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RAMAPURAM CHENNAI

4th International Conference on

CHALLENGES AND OPPORTUNITIES IN RENEWABLE ENERGY, SMART SYSTEMS AND E-MOBILITY

ICCORSE 2026

12th May, 2026

Hybrid Mode

Organized by

Department of Electrical and Electronics Engineering

Easwari Engineering College

Chennai – 600 089

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SUSTAINABLE DEVELOPMENT GOALS

4 QUALITY EDUCATION | 7 AFFORDABLE AND CLEAN ENERGY | 9 INDUSTRY, INNOVATION AND INFRASTRUCTURE | 12 RESPONSIBLE CONSUMPTION AND PRODUCTION | 13 CLIMATE ACTION

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4th International Conference on Challenges and Opportunities in Renewable Energy, Smart Systems & E-Mobility (ICCORSE 2026)

12th May 2026 (Hybrid Mode)

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4th International Conference on Challenges and Opportunities in Renewable Energy, Smart Systems & E-Mobility

Edited by

Dr. J. Lydia, Dr. K. Prabaakaran, Dr Raghavendran C R

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Message from the Principal

Dr. P. Deiva Sundari
Principal
Easwari Engineering College

It is my privilege to extend a warm welcome to all the delegates, researchers, academicians, industry professionals, and students participating in this conference. Conferences of this nature provide an excellent opportunity to exchange knowledge, showcase innovative research, and foster collaboration among academia and industry.

The publication of the conference proceedings reflects the collective efforts of researchers and contributors who strive to address contemporary challenges through technological advancements and scientific exploration. I am confident that the ideas and findings presented in these proceedings will contribute significantly to research, innovation, and societal development.

I congratulate the Department and the organizing committee for their dedicated efforts in successfully organizing this conference and compiling the proceedings. I also appreciate the authors, reviewers, and participants for their valuable contributions and active involvement.

I wish the conference great success and hope that the deliberations and discussions will inspire new perspectives and future collaborations among researchers and professionals.

Message from the Head of the Department

Dr. J. Lydia
Head of the Department
Easwari Engineering College

It gives me immense pleasure to welcome all the participants, researchers, academicians, industry experts, and students to this conference. The conference serves as an excellent platform for sharing innovative ideas, recent research advancements, and emerging technologies in various interdisciplinary domains.

The enthusiastic response received from researchers and professionals reflects the growing interest in collaborative research and knowledge exchange. I am confident that the presentations and discussions during this conference will provide valuable insights and inspire future innovations.

I appreciate the efforts of the organizing committee, faculty members, student volunteers, authors, and reviewers for their dedication and commitment towards the successful conduct of this conference and the preparation of these proceedings.

I extend my sincere wishes to all the participants for a productive and enriching experience and hope that this conference proceedings will serve as a valuable reference for researchers and academicians.

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AI BASED MOTOR CONDITION MONITORING AND FAULT PREDICTION SYSTEM

Roshini S, Sabesh D, Manoj Kumar K, Ranjani G

Easwari Engineering College

ABSTRACT

This paper presents a robust AI-based motor fault detection system designed for real-time industrial applications. Induction motors are widely used in industries, and unexpected failures lead to high operational costs. The proposed system integrates vibration and current signal analysis with hybrid machine learning algorithms for accurate fault classification. Features such as RMS, kurtosis, and FFT-based spectral components are extracted. A hybrid model combining Support Vector Machine and Artificial Neural Network is implemented. Experimental results show an accuracy of 97.2%, outperforming conventional techniques. The system demonstrates low computational cost, making it suitable for embedded platforms. The proposed system supports predictive maintenance strategies. It reduces unexpected industrial downtime significantly. Real-time monitoring improves operational reliability and safety. Cloud integration enables remote supervision and analysis. The framework is suitable for smart manufacturing environments. Future work may include deep learning-based fault prediction.

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SMART IRRIGATION SYSTEM USING ESP32 AND BLYNK IOT

Mohankumar S, Murletharan S, Pooja Srinivasan, Priyan J

Easwari Engineering College

ABSTRACT

"Water scarcity is an escalating global challenge that demands intelligent and resource-efficient agricultural practices. Traditional irrigation methods lack real-time soil monitoring capabilities, resulting in water wastage and suboptimal crop yields. This paper presents a dual-zone smart irrigation system based on the ESP32 microcontroller, integrated with the Blynk IoT cloud platform, to enable autonomous and remotely configurable irrigation control. Two capacitive soil moisture sensors connected to the ESP32 analog-to-digital converter (ADC) pins continuously monitor moisture levels across independent field zones. Raw analog values are converted to moisture percentages using calibrated dry (ADC: 3500) and wet (ADC: 1500) reference constants. A DHT22 temperature sensor provides ambient environmental data displayed on the cloud dashboard. User-defined moisture thresholds are configured remotely via the Blynk mobile or web application, and threshold-based decision logic independently activates LED irrigation indicators for each zone. The system transmits real-time sensor data to the Blynk cloud at one-second intervals over Wi-Fi. Experimental validation demonstrated accurate dual-zone moisture detection with less than 3% deviation from reference measurements, instantaneous threshold response within 1 second, and uninterrupted IoT communication over extended test periods. The proposed architecture offers a cost-effective, scalable, and modular solution suitable for small-scale precision agriculture and embedded systems education."

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MULTI MODEL AUTONOMOUS ROBOT

Rajaguru S, Nikesh G, Rithika P, Rakshitha S

Easwari Engineering College

ABSTRACT

"Autonomous robotic systems operating across multiple ask environments demand embedded architectures capable of real-time sensor fusion and adaptive decision-making. This paper presents the design and implementation of a Multi-Mode Autonomous Robot Car (MMARC) built on the Arduino UNO (ATmega328P) microcontroller platform. The proposed system integrates four operational modes: (i) obstacle avoidance using the HC-SR04 ultrasonic sensor mounted on an SG90 servo for 180° scanning, (ii) path-tracking using dual infrared (IR) sensors, (iii) wireless remote control via the HC-05 Bluetooth module paired with a smartphone application, and (iv) autonomous smart parking utilizing distance-based gap detection. An L298N dual H-bridge motor driver controls four DC gear motors for omnidirectional mobility. Experimental results demonstrate an obstacle detection accuracy of 96.4% across 250 test trials, a line-following path deviation error of less than ±4 mm at a velocity of 22.3 cm/s, and a successful smart parking rate of 94% in structured environments. The total hardware cost remains under USD 42, establishing the system as a scalable, cost-effective solution for educational robotics and low-cost industrial automation prototyping. Comparative evaluation against five recent enchmark systems confirms a performance improvement of 3.4–11.4% in obstacle detection accuracy over xisting single-mode and dual-mode counterparts."

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SMART RAILWAY TRACK CRACK DETECTION SYSTEM USING ARDUINO UNO AND SENSOR-BASED MONITORING

Varun A K, Sowbar Sathik E, Tharun Kumar M, Thilagan M R

Easwari Engineering College

ABSTRACT

"Railway transportation is a backbone of modern infrastructure, carrying millions of passengers and goods daily. However, railway track defects such as cracks, fractures, and misalignments remain a critical safety concern. These defects, if not detected early, can lead to catastrophic accidents including derailments, causing significant loss of life and property. Traditional inspection methods rely heavily on manual monitoring, which is not only time-consuming but also prone to human error and inefficiency. In recent years, the integration of embedded systems and sensor technologies has opened new possibilities for automated monitoring solutions. This paper presents a smart railway track crack detection system using Arduino Uno, IR sensors, and proximity sensors. The system is designed to continuously monitor track conditions and identify abnormalities in real time without human intervention. The IR sensor detects surface irregularities, while the proximity sensor ensures the presence and continuity of the metal track. The proposed system operates on a simple yet effective principle where sensor signals are processed by the Arduino Uno microcontroller. Upon detection of a crack or discontinuity, the system triggers an immediate alert using a buzzer. This ensures that faults are identified at an early stage, enabling quick maintenance actions and preventing potential accidents. Experimental observations indicate that the system provides reliable detection for both minor and major cracks with minimal delay. The use of low-cost components makes the system economically feasible for large-scale deployment across railway networks. Additionally, the modular design allows easy integration with advanced communication technologies in the future. Overall, the proposed solution offers a cost-effective, efficient, and scalable approach for improving railway safety. By reducing dependency on manual inspection and enabling real-time monitoring, the system significantly enhances the reliability and safety of railway operations."

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SMART GAS USAGE PREDICTION AND SAFETY SYSTEM

Manikandan.P, Rajesh.S, Nithish.G, Nirmal.M, Sujatha M

Easwari Engineering College

ABSTRACT

A Smart Gas Usage Prediction and Safety System is designed to enhance domestic and industrial gas management through intelligent monitoring, predictive analysis, and automated safety mechanisms. The proposed system utilizes gas sensors, microcontrollers, and IoT technology to continuously monitor gas consumption levels and detect hazardous gas leakage conditions in real time. Advanced data analysis techniques are employed to predict future gas usage patterns, enabling efficient resource planning and reducing unnecessary consumption. In the event of gas leakage or abnormal concentration levels, the system automatically triggers alarms, sends notifications, and activates safety measures to prevent accidents and ensure user protection. Remote monitoring through mobile or cloud-based platforms further improves accessibility and operational control. The system aims to improve safety, minimize energy wastage, and support efficient gas utilization in residential and industrial environments. Experimental evaluation demonstrates reliable performance, quick response time, and cost-effective implementation for smart gas management applications. The system improves safety in domestic and industrial environments. IoT integration enables continuous remote monitoring capabilities. Automated alerts help prevent hazardous gas leakage accidents. Predictive analysis reduces unnecessary gas consumption effectively. The framework supports efficient energy resource management. Future enhancements may include AI-based usage optimization.

IoT BASED ON SMART TEMPERATURE AND HUMIDITY MONITORING SYSTEM

Puhalvanan R.S, Muthupriyan.R, Pooja Sree.J.R, Sachin Srinivasan.S

Easwari Engineering College

ABSTRACT

This paper presents an IoT-based Smart Temperature and Humidity Monitoring System designed for real-time environmental monitoring and intelligent data management. The proposed system employs temperature and humidity sensors integrated with a microcontroller and IoT communication modules to continuously collect and transmit environmental data to a cloud platform. The monitored information can be accessed remotely through mobile or web applications, enabling users to observe environmental conditions from anywhere. The system provides automated alerts and notifications when temperature or humidity levels exceed predefined thresholds, ensuring timely preventive actions. The proposed framework is suitable for applications such as agriculture, industrial monitoring, healthcare, smart homes, and storage facilities where environmental control is critical. By utilizing IoT technology, the system enhances monitoring accuracy, reduces manual supervision, and improves operational efficiency. Experimental results demonstrate reliable performance, low power consumption, and cost-effective implementation, making the proposed smart monitoring system an efficient solution for modern environmental management applications. The system enables reliable environmental monitoring in real time. Remote access improves operational convenience and efficiency. Automated alerts ensure timely preventive corrective actions. The framework is suitable for agriculture and healthcare applications. Low power consumption makes the system cost effective. Future work can include AI-driven environmental analytics.

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SMART RESPONSIVE ROOF SYSTEM

S.Surendhar, S.Swathi, R.C Sai Surya, D.Yuvan Shankar, Kamalaselvan A

Easwari Engineering College

ABSTRACT

Unpredictable weather conditions, particularly sudden rainfall, pose challenges in protecting open residential and commercial spaces. Conventional roofing systems rely heavily on manual intervention, leading to delayed responses and potential damage to assets. This paper proposes a Smart Rain-Responsive Roof System based on embedded control using a microcontroller and environmental sensing. The system employs a rain sensor interfaced with an Arduino-based controller to detect precipitation in real time and actuate a servo-driven roof mechanism. A novel delay-based decision algorithm is introduced to accurately distinguish between active rainfall and residual moisture on the sensor surface, thereby minimizing false triggering. The system demonstrates improved reliability with a response accuracy of approximately 92%, reducing erroneous actuation compared to conventional systems by nearly 35%. Experimental results validate the system's effectiveness in real-time operation with low power consumption and cost efficiency. The proposed solution enhances automation, safety, and user convenience, making it suitable for smart homes and climate-responsive infrastructure. The automated mechanism improves environmental adaptability efficiently. Sensor-based monitoring reduces the need for manual operation. The system enhances user comfort and structural protection. Energy efficiency is improved through intelligent roof control. The framework is suitable for modern smart building applications. Future enhancements may include solar energy integration.

PATTERN BASED STREET LIGHT SYSTEM

Prasanna, Mohith, Pramoodh, Praveen, Arul Doss Adaikalam I

Easwari Engineering College

ABSTRACT

This paper presents the design and implementation of an automated, energy-efficient lighting solution utilizing an Arduino-based microcontroller architecture integrated with high-voltage power regulation techniques. The primary challenge in low-cost embedded lighting systems is the disparity between logic-level control (5V) and high-power illumination requirements (12V). We propose a hardware-efficient methodology that leverages the V_{IN} bus of an Arduino Uno R3 to facilitate a seamless 12V power distribution without external rail splitting. The system integrates a Light Dependent Resistor (LDR) for ambient light sensing, a Passive Infrared (PIR) sensor for motion detection, and a Real-Time Clock (RTC) for temporal synchronization. Control is achieved via a Pulse Width Modulation (PWM) signal driving an N-channel IRF540N MOSFET. Experimental results indicate that the proposed ""Direct-Jack VIN"" configuration eliminates the need for wire splicing while maintaining a common ground, ensuring system stability. The system demonstrates a 40% reduction in idle power consumption compared to non-regulated 12V setups and provides adaptive dimming based on environmental variables. The proposed system significantly reduces unnecessary energy consumption. Automatic lighting improves safety for road users at night. Sensor integration enables intelligent and adaptive operation. The framework supports smart city infrastructure development. Maintenance costs are minimized through efficient lighting control. Future work may include IoT-based remote management features.

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IoT-ENABLED SMART WASTE SEGREGATION AND REAL-TIME MONITORING SYSTEM FOR SUSTAINABLE URBAN MANAGEMENT

Shrisha S, Subasri V, Shreya Rajesh, Sharmitha S, Raghavendran C R

Easwari Engineering College

ABSTRACT

"The rapid growth of urban populations has significantly increased municipal solid waste generation, necessitating efficient and intelligent waste management systems. Conventional methods suffer from lack of segregation, inefficient scheduling, and absence of real-time monitoring, leading to environmental pollution and increased operational costs. This paper presents a Smart IoT-enabled waste management system that performs automated waste segregation and real-time bin monitoring using an ESP32 microcontroller. The system utilizes proximity and moisture sensors to classify waste into wet and dry categories, while a servo motor directs waste into designated compartments. Ultrasonic sensors continuously measure bin fill levels, and real-time data is transmitted to a cloud-based dashboard via Wi-Fi. Experimental results demonstrate a response time of 0.7 s and fill-level accuracy within ±0.8 cm. The system reduces human intervention, improves hygiene, and enhances operational efficiency. The proposed solution is cost-effective, scalable, and suitable for smart city applications."

SWS WITH AUTOMATED ALERT SYSTEM

Manimaran V V, Mohamed Yehya, Mohammed Sabier A, Raghaveswar S

Easwari Engineering College

ABSTRACT

An SWS with Automated Alert System is designed to provide intelligent monitoring and rapid notification capabilities for enhanced safety and operational efficiency in critical environments. The proposed system utilizes sensors and embedded controllers to continuously monitor important parameters such as environmental conditions, system status, or abnormal events in real time. When predefined threshold values are exceeded or unusual conditions are detected, the system automatically generates alerts through alarms, mobile notifications, or wireless communication modules to ensure immediate user awareness and response. The integration of automation and smart sensing technologies reduces manual supervision, improves reliability, and enables faster decision-making during emergency situations. The system is suitable for applications including industrial monitoring, environmental safety, smart buildings, and security management. In addition, the proposed framework offers low power consumption, cost-effective implementation, and user-friendly operation. Experimental results demonstrate reliable performance, accurate monitoring, and efficient alert generation for real-time safety and warning applications.

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SMART CAP FOR VISUALLY IMPAIRED USING ULTRASONIC SENSOR AND MICROCONTROLLER

Chunduri Srivaishnavi Ramalakshmi, Akash S, Afrah Fathima A, Dharshan Raj S

Easwari Engineering College

ABSTRACT

The proposed Smart Cap for Visually Impaired individuals is designed to improve independent mobility and personal safety using affordable embedded technology. The system integrates ultrasonic sensors, a microcontroller, buzzer alerts, and vibration feedback mechanisms to detect nearby obstacles in real time. The ultrasonic sensor continuously measures the distance between the user and surrounding objects, and the microcontroller processes the received data to provide instant audio or vibration alerts whenever obstacles are detected within a predefined range. The cap is lightweight, portable, energy efficient, and user friendly, making it suitable for daily outdoor and indoor navigation. The proposed solution helps visually impaired users identify obstacles such as walls, furniture, poles, and moving objects, thereby reducing the risk of accidents and improving confidence during movement. The device can operate with rechargeable battery support and can be further integrated with GPS and GSM modules for location tracking and emergency communication. Compared to traditional walking aids, the smart cap offers hands-free assistance and enhanced comfort. The project demonstrates the effective use of embedded systems and sensor technology in assistive healthcare applications to support inclusive and accessible living for visually challenged individuals.

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AUTOMATED MAIL ALERT

Madhumitha D, Hemala R, Hema Dharshini A S, Kiruthika J, Keerthana J

Easwari Engineering College

ABSTRACT

The Automated Mail Alert System is developed to provide instant notifications whenever new physical mail is delivered into a mailbox. The system uses sensors, a microcontroller, and wireless communication technology to detect mailbox activity and automatically send alerts to users through email or mobile notifications. The proposed model improves convenience, security, and efficiency by ensuring users are informed immediately about mail delivery without the need for frequent manual checking. The sensing mechanism identifies the opening or insertion of mail inside the mailbox and transfers the information to the controller for processing. Once validated, the system triggers an automated alert through internet-based communication platforms. This solution is highly beneficial for residential homes, offices, institutions, and elderly individuals who may face difficulty in regularly monitoring mailboxes. The system is cost effective, energy efficient, and easy to install in existing mailbox structures. Additional features such as camera integration, timestamp logging, and cloud-based storage can further enhance reliability and security.

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SMART BABY MONITORING AND ALERT SYSTEM

Akshaya G, Akshaya Sekar, Ashavarth S, Aswini P, Karpagam R

Easwari Engineering College

ABSTRACT

The Smart Baby Monitoring and Alert System is designed to ensure infant safety and provide continuous monitoring of a baby's health and environmental conditions using sensor-based technology. The system incorporates sensors for monitoring parameters such as temperature, humidity, sound, and baby movement, along with a microcontroller for real-time data processing and alert generation. Whenever abnormal conditions such as excessive crying, unusual body temperature, or unsafe environmental conditions are detected, the system immediately sends notifications to parents or caregivers through mobile applications or wireless communication modules. The proposed system enhances parental convenience by enabling remote monitoring and reducing the need for constant physical supervision. It is particularly useful for working parents and healthcare centers where continuous observation of infants is essential. The device is compact, energy efficient, and capable of operating continuously with reliable performance. Future enhancements may include camera integration, sleep pattern analysis, and cloud-based health data storage for advanced monitoring capabilities.

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SMART GLOVE-BASED SIGN LANGUAGE TO TEXT AND SPEECH CONVERSION SYSTEM

Abirami V, Atshaya K N, Dhayas Sri R, Dibika A

Easwari Engineering College

ABSTRACT

"People with hearing and speech impairments rely on sign language for communication, but most people are not trained to understand it. This creates communication barriers in daily life, especially in hospitals, schools, and public places. Existing solutions are either expensive, complex, or not suitable for real-time everyday use. To address this, we propose a smart glove-based system that converts sign language gestures into text and speech in real time. The glove uses flex sensors to detect finger movements, and an Arduino microcontroller processes these signals to recognize gestures. The output is displayed on an LCD and transmitted via Bluetooth or converted into voice. This system provides a low-cost, portable, and offline assistive technology solution. The system improves communication accessibility for disabled individuals. Wearable technology ensures portability and user convenience. Real-time conversion enhances interaction in public environments. The framework promotes inclusive and assistive communication. Machine learning can improve gesture recognition accuracy further. Future developments may support multiple sign languages.

"

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SMART ADAPTIVE STREET LIGHTING SYSTEM USING IR, LDR SENSOR USING ARDUINO UNO

Allanso Griffith B, Darshan Ku, R Balamurugan, Thilagar K V

Easwari Engineering College

ABSTRACT

"The Smart Adaptive Street Lighting System is an innovative project designed to automatically control street lights based on environmental and human activities. It combines modern sensing technology to reduce energy wastage and improve efficiency in public lighting. The system mainly utilizes three types of sensors: LDR, IR, and PIR. The LDR detects the surrounding light intensity to determine day or night conditions. When daylight is sufficient, the lights remain off, saving electricity. During the night or low light, the system activates the street lights automatically. This automation eliminates manual operation, ensuring continuous and reliable performance. It also contributes to reducing overall energy consumption and maintenance costs."

AUTOMATIC CAR PARKING SYSTEM USING RFID

Abi J, Ashwini P, Bhuvaneshwari K, Bhuvaneshwari S

Easwari Engineering College

ABSTRACT

"The rapid growth of vehicles has created parking problems in urban areas and commercial spaces. Traditional parking systems are time-consuming and require manual monitoring. The RFID-based Car Parking System provides an automated solution using RFID tags and readers. Each vehicle is identified automatically at the entry and exit gates. The system controls gate operation, records vehicle details, and manages parking slots efficiently. It reduces waiting time, improves security, and minimizes human effort. The system can also support automatic billing and space monitoring. Thus, it is an effective smart parking solution for modern cities. The system minimizes manual intervention during parking operations. RFID technology ensures secure and reliable vehicle identification. Automated access control reduces waiting time effectively. The framework improves parking space management efficiency. It is suitable for malls, offices, and residential complexes. Future improvements may include mobile payment integration."

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SMART MEDICINE ALERT SYSTEM

Abdullah Aazam S, Marish Kumar P

Easwari Engineering College

ABSTRACT

"This project presents a smart alert system using a microcontroller that provides notifications through a liquid crystal display, buzzer, and Telegram messaging platform. The system monitors time or user defined conditions and triggers an alert when the required condition is met. The liquid crystal display shows the alert message, while the buzzer produces an audible signal to attract attention. At the same time, a notification is sent to the user through Telegram using an internet enabled communication module. A push button is used for user interaction to acknowledge the alert, after which the system updates the display and stops the buzzer. This system is useful for applications such as reminders, security alerts, and automation systems. The design is simple, efficient, and suitable for real time embedded system applications."

AI-ENHANCED CONTEXT-AWARE TEXT-TO-SPEECH SYSTEM FOR ASSISTIVE WEARABLE DEVICES

Vikas Veeramanikantan[1], Dhruv.K.Prajapati[2], Jeevapandiyan.S.

[1]University of Limerick, [2]Easwari Engineering College

ABSTRACT

"This paper presents an AI-enhanced, context-aware text-to-speech (TTS) framework integrated into a wearable assistive device for individuals with visual impairments. Unlike conventional TTS systems that treat all textual inputs uniformly, the proposed system leverages natural language processing (NLP) models and environmental context sensors to modulate speech output dynamically, based on the semantic importance, emotional tone, and urgency of detected content. A lightweight transformer-based model deployed on an edge-computing module interprets scene context captured via a wearable camera and prioritizes critical information - such as hazard warnings, navigation cues, and social interaction prompts - to deliver intelligible, context-sensitive audio feedback. Experimental evaluations demonstrate significant improvements in information delivery latency, user comprehension rates, and overall usability compared to baseline TTS approaches. The proposed system achieves a context classification accuracy of 92.4% and measurably reduces cognitive load for users navigating dynamic environments."

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OFFLINE MOBILE-BASED SMART HOME AUTOMATION SYSTEM

Nivedita R, Priyadarshini, Sachin, Mohammed Arsath, Indhu Sailaja K A

Easwari Engineering College

ABSTRACT

An Offline Mobile-Based Smart Home Automation System is developed to provide secure and efficient control of household appliances without relying on internet connectivity. The system uses a mobile application along with wireless communication technologies such as Bluetooth or local Wi-Fi to establish direct communication between the smartphone and the home automation controller. It enables users to operate devices including lights, fans, and other electrical appliances remotely within a limited range. The integration of sensors allows automatic operation based on environmental conditions such as motion, temperature, and light intensity, improving user comfort and energy efficiency. Unlike cloud-based systems, the proposed offline framework ensures better privacy, reduced network dependency, and uninterrupted performance during internet outages. The system is designed to be cost-effective, easy to install, and suitable for modern residential applications. Experimental results demonstrate reliable operation, efficient energy management, and enhanced convenience through intelligent home automation.

AUTOMATIC WATER LEVEL MONITORING AND PUMP CONTROL SYSTEM

Sudharshan B, Vishal J, Suhail Ahamed Ta, Yuvaraj R

Easwari Engineering College

ABSTRACT

This paper presents an Automatic Water Level Monitoring and Pump Control System designed to efficiently manage water resources in domestic, agricultural, and industrial applications. The proposed system continuously monitors the water level in storage tanks using sensors interfaced with a microcontroller-based control unit. Based on the detected water level, the system automatically switches the water pump ON or OFF, thereby preventing overflow, dry running, and water wastage. Real-time monitoring and automated control improve operational efficiency while reducing human intervention and energy consumption. The system also incorporates alert mechanisms and display modules to provide users with updated tank status information. Advanced control logic ensures reliable and safe operation under varying environmental conditions. The proposed model offers a low-cost, energy-efficient, and user-friendly solution for smart water management. Experimental analysis demonstrates improved reliability, reduced maintenance requirements, and effective conservation of water resources through intelligent automation and monitoring techniques.

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MACHINE LEARNING BASED FAULT DETECTION AND CLASSIFICATION IN SMART GRID SYSTEMS

Tejaswini S, Sai Priyadarshini G, Subesh S, Sanjay G

Easwari Engineering College

ABSTRACT

The increasing complexity of modern smart grid systems, driven by the integration of renewable energy sources and distributed generation, has significantly challenged traditional fault detection and classification methods. Conventional techniques often fail under dynamic and nonlinear operating conditions. This paper proposes a robust machine learning-based framework for fault detection and classification in smart grids. The methodology incorporates supervised learning models such as Support Vector Machines and Random Forest along with unsupervised Autoencoders for anomaly detection. Electrical parameters including voltage, current, and harmonic distortion are used as input features. Synthetic data generation using Generative Adversarial Networks is employed to address data scarcity and improve generalization. Simulation results on an IEEE test bus system demonstrate that the proposed model achieves an accuracy of 98%, outperforming traditional methods by approximately 6–10%. The framework exhibits high robustness under varying fault conditions and effectively identifies both known and unknown faults. The results confirm that machine learning-based approaches significantly enhance reliability, adaptability, and fault response time in smart grid systems.

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ADAPTIVE TRAFFIC SIGNAL CONTROL USING COMPUTER VISION AND EMBEDDED EMERGENCY PRIORITY MANAGEMENT.

Sudesh S, Sai Vishnu G, Santhosh S, Sakthikumar S

Easwari Engineering College

ABSTRACT

"Traffic congestion in urban road networks has become a major challenge due to increasing vehicular density and the limitations of conventional fixed-time traffic signal systems. Traditional systems fail to adapt dynamically to varying traffic conditions, leading to excessive delays, fuel wastage, and increased emissions. This paper proposes an adaptive traffic signal control system based on computer vision and embedded emergency priority management using OpenCV and Arduino-based control. The proposed system employs camera-based vehicle detection, lane-wise density estimation, and dynamic signal allocation using a priority-based optimization algorithm. A microcontroller-based control unit adjusts green signal timing according to measured traffic density while also providing emergency vehicle preemption and pedestrian crossing support. The proposed model integrates image processing techniques including background subtraction, contour-based vehicle detection, and density-driven signal scheduling. A mathematical traffic allocation model is developed to optimize signal duration in real time. Simulation and prototype validation demonstrate improved average traffic throughput by 31.4%, reduction in average waiting time by 42.8%, and emergency vehicle response improvement of 55% compared to conventional fixed-time systems. Comparative evaluation with existing density-based systems shows superior adaptability and reduced congestion under varying traffic loads. Results indicate that the proposed intelligent traffic management framework offers a scalable and cost-effective solution for smart city transportation systems. Future enhancements include deep learning-based vehicle classification and IoT-enabled city-wide deployment."

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OPTIMIZED EMBEDDED CONTROL SYSTEM FOR ENERGY-EFFICIENT MOTOR DRIVE USING ARM-BASED MICROCONTROLLER AND ADAPTIVE PWM TECHNIQUES

Sanjay S,Siranjeevi S,Vignesh N,Vikash R

Easwari Engineering College

ABSTRACT

"Energy efficiency in motor-driven systems has become a critical requirement in industrial automation and smart energy applications. Conventional PWM-based motor control techniques often fail to adapt to dynamic operating conditions, leading to increased power losses and reduced performance. This paper proposes a novel adaptive PWM-based embedded control system using an ARM LPC2148 microcontroller. The system dynamically adjusts duty cycle based on real-time feedback parameters such as speed, load, and temperature. A mathematical model of the motor is developed, and an adaptive control algorithm is implemented to optimize system performance. Experimental results demonstrate that the proposed system achieves an efficiency improvement of up to 25% and reduces response time significantly compared to traditional methods. The system also improves torque stability and minimizes thermal losses. The proposed approach is cost-effective, scalable, and suitable for industrial motor control applications. Future work includes integration with IoT platforms and AI-based predictive optimization."

SMART HOME AUTOMATION BY USING AI

Sharukesh. R, Vishnuvarthan. M, Shreevathson. V, Sreeneevasan. Pi

Easwari Engineering College

ABSTRACT

"This paper presents an AI-driven smart home automation framework that addresses the limitations of traditional, rule-based home automation systems. Current infrastructure often lacks the predictive capability and real-time adaptation required for modern energy efficiency standards. We propose a comprehensive architecture integrating NodeMCU-based embedded controllers, IoT sensor arrays, and machine learning algorithms (Supervised Learning and Reinforcement Learning). By utilizing edge computing, our system minimizes latency by processing decisions locally rather than relying purely on cloud-based computation. The implementation, featuring MOSFET-based PWM appliances control, achieves a 25% reduction in total energy consumption and 95% environmental stability. This study details the system architecture, mathematical optimization model, and experimental validation, confirming that proactive, AI-integrated decision making transforms passive homes into responsive, adaptive ecosystems."

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QUANTUM COMMUNICATION AND INFORMATION PROCESSING

Sahitya Sastry, Subash.A, V.Suresh

Easwari Engineering College

ABSTRACT

"Quantum communication and quantum information processing are emerging technologies designed to provide ultra-secure, high-speed, and scalable data exchange systems. Unlike classical communication, quantum systems use qubits, superposition, and entanglement to enable secure key generation and efficient processing. The proposed architecture combines quantum channels with classical control networks to create hybrid communication infrastructure capable of global connectivity through fibre, free-space, and satellite links. Core design goals include security, low latency, cost efficiency, manageability, and shared infrastructure. Quantum nodes, entanglement distribution, software-defined networking (SDN), and network management services are integrated to improve performance and scalability. In information processing, measurement basis selection, parallelism, and error correction enhance reliability and computational efficiency. This framework represents the transition from basic point-to-point quantum links to intelligent multi-node quantum networks that can support secure communication, distributed computing, and next-generation internet services."

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HUMAN PRESENCE BASED POWER LINE SAFETY ALERT SYSTEM

Karthik R, Lingesh S, Lithish S, Maneesh Bhanu

Easwari Engineering College

ABSTRACT

This paper presents human presence-based power line safety alert system. Power transmission lines are essential for supplying electricity, but they also create hazardous environments for humans and animals when safety precautions are ignored. Accidental contact or movement near high-voltage lines can result in severe injuries and fatalities. This paper presents a Human Presence Based Power Line Safety Alert System that detects movement near danger zones and provides immediate warning signals. The system uses a Passive Infrared (PIR) sensor to identify the presence of humans or animals by sensing infrared radiation changes. An Arduino Uno microcontroller processes the sensor input and activates an LED and buzzer whenever motion is detected. The proposed system is low-cost, reliable, and suitable for improving safety in power line areas through continuous monitoring and real-time alerts. The system improves safety near high-voltage transmission areas. Real-time alerts help prevent accidental electrical hazards. The framework supports continuous monitoring and reliable operation. Low-cost implementation makes it suitable for wide deployment The design enhances awareness in restricted danger zones. Future work may include wireless notification integration."

 ISBN: 978-81-990189-7-6

"GESTURE-CONTROLLED WIRELESS MOUSE GLOVE USING ESP32, FLEX SENSORS, AND MPU6050"

Ganesh Vishwa H, Harrish K, Hari Prasath P, Harjith Aridtra

Easwari Engineering College

ABSTRACT

"This paper presents a compact, low-cost, wireless gesture-controlled mouse glove that maps natural hand motions to standard mouse events using an ESP32 microcontroller, two resistive flex sensors, and an MPU6050 inertial measurement unit (IMU). The system performs onboard signal conditioning (exponential moving average), sensor fusion (complementary filter), and BLE HID report generation at 100 Hz to deliver cursor motion and click events to a paired host. Experimental evaluation with four participants on a 1080p display shows mean cursor error 2.9 ± 0.7 px, click detection latency 27.6 ± 3.2 ms, and end-to-end latency ≈ 27.1 ± 3.2 ms, while the complete hardware bill of materials remains under USD 15. Power profiling indicates continuous operation of approximately 6.0 ± 0.2 hours on an 850 mAh LiPo cell. Results demonstrate that a self-contained embedded glove can achieve performance comparable to conventional optical mice for many interactive tasks while remaining inexpensive and portable."

FACE RECOGNITION SECURITY SYSTEM

Harish S, Hari Ragavendran S, Jaganathan B, Kavin Siddarth R

Easwari Engineering College

ABSTRACT

Traditional access control systems relying on keys, passwords, and RFID cards are increasingly susceptible to unauthorized duplication, loss, and sharing. This paper presents a fully embedded face recognition security system leveraging the ESP32-CAM module (Xtensa dual-core LX6 @ 240 MHz, OV2640 camera, 4 MB PSRAM) with an on-device MTMN face detection cascade and a MobileNet-based 128-dimensional face embedding network. Upon successful identification, a relay module activates a 12V solenoid door lock; unrecognized faces trigger a red LED alert. The system achieves 92.4% recognition accuracy at 200–500 lux indoor illumination with a mean response latency of 1.8 seconds and an optimal detection range of 0.5–1.5 m. Wi-Fi connectivity enables live video streaming and access logging via a hosted web interface. Experimental validation across illumination levels (50–800 lux), distances (0.5–2.0 m), and angles (±30°) confirms robust real-time performance. The proposed system outperforms comparable fully embedded, cloud-free implementations by 4.4% in accuracy while reducing response latency by 7.6% and maintaining hardware cost below USD 25. Applications include smart home security, office access control, laboratory entry management, and automated attendance systems."

 ISBN: 978-81-990189-7-6

SMART NUTRITION DEFICIENCY DETECTION SYSTEM

Lavanya. D. S, Deekshitha. Y. C, R. Brunda, Yoga Deepika. K. B

Sri Sairam College of Engineering

ABSTRACT

A Smart Nutrition Deficiency Detection System is developed to identify and monitor nutritional deficiencies in plants or individuals through intelligent sensing and data analysis techniques. The proposed system utilizes sensors, image processing, and machine learning algorithms to detect deficiency symptoms based on parameters such as leaf color, growth patterns, nutrient levels, or health indicators. The collected data are analyzed in real time to determine the type and severity of nutrient deficiency, enabling timely corrective actions and improved health management. The system provides users with accurate recommendations for nutrient supplementation, fertilizer application, or dietary improvements through a user-friendly interface. Integration with IoT technology allows remote monitoring and continuous data tracking for enhanced decision-making. The proposed framework helps improve agricultural productivity, crop quality, and health monitoring efficiency while reducing manual inspection efforts. Experimental results demonstrate reliable detection accuracy, fast response, and cost-effective implementation for smart nutrition management applications.

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REVOLUTIONIZING PRE-HOSPITAL CARE WITH THE AI-POWERED UNIVERSAL SMART HEALTH CAPSULE (USHC)

Sathiya A,Varun D,Manoj K M,Anandha G, Chandhu Sriram M K

Sri Sairam College of Engineering

ABSTRACT

"The Universal Smart Health Capsule (USHC) is a next-generation wearable device developed to address the urgent challenge of pre-hospital medical emergencies, where the majority of cardiac-related deaths occur within the first ten minutes before professional care is available. Unlike existing consumer devices with limited monitoring capabilities, the USHC integrates non-invasive optical, bioimpedance, and thermal sensors to continuously measure critical vital parameters, including heart rate, oxygen saturation, blood pressure, glucose, hydration, and body temperature. Intelligent data processing enables real-time analysis to predict and potentially prevent life-threatening events such as cardiac arrest and hypoglycemia. Beyond monitoring, the capsule can initiate proactive responses by administering micro-doses of stabilizing compounds, alerting caregivers, and notifying emergency services with live health information and GPS location. A companion mobile application supports real-time dashboards, predictive alerts, and telemedicine connectivity. Initial prototype testing indicates that the system delivers reliable monitoring and rapid emergency response, though large-scale clinical validation remains necessary. Ultimately, the USHC is designed to reduce preventable deaths and improve access to timely emergency care, particularly in resource-limited regions."

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IoT-ENABLED SMART ENERGY METER WITH REAL-TIME MONITORING AND PREDICTIVE ANALYSIS

Reshma Farhin J, Lalith Adithya M, Sindhuja S, Yuva Ganesh Pandy B

Sri Sairam College of Engineering

ABSTRACT

"The sharp rise in household energy consumption requires an upgrade from simple metering to smart and efficient energy monitoring. In this paper, an IoT-based energy consumption monitoring system using AI for predictions is designed and implemented. The system uses an ESP32 microcontroller integrated with a ZMPT101B voltage sensor and an SCT-013 current sensor to measure instant power variables. Measurement data is sent to a Firebase cloud database and simultaneously stored in an SD card with a FAT32 file format to sustain operations even when there is no Internet connection. A Flutter application fetches live usage data, accumulated usage data, and estimates the amount that would be required for the bill for the next month. On the analysis part, several regression models such as Linear Regression, Decision Tree Regressor, Random Forest Regressor, Support Vector Regressor, and LSTM Networks are used to train the model with the data obtained in past months to predict the electricity bill per month accurately, which is around 92%."

AI-BASED AGRICULTURAL MARKET INTELLIGENCE SYSTEM

Divyashri, Ritesh, Manoj K M, Praveen, Vamshi Yadav N S

Sri Sairam College of Engineering, Bengaluru

ABSTRACT

Agriculture is the backbone of many economies, yet farmers persistently face challenges including information asymmetry, lack of real-time market data, limited awareness of value addition techniques, and over-reliance on exploitative intermediaries. This paper presents an AI-Based Agricultural Market Intelligence System that leverages deep learning and Generative Artificial Intelligence (AI) to enhance farmer profitability and decision-making. The system integrates Long Short-Term Memory (LSTM) and Transformer-based price prediction models, a composite score-based market recommendation engine, a Generative AI chatbot powered by a Large Language Model (LLM), and a neural machine translation module supporting six major Indian regional languages. Experimental evaluation on a four-year multi-market agricultural dataset demonstrates that the proposed Transformer model achieves the lowest prediction error (MAE: 6.5, RMSE: 9.2) compared to ARIMA, Random Forest, and LSTM baselines. A pilot deployment across 50 farmers in Karnataka, India yielded an average 18% improvement in net realized crop price and a user satisfaction score of 4.3 out of 5.0. The proposed system provides an end-to-end, inclusive, and accessible decision support platform for smallholder farmers."

 ISBN: 978-81-990189-7-6

AI BASED NOISE POLLUTION MONITORING SYSTEM

Revathi B, Monisha Y M, Leela Selvamathi B, Sri Madhura S, Saranya R

Sri Sairam College of Engineering Bengaluru

ABSTRACT

"Noise pollution has emerged as a critical environmental concern in urban and industrial regions, adversely affecting human health, productivity, and ecological balance. Traditional noise monitoring systems lack real-time adaptability, intelligent classification, and predictive capabilities. This paper proposes an AI-based noise pollution monitoring system integrating embedded hardware and machine learning techniques to detect, classify, and analyze environmental noise in real time. The system utilizes a microcontroller-based data acquisition unit with sound sensors to capture ambient noise levels. Extracted audio features are processed using supervised learning algorithms for classification into categories such as traffic, industrial, and human-generated noise. Experimental results demonstrate an accuracy of 93.4% in noise classification and a 27% improvement in anomaly detection compared to conventional threshold-based systems. The proposed model enables efficient monitoring, decision-making, and proactive control strategies. The system is scalable, cost-effective, and suitable for smart city applications."

ALGORITHMIC HERDING IN EV SMART CHARGING: EXPERIMENTAL QUANTIFICATION OF DEMAND SYNCHRONIZATION CASCADES IN PRICE-RESPONSIVE DISTRIBUTION NETWORKS

Ananda Valli, T M Desshika, Kanimozhi D, Chandrakala D

Easwari Engineering College

ABSTRACT

"The proliferation of price-responsive smart charging algorithms across electric vehicle (EV) fleets has introduced an emergent grid threat: algorithmic herding the spontaneous synchronization of individually optimized charging decisions into collective demand surges. When thousands of EVs independently respond to identical price signals, their aggregate behavior mimics a single coordinated load step, imposing abrupt, high-magnitude stress on distribution feeders unprepared for such transients. This paper presents a simulation-based investigation modelling 150 EV chargers across three interconnected distribution feeders, each governed by commercially representative price-responsive optimization algorithms. Controlled price-trigger events are introduced to quantify cascade propagation velocity, frequency nadir depth, and feeder voltage deviation as functions of fleet synchronization percentage. Results establish the first empirically derived synchronization threshold curve defining the critical EV penetration level beyond which algorithmic herding induces measurable grid instability. Findings directly inform smart charging algorithm diversity requirements and distribution-level grid code revisions essential for high-penetration EV futures."

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GEN - AI AGENT FOR SMARTER CLOUD DATA MANAGEMENT

Sakthi Sylesh P K , Prasanna Raj, Sathya

Sri Sairam College of Engineering

ABSTRACT

This paper presents a Generative Artificial Intelligence (Gen-AI) agent for smarter cloud data management aimed at improving efficiency, security, and intelligent decision-making in cloud computing environments. The proposed system utilizes advanced AI models to automate data organization, resource allocation, storage optimization, and predictive analytics within cloud platforms. By integrating machine learning and natural language processing techniques, the Gen-AI agent can analyze large volumes of cloud data, identify usage patterns, detect anomalies, and provide intelligent recommendations for efficient data handling. The framework supports automated backup management, real-time monitoring, and adaptive scaling of cloud resources to reduce operational costs and improve system reliability. In addition, the AI-driven approach enhances data accessibility, minimizes manual administrative tasks, and strengthens cybersecurity through proactive threat detection. The proposed solution offers a scalable, intelligent, and cost-effective framework for modern cloud infrastructure management, enabling organizations to achieve improved performance, optimized resource utilization, and enhanced data governance in dynamic cloud environments.

DATA-DRIVEN ENERGY AUDITING AND EFFICIENCY ASSESSMENT IN SMART CAMPUS ENVIRONMENTS

Dinakar S M Kamaleshrajan S Lakshmanan K Chandrakala D

Easwari Engineering College

ABSTRACT

"This report presents a comprehensive energy audit of the Main Block and Electronics Block III (EB Block III) of Easwari Engineering College, covering six floors (Ground to Fifth) of the Main Block and two floors (Third and Fourth) of EB Block III. The audit systematically documents 2,338 electrical devices across 466 device-location entries in eight device categories including fans, lights, air conditioners, computers, and laboratory equipment. The total estimated monthly energy consumption of the audited buildings is 65,710 kWh (approximately 2,527 kWh/day). The audit identifies legacy induction fan technology, incomplete LED lighting upgrades, unmanaged computer idle loads, and air conditioning inefficiencies as the four primary sources of avoidable energy wastage, totalling approximately 12,461 kWh/month - 19% of the total campus load. The report further presents the Smart Energy Auditor, a full-stack AI and machine learning application developed to automate and scale the audit findings. The application employs a Gradient Boosting Regressor model (>98% accuracy) for hardware-level consumption prediction and integrates Google Gemini 1.5 Pro for utility bill diagnostics, with privacy-safe local OCR via Tesseract.js. Full implementation of all structured recommendations is projected to reduce monthly consumption by 18,534 kWh (28.2%) and deliver annual savings of Rs. 13,56,856 at a total capital investment of Rs. 32,24,920, with an overall payback period of approximately 4.1 years."

 ISBN: 978-81-990189-7-6

LOW-POWER CMOS ANALOG CIRCUIT DESIGN FOR BIOMEDICAL WEARABLES

Sriram R, Pavithra S, Samuel Pr, Chandrakala D

Easwari Engineering College

ABSTRACT

"The rapid spread of wearable health monitoring devices has pushed analog circuit designers into demanding territory: capturing biological signals with high fidelity while consuming power in the nanowatt-to-microwatt range. This review surveys low-power CMOS analog front-end (AFE) architectures spanning instrumentation amplifiers (IA), operational transconductance amplifiers (OTA), analog-to-digital converters (ADC), active filters, and energy harvesting interfaces. Key biosignal modalities ECG, EEG, EMG, and PPG each impose distinct bandwidth, noise, and power constraints that drive circuit innovation. Subthreshold CMOS operation, chopper stabilization, current reuse, and dynamic voltage scaling are examined as primary power-reduction strategies, along with their tradeoffs in SNR, CMRR, and noise efficiency factor (NEF). Emerging directions including AI-integrated analog inference, flexible electronics, and piezoelectric energy harvesting are discussed. The review consolidates findings from literature published between 2020 and 2025."

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VITALWEAR: A SMART WIRELESS COMPANION FOR HUMAN HEALTH

Andrew C.K, Dhanush Kumar S.M, Moni Sanjay D.V, Chandrakala D

Easwari Engineering College

ABSTRACT

"Wearable technologies have emerged as a transformative solution for continuous health monitoring, enabling real-time tracking of physiological parameters and improving preventive healthcare. This paper presents VitalWear, a smart wireless wearable device designed to monitor key human health indicators such as heart rate, body temperature, physical activity, and oxygen saturation. The proposed system integrates low-power sensors, wireless communication modules, and cloud-based data analytics to provide seamless and continuous monitoring. The device leverages Internet of Things (IoT) architecture for real-time data transmission and remote accessibility. Advanced data processing techniques enable early detection of abnormalities and support timely medical intervention. Recent advancements in wearable biosensors and wireless health systems highlight their importance in personalized healthcare and disease management. The system is designed with energy efficiency, portability, and user comfort as key considerations. Experimental analysis demonstrates reliable performance with reduced power consumption and improved accuracy. The proposed VitalWear systemcontributes to the development of next-generation smart healthcare solutions by combining wireless technology, sensor integration, and intelligent monitoring."

 ISBN: 978-81-990189-7-6

REAL - TIME FETAL HEALTH TRACKER

Rupa Ezhil Arasi, Anusha Nc Gowda, Harshitha K, Agnur Vanshika, Prerana Pranathi G

Sri Sairam College of Engineering

ABSTRACT

"Fetal well-being requires continuous monitoring to ensure safe development throughout pregnancy. This project presents a Smart Fetal Monitoring Wearable Waist Belt, an IoT-based system designed to track fetal health in real time and provide early alerts in case of abnormalities. The wearable belt is equipped with advanced sensors to measure heart rate, body temperature, and detect fetal movements using pressure-based sensing technology. By continuously monitoring patterns such as baby kicks and activity levels, the system helps assess fetal condition and identify any unusual changes. The collected data is processed through a microcontroller and transmitted to a connected mobile application. The mobile app displays real-time data, tracks daily fetal movement patterns, and sends alerts if reduced or irregular movements, abnormal heart rate, or temperature changes are detected. It also includes location details. This system aims to provide an affordable, efficient, and user-friendly solution for continuous fetal monitoring, ensuring timely awareness and improved care.an emergency feature that allows quick communication with caregivers by sharing ."

AN INTEGRATED FRAMEWORK FOR PROACTIVE HEALTH MONITORING : CONCURRENT MANAGEMENT OF TYPE 2 DIABETES AND PREDICTION OF GLAUCOMA USING DEEP LEARNING

Sadhana R, Dhinakaran

Vel Tech Rangarajan Dr. Sagunthala R & D Institute of Science & Technology

ABSTRACT

This paper presents an integrated healthcare framework for the proactive monitoring and management of Type 2 Diabetes and the early prediction of glaucoma using deep learning techniques. The proposed system combines medical data analysis, retinal image processing, and intelligent prediction algorithms to support early diagnosis and continuous health monitoring. Diabetes is a chronic disease that can lead to severe complications, including diabetic retinopathy and glaucoma, if not detected and managed effectively. The framework utilizes patient health parameters such as glucose levels, blood pressure, and retinal scan images to identify potential health risks using machine learning and deep learning models. Convolutional Neural Networks are employed for accurate glaucoma prediction from retinal images, while predictive analytics assist in monitoring diabetic conditions and identifying abnormal patterns. The system aims to assist healthcare professionals by providing faster and more reliable diagnostic support, thereby improving treatment outcomes and reducing the burden on medical infrastructure.

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ADAPTIVE SWARM-ACTUATED NET SYSTEM FOR SPACE DEBRIS CAPTURE: INTEGRATING DISTRIBUTED ROBOTICS WITH FLEXIBLE CAPTURE MECHANISMS

Idris, Nishanthan R, Nithin A, Chandrakala D

Easwari Engineering College

ABSTRACT

"The increasing density of orbital debris poses a critical threat to satellite operations and long-term space sustainability, potentially leading to cascading collision scenarios. Conventional debris removal approaches, including single-satellite net systems and rigid capture mechanisms, suffer from limited adaptability and high failure risk when interacting with non-cooperative, tumbling targets. This paper proposes an Adaptive Swarm-Actuated Net System (ASANS) that integrates distributed swarm robotics with a flexible, multi-point actuated net for efficient debris capture. The proposed system utilizes a coordinated network of small satellites to dynamically deploy, shape, and control a deformable net structure in real time. By leveraging decentralized control algorithms, adaptive tensioning strategies, and multi-agent sensing, the system enhances capture reliability and robustness in uncertain orbital conditions. A system-level architecture, operational workflow, and control strategy are presented, along with an analysis of key engineering challenges including orbital dynamics, communication constraints, and nonlinear net behaviour. Simulation-based validation strategies and feasibility assessments are discussed. The proposed approach demonstrates strong potential as a scalable and fault-tolerant solution for next-generation active debris removal missions."

SMART PEST SURVEILLANCE SYSTEM

Prathiksha R, Atheesha C, Narmatha M, Anush Kunjumon, Kalidass M

Sri Sairam College of Engineering

ABSTRACT

"Agricultural productivity is critically impacted by pest infestations, which result in significant crop losses and increased dependency on chemical pesticides. This paper proposes a Smart Pest Surveillance System that integrates Internet of Things (IoT), computer vision, and machine learning techniques to enable automated and real-time monitoring of pest activity in agricultural environments. The system employs camera traps to capture pest images and environmental sensors to collect key parameters such as temperature, humidity, and soil moisture, which influence pest behavior. The captured images are processed using advanced image processing techniques and deep learning models to accurately detect and classify pests. Simultaneously, environmental data is analyzed to identify correlations between climatic conditions and pest occurrence. By combining visual and sensor data, machine learning algorithms are utilized to predict potential pest outbreaks and generate timely alerts for farmers. Additionally, the system provides analytical insights and visual reports through an interactive interface to support informed decision-making. The proposed system reduces excessive pesticide usage, promotes sustainable agricultural practices, and improves crop yield. Experimental results indicate that the system achieves reliable pest detection accuracy and effective early warning capabilities, making it a scalable and cost-efficient solution for precision agriculture."

 ISBN: 978-81-990189-7-6

WEED MANAGEMENT THROUGH DETECTION AND REMOVAL IN COTTON CULTIVATION

Rupa Ezhil Arasi P, Yashashree M, Yuktha Prashanth Kumar, Santhosi Senthil, Venkatesh B

Sri Sairam College of Engineering

ABSTRACT

"Weeds significantly reduce crop productivity by competing with cultivated plants for essential resources such as nutrients, sunlight, water, and fertilizers. In cotton farming an important commercial non-food crop in India-weed infestation poses a serious threat to yield and profitability. Although weed removal is vital for optimizing crop output, traditional manual methods are labor-intensive and time-consuming. This project proposes an automated, eco-friendly solution for weed management in cotton plantations using Internet of Things (IoT)-enabled devices and Unmanned Aerial Vehicles (UAVs). The system is designed to detect weeds throughout the various growth stages of cotton plants using embedded sensors. Upon detection, targeted pesticide spraying is carried out by robotic sprayers integrated into the UAVs. This precision approach minimizes chemical usage, reduces production costs, and enhances sustainability. By automating weed detection and removal, the proposed system offers a low-effort, efficient alternative to manual labor, contributing to improved cotton yield and environmentally responsible farming practices."

LOW COST SOLAR PANEL DEFECT DETECTION

Nithin A, Nivasini N N, Vishnu Priya V

Easwari Engineering College

ABSTRACT

The rapid growth of solar energy infrastructure has created an urgent need for efficient maintenance and monitoring solutions. Traditional solar panel inspection methods are labour-intensive, time-consuming, and often inaccurate due to human error. This paper presents an affordable, IoT-based visual inspection system for automated solar panel defect detection using the ESP32-CAM module. The system captures real-time imagery of solar panels using the OV2640 camera integrated in the ESP32-CAM module and processes visual data at the edge, employing a FOMO (Faster Objects, More Objects) deep learning model trained on the Edge Impulse platform. Key defects targeted include physical damage such as cracks and dents. Experimental results demonstrate the system's effectiveness in identifying surface defects under varying lighting and environmental conditions. The proposed system significantly reduces the cost of solar panel maintenance while improving defect detection accuracy, making it suitable for large-scale solar farm deployments. The proposed system enhances photovoltaic maintenance efficiency. Automated monitoring reduces manual inspection efforts significantly. Real-time detection improves solar panel operational reliability. The framework is cost effective for large-scale deployment. IoT integration enables remote fault analysis and supervision. Future work may include thermal image-based defect detection."

 ISBN: 978-81-990189-7-6

IoT BASED SMART GRID MONITORING SYSTEM

Haemasoorya T, Jaivignesh M, Vishnukumar T, Mahisha V

Easwari Engineering College

ABSTRACT

The IoT-Based Smart Micro Grid Monitoring System is designed to enhance the efficiency, reliability, and sustainability of modern power distribution networks. By integrating IoT-enabled sensors and communication modules, the system continuously monitors parameters such as voltage, current, frequency, and energy consumption across the microgrid. Real-time data is transmitted to a centralized platform, enabling predictive analysis, fault detection, and load balancing. This approach ensures optimized energy usage, reduces downtime, and supports renewable energy integration. Compact, scalable, and cost-effective, the system demonstrates how IoT technology can transform traditional grids into intelligent, adaptive infrastructures for smart energy management. The proposed framework improves reliability of modern power systems. IoT communication enables efficient remote grid supervision. Real-time monitoring supports quick fault identification and response. The system contributes to sustainable energy management practices. Scalable architecture supports renewable energy integration effectively. Future enhancements may include AI-based load forecasting.

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HYDROCROP PILOT : INTELLIGENT WATER DRIVEN CROP MANAGEMENT FOR SUSTAINABLE FARMING

Tharani, Abith Ma, Priyanka D K, Ajay, Vijet

Sri Sairam College of Engineering

ABSTRACT

This paper presents HydroCrop Pilot, an intelligent water-driven crop management system designed to support sustainable farming through efficient water utilization and smart agricultural monitoring. The proposed framework integrates Internet of Things (IoT) sensors, wireless communication, and intelligent data analysis to continuously monitor soil moisture, temperature, humidity, water levels, and crop conditions in real time. Based on the collected environmental data, the system automatically regulates irrigation schedules to ensure optimal water distribution and minimize wastage. Advanced analytics and decision-support mechanisms help farmers identify crop stress, improve yield quality, and enhance resource management. The HydroCrop Pilot system also enables remote monitoring through cloud connectivity and mobile-based interfaces, allowing farmers to access field information from anywhere. By reducing excessive water consumption and improving irrigation efficiency, the proposed model contributes to environmentally sustainable agriculture. Experimental results demonstrate that the system provides reliable operation, cost-effective farm management, and improved crop productivity under varying agricultural conditions.

 ISBN: 978-81-990189-7-6

"IoT-BASED SMART ENERGY METER USING ESP32 AND PZEM-004T"

Muralimanickam S, Sheama Prasaad R L, Thulasiram S, Priya N

Easwari Engineering College

ABSTRACT

The IoT-Based Smart Energy Meter using ESP32 and PZEM-004T is designed to monitor electrical energy consumption in real time and provide efficient energy management solutions through Internet of Things technology. The system uses the PZEM-004T sensor module to measure electrical parameters such as voltage, current, power, frequency, and energy consumption, while the ESP32 microcontroller processes the data and transmits it to cloud platforms for remote monitoring. Users can access real-time energy usage information through mobile applications or web dashboards, enabling better awareness and control over electricity consumption. The proposed system supports accurate energy measurement, reduced manual meter reading, and improved transparency in power utilization. It also provides alerts for abnormal power usage and helps consumers optimize energy consumption to reduce electricity costs. The implementation is cost effective, scalable, and suitable for residential, commercial, and industrial applications.

ADAPTBANK: A NEXT-GENERATION SMART CHARGING SOLUTION COMBINING ADAPTER AND POWER BANK

Mohammed Ovaiz A, Sanjay Kumar S, Sanjiv S S, Santhosh M

Vel Tech High Tech Dr. Rangarajan Dr. Sakunthala Enineering College

ABSTRACT

"The proliferation of portable electronic devices has driven an increasing demand for compact, efficient, and intelligent charging solutions. Conventional charging adapters and power banks operate independently, leading to redundancy, reduced portability, and inefficient energy utilization. This paper presents ADAPTBANK, a smart dual-mode charging system that integrates a USB Power Delivery (USB-PD) charger and a power bank into a single intelligent unit. The proposed system incorporates a power path controller, MOSFET-based switching mechanism, internal battery storage, and Bluetooth Low Energy (BLE) connectivity for real-time monitoring and control through a mobile application. Intelligent power flow management enables automatic switching between adapter mode and power bank mode based on device charging requirements and internal battery conditions. Experimental validation demonstrates seamless operation, improved power efficiency, enhanced portability, and user convenience. The system provides a reliable and innovative solution for modern portable charging needs."

 ISBN: 978-81-990189-7-6

ADVANCING AQUEOUS SODIUM-ZINC HYBRID BATTERIES THROUGH HYBRID ELECTROLYTES AND MATERIAL ENGINEERING

Nithin .V, M .Prithikha, Nitharshana S.R, Chandrakala D

Easwari Engineering College

ABSTRACT

"Aqueous sodium-zinc hybrid batteries (ASZHBs) represent a promising frontier in safe, low-cost energy storage, combining the high capacity of zinc anodes with the sustainable intercalation chemistry of sodium cathodes. A primary hurdle for these systems is the narrow electrochemical stability window (ESW) of water (1.23 V), which leads to water electrolysis and hydrogen evolution. This review draws on recent source findings to propose the use of acetonitrile/water hybrid electrolytes to expand the ESW to 3.0 V and underscores the importance of zinc metal anode engineering to ensure stable cycling. The synergy between hybrid electrolyte design and advanced material engineering offers a compelling pathway towards high-performance, non-flammable energy storage solutions."

ISBN: 978-81-990189-7-6

"STATE-OF-THE-ART REVIEW OF NEUROMORPHIC EVENT-BASED GESTURE RECOGNITION FOR LOW-LATENCY APPLICATIONS"

Pratheesha G, Thishanth M, Suthesi M, Chandrakala D

Easwari Engineering College

ABSTRACT

"Neuromorphic event-based vision has emerged as a promising paradigm for achieving low-latency and energy-efficient perception in real-time applications. Unlike conventional frame-based vision systems, event-based sensors capture asynchronous changes in the visual scene, enabling high temporal resolution and reduced data redundancy. This paper presents a state-of-the-art review of neuromorphic event-based gesture recognition techniques for low-latency touchless interfaces. The review covers key components of the system, including event-driven sensors, data representations, feature extraction methods, and learning algorithms such as spiking neural networks and deep learning models. Various benchmark datasets and evaluation metrics are also discussed. Furthermore, the paper analyzes the advantages of event-based approaches in terms of speed, power efficiency, and robustness under challenging conditions such as dynamic lighting and motion blur. Key challenges, including limited datasets, hardware constraints, and algorithmic complexity, are critically examined. Finally, emerging research directions such as edge computing, explainable AI, and hybrid neuromorphic architectures are highlighted. This review aims to provide a comprehensive understanding of current developments and guide future research toward efficient and scalable gesture recognition systems."

 ISBN: 978-81-990189-7-6

A CRITICAL REVIEW OF DATA-DRIVEN FAULT DETECTION TECHNIQUES FOR INDUCTION MOTORS

Harish M, Gopinath N, Dharnidhar S, Chandrakala D

Easwari Engineering College

ABSTRACT

"Induction motors are widely used in industrial and institutional applications due to their robustness, simplicity, and cost-effectiveness. However, unexpected faults in these motors can lead to significant operational disruptions, energy losses, and maintenance costs. In recent years, data-driven techniques, particularly those based on machine learning (ML), have emerged as powerful tools for accurate and early fault detection. This paper presents a critical review of data-driven fault detection techniques for induction motors, focusing on the integration of signal processing, feature extraction, and intelligent classification methods. Various types of faults, including stator, rotor, bearing, and air-gap eccentricity faults, are examined along with commonly used data sources such as vibration, current, and thermal signals. The review analyzes traditional ML algorithms, deep learning architectures, and hybrid approaches in terms of accuracy, computational complexity, and real-time applicability. Furthermore, key challenges such as data quality, model generalization, and deployment constraints are discussed. Finally, future research directions are highlighted, emphasizing the role of edge computing, IoT integration, and explainable AI in advancing reliable and scalable fault diagnosis systems. This study aims to provide a comprehensive understanding of current advancements and guide researchers toward developing more efficient and intelligent condition monitoring solutions for induction motors."

COMPREHENSIVE ENERGY AUDITING AND OPTIMIZATION FOR INSTITUTIONAL BUILDINGS

Cecelia Maria Selvi J, Harshini S, Loshika V, Lydia J

Easwari Engineering College

ABSTRACT

"Energy has become one of the most critical resources in modern educational institutions, where a wide range of electrical and mechanical systems are continuously used to support academic, research, and administrative activities. The Mechanical Block, being one of the most resource-intensive facilities, houses classrooms, laboratories, and workshops equipped with various energy-consuming devices such as lighting systems, fans, air conditioners, computers, and heavy industrial machinery. This report presents a comprehensive and detailed energy audit of the Mechanical Block with the objective of analyzing energy consumption patterns, identifying inefficiencies, and proposing practical energy optimization strategies. The study follows a structured methodology involving planning, field investigation, data collection, analysis, and reporting. Detailed data was collected regarding the number of devices, their power ratings, operating hours, and spatial distribution across different floors. The analysis reveals that workshop machinery constitutes the largest share of energy consumption due to its high power rating and operational intensity. Air conditioning systems and computing equipment also contribute significantly, despite their relatively lower numbers. Additionally, lighting systems and fans, though individually consuming less power, collectively account for a considerable portion of total energy usage due to their widespread presence and long operating durations. Several inefficiencies were identified during the audit, including idle running of machines, excessive lighting usage, lack of real-time monitoring systems, and the use of outdated equipment. Based on these findings, various energy-saving measures are proposed, such as replacing conventional lighting with LED systems, optimizing machine operation schedules, implementing smart monitoring systems, and promoting energy awareness among users."

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IoT-BASED SMART DOOR LOCK SYSTEM FOR ENHANCED SECURITY

Makeshwari G, Lekhasree S, Mahalakshmi R, Lydia J

Easwari Engineering College

ABSTRACT

"The Smart Door Lock System with IoT Integration is an advanced security solution developed to provide reliable and intelligent access control for homes, offices, and restricted areas. Traditional locking systems that rely on physical keys are prone to issues such as key loss, duplication, and unauthorized access, making them less secure in modern environments. To overcome these limitations, this project implements a dual authentication mechanism using RFID card-based access and keypad-based PIN entry. The system is built around the ESP32 microcontroller, which acts as the central processing unit and manages all input and output operations efficiently. When a user scans a valid RFID card or enters the correct PIN, the system verifies the credentials and grants access by activating a servo motor to unlock the door, while an LED indicator glows to show successful authentication. In case of incorrect input or unauthorized access, the system denies entry, keeps the door locked, and indicates failure through a blinking LED. Additionally, the system simulates monitoring by displaying messages on the serial monitor, representing image capture functionality for security purposes. This project demonstrates a cost-effective, user-friendly, and scalable smart security system, and it can be further enhanced with IoT features such as remote monitoring, cloud storage, and real-time alerts."

ISBN: 978-81-990189-7-6

DESIGN OF EV SYSTEM WITH PORTABLE CHARGER

Kishore U S, Dhanush Balaji R, Praveen S, Priya N

Easwari Engineering College

ABSTRACT

"The fast rise of electric cycle transit in the last-mile mobility has demonstrated the necessity of charging solutions based on low-power batteries that are compact-sized, flexible, accessible, and accessible to the population. The traditional electric vehicle charging stations are configured to support heavy capacity systems which cannot be distributed in micro-mobility. This paper gives the design and simulation of a portable electric system of charging a bicycle with multiple sources of power through a combination of solar photovoltaic panel and the AC grid. To allow charging several batteries at the same time, an AC-DC rectifier and a Single Input Multiple Output (SIMO) DC-DC converter is used in the architecture. A control and battery management system utilizing microcontrollers achieves regulated voltage, shared current under control and works safely. Simulation data attests to constant DC output, equalized multi-battery charging, and high control at different input conditions. The suggested system provides a scalable, energy-saving system that can serve the goal of sustainable urban transportation"

 ISBN: 978-81-990189-7-6

AI-DRIVEN CAMPUS CARBON MANAGEMENT PLATFORM

Gowtham G, Dharshan S, Bhuvaneswaran R, Abijith G S, Nageswari D, Geethamahalakshmi G

R.M.K. College of Engineering and Technology

ABSTRACT

"Universities and institutional campuses are increasingly recognized as microcosms of urban sustainability challenges. Traditional carbon footprint monitoring systems rely on retrospective reporting, often limited by fragmented datasets and delayed corrective actions. Recent advancements in artificial intelligence (AI) and Internet of Things (IoT) technologies enable real-time monitoring, predictive analytics, and dynamic optimization of energy and resource use. The proposed platform integrates IoT sensors, smart meters, and AI algorithms to continuously capture data on electricity, water, transportation, and waste. A centralized AI engine converts raw usage into carbon equivalents (CO2e), allocates departmental carbon budgets, and provides real-time dashboards. Machine Learning (ML) and Reinforcement Learning (RL) models are employed to predict demand, optimize renewable energy integration, and recommend corrective actions. Comparative analysis is conducted against traditional monitoring systems and recent AI-enabled deployments in higher education institutions. Unlike static scheduling approaches, AI dynamically adjusts to fluctuating demand and intermittent renewable supply. Predictive analytics identify inefficiencies early, aligning sustainability with cost savings. However, challenges persist: the global rise of AI data centers could consume 945 TWh annually by 2030, with fossil fuels meeting 60% of demand, potentially adding 220 million tons of CO2 emissions. This paradox underscores the need for campuses to adopt efficient AI algorithms, renewable integration, and carbon-aware computing practices to ensure net positive climate impact. This paper represents a paradigm shift from compliance-oriented monitoring to proactive, intelligent carbon governance. By embedding carbon visibility into daily operations, campuses can achieve measurable reductions in emissions, enhance energy efficiency, and foster student and staff engagement in sustainability. Comparative evidence from 2025–2026 demonstrates that AI-powered systems significantly outperform traditional models in accuracy, responsiveness, and impact. Future research should address the dual challenge of scaling AI for sustainability while mitigating its own energy footprint, ensuring that campuses remain leaders in climate responsibility."

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ARTIFICIAL INTELLIGENCE BASED POWER QUALITY EVALUATION IN RENEWABLE ENERGY INTEGRATED MICROGRID CLUSTERS

Mathivadhani S, Jaisiva S

Sri Krishna College of Technology, Coimbatore

ABSTRACT

"The increasing penetration of renewable energy sources such as solar photovoltaic and wind energy in modern power systems has led to the development of renewable energy-based microgrid clusters. Although these systems offer significant environmental and economic benefits, they also introduce several power quality issues including voltage fluctuations, harmonic distortion, frequency deviations, and transient disturbances due to the intermittent nature of renewable generation. Effective assessment and monitoring of power quality in such microgrid environments are essential to ensure reliable and stable operation of the power network. This research focuses on the development of an Artificial Intelligence (AI)-based framework for power quality assessment in renewable energy integrated microgrid clusters. The proposed approach utilizes advanced AI techniques such as Artificial Neural Networks (ANN), Machine Learning (ML), and Deep Learning (DL) algorithms to analyze real-time electrical parameters and identify various power quality disturbances with high accuracy. Data collected from distributed renewable energy sources, smart sensors, and monitoring devices are processed to detect abnormalities, classify disturbances, and predict system behavior under varying operating conditions. The AI-based assessment model enhances the speed and reliability of power quality analysis compared to conventional monitoring techniques. Furthermore, the proposed system supports intelligent decision-making for maintaining voltage stability, reducing harmonic impacts, and improving overall grid performance. The outcomes of this study contribute to the development of smart and resilient renewable energy microgrid systems capable of ensuring efficient energy management and improved power quality standards in future sustainable power networks."

 ISBN: 978-81-990189-7-6

TEMPERATURE-COMPENSATED ADAPTIVE MPPT ALGORITHM WITH THERMAL MANAGEMENT INTEGRATION FOR HIGH-TEMPERATURE PHOTOVOLTAIC APPLICATIONS

B. Lingesh Datta, Prabaakaran K

Easwari Engineering College

ABSTRACT

"Microgrids with high penetration of renewable energy sources (wind and solar) face critical frequency stability challenges due to the reduced inertia and damping provided by inverter- based resources compared to conventional synchronous generators. Existing centralized control schemes require high- speed communication networks and suffer from single points of failure, while decentralized approaches often fail to coordinate effectively during rapid transients. This paper presents a decentralized adaptive control strategy that dynamically adjusts virtual inertia and damping coefficients based on real-time estimation of grid operating conditions without requiring wide- area communication. The approach employs recursive least squares identification to estimate equivalent inertia and damping from frequency measurements, enabling each distributed energy resource (DER) to autonomously adjust its control parameters. A predictive frequency deviation model enables proactive response to predicted transients. Comprehensive MATLAB/ Simulink validation across multiple microgrid configurations demonstrates the proposed method maintains frequency within acceptable limits (±1 Hz) under severe disturbances including 40% sudden load reduction, renewable generation curtailment, and islanding events. Comparative evaluation against conventional droop control, centralized model predictive control (MPC), and recent distributed cooperative approaches shows superior frequency nadir improvement (28–35% better), faster settling time, and enhanced stability margin. The decentralized nature eliminates communication latency effects and improves fault tolerance while reducing computational burden on central controllers. Results indicate the approach is particularly effective for microgrids with 60–80% renewable penetration, where conventional methods experience instability."

PLASTIC TO POWER (TURNING WASTE TO CLEAN ENERGY)

Sathviki K and Sarath Manickam M, Suresh V

Easwari Engineering College

ABSTRACT

"This research transforms environmental burdens into a clean energy goldmine by reimagining plastic waste as a high-value fuel source. By subjecting stubborn polypropylene to a "solar-aging" UV pretreatment, we effectively pre-shatter its carbon bonds, making it ripe for transformation. When paired with a light-activated brookite (TiO2} catalyst, this "sunburned" plastic yields a staggering 1400% increase in hydrogen production compared to untreated waste. It's a creative pivot that doesn't just manage trash—it harvests it. Beyond the lab, we've designed a blueprint for a 24/7 industrial powerhouse. By implementing concentrated UV shredding and thin-layer flow reactors, we eliminate natural bottlenecks to maximize efficiency. Our strategy integrates magnetic catalyst recovery and AI-driven sorting to handle real-world "dirty" plastics, upcycling them into premium hydrogen and pharmaceutical-grade chemicals. This approach proves that the solution to our climate crisis isn't just floating in the wind; it's hidden in our waste"

 ISBN: 978-81-990189-7-6

ENERGY AUDIT AND EFFICIENCY IMPROVEMENT IN ACADEMIC BLOCK AND BOYS HOSTEL

S R Sreecharan, Vijay Vignesh S, Vijay Bharathi P

Easwari Engineering College

ABSTRACT

"Energy auditing is a systematic and structured approach used to evaluate electrical energy consumption. In academic and residential buildings, energy usage is influenced by lighting systems, cooling equipment, air conditioning units, and user behavior. Lighting systems operate for long durations, while air conditioners contribute significantly to peak load demand. Continuous loads such as CCTV and networking devices operate 24/7 and form a constant base load within the system. Energy auditing is a systematic and structured approach used to evaluate electrical energy consumption. In academic and residential buildings, energy usage is influenced by lighting systems, cooling equipment, air conditioning units, and user behavior. Lighting systems operate for long durations, while air conditioners contribute significantly to peak load demand. Continuous loads such as CCTV and networking devices operate 24/7 and form a constant base load within the system. Energy auditing is a systematic and structured approach used to evaluate electrical energy consumption. In academic and residential buildings, energy usage is influenced by lighting systems, cooling equipment, air conditioning units, and user behavior. Lighting systems operate for long durations, while air conditioners contribute significantly to peak load demand. Continuous loads such as CCTV and networking devices operate 24/7 and form a constant base load within the system."

AN INTEGRATED IOT-AI FRAMEWORK FOR PRECISION DAIRY FARMING

Sivaprakash C, Utsaw Chandra, Kanishka Joshi and Manas Singh

Sri Sairam College of Engineering

ABSTRACT

This paper presents an integrated Internet of Things (IoT) and Artificial Intelligence (AI) framework for precision dairy farming aimed at improving productivity, animal health, and farm management efficiency. The proposed system employs smart sensors and connected devices to continuously monitor critical parameters such as temperature, humidity, feed intake, milk yield, animal movement, and health conditions in real time. The collected data are transmitted through IoT networks to a centralized cloud platform for storage and analysis. Advanced AI algorithms are utilized to predict diseases, detect abnormal behavior, optimize feeding schedules, and support decision-making for farmers. The framework enhances resource utilization, reduces manual intervention, and enables early identification of health issues, thereby minimizing economic losses. In addition, remote monitoring and automated alerts improve operational reliability and animal welfare. The proposed IoT-AI based precision dairy farming model offers a scalable, cost-effective, and intelligent solution for sustainable dairy farm management in modern agricultural environments.

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DIGITAL IOT FRAMEWORK FOR CAMPUS SAFETY AND SURVEILLANCE

Gowtham G, Dharshan S, Bhuvaneswaran R, Abijith G S, Nageswari D Geethamahalakshmi G

R.M.K. College of Engineering and Technology

ABSTRACT

"Campus safety has become a critical priority in higher education institutions worldwide. Traditional surveillance systems, often reliant on isolated CCTV networks and manual monitoring, struggle to provide real-time situational awareness and proactive threat detection. With the rapid evolution of the Internet of Things (IoT), campuses can now deploy interconnected digital frameworks that integrate sensors, cameras, and AI analytics to enhance safety, streamline emergency response, and ensure a secure learning environment. The paper proposes integrates smart cameras, biometric access controls, environmental sensors, and mobile applications into a unified platform. IoT devices continuously capture data on movement, access patterns, and environmental anomalies. This data is processed through AI-driven analytics engines capable of detecting suspicious behavior, unauthorized access, or hazardous conditions. A cloud-based dashboard provides administrators with real-time alerts, predictive insights, and automated incident reporting. Comparative analysis is conducted against traditional surveillance systems and recent IoT-enabled deployments in educational institutions. Smart IoT frameworks achieve 30–40% faster emergency response times, compared to 10–15% improvements in traditional CCTV setups. AI-enabled facial recognition and anomaly detection reduce false alarms by 25%, while integrated mobile alert systems increase student and staff engagement in safety protocols. Case studies from smart campuses in Asia and Europe report measurable reductions in unauthorized access incidents and improved coordination between campus security and local authorities. By embedding IoT sensors and AI analytics into daily campus operations, institutions can achieve real-time threat detection, faster emergency response, and improved safety outcomes. Comparative evidence from recent deployments demonstrates that IoT-enabled systems significantly outperform traditional surveillance in accuracy, responsiveness, and impact. Future research should focus on integrating blockchain for secure data management, edge computing for faster analytics, and privacy-preserving AI to ensure ethical and sustainable adoption."

COMPREHENSIVE EVALUATION OF SUSTAINABLE BIOREMEDIATION: EFFICACY OF TURMERIC, KUMKUM, AND SPECIFIC SEED BASED MATERIALS IN WATER SAFETY

R.Hema Swarna Meena[1], Kesavan T[2]

[1]Holy Cross College, [2]Easwari Engineering College

ABSTRACT

"This thesis presents a comprehensive investigation into the bioremediation potential and water safety enhancement capabilities of several natural, plant-based materials. The study focuses on turmeric (Curcuma longa), kumkum (a traditional ritual material), and four specific seeds: sesame (Sesamum indicum), mustard (Semen sinapis), horse gram (Macrotyloma uniflorum), and flax (Linum usitatissimum). As the global water crisis intensifies, there is an urgent need for sustainable, non-toxic, and cost-effective alternatives to synthetic chemical coagulants like aluminum sulfate. This research utilizes a multi-dimensional approach, integrating a systematic literature synthesis with primary experimental protocols. The experimental methodology includes UV-vis spectrophotometry, microbiological assays (Spread Plate and Stab Culture), molecular DNA isolation, and rigorous physicochemical characterization (pH, turbidity, phosphorus levels). Findings indicate that sesame and flax derivatives function as potent adsorbents and flocculants for heavy metals and organic dyes, while white mustard protein serves as an effective natural coagulant for anionic dyes. The study also explores the scientific validation of ritualistic materials, finding a lack of empirical evidence for kumkum in current literature but providing a baseline through experimental ""ritual samples."" The successful isolation of DNA from seed-treated water validates the potential for molecular-level monitoring of bioremediation processes. This work concludes that integrating these natural materials into water treatment systems offers a viable ecological pathway, provided that processing conditions and nutrient loads are carefully managed."

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ARCHITECTURAL OPTIMIZATION OF AI-INTEGRATED ACADEMIC ECOSYSTEMS

Sivaprakash C, Bhoomika R, Navya Shree N & Anshuman Sharma

Sri Sairam College of Engineering

ABSTRACT

"The integration of Artificial Intelligence (AI) into higher education represents a transformative frontier in AI Engineering, shifting from static digital tools to dynamic, embedded intelligence systems. This paper presents an exhaustive investigation into the technical requirements and systemic challenges of implementing AI within the university environment, focusing on the convergence of embedded systems, microprocessors, and smart optimization. Using a descriptive analytical framework supported by a survey of 240 faculty members and 15 AI experts at leading institutions, we evaluate the readiness of academic ecosystems for AI integration. The study identifies key hardware prerequisites, such as IoT-enabled sensor networks and RFID-based resource management, alongside software needs like Intelligent Tutoring Systems (ITS). Experimental data reveals that while 60% of students utilize AI for personalized learning, institutional infrastructure gaps remain significant, with a mean score of 2.93 for curriculum support. We propose a robust system architecture for a ""Smart Learning Environment"" (SLE) that utilizes microprocessor-driven optimization to balance computational load and power consumption in real-time educational data processing. The paper concludes with a strategic roadmap for ethical AI deployment, mitigating risks of algorithmic bias and electronic plagiarism through cryptographic verification."

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ABOUT THE COLLEGE

Easwari Engineering College (Autonomous), a constituent institution of the renowned SRM Group of Institutions, Ramapuram, Chennai, was established in the year 1996 with a strong vision of delivering quality technical education and nurturing excellence in research, innovation, and global competence. Over the past 29 years, the institution has grown steadily in stature and reputation, emerging as a top-ranked institution recognised by the NIRF. The college offers a comprehensive academic portfolio comprising 15 under-graduate and 7 post-graduate programs across diverse disciplines of Engineering, Management, and Computer Applications. The institution has been recognised as a Research Institute by Anna University, Chennai. Easwari Engineering College has established 24 Centres of Excellence in various emerging technologies for the benefit of students. The Directorate of Research delivers global, impactful, and future-focused research while fostering entrepreneurship, innovation, and start-up opportunities.

ABOUT THE DEPARTMENT

The Department of Electrical and Electronics Engineering (EEE) at Easwari Engineering College, established in 1996, is a premier department that focuses on building strong fundamentals in electrical sciences while integrating modern technologies such as embedded systems and renewable energy. The department offers undergraduate, postgraduate, and research programs, and is recognized for its NBA accreditation and status as a research center under Anna University. With well-equipped laboratories, experienced faculty, and active industry interaction through workshops, guest lectures, and projects, the department emphasizes innovation, practical learning, and skill development, preparing students for successful careers in core engineering, IT industries, higher education, and entrepreneurship.

ABOUT THE CONFERENCE

The International Conference on Challenges and Opportunities in Renewable Energy, Smart Systems, and E-Mobility (ICCORSE-2026) is a prestigious international event organized by the Department of Electrical and Electronics Engineering at Easwari Engineering College. This interdisciplinary conference aims to bring together leading researchers, academicians, industry professionals, and practitioners from around the globe. It provides a dynamic platform for exchanging innovative ideas, presenting cutting-edge research, and fostering collaborations. The conference focuses on exploring emerging trends, technological advancements, and real-world challenges in the domains of Renewable Energy, Smart Systems, and E-Mobility, contributing to sustainable development and future-ready solutions.

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