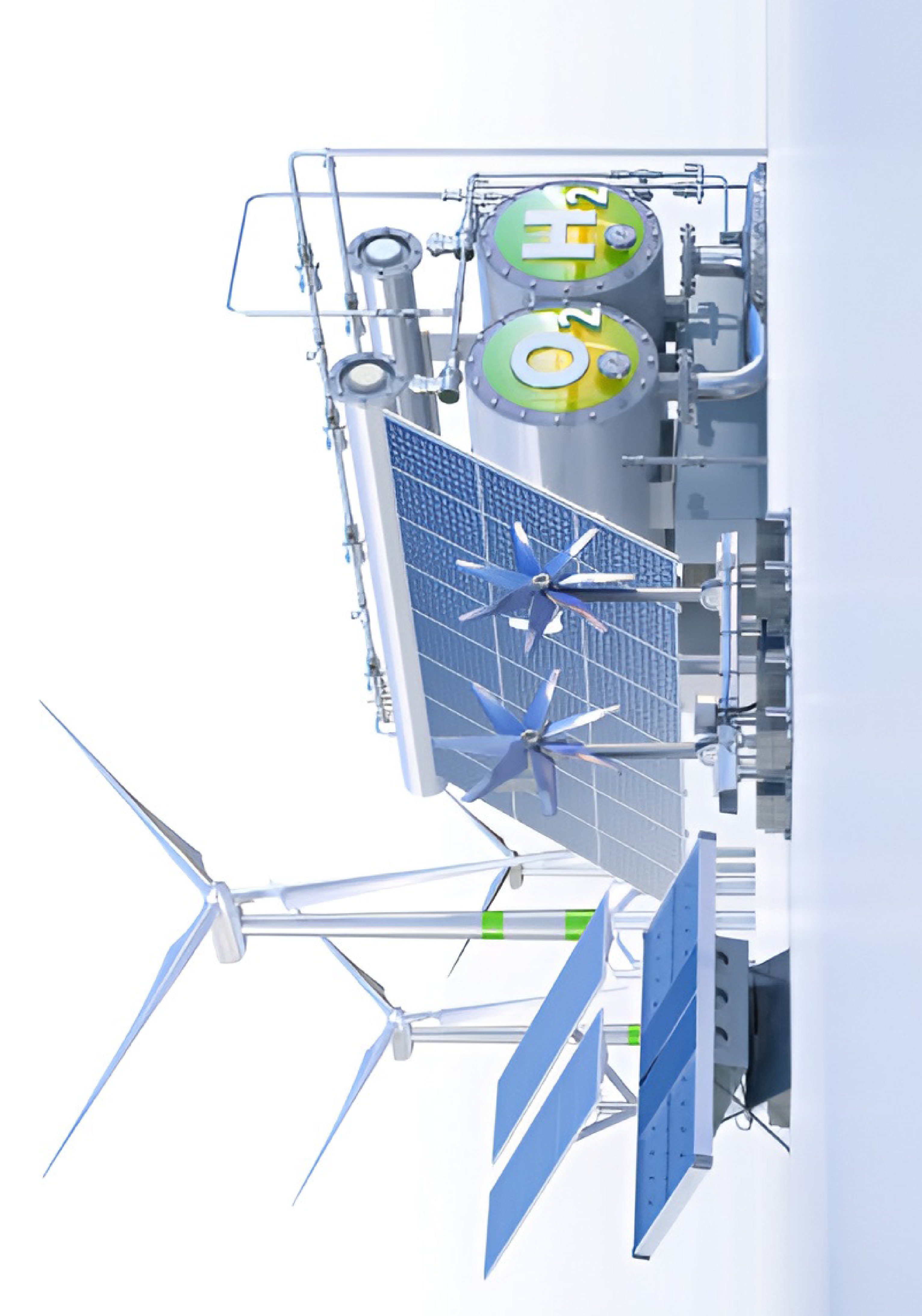


Electro Frontiers

(Technical Magazine)

2025-26

Published on 09-07-2026

Department of
Electrical & Electronics Engineering
VELAGAPUDI RAMAKRISHNA SIDDHARTHA ENGINEERING COLLEGE
(Autonomous)
Kanuru, Vijayawada-520007, Andhra Pradesh


EDITORIAL BOARD

Siddhartha Academy of Higher Education (Deemed-to-be University) Vijayawada

Velagapudi Ramakrishna Siddhartha Engineering College (VRSEC) was the first private engineering college in the united Andhra Pradesh, founded in 1977. In 2024, VRSEC achieved deemed university status, marking a new era for the institution. With nine undergraduate and postgraduate programs in engineering, including B.Tech., MTech., MBA, and MCA, VRSEC has consistently upheld quality standards, being the first private engineering institution in the state to receive NBA accreditation in five cycles since 1998 and to adopt Outcome-Based Education (OBE) in 2013. The institute was reaccredited by NAAC with an 'A+' grade in 2021 and ISO 21001:2018 certified. The institute was conferred autonomous status in 2006 again in 2012 later it was extended from the UGC for an additional 10 years, up to 2028, without a peer team visit. VRSEC is recognized among India's top engineering institutions by agencies like Outlook, Data Quest, and Careers 360. The college has consistently ranked within the top 200 in the NIRF rankings for the last seven years.

In 2024, VR Siddhartha Engineering College was declared as a deemed-to-be university under Section 3 of the UGC Act, 1956 by Ministry of Education, Government of India. With a legacy of educational excellence, the institution's UGC-granted autonomy, renewed through 2027-28, provides a strong foundation for its transformation. Guided by a detailed 15-year strategic vision and a 5-year rolling implementation plan, Siddhartha Academy of Higher Education focuses on key areas such as academics, faculty recruitment, student admissions, research, ICT infrastructure, and administration, with specific annual milestones and measurable outcomes.

SAGTE, as a responsive educational trust, aligns with the Government of India's target of achieving a 50% GER in higher education by 2035. Siddhartha Academy of Higher Education, Deemed-to-be University, offers diverse undergraduate and postgraduate programs through its specialized schools, including the School of Engineering (B.Tech., M.Tech.), School of Management (MBA), School of Law, School of Science (B.Sc., M.C.A.), and School of Arts & Commerce (B.Com.). Envisioned to support interdisciplinary and multidisciplinary education for students' holistic development, the university aligns with the aspirations and requirements of NEP 2020 to equip students with the skills and knowledge essential for future growth and societal contributions.

VISION AND MISSION

UNIVERSITY VISION

To be a centre of excellence in education, innovation and research with a global presence in arts, science, technology, medicine, management, legal studies, and social studies, enriching the frontier areas of national and international importance.

UNIVERSITY MISSION

- To create a transformative educational experience for students focused on problemsolving skills, communication abilities, interpersonal relations, and leadership.
- To cultivate a vibrant university community that attracts and retains diverse, worldclass talent, creating a collaborative environment open to the free exchange of ideas where research, creativity, innovation, and entrepreneurship can flourish, and ensuring individuals achieve their full potential.
- To impact society pragmatically-regionally, nationally, and globally-by engaging with industry, outstanding national and international universities, and research organizations.
- To be a global university that nurtures excellence in education and innovation, fostering a knowledgeable society

INSTITUTE VISION

To nurture excellence in various fields of engineering by imparting timeless core values to learners and to mould the institution into a centre of academic excellence and advanced research.

INSTITUTE MISSION

To impart high quality technical education in order to mould the learners into globally competitive technocrats who are professionally deft, intellectually adept and socially responsible. The institution strives to make the learners inculcate and imbibe pragmatic perception and proactive nature so as to enable them to acquire a vision for exploration and an insight for advanced enquiry.

Siddhartha Academy of Higher Education (Deemed-to-be University), Vijayawada – Administrative Block

ABOUT THE DEPARTMENT

DEPARTMENT VISION

To impart quality education and strive for centre of excellence in research**.**

DEPARTMENT MISSION

To prepare future technocrats for a global work place through excellence in teaching and research. The department endeavours to prepare the students professionally skilful, intellectually proficient and socially responsible

Velagapudi Ramakrishna Siddhartha Engineering College, established in the year 1977, is the first private Engineering College in the state of Andhra Pradesh. It is a self-financing institution which owes its foundation to the bold and inspired vision of Siddhartha Academy of General and Technical Education, Vijayawada. Established in the year 1977, the EEE department offers two programs, one undergraduate and one postgraduate. The undergraduate program is the B. Tech. Program in Electrical and Electronics Engineering (EEE) with an intake of 132. The department has twenty six qualified faculty supported by thirteen technical and administrative staff. The faculty composition is Two Professors, Five

Associate Professors, Two Assistant professors (SG), Three Senior Assistant professors and Thirteen Assistant Professors with 16 Ph.D and Eleven M.Tech. The faculty is also committed for research and publishing papers regularly in different areas. The research area comprises Optimal Control Systems, Power System Operation and Control, HVDC Transmission, Electric Drives, Power Quality, Distributed Generation, Gas Insulated Substations, Reduced order modelling, Optimal power flow, FACTS etc. The EEE department having ten laboratories which are well equipped with advance equipment.

The Department is equipped with High Voltage Engineering Lab, AC Network Analyzer and EHV 220kV Transmission Line Simulator in Power Systems Lab first of its kind in any private engineering college in A.P. Also, the department is actively engaged in consultancy work in electrical meter testing and third-party quality assurance for Vijayawada Municipal Corporation electrical works. The technical staff provides assistance to faculty for various laboratories and they provide electrical maintenance for the college campus.

Department produces well-disciplined students with high pass percentage and good campus placements. For the last forty-seven years, the department has produced highly professional and competitive engineers with greater quality and appropriate skills suitable for a rapidly changing industrial scenario. Our alumni are well established in India as well as abroad. **Under Graduate Program of our department is accredited by National Board of Accreditation (NBA) for a period of 3 years i.e., from 01-07-2022 to 30-06-2025.**

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Program: B.Tech. Electrical and Electronics Engineering

PEO1: Excel in chosen professional career and/or higher education

PEO2: Demonstrate leadership, teamwork and managerial abilities with effective communication.

PEO3: Design innovative, economical Sustainable and socially responsible engineering solutions in multidisciplinary environment.

PEO4: Engage in lifelong learning and uphold ethical and professional values to adapt in emerging technologies and global challenges.

PROGRAMME OUTCOMES (POs)

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4).

PO3: Design/Development of Solutions: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)

PO4: Conduct Investigations of Complex Problems: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modeling, analysis & interpretation of data to provide valid conclusions. (WK8).

PO5: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modeling recognizing their limitations to solve complex engineering problems. (WK2 and WK6).

PO6: The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).

PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)

PO8: Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO9: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.

PO10: Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11: Life-Long Learning: Recognize the need for and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO1: Apply knowledge of electrical engineering to analyze, design and develop efficient systems for the generation, transmission, distribution and utilization of electric power using simulation tools and techniques.

PSO2: Develop expertise in control and power conversion technologies for effective energy management emphasizing applications in renewable energy systems and electric vehicles.

PSO3: Design and implement intelligent electronic systems using IoT, embedded, and VLSI technologies for efficient and smart automation solutions.

PSO4: Demonstrate proficiency in programming, simulation and system integration to innovate and optimize AI enabled smart, sustainable and intelligent electrical systems aligned with emerging industrial and societal needs.

HOD'S DESK

It gives me immense pleasure to present **Electro Frontiers**, the Technical Magazine of the Department of Electrical and Electronics Engineering for the academic year **2025–26**. This edition reflects our department's unwavering commitment to academic excellence, technological innovation, research, and professional development. It serves as a vibrant platform to showcase the achievements, research contributions, technical articles, innovative projects, and creative accomplishments of our students and faculty members.The Department of Electrical and Electronics Engineering continues to strengthen its academic and research ecosystem through quality education, outcome-based learning, industry collaboration, modern laboratory facilities, and innovation-driven practices. This magazine highlights significant milestones, including student projects, faculty publications, technical events, workshops, industrial interactions, consultancy activities, and various departmental achievements that demonstrate our commitment to developing competent, ethical, and future-ready engineers capable of addressing global technological challenges.

I sincerely express my gratitude to the University Management, Editorial Committee, faculty members, students, alumni, and all contributors whose dedication and collective efforts have made this publication possible. I hope this edition of **Electro Frontiers** serves as a valuable source of knowledge, inspiration, and technological insight, motivating every reader to embrace innovation, pursue excellence, and contribute meaningfully to the advancement of engineering, sustainable development, and society.

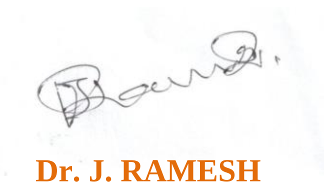
Yours

Dr. P.V.R.L. NARASIMHAM
Professor & Head

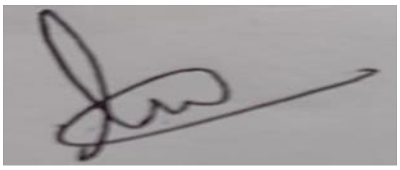
EDITORIAL MESSAGE

It is with great pride and pleasure that we present the **2025–26 edition of Electro Frontiers**, the Technical Magazine of the Department of Electrical and Electronics Engineering. This publication reflects our department's commitment to academic excellence, technological innovation, research, and holistic student development. It serves as a platform to showcase the achievements, innovative ideas, technical contributions, and collective efforts of our students, faculty members, and staff.The continued growth of our department is driven by the dedication of our faculty and the enthusiasm of our students. Through quality teaching, research, industry collaboration, and outcome-based learning, we strive to nurture technically competent, innovative, and ethically responsible engineers capable of addressing the challenges of the rapidly evolving technological world. This magazine highlights significant research activities, technical articles, innovative projects, publications, workshops, industrial interactions, and academic accomplishments that reflect the vibrant learning culture of our department. It also provides students with an opportunity to express their creativity through literary, cultural, and extracurricular contributions, making **Electro Frontiers** a comprehensive reflection of departmental excellence.

We sincerely express our gratitude to the University Management, Principal, Head of the Department, Editorial Committee, faculty members, students, alumni, and all contributors whose dedication and collective efforts have made this publication possible. We hope this edition of **Electro Frontiers** inspires readers to embrace innovation, strengthen their technical knowledge, and contribute meaningfully to the advancement of engineering, technology, and society.



Dr. J. RAMESH
ASSOC.PROFESSOR
CHIEF-EDITOR



Mr. P. VENKATESH
ASST. PROFESSOR
EDITOR

TABLE OF CONTENTS

Innovation in Action: How a Student Project Became a Startup

1.An IoT-Enabled Hybrid Convertible Bed for Enhanced Patient Mobility and Care

The healthcare sector is constantly evolving to meet the growing demand for innovative solutions to improve patient care and caregiver efficiency. Among the most vulnerable groups are bedridden patients, who face severe challenges related to mobility, hygiene, and health monitoring. Traditional hospital beds and wheelchairs are often insufficient to meet these needs, as they require manual intervention for patient transfers, lack integration with modern monitoring systems, and fail to provide real-time health updates. These limitations not only impact the quality of life for patients but also impose significant physical and mental stress on caregivers, especially in hospitals, homecare environments, and rehabilitation centers. To address these challenges, we propose the development of an IoT-enabled hybrid convertible bed that seamlessly integrates advanced mobility features with health monitoring capabilities, providing a comprehensive solution for bedridden individuals.

The hybrid convertible bed offers a transformative approach to patient mobility by integrating cutting-edge mechanical and IoT technologies. Its design enables it to function both as a bed and a wheelchair, eliminating the need for manual transfers and ensuring a smooth transition between these modes. This feature not only enhances patient comfort but also significantly reduces the physical strain on caregivers, improving overall efficiency in caregiving settings. Additionally, the bed is equipped with gesture control functionality, allowing patients or caregivers to operate the system intuitively with minimal effort. This innovation is particularly beneficial for individuals with limited mobility, as it empowers them to regain some independence in their daily lives.

A standout feature of the proposed system is its IoT-based health monitoring mechanism. Sensors integrated into the bed continuously track vital parameters such as heart rate, oxygen levels, body posture, and movement. These readings are transmitted to a cloud-based platform in real-time, enabling caregivers and healthcare professionals to monitor the patient's condition remotely. This proactive approach to health management allows for timely interventions in case of abnormalities, reducing the risk of complications and enhancing patient outcomes. Furthermore, the data collected can be analyzed over time to provide insights into the patient's health trends, aiding in personalized treatment planning.Sanitation and hygiene are critical concerns for bedridden patients, as prolonged immobility often leads to skin infections and pressure ulcers. To address this, the hybrid convertible bed incorporates an integrated sanitation system that ensures cleanliness and prevents infections. This system not only enhances patient comfort but also minimizes the risk of hospital-acquired infections, making it a valuable addition to healthcare facilities. The bed's ergonomic design further prioritizes patient safety, with features such as adjustable supports, anti-slip surfaces, and secure locking mechanisms.

The proposed solution is highly versatile and can be customized for various applications. In hospitals, it streamlines operations by reducing the time and effort required for patient transfers, freeing up resources for other critical tasks. In homecare settings, it provides families with an affordable and efficient way to manage the needs of bedridden individuals, ensuring a better quality of life. Rehabilitation centers can also benefit from the system's mobility features, which support therapy and recovery processes. The scalability of the design makes it suitable for diverse patient demographics, including pediatric and bariatric care.The technological framework of the hybrid convertible bed integrates IoT sensors, gesture-based controls, and a robust mechanical structure. Time-series data collected from sensors is processed in real-time, providing actionable insights for caregivers.

The modular design of the bed ensures ease of maintenance and facilitates upgrades to incorporate future. The development of this IoT-enabled hybrid convertible bed aligns with global efforts to modernize healthcare infrastructure and enhance patient care. By optimizing mobility, ensuring real-time health monitoring, and addressing sanitation concerns, the system addresses critical challenges faced by patients and caregivers alike. Future advancements in the design could include the integration of artificial intelligence for predictive health alerts, renewable energy solutions for sustainable operation, and incentive-driven models to make the technology more accessible. These enhancements will further solidify the bed’s role as a game-changing innovation in the healthcare industry.

Authored by

MD Rayyan - 238W5A0225

K Sathish Kumar - 238W1A0281

Guided By

Dr G Srinivasa Rao

Associate Professor

2. One India – One Water Grid – One Power Grid

(A Vision for Sustainable Water and Energy Security)

India is endowed with an extensive network of perennial and seasonal rivers that support agriculture, drinking water supply, hydropower generation, industries, and ecosystems. However, the distribution of water resources is highly uneven due to variations in monsoon rainfall, river basin characteristics, and geographical conditions. Every year, the northern and northeastern regions experience severe flooding during the monsoon, while several central, western, and southern states face recurring droughts and water shortages. Simultaneously, the country's growing demand for electricity requires reliable, sustainable, and renewable energy resources. The vision of **"One India – One Water Grid – One Power Grid"** aims to establish an integrated national framework for optimized water resource management through scientifically planned river interlinking while strengthening the existing National Power Grid with additional hydropower and pumped-storage generation. This concept seeks to improve water availability, enhance renewable energy production, and support India's long-term sustainable development

One Water Grid – Connecting India's River Basins

The proposed **One Water Grid** envisions the interconnection of selected river basins through a network of multipurpose reservoirs, balancing dams, gravity canals, tunnels, aqueducts, and lift irrigation systems to transfer a scientifically assessed portion of surplus monsoon water to water-deficit regions. Conceptual inter-basin transfer corridors such as **Ganga–Yamuna–Chambal–Narmada, Ganga–Son–Mahanadi, Mahanadi–Godavari, Godavari–Krishna, Krishna–Pennar, Pennar–Cauvery, and Cauvery–Vaigai–Gundar** could improve irrigation potential, groundwater recharge, drinking water supply, flood moderation, drought resilience, and regional water equity. Wherever topography permits, gravity-flow systems should be preferred to minimize energy consumption, while lift pumping systems can be adopted only where elevation differences make gravity transfer technically infeasible.

One Power Grid – Renewable Energy Integration

India's **One Power Grid**, operating as a synchronized national grid at **50 Hz**, provides an ideal platform for integrating future water infrastructure with renewable energy generation.

Existing multipurpose reservoirs and newly developed balancing reservoirs can accommodate hydroelectric stations and pumped-storage plants that operate in coordination with solar and wind energy resources. During periods of surplus renewable generation, reversible pump-turbines can store energy by pumping water to elevated reservoirs, while during peak electricity demand the stored water can be released through turbines to generate clean electricity. Such integration improves grid stability, frequency regulation, renewable energy penetration, peak-load management, and overall power system reliability while reducing dependence on fossil-fuel-based generation.

Hydropower Development Opportunities

India already possesses several strategically important hydropower stations, including **Tehri, Bhakra–Nangal, Nathpa Jhakri, Hirakud, Sardar Sarovar, Koyna, Nagarjuna Sagar, Srisailam, Idukki, and Mettur Hydroelectric Power Station**, which significantly contribute to renewable electricity generation and water resource management. In addition, several river basins such as the **Upper Brahmaputra, Siang, Subansiri, Teesta, Upper Ganga, Upper Narmada, Upper Godavari, Chambal–Narmada corridor, Mahanadi headworks, Krishna–Pennar Lift Corridor, Western Ghats, and Nilgiri–Cauvery region** have the potential for future hydropower or pumped-storage development, subject to detailed hydrological, geological, environmental, seismic, and techno-economic feasibility studies. These projects could substantially increase India's renewable energy capacity while supporting large-scale integration of solar and wind power.

Smart Water and Energy Infrastructure

The successful implementation of the **One Water Grid – One Power Grid** vision will require advanced engineering and digital technologies. Multipurpose reservoirs, barrages, tunnels, canals, pumping stations, hydroelectric generating units, and extra-high-voltage transmission systems must be integrated with modern **SCADA**, **Geographic Information Systems (GIS)**, **Remote Sensing**, **Artificial Intelligence (AI)**, **Internet of Things (IoT)** sensors, **Digital Twin technology**, and cloud-based monitoring platforms. These intelligent systems can continuously monitor reservoir levels, river flows, canal discharge, hydropower generation, transmission performance, and weather conditions, enabling optimized reservoir operation, accurate flood forecasting, predictive maintenance, and efficient allocation of water and energy resources across the country.

Benefits and Future Perspective

The realization of **"One India – One Water Grid – One Power Grid"** could transform India's water and energy sectors by improving irrigation, strengthening food security, enhancing groundwater recharge, ensuring reliable drinking water supply, reducing flood and drought impacts, promoting inland navigation, and supporting balanced regional development. Additional hydropower and pumped-storage facilities would provide clean, flexible, and reliable electricity while enhancing the stability of the National Power Grid and facilitating greater integration of renewable energy sources. Although the concept offers significant national benefits, its implementation must be based on rigorous scientific planning, basin-wise hydrological assessment, environmental protection, interstate cooperation, social impact evaluation, and economic feasibility.

A phased and evidence-based approach will ensure that future water and energy infrastructure contributes to sustainable development while preserving ecological balance. The vision of **"One India – One Water Grid – One Power Grid"** represents a long-term national strategy to achieve water security, energy resilience, and inclusive economic growth through integrated engineering and responsible resource management.

Authored by

V. Sai Siddhartha (24EU06128)

K.Hema Sai Sree (25EU06022)

Aluri Likith Sai (26EU09002)

Nadakuditirohini (26EU9008)

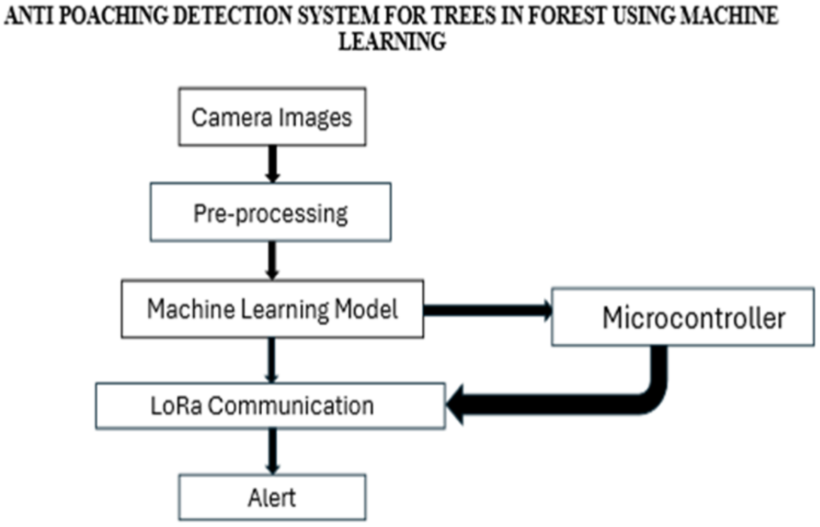
Guided By

Dr. J.Ramesh

Associate Professor

3. AI-Enabled Anti-Poaching Detection System for Smart Forest Protection

Forests are among the most valuable natural ecosystems on Earth, supporting biodiversity, regulating climate, conserving water resources, and acting as major carbon sinks. However, illegal tree cutting and forest poaching have become significant environmental challenges, leading to deforestation, habitat destruction, and ecological imbalance. Conventional forest surveillance methods primarily rely on manual patrolling, which is often ineffective in monitoring vast and remote forest regions. Recent advancements in Artificial Intelligence (AI), Machine Learning (ML), Computer Vision, and the Internet of Things (IoT) have enabled the development of intelligent surveillance systems capable of automatically detecting illegal activities. The proposed **AI-enabled Anti-Poaching Detection System** utilizes machine learning algorithms, image processing, and long-range wireless communication to continuously monitor forest environments and provide real-time alerts to forest authorities. This intelligent approach significantly enhances forest security while reducing human intervention and response time.



Machine Learning-Based Forest Monitoring

The proposed system continuously captures images from strategically installed surveillance cameras located in vulnerable forest regions. These images are processed using advanced computer vision techniques to identify normal and abnormal activities occurring within the protected area. Before analysis, the captured images undergo preprocessing operations such as resizing, noise removal, brightness enhancement, and data augmentation to improve image quality and detection accuracy. A deep learning model based on the **YOLO (You Only Look Once)** object detection algorithm analyses each image in real time to identify objects such as trees, humans, vehicles, chainsaws, and other equipment associated with illegal logging. Unlike

conventional monitoring systems, the AI model simultaneously detects multiple objects within a single image while maintaining high detection speed and accuracy. By comparing detected objects with predefined safety conditions, the system intelligently distinguishes between normal forest activity and suspicious behaviour that may indicate tree poaching or unauthorized entry into protected areas.

Real-Time Alert Generation through LoRa Communication

One of the major challenges in forest surveillance is maintaining reliable communication in remote locations where mobile network coverage is limited. To address this issue, the proposed system incorporates LoRa (Long Range) wireless communication technology, which enables low-power data transmission over several kilometres. Once the machine learning model detects suspicious activity, the processing unit generates an alert containing the type of detected object, location information, and time of detection. This information is transmitted through LoRa modules to the nearest forest monitoring station without requiring conventional internet connectivity. Upon receiving the alert, the monitoring system immediately notifies forest officials through mobile applications, SMS services, or centralized dashboards, enabling rapid response to illegal activities. The combination of AI-based detection and long-range communication creates a reliable early-warning system capable of protecting valuable forest resources even in inaccessible regions.

Future Scope and Environmental Significance

The integration of Artificial Intelligence with intelligent sensing technologies opens new possibilities for sustainable forest management. Future versions of the proposed system can incorporate **thermal imaging cameras, unmanned aerial vehicles (drones), satellite remote sensing, GPS tracking, acoustic sensors for chainsaw detection, cloud computing, and Digital Twin technology** to achieve comprehensive forest surveillance. Artificial Intelligence can further analyse historical data to identify poaching hotspots, predict illegal activities, and optimize forest patrol routes using predictive analytics. The integration of renewable energy-powered sensor nodes and IoT-enabled monitoring stations will enable continuous operation with minimal maintenance. Such intelligent forest protection systems not only help prevent illegal logging but also contribute to biodiversity conservation, climate change mitigation, wildlife protection, and sustainable management of natural resources. As smart environmental monitoring technologies continue to evolve, AI-driven surveillance systems will become indispensable tools for protecting forests and preserving ecological balance for future generations. The proposed system demonstrates how modern engineering technologies can effectively support environmental conservation while strengthening the nation's natural resource management capabilities.

Looking Ahead

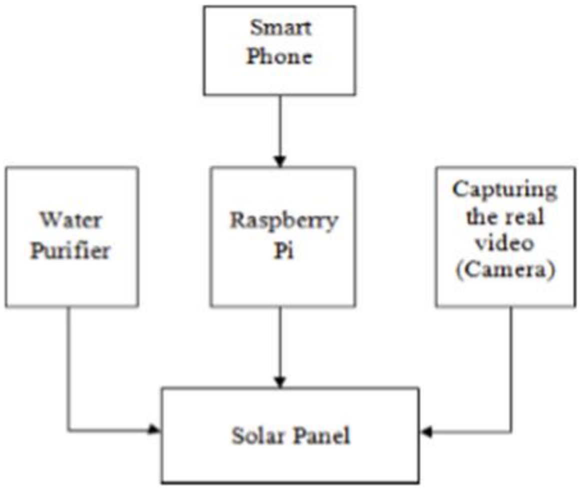
The AI-enabled Anti-Poaching Detection System represents a significant advancement in intelligent forest surveillance by combining machine learning, computer vision, YOLO object detection, and LoRa communication into an integrated monitoring platform. The system continuously analyses forest environments, detects illegal activities in real time, and delivers immediate alerts to forest authorities, thereby improving response time and reducing dependence on manual patrolling. With future integration of advanced sensing technologies, autonomous drones, and predictive artificial intelligence, such smart surveillance systems have the potential to revolutionize forest conservation and ensure the sustainable protection of natural ecosystems for future generations.

G. Pavani – 248W5A0216
Y. Sri Valli – 238W1A02C0
K. Veda Hasitha – 238W1A0284
U. Harika – 238W1A02B3

Guided By
Mr. R. Madhusudan Rao
Assistant Professor

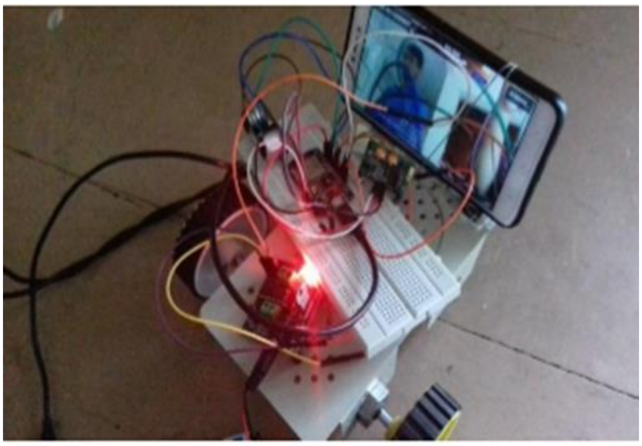
4. AI-Based Floating Solar Panel Cleaning Robot

Floating Solar Photovoltaic (FPV) power plants are emerging as an innovative renewable energy solution for generating electricity while efficiently utilizing water bodies such as reservoirs, lakes, and dams. Compared with conventional ground-mounted solar farms, floating solar installations reduce land requirements, minimize water evaporation, and improve photovoltaic efficiency due to the cooling effect of water. However, continuous exposure to dust, bird droppings, algae, humidity, and other environmental contaminants significantly reduces solar panel efficiency by blocking incoming solar radiation. Manual cleaning of floating solar panels is difficult, unsafe, time-consuming, and expensive because the panels are installed over water surfaces. To overcome these challenges, an **Artificial Intelligence-based Automatic Floating Solar Panel Cleaning Robot** has been developed to perform continuous and efficient cleaning with minimal human intervention. The proposed robotic platform integrates Raspberry Pi, camera vision, ultrasonic sensors, water pumping mechanisms, motor control, and wireless communication to improve energy generation while reducing maintenance costs.



Intelligent Robotic Cleaning System

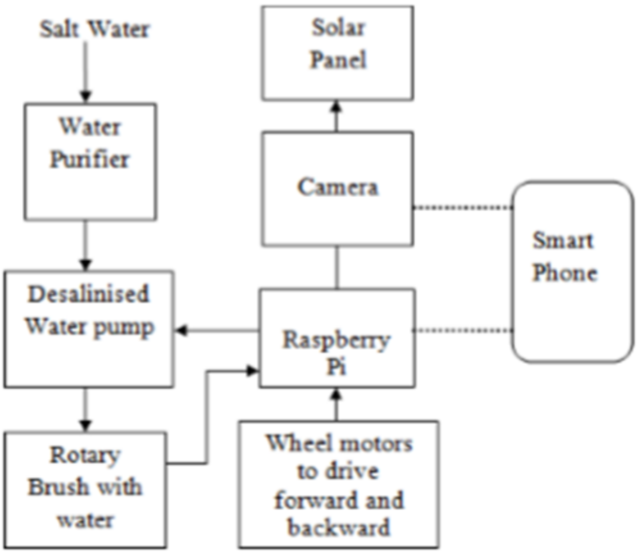
The proposed robotic cleaning system employs a Raspberry Pi controller as the central processing unit responsible for coordinating all sensing, navigation, and cleaning operations. The robot moves across floating solar panels using gear motors driven through an LM293D motor driver, while a rotating brush removes accumulated dust and contaminants. Water required for cleaning is directly collected from the surrounding water body and supplied through a controlled pumping mechanism. A high-resolution camera continuously captures images of the solar panels for monitoring and



inspection, while wireless communication through Wi-Fi enables manual or automatic operation using the Node-RED platform. The system can switch between dry cleaning and water-assisted cleaning modes depending on operating conditions. This intelligent architecture enables efficient cleaning, minimizes human intervention, and supports remote operation for large-scale floating solar power plants.

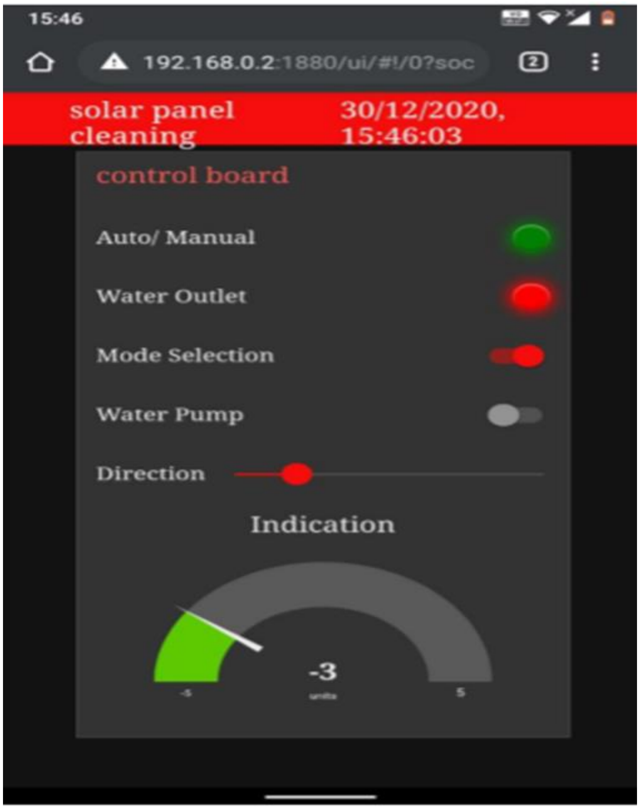
AI-Based Monitoring and Smart Control

The robot incorporates Artificial Intelligence-assisted monitoring to improve operational efficiency and preventive maintenance. A camera mounted on the robotic platform continuously records video and uploads visual data for inspection of panel cleanliness and possible damage. Ultrasonic sensors detect nearby obstacles to ensure safe movement, while infrared sensors assist in path tracking during navigation. Through the Node-RED interface, operators can remotely control robot movement, cleaning mode, water pumping, and system status using a smartphone or other wireless devices. The Raspberry Pi processes all control commands, coordinates sensor information, and manages motor operation in real time. This intelligent combination of computer vision, wireless communication, and embedded control enables autonomous cleaning with improved reliability and reduced maintenance effort.



Future Scope

Future floating solar cleaning robots can be significantly enhanced by integrating Artificial Intelligence, Machine Vision, Deep Learning, Digital Twin technology, Internet of Things (IoT), GPS navigation, autonomous path planning, LiDAR sensors, drone-assisted inspection, and predictive maintenance algorithms. AI-based image processing can automatically detect dust accumulation, bird droppings, algae growth, cracks, or hot spots on photovoltaic modules, enabling condition-based cleaning rather than scheduled maintenance. Swarm robotics can coordinate multiple cleaning robots simultaneously for utility-scale floating solar plants, while cloud-based monitoring platforms can optimize maintenance schedules and improve energy production. Integration with weather forecasting systems and intelligent energy management platforms will further reduce operational costs and enhance the long-term reliability of floating photovoltaic installations. (These are recommended future enhancements beyond the original paper.)



The AI-based Floating Solar Panel Cleaning Robot provides an efficient, safe, and intelligent solution for maintaining floating photovoltaic power plants. By integrating Raspberry Pi, embedded control, wireless communication, intelligent sensing, water-assisted cleaning, and camera-based monitoring, the proposed system improves photovoltaic efficiency while reducing manual labour and maintenance costs. Such intelligent robotic technologies will play a vital role in supporting large-scale renewable energy generation and the future development of autonomous smart solar power plants.

Authored by

V. Sai Siddhartha (24EU06128)

K.Hema Sai Sree (25EU06022)

Aluri Likith Sai (26EU09002)

Nadakuditirohini (26EU9008)

Guided By

Dr. J.Ramesh

Associate Professor

5. Smart Wake: An AI-Powered Computer Vision Alarm System

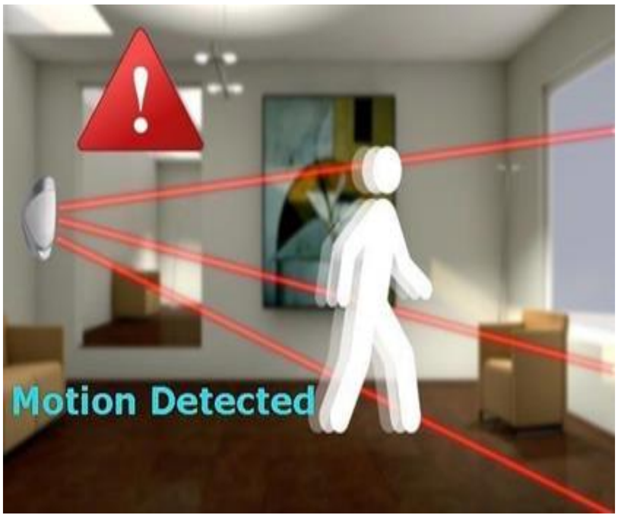
Maintaining a consistent wake-up routine is essential for improving productivity, physical health, and mental well-being. However, conventional alarm clocks depend only on sound or vibration, allowing users to easily snooze or switch off alarms while remaining half asleep. This common behaviour often leads to oversleeping, poor time management, reduced work efficiency, and unhealthy daily routines. With recent advances in Artificial Intelligence (AI), Computer Vision, and Mobile Computing, alarm systems are evolving beyond simple time-based notifications into intelligent systems capable of verifying whether the user is actually awake. The **Smart Wake** system combines computer vision, mobile application technology, QR-code verification, and intelligent motion analysis to ensure that the user is physically active before the alarm is deactivated. By transforming the wake-up process into an interactive verification task, the system promotes healthy habits while significantly improving the reliability of conventional alarm systems.

Intelligent Wakefulness Verification Using Computer Vision

The proposed Smart Wake system introduces a dual-layer verification mechanism that combines **QR code authentication** with **computer vision-based motion detection**. When the scheduled alarm is activated through the Flutter mobile application, the user is required to leave the bed and scan a QR code placed at a predefined location such as a study table, bathroom, or kitchen. Simultaneously, the smartphone camera or an external CCTV camera captures real-time video, which is transmitted to a Python backend for analysis using OpenCV. The backend processes consecutive image frames through grayscale conversion, frame differencing, contour extraction, and motion analysis to verify that the user is actively moving. The alarm is disabled only when both QR verification and sufficient physical activity occur within a predefined time interval. If inactivity is detected or verification fails, the alarm automatically restarts, encouraging genuine wakefulness rather than simple alarm dismissal. This intelligent verification strategy effectively prevents passive snoozing and establishes a disciplined morning routine.

Flutter Mobile Application and Intelligent System Architecture

The Flutter mobile application serves as the central interface for configuring alarms, selecting verification methods, generating QR codes, and communicating securely with the backend server. Developed using Google's Flutter framework, the application provides a responsive cross-platform environment for both Android and iOS devices. Upon alarm activation, the application launches the selected verification module and continuously exchanges data with the Python backend through REST APIs. The backend validates QR codes, processes live video streams using OpenCV, compares timestamps, and determines whether sufficient user activity has occurred. This distributed architecture separates user interaction from computational processing, enabling efficient real-time verification while maintaining system scalability. The modular software design also allows future integration of additional authentication techniques such as voice recognition, facial recognition, gesture analysis, wearable sensors, and cloud-based synchronization, making the Smart Wake platform adaptable to future intelligent healthcare and personal productivity applications.



Applications and Future Scope

The Smart Wake system demonstrates how Artificial Intelligence and Computer Vision can significantly improve everyday lifestyle applications through intelligent automation. Beyond personal alarm systems, similar technologies can be employed in healthcare for elderly monitoring, patient rehabilitation, hospital activity verification, driver alertness monitoring, industrial worker safety, and student attendance systems. Future versions may integrate **Deep Learning, Facial Recognition, Eye-State Detection, Pose Estimation, Internet of Things (IoT), Wearable Devices, Smart Home Automation, Cloud Computing, and Artificial Intelligence Assistants** to create highly personalized wake-up experiences. Machine learning algorithms could analyse individual sleeping patterns and automatically adjust alarm strategies based on behavioural responses. Integration with smart home devices could automatically switch on room lighting, adjust air conditioning, open curtains, or activate coffee machines immediately after verified wakefulness. Such intelligent ecosystems represent the next generation of human-centric automation, where AI continuously enhances productivity, health, and quality of life through adaptive and context-aware technologies.

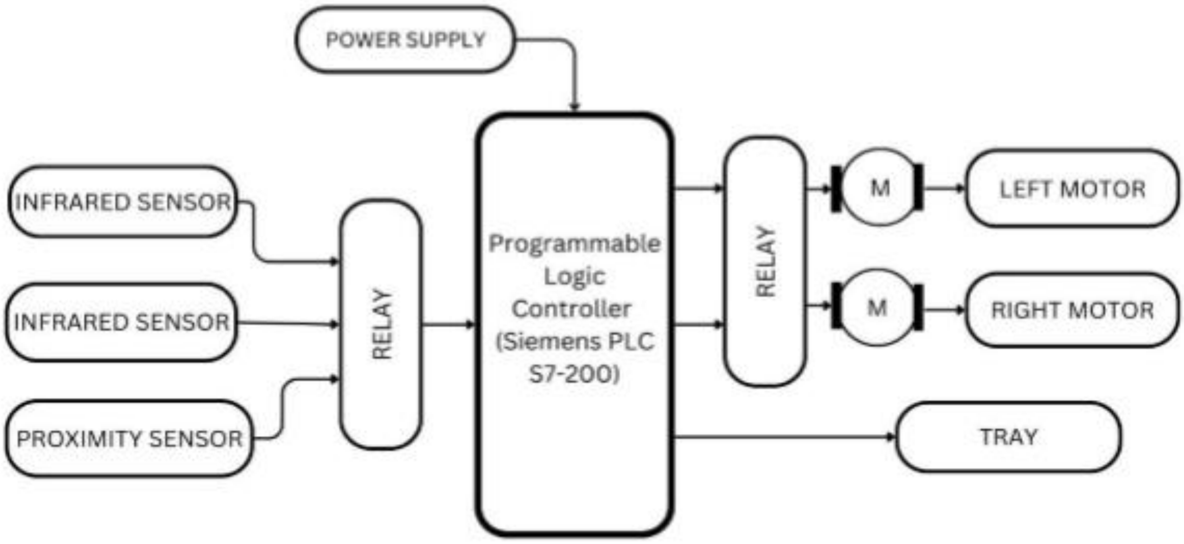
Final Thoughtsus

The Smart Wake system successfully demonstrates an innovative application of Artificial Intelligence and Computer Vision for improving daily productivity and healthy lifestyle management. By combining QR-code authentication, real-time motion detection, Flutter mobile application development, Python backend processing, and OpenCV-based activity analysis, the system ensures that users are genuinely awake before disabling the alarm. This intelligent verification mechanism minimizes oversleeping, enhances user accountability, and promotes disciplined morning routines. As AI, IoT, and intelligent sensing technologies continue to evolve, future wakefulness verification systems will become increasingly personalized, adaptive, and seamlessly integrated into smart homes and digital healthcare ecosystems, contributing significantly to human well-being and intelligent living environments.

Authored by
K. Sravani – 238W1A0220
G. E. S. Vasavi – 248W5A0204
S. Krupavaram – 238W1A0251
P. Kamalkumar – 228W1A0290
P. Jayaram – 238W1A0243
Guided By
Dr. T. Naveen Kumar
Assistant Professor

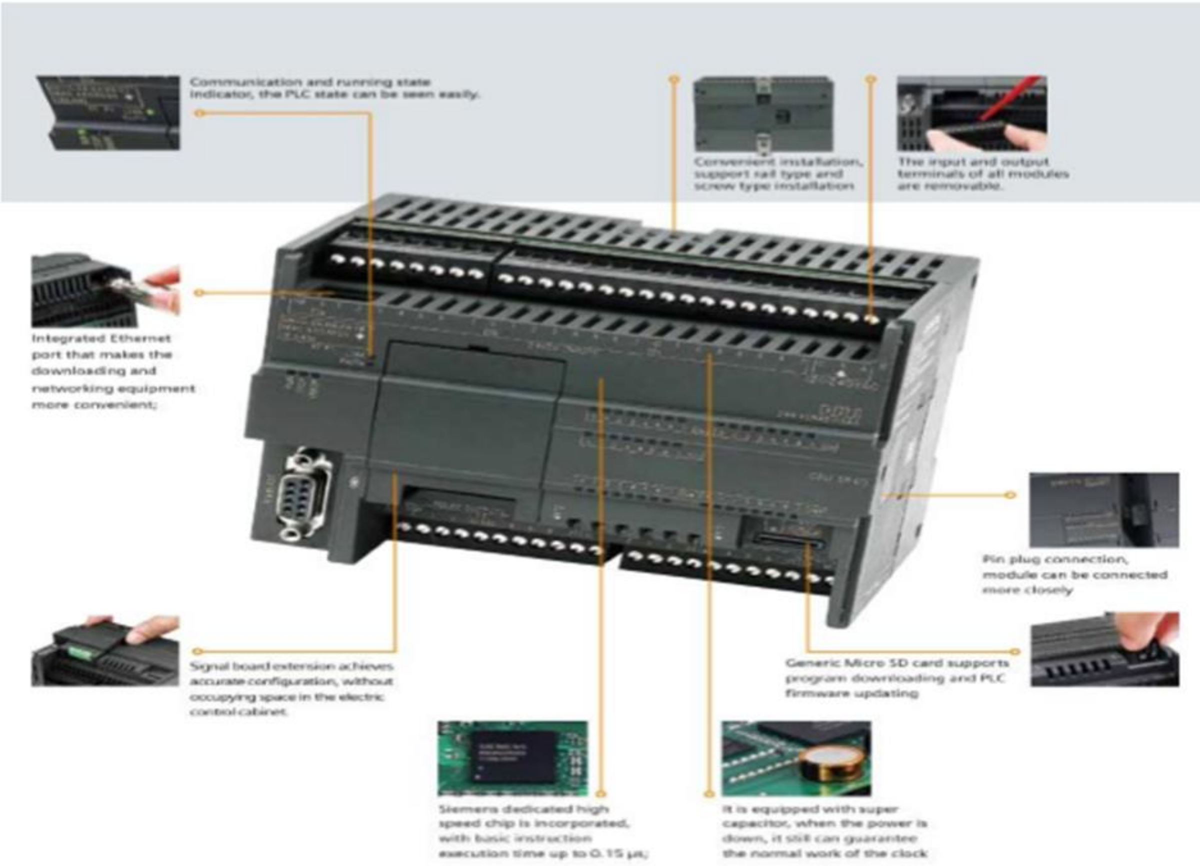
6. PLC-Controlled Automated Guided Vehicle (AGV)

Industrial automation has become the cornerstone of modern manufacturing by improving productivity, reducing manual intervention, and ensuring safe material handling. Among various automation technologies, **Automated Guided Vehicles (AGVs)** have emerged as intelligent transportation systems capable of moving raw materials, finished products, and industrial components efficiently within factories and warehouses. Unlike manually operated vehicles, AGVs travel along predefined paths without human intervention, thereby minimizing labour costs, improving operational safety, and increasing production efficiency. While many conventional AGVs employ microcontrollers or microprocessors for navigation, the proposed system introduces a **Programmable Logic Controller (PLC)-based AGV**, offering greater industrial reliability, simplified maintenance, and seamless integration with existing automation systems. PLCs are specifically designed for harsh industrial environments and provide superior control, flexibility, and durability compared with conventional embedded controllers. The adoption of PLC technology enhances system reliability and enables the AGV to operate continuously with high precision in smart manufacturing environments.



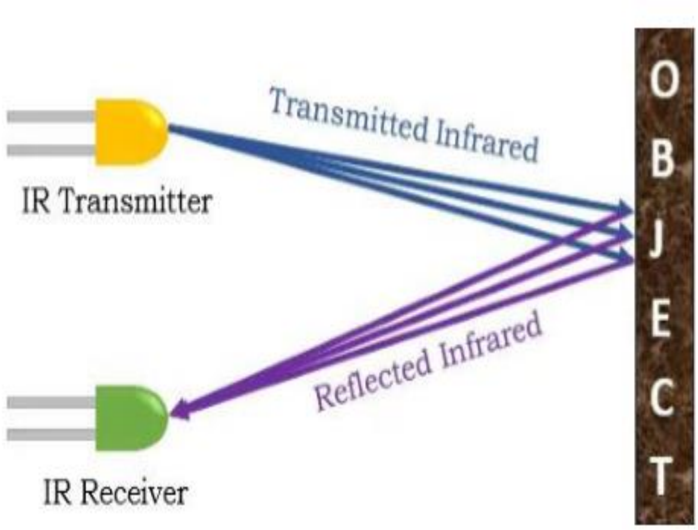
PLC-Based Intelligent Navigation and Motion Control

The proposed AGV employs a **Siemens S7-200 Programmable Logic Controller** as the central control unit responsible for processing sensor inputs and generating motor control signals. Infrared sensors continuously monitor the predefined guide path, while a proximity sensor detects obstacles present in the vehicle's movement path. The PLC executes a ladder logic program that analyses sensor signals in real time and controls the left and right DC motors through relay interfaces. During normal operation, the AGV follows the designated route by continuously correcting its direction based on infrared sensor feedback. Whenever an obstacle is detected, the PLC immediately stops the vehicle, activates an internal timer, and resumes operation only after the obstruction has been cleared. This intelligent control strategy provides accurate navigation, reliable obstacle avoidance, and smooth vehicle movement without requiring complex programming or continuous human supervision. The Siemens S7-200 PLC also supports industrial communication protocols and expansion modules, making the proposed AGV suitable for integration into automated manufacturing and warehouse management systems.



Sensor-Based Path Following and Industrial Automation

Accurate navigation is one of the most critical requirements of an Automated Guided Vehicle. The proposed system utilizes **Infrared (IR) sensors** to detect the guide path and maintain directional movement throughout the transportation process. The sensors continuously transmit positional information to the PLC, enabling automatic steering corrections whenever the



AGV deviates from its predefined route. A dedicated proximity sensor provides additional safety by detecting obstacles positioned in front of the vehicle. Once an obstacle is identified, the PLC immediately interrupts motor operation, initiates a programmed delay using ladder logic timers, and restarts the vehicle only after the path becomes clear. This intelligent sensor integration significantly enhances operational safety while ensuring uninterrupted material transportation in industrial environments. The combination of PLC control and sensor-based navigation enables precise movement, reduced operational errors, and improved reliability compared with conventional manually operated transport systems.

Industrial Applications and Future Scope

PLC-controlled Automated Guided Vehicles are becoming essential components of modern **Industry 4.0** manufacturing systems due to their ability to transport materials safely, accurately, and autonomously. These intelligent vehicles are widely used in automotive industries, pharmaceutical manufacturing, food processing plants, logistics centres, e-commerce warehouses, airports, and smart factories for automated material movement. The ladder logic implemented in the Siemens PLC enables flexible vehicle operation while simplifying troubleshooting and maintenance. Future AGV systems can be further enhanced by integrating **Artificial Intelligence (AI), Machine Vision, Industrial Internet of Things (IIoT), LiDAR, RFID navigation, cloud-based fleet management, predictive maintenance, and Digital Twin technology**. These advanced technologies will enable dynamic path planning, intelligent traffic management, autonomous decision-making, and real-time monitoring of multiple AGVs operating simultaneously within smart manufacturing facilities. Such intelligent automation will improve productivity, reduce operating costs, optimize energy utilization, and support the development of highly efficient digital factories of the future.

Towards a Sustainable Future

The PLC-controlled Automated Guided Vehicle demonstrates an efficient and reliable solution for intelligent industrial material handling by combining Siemens PLC technology, infrared sensing, proximity-based obstacle detection, relay switching, and ladder logic programming into a unified automation platform. Compared with conventional microcontroller-based AGVs, the PLC-based system offers improved reliability, easier maintenance, higher operational safety, and better compatibility with existing industrial automation systems. The modular design and programmable architecture also provide flexibility for future upgrades involving AI-driven navigation, wireless communication, and smart factory integration. As industries continue adopting Industry 4.0 technologies, PLC-controlled AGVs will play a vital role in achieving fully automated, efficient, and sustainable manufacturing operations.

Authored By:

B.R.V.Kishore – 228w5a0202

B.Prudhvi Narayana – 228w5a0204

A.Kiran Sai – 218w1a0254

S.Priya Mallika – 218w1a0241

P.Sowmya Sri – 218w1a0235

Under the Guidance of:

Dr. SNVSK.Chaitanya

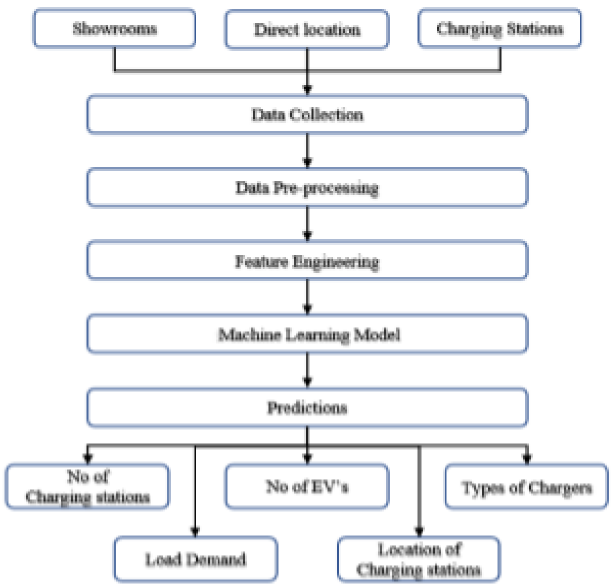
Assistant Professor

7. Intelligent EV Charging Networks: A Data-Driven Approach to Sustainable Transportation

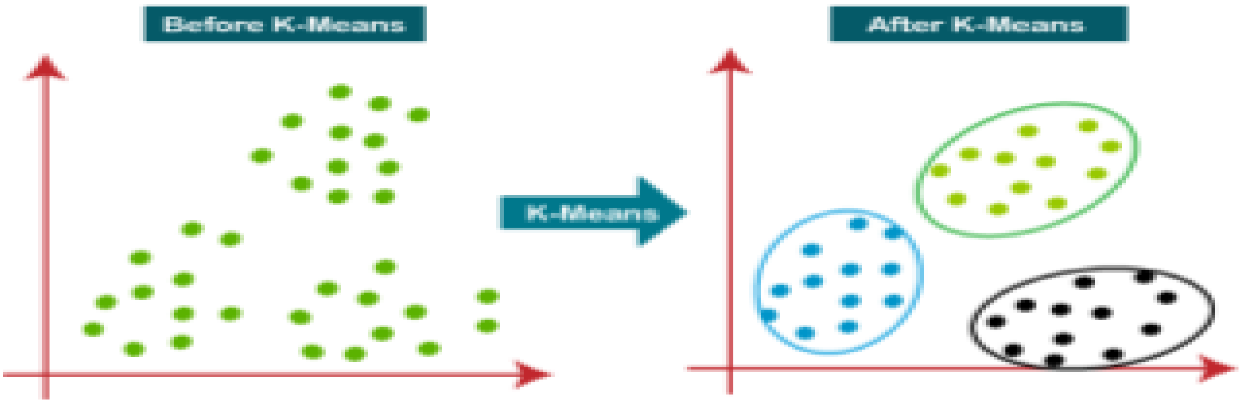
The rapid adoption of Electric Vehicles (EVs) is transforming the global transportation sector by reducing greenhouse gas emissions, decreasing dependence on fossil fuels, and promoting sustainable mobility. However, the increasing number of EVs has created significant challenges for the planning and operation of charging infrastructure. Insufficient charging stations, uneven distribution of charging facilities, long waiting times, and uncertain charging demand can negatively affect EV adoption and user satisfaction. Therefore, intelligent planning of charging infrastructure has become essential for supporting future electric mobility. The proposed research introduces a data-driven methodology that combines **Autoregressive Integrated Moving Average (ARIMA)** forecasting with **K-Means clustering** to estimate future EV growth, predict charging demand, and identify optimal charging station locations. This integrated approach enables planners and utility providers to develop scalable, efficient, and economically viable charging networks capable of meeting future transportation demands.

AI-Based Demand Forecasting and Infrastructure Planning

The proposed framework utilizes historical electric vehicle adoption data together with charging station usage information to develop an intelligent infrastructure planning model. Initially, EV registration records, charging station statistics, and geographical information are collected from multiple reliable sources, including charging stations, vehicle dealerships, and regional transportation databases. The collected data undergo preprocessing to remove duplicate records, estimate missing values, and improve overall data quality through feature engineering. The **ARIMA time-series forecasting model** is then employed to predict future EV adoption and charging demand by analysing historical trends and temporal relationships within the dataset. Simultaneously, the **K-Means clustering algorithm** groups charging stations based on geographical location and charging demand characteristics to identify high-demand regions requiring additional charging infrastructure. The combination of forecasting and clustering provides planners with valuable insights into future charging requirements, charger types, station

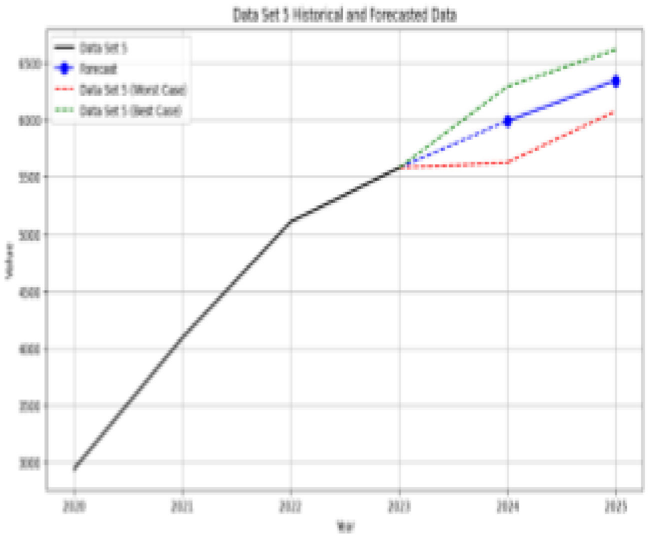


capacities, and optimal installation locations without relying on computationally intensive optimization algorithms. This intelligent planning methodology supports efficient utilization of electrical infrastructure while minimizing congestion at charging stations and improving accessibility for EV users.



Forecasting Results and Intelligent Charging Infrastructure

The effectiveness of the proposed framework is demonstrated through comprehensive forecasting and clustering analyses using real electric vehicle adoption datasets. The ARIMA forecasting model successfully predicts future EV growth and charging demand for different states by analysing historical registration trends from 2020 to 2023. The forecasting results indicate a significant increase in electric vehicle penetration over the coming years, emphasizing the need for proactive expansion of charging infrastructure. K-Means clustering further identifies regions with higher EV density and charging demand, enabling planners to prioritize installation of additional charging stations in high-utilization areas. Daily charging load analysis, average station demand, and charger-type distribution provide valuable information for selecting suitable charging capacities and minimizing waiting times for EV users. The proposed integrated framework supports evidence-based decision making for government agencies, utility companies, charging network operators, and urban planners while ensuring reliable and sustainable charging infrastructure development.



Future Directions

Future EV charging infrastructure can be significantly enhanced through the integration of Artificial Intelligence, Internet of Things (IoT), Digital Twin technology, Vehicle-to-Grid (V2G), Smart Grid communication, Renewable Energy Integration, Battery Energy Storage Systems (BESS), and Deep Learning-based forecasting models. Real-time charging demand prediction using transformer-based neural networks, reinforcement learning for adaptive charger scheduling, and cloud-based energy management platforms can further optimize charging operations while reducing grid congestion. Integration with rooftop solar photovoltaic systems and battery storage can enable green charging stations with lower carbon emissions. Digital Twin technology can continuously monitor charging station performance, while AI-based predictive maintenance can minimize equipment failures and improve system reliability. Such intelligent charging ecosystems will play a crucial role in supporting sustainable transportation, smart cities, and future carbon-neutral energy systems.

Towards a Sustainable Future

The proposed AI-driven charging infrastructure planning framework successfully combines ARIMA time-series forecasting with K-Means clustering to predict future EV charging demand and optimize charging station deployment. By integrating forecasting, geographical analysis, and machine learning, the methodology enables efficient utilization of charging infrastructure while improving accessibility, reducing waiting times, and supporting future electric vehicle adoption. The proposed framework provides a scalable and practical decision-support tool for policymakers, utility providers, and charging network operators, thereby contributing to the development of reliable, intelligent, and sustainable electric mobility infrastructure.

Authored by
Ch.Sashanka Pavan (24EU06009)
P.Mamatha Reddy (24EU06042)
K.Naga Phanindra (24EU06024)
R.Vaishnavi (24EU06043)
Guided By
Dr. J.Ramesh
Associate Professor

8. The Rise of Drone-Based Technology

Only in recent years, though, drone-based technology has ever so rapidly changed the face of so many different aspects of the world including agriculture, delivery services, and even entertainment. From artificial intelligence to machine learning and automation, drones are increasingly flying towards purposes where such things were once thought to be far in the future. Drones, also known as Unmanned Aerial Vehicles (UAVs), are aircraft that operate without a human pilot onboard. They are typically controlled remotely by a human operator or autonomously through pre-programmed flight plans. The popularity of drones has soared due to their versatility, cost-effectiveness, and ability to access hard-to-reach areas.

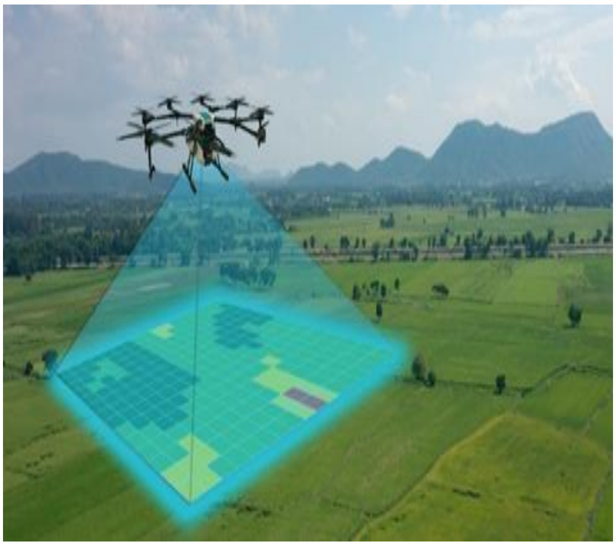
Key Applications of Drone-Based Technology:

Aerial Photography and Filmmaking the most common application of drones today is in aerial photography and filmmaking. Drones with high-definition cameras give a new perspective, enabling filmmakers to capture stunning aerial shots that would have been expensive or dangerous to obtain in the past. Drones are now integral tools in everything from Hollywood films to commercial advertisements and travel vlogs.

Agriculture: Precision Farming Drones are transforming the way farmers monitor and manage their crops. Known as "precision farming," drone technology allows for real-time data collection on crop health, soil conditions, and irrigation needs. Drones can take high-resolution images and use sensors to detect issues such as disease or pest infestations. By giving farmers detailed insights, drones help optimize crop yields and reduce resource waste, which is vital for the environment.

Drone delivery systems are gaining popularity as a solution to meet the growing demand for faster and more efficient delivery services. Companies such as Amazon and UPS are working on delivering packages directly to the doorsteps of consumers, avoiding traditional road traffic and saving hours in delivery time. Drones can navigate over traffic, saving hours in delivery time, especially in urgent deliveries like medical supplies or time-sensitive products. They are also more environmentally friendly than traditional methods, using less fuel and fewer emissions.However, there are some challenges that need to be overcome before drones can become widely adopted, including airspace regulations, safety concerns, and technical limitations such as battery life and payload capacity. Introducing drones into busy urban environments and ensuring they can be flown safely in coordination with manned aircraft is a challenging task that needs careful planning. With all these challenges in place, however, drone delivery systems hold tremendous promise and could soon be a common feature in urban skies, offering consumers around the globe faster, greener, and more efficient delivery services.

Surveying and Mapping:



The drones have transformed surveying and mapping in industries like construction, mining, and real estate. The collection of data over vast areas can now be done in a much faster, safer, and efficient manner using advanced technologies like LIDAR sensors in the drone. They generate highly accurate topographical maps and 3D models that are required for planning and designing any project. These maps are highly accurate in helping professionals understand terrain elevation, slopes, and other geographical features. Drones also enable real-time monitoring of land changes, making them invaluable for tracking construction progress, assessing environmental impact, and identifying potential hazards or issues before they become critical. Drones are used in mining to monitor excavation sites and stockpiles. In real estate, they are used to create detailed aerial views of properties and land, aiding in site assessments and sales presentations. Drones can also reach inaccessible or hazardous areas, thereby reducing the need for manual inspections and the risk to workers. Drones have streamlined data collection, significantly improved decision-making processes and reduced project timelines, making them indispensable tools in modern surveying and mapping.

Search and Rescue Missions: Drones are now an irreplaceable means of search and rescue operations especially in areas considered too slow to reach, unsafe, or just too inefficient. Equipped with advanced technologies, such as thermal imaging cameras, a drone can actually detect the signature of heat of missing persons within dense forests, remote areas of wilderness, or mountain terrains that even human search teams cannot penetrate. This capability greatly accelerates the search process, enabling responders to cover vast areas quickly and efficiently. Drones are deployed in disaster-affected areas to assess structural damage, identify hazards, and locate survivors while reducing the exposure of rescue teams to dangerous conditions such as collapsed buildings or unstable terrain. Drones are able to reach areas that human responders would deem too hazardous to approach, including collapsed structures, wildfires, or flooded zones. These provide real-time data and aerial footage, guiding rescue efforts. Additionally, drones can bring essential supplies, such as food, water, or first aid kits, to stranded people and reduce the response time in an emergency. Drones have remained an indispensable feature in contemporary search and rescue work because of the ability to go to hard-to-reach locations with a significantly reduced risk to human life.

Environmental Monitoring: Drones have become an essential tool in environmental monitoring and conservation, offering a cost-effective and efficient way to gather data over large and often inaccessible areas. With their ability to fly over vast and remote regions, drones are used to track wildlife populations, monitor ecosystems, and assess the health of forests and other natural habitats. Equipped with high-resolution cameras and sensors, drones can capture detailed images and videos, providing valuable insights into biodiversity and the impacts of human activity on the environment. In particular, drones are crucial for monitoring deforestation, where they can capture aerial footage to assess tree loss in real time, or measure forest regeneration efforts after logging or fire events. They also play a critical role in observing the effects of climate change, such as the melting of glaciers or shifts in water levels. By collecting data on temperature, air quality, and pollution levels, drones contribute to efforts to track environmental degradation and its global impact. Furthermore, drones are used in conservation efforts to monitor endangered species, track poaching activities, and enforce protected areas. With their ability to quickly and safely collect data in even the most remote or hazardous environments, drones are becoming an indispensable tool for environmental research and protection, helping to inform policy and global strategies for combating climate change and preserving natural resources.

Drones have been part of military and defence operations for decades, providing critical capabilities that enhance strategic advantage while minimizing risks to human life. In the area of reconnaissance and surveillance, drones are used to gather real-time intelligence over vast areas, often in hostile or high-risk zones where human personnel would face significant danger. Such pieces of equipment like cameras, sensors, and advanced imaging technology, arsented on board

the drones help provide the much-needed information relating to enemy movement, terrain, and other forms of critical information for the operational planning of forces. The others include targeted strikes, which focus on using munitions that ensure high-value targeting or neutralize threats without exposing troops to engagements by the ground. This is particularly useful in circumstances where traditional ways of war may be too expensive or too complicated. Besides their combat duties, drones are used for various logistical purposes such as resupplying troops, evacuating the wounded, or providing critical supplies to inaccessible places. The drone's ability to fly autonomously or be operated from a remote location allows these high-risk tasks to be completed without risking the lives of people. With advancing technology, drones have transformed and developed from being more autonomous to high-tech vehicles, making them essential components of modern defense systems. To large extent, its versatility, low operating costs, and minimal risks to military personnel have made drones an essential resource in offensive as well as defensive military operations globally.

The Future of Drone-Based Technology:

The future of drone-based technology is poised for tremendous growth and innovation, with advancements in artificial intelligence (AI) and machine learning at the forefront. As drones become increasingly autonomous, they will be able to navigate complex environments with little to no human input. This shift will greatly enhance the efficiency and safety of drone operations, particularly in areas like search and rescue, surveillance, and delivery. AI-powered drones will be able to analyze real-time data to make decisions on their own, improving their ability to respond to dynamic situations such as locating missing persons, monitoring natural disasters, or optimizing delivery routes in urban settings.Another exciting development is the creation of advanced drone infrastructure, including concepts like "drone highways" or dedicated flight paths, which will make large-scale drone operations in urban areas safer and more manageable. These controlled airspaces could be designed to keep drones separated from other air traffic, reducing the risk of accidents and enabling drones to travel across cities and towns without disruption. The implementation of such infrastructure would pave the way for widespread adoption of drones in everyday life, making them a common part of our transportation, delivery, and emergency response systems.As drone technology continues to evolve, new applications will emerge across various sectors, from agriculture to healthcare to entertainment. The integration of 5G networks, improved battery life, and enhanced navigation systems will further expand the capabilities of drones, allowing them to operate with even greater precision and reliability. While challenges like regulation, privacy concerns, and airspace management remain, the future of drone technology is bright, promising to reshape industries and improve quality of life around the world.

The drone-based technology is reshaping industries and daily life in profound ways. Whether it's enhancing precision in agriculture, revolutionizing delivery systems, or improving public safety through search and rescue missions, drones are proving to be invaluable tools with the potential to drive global change. As technology continues to advance, drones will likely play an even larger role in our world, making operations more efficient, reducing risks, and expanding the possibilities of what can be achieved. While there are challenges to overcome such as regulatory hurdles, privacy concerns, and technical limitations the ongoing innovations in drone capabilities signal a future full of exciting potential. The continued development of autonomous drones, smarter infrastructure, and integration with other emerging technologies will only enhance their versatility and impact, solidifying drones as a cornerstone of tomorrow's technological landscape.

Authored By

N. Sai Kiran	218W1A0231
B. Sai Manohar	218W1A0205
SK. Raheem	228W5A0218
SK. Imran	218W1A0239

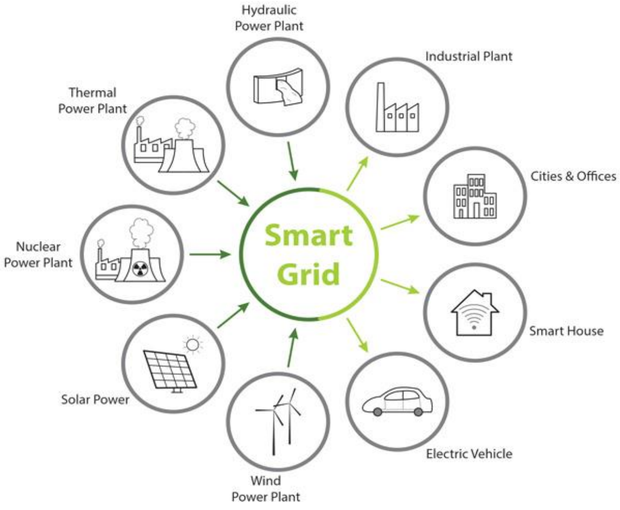
Guided By
Mr.V. Hari Vamsi
Assistant Professor

9. Smart Grid Technologies for Sustainable and Efficient Energy System

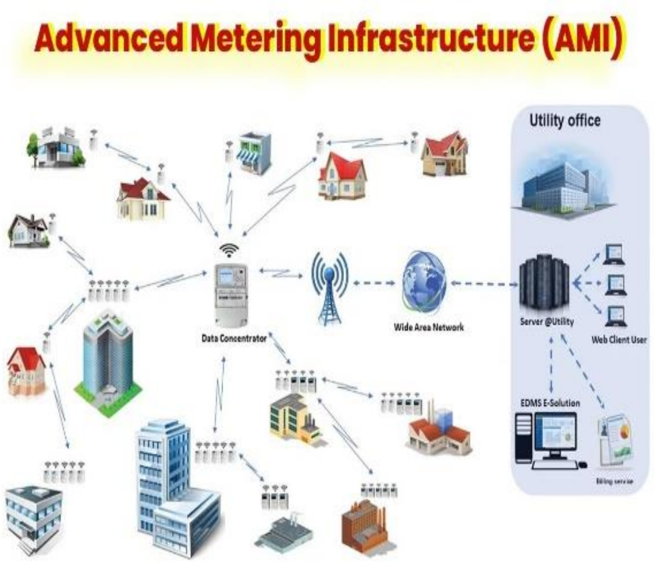
Smart grid solutions convert traditional electrical networks into sustainable, efficient systems using advanced digital technology. They promote renewable energy, meet energy demands, and focus on decarbonization. Advanced metering infrastructure (AMI) facilitates communication between utilities and customers, while SCADA systems monitor and control the grid in real-time using sensors and remote terminal units. Distributed energy resources (DERs), such as solar panels, wind turbines, and battery storage systems, are seamlessly integrated into the grid with the help of advanced inverters and energy storage systems that enhance stability and reduce reliance on fossil fuels. Energy management systems optimize power flow and balance supply and demand using predictive algorithms, machine learning models, and blockchain-based transactions, adding security and transparency to grid operations.

Advanced Metering Infrastructure (AMI): Smart meters are a cornerstone of AMI, providing real-time data on energy consumption. These devices empower consumers to monitor their usage patterns and make informed decisions, while utilities can efficiently manage energy distribution and billing.

Renewable Energy Integration: Smart grids facilitate the integration of renewable energy sources such as solar and wind. By managing the intermittent nature of these resources, smart grids ensure a stable and reliable energy supply while reducing dependence on fossil fu Renewable energy integration refers to the inclusion of renewable sources such as solar, wind, and hydropower in the existing electrical grid to build a more sustainable and resilient energy system.This process aims at diversifying energy generation, reducing reliance on fossil fuels, and increasing the resilience of the grid. However, it poses challenges since renewables are intermittent in nature and require the improvement of grid management technologies, energy storage solutions, and demand response strategies to maintain a consistent and reliable power supply.



Electricity Smart Grid



Energy Storage Solutions: Energy storage solutions are crucial for capturing and storing energy produced at one time, reducing imbalances between demand and production. They are essential for integrating renewable energy sources like solar and wind into the grid, managing their intermittent nature. There are various types of storage solutions, including electrochemical, mechanical, thermal, and chemical. Advancements in battery technology make these solutions safer, more efficient, and environmentally friendly. Benefits of energy storage include grid stability, renewable integration, and cost efficiency. It helps balance supply and demand, ensuring a reliable power grid, and storing excess energy for low-generation periods. Additionally, it reduces the need for peaking power plants, leading to cost savings.

Demand Response (DR): Demand Response (DR) is an approach wherein the end-users vary their consumption of electricity according to time-based rates or monetary incentives. This aids in balancing supply and demand, improving the reliability of the grid, and can potentially reduce electricity costs. DR is especially helpful for integrating renewable energy sources into the grid because it can manage the supply fluctuations by changing the demand in accordance with the patterns of renewable generation. There are two types of DR, namely: Economic DR, wherein consumers change their consumption patterns to decrease their electricity bill, and Reliability DR, where consumers alter their consumption to prevent grid instability or outages at times of peak demand or system stress.

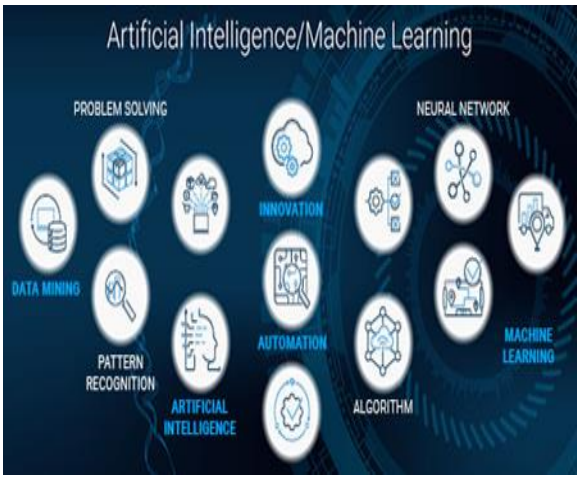
Advancements in technology, such as smart grids and real-time data analytics, have enhanced the effectiveness of DR programs, facilitating better communication between utilities and consumers, enabling more responsive and automated demand adjustments. In summary, Demand Response is a critical component in modern energy management, offering economic benefits to consumers and operational advantages to utilities, while supporting the integration of renewable energy sources and contributing to overall grid stability.

IoT and Automation: The Internet of Things (IoT) refers to a network of interconnected devices that communicate and exchange data over the internet, enabling real-time monitoring and control across various applications. When integrated with automation, IoT facilitates the seamless operation of systems without human intervention, leading to increased efficiency and productivity. In industrial settings, IoT enhances automation by connecting devices, sensors, and systems, allowing for streamlined operations and improved data management. This integration enables real-time monitoring and control of manufacturing processes, resulting in reduced errors and optimized performance.

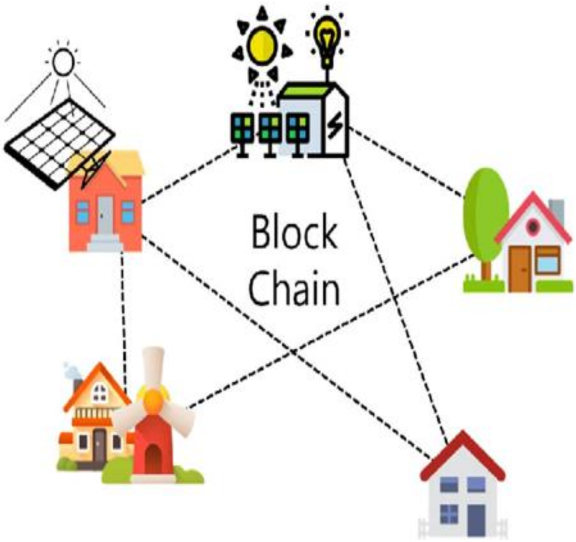
In the realm of home automation, IoT connects household devices to the internet, enabling remote control and monitoring. This connectivity allows for the automation of tasks such as lighting, security, and climate control, enhancing convenience and energy efficiency. The convergence of IoT and automation is transforming industries by enabling intelligent decision-making and operational efficiency. As technology advances, the integration of IoT with automation is expected to further revolutionize various sectors, leading to smarter and more responsive systems.

Future Trends

AI and Machine Learning: Artificial intelligence and machine learning will completely transform smart grids by enabling more accurate energy demand forecasting, finding faults before they become worse, and improving the efficiency and sustainability of grid operations. They are going to enable utilities to analyze the large datasets required to improve reliability, efficiency, and sustainability for grid operations by predicting energy consumption patterns and adjusting dynamically to meet the real-time demand of energy.



Blockchain for Energy Transactions: Blockchain will introduce secure, transparent, and decentralized platforms for energy trading. This technology enables peer-to-peer energy markets where individuals can sell excess energy from renewable sources directly to other users. It also simplifies the tracking and verification of energy generation and consumption, reducing administrative overhead and fostering trust among stakeholders.



5G Connectivity: The adoption of 5G networks will drastically enhance the communication infrastructure of smart grids. With ultra-fast speeds and low latency, 5G will support seamless data exchange between millions of devices, such as smart meters, sensors, and IoT-enabled appliances. This improved connectivity will facilitate real-time monitoring and control of grid operations, ensuring rapid responses to changes in demand or system failures.

Electric Vehicle (EV) Integration:

As the adoption of electric vehicles increases, their role in smart grids will expand dramatically. EVs will be mobile energy storage units, capable of storing electricity during low-demand periods and supplying it back to the grid during peak demand. This bidirectional energy flow, known as vehicle-to-grid (V2G) technology, will help balance grid loads, improve energy flexibility, and enhance the overall stability of power systems.

Smart grid technologies represent a paradigm shift in the way we manage energy. By embracing innovation and investing in sustainable solutions, we can create an energy system that not only meets the demands of the present but also ensures a greener and more efficient future for generations to come.Smart grids support renewable energy integration by effectively managing intermittent sources like solar and wind. They ensure a stable and reliable supply of electricity by balancing generation and demand while reducing reliance on fossil fuels.

Authored By
K. Hrishitha Neelima (228w5a012)
T. Rohith Sri Naga Harsha (218w1a0245)
G. Sushma (228w5a0207)
K. Siva Kumar (228w5a0211)

Guided By
Mr.T. Suneel
Assistant Professor

10. Smart Automation of PVC Pipe Socketing Using PLC

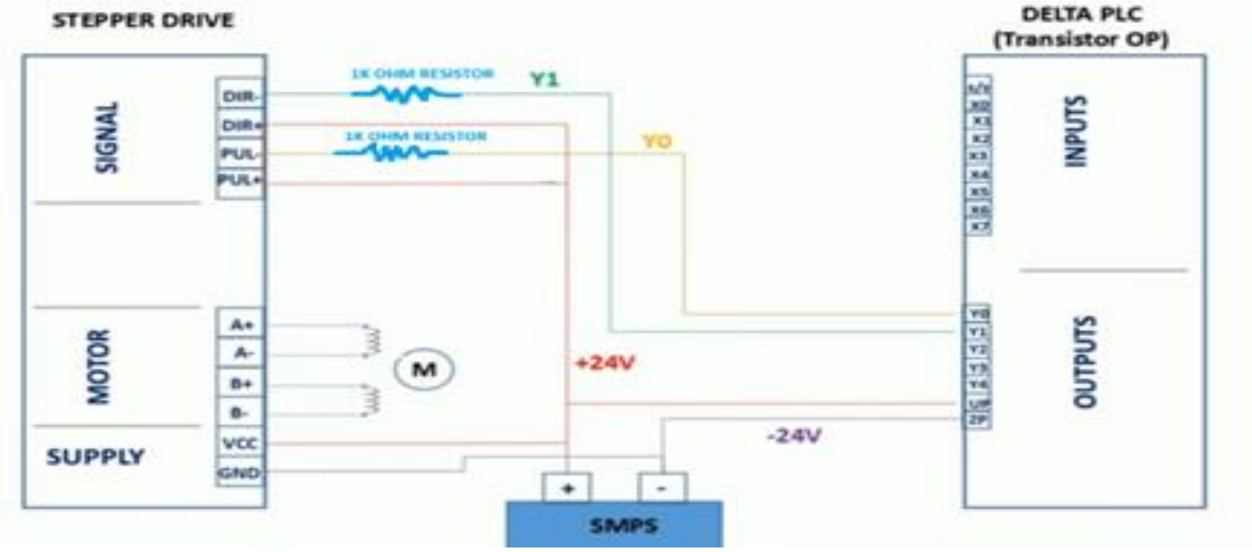
PVC pipes are extensively used in borewell installations, drinking water distribution, agricultural irrigation, sewage systems, and industrial piping because of their high strength, corrosion resistance, and long service life. One of the most critical manufacturing stages is the socketing process, where one end of the pipe is heated, expanded, and shaped to create a leak-proof joint. In conventional manufacturing, this operation largely depends on manual handling, resulting in inconsistent socket dimensions, lower production rates, higher labour costs, and increased safety risks. Modern industries therefore employ **Programmable Logic Controller (PLC)-based automation** to achieve precise, repeatable, and reliable socket formation while significantly improving manufacturing efficiency. PLC-based automation ensures consistent product quality, minimizes human intervention, and enables continuous industrial production with real-time monitoring and process control.

PLC-Based Automated Socketing Process

The automated socketing system integrates multiple mechanical, electrical, pneumatic, and control engineering technologies into a synchronized manufacturing process. Initially, the PVC pipe is transported to the loading station, where proximity sensors detect its presence and accurately position it inside the heating zone. A temperature-controlled heating unit softens the pipe end to the required forming temperature without causing material degradation. Once the desired temperature is achieved, the PLC activates hydraulic cylinders and pneumatic clamps to hold the pipe firmly while the socket-forming mechanism expands the pipe end with high dimensional accuracy. After socket formation, the pipe is transferred to the cooling station, where controlled cooling preserves the socket dimensions before the finished pipe is released for inspection. Throughout the manufacturing cycle, the PLC continuously receives sensor feedback and controls every actuator, ensuring smooth, synchronized, and repeatable operation.

Industrial Control System

The Programmable Logic Controller acts as the central controller of the entire manufacturing process. Various industrial sensors continuously monitor pipe position, heating temperature, hydraulic cylinder movement, and machine status before transmitting real-time signals to the PLC. Based on the programmed ladder logic, the PLC sequentially operates stepper motors, hydraulic valves, pneumatic cylinders, heaters, and cooling mechanisms through digital output modules. A Human Machine Interface (HMI) enables operators to select automatic or manual operating modes, adjust production parameters, monitor system status, and receive fault alarms. The coordinated operation of sensors, actuators, and PLC control ensures high manufacturing accuracy, reduced cycle time, and safe machine operation under different production conditions.



Benefits and Future Developments

PLC-based automation has transformed PVC pipe manufacturing by improving production speed, dimensional accuracy, process consistency, and workplace safety. Automated socketing minimizes human error, reduces material wastage, lowers production costs, and enables continuous operation with minimal operator intervention. Future industrial manufacturing systems are expected to integrate **Industrial Internet of Things (IIoT), Artificial Intelligence (AI), Machine Vision, SCADA, cloud-based**

monitoring, predictive maintenance, and Digital Twin technologies to further enhance manufacturing intelligence. These technologies will enable automatic fault diagnosis, remote monitoring, adaptive process control, production analytics, and energy optimization, thereby supporting the development of smart factories under the principles of **Industry 4.0**.

Final Thoughts

The adoption of PLC-based automation in PVC pipe socketing represents a significant advancement in modern industrial manufacturing by combining precise control, intelligent sensing, and automated process sequencing. The integration of programmable controllers, industrial sensors, hydraulic systems, pneumatic actuators, and Human Machine Interfaces enables consistent socket quality, improved productivity, enhanced operational safety, and reduced manufacturing costs. As Industry 4.0 technologies continue to evolve, future PVC manufacturing plants will increasingly incorporate AI-driven monitoring, cloud connectivity, and predictive maintenance, paving the way for highly efficient, intelligent, and sustainable production systems capable of meeting the growing demands of global infrastructure development.

Authored By:

B.R.V.Kishore – 228w5a0202

B.Prudhvi Narayana – 228w5a0204

A.Kiran Sai – 218w1a0254

S.Priya Mallika – 218w1a0241

P.Sowmya Sri – 218w1a0235

Under the Guidance of:

Mr. P.Venkatesh

Assistant Professor

FACULTY PUBLICATIONS

<u>International Journals (26)</u>

SCI/SCIE: 10, SCOPUS: 10, ESCI: 6

Q1: 7 Q2: 8 Q3: 9 Q4: 2 UG: 0

[1] M. R. Ranga, B. Venkateswara Rao, and S. Kotni, "Improved grey wolf optimization for parameter extraction of polycrystalline and mono crystalline solar PV panels using double diode model," *Franklin Open*, vol. 11, p. 100273, Jul. 2025, doi: 10.1016/j.fraope.2025.100273.

[2] S. Gope, S. Dawn, H. Shuaibu, and T. S. Ustun, "Optimal scheduling of active and reactive power considering distributed renewable power generation in electricity market," *Discover Sustainability*, vol. 6, no. 1, Sep. 2025, doi: 10.1007/s43621-025-01209-6.

[3] S. Dawn, B. Vadlamudi, M. L. N. Vital, S. S. Das, K. D. Rao, and A. A. Mansur, "Enhancing grid stability and sustainability in electrical markets: A review on the synergy of renewable energy and electric vehicles," *Energy Exploration & Exploitation*, Oct. 2025, doi: 10.1177/01445987251383177.

[4] P. K. Pedapati, K. Murugan, K. D. Rao, A. Hemachander, A. S. Hassan, and T. S. Ustun, "Performance analysis of a fault-tolerant multiport converter for hybrid standalone applications," *Energy Exploration & Exploitation*, vol. 43, no. 5, pp. 1834–1856, Jun. 2025, doi: 10.1177/01445987251339850.

[5] S. Madhankumar, V. R. Aduru, V. R. Lenin, V. S. Kannan, A. K. Singh, and N. V. S. S. Chinamilli, "Analysis of thermal performance and drying kinetics of indirect solar drying under natural and forced convection," *Solar Energy*, vol. 299, Oct. 2025, doi: 10.1016/j.solener.2025.113767.

[6] D. Nagesh, R. Devarapalli, B. Venkateswara Rao, and Ł. Knypiński, "Triple-diode model parameter extraction of a mono-crystalline PERC solar photovoltaic module using FDB-based chimp optimization algorithm," *Przegląd Elektrotechniczny*, vol. 1, no. 10, pp. 58–64, Oct. 2025, doi: 10.15199/48.2025.10.7.

[7] E. Kannan, R. Jayaraman, C. Kumar, and G. R. Rajamani, "Enhanced energy-efficient load prediction in smart grids using bidirectional LSTM and gated recurrent unit networks," *Sustainable Computing: Informatics and Systems*, vol. 48, p. 101230, Dec. 2025, doi: 10.1016/j.suscom.2025.101230.

[8] S. Thumati, V. R. Aduru, I. Abdul, R. Guttula, J. V. N. Ramesh, and L. Ushasree, "Adaptive Frilled Lizard Optimization for Enhancing Distribution Feeder Performance with Renewables and Charging Stations," *International Journal of Intelligent Engineering & Systems*, vol. 18, no. 5, pp. 760–770, Jul. 2025, doi: 10.22266/ijies2025.0630.53.

[9] A. Rajamallaiah, S. V. K. Naresh, Y. Raghuvamsi, S. Manmadharao, K. Bingi, and A. R., "Deep Reinforcement Learning for Power Converter Control: A Comprehensive Review of Applications and Challenges," *IEEE Open Journal of Power Electronics*, vol. 6, pp. 1769–1802, Oct. 2025, doi: 10.1109/OJPEL.2025.3619673.

[10] S. Anmadha Rao, R. J. Satputaley, P. V. R. L. Narasimham, M. Dhananjaya, and B. Ramesh, "Mitigation of Voltage Harmonics in Grid Powered EV Fast Charging Station using MLI based DVR," *International Journal of Circuit Theory and Applications*, pp. 1–13, Oct. 2025, doi: 10.1002/cta.70193.

[11] K. Srilakshmi, G. S. R., V. N., P. K. Balachandran, and K. Sangeetha, "Chimp algorithm based Solar-Hydrogen energy powered UPQC for distribution," *Energy Exploration & Exploitation*, Nov. 2025, doi: 10.1177/01445987251390554.

[12] P. Venkatesh and K. S. Kumar, "Optimal reactive power dispatch in electricity market using hybrid whale and sine cosine optimization algorithm," *International Journal of Ambient Energy*, vol. 46, no. 1, Nov. 2025, doi: 10.1080/01430750.2025.2592991.

[13] S. Dawn, S. S. Das, M. M. Islam, and T. S. Ustun, "Optimizing Wind Power Integration: Increasing Profitability and Market Efficiency through Machine Learning Based Wind Speed Forecasting in Japan's Electricity Grid," *Energy Exploration & Exploitation*, Jan. 2026, doi: 10.1177/01445987251414449.

[14] L. K. Vijaya, M. Manimozhi, and J. V. Kumari, "Dynamic Ball Balancing Using Deep Deterministic Policy Gradient (DDPG)-Controlled Robotic Arm for Precision Automation," *International Journal of Robotics & Control Systems*, vol. 5, no. 3, p. 1661, Jul. 2025, doi: 10.31763/ijrcs.v5i3.1892.

[15] T. Yuvapriya, J. V. Kumari, V. L. Korupu, and V. K. Elumalai, "Enhanced trajectory tracking and robustness in magnetic levitation via Takagi–Sugeno fuzzy control: Experimental approach," *Scientific Reports*, vol. 16, p. 685, Jan. 2026, doi: 10.1038/s41598-025-25356-y.

[16] S. R. Bondalapati *et al.*, "Smart vehicle cybersecurity: Implementing an autonomous and adaptive intrusion response system," *ASEAN Engineering Journal*, vol. 15, no. 4, pp. 221–228, 2025, doi: 10.11113/aej.V15.24631.

[17] V. Vaadaala, K. H. S. Basha, R. A. Babu, K. V. Dudekula, B. S. Benarji, and S. R. Bondalapati, "Cloud and IoT-Driven Smart Irrigation: A Modern Approach to Water Management in Agriculture," *IAENG International Journal of Computer Science*, vol. 53, no. 1, pp. 305–322, Jan. 2026.

[18] M. R. Ranga, B. Venkateswara Rao, and S. Kotni, "A human evolutionary optimization-based approach to optimal parameter extraction of various solar photovoltaic cells using seven parameters model," *Engineering Research Express*, vol. 8, no. 4, Feb. 2026, doi: 10.1088/2631-8695/ae3cdf.

[19] M. R. Ranga, B. Venkateswara Rao, and S. Kotni, "Metaheuristic based parameter extraction of solar photovoltaic panel: A Human Evolutionary Optimization Algorithm perspective," *Franklin Open*, vol. 15, p. 100597, 2026, doi: 10.1016/j.fraope.2026.100597.

[20] S. S. Das, S. Dawn, S. Gope, T. S. Ustun, and U. Cali, "Electric mobility in India: Charging Infrastructure, Energy Storage, Grid Integration, and Policy Perspectives," *Energy Conversion and Management: X*, p. 101768, Mar. 2026, doi: 10.1016/j.ecmx.2026.101768.

[21] B. Baddu, R. Ch., R. Srinivasa, and S. Bondalapati, "Congestion management of power transmission line with advanced interline power flow controller," *Journal of Mechatronics, Electrical Power, and Vehicular Technology*, vol. 16, pp. 52–68, 2025, doi: 10.55981/j.mev.2025.795.

[22] L. Ethavath, J. Manoranjini, B. B. R. Emani, N. Chippada, M. S. Vani, S. Areefunnisa, and S. R. Bondalapati, "Smart Road Surface Condition Analysis via WOA-BP Neural Network and Multi-Sensor Integration," *IAENG International Journal of Computer Science*, vol. 52, no. 10, pp. 3495–3502, 2025.

[23] R. P. Narasipuram and B. Vadlamudi, "New energy vehicle strategy for electric vehicle adoption in India," *International Journal of Mathematical Modelling and Numerical Optimisation*, vol. 16, nos. 2–4, 2026, doi: 10.1504/IJMMNO.2026.153026.

[24] G. Gengi, P. Narayanan, R. Jayaraman, and R. S. R. Sankar, "Enhanced Load Forecasting in Distribution Networks Using LSTM Integrated with Quadratic Regression Model," *Tehnički Vjesnik*, vol. 33, no. 3, pp. 877–884, 2026, doi: 10.17559/TV-20250507002650.

[25] K. Dhananjay Rao, K. V. S. R. Prasad, P. Pavani, S. Dawn, and T. S. Ustun, "Optimal Fractional-Order Control Scheme for Hybrid Electric Vehicle Energy Management," *World Electric Vehicle Journal*, vol. 17, no. 4, p. 197, 2026, doi: 10.3390/wevj17040197.

[26] G. R. Rao, K. Dhananjay Rao, P. Chongala, P. Pavani, S. Dawn, and T. S. Ustun, "Advances in dissolved gas analysis for power transformer diagnostics: From traditional methods to artificial intelligence driven prognostics," *Engineering Applications of Artificial Intelligence*, vol. 181, no. 2, 2026, doi: 10.1016/j.engappai.2026.115390.

International Conferences (38)

SCOPUS: 38 IEEE Conference: 33

UG: 35 PG: 0

[1] P. Sandeep, G. Srinivasarao, N. R. K. Darbar, and P. Arjun, "Simulation-based Study of Wireless EV Charging using Inductive Coupling," in *Proc. 2025 6th Int. Conf. Electronics and Sustainable Communication Systems (ICESC)*, Coimbatore, India, Oct. 2025, doi: 10.1109/ICESC65114.2025.1121250.

[2] N. Upendra, R. C. Vankina, I. P. Sahay, B. Kiranmayi, and B. Manohar, "Adaptive Plug-and-Play DG Systems with IoT Driven THD Monitoring and Reduction," in *Proc. 2025 7th Int. Conf. Inventive Material Science and Applications (ICIMA)*, Namakkal, India, Jul. 2025, doi: 10.1109/ICIMA64861.2025.1107406.

[3] G. Vignesh, B. Venkateswara Rao, G. Swathi, and K. Sri Vidya, "Impact of Contingencies and SVC Placement on Power Flow in a 5 Bus System," in *Proc. 2nd Int. Conf. Smart and Sustainable Energy Systems (ICSSES 2025)*, India, Mar. 2025, doi: 10.1088/1755-1315/1529/1/012018.

[4] D. N., R. Devarapalli, V. R. Bathina, and Ł. Knypiński, "FDB-Based Chimp Optimization Algorithm for Parameter Extraction of Mono-Crystalline PERC Solar Photovoltaic Modules," in

Proc. 2025 Progress in Applied Electrical Engineering (PAEE), Koscielisko, Poland, Sep. 2025, doi: 10.1109/PAEE68231.2025.1115591.

[5] M. R. S. R. S. Ramya, R. M. Rao, B. V. Rao, Y. Moulika, R. Kamakshi, and Devaki, "Enhanced Parameter Extraction for Double-Diode Modeling of Solar PV Cells Using Improved Grey Wolf," in *Proc. 2nd Int. Conf. Smart and Sustainable Energy Systems (ICSSES 2025)*, India, Mar. 2025, doi: 10.1088/1755-1315/1529/1/012017.

[6] A. Kowshik, V. R. Aduru, R. Kancharla, R. Sundar, R. Devarapalli Parasa, and S. Snigdha, "Design and Analysis of Air-Gap Faults in Switched Reluctance Motor," in *Proc. 2nd Int. Conf. Smart and Sustainable Energy Systems (ICSSES 2025)*, India, Mar. 2025, doi: 10.1088/1755-1315/1529/1/012019.

[7] V. Ravindranadh Chowdary, P. Pavan Aditya, A. Venkata Sai Deepika, C. Pavani, G. Sivanarayana, and V. Prasanthi, "Design of Solar MPPT System with Fuzzy-Logic Based Inverter Control for Grid Connected Loads," in *Proc. 2025 6th Int. Conf. Electronics and Sustainable Communication Systems (ICESC)*, Coimbatore, India, Sep. 2025, doi: 10.1109/ICESC65114.2025.1121238.

[8] M. R. Ranga, V. Nagarjuna, B. J. Vesli, K. B. Kumar, and M. Phaneendra, "Solar Power Forecasting System Using Combined CNN-LSTM and Ensemble Neural Networks," in *Proc. 2025 10th Int. Conf. Communication and Electronics Systems (ICCES)*, Coimbatore, India, Oct. 2025, doi: 10.1109/ICCES67310.2025.1133639.

[9] U. Meenakshi, V. H. Vamsi, T. G. N. S. Varshitha, T. J. N. Ganesh, and P. S. Krishna, "Electrical Load Monitoring with LoRa and PZEM for Sustainability," in *Proc. 2025 6th Int. Conf. Electronics and Sustainable Communication Systems (ICESC)*, Coimbatore, India, Sep. 2025, doi: 10.1109/ICESC65114.2025.1121259.

[10] H. Sanaboda, V. R. Aduru, V. S. S. Chandolu, B. B. Appikatla, and R. Vavilapalli, "Smart Waste Monitoring Enhancing Urban Cleanliness with Real-Time Alerts," in *Proc. 2025 6th Int. Conf. Electronics and Sustainable Communication Systems (ICESC)*, Coimbatore, India, Sep. 2025, doi: 10.1109/ICESC65114.2025.1121260.

[11] S. R. Sattenapalli, S. Dawn, M. Sanivada, K. D. Kumar, and K. Bhavani, "Study of Thermal and Thermal-Wind Systems in a Regulated Power System," in *Proc. 2025 4th Int. Conf.*

Automation, Computing and Renewable Systems (ICACRS), 2025, doi: 10.1109/ICACRS67045.2025.11324275.

[12] M. Sindhuja, B. V. Rao, K. Sirisha, L. Shaini, and J. Amulya, "Detection of Open Circuit Faults in Overhead Transmission Lines with Raspberry Pi Pico and Alerting Using GSM Module," in *Proc. 2025 IEEE 3rd Int. Symp. Sustainable Energy, Signal Processing and Cybersecurity (iSSSC)*, Gunupur, India, Nov. 2025, doi: 10.1109/iSSSC66652.2025.1138883.

[13] Ch. Sanjay, J. Ramesh, D. Sunny, M. V. Lakshmi, and C. M. Babu, "Enhanced PLL-Driven Control of a Three-Phase DSTATCOM for Power Quality Compensation in Microgrids," in *Proc. 2026 Int. Conf. Electronics and Renewable Systems (ICEARS)*, Tuticorin, India, Feb. 2026, doi: 10.1109/ICEARS67481.2026.11416709.

[14] R. Jayaraman, T. Vasundha Devi, G. Siva Nandu, M. Yugandhar, and K. M. Priya, "State-Space Modeling of Three-Phase Self-Excited Induction Generator with D-STATCOM Voltage Regulation," in *Proc. 2026 Int. Conf. Electronics and Renewable Systems (ICEARS)*, Tuticorin, India, Feb. 2026, doi: 10.1109/ICEARS67481.2026.11416661.

[15] G. S. Nandu, J. Ramesh, Chinnam Sanjay, and T. Satyavathi, "Intelligent Fault Detection and Diagnosis in Power Transmission Systems Using Supervised Learning," in *Proc. 2026 Int. Conf. Electronics and Renewable Systems (ICEARS)*, Tuticorin, India, Feb. 2026, doi: 10.1109/ICEARS67481.2026.11416750.

[16] T. Vasundharadevi, R. Jayaraman, K. Mahima, M. Yugandhar, P. Sahithi, and S. Fathima, "Real-Time Remote Monitoring of Toxic Environments in Mining Sites Using ESP and LoRa," in *Proc. 2026 8th Int. Conf. Intelligent Sustainable Systems (ICISS)*, Tirunelveli, India, Apr. 2026, doi: 10.1109/ICISS67859.2026.11453526.

[17] A. K. Chekuru, V. K. Nuka, S. Allu, D. K. Monditoka, and Y. N. S. Parvathi, "Enhancing the Object Recognition and Data Management System for the Visually Impaired," in *Proc. 2025 10th Int. Conf. Communication and Electronics Systems (ICCES)*, Coimbatore, India, Dec. 2025, doi: 10.1109/ICCES67310.2025.1133705.

[18] S. Tummapudi, S. Danduprolu, B. Navyasri, G. Gopi, and P. S. Chirala, "Smart Electric Fencing for Agriculture Field Protection for Wildlife," in *Proc. 2025 8th Int. Conf. Emerging Technologies in Computer Engineering: Advances in Computing, Healthcare and Smart Systems (ICETCE)*, Jaipur, India, Nov. 2025, doi: 10.1109/ICETCE66848.2025.

[19] S. Tummapudi, S. Danduprolu, B. Navyasri, G. Gopi, and P. S. Chirala, "Smart Transmission Line Protection Using STM32F103C8T6," in *Proc. 2025 4th Int. Conf. Applied Artificial Intelligence and Computing (ICAAIC)*, Dec. 2025, doi: 10.1109/ICAAIC64647.2025.11330690.

[20] M. L. N. Vital, Y. Vasanthi, M. K. P. Lahari, and A. Govindu, "Smart IoT Based Solar PV Fault Detection System," in *Proc. 2025 IEEE Int. Conf. Smart Power, Energy, Renewables, and Transportation (SPERT)*, Surat, India, 2025, doi: 10.1109/SPERT67079.2025.114694.

[21] M. L. N. Vital, T. S. Siddhartha, A. S. Gutta, V. V. B. Prasad, and S. S. Soumya, "Single Phase Five Level Common Ground Switched Capacitor Multilevel Grid Connected PV Inverter with Reduced THD and Device Count," in *Proc. 5th IEEE Int. Conf. Power, Control and Computing Technologies (ICPC²T 2026)*, National Institute of Technology, Raipur, India, Mar. 2026.

[22] M. L. N. Vital, A. Rama Devi, K. Venkatesh, D. Tirumala Rao, P. V. D. S. Sai Rakesh, and G. Anjani Kumar, "Common Ground Transformerless Seven-Level Switched Capacitor Multilevel Grid Connected Inverter with Improved THD and Smaller Sized Switched Capacitors," in *Proc. 5th IEEE Int. Conf. Power, Control and Computing Technologies (ICPC²T 2026)*, National Institute of Technology, Raipur, India, Mar. 2026.

[23] T. Koda, V. R. Aduru, A. Gulipilli, G. S. Nallagonda, and V. S. Geddapu, "Optimized Blood Matching System," in *Proc. 2025 7th Int. Conf. Innovative Data Communication Technologies and Application (ICIDCA)*, Coimbatore, India, Oct. 2025, doi: 10.1109/ICIDCA66325.2025.11280584.

[24] A. V. S. Deepika, V. R. Chowdary, P. P. Aditya, C. Pavani, G. S. Narayana, and V. Prasanthi, "A Raspberry Pi Based Approach to Skin Cancer Detection Through Transfer Learning," in *Proc. 2025 3rd DMIHER Int. Conf. Artificial Intelligence in Healthcare, Education and Industry (IDICAIHEI)*, Wardha, India, Nov. 2025, doi: 10.1109/IDICAIHEI65991.2025.11378775.

[25] R. Chowdary, A. R. Kothapalli, P. Alla, D. P. Jetty, U. K. Pedada, and C. N. Banavathu, "A Hybrid AC/DC Microgrid: Integrating Power for Future Generation," in *Proc. 2025 Int. Conf. NexGen Networks and Cybernetics (IC2NC)*, Erode, India, Dec. 2025, doi: 10.1109/IC2NC67409.2025.1137636.

[26] V. Ravindranadh, A. Prabhas, K. Akhil Reddy, J. Dinesh Paul, P. Uday Kiran, and B. Charan Nayak, “Implementation of Fuel Cell Stack with Boost Converter,” in *Proc. 2025 Int. Conf. NexGen Networks and Cybernetics (IC2NC)*, Erode, India, Dec. 2025, doi: 10.1109/IC2NC67409.2025.1137648

[27] I. Damarla, B. Nagarajan, V. Mahendran, and P. Anbarasan, “Analysis of a Seven-Level Asymmetric Inverter with a Cascaded H-Bridge Configuration,” in *Proc. 2025 2nd Int. Conf. Artificial Intelligence and Knowledge Discovery in Concurrent Engineering (ICECONF)*, Chennai, India, Oct. 2025, doi: 10.1109/ICECONF65644.2025.11379495.

[28] I. Damarla, P. V. Cherukuri, M. Sake, G. Lolu, and M. Yakasiri, “Design of an On-Board Fast Charger Using BLSI Cuk Converter for EV Applications,” in *Proc. 2025 IEEE Int. Conf. Smart Power, Energy, Renewables, and Transportation (SPERT)*, Surat, India, Dec. 2025, doi: 10.1109/SPERT67079.2025.114692.

[29] I. Damarla, S. Obilisetti, S. Shaik, M. S. Rajulapati, and K. N. C. Rachabattuni, “Analysis of Vienna Rectifier Based LLC Resonant Converter for EV Fast Charging,” in *Proc. 2025 IEEE Int. Conf. Smart Power, Energy, Renewables, and Transportation (SPERT)*, Surat, India, Dec. 2025, doi: 10.1109/SPERT67079.2025.11469662.

[30] B. Vadlamudi and G. Srilakshmi, “Islanding Detection Using Optimized BI-LSTM Classifier with CWT,” in *Proc. 2025 IEEE Int. Conf. Smart Power, Energy, Renewables, and Transportation (SPERT)*, Surat, India, Dec. 2025, doi: 10.1109/SPERT67079.2025.11469392.

[31] B. Vadlamudi and B. Kartika, “Enhanced Power Quality in Micro Grids Using Intelligent UPQC Configuration,” in *Proc. 2025 IEEE Int. Conf. Smart Power, Energy, Renewables, and Transportation (SPERT)*, Surat, India, Dec. 2025, doi: 10.1109/SPERT67079.2025.114688.

[32] V. T. G. Gudipalli, V. T. Gopi, S. V. R. Lakshmi Kumari, P. Thikkisetti, P. L. V. D., K. L. V. Datta, L. M., and U. L. Manikanta, “Real-Time Monitoring and Alerting of Patient Vital Signs via Camera Feed Analysis and MQTT Protocol,” in *Proc. 2025 3rd DMIHER Int. Conf. Artificial Intelligence in Healthcare, Education and Industry (IDICAIHEI)*, India, Nov. 2025, doi: 10.1109/IDICAIHEI65991.2025.11378606.

[33] E. Poongulali, R. Jayaraman, M. Joseph, A. S. Kodiganti, and R. Tamilselvan, “Smart Charging Stations for Electric Vehicles: ARIMA-Based Demand Forecasting and K-Means

Clustering for Infrastructure Optimization," in *Proc. 2026 9th Int. Conf. Trends in Electronics and Informatics (ICOEI)*, Tirunelveli, India, 2026, doi: 10.1109/ICOEI68323.2026.1154133.

[34] E. Poongulali, R. Jayaraman, M. Joseph, A. S. Kodiganti, and R. Tamilselvan, "Innovative Deep Learning Approaches for Early and Efficient Recognition of Eye Diseases," in *Proc. 2026 9th Int. Conf. Trends in Electronics and Informatics (ICOEI)*, Tirunelveli, India, 2026, doi: 10.1109/ICOEI68323.2026.1154210.

[35] A. K. Chekuru, V. K. Nuka, S. Allu, D. K. Monditoka, and Y. N. S. Parvathi, "Intelligent Salt Dispensing System for Hypertension Patients Using BP Data and Microcontroller Automation," in *Proc. 2026 6th Int. Conf. Trends in Material Science and Inventive Materials (ICTMIM)*, India, Apr. 2026, doi: 10.1109/ICTMIM68190.2026.1150686.

[36] S. N. V. S. K. Chaitanya, P. Y. Chakri, L. S. Sai, K. P. Kumar, P. Santhosh, and P. S. D. S. Badarinath, "Smart Energy Monitoring: A Case Study on PLC Based Data Acquisition and Python Analytics," in *Proc. 2025 IEEE Int. Conf. Smart Power, Energy, Renewables, and Transportation (SPERT)*, Surat, India, 2025, doi: 10.1109/SPERT67079.2025.11469730.

[37] M. L. N. Vital, T. S. Siddhartha, A. Gutta, V. V. B. Prasad, and S. S. Soumya, "Remote Electrification Using Renewable Energy Sources," in *Proc. 7th Int. Conf. Science and Innovative Engineering (ICSIE 2026)*, Prince Dr. K. Vasudevan College of Engineering and Technology, Chennai, India, Apr. 2026.

[38] N. S., M. L. N. Vital, Y. Vasanthi, M. K. P. Lahari, and A. Govindu, "A Structured Methodology for Developing a Home-Made Food Ordering Website Using HTML and CSS," in *Proc. 7th Int. Conf. Science and Innovative Engineering (ICSIE 2026)*, Prince Dr. K. Vasudevan College of Engineering and Technology, Chennai, India, 2026.

Book Chapters (5)

SCOPUS: 5

UG: 5 PG: 0

[1] N. Upendra, R. C. Vankina, G. Kamalakar, P. V. Krishna, and G. Srinivas, "Integrated Smart Energy Management for Sustainable Grid Optimization and Predictive Maintenance," *IOP Conf. Ser.: Earth Environ. Sci.*, vol. 1529, no. 1, p. 012006, Aug. 2025, doi: 10.1088/1755-1315/1529/1/012006.

[2] M. R. S. R. S. Ramya, R. M. Rao, B. V. Rao, Y. Moulika, R. Kamakshi, and M. Devaki, “Enhanced Parameter Extraction for Double-Diode Modeling of Solar PV Cells Using Improved Grey Wolf Optimization,” *IOP Conf. Ser.: Earth Environ. Sci.*, vol. 1529, no. 1, p. 012017, Aug. 2025, doi: 10.1088/1755-1315/1529/1/012017.

[3] N. Upendra, R. C. Vankina, I. P. Sahay, B. Kiranmayi, and B. Manohar, “Effective Power Sharing and Improved Droop Control in a Hybrid Grid with V2G/G2V,” *IOP Conf. Ser.: Earth Environ. Sci.*, vol. 1529, no. 1, p. 012007, Aug. 2025, doi: 10.1088/1755-1315/1529/1/012007.

[4] I. Damarla, V. Pradyumna, J. Ramyasri, R. Ajaybabu, and T. Kiran, “Design and Performance Analysis of Fuel Cell Based Electric Vehicle with Ultra Boost Converter,” in *Communications in Computer and Information Science*, vol. 2613, S. L. Gundebommu, L. R. Chintala, and S. R. Kotha, Eds. Cham, Switzerland: Springer, Aug. 2025, doi: 10.1007/978-3-032-00983-8_13.

[5] R. V. K. Bobbili, S. N. V. S. K. Chaitanya, P. N. Botcha, N. V. Dara, S. Dasam, and S. S. Miriyala, “Simulation of a Solar Power Generation System Based on a Boost Converter Using Fuzzy Logic Controller-Based MPPT,” *IOP Conf. Ser.: Earth Environ. Sci.*, vol. 1529, no. 1, p. 012013, Aug. 2025, doi: 10.1088/1755-1315/1529/1/012013.

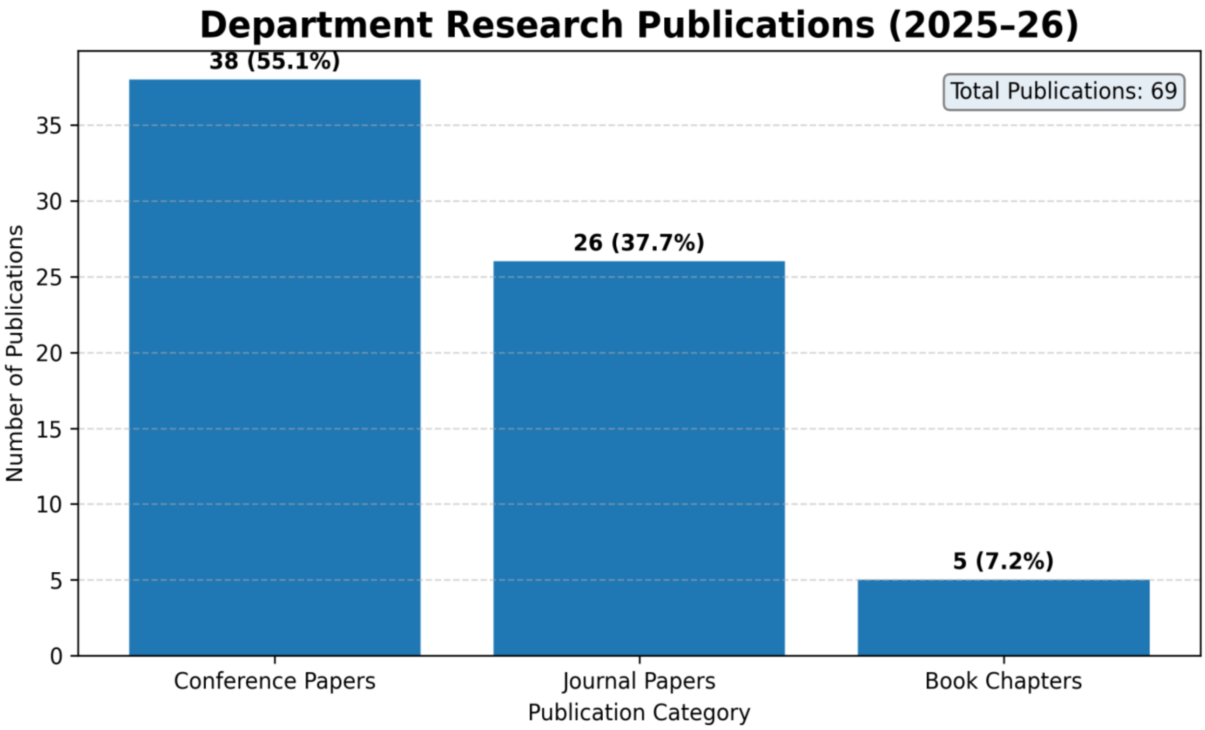


Fig. 1. Category-wise distribution of research publications during the academic year 2025–26.

Best Associate Editor Award

Subhojit Dawn
Velagapudi Ramakrishna Siddhartha Engineering College

The editorial board of Journal of Electrical Engineering and Technology expresses its sincere gratitude and appreciation to Prof. Subhojit Dawn (Velagapudi Ramakrishna Siddhartha Engineering College) for valuable service as Associate Editor for the Journal of Electrical Engineering and Technology in 2025. We believe that your academic contribution will add to the further development of science.

Sincerely yours,

Editor-In-Chief
Journal of Electrical Engineering & Technology

ACULTY INTERACTION WITH OUTSIDE THE COUNTRY

Dr.Subhojit Dawn, Assistant Professor/EEE has received Best Associate Editor Award from Journal of Electrical Engineering and Technology

EDITORIAL BOARD

Dr. J. RAMESH
ASSOC PROFESSOR
DEPT OF EEE
CHIEF-EDITOR

Mr. P. VENKATESH
ASST PROFESSOR
DEPT OF EEE
EDITOR

DESIGN CREDITS

V SAI SIDDHARTHA
(24EU06128)

K.HEMA SAI SREE
(25EU06022)

ALURI LIKITH SAI
(26EU09002)

NADAKUDITIROHINI
(26EU9008)