Mookambigai College of Engineering

(Approved by AICTE and Affiliated to Anna University, Chennai)
Kalamavur, Pudukkottai - 622502

(Estd in 1985)

IEEE (STB29571)

IEEE STUDENT BRANCH

Organised

A National Level Conference on "Emerging Trends in Engineering and Technology" (NCETET '25)

on

Date: 31.10.2025
(Friday)

Proceedings

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Mr.O.Rajagunasekaran	Dr.R.Elangovan	Dr.P.Vasudevan
CONVENER	PRINCIPAL	DIRECTOR

A National-Level Conference on Emerging Trends in Engineering and Technology

(NCETET ’25) – 31 Oct 2025

Authors: Dr. P. Vasudevan, Dr. R. Elangovan, and Mr. O. Rajagunasekaran

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About Mookambigai College of Engineering

Founded in 1985, Mookambigai College of Engineering is a proud initiative of the Sri Mariamman Educational, Health, and Charitable Trust, based in Woraiyur, Tiruchirappalli. The management is guided by a team of progressive-minded and benevolent Trustees, with the far-sighted and enthusiastic Late Thiru S. Subramaniam serving as the Founder Chairman. The Trust also operates Srinivasa Polytechnic on the same campus.

Since its inception, Mookambigai College of Engineering has steadily grown, achieving remarkable milestones along the way. Today, it stands as a beacon of excellence, known for its commitment to high educational standards. The institution follows a bi-dimensional approach: fostering strong student-faculty involvement and encouraging continuous interaction between industry, academia, and society.

The primary mission behind establishing the Engineering College was to provide quality technical education to students, particularly from rural and marginalized backgrounds in and around Pudukkottai and Trichy, at an affordable cost. This commitment to affordability does not compromise the quality of education offered. The institution is affiliated with Anna University, Chennai.

Located on a sprawling 200-acre campus in the peaceful village of Kalamavur, along the Trichy-Pudukkottai highway, the college is just 20 km from Trichy Airport, placing it in the geographical center of Tamil Nadu. The region is home to major industrial hubs like BHEL, Ordnance Factory, Golden Rock Railway Workshop, and prestigious educational institutions including NIT, Trichy, IIM, Trichy, and Anna University, Trichy.

With over 13,500 alumni spread across the globe, our graduates continue to contribute to various industries, serving as living testimony to the strong foundations laid by their Alma Mater. At Mookambigai College of Engineering, we are dedicated to nurturing competent, talented engineers who embody ethical and moral values, ready to contribute to our nation’s progress toward becoming a developed country.

About the National Conference

The Objectives of National Conference on "**Emerging Trends in Engineering and Technology – NCETET'25**";

A National Level Conference is a prestigious academic platform that brings together researchers, academicians, industry experts, scholars, and students from across the country to exchange knowledge, present innovative ideas, and discuss emerging trends in their respective fields. Such conferences play a significant role in promoting interdisciplinary collaboration, encouraging cutting-edge research, and showcasing technological and societal advancements.

Through keynote addresses, technical sessions, paper presentations, workshops, and panel discussions, participants gain valuable insights into the latest developments and challenges in the domain. The event also provides opportunities for networking, research dissemination, and future academic or industrial collaborations.

National level conferences strengthen the academic ecosystem by:

* Fostering research culture
* Encouraging evidence-based innovations
* Enhancing institutional visibility
* Creating a forum for national integration of ideas
* Building bridges between academia and industry

Overall, a National Level Conference serves as a catalyst for knowledge sharing, capacity building, and professional growth, contributing meaningfully to national development.

Organising Committees:

Chief Patrons

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Chair Person.

Thiru D.Ravi,

Chief Executive.

Patrons

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Director.

Dr.R.Elangovan,

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R.Gayathiri/ Final year ECE/Member IEEE

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Message from Chairperson

It is my pleasure to extend warm greetings to everyone who participated in the National Level Conference conducted on **31st October 2025**. The conference brought together distinguished academicians, researchers, industry experts, and students from across the country, creating a rich platform for meaningful dialogue and knowledge exchange.

I express my sincere appreciation to all the speakers, presenters, delegates, and participants whose valuable contributions made the event truly impactful. My heartfelt thanks also go to the organizing committee, faculty members, and volunteers for their exemplary dedication in ensuring the success of the conference.

May the insights shared and connections built during the conference continue to inspire innovation, research, and collaboration in the days ahead.

Warm greetings and Best wishes to all.

Tmt. Uma Ravi,
Chairperson,
Mookambigai College of Engineering.

Message from Chief Executive

The National Conference on Emerging Trends in Engineering and Technology 2025 has provided a platform for the students and research scholars to exhibit their knowledge. This event not only encourages innovation but also fosters collaboration among participants from diverse backgrounds. As they share their findings and insights, new ideas are ignited, paving the way for future advancements in the field. The exchange of ideas during this conference is vital, as it allows for the cross-pollination of concepts that can lead to groundbreaking developments.

Attendees leave inspired, equipped with fresh perspectives and a renewed commitment to pushing the boundaries of Engineering and Technology. This dynamic environment nurtures a sense of community, where relationships formed can lead to ongoing partnerships and collective problem-solving. Ultimately, the synergy generated at such gatherings propels the industry forward, ensuring that progress is not only achieved but sustained over time.

Thiru. D. Ravi,
Chief Executive,
Mookambigai College of Engineering.

Message from Director

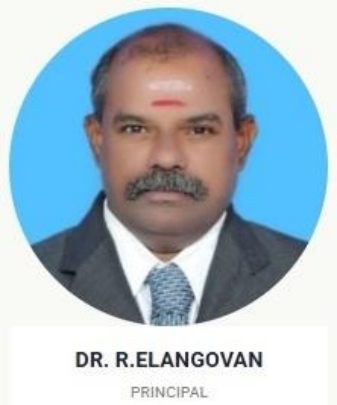
I am pleased to extend my warm greetings to all the participants, contributors, and readers of the National Level Conference held on 31st October 2025. This conference served as an excellent platform for academicians, researchers, industry professionals, and students to share their knowledge, present their findings, and engage in meaningful discussions on emerging trends and innovations.

The research papers and articles included in this Proceedings volume reflect the depth of inquiry, quality of scholarship, and diversity of perspectives brought forth by the participants. I commend all the authors for their valuable contributions and appreciate the rigorous review process undertaken by the editorial and organizing committees to ensure high academic standards.

My sincere gratitude goes to the resource persons, delegates, faculty members, and volunteers whose dedicated efforts made the conference a great success. I am confident that this Proceedings will serve as a useful reference for future research and inspire continued exploration in the field.

I extend my best wishes to the organisers and all contributors for their ongoing academic and professional pursuits.

Dr. P. Vasudevan,
Director,
Mookambigai College of Engineering.



Message from Principal

The National Conference, held in hybrid mode on October 31st, gave an opportunity for aspiring Engineers to showcase their abilities in front of others. The event featured a variety of presentations and workshops that encouraged collaboration and innovation. Participants left inspired, eager to apply their newfound knowledge in their future projects.

Many expressed a desire to continue the connections made during the conference, recognising the value of networking within their field. As the day concluded, discussions about future collaborations and potential projects buzzed among attendees, setting the stage for ongoing creativity and partnership.

My best wishes to organising committee, participants and delegates from other colleges to have a bright future in the field of Engineering and technology.

Dr.R. Elangovan,
Principal,
Mookambigai College of Engineering.

Chief Guest Message

It is indeed a great honour and privilege to address the National Conference on Emerging Trends in Engineering and Technology (NCETET-25), organised by IEEE student branch, Mookambigai College of Engineering.

Conferences such as NCETET-25 play a vital role in fostering a culture of innovation, research, and collaboration among students, academicians, and professionals. They serve as dynamic platforms for the exchange of knowledge, the exploration of emerging technologies, and the cultivation of ideas that can shape the future of Engineering and society at large.

I sincerely appreciate the dedicated efforts of the organising committee for bringing together distinguished experts, young researchers, and industry practitioners under one roof. Such initiatives not only promote academic excellence but also inspire the next generation of Engineers to pursue innovation with integrity and purpose.

I am confident that the deliberations and discussions held during this conference will lead to valuable insights, productive collaborations, and impactful outcomes that contribute meaningfully to the advancement of science and technology.

I extend my best wishes for the grand success of NCETET-25 and hope that it continues to serve as a beacon of knowledge and inspiration for all participants.

Dr. Barkha Kumari
Assistant Professor
Department of AI & ML
G H Raisoni College of Engineering and Management,
Pune. Maharashtra.

Chief Guest Message

It gives me immense pleasure to convey my warm greetings to all the participants, organisers, and contributors of the National Level Conference held on 31st October 2025. Being invited as the Chief Guest for this remarkable academic event was truly an honour, and I deeply appreciate the opportunity to engage with such a vibrant community of scholars and professionals.

I extend my heartfelt appreciation to the organisers and coordinators for their meticulous planning and dedication in ensuring the success of the conference. The efforts of the editorial team in preparing this Proceedings volume also deserve special recognition.

I congratulate all the authors, presenters, and delegates for their valuable contributions and encourage them to continue pursuing excellence in research and innovation. I am confident that the deliberations and outcomes of this conference will inspire meaningful advancements and foster continued collaboration.

My best wishes to the institution and the organizing committee for their future academic endeavours.

Dr. K.Arunkarthikeyan. Ph.D, PDF.
Faculty of Mechanical Engg,
G.H. Patel College of Engineering &Technology,
Anand, Gujarat.

Chief Guest Message

It is a privilege to address the National Conference on Emerging Trends in Engineering and Technology (NCETET-25), organised by the Department of IEEE Student Branch, Mookambigai College of Engineering. Conferences like NCETET-25 serve as important platforms for fostering innovation, knowledge sharing, and collaboration among students, researchers, and faculty.

I commend the organising team for their efforts in bringing together experts from diverse fields to deliberate on the latest advancements in Engineering and Technology. I am confident that the discussions and interactions at this conference will spark new ideas and contribute significantly to the growth and development of the Engineering community.

I wish the conference every success and hope it continues to provide an enriching platform for learning, collaboration, and the exchange of innovative ideas.

Prof. Naveen BP,
Head, Civil Engineering,
National Institute of Technical Teachers' Training & Research,
Kolkata (Ministry of Education, Government of India).

Chief Guest Message

I am pleased to extend my warm greetings to all the participants, organisers, and contributors of the National Level Conference held on 31st October 2025. It was an honour to be invited as the Chief Guest for this significant academic event, and I am delighted to have been part of a forum that brought together distinguished scholars, researchers, industry experts, and students from across the country.

The conference served as an enriching platform for meaningful discourse, innovative ideas, and collaborative learning. The depth of research presented and the enthusiasm shown by the participants were truly commendable. Such initiatives play an essential role in advancing knowledge, fostering critical thinking, and encouraging the pursuit of excellence in diverse fields.

I am confident that the insights gained, discussions held, and networks formed during this conference will continue to inspire future research and innovation. I wish the institution and the entire organising team continued success in their future academic endeavours.

Best wishes to all.

Dr.Pabitra Guchhait,
Assistant Professor,
G H Raisoni College of Engineering and Technology,
Wagholi ,Pune.

Message from Convener

I am delighted to extend my warm greetings to all the participants, contributors, and delegates of the National Level Conference held on 31st October 2025. As the Convener of this event, it has been a privilege to coordinate a platform that brings together eminent academicians, researchers, industry professionals, and students to share their insights and engage in meaningful scholarly exchange.

The conference was designed to encourage the presentation of innovative ideas, foster academic dialogue, and promote collaborative learning. I am pleased to note that the papers, discussions, and interactions throughout the event reflected a high standard of research and intellectual engagement. The contributions compiled in this Proceedings volume stand as a testament to the hard work and dedication of all involved.

I express my sincere gratitude to our esteemed Chief Guest, resource persons, reviewers, and session chairs for their valuable time and support. My heartfelt appreciation also goes to the organizing committee, faculty members, and student volunteers whose tireless efforts ensured the successful conduct of the conference.

I congratulate all the authors and participants for their enthusiasm and commitment to advancing knowledge. I am confident that the insights gained through this conference will inspire further research and innovation in the days ahead.

My best wishes to everyone for continued academic excellence and success.

Prof. O.Rajagunasekaran,
Convener,
Department of EEE,
Mookambigai College of Engg.

Department of Computer Science and Engineering Articles

NCETET25CSE001

Brain Tumor Detection using Convolutional Neural Network

[1]T. Ragunath, [2]T. Jaivanth, [3]Prajeesranjan, [4]R. Sathish Kumar

[1]Assistant Professor, M.I.E.T Engineering College, Tamil Nadu, India.
[2,3,4]Assistant Professor, Shivani Engineering College, Tamil Nadu, India.

Abstract:

Brain tumor detection is a critical task in medical imaging that aids in early diagnosis and treatment planning. In recent years, convolutional neural networks (CNNs) have emerged as powerful tools for image classification tasks, including medical image analysis. This project aims to utilize CNNs for the automatic detection and classification of brain tumors from magnetic resonance imaging (MRI) scans. The proposed methodology involves pre-processing of MRI images to enhance contrast and remove noise, followed by feature extraction using a CNN architecture. The CNN model is trained on a dataset comprising both tumor and non-tumor MRI images, utilizing techniques such as data augmentation to improve generalization. The trained model is then evaluated on a separate test dataset to assess its performance in terms of accuracy, sensitivity, specificity, and other relevant metrics. Byleveraging deep learning techniques, this project aims to overcome the limitations of traditional methods for brain tumor detection, such as manual segmentation and visual inspection by radiologists, which are time-consuming and subject to inter-observer variability. The automated nature of CNN-based detection enables rapid analysis of large volumes of medical images, potentially leading to earlier detection of tumors and improved patient outcomes. Overall, this project contributes to the advancement of medical image analysis by harnessing the power of deep learning for accurate and efficient brain tumor detection, with the potential to make a significant impact on clinical practice and patient care.

NCETET25CSE002

A Deep Learning Approach Robust Photo Authentication and Tamper

[1]Jeyanthi B, [2]Gopalvenkatesh K, [3]Kailash kumar R, [4]Chandramouli K

[1]Assistant Professor, Mookambigai College of Engineering, Tamil Nadu, India.

[2,3,4] Student, Mookambigai College of Engineering, Tamil Nadu, India.

Abstract:

The rapid advancement of digital technologies, image manipulation has become increasingly sophisticated and accessible, raising serious concerns regarding the authenticity and integrity of digital photographs. Traditional cryptographic or watermarking-based methods for photo authentication are often limited in robustness and may fail to detect subtle or complex tampering operations. Therefore, there is a growing need for an intelligent and reliable system capable of accurately identifying image forgeries and restoring tampered regions. This study proposes a deep learning–based approach fo r robust photo authentication and tamper recovery. By leveraging convolutional neural networks (CNNs) and generative models, the system can effectively learn intricate patterns and discrepancies introduced during image manipulation. The proposed framework not only detects tampered areas with high precision but also reconstructs the original image content using contextual information. This approach aims to enhance the trustworthiness of digital images across various domains, including digital forensics, media verification, and secure image transmission.

NCETET25CSE003

Unified Smart Card System for Secure Authentication and Access Control

[1]S. Sigappi, [2]D. Ramya Cauvery, [3]B. Jeyanthi ,[4]S. Harishka

[1,2,3]Assistant Professor, Mookambigai College of Engineering, Tamil Nadu, India.

[4] Student, Mookambigai College of Engineering, Tamil Nadu, India.

Abstract:

The Unified Smart Card System is developed to integrate multiple access functionalities into a single, secure authentication platform. This system eliminates the dependency on multiple identification cards by providing a unified and encrypted authentication mechanism. The proposed model utilizes advanced encryption algorithms, role-based access, and real-time verification to ensure data integrity and system security. Simulation models and conceptual hardware implementations demonstrate that the system is efficient in preventing unauthorized access, enhancing operational convenience, and improving overall security scalability across different institutional environments.

NCETET25CSE007

OFFLINE RAG-BASED CHATBOT WITH LLM INTEGRATION

[1]R. Mariya Rushanthini, [2]Raja Rajesh Wari K, [3]Sherlin Liancy M, [4]Jenifer S

[1]Assistant Professor, Mookambigai College of Engineering, Tamil Nadu, India.

[2,3,4] Student, Mookambigai College of Engineering, Tamil Nadu, India.

Abstract:

Chatbots have changed from basic rule-based systems to intelligent assistants that can understand human language. Traditional offline chatbots used Natural Language Processing (NLP) methods, but they struggled with understanding context and retaining knowledge. This paper presents an Offline Virtual Chatbot powered by Retrieval-Augmented Generation (RAG) and Large Language Models (LLMs). Unlike NLP-driven systems that depend on pre-programmed responses, this design combines a local vector database and contextual retrieval pipeline. This allows the chatbot to generate meaningful and dynamic replies without needing the internet. The model uses FAISS for document retrieval, Sentence Transformer embeddings for semantic search, and a locally hosted LLaMA-based LLM for generating responses. It also supports speech interaction using Vosk for speech-to-text and Pyttsx3 for text-to-speech. Experimental evaluation shows better accuracy, fluency, and adaptability compared to traditional NLP-based chatbots. This method lays the groundwork for offline, privacy-focused AI assistants that can reason in real-time.

NCETET25CSE010

HYBRID MULTI-DISEASES PREDICTION USING TEMPORAL FUSION

[1]S. Sigappi, [2]Harini S, [3] Roshini CA

[1]Assistant Professor, Mookambigai College of Engineering, Tamil Nadu, India.

[2,3] Student, Mookambigai College of Engineering, Tamil Nadu, India.

Abstract:

Dietary nutrient intake plays a vital role in maintaining human health and is strongly associated with chronic diseases such as diabetes, hypertension, obesity, and cardiovascular disorders. Traditional disease prediction models mainly focus on single-disease prediction using static nutrient data, which limits their ability to capture complex and time-dependent dietary patterns. To address these limitations, this study proposes a hybrid Temporal Fusion Transformer (TFT) and Cat-Boost model for multi-label disease prediction. The TFT model learns temporal changes and dependencies in nutrient intake, while Cat-Boost performs accurate classification across multiple diseases. By combining temporal learning and powerful tabular classification, the proposed model achieves higher accuracy and interpretability compared to traditional approaches, offering a more comprehensive understanding of the relationship between nutrition and chronic disease risk.

NCETET25CSE011

AI Based Internship Recommendation Engine for Pm Internship Scheme

[1]E. Shapna Rani, [2]S K Varsha, [3]P Teja Sri,[4]T Siganthini,

[1]Assistant Professor Saranathan College of Engineering, Tamil Nadu, India.

[2,3,4] Student, Saranathan College of Engineering, Tamil Nadu, India.

Abstract:

The paper introduces an AI-powered recommendation system that helps students discover the most suitable government internship schemes, with a special focus on the Prime Minister's Internship Scheme (PMIS). The system evaluates each student's profile by analyzing their skills, qualifications, academic performance, and personal preferences. To ensure both accuracy and eligibility compliance, the model follows a hybrid approach — it first applies rule-based filters based on official government criteria and then uses machine learning to rank the most relevant schemes. The system relies on authentic internship metadata collected from central government portals, and uses a semantic feature-engineering pipeline to intelligently match student competencies with internship requirements. Compared to traditional manual searching or simple keyword-based filtering, this AI-based approach provides more precise and relevant recommendations. The overall goal is to simplify the internship discovery process, improve student–scheme matching, and support educational institutions and government bodies in boosting student participation in national-level internship programs.

NCETET25CSE012

Rainfall Prediction Model for Crop Yield Protection using Weather Forecasting Techniques

[1]G. Sharmila, [2]Roshini CA,[3] Anitha A,[4]Malakodi M

[1]Assistant Professor, Mookambigai College of Engineering, Tamil Nadu, India.

[2,3,4] Student, Mookambigai College of Engineering, Tamil Nadu, India.

Abstract:

In many agricultural regions, especially during the monsoon season, farmers face significant crop losses due to sudden and excessive rainfall. These losses are often worsened by a lack of timely and accurate information about weather conditions and soil health. Traditional weather forecasts alone are not sufficient, as they do not reflect the real-time field conditions such as soil moisture or ongoing rainfall. Moreover, many small-scale farmers do not have access to advanced weather monitoring systems or the technical knowledge to interpret complex forecasts. This results in poor reparedness, crop damage, and reduced yields. Therefore, there is a need for a smart, affordable, and accessible alert system that combines real-time environmental monitoring (through sensors) ith weather forecast data to provide farmers with early warnings and actionable advice to protect their crops during periods of high rainfall.

NCETET25CSE013

Proof-of-Authority Blockchain Framework for Counterfeit and Expired Medicine Prevention with Billing Integration

[1]D. Ramya Cauvery, [2]R. Sri Abirami

[1]Assistant Professor, Mookambigai College of Engineering, Tamil Nadu, India.

[2]Student, Mookambigai College of Engineering, Tamil Nadu, India.

Abstract:

Counterfeit and expired medicines remain a major threat to global healthcare, leading to patient harm and economic losses. This paper presents a blockchain-based framework that utilizes the Proof-of-Authority (PoA) consensus mechanism to ensure transparent and tamper-proof traceability across the pharmaceutical supply chain. The proposed system integrates blockchain verification with pharmacy-billing software to automatically detect and block the sale of counterfeit or expired medicines during transaction processing. To strengthen product authentication, a dual-layer verification model is employed using QR code encryption and image steganography, providing hidden data protection against duplication and manipulation. The framework achieves faster validation, reduced computational costs, and improved trust among authorized network participants, such as manufacturers, distributors, and regulators. The experimental analysis demonstrates the system's capability to enhance supply chain transparency and reduce the likelihood of unauthorized product circulation. The study concludes that integrating PoA-based blockchain with billing and steganographic verification offers a practical and scalable solution for securing medicine authenticity in real-time retail environments.

NCETET25CSE014

The Physiological and Psychological Effects of Physical Activity on Overall Wellness

[1]Dr.M. Sivakumar, [2] B. Umamaheswari , [3]Priyanka Mitra, [4]Anju Rajput
[1]Professor, Mookambigai College of Engineering, Tamil Nadu, India.
[2,3,4]Assistant Professor, JECRC, Jaipur, India.

Abstract:

Counterfeit and expired medicines remain a major threat to global healthcare, leading to patient harm and economic losses. This paper presents a blockchain-based framework that utilizes the Proof-of-Authority (PoA) consensus mechanism to ensure transparent and tamper-proof traceability across the pharmaceutical supply chain. The proposed system integrates blockchain verification with pharmacy-billing software to automatically detect and block the sale of counterfeit or expired medicines during transaction processing. To strengthen product authentication, a dual-layer verification model is employed using QR code encryption and image steganography, providing hidden data protection against duplication and manipulation. The framework achieves faster validation, reduced computational costs, and improved trust among authorized network participants, such as manufacturers, distributors, and regulators. The experimental analysis demonstrates the system's capability to enhance supply chain transparency and reduce the likelihood of unauthorized product circulation. The study concludes that integrating PoA-based blockchain with billing and steganographic verification offers a practical and scalable solution for securing medicine authenticity in real-time retail environments.

NCETET25CSE015

CLOUD AND AI - BASED SMART INSTITUTION

[1]A. Arockia Sudha,[2] Manikandan R, [3]Vairavapandiyan K, [4]Sakthivel K
[1]Assistant Professor, Mookambigai College of Engineering, Tamil Nadu, India.
[2,3,4] Student, Mookambigai College of Engineering, Tamil Nadu, India.

Abstract:

The management of educational institutions involves handling numerous academic and administrative tasks such as fee payment, announcements, attendance, and performance tracking. Traditional systems depend heavily on manual operations, which often result in errors, delays, and inefficient communication. This paper proposes a Cloud and AI-Based Smart Institution Management System that automates and enhances institutional processes. The system integrates Artificial Intelligence (AI) and Cloud Computing technologies to deliver an intelligent, scalable, and centralized solution. Major modules include an AI Chatbot for assistance, Cloud-based Online Payment System, Smart Announcement and Notification Panel, and an AI-powered Smart Dashboard integrated with YOLO object detection for real-time monitoring. The proposed system ensures secure data storage, transparency, automation, and smart decision-making for effective institutional management.

NCETET25CSE016

AI-Powered Prediction of Low-Carbon Engine Efficiency and Emission Characterization

[1]P. Valarmathi, [2] Sathiya Mahamani

[1] Professor, Mookambigai College of Engineering, Tamil Nadu, India.

[2] Student, Mookambigai College of Engineering, Tamil Nadu, India.

ABSTRACT

The growing global demand for sustainable energy and low-carbon mobility has accelerated research on intelligent engine performance prediction. This paper presents an AI-driven predictive framework for analyzing and forecasting multi-fuel engine efficiency and emission characteristics using advanced machine learning techniques. The study utilizes the Low Carbon Engine Dataset, comprising over 8,000 records across Hydrogen, Ethanol-Blend, and Synthetic e-Fuel types with key operating parameters such as air–fuel ratio, ignition timing, and manifold pressure. Data preprocessing involved rigorous outlier detection, skewness correction, feature encoding, and scaling to ensure data reliability. Two machine learning categories were developed: efficiency prediction using Linear Regression and Random Forest, and emission prediction using Decision Tree and Gradient Boosting Regressors under a multi-output framework. Model evaluation was performed using R2, MAE, and RMSE metrics to validate accuracy and robustness. The integration of Power BI visual analytics provided interactive insights into efficiency trends and emission correlations across different fuel types. Experimental results highlight the potential of AI-assisted modeling in optimizing combustion processes and supporting the transition toward cleaner, low-carbon engine technologies. The proposed framework establishes a scalable foundation for future extensions involving deep learning and real-time emission control systems.

NCETET25CSE017

Prediction Passenger survey

[1]M. FloraMary, [2]SK.Sivabharathi, [3]M. Swetha, [4]S. Harini Devi

[1]Assistant Professor, Mookambigai College of Engineering, Tamil Nadu, India.

[2,3,4] Student, Mookambigai College of Engineering, Tamil Nadu, India.

Abstract

Maritime disasters pose severe risks to human life, often resulting in high casualty rates due to unpredictable environmental conditions, inadequate safety measures, and delayed emergency responses. Traditional methods for assessing survival chances rely on historical assumptions and lack the ability to dynamically analyze complex, interrelated factors such as passenger demographics, ship conditions, and safety infrastructure. This project aims to develop a data-driven predictive framework capable of learning patterns from historical maritime data to forecast survival probabilities. By leveraging machine learning (ML) techniques, the system seeks to identify key factors influencing survival and accurately estimate the likelihood of a passenger surviving an incident. The resulting system can support maritime authorities in optimizing safety protocols, improving evacuation planning, and enhancing overall disaster preparedness.

NCETET25CSE018

Optimized Deep Learning Framework for End-to-End Speech-to-Text

[1]D. Ramya Cauvery, [2]M. Floramary, [3]J.F. Haritha

[1,2]Assistant Professor, Mookambigai College of Engineering, Tamil Nadu, India.

[3] Student, Mookambigai College of Engineering, Tamil Nadu, India.

Abstract

Communication is a fundamental human need, yet individuals with hearing and speech impairments often face challenges in expressing themselves effectively with the general population. Sign language serves as their primary mode of communication, but most people are not familiar with it, creating a communication gap. This project aims to bridge that gap through Indian Sign Language (ISL) recognition using modern computer vision and deep learning techniques. The proposed system captures hand gestures through a camera and processes the images using a Convolutional Neural Network (CNN) to accurately recognize ISL signs. The recognized gestures are then translated into corresponding text or speech, enabling real-time communication between hearing-impaired individuals and others. The model is trained on a large dataset of Indian sign language gestures to improve accuracy and robustness under various lighting and background conditions.

NCETET25CSE019

Retinal Imaging-Based Prediction of Heart Disease Risk

[1]M. Revathi, [2]L. Meenatchi, [3] S. Rajeswari, [4]M. Abinaya

[1]Assistant Professor, Mookambigai College of Engineering, Tamil Nadu, India.

[2,3,4] Student, Mookambigai College of Engineering, Tamil Nadu, India.

ABSTRACT

Heart disease is one of the leading causes of death worldwide, primarily due to delayed diagnosis and lack of continuous health monitoring. Recent advancements in medical imaging and artificial intelligence offer new possibilities for early detection of cardiovascular abnormalities. This project presents a deep learning–based approach for predicting heart disease risk through retinal imaging analysis. Convolutional Neural Networks (CNNs) are employed to extract and interpret etinal vascular features correlated with cardiovascular conditions. The model demonstrates high accuracy and potential as a non-invasive, cost-effective diagnostic tool for large-scale screening.

NCETET25CSE020

Numerical Simulation of Networked Control Systems

[1]R. Sayeelakshmi, [2]*R. Chitra, AP, [3]S. Revathy,AP, [4] K.Sasikala,AP.*

[1] Professor, Department of Mathematics, Mookambigai College of Engineering, Tamil Nadu, India.

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ABSTRACT

Networked Control Systems (NCSs) integrate control loops with distributed sensors, actuators, and controllers connected via communication networks. Such systems inherently experience communication delays, packet loss, and jitter, which can degrade performance or even destabilize the closed-loop behavior. This paper presents a delay-aware numerical simulation framework for analyzing the dynamic behavior of NCSs under various delay conditions. Using delay differential equation (DDE) formulations and co-simulation tools such as MATLAB / Simulink TrueTime and Python JiTCDDE, we model constant, time-varying, and stochastic delays. Simulation results demonstrate how increasing communication latency impacts system stability, overshoot, and settling time. Comparative results validate that predictor-based and LMI-based control strategies improve robustness against delay uncertainties.

NCETET25CSE022

AODV BASED BANDWIDTH ESTIMATION USING MANET

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Abstract

Bandwidth estimation in high-mobility AODV for MANETs is crucial due to unpredictable factors like transmission range, node mobility, and environmental conditions affecting link lifetimes. Mobile nodes constantly balance reachability with unreliability, updating bandwidth forecasts post each encounter. MANETs, vital for data processing intelligence, demand unique network services due to their wireless nature. In MANETs, nodes autonomously form networks sans infrastructure, posing challenges like shared medium, node mobility, energy constraints, and dynamic node movements. Routes in MANETs have limited lifes pans, influenced by considerable mobility, leading to intermittent data connections. Optimization strategies must adapt to dynamic node and link changes, considering factors like available bandwidth, latency, and node lifespan. Relays play a key role in bandwidth estimation in AODV, reducing broadcast senders and network flooding. In AODV, relays manage topology control messages, ensuring efficient message dissemination

NCETET25CSE023

DECISIONSUPPORT SYSTEM FOR HEART DISEASE PREDICTION

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ABSTRACT:

Cardiovascular disease remains a leading cause of death worldwide, and hence timely and accurate diagnosis is of paramount importance. In this thesis, a multimodal machine learning approach is proposed, where clinical data are combined with electrocardiogram (ECG) signal data to improve prediction of heart disease. Clinical data in the form of features like age, cholesterol, and blood pressure are processed using supervised machine learning methods like Random Forest, Decision Tree, and K-Nearest Neighbors. At the same time, ECG signals are preprocessed and processed with wavelet transform methods to extract key features like QRS complexes and P-T wave morphology.Python is the main development environment for modeling clinical data and processing ECG signals. The experimental results show that the combination of structured clinical features with dynamic ECG features leads to better prediction accuracy and mHeart Disease, ECG, Clinical Data, Machine Learning, Wavelet Transform, Python,Random Forest Model stability. This multimodal approach allows robust diagnostic tools to be developed for early diagnosis and risk stratification of cardiovascular diseases, and hence more effective and personalized healthcare interventions.

NCETET25CSE024

DEEPFAKE IMAGE AND VIDEO DETECTION

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ABSTRACT

Digital media's exponential growth has resulted in rapid visual content manipulation of disturbing scale, thus presenting substantial issues of information authenticity and security. The growth of artificial intelligence tools has facilitated the creation of deepfakes, or created media using social imagery and video that is crafty enough to circumvent traditional detection methods. This research introduces a robust deep learning-based framework to detect fraudulent or fabricated visual content with great accuracy. The proposed system encompasses a convolutional neural network (CNN) model, a deep learning architecture called a ResNet model, to extract and learn complex visual features from images and video frames. Image features are investigated, including facial irregularities, differences in lighting, and unnatural blending artifacts, to separate authentic from fraudulent media. The study applies conventional mathematical formulations to refine detection and improve classification accuracy. The CNN incorporated in this hybrid model is computationally efficient and allows the model to converge more quickly while being reliable across different manipulation techniques and resolutions. The implications of this research serve to strengthen the verification of digital content and contribute a robust, scalable, and intelligent solution for the identification of deepfake media across multiple formats in forensic, investigative, and cybersecurity applications.

NCETET25CSE025

E-VOTING SYSTEM USING BLOCKCHAIN WITH REAL-TIME VOTERVERIFICATION: A REVIEW

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ABSTRACT

It's still a challenge today to provide security, transparency, and integrity on electronic voting systems in today's digital landscape. This research proposes a biometric blockchain to improve existing voting methods shortcomings. The system proposed allows facial recognition to authenticate voters, buffering against duplicate or fraud voting while still ensuring voter eligibility. Votes that have been authenticated are turned into transactions on the blockchain, allowing for immutability, traceability, and decentralized throughout the process. Each vote will have a transaction ID, contextually cryptographic included, that allows for vote traceability without the voter being revealed. Votes marked as fraud in the blockchain system will be rejected as a result of nefarious activity by the TX (Transaction) validation. The established framework, when being applied, has improved transparency, removed human latency, and allowed for same-day real-time access to actual voting results. In conclusion, the proposed framework constitutes a secure, efficient, and confidentiality-presumed digital voting system capable of reinforcing democratic processes using blockchain technology and biometric authentication.

NCETET25CSE026

ALZHEIMER'S DISEASE FROM BRAIN MRI USING VGG16-BASED DEEP LEARNING: A REVIEW

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ABSTRACT

Alzheimer's disease is an advancing neurological disorder that leads to major memory loss and cognitive deterioration. To achieve effective treatment and patient management, early diagnosis is needed. The study proposes an automatic diagnostic system that is based on a deep learning framework utilizing a pre-trained VGG16 neural network architecture to automatically detect Alzheimer's disease from brain MRI images. The automatic system utilizes a data preprocessing pipeline, conducts image normalization, and allows for image augmentations to improve model generalization. The implemented model extracts features from regions of the brain that are significant for diagnosis, such as the hippocampus and cortical regions that show degenerative changes. The authors utilize transfer learning to fine-tune their VGG16 model in order to do detection with less data. The proposed approach demonstrates better classification accuracy, lower computer processing time needed, and better scalability than approaches based on traditional machine learning techniques. The automated framework presented is an advance towards faster and more reliable processing so that healthcare providers may more reliably identify the development of the disease and take measures to improve the clinical course for patients with Alzheimer's disease.

NCETET25CSE027

INTELLIGENT VISION SYSTEM FOR DETECTING FATIGUE AND DISTRACTION OF DRIVER ASSISTANCE SYSTEM

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ABSTRACT

This research proposal aims to create an intelligent vision-based system to detect driver fatigue and driver distraction in real time through deep learning systems. In this work, the YOLO algorithm is used to extract facial features that enable ongoing tracking for eye closure, yawn rate, head position, and external objects. Drowsiness assessment is conducted usingPERCLOS and MAR measurements, while distraction is determined by assessing head turns and interactions with objects (cell phones etc.). The dataset used to train and test the model is taken from Roboflow and contains a diverse sample of illumination conditions, head positions, and driver habits. Once signs of fatigue or distraction are detected, the system generates automated audio and visual warnings to mitigate potential accidents. By coupling robust image processing with effective real time detection, the goal of this work is to increase road safety, and contribute towards the development of future advanced driver assistance systems to reduce human error.

Department of Electronics and Communication Engineering Articles

NCETET25EC001

An Optimized Battery Storage Based Solar Floor Cleaning Robot

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ABSTRACT

The increasing demand for sustainable and energy-efficient solutions in cleaning systems has led to the development of solar-powered automation technologies. This project, titled "Battery Storage Optimised Based Solar Floor Cleaning," presents an eco-friendly, autonomous floor cleaning system powered by solar energy with a focus on efficient battery management. The system utilizes a solar panel to charge a rechargeable battery, which in turn powers the cleaning mechanism comprising motors for movement, brushes for sweeping, and a sprayer for wet cleaning. A microcontroller unit monitors the battery voltage levels and controls the cleaning operations based on available power, thereby optimizing the battery's lifespan and ensuring efficient energy usage.Battery storage optimization is achieved by regulating the charging and discharging cycles using embedded control logic. The system ensures that the cleaning unit only operates when sufficient energy is stored, and enters a low-power standby mode otherwise. This not only prevents battery over-drain but also maximizes solar utilization during daylight hours. The prototype demonstrates a viable solution for large-area floor cleaning applications such as in public buildings, educational institutions, and industrial facilities. With zero dependency on grid electricity and reduced human intervention, this project highlights the integration of renewable energy and automation in everyday cleaning systems.

Key words: Battery Management System, Pulse Width Modulation & Revolutions per Minute.

NCETET25EC002

Wild Guard: An IoT and AI-Based Real-Time Animal Detection and Alert System for Human Safety and Wildlife Conservation

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ABSTRACT

Wild Guardis a real-time, low-cost system developed to prevent human–animal conflicts in areas near forests and farmlands. It integrates computer vision, machine learning, and wireless communication to detect and alert about animal movements. Using an Infrared (IR) camera and a YOLO-A deep learning model trained on common wild species, it accurately identifies animals in both day and night conditions. Once detected, alerts are sent via LoRa to nearby towers that trigger LEDs and buzzers, while SMS notifications are simultaneously delivered through the Twilio API to farmers and forest officials. Detection details such as time, location, and species are stored on the cloud for later analysis, helping to map high-risk zones and monitor animal movement. The system ensures timely alerts, works efficiently in network-poor regions, and promotes both human safety and wildlife conservation.

NCETET25EC003

Smart Fire Detection System Using Image Processing Techniques

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ABSTRACT

Apart from causing tragic loss of lives and valuable natural and individual properties including thousands of hectares of forest and hundreds of houses, forest fires are a great menace to ecologically healthy grown forests and protection of the environment. Every year, thousands of forest fire across the globe cause disasters beyond measure and description. Forest and urban fires have been and still are serious problem for many countries in the world. Currently, there are many different solutions to detect the forest fires. People are using sensors to detect the fire. In this paper, we discuss a new approach for fire detection, in which modern technologies are used. In particular, we propose a platform that Artificial Intelligence based KNN algorithm. The computer vision methods for recognition and detection of smoke and fire, based on the still images or the video input from the cameras. The accuracy is based on the algorithm which we are going to use and the datasets and splitting them into train set and test set. Data has been collected from various sources and have been merged. At every stage of pre-processing, a Logistic Regression has been used.

Keywords - Flame Detection, Smoke detection, Real Time monitoring, Color Analysis, KNN algorithm.

NCETET25EC004

Image-Based Detection of Adulteration in Pulses Using Convolutional Neural Networks

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ABSTRACT

Food adulteration is a significant worldwide concern that impacts both health and the quality of food. Pulses, an essential component of the Indian diet, are frequently mixed with impurities such as sand, husk, and metal particles to bulk up quantity and cut costs. Traditional detection techniques like visual examination and chemical testing are often slow and prone to errors. This study introduces a system based on Convolutional Neural Networks (CNN) for identifying adulteration in pulses through image processing. The system features pre-processing steps to improve image characteristics and classification to distinguish between pure and adulterated samples. Test results indicate that the CNN model achieves high levels of accuracy with minimal need for human involvement. The proposed solution is quick, portable, and easy to use, making it suitable for food testing labs and production plants. It offers an efficient and trustworthy method for ensuring food safety and stopping the distribution of adulterated pulses.

Key Words:*Food, Diet, Pulses, Adulteration, Image processing, Convolutional Neural Network (CNN),Pre-processing*.

NCETET25EC005

IoT Enabled Smart Container System for Safe and Efficient Food Management

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ABSTRACT

An innovative IoT-Integrated Smart Container System designed to revolutionize the food logistics and supply chain sector through real-time environmental monitoring, predictive analytics, and block chain-backed transparency. Each container is embedded with a network of smart sensors that continuously measure parameters such as temperature, humidity, vibration, and gas concentration, ensuring optimal storage conditions throughout transit. The collected data is transmitted via an IoT gateway to a secure cloud platform, where AI-driven analytics predict potential spoilage risks and generate actionable insights for stakeholders. The system issues instant alerts through mobile and web applications whenever critical deviations occur, allowing for timely corrective measures to maintain food quality and compliance with global safety standards. By integrating with logistics management systems, it also supports route optimization, energy efficiency, and operational automation, resulting in reduced transportation delays and fuel consumption. Beyond food logistics, this scalable and cost-effective framework can be extended to pharmaceuticals, floriculture, and chemical supply chains. By minimizing spoilage, reducing carbon emissions, and promoting traceability through block chain, the Smart Container System contributes directly to sustainable, transparent, and intelligent global supply chains aligned with modern Industry 4.0 and UN SDG 12 goals.

Keywords: Internet of Things (IoT), Smart Sensors, Food Logistics, Supply Chain Management, Energy efficiency

NCETET25EC006

Cloud-Integrated MQTT Architecture for Kitchen Safety Alerts and Energy Management

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ABSTRACT

The rapid evolution of the Internet of Things (IoT) has transformed the traditional concept of homes into intelligent and interconnected systems capable of automation, remote control, and safety monitoring. Kitchens, being one of the most accident-prone areas in any household, demand effective real-time monitoring and safety mechanisms. This paper presents the design and implementation of an IoT-based Smart Kitchen Safety and Automation System using the ESP8266 microcontroller. The proposed system continuously monitors environmental parameters such as temperature, humidity, and gas concentration, while also detecting human presence using motion sensors. When the gas level exceeds a predefined threshold, the system automatically activates a buzzer alarm and an exhaust fan to mitigate danger. The system additionally allows remote operation of kitchen appliances through a web dashboard interface. The implementation demonstrates how low-cost IoT modules can significantly enhance kitchen safety and user convenience. The results confirm that this system effectively minimizes potential risks and provides a scalable foundation for future smart home automation developments.

NCETET25EC007

Design and Implementation of a Real-Time Industrial Machine Monitoring System Using Sensor Data Acquisition and IoT-Based Analytics

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ABSTRACT

The speedy development of the Internet of Things (IoT) has helped industries shift from conventional machine monitoring to smart, real-time systems that allow for improved operational efficiency and productivity. This project deals with the design and implementation of an industrial machine monitoring system in real-time through sensor data acquisition and IoT-based analytics. The system incorporates several sensors to constantly gather key parameters like temperature, vibration, speed, and power consumption of industrial equipment. The data are sent to a cloud platform via an IoT gateway for storage, visualization, and predictive analysis. Through real-time monitoring and data analytics, the system facilitates early fault detection, maintenance scheduling, and performance optimization. The solution lowers machine downtime, reduces operational expenses, and provides safety and reliability in industrial operations. In general, this system shows how IoT and sensor technologies can transform industrial automation and decision-making using real-time data-driven insights.

NCETET25EC008

AI Integrated Power Plant Monitoring System for Real-Time Fault Detection and Energy Optimization.

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ABSTRACT

The high-speed of development of the artificial intelligence (ai) technologies has provided the possibilities of improving the security, productivity and efficiency of the work of the power plants. In this paper, the author suggests an ai-based power plant monitoring system with built-in machine learning and deep learning algorithms to facilitate predictive maintenance, anomaly detection, fault diagnosis, and energy optimization. The system constantly collects real-time information via different sensors and processes it via edge and cloud computing systems to deliver insights and adaptive control in a timely manner. The proposed framework will reduce downtime of the equipment, decrease the operational costs and enhance the accuracy of fault detection by combining AI-driven models with the current infrastructure. Furthermore, the system builds the cybersecurity-conscious monitoring, as well as the digital twin simulations to manage the overall performance of the system. The findings show that AI-based monitor.

NCETET25EC009

Design and Analysis of Slot Antenna for Radar Applications

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ABSTRACT

This paper presents the design and analysis of a planar slot antenna operating at 4 GHz for radar applications. The antenna was constructed on an FR-4 substrate with a carefully optimized rectangular slot, employing Matlab simulations to ensure resonance and impedance matching at the target frequency. A microstrip feed was implemented to achieve efficient energy coupling and wide bandwidth performance. The Experimental validation included return loss and radiation pattern assessments have done in simulation. The results demonstrated a return loss of –18 dB at 4 GHz, a bandwidth of approximately 500 MHz, and a measured peak gain of 7 dBi. These findings confirm the suitability of the proposed slot antenna for advanced radar systems with compactness, ease of integration, and robust performance.

Keywords: *slot antenna, radar, microstrip, feed, bandwidth, gain*

NCETET25EC010

A Predictive Smart Power Management System for Residential Energy Conservation Using ESP32 IOT Platform

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ABSTRACT

The project is a real-time, low-cost system developed to prevent energy wastage and improve convenience in residential settings. Traditional automation systems often rely on fixed schedules or complex, costly hardware, failing to address the core problem of non-contextual device operation. This system integrates embedded intelligence, wireless communication, and contextual sensing to control and conserve energy. Using an **ESP32-S2** microcontroller, the system employs a **Predictive Control Logic** informed by local sensors—a **Passive Infrared (PIR) Motion Sensor** and a **Light Dependent Resistor (LDR)**—to ensure **real home appliances** (like lights and fans) only operate when a specific, confirmed user need (e.g., motion and darkness) is present. The ESP32 safely controls these loads via **relay modules**, with operational status monitored and manually controlled through a user-friendly interface on the **BlynkIoT platform**. The solution is affordable, ensures reduced manual effort, promotes energy efficiency, and acts as a strong base model for advanced, sustainable smart home applications.

Index Terms: *IoT , ESP32-S2, Predictive Control, Energy Conservation, PIR Sensor, LDR*

NCETET25EC011

IoT-Based Urban Waste Management and Notification System

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ABSTRACT

Technology plays a vital role in simplifying human life and improving living standards. In this work, we propose an innovative solution that aims to revolutionize waste management and support the vision of a Clean India. In many urban areas, garbage bins placed in open public locations overflow due to the increasing amount of waste generated each day, leading to unhygienic surroundings and health hazards for citizens. To overcome this problem, we present a wireless solid waste management system designed for smart cities. This system enables municipal authorities to remotely monitor the status of waste bins in real time through a cloud-based web server. When the waste level in a bin reaches its maximum threshold, an alert is automatically sent to the waste management department via a GSM module installed in the device. This ensures timely collection of waste by sending garbage collection vehicles to the required locations. The proposed system significantly enhances operational efficiency by optimizing both time and cost, while promoting a cleaner and healthier urban environment.

Keywords—**Waste management, ESP32 Microcontroller, IoT, GSM.**

Department of Mechanical Engineering Articles

NCETET25ME001

Prototype Development of Customized 3d Printed Footwear for Physically Challenging Persons

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Abstract

This research presents the prototype development of customized 3D printed footwear for physically challenged persons, focusing on achieving personalized fit, comfort, and improved mobility through digital manufacturing techniques. The design process integrates 3D scanning, computer-aided design (CAD), and additive manufacturing to create footwear tailored to individual foot geometries. The models, including Crocs-type and Flip-Flop designs, were developed using PLA (Polylactic Acid) material and fabricated via Fused Filament Fabrication (FFF) technology. Prior to printing, the designs were evaluated using simulation analysis to assess stress distribution, deformation, and overall structural performance under human foot loading conditions. The simulation results indicated that the maximum stress and deformation values were within the safe limits of PLA, demonstrating sufficient strength and stability for daily use. The Crocs model exhibited superior load distribution and support, while the Flip-Flop design provided enhanced flexibility and comfort. The outcomes validate that 3D printing offers an efficient, cost-effective, and eco-friendly approach to producing user-specific footwear for individuals with physical challenges. This study establishes a strong foundation for future research in functional customization using flexible materials such as TPU, with potential applications in medical orthotics and rehabilitation footwear.

Keywords: 3D Printing, PLA, Customized Footwear, Physically Challenged Persons, Simulation, Additive Manufacturing, CAD Design.

NCETET25ME002

Epoxy Composites Reinforced with CNT–Al_2O_3 Hybrid Fillers: A Review

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Abstract

The combination of carbon nanotubes (CNTs) with micro-scale ceramic particles within polymer matrices provides a promising route to develop high-performance, multifunctional composite materials. This review summarizes studies in which CNTs were grown on alumina (Al_2O_3) microspheres using chemical vapor deposition (CVD) and later embedded in an epoxy matrix reinforced with woven glass fibers. The incorporation of CNT–Al_2O_3 hybrids improves the mechanical and thermo-mechanical properties of the composites due to enhanced load transfer and interfacial bonding. The work of Yin et al. [1], Zakaria et al. [2], and Kumar et al. [7] highlights the effectiveness of this hybrid approach in creating strong, lightweight structural materials.

Keywords: Glass fabric, carbon nanotubes (CNTs), alumina, epoxy composites.

NCETET25ME003

Enhanced Wear Resistance of Epoxy Nanocomposites Reinforced with CNT–Al_2O_3 Hybrid Fillers

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Abstract

Epoxy-based composites are widely utilized in engineering sectors owing to their outstanding mechanical stability and structural efficiency. This study explores the dry sliding wear behaviour of epoxy nanocomposites reinforced with multi-walled carbon nanotubes (MWCNTs) and alumina (Al_2O_3) hybrid fillers. The hybrid nanofillers were incorporated in varying weight percentages (0.1–0.5 wt %) and evaluated under loads of 20 N, 40 N, and 60 N using a pin-on-disc apparatus with a 50 mm track diameter. The results revealed that the inclusion of CNT–Al_2O_3 hybrids notably enhanced wear resistance, with the 0.3 wt% composition showing optimum performance—exhibiting wear resistance improvements of 83%, 81%, and 80% at low, medium, and high loads, respectively, compared to neat epoxy.

Keywords: epoxy nanocomposites, MWCNTs, alumina, wear behaviour, hybrid reinforcement

NCETET25ME004

Investigating the Mechanical Properties of Glass Fabric Epoxy Composites Reinforced with MWCNT–Al_2O_3 Hybrid Fillers under Cryogenic Treatment-A Review

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Abstract

The integration of carbon nanotubes (CNTs) with micro-scale particles in polymer matrices provides a promising pathway for developing high-performance, multifunctional composites. This review discusses epoxy-based composites reinforced with glass fabrics and hybrid fillers composed of CNTs grown directly on alumina (Al_2O_3) microspheres via chemical vapor deposition (CVD). These hybrid-reinforced composites were further subjected to cryogenic treatment to enhance their mechanical properties. The study highlights the effectiveness of combining CNT–Al_2O_3 hybrid fillers with cryogenic processing for improved fiber-reinforced composite performance.

Keywords: Glass fabric, Carbon nanotubes, Alumina, Cryogenic treatment

NCETET25ME005

Fabrication and Study of Mechanical Properties of Fly Ash and Jute Fiber Bio-Composites

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Abstract

The rapid industrial growth and population increase have led to a high demand for synthetic, non-biodegradable materials that negatively impact the environment. This study aims to develop a sustainable bio-composite using fly ash—a thermal power plant byproduct—and jute fiber as reinforcement with epoxy resin as the matrix. Mechanical properties such as tensile, flexural, and compressive strengths were studied at varying compositions of fly ash (30–60%) and jute fiber (2–5%) using the hand lay-up method. Experimental testing was performed on a universal testing machine (UTM) according to ASTM and ISO standards. Results revealed that the mechanical properties improved with increasing fly ash and jute fiber content. The proposed composite offers a lightweight, eco-friendly, and cost-effective alternative to synthetic materials used in various industrial applications.

Keywords: Jute fiber, Fly ash , Epoxy

NCETET25ME006

Advanced Surface Engineering and Joining Technologies: A Review of Hardfacing Processes and Cold Metal Transfer Welding for Wear-Resistant and Dissimilar Material Applications

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Abstract

Wear remains a primary cause of component failure across critical industrial sectors, necessitating advanced surface engineering solutions to enhance durability and operational efficiency. Hardfacing, a well-established technique involving the deposition of wear-resistant alloys onto tougher substrates, offers a cost-effective strategy to combat abrasive, impact, corrosive, and high-temperature degradation. Concurrently, Cold Metal Transfer (CMT), a digitally controlled, low-heat-input variant of gas metal arc welding, has emerged as a precision joining technology ideal for thin sheets, dissimilar metals (e.g., Al/steel), and spatter-free applications. While hardfacing traditionally relies on high-energy processes such as plasma transferred arc welding (PTAW) or laser cladding, and CMT has been predominantly explored for aluminum welding, this review identifies a compelling synergy between the two. We critically examine how CMT's precise thermal control, minimal dilution, and compatibility with automation can enable novel hardfacing applications, including low-distortion repair of thin-walled components, additive manufacturing of functionally graded wear-resistant layers, and sustainable deposition of Fe-based alternatives to cobalt-containing alloys (particularly relevant in nuclear environments to avoid radioactive $^{58}Co/^{60}Co$ activation). The paper synthesizes open-access, Scopus-indexed research on hardfacing materials (Fe-, Co-, and Ni-based systems), CMT process mechanics, and microstructural outcomes, while highlighting key challenges in material compatibility, process optimization, and tribological validation. By bridging these domains, this work outlines a roadmap for next-generation surface engineering that integrates intelligent deposition with advanced alloy design for remanufacturing, repair, and high-performance additive applications.

Keywords: Hard facing, Cold Metal Transfer (CMT), wear resistance, low dilution deposition, functionally graded materials, sustainable surface engineering.

NCETET25ME007

Enhancement of Fire Evacuation System in Car Parking Area Using Computational Fluid Dynamics (CFD)

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Abstract

The aim of this project is to find an alternative method for fire prevention in car parking areas using jet fans and Computational Fluid Dynamics (CFD) simulation. This analysis also seeks to identify the most suitable placement for jet fans and to determine the necessary placement of exhaust fans to remove propagated smoke. The primary objective is to minimize the temperature in the shortest possible time during a fire accident. The study examines the effectiveness of the designed emergency ventilation system for a basement car parking area. The jet fans are intended to automatically spray moisture-containing air during a fire with the help of sensors. Similarly, the exhaust fans are automatically activated when smoke forms.

Keywords: Computational Fluid Dynamics (CFD), Fire Evacuation, Jet Fans, Exhaust Fans, Car Parking entilation, Smoke Control

NCETET25ME008

Design and Fabrication of Split Muff Coupling Using 3D Printing

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Abstract

This paper presents the design and fabrication of a split muff coupling using additive manufacturing, specifically 3D printing technology. The split muff coupling is a type of rigid coupling used to connect two co-linear shafts for torque transmission. The design was modeled using CAD software and fabricated using a Cube 3D printer with ABS material. The mechanical analysis ensures that the design can withstand operational stresses, and the factor of safety confirms the system's reliability under normal conditions. This study demonstrates the feasibility of producing functional mechanical components using cost-effective and rapid additive manufacturing methods.

Keywords-Split Muff Coupling, Rigid Coupling, Additive Manufacturing, 3D Printing, Mechanical Design.

Department of Artificial Intelligence and Data Science Engineering

Articles

NCETET25CS004

ENHANCING THE SAFETY OF PPE IN INDUSTRIAL SITES USING HYBRID

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Abstract:

Personal Protective Equipment (PPE) is essential for worker protection in industrial environments;however, compliance monitoring remains a significant challenge. This research proposes anintelligent PPE safety enhancement model using a hybrid deep learning framework integrated witha Diffusion Algorithm. The hybrid model combines Convolutional Neural Networks (CNN) andVision Transformers (ViT) to improve detection accuracy of PPE components such as helmets,gloves, masks, and vests under variable lighting, occlusion, and motion conditions. The DiffusionAlgorithm is implemented to reduce noise and enhance image clarity for robust feature extraction.Experimental results demonstrate improved precision, recall, and inference speed compared toconventional architectures. This system enables real-time surveillance, automated alerting, andinsightful analytics that promote workplace safety. The work concludes with a detailed discussionof edge deployment feasibility and scalability in large industrial facilities.

NCETET25CSE005

A LIGHTWEIGHT REAL-TIME PPE DETECTION IN INDUSTRIAL

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Abstract:

Industrial safety relies heavily on ensuring that workers correctly wear Personal Protective Equipment (PPE). Manual PPE monitoring is prone to human error, inefficiency, and delay. Deep learning models such as YOLO and Faster R-CNN offer high accuracy but are computationally intensive, limiting their real-time usability on edge devices. This paper proposes a light weight Real-Time Detection Transformer integrated with MobileNetV3 backbone (RT-DETR-MV3) to achieve faster and efficient PPE detection. The MobileNetV3 backbone accelerates feature extraction using depth wise separable convolutions and attention mechanisms, while the RT-DETR head leverages transformer-based multi-head attention for context-aware detection. Experimental results show that RT-DETR-MV3 achieves comparable accuracy to the original RT-DETR model with a 60% reduction in FLOPs and a 3× speed increase, enabling real-time PPE detection for industrial surveillance systems.

NCETET25CSE006

HYBRID FOREX PRICE FORECASTING USING TEMPORAL FUSION

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Abstract:

Traditional Forex forecasting models, like LSTM and XGBoost ensembles, have a hard time adjusting to sudden market changes. They also do not fully combine technical and fundamental data. Additionally, they do not offer reliable estimates of uncertainty, which results in predictions that are less accurate and inconsistent. To overcome these issues, this paper presents a new Forexforecasting framework that combines the Temporal Fusion Transformer (TFT), XGBoost, and a Dynamic Gating Network to improve hourly and daily predictions of foreign exchange prices. Traditional models, such as LSTM-XGBoost ensembles, often struggle to adapt and do not effectively combine sequential and tabular features. The new system improves forecasting by using TFT to capture long-term time dependencies, XGBoost for nonlinear tabular learning, and the gating network for context-sensitive weighting. By using both technical and fundamental indicators, this hybrid method creates accurate quantile-based forecasts, visual time line predictions, and actionable Buy/Hold/Sell trading signals. Experimental results show that the TFT-GB-Gate model outperforms traditional ensemble methods in accuracy, stability, and interpretability, making it suitable for use in automated trading systems.

NCETET25CSE008

Web-Based Real-Time Traffic Simulation and Congestion

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Abstract:

The project develops a web-based real-time traffic simulation and congestion management system aimed at optimizing traffic flow at urban intersections. The application enables visualization of traffic patterns, vehicle distribution, and intersection congestion using a modular, agent-oriented simulation approach. The system allows users to configure traffic parameters, test alternative signal timings, and evaluate traffic flow under different scenarios, including uniform, normal, increasing, decreasing, and empirical vehicle distributions. Enhancements include IoT integration for real-time data collection, adaptive optimization of traffic signals, and the potential to analyze environmental and economic impacts of traffic. The project is implemented using Python (Streamlit), JavaScript, and REST APIs, and can run on low-cost setups with free webhosting. Its applications include urban transport planning, municipal traffic management, educational research, and situational analysis in logistics or emergency scenarios. The system provides a low-cost, accessible solution for improving traffic efficiency, reducing congestion, and supporting decision-making in smart city initiatives.

NCETET25CSE009

AI-Powered Predictive Pharmacogenomics

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Abstract:

The prevailing challenge in precision oncology is genetic heterogeneity, which renders the traditional & quot;one-size-fits-all & quot; treatment ineffective, resulting in delayed patient outcomes and increased morbidity. This paper presents a Minimal Viable Model (MVM) leveraging an AI-Powered Predictive Pharmacogenomics approach to transition from reactive treatment to proactive, evidence-based therapy selection. I developed a 2-Layer 1D Convolutional Neural Network (CNN) in PyTorch, trained exclusively on gene expression and IC50 data from the Genomics of Drug Sensitivity in Cancer (GDSC) repository. Focusing on the binary classification (Sensitive/Resistant) of the anti-cancer drug Ulixertinib in Lung Cancer cell lines, the model achieved a test set accuracy of 80.00 on unseen data. This result validates the1D CNN's capacity to extract pharmacogenomic signatures from high-dimensional gene expression profiles, demonstrating a robust proof-of-concept for clinical decision support.

Department Electrical and Electronics Engineering Articles

NCETET25EE001

IMPLEMENTATION OF DC TO DC CONVERTER IN E VEHICLE

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Abstract-
Electric vehicles (EVs) have become the most excellent substitute for traditional vehicles that run on fossil fuels because of their lower running costs and pollution rates. The need for isolated charging infrastructure has grown as EVs' numbers continue to rise. On the other hand, effective converters can be used to enhance EV rapid charging. This work proposes a current-fed dual direct current (DC) to direct current (DC) converter for EV charging applications based on a fractional controller. The resonance condition for zero voltage switching and zero current switching is attained using the switches' resultant capacitance. The MATLAB Simulink tool is used to construct the suggested converter architecture. As required for a high-voltage electric vehicle charger, the resulting assessment confirmed that the proposed converter architecture offers improved switching features for various Operation scenarios. As a result, it has been demonstrated that the suggested converter is more effective at charging EV batteries.

NCETET25EE002

ADVANCED HYBRID CONTROL SCHEMES FOR Z-SOURCE INVERTORS FED INDUCTION MOTOR DRIVE IN ELECTRIC VEHICLE

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ABSTACT

The integration of advanced control strategies with Z-source inverters (ZSI) has opened new possibilities in achieving efficient and reliable motor drive systems. This project focuses on the development of an advanced hybrid control scheme that combines vector control and fuzzy logic algorithms to enhance the performance of an induction motor drive fed by a Z-source inverter. The ZSI topology offers both voltage buck–boost capability and improved immunity to shoot-through faults, making it ideal for electric drive applications. The proposed hybrid control system ensures better torque control, dynamic response, and harmonic reduction compared to conventional control methods. Additionally, the integration of IoT-based monitoring enables real-time data acquisition, performance analysis, and fault detection through a cloud platform. The developed system demonstrates enhanced efficiency, reliability, and adaptability, making it suitable for applications such as electric vehicles (EVs) and industrial motor drives.

NCETET25EE003

SPEED CONTROL PERFORMANCE ANALYSIS OF BLDC MOTOR USING MULTIPLE INPUT SOURCES FOR ELECTRIC VEHICLE APPLICATION.

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Abstract:

In the proposed research, three input sources—a Solar Photovoltaic (SPV), Battery, and Super Capacitor (SC)—are used to control the speed of a BLDC motor. The super capacitor is used to discharge energy to the BLDC motor as rapidly as possible so that it can attain the desired speed. The lithium ion battery and SPV are used to increase the electric vehicle's (EV) range. The energy can be released by the super capacitor in a matter of milliseconds. In order for the BLDC motor to obtain enough energy in a brief amount of time and to attain the maximum or predetermined speed as soon as feasible. Electric vehicles typically have poor pick times (maximum or predetermined speeds) or require longer times to attain their maximum speeds. The public becomes extremely afraid of buying electric vehicles as a result. The aforementioned disadvantage is removed in the proposed paper, making electric vehicles a rival to gasoline-powered automobiles. Two distinct methods are used to analyze the speed control performance of BLDC motors: (i) Battery-SPV combination; (ii) Battery-SPV-SC combination. The speed at which the motor reaches its specified speed is measured. The three-phase Voltage Source Inverter (VSI), which will drive the EV at a steady speed, is adjusted using basic PI controllers. The BLDC motor's performance is tested using MATLAB Simu-link for a range of fixed speeds and input source combinations. Performance features of the BLDC motor during speed control were examined and a hardware model was created.

NCETET25EE004

SIZING OF VOLTAGE SOURCE FOR A BATTERY ENERGY STORAGE SYSTEM IN MICRO-GRID WITH RENEWABLE ENERGY SOURCES

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ABSTRACT

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

NCETET25EE005

GRID TIED SOLAR PV SYSTEM WITH POWER QUALITY ENHANCEMENT USING ADAPTIVE GENERALIZED MAXIMUM VERSORIA CRITERION

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ABSTRACT

This project presents a three-phase grid-tied solar photovoltaic (PV) system with features for power quality correction. This system compensates for a number of power quality (PQ) problems, including harmonics, redundant reactive power, and load unbalancing, while transferring power produced by a solar PV array to feed linear and nonlinear loads. A three-phase voltage source converter (VSC) is used to transform the DC electricity produced by the PV array into AC. For the grid-tied solar PV system to transfer active power and reduce PQ issues, an effective control method is needed.

The Perturb and Observe based maximum power point tracking (MPPT) algorithm is used to make efficient use of the solar PV array. An IGBT-based VSC and DSP (dSPACE DS-1202) are used in the lab to build the experimental grid integrated PV system setup. Using a laboratory prototype, the effectiveness of the AGMVC control mechanism is experimentally confirmed.

This control method is contrasted with several traditional controllers, including instantaneous reactive power theory (IRPT) and synchronous reference frame theory (SRFT), as well as newly created weight-based controllers, such as normalised kernel least mean fourth-neural network (NKLMF-NN), least mean mixed norm (LMMN), and least mean square (LMS). AGMVC is compared to the control methods mentioned above using a number of variables, including fundamental weight convergence, steady state error, computational complexity, phase lock loop (PLL) requirement, and harmonic compensation capacity. The IEEE-519 standard is used to verify the system's performance.

NCETET25EE006

BRAILLE CONVERTING COMMUNICATION DEVICE FOR THE HEARING AND IMPAIRED PERSON

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ABSTRACT:

This project presents a Tending to the issues of people with visual and hearing troubles through a solitary helping framework is a difficult task. Numerous researches focus on tending to the issues of one of the above difficulties yet not all. This single unique system powered by Arduino is designed to support all these solutions. Braille is a system developed to assist the visually and hearing-impaired person by creating arrangements of dots which form letters, numbers, and punctuation marks. Thanks to technology, our project focuses on achieving the best technique that helps the visually impaired by letting them listen to what is represented as text through GSM as well as feel it in Braille, which is achieved using a device that can understand the text given in the GSM as SMS and convert the content to Braille. An abled person can send a message to a Deaf-Blind person from their mobile phone. Once the message is received by the device, it starts converting the letters in the message to Braille format. The Deaf-Blind person can feel the characters by placing their palm on the Braille display unit. Using the sound bite hearing system technique, our project provides a better way for people with hearing impairments to hear audio by biting the vibrator connected to the GSM module. The deaf person can make a call through GSM using a call switch and also hear the audio from the opposite person by implementing the sound bite hearing system. The GSM module and sound bite hearing system are used for long-distance communication with deaf people.

NCETET25EE007

Smart IoT Framework for Adaptive Monitoring and Protection of Electrical Transmission Networks in Evolving Power Grids

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ABSTRACT

The rapid evolution of modern power grids demands intelligent, adaptive, and secure monitoring systems to ensure reliable energy transmission and fault-tolerant operation. This paper proposes a Smart IoT Framework for Adaptive Monitoring and Protection of electrical transmission networks, integrating distributed sensors, intelligent electronic devices (IEDs), and cloud-based analytics to achieve real-time situational awareness. The proposed framework employs Internet of Things (IoT) technologies for continuous data acquisition of line parameters such as current, voltage, temperature, and sag while adaptive algorithms analyse these parameters to predict faults and optimise grid performance. A hybrid communication infrastructure based on wireless sensor networks (WSN), LoRa, and 5G ensures low-latency data transmission and robust connectivity in diverse terrains. The system incorporates edge computing for fast decision-making and uses AI-based protection schemes to isolate faults dynamically, minimising outage durations. Experimental validation on a scaled laboratory setup demonstrates improved fault detection accuracy, reduced response time, and enhanced reliability compared to conventional protection methods. The proposed IoT-enabled adaptive framework offers a scalable solution for the modernisation of evolving power grids and supports the transition toward smarter, self-healing transmission networks.

NCETET25EE008

SOLAR PANEL HEALTH MONITORING SYSTEM USING DEEP LEARNING APPROACH

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ABSTRACT:

In recent years, solar energy has emerged as a pillar of sustainable development. However, maintaining panel efficiency under extreme environmental conditions remains a persistent hurdle. This study introduces an automated defect detection pipeline that leverages deep learning and computer vision to identify five standard anomaly classes: Non-Defective, Dust, Defective, Physical Damage, and Snow on photovoltaic surfaces. To build a robust foundation, a heterogeneous dataset of 8973 images was sourced from public repositories and standardized into a uniform labeling scheme. This dataset was then expanded through an aggressive augmentation strategy, including flips, rotations, zooms, and noise injections. A YOLOv11-based model was trained and fine-tuned using both fixed and adaptive learning rate schedules, achieving a mAP@0.5 of 85% and accuracy, recall, and F1-score above 95% when evaluated across diverse lighting and dust scenarios. The optimized model is integrated into an interactive dashboard that processes live camera streams, issues real-time alerts upon defect detection, and supports proactive maintenance scheduling. Comparative evaluations highlight the superiority of this approach over manual inspections and earlier YOLO versions in both precision and inference speed, making it well suited for deployment on edge devices. Automating visual inspection not only reduces labor costs and operational downtime but also enhances the longevity of solar installations. By offering a scalable solution for continuous monitoring, this work contributes to improving the reliability and cost-effectiveness of large-scale solar energy systems.

NCETET25EE009

Underground Cable Fault Detection System

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ABSTRACT

Underground cables have been widely used with the development of power system grid. Underground cables are prone to a wide variety of faults due to underground conditions, wear and tear, rodents. Detecting fault source is difficult because entire line is to be dug in order to check fault at cable line. The repairmen know exactly which part has fault and only that area is to be dug to detect the fault source. Thus it saves a lot of time, money and allows to service underground cable lines faster. The aim of this project is to determine the distance of underground cable fault from base station in Km using ARDUINO NANO. The prototype uses simple concept of ohm's law. The prototype is modelled with a set of resistors representing cable length in km and fault creation is made by a set of switches at every known distance. The fault occurring distance, phase, is displayed on a 16X2 LCD interfaced with the microcontroller. Buzzer make alarm sounds whenever the fault occurs in three phase line.

NCETET25EE010

Controlled DC-Reactor Fault Current Limiters: Principles and Applications for Battery Energy Storage System Protection

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ABSTRACT

Battery energy storage systems (BESS) interfaced with DC grids require advanced protection schemes due to unique DC fault characteristics. Controlled DC-reactor fault current limiters (FCLs) offer dynamic restriction of fault currents, protecting BESS components and enhancing system reliability. This paper presents the operating principles, integration techniques, control strategies, and application case studies of controlled DC-reactor FCLs. The findings highlight their role in fault management, selective isolation, and resilience improvements in modern energy storage networks.

NCETET25EE011

LANDSLIDE MONITORING AND CONTROL IN MOUNTAIN AREA USING RF COMMUNICATION

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ABSTRACT

Landslides in mountainous regions pose significant risks to human life, infrastructure, and the environment. Early detection and continuous monitoring are crucial to mitigate these risks. Recent advancements in wireless communication and the Internet of Things have enabled the deployment of cost-effective, real-time monitoring systems using Radio Frequency technologies. LoRa-based wireless sensor networks have been effectively employed for landslide and rockfall monitoring, offering long-range communication with low power consumption, as demonstrated in Pantelleria Island. High-range wireless networks integrated with geosensors provide predictive capabilities for potential landslides, while fuzzy logic-based particle swarm optimization enhances adaptive monitoring and early warning. IoT-enabled systems allow distributed sensing and centralized data processing, facilitating timely alerts and preventive actions. The integration of GNSS-RTK technology with RF communication further improves positional accuracy and real-time data acquisition. This paper reviews current methodologies and presents a framework for an RF-based landslide monitoring system in mountainous regions, emphasizing real-time monitoring, early warning, and disaster prevention.

NCETET25EE012

Artificial Intelligence – Convolution Neural Network Architectures in a Nutshell

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Abstract

It is a well-known fact that all the Artificial Intelligence (AI) researches happening across multiple verticals such as Neuro Imaging, Computer Vision, Deep learning etc point to one master goal of modelling the human brain function by understanding how each part of the brain works. The Convolution neural network (CNN) is one of best deep architecture suitable to handle variety of inputs. In this paper we explore the different types of input data the CNN deep architecture can process and some of the CNN configuration changes that has proved good Accuracy. We have highlighted those specialized CNN architectures along with different types of data inputs they handle including the Functional Magnetic Resonance (fMRI) Neuro Image brain data input.

Department of Electronics and Instrumentation Engineering Articles

NCETET25EI01

Brain–Computer Interface (BCI) for Industrial Automation

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ABSTRACT

Brain–Computer Interface (BCI) technology has emerged as one of the most promising paradigms for bridging human cognition and autonomous systems. This study explores the design and development of a real-time EEG-based BCI framework for industrial automation, emphasizing affordability, reliability, and human-centric safety. The proposed system acquires electroencephalogram (EEG) signals from a non-invasive headset, preprocesses them using digital filters, and classifies mental states through a supervised machine-learning algorithm. Classified commands are transmitted via an IoT-enabled ESP32 module to control industrial actuators such as motors or robotic arms. The integrated framework provides an end-to-end connection between the operator's brain signals and machine control units. Experiments with multiple participants yielded an average accuracy of 92 percent, latency under 250 milliseconds, and consistent reliability across sessions. The work demonstrates that merging BCI with IoT and AI can fundamentally transform industrial safety and productivity within Industry 5.0 by enabling seamless cognitive automation.

NCETET25EI02

SOLAR AND GRID-INTEGRATED EV CHARGER USING SEPIC TOPOLOGY

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ABSTRACT :

Building dependable, sustainable, and effective charging infrastructure is essential given the growing demand for electric cars (EVs).The design and execution of hybrid EV charging system that combines grid power with solar photovoltaic (PV)energy is suggested by this project.The output is controlled by a SingleE nded Primary Inductor Converter (SEPIC).The SEPIC converter was chosen because it can produce a steady DC output across a broad range of input voltages, which makes it perfect for systems with intermittent and variable energy sources like solar power

and a fluctuating grid supply.By making solar energy the main power source, the system architecture lessens reliance on the traditional grid and promotes the use of renewable energy in the EV charging industry.The s uggested configuration maximizes the usage ofclean energy while guaranteeing continuous charging by utili zing solar energy when it is available and smoothly transitioning to grid power when required.In addition to increasing energy reliability, this hybrid setup makes a substantial contribution to lowering carbon emissions linked to electricity generated from fossil fuels.Additionally, the charging system's overall performanc e and efficiency are improved by using a SEPIC converter, which allows for smooth voltage management an d flexibility to various input conditions without sacrificing output quality.The deployment of this hybrid syst em promotes the creation of environmentally friendly infrastructure and is in line with international initiative s to move toward sustainable mobility.To sum up, our initiative opens the way by showcasing a workable an d expandable strategy for maximizing the use of renewable energy in EV charging.

Key words :Single Ended Primary Inductor Converter (SEPIC), EV charging, Solar Photovoltaic energy.

Department of Information Technology Articles

NCETET25IT001

Enhancing Electoral Integrity through Internet-Based Elective Systems Using Multi-Factor Authentication

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ABSTRACT

The Internet Elective System is a cutting- edge digital voting framework designed to modernize the electoral process in democratic nations. By integrating Aadhaar-based authentication, facial recognition, and blockchain technology, it aims to eliminate challenges like impersonation, proxy voting, and logistical complexities in traditional voting systems. The project leverages secure authentication mechanisms to ensure one voter per vote, combined with cryptographic encryption and end-to-end transparency. Through a hybrid of web and mobile platforms, the system enables secure, location- independent participation for all eligible citizens. This paper discusses the architecture, methodologies, implementation, and evaluation of the Internet Elective System, providing a blueprint for large-scale, trustworthy, and future-ready elections.

NCETET25IT002

AI-ENABLED SKIN CANCER DETECTION AND VIRTUAL DERMATOLOGY ASSISTANT USING DEEP LEARNING

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ABSTRACT

The current state of affairs demonstrates that the detection of skin cancer is dependent on manual examination and biopsies, which are costly, time-consuming, and prone to human error. For prompt treatment and higher patient survival rates, early identification of skin abnormalities is essential. In order to accurately classify skin lesion images, this project automatically extracts features like colour, shape, and texture using the VGG16 deep learning model. To improve accuracy and do away with the need for manual segmentation, the system combines AI-driven automated classification with noise removal. Skin cancer detection is now accessible, effective, and user-friendly thanks to a chatbot-powered virtual dermatology assistant that answers questions, gives users information, and suggests doctors.

NCETET25IT003

TRAX: AI-Powered Train Traffic Control for Maximizing Section Throughput

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ABSTRACT

The increasing density of train traffic across major Indian railway sections poses significant challenges in maintaining punctuality and maximizing throughput. This paper presents TRAX (Train Routing & AI eXpert), an AI-powered train dispatch decision support system designed to assist section controllers in real-time. The system integrates simulation-based optimization, machine learning prediction, and reinforcement learning to dynamically recommend dispatch actions under changing conditions. Using data from real-world timetables and signaling systems, TRAX aims to reduce delays, enhance line capacity, and improve controller efficiency. Simulation experiments validate its effectiveness, achieving reduced average delay and higher throughput compared to existing systems.

NCETET25IT004

TITLE: TRANSFORMING VOTING IN ELECTIONS: FROM PHYSICAL BALLOTS TO SECURE DIGITAL PLATFORMS

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ABSTRACT

Over the past decade, the electoral process has experienced a fundamental change brought about by development in digital technology and engineering-systems. Conventional voting using physical ballots and polling stations is challenged by cost, accessibility, turnout, and security. This paper looks at the new trend of digital voting systems, such as remote internet-voting, blockchain-based structures, cloud and IoT integration, under the frameworks of engineering design, trust, and reliability of systems. A method is suggested to evaluate digital voting deployment, supported by evidence from selected case-studies (e.g., Estonia, Switzerland) on take-up, voter turnout, and security results. The findings accentuate opportunities (increased accessibility, economy, quicker results) and dangers (cybersecurity risks, trust deficit, digital divide). A live case study of Estonia's national i-voting is outlined. The work concludes with design-driven suggestions for next-generation electoral systems, focusing on modular design, end-to-end verifiability, voter verification, and hybrid solutions blending digital and physical modalities.

NCETET25IT005

POLICE DUTY PORTAL: A WEB – BASED AUTOMATION SYSTEM FOR DUTY MANAGEMENT

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ABSTRACT

The Police Duty Portal is a web-based system developed to automate the process of scheduling and managing police duties. The project aims to replace traditional manual record keeping with a centralized digital platform that ensures transparency, efficiency, and accuracy in duty allocation. Through role-based access, administrators can assign tasks, track attendance, and monitor officer availability in real time. The portal enhances coordination, reduces paperwork, and minimizes errors caused by manual processes. It also promotes accountability and provides quick access to duty details for both administrators and police officers. This system represents a step toward digital transformation in police administration, improving operational performance and communication across departments.

NCETET25IT006

SMARTHIRE

AI-Powered Virtual Job Interview Simulator

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Abstract

This paper introduces an innovative, AI-powered platform designed to optimize and secure the candidate valuation process in recruitment, education, and certification. The system uses Natural Language Processing (NLP) and GPT-4's advanced capabilities to analyze uploaded PDF resumes, generating personalized, concise, and role-specific questions tailored to the candidate's profile. It evaluates responses in real-time through sentiment analysis and coherence assessments. For security, it integrates real-time facial recognition for identity verification, preventing impersonation, and sends instant alerts for anomalies. The platform provides constructive, adaptive, and personalized feedback, creating an interactive and engaging assessment. By combining automated resume parsing, intelligent Q&A, and biometric security, this simulator offers an efficient, secure, and transformative solution for career preparedness.

Department of Civil Engineering Articles

NCETET25CE001

Removal Of Microplastic from Textile Effluent by Using Granular Filtration Methodology

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ABSTRACT

Textile effluent microplastics generate extensive environmental contamination because they are persistent and of small size. This research aims to remove microplastic through granular filtration, using sand, gravel, and activated carbon as filter materials. The technique was successful in lowering turbidity, suspended solids, and microplastic composition in effluent. Findings indicate that granular filtration is an easy, inexpensive, and environment-friendly method of reducing microplastic contamination and enhancing wastewater quality.

NCETET25CE002

Translucent Timber

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ABSTRACT

A novel building material that goes by translucent timber was created to replace glass because of its poor thermal insulation and high carbon footprint. It is created by removing the lignin from balsa wood and adding a clear polymer resin to the cellulose scaffold that results. This material comes from a renewable resource, is shatterproof, and provides five times better thermal insulation than double-pane glass. It offers a long-lasting and environmentally responsible substitute for glass while drastically lowering heating and cooling energy usage.

NCETET25CE003

HYBRID SYSTEM OF SOIL NAILING AND BIO-GEOTEXTILE SYSTEM FOR UNSTABLE SLOPES

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ABSTRACT

This project develops a hybrid slope stabilization system integrating steel soil nails for structural support and bio-geotextiles for environmental sustainability. It aims to mitigate risks from unstable slopes and eroded embankments through site investigations, stability assessments, and eco-friendly design solutions. The system enhances mechanical stability and vegetation growth, reducing rain-induced failures. Project outcomes include engineering designs, environmental assessments, and cost-benefit analyses, promoting a sustainable and resilient approach to slope protection.

Keywords - Unstable slope, Soil nailing, Bio – geotextile , Slope analysis with PLAXIS

NCETET25CE004

Biochar-Based Advanced Materials for Fluoride Removal from Groundwater

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ABSTRACT

Groundwater fluoride contamination poses a severe public health threat across vast regions of India, China, East Africa, and Latin America, where natural geogenic processes elevate fluoride concentrations beyond the WHO guideline of 1.5 mg/L, leading to dental and skeletal fluorosis and potential neurotoxic effects. Conventional defluoridation technologies such as precipitation, ion exchange, and reverse osmosis are often cost-prohibitive, energy-intensive, or generate hazardous sludge, limiting their applicability in rural and low-resource settings. Biochar-based advanced materials have emerged as a sustainable, low-cost, and tunable alternative for fluoride remediation. Derived from abundant agro-waste feedstocks via pyrolysis, biochar can be engineered through metal impregnation (e.g., Al, Fe, Mg), surface functionalization, or composite formation to enhance fluoride affinity. Key removal mechanisms include ligand exchange, electrostatic attraction, and surface precipitation, with reported adsorption capacities ranging from 5 to 13.6 mg/g. Recent studies demonstrate promising performance in batch and column systems, though challenges remain regarding selectivity in complex groundwater matrices, long-term stability, and scalability. This review synthesizes current advances, critically evaluates modification strategies and outlines future directions emphasizing green synthesis, field validation, and integration into decentralized water treatment systems to accelerate the transition from lab-scale innovation to real-world impact.

Key Words:Biochar, fluoride removal, groundwater remediation, adsorption, surface modification, sustainable materials, water treatment.

NCETET25CE005

AI-Driven n8n Workflow for Billing and Iterative Cash-Flow Optimization

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ABSTRACT

This project develops an AI-driven automation workflow combining n8n and Ollama AI to streamline billing and iterative cash-flow optimization in construction management. It extracts detailed billing data from construction bills using AI-powered text recognition integrated in n8n, organizing this information into Excel sheets for efficient invoice generation and financial tracking. A JavaScript-implemented Newton-Raphson method is applied to calculate the Internal Rate of Return (IRR) dynamically from the project's cash flows, facilitating accurate forecasting and decision-making. This integration enables real-time monitoring of project financial health, reduces manual processing errors, and accelerates billing cycles. By combining AI-driven data extraction with workflow automation and advanced financial analytics, the project enhances cost control, improves cash-flow management, and supports proactive planning. This solution represents a practical advancement in construction project automation, delivering efficiency, accuracy, and financial insight critical for project profitability and management success.

Keywords: *AI, n8n, Construction bills, ollama.*

NCETET25CE006

Design of Airfield for Plain Topography

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ABSTRACT

The design of an airfield is a multidisciplinary task that integrates civil engineering, aerodynamics, meteorology, and environmental planning. This paper focuses on the design aspects specific to plain topography, where terrain conditions are largely level and uniform. Key elements such as site selection, runway orientation, drainage design, and pavement composition are discussed with reference to international standards. Findings indicate that airfields constructed on plain terrain offer cost and time advantages due to reduced earthwork requirements. However, effective drainage and soil stabilization remain critical. The study concludes with recommendations for sustainable and efficient design practices for airfields in plain topography regions.

NCETET25CE007

Evaluation of Concrete Strength Using Eggshell Powder as Partial Replacement of Cement

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ABSTRACT

The growing environmental impact of cement production has driven the need for sustainable materials in the construction industry. This study investigates the potential of using eggshell powder (ESP) and palm oil fuel ash (POFA) as partial replacements for cement in concrete to enhance sustainability and mechanical performance. Eggshell powder, rich in calcium carbonate ($CaCO_3$), contributes to the lime content essential for hydration, while POFA, high in silica (SiO_2), exhibits pozzolanic properties that form additional calcium silicate hydrate (C–S–H) gel, improving long-term strength. In this experimental work, 20% of cement was replaced by a hybrid blend of 10% ESP and 10% POFA by weight. Concrete specimens and beam elements were cast and tested for workability, compressive strength, split tensile strength, and flexural strength at different curing ages. The results revealed that the hybrid mix achieved higher compressive strength than the conventional M35 grade concrete beam, indicating enhanced hydration efficiency and improved microstructural bonding due to the synergistic effect between ESP and POFA. The study further confirmed that the inclusion of these materials reduced the overall carbon footprint and promoted effective waste utilization without compromising structural performance. Hence, the combination of eggshell powder and palm oil fuel ash can serve as a sustainable, economical, and high-performance cement substitute for eco-friendly concrete production.

Keywords:*Eggshell powder, palm oil fuel ash, compressive strength, sustainable concrete, pozzolanic reaction, hybrid cement replacement, eco-friendly construction.*

NCETET25CE008

Sustainable Photocatalytic Reduction of Hexavalent Chromium from tannery Effluents Using NiO Nanocatalyst

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ABSTRACT

In this study, nickel oxide (NiO) nanocatalysts were successfully synthesized via the co-precipitation method and evaluated for their photocatalytic efficiency in the reduction of hexavalent chromium [Cr(VI)]. The synthesized NiO nanoparticles were characterized using XRD, FTIR, SEM-EDX, and UV–Vis spectroscopy to examine their structural, morphological, and optical properties. XRD analysis confirmed the crystalline nature of NiO with an average crystallite size of 56.23 nm, while FTIR spectra identified the functional groups corresponding to Ni–O bonding. SEM images revealed irregularly shaped NiO particles with sizes ranging from 100 to 200 nm, and EDX analysis confirmed the elemental composition of Ni and O without any detectable impurities, indicating high sample purity. The UV–Vis spectrum showed a strong absorption peak at 360 nm, corresponding to a band gap energy of 3.4 eV.

A specially designed, industrial-oriented photo reactor was employed to optimize the photo catalytic reduction of Cr(VI) using the NiO nano catalyst. Under optimized conditions, the NiO catalyst achieved removal efficiencies of 82% under solar irradiation and 89% under UV irradiation, influenced by parameters such as catalyst dosage, pH, pollutant concentration, and reaction time. The kinetic study revealed that the Cr(VI) reduction followed pseudo-second-order kinetics with a rate constant of 0.0614 min^{-1}, validating the predictions made using the Central Composite Design (CCD) model. Furthermore, the synthesized NiO nanocatalyst demonstrated significant antibacterial activity against Staphylococcus aureus, Escherichia coli, and Pseudomonas putida across various concentrations.

Key words: Hexavalent Chromium, Nano catalyst, Photocatalytic reduction, Response Surface Methodology, Central Composite Design, Anti-bacterial activity

NCETET25CE009

Development of Geopolymer Concrete Using Industrial By-Products

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ABSTRACT

The increasing environmental impact of Portland cement production has prompted the development of alternative binder systems for sustainable construction. Geopolymer concrete, synthesized from industrial by-products such as fly ash and ground granulated blast furnace slag (GGBS), offers a low-carbon alternative with comparable or superior mechanical performance. This study investigates the development and characterization of geopolymer concrete mixtures incorporating varying ratios of fly ash and GGBS, activated with sodium hydroxide (NaOH) and sodium silicate (Na_2SiO_3) solutions. A series of mixes with different activator concentrations (8–14 M NaOH) and fly ash-to-GGBS ratios (100:0, 70:30, 50:50, and 30:70) were prepared and cured at ambient and elevated temperatures. Mechanical properties, microstructure, and durability characteristics were evaluated. Results show that increasing the GGBS content significantly improved early-age strength due to enhanced calcium silicate hydrate (C–A–S–H) gel formation. The optimal mix (50:50 fly ash–GGBS, 12 M NaOH, Na_2SiO_3/NaOH = 2.0) achieved a 28-day compressive strength of 58 MPa and demonstrated superior resistance to sulphate attack compared to OPC concrete. The findings confirm the feasibility of using industrial by-products to develop high-performance geopolymer concretes, contributing to sustainable and circular construction practices.

Keywords: Geopolymer concrete, fly ash, GGBS, sustainable materials, alkaline activation, recycled industrial by-products.

NCETET25CE010
Solid waste management of tannery sludge in concrete

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ABSTRACT

The study deals with collection and characteristic study of tannery sludge. Heavy metal analysis and structural details of the molecules were studied by means of Electron Dispersive-X-ray Spectroscopy and Scanning Electron Microscope from which the heavy metals detected were Cadmium, Lead and Chromium The high concentration of trivalent chromium along with organic / inorganic in tanned solid waste such as buffing dust, shavings and sludge causes severe groundwater contamination in the case of land co-disposal and chronic air pollution during thermal incineration. In the present investigation, these tannery wastes were subjected to incineration at 800-850ºC in a starved air thermal incinerator under different flow rate of oxygen to optimize the flux of oxygen required to prevent the conversion of trivalent chromium to hexavalent chromium (combustion). The study aimed to explore the reuse potential of sludge generated from tanning industries. To examine the possibility of its reuse in construction materials, standard blocks of dimension- cube 15x15x15cm, cylinder-15cm dia. and 30 cm long and beam 10x10x50cm were prepared, in which tannery sludge was used as a partial replacement of cement by mixing 15, 20 and 25% of sludge burnt ash in concrete. Then these cubes were cured for 7 days and 28 days. After the experimental curing, the blocks were evaluated for compressive, tensile and flexural strength and curing water chemical properties were determined in terms of concentration of heavy metals. Therefore, the sludge from tanning industries has a potential to be reused as construction materials in different applications.

Keywords: Tannery sludge, Heavy metals, Incineration

NCETET25CE011

Sustainable floating desalination unit powered by waves for disaster-prone shores

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ABSTRACT

Coastal communities globally experience life-threatening water shortages during disasters when infrastructure is compromised and power grids go down. Traditional desalination plants shut down exactly when they are required. This project creates a sustainable floating desalination unit that uses ocean wave energy to generate safe drinking water without any electricity, an independent water source desperately needed in emergencies. It merges wave-powered mechanical pressure generation with reverse osmosis desalination technology into one portable platform. An oscillating flap in the surface acts on a pump connected to a hydraulic intensifier that produces the high pressure required for seawater desalination. This feeds a validated industrial-grade reverse osmosis membrane that filters out salts, bacteria, viruses and contaminants — turning seawater into fresh drinking water that meets World Health Organization standards. On a daily basis, the unit generates sufficient fresh water to supply a small community in an emergency situation, operating around the clock so long as waves persist. Multi-stage filtration preserves the system parts and post-treatment chlorination ensures total microbiological security. Our preference for portability and simplicity allows emergency response teams to quickly deploy it without specialized technical knowledge. The system releases brine at levels far less concentrated than traditional desalination plants, reducing environmental harm. Through renewable, grid-agnostic freshwater production, it tackles water security for hundreds of millions of people living in disaster-prone coastal areas where climate change is increasingly imperiling conventional sources of water.

NCETET25CE012

Performance Evaluation of Concrete Incorporating Metakaolin and Polypropylene Fibres with Polycarboxylate Ether

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ABSTRACT

The performance of concrete incorporating metakaolin (MK), polycarboxylate ether (PCE), and polypropylene fibres (PPF) has been extensively investigated to enhance its mechanical properties and durability. Research indicates that the inclusion of MK, PCE and PPF significantly improves the strength and resistance of concrete under various environmental conditions. While adding metakaolin in concrete superplasticizer must be added to increase the strength. Polycarboxylate ether is a superplasticizer which reduces the water content and increases workability of concrete.. In studies examining concrete exposed to multi-salt soaking and freeze–thaw cycles, both additives were found to enhance mechanical performance. Optimal results were obtained with a 10% replacement of cement by MK and PPF contents of 0, 0.2, 0.4, and 0.6 kg/m³, which improved resistance to deterioration under severe conditions. However, excessive PPF content (e.g., 1.5 kg/m³) led to fibre agglomeration and increased internal porosity, thereby reducing freeze–thaw resistance. The mixture containing 10% MK and 0.4% PPF exhibited the highest compressive, split tensile, and flexural strengths, while further increasing the PPF dosage to 0.6% resulted in a noticeable reduction in these mechanical properties.

NCETET25CE013

A Review on Modern Construction Materials used in Fabrication Technologies

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ABSTRACT

Building material is any material which is used for a construction purpose. Advanced construction materials have become integral to modern manufacturing and fabrication processes, particularly in the context of Metal Structure (MS) fabrications. These materials offer enhanced properties such as increased strength, durability,corrosion resistance, and cost-effectiveness, significantly improving the performance and longevity of MS structures. The use of high-strength steels, composite materials, and innovative coatings has revolutionized the way MS fabrications are designed, constructed, and maintained. This paper explores the role of advanced construction materials in MS fabrications, examining their properties, applications, and benefits. Special focus is given to materials like high-tensile steel, corrosion-resistant alloys, and nano-enhanced composites, which contribute to the development of more sustainable and efficient construction practices. Additionally, the paper addresses challenges in material selection, the impact of these materials on fabrication techniques, and their potential to reduce environmental impact. As the construction industry moves towards more sustainable and technologically advanced solutions, the integration of these materials into MS fabrication processes is poised to drive innovation and efficiency in the sector.

NCETET25CE014

Experimental Investigation of Conductive Concrete by Adding Blast Furnace Slag and Graphite

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ABSTRACT

Generation of industrial by-products has increased significantly with industrialization. Graphite and blast furnace slag is one of the industrial by product produced by steel industry. At present the amount of slag deposited in storage yards, leading to the occupation of farm land and serious pollution to the environment. Improving the slag utilization is an important way to resolve these problems.

This presents and experimental investigation of the conductive concrete can eliminate snow and icing on road areas, pavements and bridge decks with the effect of using different conductive fillers; Graphite powder and Blast furnace slag as adding (15%, 20% and 25% by volume of concrete) on the electrical, physical mechanical and durability properties of fresh and harden concrete was evaluated (i.e. slump, unit weight, water absorption, compressive strength, flexural strength and split tensile strength) on M30 grade of concrete.

In the following investigation the main objective of this experiment were measured conductive properties – heating resistivity and temperature module. Potential applications include heating for de-icing the pavements.

NCETET25CE015

Entrepreneurial awareness among the younger generation to become an entrepreneur

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ABSTRACT

Entrepreneurship is gaining a great deal of significance in the present days. It is recognized as a crucial source of monetary improvement of a country. An entrepreneur is one who organizes and runs an enterprise. Entrepreneurial focus about the expertise, notion in the path of entrepreneurship, and it is the essential key for starting and going for walks very own organization. The existing study attempts to analyze the entrepreneurial focus among the younger generation. A structured questionnaire was used to collect primary data from a sample of 50 young people. The results showed that respondents have some awareness of entrepreneurship**.**

Keywords: Young entrepreneurs, start-up, technology challenges, and entrepreneur survival schemes

NCETET25CE016

An experimental and analytical evaluation of gfrp reinforced concrete beams in the marine environment

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ABSTRACT

In the present years, due to enhanced properties of Glass Fiber-Reinforced Polymers (GFRP) there has been a rapid increase in usage of GFRP reinforcing bars for concrete structure. The GFRP bars have been used extensively in the marine structures where the conventional steel reinforcement which is affected by corrosion is more overriding. Deterioration of structures due to corrosion can be solved by the GFRP rebar which is reinforced in concrete structures were subjected to harsh environments, namely high temperature and marine conditions. After all these years of investigation and implementation, researchers have concluded GFRP as the corrosion resistant reinforcing material in the corrosion protection policies. The present study made the comparative analysis of concrete cube of size 150 mm x 150 mm x 150 mm which was cured with saline solution as well as potable water were compared to investigate the strength characteristic of test specimens. Further, concrete beam of size 700 mm x 150 mm x 150 mm with 12 mm diameter GFRP rebar and conventional steel rebar which was cured in saline solution for 21 days. Then the Flexural test has been conducted experimentally for both the beams and the results which were obtained from experimentally are compared with analytical results which are obtained using Ansys.

NCETET25CE017

Sustainable Structural Panel Element Using Enviro Board

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ABSTRACT

Enviro Boards are sustainable structural panel elements made primarily from agricultural waste such as wheatstraw,rice straw, providing an affordable and environmentally friendly building solution. These strawboardpanels reduce agricultural waste and carbon emissions by reutilizing renewable, plentiful materials like straw.Their production consumes less water and energy compared to conventional panels, and they offer beneficialthermal and acoustic insulation properties that enhance interior comfort and energy efficiency. Enviro Boardsare lightweight, easy to transport and install, lowering construction costs and associated emissions. The panelsare versatile for various interior uses including furniture, wall cladding, and ceiling panels and promotesustainability across social, economic, and environmental domains by supporting rural livelihoods and healthier building environments.

NCETET25CE018

Multilayer gravitational greywater filter for smart cities

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ABSTRACT

The graywater reuse systems that are eco-friendly have been made necessary as the scarcity of water becomes severe and the demand for domestic water rises. A gravity filtration unit that is multilayered and has no cost for electricity and is low-priced is introduced in this project for using at home. The system utilizes ecofriendly materials, that is, coconut fiber, activated charcoal, moringa seed powder, and crushed corn cob to get rid of turbidity, suspended solids, colour, odour, and organic impurities from the domestic greywater. The efficiency of the filtration process is reached by using several methods together such as physical filtration, adsorption, natural coagulation, and decay of organic pollutants. The water after treatment can be used for non-potable needs like watering the garden, flushing toilets, and cleaning floors. The adoption of this solution cuts off the freshwater resource dependency and encourages the decentralized, sustainable water reuse that is in line with the smart and eco-friendly urban development.

Keywords: Greywater Treatment · Natural Filtration Media · Smart Water Reuse · Low Cost Filter · Gravitational System · Sustainable Water Technology

NCETET25CE019

Biochar Root Loop System (BRLS): An Innovative Sustainable Approach for Wastewater Treatment

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ABSTRACT

The Biochar Root Loop System (BRLS) is an innovative and sustainable wastewater treatment technology designed to integrate the natural purification capabilities of biochar and plant root systems. This system utilizes biochar as an adsorptive medium with high surface area and porous structure to effectively remove contaminants such as heavy metals, organic pollutants, nutrients (nitrogen and phosphorus), and suspended solids from wastewater. Simultaneously, plant roots within the loop enhance microbial activity and promote phytoremediation, leading to improved nutrient uptake and biodegradation of pollutants. The closed-loop design ensures continuous circulation of water, maximizing contact time between wastewater, biochar, and plant roots, thereby achieving high purification efficiency in minimal space and with low energy consumption. The BRLS promotes a circular economy approach by using biochar derived from agricultural or organic waste, making the process both environmentally friendly and cost-effective. Compared to conventional methods, the BRLS offers advantages such as reduced treatment time, minimal sludge generation, and enhanced water quality suitable for reuse in irrigation or non-potable applications. Overall, this system represents a promising eco-technological solution for decentralized wastewater treatment, aligning with sustainable development goals and advancing green engineering practices.

NCETET25CE020

Translucent Concrete as an Energy-Efficient and Aesthetic Building Material

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ABSTRACT

Translucent concrete, also known as light-transmitting concrete, is an innovative material that merges the strength of traditional concrete with the ability to transmit light. It is produced by embedding optical fibres or other light-conducting materials within a concrete matrix, enabling the passage of natural or artificial light. This unique property not only enhances architectural aesthetics but also promotes energy efficiency by reducing dependency on artificial lighting during daytime.

This paper presents the development, properties, and applications of translucent concrete as a sustainable material for modern architecture. Experimental analysis focuses on the mechanical and optical behaviour of concrete containing varying percentages of optical fibres. Results demonstrate that translucent concrete maintains adequate strength while significantly improving light transmittance, making it a viable solution for eco-friendly and visually appealing structures.

Thiru. S. Subramaniam (Late)

Founder - Chairman

Mookambigai College of Engineering.