends on the correct image combination and reconstruction point. The proposed approach offers enhanced resistance against brute-force attacks, interception threats, and unauthorized decoding, while maintaining efficient transmission performance. The architecture demonstrates a flexible and robust security model suitable for applications requiring high confidentiality, controlled reconstruction, and multi-layer cyber protection.

QUAKEGUARD: WEB BASED EARTHQUAKE ANALYSIS BY USING MACHINE LEARNING MODELS

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Abstract: Earthquakes are among the most destructive natural disasters, often occurring without prior warning and causing severe damage to life and infrastructure. Accurate prediction of earthquake magnitude remains a significant challenge in modern seismology and disaster management. This paper presents QuakeGuard, a web-based real-time earthquake analysis and prediction system that integrates advanced machine learning techniques with interactive visualization tools. The proposed system utilizes a comprehensive dataset comprising five years of historical seismic data along with real-time data obtained from the United States Geological Survey (USGS). Key geological features such as latitude, longitude, and depth are used as input parameters for prediction. Multiple machine learning models, including Random Forest, XG Boost, Linear Regression, Support Vector Machine (SVM), and K-Nearest Neighbors (KNN), are trained and evaluated to capture both linear and non-linear patterns in seismic data. To enhance prediction accuracy and robustness, an ensemble learning approach is employed, where outputs from all models are combined using an averaging strategy. The system achieves strong performance with an R^2 score of approximately 0.85, RMSE of 0.37, and MAE of 0.27. In addition, the system incorporates K Means clustering to identify seismic activity zones and provides interactive heatmaps for visualizing earthquake intensity and distribution across different regions. A magnitude-based risk prediction mechanism classifies earthquakes into Low, Medium, and High-risk levels, enabling better interpretation and decision-making. The system is implemented as a full-stack web application using a Flask-based backend and a React frontend, enabling real-time data analysis, prediction, and visualization through an interactive dashboard. With low latency and high accuracy, QuakeGuard serves as an effective tool for earthquake monitoring, risk assessment, and disaster preparedness.

**AI- ENABLED AUTONOMOUS FIRE- FIGHTING AND HUMAN RESCUE ASSISTANCE ROBOT WITH
REAL TIME VISION AND ALARM SYSTEM**

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Abstract

Fire accidents pose significant risks to human life and property, especially in environments where direct human intervention is dangerous. This paper presents the design and implementation of a semi-autonomous fire fighting and human rescue assistance robot aimed at reducing human exposure in hazardous conditions. The proposed system integrates flame sensors for real time fire detection and an ESP32 CAM module for live visual monitoring. An ESP32 microcontroller serves as the central control unit, processing sensor inputs and executing movement through DC motors controlled by a motor driver. Upon detecting fire, the system automatically activates a water spraying mechanism and triggers an audible alarm to alert nearby individuals. The robot can be remotely monitored and manually guided, enabling safe navigation in smoke filled and high temperature environments. The developed system provides a cost effective and reliable solution for early fire detection, rapid response, and basic rescue assistance. It improves operational safety and reduces response time compared to conventional manual firefighting approaches. This work demonstrates the practical application of embedded systems and robotics in enhancing fire safety and emergency response operations.

ICRIT 427

**DESIGN AND IMPLEMENTATION OF AN ON-BOARD EV CHARGER WITH INTEGRATED SOLAR
ROOF ENERGY HARVESTING AND LOW VOLTAGE DC-DC CONVERSION**

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Abstract

This project proposes a Design and Implementation of an on-board EV Charger with Integrated Solar Roof Energy Harvesting and Low Voltage DC-DC Conversion. The system utilizes a high-frequency inverter coupled with an isolation transformer to ensure safe and compact AC-DC conversion from the grid, while a bidirectional DC-DC converter facilitates energy transfer between the battery pack and auxiliary low-voltage systems, enabling efficient charging and discharging operations. Solar roof integration complements grid power by feeding renewable energy into the battery via the bidirectional converter, reducing reliance on external power sources. A DSP-based PWM generator and PI controller form the control core, dynamically adjusting PWM pulses to regulate voltage/current using feedback signals (V_{ref} and V_{act}) for precise charge management. The driver circuit (TLP250) ensures robust switching of power devices, enhancing reliability. The inclusion of PWM receivers and an isolation transformer ensures noise immunity and galvanic separation, critical for safety in high-voltage environments. This topology supports versatile operation modes, including grid-to-vehicle, vehicle-to-grid, and solar-to-vehicle power flows, optimizing energy utilization. The proposed design emphasizes compactness, high power density, and bidirectional capabilities, making it suitable for modern EVs with integrated solar systems. By merging renewable energy harvesting with advanced power electronics, this charger aims to reduce carbon footprint, operational costs, and charging downtime, marking a significant step toward sustainable EV infrastructure. This project is implemented by using MATLAB SIMULINK 2024a.

MULTI-SCALE SPATIO-TEMPORAL TRAFFIC FLOW PREDICTION SYSTEM USING DEEP BELIEF NETWORKS

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Abstract:Escalating vehicle density across urban corridors has exposed the limitations of reactive traffic management strategies, driving demand for intelligent systems capable of anticipating near-future flow conditions with sufficient leadtime to enable meaningful intervention. This paper introduces a web-based, multi-scale spatio-temporal traffic flow prediction platform built around a Deep Belief Network (DBN) trained on historical road-sensor records to forecast vehicle flow at 15-minute and 30-minute horizons across a connected, multi-segment road network. A stochastic live-simulation engine models realistic operational dynamics including rush-hour intensity surges, weather-driven flow suppression, incident-induced capacity losses, and inter-segment congestion propagation. Temporal feature construction encompasses lag observations, rolling statistical summaries, and trend indicators, while spatial feature engineering derives neighbour-average flows, directional upstream and downstream contributions, and weighted adjacency scores from the road-network graph. A Flask REST API coordinates batch prediction, and an interactive Bootstrap and Chart.js dashboard delivers real-time congestion analytics. Empirical evaluation against a curated historical dataset demonstrates that the DBN-based pipeline achieves competitive predictive accuracy with computationally feasible inference latency, confirming its suitability for practical deployment in both academic and municipal traffic management environments.

FEDERATED RESNET-50-TRANSFORMER HYBRID WITH XAI FOR DISTRIBUTED IOT PREDICTIVE MAINTENANCE IN INDUSTRY 4.0

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Abstract:Despite advances in centralized deep learning for IoT predictive maintenance, challenges persist: data privacy silos across factories, computational burdens on edge devices, poor long-range temporal modeling beyond RNNs, and opaque “black-box” decisions hindering industrial trust. This Phase 2 extends the Phase 1 hybrid ResNet-50 RNN with Adagrad optimizer—reporting 100% validation accuracy on benchmark datasets—by introducing FedResTrans-XAI: a federated ResNet-50 Transformer hybrid augmented with explainable AI. ResNet-50 extracts robust spatial features from heterogeneous sensor streams (vibration, temperature, pressure), while Transformer encoders leverage self-attention for superior long-sequence dependencies, surpassing RNN limitations. Federated learning via FedAvg enables privacy-preserving collaborative training across distributed IoT edges, avoiding raw data centralization. XAI with SHAP and attention maps elucidates fault attributions, e.g., pinpointing vibration anomalies as 65% contributors. Evaluated on NASA bearing and PU roller datasets under federated settings, FedResTrans-XAI achieves 98.2% accuracy, 96.5% F1-score, 25% latency reduction vs. Phase 1, and 35% downtime savings—outperforming baselines like CNN-LSTM by 7-12% while ensuring GDPR-compliant deployment. This framework paves the way for scalable, interpretable Industry 4.0 maintenance. The interface’s intuitive evolution from setup to SHAP-explained alert positions it as a robust tool for industrial PHM, effectively detecting degradation via spectral features without overfitting pitfalls. Overall success affirms spectrogram-SHAP fusion for binary failure prediction, enabling proactive maintenance that could slash costs by 20-50% in real IoT fleets by prioritizing true positives like the 276 captured here. The tool’s phased structure from data loading (Excel/CSVs like test1.csv, balanced datasets) to multi-tab diagnostics (Accuracy, Loss, Confusion Matrix, SHAP)—facilitates end-to-end MLOps for predictive maintenance. Single-row inference bridges batch training to real-time use, ideal for edge deployment on transducers where 95% confidence triggers preemptive action, minimizing downtime in applications like satellite systems or manufacturing.

SUPERIOR PHISHING DETECTION USING LENET-TRANSFORMER HYBRID FRAMEWORK

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Abstract:Phishing attacks in 2025 have escalated with AI-generated zero-day variants exploiting obfuscated URLs and behavioral mimicry, necessitating advanced detection beyond Phase 1's LeNet + stacked autoencoder model that achieved 98.2% accuracy on numerical datasets from URLs and webpages. Traditional detection methods, such as rule-based filters and signature matching, falter against these sophisticated phishing variants due to their static nature and inability to adapt to obfuscated patterns or AI-driven mimicry. This gap exposes organizations to heightened risks, including credential theft, ransomware entry points, and widespread data breaches, underscoring the urgent need for dynamic, learning-based defenses. Automated phishing detection using machine learning surpasses traditional methods by continuously learning from vast datasets, adapting to zero-day attacks without manual signature updates that lag behind threat actors. The primary problem is Phase 1's limited capture of long-range dependencies and contextual patterns in sequential phishing data, causing vulnerabilities to imbalanced classes and novel threats that static convolutional features alone cannot generalize effectively. Phishing tactics evolve faster than rule-based or single-model defenses can update, seeing surges in encrypted, HTTPS-masked attacks. Continuous learning in hybrids enables real-time adaptation, unlike rigid systems vulnerable to zero-day exploits on numerical datasets. Organizations face escalating breach costs without scalable, inference-speed solutions under 1 second. This Phase 2 introduces a streamlined two-component hybrid: LeNet for hierarchical convolutional feature extraction followed by a Transformer encoder with multi-head self-attention for global sequence modeling and positional encoding, enabling robust binary classification without ensembles. LeNet-Transformer hybrid directly tackles these issues, promising enhanced generalization and real-time efficacy to fortify cybersecurity postures against an ever-adaptive threat landscape. The intuitive dashboard interface enables seamless end-to-end evaluation from model training to real-time single-URL inference, positioning this framework as production-ready for enterprise cybersecurity against AI-generated zero-day threats. Expected performance surpasses Phase 1 with 99.6% accuracy, 98.0% precision, 99.4% recall, and 99.4% F1-score on PhishTank/UCI benchmarks and inference under 1s for real-time deployment.

DEEP LEARNING–BASED MARITIME SURVEILLANCE SYSTEM FOR SHIPPING OBJECT DETECTION

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Abstract:The Maritime surveillance plays a vital role in ensuring coastal security and safe navigation. Traditional monitoring systems such as radar and AIS face limitations in accuracy and reliability, often failing to detect small vessels and depending on external signal transmission. The Manual monitoring of video streams is time-consuming and prone to human error. To address these challenges, this paper proposes a deep learning–based ship detection system using a YOLO-based object detection model for real-time analysis. The system processes live video streams and identifies ships efficiently, detecting vessels of different sizes under varying environmental conditions. Multi-scale feature learning improves detection of small and distant ships, while preprocessing techniques such as resizing and normalization enhance input quality. Data augmentation further improves the model's generalization ability, and Non-Maximum Suppression is used to remove duplicate detections. Experimental results show improved accuracy and reduced false detections, along with fast inference suitable for real-time applications. Overall, the proposed method provides an efficient and intelligent solution for maritime surveillance.

DYNAMIC PPE COMPLIANCE DETECTION UNDER REAL-WORLD CONSTRUCTION CONDITIONS

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Abstract:

Construction environments present significant safety challenges due to the high risk of accidents and inconsistent use of Personal Protective Equipment (PPE) such as helmets, safety vests, gloves, boots, and masks. Conventional monitoring approaches rely heavily on manual supervision, which is limited by inefficiency, accuracy, and continuous coverage. This paper proposes an advanced automated PPE detection framework based on an enhanced YOLOv11 deep learning model to address these limitations. The system processes real-time video streams to accurately identify and classify multiple PPE components under diverse and complex site conditions, including low illumination, occlusions, and dense worker presence. A context-aware detection mechanism ensures reliable performance across dynamic construction environments. Detected violations of safety compliance are immediately reported through integrated alert systems, including SMS and mobile notifications, enabling rapid corrective measures. The proposed approach enhances operational safety by ensuring continuous monitoring and minimizing the likelihood of overlooked violations. Furthermore, it supports regulatory adherence and improves overall safety management practices. Experimental outcomes demonstrate improved detection accuracy and responsiveness compared to traditional methods, contributing to a safer and more efficient construction workplace.

ICRIT 433

IOT-BASED SMART EV CHARGING AND MONITORING SYSTEM

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Abstract:

The rapid adoption of electric vehicles (EVs) has created a growing demand for efficient, intelligent, and scalable charging infrastructure. This project presents the design and implementation of an IoT-based smart EV charging and monitoring system aimed at optimizing energy usage, improving user convenience, and enabling real-time system management. The proposed system integrates embedded hardware, sensors, and cloud-based platforms to monitor key parameters such as voltage, current, charging status, battery level, and energy consumption. Using Internet of Things (IoT) technology, the collected data is transmitted to a centralized server, allowing users and operators to access real-time information through a web or mobile application. The system incorporates smart features such as remote charging control, scheduling, fault detection, and automated billing. Additionally, it supports load management strategies to reduce peak demand and enhance grid stability. By leveraging data analytics, the system can also provide insights for efficient energy utilization and predictive maintenance. This solution enhances the overall efficiency, reliability, and accessibility of EV charging infrastructure, making it suitable for smart homes, public charging stations, and commercial applications. The implementation of this system contributes to sustainable energy management and supports the advancement of smart grid technologies.

VCB-NET: VISION TRANSFORMER AUGMENTED CNN-BILSTM FOR CROSS-DOMAIN FACE MORPHING DETECTION

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Abstract:

Face morphing attacks threaten eMRTD biometric security by blending multiple identities to bypass enrollment verification, with existing CNN-BiLSTM models achieving 92.5% accuracy on SSMD training but degrading to 78-85% on cross-dataset (FRGC) and print-scan variants due to local feature bias. eMRTD workflows involve print-scan cycles, introducing JPEG compression artifacts, scanner noise, and resolution degradation that degrade detection performance. Enrollment-time threat modeling targets the critical vulnerability window during eMRTD biometric enrollment, where attackers submit a single morphed facial image that deceives automated face recognition systems (AFRS) into linking multiple identities to one reference biometric template. By focusing on enrollment, it addresses the “zero-trust” gap in biometric pipelines: templates enrolled from morphed faces (e.g., blending two identities via GANs) evade intra-class variation checks, enabling identity takeover without altering live probes or hardware. This modeling pioneers proactive defense in Industry 4.0-aligned biometrics, where IoT-linked enrollment (e.g., border kiosks) demands real-time S-MAD to counter evolving deepfake threats, outperforming reactive methods by 40-60% in AUC scores from recent CVPR benchmarks. This work introduces VCB-Net—a Vision Transformer-CNN-BiLSTM fusion integrating parallel ViT-Base (12 layers, 32×32 patches) for global self-attention on long-range morph artifacts, cross-attention fusion with CNN spatial-spectral features, and BiLSTM sequential refinement—trained via contrastive loss, MixUp augmentation, and stratified 5-fold CV across SSMD+FRGC datasets. The development and evaluation of this deep learning-based morphed image detection system mark a significant advancement in digital image forensics, particularly for applications in identity verification, cybersecurity, and biometric security systems. VCB-Net achieves superior performance of 97.8% accuracy, 98.2% precision, 97.5% recall, and 97.8% F1-score on cross-domain tests (vs Phase 1: 85.2% accuracy, 86.1% precision, 84.8% recall, 85.4% F1).

HOPE: AI-POWERED HUMAN DETECTION DRONE IN DISASTER MANAGEMENT

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Abstract:

In this work, HOPE: AI-Powered Human Detection Drone for Disaster Management is proposed as a system aimed at helping rescue and search efforts through quick and accurate detection of victims in disaster-hit zones. The main contribution of this work involves using a combination of artificial intelligence and multi-sensors such as thermal and infrared sensors for identifying human presence in difficult situations like reduced visibility and debris. A detection algorithm powered by artificial intelligence can be used for analyzing sensor input and obtaining the data needed to identify human presence. GPS technology will be used in this solution to obtain the location coordinates of the victims detected. Communication technology will also be involved in alerting rescue personnel about the discovery of victims. Evaluation of the solution conducted in an experimental setting proves its effectiveness in enhancing detection efficiency.

AI-BASED BATTERY HEALTH MONITORING SYSTEM FOR ELECTRIC VEHICLES

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Abstract:

The rapid adoption of electric vehicles (EVs) has increased the need for efficient battery management systems to ensure safety, reliability, and longevity. This project presents an Artificial Intelligence (AI)-based battery health monitoring system designed to accurately assess and predict the State of Health (SoH) and State of Charge (SoC) of EV batteries in real time. The proposed system leverages machine learning algorithms to analyze key battery parameters such as voltage, current, temperature, and charging/discharging cycles. By processing historical and real-time data, the AI model identifies degradation patterns and predicts potential failures before they occur. This enables proactive maintenance, reduces operational costs, and enhances battery lifespan. Additionally, the system can provide intelligent alerts and performance insights to users and manufacturers, improving overall vehicle efficiency and safety. Compared to traditional monitoring methods, the AI-driven approach offers higher accuracy, adaptability, and scalability.

SOLAR-ASSISTED ELECTRIC VEHICLE WITH SMART CHARGING MECHANISM

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Abstract:

The rapid depletion of fossil fuels and the rising environmental concerns due to greenhouse gas emissions have accelerated the transition toward sustainable transportation systems. Electric Vehicles (EVs) have emerged as a promising solution; however, their dependence on grid-based electricity, often generated from non-renewable sources, limits their environmental benefits. This project presents the design and development of a Solar-Assisted Electric Vehicle (SA-EV) integrated with a Smart Charging Mechanism to enhance energy efficiency, reduce grid dependency, and promote clean energy utilization. The proposed system incorporates photovoltaic (PV) panels mounted on the vehicle and/or connected through an external solar charging station to harness solar energy. This energy is either directly utilized or stored in a battery through a charge controller. A smart energy management system is employed to optimize power flow between the solar panels, battery, and electric drivetrain. The smart charging mechanism uses sensors, microcontrollers, and intelligent algorithms to monitor battery parameters such as State of Charge (SoC), temperature, and voltage, ensuring safe and efficient charging. It also supports adaptive charging strategies based on solar availability, load demand, and battery health conditions. Additionally, the system integrates Maximum Power Point Tracking (MPPT) techniques to extract maximum energy from solar panels under varying environmental conditions. The proposed model aims to reduce charging time, improve battery lifespan, and enhance overall vehicle performance. Simulation and experimental results demonstrate that the Solar-Assisted EV with smart charging significantly reduces reliance on conventional power sources while maintaining reliable operation. This innovative approach not only contributes to sustainable mobility but also aligns with global efforts to reduce carbon emissions and promote renewable energy technologies. The system is particularly beneficial for regions with high solar irradiance, offering an eco-friendly and cost-effective alternative for future transportation.

SEVEN LEVEL CASCADED H-BRIDGE INVERTER WITH DIFFERENT MODULATION TECHNIQUES

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Abstract:

Multilevel inverters play a major role in renewable energy applications because of reduced voltage stress, low total harmonic distortion, low rating switches and reduced filter size. This paper presents a seven-level cascaded h-bridge inverter with different modulation techniques. The phase shifting and level shifting carrier modulation techniques are employed to control the semi-conductor switches. A DC voltage of 300V is applied in each H-Bridge. There are six triangular carrier waves with the frequency of 900Hz are used. For a seven-level MLI, three H-Bridge inverters are cascaded. There is a total of 12 switches employed in this circuit. The in-phase disposition (IPD), Phase opposite disposition (POD) and alternate phase opposite disposition (APOD) carrier level shifting techniques are applied. This seven level multi-level inverter circuit is simulated in MATLAB Simulink with IGBT Switches for a resistive load. The total harmonic distortion (THD) Analysis is performed in each modulation techniques using FFT Analyser. The simulation results are presented and the THD is compared to identify the suitable carrier Modulation techniques for renewable energy applications.

SMART HELMET EMBEDDED BASED RIDER BEHAVIOUR MONITORING SYSTEM

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Abstract:

Road safety remains a critical global concern, with two-wheeler accidents accounting for a significant proportion of traffic fatalities. Human error and reckless riding behaviour are among the leading causes of such incidents. This project proposes a Smart Helmet Embedded Rider Behaviour Monitoring System that integrates sensor-based technology with real-time data processing to enhance rider safety and accountability. The system embeds multiple sensors — including an accelerometer, gyroscope, alcohol detection sensor, and GPS module — within a standard motorcycle helmet. These sensors continuously monitor key behavioural parameters such as sudden acceleration, hard braking, sharp cornering, drowsiness indicators, and alcohol consumption. An onboard microcontroller (such as Arduino or ESP32) processes the sensor data in real time and triggers alerts when unsafe riding patterns are detected. Collected data is transmitted wirelessly via Bluetooth or Wi-Fi to a companion mobile application, where riding behaviour is logged, analysed, and visualised. Critical alerts — such as drunk riding detection or collision impact — can automatically notify emergency contacts or authorities. The proposed system aims to promote responsible riding habits, reduce accident rates, and provide actionable insights for riders, fleet managers, and traffic safety authorities. The solution is designed to be lightweight, cost-effective, and easily integrated into commercially available helmets, making it a practical step toward intelligent transportation safety systems.

AI AGENT JOB ECOSYSTEM

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Abstract: The AI Agent Job Ecosystem is a data-driven platform designed to analyze and streamline the understanding of emerging job roles in the artificial intelligence domain through a unified and interactive system. The platform provides a centralized environment for users such as job seekers, analysts, and organizations to explore, evaluate, and understand AI-related career opportunities efficiently. The system enables administrators to manage structured datasets including job roles, salary details, demand levels, required skills, and experience criteria. It allows users to explore various AI job categories such as AI Engineers, Data Scientists, Machine Learning Specialists, and Prompt Engineers through an intuitive dashboard interface. The platform presents this data visually using interactive charts, cards, and filters to simplify complex job market insights. A key feature of the system is its ability to transform raw job-related data into meaningful insights through data visualization tools. Users can analyze trends such as average salary, job demand, and experience requirements across different roles. The platform supports dynamic filtering, enabling users to customize their view based on specific criteria, thereby enhancing decision-making. As part of the proposed system, the platform includes an analytics module that provides detailed insights into job distribution, skill demand, and market trends. These insights help users identify high-demand roles and required competencies, supporting career planning and skill development. The system ensures efficient data handling and visualization, maintaining accuracy and clarity in presenting information. Additionally, the platform offers features such as real-time dashboard updates, user-friendly navigation, and structured data representation. Built using tools like Power BI and modern data processing techniques, the system ensures scalability, flexibility, and ease of use. Overall, the AI Agent Job Ecosystem provides a comprehensive solution for understanding the evolving AI job market, reducing complexity, improving accessibility to insights, and supporting informed career decisions.

CLASS TOPPER OPTIMIZED HIGH GAIN DC-DC QUASI Z-SOURCE BASED BOOST CONVERTER FOR GRID-TIED PV APPLICATIONS

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Abstract:

The growing use of photovoltaic (PV) systems requires efficient power conversion to step up low panel voltages to grid-level AC. Conventional boost converters suffer from limited voltage gain, higher losses, and complex control, making them less effective for modern grid-tied applications. This paper presents a high-gain DC-DC Quasi Z-Source boost converter integrated with a three-phase grid-tied PV system, modeled in MATLAB/Simulink. The topology uses a switched-capacitor structure to achieve higher voltage gain, continuous input current, and reduced component stress compared to traditional converters. A dual-loop PI control strategy is implemented. The outer loop uses a Class Topper Optimization (CTO) algorithm to tune PI parameters by minimizing ITAE, ensuring efficient MPPT and stable voltage control under varying conditions. The inner loop regulates real and reactive power using DQ0 transformation and PI controllers. The boosted DC voltage is converted to AC using a three-phase inverter with sinusoidal PWM, and an LC filter ensures low harmonic distortion. Hardware implementation includes a low-power PV panel, MOSFET switches, and gate drivers, achieving voltage boosting from 8–14 V to 12–48 V. Results show improved voltage gain, stable operation, low harmonic distortion, and effective power control, making the system suitable for grid-connected renewable energy applications.

DESIGN OF RIDER MONITORING AND ACCIDENTALERT SYSTEM FOR TWO WHEELER

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Abstract

It's dangerous to ride a bike because people drive drunk, fail to use helmets, and take a long time to respond to emergencies. This is especially true in places where motorcycles are usual. These problems often lead to serious deaths and injuries, which shows how essential it is to have an intelligent and automated protective system. This paper talks about a system that utilizes embedded technology to keep an eye on riders and warn them about accidents. This makes riding safer and lowers the chance of accidents. There's a two main parts to the proposed system: a helmet unit as well as a vehicle unit. The NRF24L01 transceiver device lets both of these components talk to each other without wires. The helmet unit has a number of sensors that check regarding the rider's health. It can determine if a rider wears the helmet the right way by using infrared sensors. It can check to see if the helmet strap is securely locked using a Hall-effect sensor. It can also tell if the rider has been drinking by using an MQ-3 alcohol sensor. A microcontroller takes these inputs and sends them to the vehicle unit. The vehicle unit gets the information and uses it to make good choices that are considered safe. If the system sees unsafe conditions, like drinking alcohol or not wearing a helmet correctly, it turns on the fuel shut-off mechanism to keep the car from starting. This keeps the rider from driving the car in a dangerous way. The system helps people stay safe before an accident and after one. If there is an accident, the integrated GPS module finds out where the rider is right away, and the GSM module sends an SOS message with location information to emergency contacts that have been set up. The proposed system is cheap, reliable, and easy to set up. It includes early detection, tracking, and emergency action to make a full solution that makes riding much safer and lowers the chances of accidents.

SOCIAL MEDIA USAGE ANALYSIS

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Abstract

The Social Media User Analysis System is a machine learning-based application developed to analyze and evaluate user behavior across social media platforms. The system focuses on examining user engagement metrics such as posts, likes, comments, shares, and follower interactions to identify activity patterns and influential users. The application consists of two primary modules: data collection and analysis. In the data collection phase, user data is gathered from structured datasets and preprocessed to ensure accuracy by removing inconsistencies and missing values. In the analysis phase, machine learning techniques are applied to extract meaningful insights and compare multiple user profiles based on their engagement levels. The system provides a user-friendly interface that presents results through visualizations such as charts and graphs, enabling users to easily understand trends and patterns. It is implemented using Python and utilizes libraries such as Pandas, NumPy, and Scikit-learn for efficient data processing and analysis. Overall, the system offers a scalable, efficient, and intelligent solution for social media user analysis, reducing manual effort and improving decision-making through data-driven insights.

AN INTELLIGENT REAL TIME CREDIT CARD FRAUD DETECTION SYSTEM USING LSTM-BASED DEEP LEARNING MODEL

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Abstract

The proliferation of digital banking transactions has been accompanied by an alarming escalation in credit card fraud, with global card fraud losses projected to exceed forty billion dollars annually by 2027. Traditional fraud detection methods, including rule-based engines and classical machine learning models, fail to capture the rich sequential context of cardholder spending behaviour, resulting in unacceptably high false positive rates. This paper presents a real-time credit card fraud detection framework based solely on a Long Short-Term Memory (LSTM) network that learns temporal dependencies directly from raw transaction sequences. The proposed system introduces a temporal transaction encoding scheme, incorporates a focal loss function to handle extreme class imbalance, and is designed for sub-50-millisecond inference latency within a streaming architecture. Evaluated on the IEEE-CIS Fraud Detection dataset, the LSTM achieves an AUC-ROC of 0.982 and reduces the false positive rate at 80 % true positive rate from 3.1 % (XGBoost) to 0.9 %, representing a reduction of over 2.2 million unnecessary card declines per month for a large bank. The paper details the system architecture, the six-module implementation pipeline, and a framework for online model adaptation to address concept drift.

INTELLILEAVE - AN AI ASSISTED LEAVE MANAGEMENT SYSTEM

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Abstract

Employee leave management is a complex HR function involving compliance, scheduling and employee well-being. We propose an AI-driven leave management system that offers predictive and prescriptive features beyond basic request/approval workflows. Our system uses machine learning to forecast team absence trends and recommend optimal leave timings, ensuring balanced staffing. A conversational chatbot handles routine employee inquiries (balances, policy explanations) instantly. The platform integrates leave calendars with project schedules and payroll for a unified data view, reducing manual coordination. Advanced AI ensures compliance with company rules and highlights at-risk cases (e.g. burnout or excessive absenteeism). We implement a serverless architecture using AWS (static front end, API Gateway + Lambda backend, DynamoDB) and leverage cloud ML services for modeling. To evaluate, we will train models on synthesized and real HR data, then simulate scenarios (holiday planning, surprise absence spikes) to measure improvements in decision accuracy and time savings. Expected outcomes include faster request processing (reducing HR workload by ~90%), more balanced team availability, and data-driven support for managers. This innovation aims to transform leave management into a proactive, data-powered HR tool.

**AI-BASED WILD ANIMAL INTRUSION DETECTION AND AUTOMATED CROP PROTECTION SYSTEM
USING MULTI-SENSORY DETERRENCE**

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Abstract: Agriculture suffers significant crop losses due to wild animals such as elephants, wild boars, deer, and monkeys entering farmland. Traditional protection methods including manual guarding, fencing, and scare devices are labor-intensive, less reliable, and costly over time. To overcome these limitations, this project presents an AI-Based Wild Animal Intrusion Detection and Automated Crop Protection System Using Multi-Sensory Deterrence. The proposed system uses a camera module with a trained deep learning model to detect and classify animals in real time with higher accuracy. Once an intrusion is detected, the controller automatically activates suitable deterrent actions such as buzzer alarms, flashing lights, water sprayers, and controlled electric fencing depending on the threat level. An ESP32 microcontroller is used for device control, wireless communication, and cloud connectivity. Instant alerts containing detection status are sent to farmers through IoT platforms, enabling remote monitoring and immediate response. The system can operate continuously with low power consumption and can be integrated with solar backup for rural areas. Compared with conventional methods, the proposed solution reduces human effort, minimizes crop damage, improves safety, and supports eco-friendly smart farming practices. Thus, the project offers a practical and scalable solution for reducing human-wildlife conflict in agricultural regions.

A HYBRID INTELLIGENT MODEL FOR ONLINE ADVERTISEMENT CLICK FRAUD DETECTION

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Abstract: The rapid expansion of digital advertising has created fertile ground for one of the most financially damaging threats in the online ecosystem — click fraud. Click fraud involves the deliberate generation of invalid or artificial clicks on pay-per-click advertisements, with the intent of exhausting an advertiser's budget or distorting campaign performance metrics. Existing detection systems largely depend on static rule-based filters that cannot adapt to the evolving tactics employed by modern fraudsters, leaving a significant volume of fraudulent activity undetected. This paper presents a hybrid intelligent model for real-time click fraud detection that combines the predictive power of XGBoost, a gradient-boosted decision tree algorithm, with a high-velocity streaming pipeline and an interactive campaign monitoring dashboard. The system ingests click events carrying attributes such as IP address, device type, browser, operating system, geographic origin, timestamp, and inter-click interval, and applies a structured preprocessing pipeline that includes data cleaning, behavioral feature engineering, label encoding, and SMOTE-based class balancing to produce a well-conditioned input for the classifier. The trained XGBoost model assigns a continuous fraud probability score to each incoming click event, and a threshold-based decision layer classifies each event as Genuine, Suspicious, or Fraudulent in real time. A FastAPI backend coordinates all system operations — handling user authentication via JWT tokens and bcrypt-secured credentials, managing advertiser campaigns, recording click events, and serving prediction results — while a Streamlit-based frontend delivers an interactive dashboard that presents live event feeds, campaign-level fraud statistics, IP block-list management, and Google and Facebook Ads platform integration. Empirical evaluation demonstrates that the proposed model achieves an accuracy of 94.7 percent, a precision of 93.2 percent, a recall of 91.8 percent, and an F1-score of 92.5 percent, with an AUC-ROC of 0.97, confirming its effectiveness in identifying fraudulent clicks while maintaining a low false-positive rate. The proposed system bridges the gap between academic fraud detection research and practical deployment, providing advertisers with a comprehensive, intelligent, and user-accessible tool for protecting their advertising investments.

**EARLY ISCHEMIC STROKE DETECTION FROM CT IMAGES USING A HYBRID CNN-LSTM MODEL
IN MATLAB**

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Abstract:

Timely identification of ischemic stroke is essential for effective medical intervention and improved patient survival. This paper presents a hybrid deep learning framework that integrates Convolutional Neural Networks (CNN) with Long Short-Term Memory (LSTM) networks for automated stroke detection using CT images. The CNN component extracts discriminative spatial features from medical images, while the LSTM captures contextual dependencies within these features to improve classification performance. Image preprocessing techniques such as noise filtering and contrast enhancement are applied to improve data quality. The proposed model is implemented in MATLAB and evaluated using standard performance metrics. Experimental findings demonstrate that the hybrid architecture achieves improved accuracy and reliability compared to conventional methods, making it a suitable decision-support tool for clinical applications.

IOT-ENABLED NOISE AND VIBRATION MONITORING SYSTEM FOR RESIDENTIAL SAFETY

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Abstract:

The rapid growth of urbanization and industrial activities has significantly increased environmental noise pollution and structural vibrations in residential areas, posing serious risks to human health and building safety. Continuous exposure to excessive noise can lead to stress, sleep disturbances, and hearing impairment, while prolonged structural vibrations may result in material fatigue and potential infrastructure damage. To address these challenges, this paper presents the design and implementation of an IoT-enabled noise and vibration monitoring system for residential safety. The proposed system integrates a sound sensor (KY-037/KY-038) and a vibration sensor (SW-420) with a NodeMCU (ESP8266) microcontroller to enable real-time data acquisition and processing. The system continuously monitors environmental conditions and compares sensor readings with predefined threshold values to detect abnormal variations. When noise or vibration levels exceed the set limits, immediate alerts are triggered using a buzzer and LED indicators, ensuring quick user awareness. In addition, the system utilizes Wi-Fi connectivity to transmit real-time data to a cloud-based platform, enabling remote monitoring, data visualization, and storage for future analysis. This allows users to track environmental conditions and respond effectively to potential risks. The developed solution is compact, cost-effective, and energy-efficient, making it suitable for residential deployment. Experimental results demonstrate reliable detection of anomalies, stable data transmission, and efficient real-time alert generation. Overall, the integration of multi-parameter sensing with IoT technology enhances early warning capabilities and contributes to the development of safer and smarter residential environments.

ANALYSIS OF ELECTRICAL DISCHARGE MACHINING PERFORMANCE ON HASTELLOY X

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Abstract

Micro-holes produced in Hastelloy X are essential for cooling in high-temperature applications, as they help reduce thermal stresses and improve heat transfer efficiency. Electrical Discharge Machining (EDM) is widely employed for machining hard materials like Hastelloy X with high accuracy. In this study, the influence of EDM parameters on the formation of circular micro-holes at both the entry and exit regions is investigated. A unique aspect of this work is the creation of a 0.8 mm (800 μm) diameter micro-hole on a Hastelloy X plate with a thickness of 3.5 mm. The key input parameters considered in this study are discharge current, Pulse-on time (Ton), Pulse-off time (Toff), and Dielectric fluid pressure. These parameters play a significant role in controlling the machining performance and quality of the micro-holes produced. Material Removal Rate (MRR) and Heat Affected Zone (HAZ) are considered as the primary response parameters. The Taguchi method is applied to systematically design the experiments and determine the optimal machining conditions using graphical analysis. Analysis of Variance (ANOVA) is utilized to identify the most influential machining parameters and to quantify their percentage contributions. Furthermore, Grey Relational Analysis (GRA) is employed as a multi-objective optimization technique to evaluate the optimal combination of output parameters. The analysis shows that discharge current has the strongest influence on both MRR and HAZ. MRR increases with higher current and pulse-on time, while it decreases with increasing pulse-off time. In contrast, HAZ rises with higher current and Ton due to increased heat input, whereas higher Toff helps reduce thermal damage. Fluid pressure exhibits a moderate effect, with optimal levels improving machining performance. The most effective process conditions are determined based on the obtained results.

THD ANALYSIS OF CASCADED H-BRIDGE MULTILEVEL INVERTER USING DIFFERENT CARRIER SIGNAL CONFIGURATIONS

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Abstract

This project focuses on reducing Total Harmonic Distortion (THD) in multilevel inverters using advanced modulation techniques. Multilevel inverters are widely used in power electronics for producing high quality output waveforms with reduced harmonic content. However, conventional methods still result in noticeable distortion. To address this issue, various Pulse Width Modulation (PWM) techniques such as SPWM, PD PWM, POD PWM, APOD PWM, SVPWM, and SHEPWM are analyzed and implemented. Equal amplitude with proper uniform voltage spacing produces a smoother and more symmetrical waveform, thereby minimizing THD, whereas unequal or improper spacing increases distortion. This approach effectively reduces lower order harmonics and improves overall waveform quality. Additionally, better DC voltage utilization and efficient switching operation are achieved. As a result, the proposed inverter system delivers improved efficiency, reduced harmonic distortion, and enhanced output performance compared to traditional inverter methods in practical applications.

ECP TECHNOLOGY: EMPOWERING CONNECTIVITY THROUGH INTEGRATED ELECTRICAL, CYBER, AND PROGRAMMING SYSTEMS FOR MODERN DEVICES AND OWN-BUILDER COMPUTING

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Abstract

ECP (Electrical, Cyber, and Programming) technology represents a holistic paradigm that integrates three core disciplines to enable comprehensive innovation in modern computing systems. This paper presents ECP technology as a unified framework for developing secure, efficient, and feature-rich applications, web platforms, and custom-built computing solutions. We explore the convergence of electrical hardware design, cybersecurity practices, and software development methodologies in the context of modern devices, IoT ecosystems, and do-it-yourself (own-builder) computing platforms. The scope encompasses storage solutions (1TB servers), sensors, power systems (DC 3.3V to 250V AC inverters), solar power supplies, networking (VoIP, tower antennas), multimedia (cameras, audio systems), and cybersecurity layers including firewalls, encryption, IDS, Apache2/Ngrok servers, and secure communications (Tor VPN, TVPN). We discuss programming technologies spanning Python, Java, C++, and web development stacks, along with free-code antivirus solutions and full-stack application development. This work aims to empower connectivity and innovation through the ECP framework for researchers, practitioners, and own-builder enthusiasts.

DESIGN AND PERFORMANCE ANALYSIS OF A GRID-CONNECTED PHOTOVOLTAIC SYSTEM FOR AN EDUCATIONAL CAMPUS USING OPEN-SOURCE TOOLS

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Abstract

A grid-connected photovoltaic system generates electricity from solar energy and supplies it to the utility grid, improving energy efficiency, reducing electricity costs, and promoting clean, sustainable, and reliable power generation. Therefore, this project proposes a Design And Performance Analysis Of A Grid-Connected Photovoltaic System for an Educational Campus Using Open-Source Tools. The system consists of a PV array, a DC–DC boost converter, a three-phase voltage source inverter (VSI), and an LC filter interfaced with the utility grid. An Artificial Neural Network (ANN)-based Maximum Power Point Tracking (MPPT) algorithm is employed to extract maximum power from the PV array under varying environmental conditions. The boost converter regulates the DC-link voltage, ensuring stable operation of the inverter. A synchronous reference frame (DQ theory)-based control strategy is implemented for effective power management. Proportional Integral (PI) controllers are used to regulate the direct and quadrature current components, enabling independent control of active and reactive power. Pulse Width Modulation (PWM) techniques generate switching signals for both the boost converter and the inverter. The system's performance is evaluated in terms of power quality, dynamic response, and efficiency. Results demonstrate improved power extraction, reduced harmonics, and stable grid synchronization. The use of advanced control techniques enhances system reliability and supports sustainable energy integration into modern power systems. Finally, this project is implemented by using MATLAB SIMULINK 2024a.

COMPARATIVE PERFORMANCE ANALYSIS OF LUO AND ZETA DC–DC CONVERTERS FOR MPPT-BASED PHOTOVOLTAIC SYSTEMS

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Abstract

The growing integration of photovoltaic (PV) systems necessitates high-efficiency DC–DC converters to ensure optimal power extraction under dynamic environmental conditions. This paper presents a detailed comparative analysis of Luo and Zeta DC–DC converter topologies for PV applications employing Maximum Power Point Tracking (MPPT) based on the Perturb and Observe (P&O) algorithm. To ensure an unbiased evaluation, both converters are modeled using an identical PV source and control architecture in the MATLAB/Simulink environment. The Luo converter exploits a voltage-lift technique to achieve enhanced voltage gain, whereas the Zeta converter operates through capacitor-based energy transfer while maintaining non-inverting output polarity. Performance metrics, including output voltage, current profile, transient response, and ripple characteristics, are systematically analyzed. Simulation results demonstrate that the Luo converter achieves a higher steady-state output voltage (~25 V) compared to the Zeta converter (~19 V), along with faster dynamic response, improved current delivery, and reduced voltage and current ripple. These characteristics indicate superior power quality and conversion efficiency. The findings establish the Luo converter as a more suitable candidate for high-gain PV applications, contributing to the advancement of efficient and reliable renewable energy conversion systems.

IOT BASED IV BAG AND MEDICAL OXYGEN (MO) MONITORING AND ALERT SYSTEM USING GSM

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Abstract

The project IOT Based IV Bag and Medical Oxygen (MO) Monitoring and Alert System using GSM is a project created with the aim of improving the level of care given to patients in the ICU through the monitoring and tracking of patients' vital body parameters. Biomedical sensors were employed in the project to monitor body temperature, heart rate, drip level, and oxygen flow in the supply pipes. This ensures the accuracy of the data collected. The Arduino Mega controller is then employed to automate the flow of the drip and oxygen using solenoid valves. The patient's vital information is then sent to a cloud server using a Wi-Fi IoT module. This enables doctors and caregivers to monitor patients' conditions using mobile devices. The GSM module is then employed for instant SMS notifications during emergency cases.

FOOD PRODUCT INVENTORY MANAGEMENT SYSTEM

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Abstract

Proper management of food products is critical to an organization because food is a perishable commodity. Because food must be monitored properly, traditional methods of keeping track of inventory often include making human errors, having redundant entries, tracking quantities of stock, and tracking whether or not food will like to expire. Our project provides a Food Inventory Management System to manage food inventory that uses a DBMS to create a single database for keeping track of food items (incl. suppliers), the levels of stock, and any potential expiration dates on inventory. This Food Inventory Management System will allow companies to have a central location at which they can manage, record, and monitor all of their food items through better free of stale and unconsumed product to improve the rate of “new” product sold based upon stock levels recorded in the system. By using common relational principles like integrity, standardization, and normalization, this system will create a more reliable source of information while removing unnecessary complexities in operation of food inventory.

AI BASED IOT ENABLE WEARABLE DEVICE FOR WOMEN'S PERSONAL SECURITY WITH MULTI-SENSOR FUSION AND CAMERA MODULE

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Abstract

The rapid growth of the population living in urban centres, coupled with the increase in the number of women joining the workforce, has unfortunately been accompanied by an increase in safety issues. In such situations, the conventional security solutions, such as mobile apps, are found to be ineffective, given the fact that the user needs to manually activate the app, which might not be possible when the situation arises. This paper proposes an innovative, autonomous solution referred to as “Smart Wearable,” which utilizes the capabilities of Artificial Intelligence and Internet of Things. In the proposed solution, the device utilizes the concept of multi-sensor fusion, incorporating the use of heart rate sensors and 3-axis motion sensors. A lightweight Machine Learning model is implemented on the ESP32 microcontroller, referred to as Edge Computing, to accurately classify human behaviour as either “Normal” or “Emergency.” In the proposed solution, the device sends the GPS location and SOS messages to the cloud infrastructure, thereby providing a proactive solution to the problem, with a 94.2% accuracy rate.

AUTOMATED MEDICINE DISPENSER USING IOT WITH REAL-TIME HEALTH ANALYSIS

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Abstract

In recent years, the growing number of elderly and chronically ill patients has emphasized the need for effective medication management. Timely intake of medicines is crucial, yet many patients forget or delay doses due to memory issues, busy schedules, or lack of supervision. Existing solutions such as manual reminders, traditional pill boxes, and basic alarm systems rely heavily on human intervention and do not consider real-time health conditions. They also lack features like automatic dispensing, remote monitoring, and emergency response, increasing the risk of missed or incorrect medication and negatively affecting patient health. To overcome these challenges, this project proposes a Smart Pill Dispenser using IoT, designed to provide both schedule-based and health condition-based medication delivery in an automated and reliable manner. The system is built around a microcontroller integrated with a Real-Time Clock (RTC) module to maintain accurate timing and ensure medicines are dispensed at predefined intervals. In addition, health monitoring sensors such as heart rate and temperature sensors are incorporated to continuously observe the patient's physiological condition. When the system detects either the scheduled time or any abnormal health parameter exceeding the defined threshold, it triggers the dispensing mechanism. A motor-driven unit, typically controlled by a servo motor, rotates the pill container to release the exact dosage of medicine. Immediately after dispensing, a buzzer alert is activated to notify the patient, ensuring that the medicine is taken without delay. The system further enhances its functionality through IoT connectivity, enabling real-time data transmission to a cloud platform. This allows caregivers or family members to remotely monitor medication schedules, track adherence, and receive instant notifications in case of missed doses or emergency situations. The proposed solution not only minimizes human intervention but also significantly reduces the chances of medication errors such as missed or incorrect dosages. By integrating automation, real-time health monitoring, and remote accessibility, the system provides a comprehensive and efficient approach to medication management, ultimately improving patient safety, adherence to treatment, and overall healthcare outcomes.

IOT BASED WASTE MANAGEMENT WITH REWARDING SYSTEM USING k-NN ALGORITHM

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Abstract

Traditional waste management systems face significant challenges due to inefficient collection schedules and lack of public participation. This paper proposes an integrated Smart Trash framework leveraging the Internet of Things (IoT) and automation to modernize waste disposal. The system utilizes a dual-layered approach: first is an automated segregation unit using sensors to classify waste into metal, E-waste, and plastic, and second is a K-Nearest Neighbor (K-NN) algorithm-based rewarding system to incentivize users. Real-time monitoring is achieved through ultrasonic sensors and the ESP8266 Wi-Fi module, which alerts authorities when bins reach maximum capacity. This proposed model not only optimizes collection routes but also promotes sustainable waste disposal habits through a point-based reward system. The K-NN classification is performed using sensor-based feature vectors and Euclidean distance metric for accurate waste categorization.

AI BASED POWER PERFORMANCE MONITORING AND EVALUATION SYSTEM FOR ELECTRIC VEHICLE

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Abstract

This project presents the design and development of an AI-based driver performance monitoring and evaluation system for electric vehicles (EVs). The system employs an Arduino Uno microcontroller as the core processing unit, integrated with various sensors such as speed, light, vibration and multiple control switches to capture real-time driving parameters. These inputs are processed and analyzed through an AI interface, which evaluates driver behaviour by examining factors such as acceleration patterns, braking efficiency, lighting control and overall safety responses. The analyzed results are displayed on an LCD module, providing immediate feedback to the driver. The main objective of this system is to promote safe, energy-efficient and environmentally responsible driving practices by continuously monitoring performance, identifying unsafe habits and supporting data-driven behavioural improvement. This intelligent system contributes to the broader goal of sustainable EV operation and enhanced road safety through AI-enabled performance evaluation.

IOT BASED FLOOD DETECTION & MACHINE LEARNING BASED FLOOD PREDICTION

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Abstract

The 2015 Chennai floods underscored a devastating gap in disaster communication, where the lack of real-time alerts regarding dam releases led to catastrophic consequences. To mitigate such risks, this research presents a multi-layered framework that integrates IoT-based detection with machine learning-driven forecasting. The system utilizes a network of IoT sensors deployed at dams and riverbanks to monitor water levels continuously. When critical thresholds are breached, the system autonomously broadcasts emergency notifications to residents in high-risk zones, ensuring timely evacuation. Complementing this reactive hardware, the project features a web-integrated machine learning component designed for riverine flood prediction. Additionally, a neural network-based rainfall predictor is incorporated to provide state-level precipitation forecasts, enabling proactive disaster preparedness. By bridging the gap between real-time telemetry and predictive AI, this integrated solution transforms flood management from a delayed response into a pre-emptive life-saving strategy. This dual-phase approach ensures that both sudden surges and seasonal risks are addressed through a unified, accessible digital platform, significantly reducing the vulnerability of river-side communities during extreme weather events.

SOIL MONITORING AND DETECTING PLANT DISEASES USING CLOUD-BASED INTERNET OF THINGS

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Abstract: The Internet of Things and cloud computing are getting better fast. This is news for farmers who want to grow healthy plants and take good care of them. Plant diseases are a problem that can hurt our food supply. Every year they destroy 20 to 40 percent of the crops we grow around the world. Usually people check for diseases by looking at the plants themselves. This takes a lot of time and work. It is also easy to make mistakes. This paper is about a system that uses the Internet of Things and cloud computing to watch plants all the time and find diseases early. The system has sensors that work together with a small computer called an ESP32. It has a camera that takes pictures all the time a sensor that measures temperature and humidity another sensor that checks the air quality, a sensor that checks how wet the soil is and a sensor that detects movement. All the information from these sensors is sent to the internet using Wi-Fi, where it is analyzed away. The results are shown on a website with colors that warn us if there is a problem. We tried this system in a greenhouse for 30 days. It worked really well. The sensors were accurate 94.7 to 99.4 percent of the time the information was sent to the internet reliably 99.56 percent of the time. It only took 312 milliseconds to get the information. The system also correctly warned us about problems 93.6 percent of the time. This system is not expensive it costs around 15 to 18 US dollars, per node. It can be used on many plants. It can help farmers take care of their plants better and reduce crop losses.

SMART CAMPUS SOCIAL PLATFORM WITH LOCATION BASED ATTENDANCE SYSTEM

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Abstract: The rapid digital transformation of educational institutions has created a demand for secure, intelligent, and efficient campus management systems. Among the most critical administrative tasks in colleges and universities is attendance management, which directly affects academic monitoring, student discipline, and institutional record accuracy. Conventional attendance approaches such as manual roll calls, sign-in registers, and single-factor digital systems often suffer from several drawbacks including human error, time consumption, and proxy attendance manipulation. To address these limitations, this paper proposes Smart Campus Social Platform With Location Based Attendance System, a Geo-Fenced Smart Campus System integrated with AI-based facial recognition and an academic social networking platform. The proposed system combines two verification layers for attendance marking. First, geo-fencing technology ensures that a student is physically located within a defined classroom boundary using real-time GPS data. Second, facial recognition based on deep learning models such as DeepFace and FaceNet validates the identity of the student before attendance is approved. This dual-factor approach substantially improves the authenticity of attendance records by preventing students from marking attendance remotely or through impersonation. In addition to attendance verification, the system also serves as a campus communication platform. Students and faculty can share announcements, study materials, academic notes, event details, and institutional updates within the same application. This integration transforms the solution from a simple attendance tool into a broader smart campus environment. These results confirm that it provides a practical, scalable, and secure solution for modern educational institutions.

ICRIT 465

INVESTIGATING THE POTENTIAL OF AN ANFIS-BASED MAXIMUM POWER POINT TRACKING CONTROLLER USING SOLAR PHOTOVOLTAIC SYSTEMS

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Abstract

The growing demand for clean and sustainable energy has significantly increased the adoption of solar photovoltaic (PV) systems. However, the efficiency of PV systems is highly dependent on environmental conditions such as solar irradiance and temperature, which vary continuously. Under such dynamic conditions, extracting maximum power from the PV system is crucial. Conventional Maximum Power Point Tracking (MPPT) techniques, such as Perturb and Observe (P&O) and Incremental Conductance (INC), often suffer from steady-state oscillations and slow response under rapidly changing environmental conditions. This paper investigates the design and performance analysis of an Adaptive Neuro-Fuzzy Inference System (ANFIS)-based MPPT controller for solar PV applications. The ANFIS controller combines the learning capabilities of neural networks with the reasoning ability of fuzzy logic to achieve precise and robust MPPT tracking.

ICRIT 466

PLANT-RESPONSIVE ENERGY-AWARE SMART FARMING SYSTEM

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Abstract

The need for sustainable agriculture amidst water scarcity and energy limitations demands smarter farming approaches beyond conventional soil-based monitoring. This project proposes a Plant-Responsive Energy-Aware Smart Farming System, where irrigation decisions are driven directly by plant physiological responses rather than soil conditions alone. The system employs low-power sensors to monitor plant stress indicators such as leaf moisture and temperature, enabling real-time, plant-centric irrigation control. This approach ensures water is supplied only when required, significantly reducing wastage. To enhance sustainability, the system is powered by solar energy and incorporates an energy-aware control mechanism that optimizes power usage and prioritizes critical operations under limited energy availability. By integrating plant-responsive sensing with intelligent energy management, the proposed system improves water efficiency, reduces energy consumption, and enhances crop productivity. This work introduces a shift from soil-centric to plant-centric precision farming, offering a scalable and eco-friendly solution for next-generation agriculture.

MINIMUM SWITCH HIGH GAIN INTERLEAVED CONVERTER FOR GREEN ENERGY SYSTEMS

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Abstract: The increasing global demand for clean and sustainable energy solutions has driven significant advancements in renewable energy technologies, particularly in solar power systems. However, one of the key challenges associated with solar photovoltaic (PV) systems is their inherently low and fluctuating output voltage, which is often insufficient for practical applications. To address this limitation, efficient power conversion techniques are essential to step up the voltage while maintaining high performance and reliability. In this paper, a minimum-switch high-gain interleaved DC-DC converter is proposed as an effective solution for green energy applications. The suggested topology is designed to achieve a substantial voltage boost, stepping up the input voltage from as low as 12 V to more than 250 V. A major advantage of the proposed converter is its reduced number of switching components, which helps minimize switching losses, simplify the circuit design, and improve overall efficiency. Additionally, the design ensures lower voltage and current stress on components, enhancing system longevity and reliability. The interleaved structure plays a crucial role in improving performance by significantly reducing input current ripple and distributing thermal stress more evenly across the system. This results in smoother operation and better efficiency under varying load and input conditions. To further enhance system reliability, a battery storage unit is integrated into the design, ensuring uninterrupted power supply even during periods of low solar irradiance or fluctuating environmental conditions. Moreover, a microcontroller-based monitoring system equipped with an LCD display is incorporated to provide real-time information about system parameters such as voltage, current, and operational status. This feature improves user interaction and facilitates easier system management and diagnostics. The performance of the proposed converter is validated through MATLAB/Simulink simulations, which demonstrate high efficiency, stable output voltage, and excellent ripple reduction characteristics. Overall, the proposed system offers a cost-effective, efficient, and reliable solution for modern renewable energy applications.

DESIGN AND DEVELOPMENT OF AN INTELLIGENT BOREWELL RESCUE ROBOT WITH REAL-TIME MONITORING AND CONTROLLED RETRIEVAL MECHANISM FOR CHILD SAFETY

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Abstract

This project proposes a Design and Development of an Intelligent Bore well Rescue Robot. The system is built around the ESP8266 microcontroller, which serves as the central control unit. Equipped with many sensors that ensure continuous monitoring of environmental conditions within the bore well. An ESP-32 camera provides live video streaming. Enabling real-time situational awareness for operators via a cloud server and Blynk mobile application.

ICRIT 469

DIGITAL TWIN-BASED AUTOMATED FAULT DIAGNOSIS OF MOTOR DRIVES IN STEEL INDUSTRIES USING IOT

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Abstract

High risk of sudden motor failures in continuous steel production lines causing significant financial losses. Replacing inefficient traditional reactive maintenance with an automated IoT-based fault diagnosis system. Developing a synchronized Digital Twin virtual replica to mirror real-time physical motor behavior. Continuous monitoring of Temperature, Vibration, and Current using integrated hardware sensors. Utilizing Support Vector Machines (SVM) for precise automated classification of industrial motor faults. Calculating Remaining Useful Life (RUL) and providing real-time visual feedback via a high-fidelity dashboard.

ICRIT 470

HYBRID QUANTUM-AI FRAMEWORK FOR SECURE AND SELF-HEALING SMART GRID SYSTEMS

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Abstract

This paper presents a hybrid quantum-AI framework designed to improve the security, efficiency, and resilience of modern smart grid systems. The proposed model integrates artificial intelligence for real-time monitoring, fault detection, and predictive maintenance, enabling early identification of system disturbances. Quantum computing techniques are utilized to solve complex optimization problems such as load balancing, energy scheduling, and power flow management with high speed and accuracy. To ensure secure communication, quantum cryptography methods like Quantum Key Distribution (QKD) are incorporated, protecting the grid from cyber threats. The system also features a self-healing mechanism that automatically isolates faulty sections and restores power through alternative paths, minimizing outages and energy loss. Furthermore, the framework supports renewable energy integration and decentralized generation. This approach provides a reliable and future-ready solution for intelligent energy management in advanced electrical power systems.

ICRIT 471

FIRE FIGHTER ROBOT

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Abstract: The main aim of this project is to build a fire fighting robot using MIT APPand Arduino. The Robot can be moved in all the four directions with 360 degree rotation to detect fire (front, back, left and right). This firefighting robot with contains a NODEMCU,ire sensor, DhT 11 TEMP sensor, GPS/ esp32cam, buzzer, L293D motor driver, DC motors, relay, LM2596, servo motors, and an ESP32-CAM module. The robot is designed to autonomously detect and extinguish fires, offering a proactive approach to fire safety. The fire sensor detects fire outbreaks, prompting the relay to on the water motor to suppress flames efficiently. Additionally, the buzzer provides an audible alert to alert nearby individuals. The L293D motor driver enables precise control of the DC motors, facilitating the robot's movement towards the fire source while navigating obstacles. Temp sensor is used to measure temp and humidity level of robot. GPS module is involved in our project to find the location of fire with latitude and langitude. The ESP32-CAM module adds a crucial visual element, allowing the robot to capture images and stream live footage, aiding in remote monitoring and decision-making. The rechargeable battery system ensures continuous operation of the robot by converting the 12v battery into 5v using lm2596 module making it suitable for deployment in various environments.Once the fire is eliminated, the robot resumes patrolling. In manual mode, users can remotely navigate the robot and control fire suppression using the MIT mobile app, which provides real-time sensor data and operational status. This project contributes to the advancement of IoT-based fire safety solutions, offering a scalable and efficient approach to fire management in hazardous environments.

ICRIT 472

**CONSTRAINT-AWARE REACTION PATHWAY OPTIMIZATION ALGORITHM(CARPOA) AND
INFORMATION SYSTEM (PRPOIS): A HOLISTIC APPROACH TO SAFE AND SUSTAINABLE
PHARMACEUTICAL SYNTHESIS**

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Abstract:Applying LLMs to computer-assisted synthesis planning has improved the process of findingretrosynthetic pathways for drug research. The data-driven generative models makealgorithmic hallucinations that give wrong answers. The system gives you suggestions forchemical paths that seem scientifically sound but need you to use chemical intermediates thatare dangerous and unstable. Regulatory authorities in the international pharmaceuticalindustry need proper data governance mechanisms to run their businesses. The isolated AImodelsdon't have these.The Pharmaceutical Reaction Pathway Optimization and Information System (PRPOIS) is acloud-based decision-support system that combines generative artificial intelligence withsecure database storage. The system uses an A* heuristic search algorithm and RAG to lookthrough large chemical databases and make many different synthetic pathway choices. Thesystem's standard design is a Third Normal Form (3NF) database structure. It also uses activePL/SQL "Constraint Shields" to make sure that manufacturing operations are safe and followindustry rules. The system uses SQL triggers to automatically get and undo all AI-generatedtransactions that have genocidal intermediates. This stops harmful hallucinations from gettinginto the company's records.The proof shows that there is a safe way to use CARPOA to make a route that meets all therequirements. CARPOA uses a Multi-Criteria Decision Analysis (MCDA) framework. This is achieved through the integration of four key components: an assessment ofcumulative step yield and economic viability relative to Institute for Clinical and EconomicReview (ICER) thresholds; a measurement of non-target toxicity footprint and environmentalsustainability via Process Mass Intensity (PMI); and a comparison against the innovationGreen Aspiration Level (iGAL). Experimental findings indicate that the PRPOIS frameworksuccessfully eliminated hazardous artificial pathways while simultaneously pinpointing themost efficient routes.

BORDER ALERT SYSTEM FOR FISHERMAN

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Jayaraj annapackiam CSI College of engineering, Nazareth, Thoothukudi.

Abstract

This paper presents a comprehensive fisherman safety system using RSSI and LiFi technologies. The system ensures real-time alerting when approaching maritime boundaries. The application will notify the information of where the devices are being located and intimate them about the issues that occur due to opponent forces in ships to server. It continuously monitoring, tracking, alerting and controlling the fisherman's activity from the remote station located on the shore.

E- COMMERCE FRAUD DETECTION SYSTEM USING MACHINE LEARNING

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Abstract

The rapid growth of e-commerce platforms and digital payment systems has led to a significant increase in online transactions, thereby elevating the risk of fraudulent activities such as unauthorized transactions, identity theft, and payment fraud. Traditional fraud detection methods, which rely on rule-based systems and manual verification, are often inefficient and incapable of adapting to evolving fraud patterns. This paper proposes a machine learning-based fraud detection system designed to identify suspicious transactions in real time. The system processes large-scale transaction data through data preprocessing and feature engineering techniques to enhance data quality and model performance. Multiple machine learning algorithms are employed to analyze transaction patterns and classify activities as legitimate or fraudulent with high accuracy. The proposed framework includes modules for data collection, preprocessing, model training, and real-time fraud detection, integrated with a web-based interface for efficient monitoring and decision-making. Experimental results demonstrate improved detection accuracy, reduced false positives, and enhanced scalability compared to conventional approaches. Overall, the system provides an efficient, scalable, and intelligent solution for securing modern e-commerce platforms, contributing to a safer and more reliable digital transaction environment.

REAL-TIME CROWD MANAGEMENT & FACE RECOGNITION ATTENDANCE SYSTEM USING CCTV CAMERA

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Abstract

The Real-Time Crowd Management and Face Recognition Attendance System represents a cutting-edge integration of Artificial Intelligence, deep learning computer vision, and cloud synchronization technologies designed to automate identity verification and real-time occupancy monitoring using existing CCTV infrastructure. Traditional attendance tracking systems suffer from manual inefficiencies, security vulnerabilities including proxy attendance, and an inability to detect real-time overcrowding—critical limitations that compromise institutional safety and operational efficiency. This paper proposes a sophisticated dual-purpose system that seamlessly combines two parallel processing pipelines: (1) YOLOv8n-based real-time people counting with SORT trajectory tracking via virtual tripwire mechanisms for accurate entry/exit counting and occupancy calculation, and (2) dlib-based deep metric facial recognition with strict deduplication logic for automated, frictionless attendance marking that completely eliminates proxy attendance vulnerabilities. The backend architecture, powered by Python 3.10 and Flask, the presentation layer comprises an intuitive HTML5/CSS3/JavaScript dashboard with role-based access control for administrators, faculty, and security. The proposed system represents a viable, cost-effective alternative to fragmented proprietary security solutions, demonstrating how modern AI and edge computing can transform existing CCTV infrastructure into intelligent, multi-purpose decision-support systems.

IOT-BASED WILD ANIMAL DETECTION AND ALERT SYSTEM FOR TRIBAL SAFETY

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Abstract

Human-wildlife conflict is an increasingly serious issue in many regions, leading to loss of crops, property damage, and threats to both humans and animals. To mitigate this problem, this paper presents an IoT-based Wild Animal Detection and Alert System using Artificial Intelligence (AI), designed to provide real-time detection and early warning of wild animal intrusions. The proposed system employs an AI-enabled camera module interfaced with an Arduino UNO for efficient image capture, classification, and alert transmission. The camera continuously monitors the surrounding environment and captures images, which are analyzed using a pre-trained deep learning model capable of recognizing different species of wild animals. Upon detection of a wild animal, the system automatically sends an instant alert message or notification to nearby residents or forest officials through an IoT network, using either Wi-Fi or GSM connectivity.

ICRIT 477

PERFORMANCE IMPROVEMENT OF GRID-CONNECTED SOLAR PV SYSTEMS USING RBFNN MPPT

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Abstract

This project proposes a performance improvement of grid-connected solar PV systems using RBFNN MPPT. To enhance the overall energy conversion efficiency and maintain a high-quality power supply for three-phase grid integration. The PV array generates variable DC voltage and current depending on solar irradiance and temperature, which are processed through a coupled inductor Z-source boost converter controlled by a Radial Basis Function Neural Network (RBFNN) based MPPT algorithm. This intelligent MPPT technique ensures fast and accurate tracking of the maximum power point, improving dynamic performance under fluctuating environmental conditions.

ICRIT 478

FARMER MANAGEMENT SYSTEM

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Abstract

The importance of agriculture to the economy around the world and its contribution to food security is well known. Good management of agricultural information is vital to facilitate proper communication between farmers, consumers, and agriculture-related organizations. However, the majority of rural communities still rely on manual methods of keeping detailed records on farmers, farming activities, and product. This method of record keeping creates issues that include duplication of data, loss or misplacement of records, delays in accessing records, and challenges in managing large amounts of records. This project proposes a Web-Based Farmers Management System to create a single centralized place to capture and store/manage agricultural data. The project is built using Python Flask Framework and MySQL, and includes functionality to enable users to register farmers, manage agricultural products, manage different categories of agriculture, and access a catalogue of products faster. A Database Management System (DBMS) provides important concepts such as normalizing a relational database, identifying relationships through the use of primary-foreign keys and database triggers to ensure consistency and integrity of data. A database trigger is a useful way to automatically log all database activity (such as adding or modifying information) for the purpose of supporting audit trails. Using web technology in conjunction with a relational database, the Farmers Management System offers a complete, organized, efficient, scalable solution for the management of agricultural records. With greater accuracy in managing agricultural data, the system allows farmers to communicate more effectively with potential customers.

A HYBRID EDGE-AI FRAMEWORK FOR ADAPTIVE SMART STREET LIGHTING WITH ELECTRICAL STATE VERIFICATION AND 12-HOUR PREDICTIVE FAULT FORECASTING

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Abstract

Urban street lighting is an important part of smart city infrastructure, but traditional systems waste a lot of energy, have slow fault detection, and lack effective monitoring. This paper presents a hybrid Edge-AI framework for adaptive street lighting that uses a distributed IoT structure. The system features a Raspberry Pi edge controller combined with LDR, PIR, and INA219 sensors to track light intensity, motion, voltage, and current in real time. A Decision Tree-based control algorithm allows for adaptive lamp operation with smart switching and brightness control based on environmental conditions. An electrical state verification method checks the expected and actual current values to identify faults like open circuits, relay failures, and unusual power usage. The system achieves an 80% control accuracy and a 91.8% fault detection accuracy, with a false alarm rate of 5.6%. It also enables predictive maintenance using regression and LSTM models to predict electrical parameters up to 12 hours in advance. Results indicate energy savings of up to 30% and better maintenance efficiency compared to traditional systems. The proposed framework shortens fault detection time, reduces reliance on networks, and supports scalable smart lighting deployment.

DESIGN AND DEVELOPMENT OF AN IOT – INTEGRATED RAILWAY TRACK INSPECTION

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Abstract

Railway track inspection robots are automated systems designed to monitor track conditions, detect faults, and ensure safe train operations. Traditional inspection methods rely heavily on manual checks, which are time-consuming, labour-intensive, and prone to human error. Existing robotic solutions often face limitations such as restricted coverage, lack of real-time data analysis, and difficulty operating in complex terrains. Therefore, this project proposes a Design and Development of an IOT Integrated Railway Track Inspection Robot AI Algorithms. To ensure safer and more reliable railway transportation by automating track monitoring and fault detection. The system employs an Arduino Uno microcontroller as the central unit, interfacing with various sensors such as ultrasonic sensors for obstacle detection, infrared sensors for track fault identification, a GPS module for location tracking and an ESP-32 camera for real-time visual monitoring. The collected data is processed and transmitted through a NodeMCU Wi-Fi to an IOT cloud platform, where the inspection results can be remotely accessed. AI-based algorithms are integrated for advanced analysis of sensor and camera data, enabling accurate detection of cracks, obstructions, and alignment issues. The motion of the robot is controlled by DC gear motors driven through an electronic relay and relay driver module, ensuring stable navigation along the track. Power is supplied from dual sources: +5V for sensors and +12V for motors, ensuring efficient operation. This system not only enhances accuracy and reduces human intervention in railway inspection but also enables real-time alerts and decision-making thereby improving safety reliability, and efficiency in railway infrastructure management.

DESIGN OF AN AUTONOMOUS DISTRIBUTED ALERT SYSTEM FOR CROP DEFENSE GRID

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Abstract

Agricultural regions bordering forest reserves face significant economic losses due to human-wildlife conflict. Traditional deterrents are often lethal or ineffective, while modern vision-based AI systems suffer from high power consumption and environmental fragility. This paper presents a decentralized, low-power IoT solution using Arduino Nano local microcontrollers and a Sensor Fusion Matrix. By cross-validating three-tier vertical laser-LDR height profiling with dual piezoelectric seismic weight detection, the system filters environmental noise to achieve near-zero false alarms. Upon threat confirmation, the system triggers species-specific bio-acoustic deterrents and transmits off-grid alerts via SX1278 LoRa modules.

COLLEGE EVENT MANAGEMENT SYSTEM

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Abstract

The College Event Management System is a web-based application designed to simplify and automate the process of organizing, managing, and participating in college events. Traditional event management methods often involve manual work, leading to inefficiencies, miscommunication, and data management issues. This system aims to overcome these challenges by providing a centralized digital platform for event coordination. The proposed system allows administrators to create, update, and manage events, while students can view event details, register online, and receive real-time notifications. It includes features such as user authentication, event scheduling, participant registration, and database management to ensure smooth operation. The system enhances communication between organizers and participants and reduces paperwork. By utilizing modern web technologies, the system ensures scalability, reliability, and ease of use. It improves efficiency, saves time, and provides a better user experience for both organizers and students. Overall, the College Event Management System serves as an effective solution for managing campus events in a structured and organized manner.

SMART RATION TRACK : IoT ENABLED ANTI-THEFT DETECTION AND FIFO INVENTORY SYSTEMS FOR PDS

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Abstract

The goal of the Smart Ration Track: IoT Enabled Anti-Theft and FIFO Inventory System for PDS is to improve the security and transparency of the Public Distribution System. This project's primary goal is to use IoT-based load sensors to monitor the weight and movement of vehicles transporting rations. The technology helps to prevent theft and unlawful removal of products by continuously measuring the weight of the vehicle and detecting any discrepancy between the loaded and unloaded weight. For real-time monitoring, all of the weight data is transferred to a cloud database, making it simple for authorities to confirm the quantity and movement of the goods while it is being transported. The technology not only detects theft but also ensures that older goods are dispersed first in order to minimize waste through effective FIFO (First In, First Out) inventory management. IoT technology lowers human error, automates data collecting, and offers rapid access to vehicle and stock data via an online interface. This clever approach supports the objectives of Digital India and guarantees that necessary goods reach the right people at the right time by encouraging accountability, transparency, and efficiency in the ration supply chain.

DESIGN AND IMPLEMENTATION OF ML BASED PERSON IDENTIFICATION SYSTEM

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Abstract

With the rapid advancement of Artificial Intelligence (AI) and Computer Vision, there is an increasing demand for intelligent systems capable of real-time monitoring and automation. This project presents a Real-Time Face Recognition and Monitoring System designed to detect, identify, and track individuals using deep learning techniques. The system utilizes computer vision algorithms to capture live video streams and perform accurate face recognition under varying conditions. The proposed system integrates face detection, feature extraction, and recognition modules. A deep learning-based model is used to generate facial embeddings, which are then compared with a stored database to identify individuals. The system also includes a web-based dashboard that allows administrators to monitor detections, view logs, and manage data efficiently. The system performs real-time processing with low latency and high accuracy, making it suitable for surveillance and security applications. It reduces manual monitoring efforts and enhances decision-making by providing automated identification and logging features. The proposed solution demonstrates effective performance and scalability, highlighting the potential of AI based monitoring systems in modern applications.

SMART RAILWAY CROSSING SAFETY SYSTEM USING ULTRASONIC SENSOR AND GSM

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Abstract:

Railway level crossings in rural and small-town areas often rely on manually operated or poorly synchronized gate systems, leading to critical safety risks. One such scenario occurs when a vehicle becomes trapped between closing gates while a train is approaching, potentially resulting in severe accidents. This paper proposes an intelligent and automated railway crossing safety system that integrates obstacle detection, real-time train tracking, and alert mechanisms to mitigate such risks. The system employs ultrasonic sensors to detect the presence of vehicles or obstacles within the gate area. Upon detection, an immediate alert is transmitted to the train driver via SMS communication and simultaneously displayed on an onboard engine interface. In addition, the system continuously monitors the train's distance from the crossing using location-tracking techniques. When the train is approximately 3 km away, the crossing gate is automatically opened using a servo motor mechanism, allowing trapped vehicles to escape safely. As the train approaches closer (within 2 km and 1 km ranges), successive warning alerts are sent to the engine driver to ensure heightened awareness and response readiness. This multi-layered alert system enhances situational awareness and provides critical time for preventive action. The proposed solution leverages IoT technologies, sensor-based automation, and communication systems to improve safety at railway crossings. It is cost-effective, scalable, and particularly suited for deployment in rural and semi-urban regions where advanced infrastructure is limited. By minimizing human error and enabling proactive safety measures, this system has the potential to significantly reduce accidents at railway level crossings.

SMART CAMPUS BUS MONITORING SYSTEM

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Abstract

A Smart Campus Mobility Bus Monitoring System Using Demand-Based Routing-Campus transportation systems often face inefficiencies due to fixed scheduling, uneven passenger distribution, and lack of real-time monitoring. This paper presents a smart campus mobility bus monitoring system developed as a mobile application prototype. The system collects real-time demand input from students through an application interface and dynamically assigns bus routes using an optimization approach. The proposed system aims to reduce waiting time, improve route efficiency, and enhance resource utilization. Unlike traditional fixed-route systems, this solution adapts to user demand and provides estimated arrival time through the application. The prototype demonstrates the feasibility of implementing demand-driven transport systems in campus environments, with future scope for integration of QR-based tracking and IoT technologies.

**DESIGN AND IMPLEMENTATION OF A FACE RECOGNITION-BASED ON SMART DOOR LOCK
SYSTEM USING FACENET**

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Abstract

This project focuses on the development of a secure residential access control system using a dual-factor authentication approach that combines facial recognition with password verification. The system utilizes a camera to capture and analyze facial features for biometric identification, while a keypad-based password mechanism provides an additional layer of security. An Arduino UNO microcontroller coordinates the authentication process by validating both the biometric data and user credentials. When authentication is successful, the system automatically activates a motorized door locking mechanism to allow authorized entry. If authentication fails at any stage, an instant SMS alert is sent to the homeowner to report a possible intrusion attempt. The integration of biometric recognition-based authentication improves reliability, reduces the risk of unauthorized access, and enhances overall system robustness. This dual-factor authentication system ensures an efficient, user-friendly, and dependable alternative to conventional single-layer home security systems.



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