Proceedings of

National Conference on Emerging Trends in

Engineering, Science and Technology

NCETEST '25

30th April 2025

Organised by

St. Anne's College of Engineering and Technology

Panruti, Cuddalore District – 607106.

Tamilnadu, India.

PREFACE

The 8th National Conference on Emerging Trends in Engineering Science and Technology (NCETEST ’25) was held on the campus of St. Anne’s College of Engineering and Technology in Anguchettypalayam, Panruti of Cuddalore District on 30th April 2025.

Conferences pave way to bring together people with common interests and discuss issues and ideas related to various topics. Eighth National Conference on Emerging Trends in Engineering Science and Technology (NCETEST ’25) will target state-of-the-art as well as emerging topics pertaining in the field of Science, Engineering and Technology and effective strategies for its implementation. It also provides a premier interdisciplinary platform for researchers, academicians, industry persons, practitioners, educators and students to present and discuss the most recent innovations, trends, and concerns as well as practical challenges encountered, and solutions adopted in the fields of innovation. The objective of this National conference is to provide opportunity for the participants to interact and exchange ideas, experience and expertise in the current trend and strategies. Besides this, participants will also be enlightened about vast avenues, current and recent technological developments in various domain and its applications will be thoroughly explored and discussed.

The proceeding is a compilation of the 89 accepted papers and represent an interesting outcome of the conference. This year, NCETEST ’25 has attracted Academicians and students across the country who have submitted their contributions with their latest advances. The accepted papers reflect the current trends in the following 5 broad research areas. 1) Computer Science & AIML 2) Electrical 3) Electronics and Communications 4) Mechanical and 5) Engineering Science.

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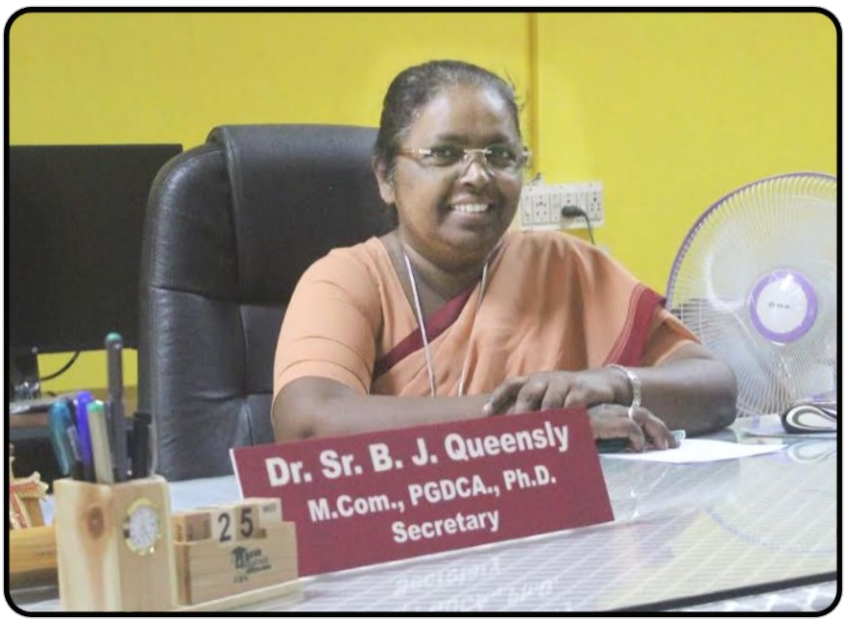
Department of Computer Science Engineering

MESSAGE FROM SECRETARY



I am delighted to extend a warm welcome to all participants, distinguished guests, academicians, researchers, and industry experts to this prestigious National Conference on Emerging Trends in Engineering, Science, and Technology.

In a world where innovation drives progress, platforms like this are vital. They foster collaboration, spark new ideas, and inspire solutions to the pressing challenges we face today. This conference aims to bridge the gap between cutting-edge research and practical applications, encouraging dialogue across disciplines and promoting a culture of continuous learning.

I am confident that the insights shared and the connections formed during this event will pave the way for groundbreaking advancements and meaningful partnerships.

I also want to sincerely thank our distinguished keynote speakers, session chairs, and reviewers for their invaluable contributions. Special recognition goes to our Conference Convener, Mr. V. Balaji, Assistant Professor & Head in the EEE Department and the organizing committee

members and volunteers. Your tireless efforts and unwavering commitment have been the backbone of this endeavor.

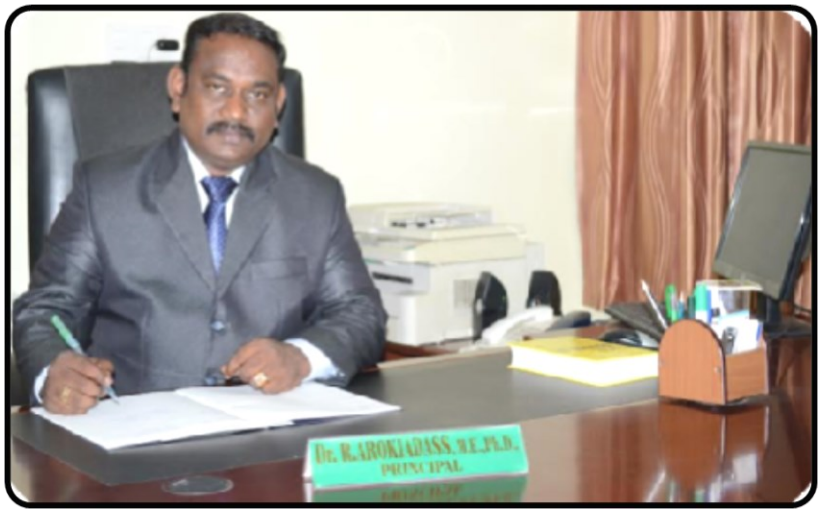
Wishing you all a fruitful and enriching experience.

Dr. Sr. B.J. Queensly, M.Com., Ph.D.,

Secretary

St. Anne's College of Engineering and Technology

MESSAGE FROM PRINCIPAL



Research across diverse Engineering disciplines serves as a cornerstone for transformative advancements in the industrial sector. Academic institutions, as custodians of knowledge, bear a vital responsibility in fostering research by providing dynamic platforms for scholarly engagement, collaboration and dissemination of innovation.

In keeping with this objective, the 8th National Conference on “Emerging Trends in Engineering, Science, and Technology (NCETEST '25) “was held on 30th April 2025, receiving a prodigious and enthusiastic response from the academic and research communities. The conference was thoughtfully organized with the objective of bringing together distinguished academicians, scientists, researchers, scholars and students. Its core aim was to facilitate the exchange of insights, experiences and research outcomes in the ever-evolving domains of Science, Engineering and Technology.

Initiatives like NCETEST '25 not only enhance academic consistency but also promote the practical application of research, thereby driving innovation and progress in industry. Such forums are instrumental in nurturing a culture of inquiry, collaboration and applied knowledge.

I extend a warm welcome to all distinguished delegates attending the conference. On behalf of the entire SANCET team, I express my deep appreciation to all authors and participants for their active engagement and

invaluable contributions. I also offer special thanks to the organizing committee for their unwavering commitment and meticulous efforts in making this conference a resounding success.

My heartfelt congratulations to the Heads of Departments, faculty members, students and all participants for their dedication and collaborative spirit. I am confident that this conference will prove to be a truly enriching and rewarding experience for all.

Best wishes for the continued success of NCETEST '25 and for the sustained growth of research and innovation in our academic community sector. Academic institutions, as custodians of knowledge, bear a vital responsibility in fostering research by providing dynamic platforms for scholarly engagement, collaboration and dissemination of innovation.

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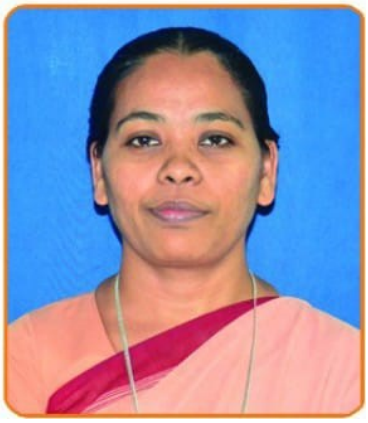
Dr. R. Arokiadass, M.E., Ph.D.,

Principal

St. Anne's College of Engineering and Technology

MESSAGE FROM VICE-PRINCIPAL & DEAN



I am delighted to acknowledge our institution's National Conference on Advances in Engineering, Science, and Technology 2025 (NCAEST'25).

This conference is a beacon of collaboration and innovation, bringing together experts, researchers, and enthusiasts to share insights, explore new ideas, and address today's pressing issues.

I welcome you all to St. Anne's College of Engineering and Technology and hope that this conference will act as a medium for all of us present here to ponder upon the topic of discussion, challenge us to strive for it, and inspire us at the same time.

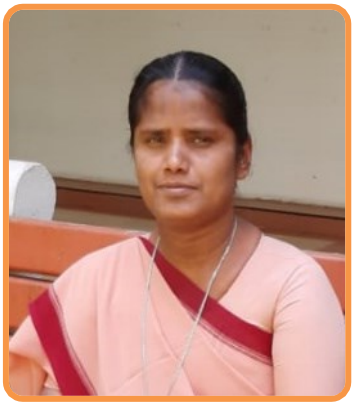
I would like to express my heartfelt gratitude to the Convener, the organizing committee, and volunteers for their tireless efforts in making this event possible.

I wish you all a fruitful and enriching experience.

Sr. Punitha Jilt, SAT

Vice Principal and HoD/CSE
St. Anne’s College of Engineering and Technology

MESSAGE FROM DEAN OF EXCELLENCE



Dear delegates,

I express my heartfelt gratitude to the Almighty Lord for His abundant grace on this occasion and to each one of you for participating in the 8th National Conference on Emerging Trends in Engineering and Technology (NCETEST'25) at St. Anne's College of Engineering and Technology (SANCET). With His blessings, I am delighted to extend my warm greetings to all of you on this special occasion.

Academic conferences play a pivotal role in building a strong foundation for innovation, collaboration, and intellectual growth. They offer a vibrant platform for young minds, seasoned researchers, and industry leaders to come together, exchange groundbreaking ideas, and ignite new possibilities for the future.

In today's rapidly advancing technological world, engineering is not just about creating solutions - it is about envisioning a better, sustainable tomorrow. Conferences such as these are stepping stones where dreams are transformed into reality, challenges are converted into opportunities, and knowledge transcends into innovation.

I am confident that the deliberations, discussions, and presentations during this conference will lead to enriching experiences for all participants. I encourage every scholar and student here to seize this opportunity - to learn, to question, to challenge, and to contribute to the growing body of knowledge in your respective fields.

I appreciate the organizing team for their dedication and commitment to fostering a research culture and creating a platform for such meaningful academic dialogue.

Wishing the 8th National Conference great success and all the participants an inspiring and rewarding experience.

Best wishes for a grand success!

Dr. Sr. S. Anita, SAT

Dean of Excellence and Head
Department of Electronics and Communication Engineering
St. Anne's College of Engineering and Technology

MESSAGE FROM CONVENER

The rapid progression of technology is profoundly transforming the global landscape. In the contemporary era, globalization has significantly accelerated the dissemination of knowledge and expertise, facilitating unprecedented advancements across various technological domains.

In light of these developments, it is increasingly essential to bring together academicians, researchers, industry professionals, and students from diverse institutions across India. Such collaborative efforts enable the sharing and expansion of knowledge concerning recent innovations in science, engineering, and technology. Interdisciplinary conferences play a pivotal role in this regard, serving as platforms where experts from various fields converge to exchange ideas, foster innovation, and address complex challenges.

This interdisciplinary conference offers a distinguished forum for participants to present their research findings, engage in meaningful discussions, and share valuable insights. By facilitating such interactions, the conference contributes to the collective advancement of knowledge and the development of innovative solutions to contemporary technological challenges.

I would like to offer special thanks to the program committee members for their meticulous reviews and insightful feedback on the submitted papers. I am also deeply appreciative of the non-teaching staff for their hard work and

commitment, which played a vital role in ensuring the smooth conduct of the conference. The successful realization of NCETEST ’25 would not have been possible without the collective contributions of all involved.

Special thanks to the authors, the committee members and the sponsors. I hope all the participants can obtain useful information from the proceedings.

Prof. V. Balaji,

Department of Electrical & Electronics Engineering,
St. Anne’s College of Engineering and Technology

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Department of Electrical and Electronics Engineering

Proceedings of the
8th National Conference on Advancements in Engineering, Science and Technology (NCETEST '25)

DRIVER DROWSINESS DETECTION SYSTEM USING EYE AND MOUTH MONITORING WITH DLIB AND OPENCV

Ms. T.Gayathri*[1],Ms. Charumathi[2], R , Ms.Poovizhi.K[3]

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Abstract

Drowsy driving is a major factor contributing to road accidents, especially during long- distance travel or extended driving periods. This project proposes a real-time driver drowsiness detection system based on facial landmark analysis. The system utilizes Dlib's 68-point facial landmark detector, OpenCV, and face recognition to track facial features and identify signs of fatigue. Two primary indicators are monitored: the Eye Aspect Ratio (EAR) to detect prolonged eye closure, and mouth aspect ratio to detect yawning. Threshold values are defined for both metrics, and alerts are triggered when the values remain beyond the thresholds for a specific duration. This approach offers a lightweight, efficient, and accurate solution for identifying early signs of drowsiness without the need for complex models. The system can be integrated into vehicles to improve driver safety and prevent potential accidents.

VISION POWERED COMPUTING: A VIRTUAL MOUSE VIA EYE TRACKING

Mr. R. Manickavasgan *[1], Ms. S. Bhagyasri[2], A.Pioshalbi[3], B.Jayasri[4]

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Abstract

*"*Vision-Powered Computing: A Virtual Mouse via Eye Tracking,"an AI-based hands-free interface enabling users to control the cursor using only their eye movements. Built using Python, OpenCV, and MediaPipe, the system replaces traditional input devices and enhances accessibility for people with motor disabilities. Unlike existing systems requiring expensive hardware, this low-cost implementation utilizes standard webcams and real-time computer vision algorithms to perform cursor movements, clicks, and scrolling. Experimental results confirm high accuracy and responsive interaction on both PC and Android devices, making the system ideal for inclusive and accessible human-computer interaction.

TIRE CRACK DETECTION USING RESNET MODEL

Mr. S. Manavalan[1], M. Ishwarya[2], A. Jeeva[3], B. Parkavi[4], C. Sargunadevi[5]

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Abstract

In the evolving landscape of automotive safety and maintenance, the assessment of tire health stands as a crucial component, influencing not only vehicle performance but also passenger safety. This project introduces a comprehensive machine learning model designed to classify tire health by leveraging the robust capabilities of deep convolutional neural networks (CNNs), specifically ResNet34 and ResNet50 architectures. These networks, renowned for their depth and ability to learn from residual mappings, have been adapted to analyze and interpret tire tread images, enabling the accurate classification of tire conditions into categories such as 'good' and 'defective'.

DOCTOR APPOINTMENT BOOKING WEBSITE USING CLOUDINARY AND NEXT.JS

Mrs. K. KAYALVIZHI [1], Ms. K. VIDHYA [2], Ms.R.RAGAVINOTHINI[3] ,Ms.R.KAMALI[4], Ms.R.KAVIYAPRIYA[5]

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Abstract

This is a simple website that helps people book doctor appointments online. It is made with Next.js, so it's fast and works well on phones and computers. Cloudinary is used to store images like doctor photos and patient records safely. Users can sign up, see doctor profiles, and book appointments easily. This makes seeing a and doctor quicker more convenient.

MULTI CANCER PREDICTION USING DEEP LEARNING

Sr. A. Punitha Jilt [1], L. Jenisha[2], A. Sushmitha[3], S. Vijayalakshmi[4], S. Ashika[5]

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Abstract

Deep learning approach is used to predict the chance of acquiring several types of malignancies, including breast, lung and skin cancer. To find patterns and risk factors linked to each kind of cancer, deep learning algorithms, such as convolutional neural networks and recurrent neural networks, are trained on enormous databases of patient data, including genetic markers, lifestyle variables, and medical history. Deep learning algorithms can accurately forecast an individual's risk of acquiring lung, Skin, breast cancer by evaluating these intricate datasets. Results indicate varied performance across cancer types, with breast, lung, and skin cancer models exhibiting high accuracy (>98%) and lower validation losses, suggesting strong generalization capabilities. These findings high lights the DL's potential in enhancing cancer detection, early diagnosis, and personalized treatment planning.

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DIABETIC RETINOPATHY PREDICTION USING DIANET

Ms.T. Gayathri [1], M. Agnes Maria [2], R. Geetha [3], A. Karthika [4], V. Vishnupriya [5]

[1]Assistant Professor, Department of CSE, St.Anne's CET,Anguchettypalayam,Panruti,India
[2]UG Student, Department of CSE, St.Anne's CET, Anguchettypalayam,Panruti,India
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Abstract

Diabetes is a major global health concern, and early diagnosis is critical to reducing its impact. This study introduces DiaNet, a novel deep learning model based on a multi-stage convolutional neural network (CNN) that predicts diabetic retinopathy from retinal images with over accuracy. Using a relatively small dataset from the Qatari population, DiaNet effectively identifies retinal regions linked to diabetes, as validated by medical experts. The model outperforms traditional clinical data-based approaches, demonstrating that retinal images alone can distinguish diabetic individuals. Furthermore, findings suggest potential prognostic value of retinal images for related conditions such as hypertension and ischemic heart disease, advocating for their integration into future clinical diagnostic workflows.

RENSIC EVIDENCE MANAGEMENT SYSTEM

Ms.V. Keerthana[1],Abinaya.M[2], Kaniha.M[3], Susi.J[4] , Suwathi.D.N[5]

[1] Assistant Professor, Department of CSE, St.Anne's CET, Anguchettypalayam,Panruti,India
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[4] Student, Department of CSE, St.Anne's CET, Anguchettypalayam,Panruti,India

Abstract

Forensic evidence management is a critical aspect of modern criminal investigations, requiring meticulous handling, secure storage, and accurate chain of custody documentation. Traditional evidence management systems face challenges such as data tampering, unauthorized access, and lack of transparency. To address these issues, this research project presents an innovative implementation of blockchain technology for the forensic evidence management system. The proposed system leverages the decentralized and immutable nature of blockchain to ensure the integrity, security, and transparency of forensic evidence throughout its lifecycle. Smart contracts are employed to automate the chain of custody process, enhancing efficiency and reducing the risk of human errors. In addition, the use of cryptographic hashing techniques enables the verification of evidence authenticity without revealing sensitive details.

SMART COMPLAINT TRACKING AND ESCALATION SYSTEM

Mrs. M. Subathiradevi[1], G.Sowmiya[2], S.kaviya[3], D.Nathiya[4]

[1] Assistant Professor, Department of CSE, St.Anne's CET, Anguchettypalayam,Panruti,India
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[4] Student, Department of CSE, St.Anne's CET, Anguchettypalayam,Panruti,India

Abstract

In today's fast-paced digital era, effective governance hinges on timely and transparent public grievance redressal. Traditional systems often fall short due to inefficiency and lack of visibility, leading to citizen dissatisfaction and delayed issue resolution. To overcome these challenges, this project proposes a digital petition management system that streamlines the process of lodging and addressing public grievances. Citizens can easily register complaints with detailed descriptions, attach images, and provide GPS-based location proof for authenticity. Once submitted, petitions are instantly forwarded to the Block Development Officer (BDO) and relevant officials, who are required to take action within three days. If unresolved, the system escalates the issue automatically to higher authorities. An integrated AI module classifies complaints, predicts resolution timelines, and generates insightful analytics for better decision-making. Built using the MERN stack (MongoDB, Express.js, React.js, and Node.js), the platform ensures scalability, security through JWT-based authentication, and efficient data handling. A dedicated admin dashboard offers real-time tracking of petitions, promoting transparency and accountability. Overall, this system bridges the gap between citizens and government, revolutionizing public grievance management through technology-driven governance.

AI – POWERED RESUME SCREENING AND INTERVIEW QUESTION GENERATION

Ms. S. Abinaya*[1], Mr. I. Abilash*[2], Mr. M. Mohamed Ali*[3], Mr. S. Muhammad Anas*[4], Mr. P. Shanmugapriyan*[5]

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[4] Student, Department of CSE, St.Anne's CET, Anguchettypalayam,Panruti,India

Abstract

This project presents an AI-powered system that helps HR professionals automatically analyze resumes and generate interview questions. The system extracts technical and soft skills using NLP techniques. If technical skills are missing, it infers them from project descriptions. Based on the extracted skills, it uses the Gemini 1.5 Flash model to dynamically generate relevant and beginnerfriendly interview questions. This reduces HR workload, speeds up the hiring process, and ensures better interview preparation — all through a simple and interactive web interface.

VIRTUAL MIRROR: AI-POWERED SIZE DETECTION AND VIRTUAL GARMENT FITTING IN PHYSICAL STORES

Ms. Guani A Sabi *[1] , Mr. K. Rajkumar [2], Mr. R .Sathishkuma[3], Mr. V. Jagadeesh [4] , Mr. S. Dinesh [5]

[1] *Assistant Professor, Department of CSE, St.Anne's CET, Anguchettypalayam,Panruti,India*

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[5]

Abstract

This project introduces a smart virtual try-on system for offline stores, combining real-time body measurement using MediaPipe, size prediction through machine learning, and realistic garment overlay using CP-VTON. The system recommends size-matching clothes and allows customers to visualize selected garments on themselves via a live camera, enhancing the fitting experience without the need for physical trials.

REAL-TIME INDIAN SIGN LANGUAGE RECOGNITION USING MEDIAPIPE AND DEEP LEARNING

Dr. Sasidhar A *[1], Mohamed Ashraf Ali M *[2]
[1] Assistant Professor, Department of CSE, University College of Engineering, Panruti, India.
[2]Student, Department of CSE, University College of Engineering, Panruti, India.

Abstract

Communication between deaf and non-deaf individuals remains a significant challenge in many societies, especially where knowledge of sign language is limited. Sign language serves as an essential tool to bridge this gap, but its effectiveness is restricted when the other party does not understand it. To address this issue, we propose a real-time Indian Sign Language (ISL) recognition system that utilizes MediaPipe for hand landmark detection and a deep learning model for gesture classification. Our system captures hand gestures using a standard webcam, extracts 3D landmarks through MediaPipe, and classifies the signs using a fully connected neural network. We focus on recognizing ISL alphabets from A to K, making it suitable for educational and communication tools. A publicly available dataset was used for model training, and the system was tested in real time with various hand positions and angles to ensure robustness. The model achieved up to 97% accuracy on several signs and performs reliably in real-time without the need for expensive hardware. This makes our solution not only cost-effective but also easy to deploy in classrooms, public service centers, or mobile applications. Our work contributes to making communication more inclusive and accessible, empowering the deaf community with practical, AI-driven tools.

ENHANCING ROAD SAFETY WITH AI DRIVEN TRAFFIC ACCIDENT ANALYSIS AND PREDICTION

Mrs.K. Kayalvizhi*[1], J. Dharani[2], A. Asin[3], M. Bhavani[4], G. Devika[5]

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Abstract

Road traffic accidents remain one of the leading causes of injury and death globally, posing a significant challenge to public safety and urban mobility. Traditional approaches to accident prevention and analysis often fall short due to limitations in data processing, real-time response, and predictive capability. This presentation explores the integration of Artificial Intelligence (AI) in traffic accident analysis and prediction, highlighting how AI can enhance road safety through data-driven insights, real-time monitoring, and predictive modeling. By leveraging data from traffic cameras, sensors, GPS devices, and historical accident records, AI algorithms can detect patterns, predict high-risk zones, and assist in proactive traffic management. Techniques such as machine learning, deep learning, and natural language processing play a pivotal role in automating data analysis and generating actionable insights. This AI-driven approach not only improves the efficiency of traffic systems but also enables timely interventions that can prevent accidents before they occur. Through case studies, system workflows, and discussion of current challenges, this work underscores the transformative potential of AI in creating safer, smarter roads.

PREDICTING AIR QUALITY USING ADVANCED MACHINE LEARNING ALGORITHM FOR ENVIRONMENTAL INSIGHTS

Ms. V. Keerthana*[1], M. Janani[2]

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Abstract

Air pollution is a growing concern in many parts of the world, especially in rapidly developing countries like India. Poor air quality has serious effects on human health, contributing to respiratory diseases, heart problems, and reduced life expectancy. Monitoring and predicting air pollution levels can help individuals and governments take preventive actions and improve public health outcomes. This project focuses on predicting air quality levels using advanced machine learning algorithms. The data used in this study was collected from air quality monitoring stations managed by the Central Pollution Control Board (CPCB) and State Pollution Control Boards (SPCBs) in India. These datasets include various air pollutants such as PM2.5, PM10, NO_2, SO_2, CO, and more, along with meteorological data like temperature and humidity. We performed thorough data preprocessing, exploratory data analysis, and feature engineering to prepare the dataset for model training. Several machine learning algorithms were explored, including Linear Regression, Random Forest, and XGBoost, to determine which model offers the best performance in predicting pollution levels. The models were evaluated using standard metrics such as R^2 Score, Mean Absolute Error (MAE), and Root Mean Squared Error (RMSE).To make the model accessible and user-friendly, we developed a simple web application using Stream lit, allowing users to input environmental data and receive real-time predictions of air quality levels. This can be especially useful for the public, health organizations, and policymakers goal of this project is to provide a smart, data-driven tool

that helps raise awareness about pollution levels and enables proactive measures to protect public health. By combining environmental data and machine learning, this project demonstrates how technology can be used for impactful and meaningful solutions in environmental monitoring.

DECODING EMOTIONAL THROUGH SENTIMENT ANALYSIS SOCIAL MEDIA CONSERVATION

Ms. V. Keerthana*[1], Ms .S.Logeshwari[2],Ms.S.Nivedha[3] ,Ms.D.Melodina[4]

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Abstract

This study uses sentiment analysis to decode emotions in social media conversations. By applying natural language processing and machine learning, it identifies emotional trends such as joy, anger, or sadness across platforms like Twitter and Facebook. The findings help understand public reactions to events, brands, and policies, offering insights for fields like psychology, marketing, and social research.

TRANSFORMING HEALTHCARE WITH AI-POWERED DISEASE PREDICTION BASED ON PATIENT DATA

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Abstract

Artificial intelligence (AI) is a powerful and disruptive Area of computer science, with the potential to Fundamentally transform the practice of medicineand The delivery of healthcare. In this review article, we Outline recent breakthroughs in the application of AI in Healthcare, describe a roadmap to building effective, Reliable and safe AI systems, and discuss the possible Future direction of AI augmented healthcare systems.

EMPOWERING WORKERS & HOMEOWNERS THROUGH SEAMLESS JOB SOLUTIONS

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Abstract

Work Connect is a web-based platform that connects skilled blue-collar workers with homeowners in need of reliable household services. The platform offers an intuitive interface for job search and hiring, backed by secure payments, real-time notifications, and AI-powered matching. It improves employment access for workers and simplifies the hiring process for customers by ensuring trust, transparency, and efficiency. Work Connect is a smart platform connecting skilled blue-collar workers with homeowners needing reliable services. It enables job matching, secure payments, automated scheduling, and real-time communication benefiting both service providers and users.

SMART ANIMAL DETECTION & CROP PROTECTION

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Abstract

Forensic evidence management is a critical aspect of modern criminal investigations, requiring meticulous handling, secure storage, and accurate chain of custody documentation. Traditional evidence management systems face challenges such as data tampering, unauthorized access, and lack of transparency. To address these issues, this research project presents an innovative implementation of blockchain technology for the forensic evidence management system. The proposed system leverages the decentralized and immutable nature of blockchain to ensure the integrity, security, and transparency of forensic evidence throughout its lifecycle. Smart contracts are employed to automate the chain of custody process, enhancing efficiency and reducing the risk of human errors. In addition, the use of cryptographic hashing techniques enables the verification of evidence authenticity without revealing sensitive details. A prototype of the blockchain-based forensic evidence management system was developed and tested in a controlled environment. The evaluation results demonstrate that the system provides enhanced data integrity, increased accountability, and improved accessibility while protecting sensitive information from unauthorized parties.

ENHANCING ROAD SAFETY WITH AI-DRIVEN TRAFFIC ACCIDENT ANALYSIS AND PREDICTION

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Abstract

Road traffic accidents are a significant cause of death and injury globally. Traditional accident analysis methods are reactive and lack real-time prediction capabilities. This paper proposes an AI-driven system to analyze traffic accident data, predict potential accident hotspots, and provide proactive safety measures. By leveraging machine learning algorithms on historical traffic data, environmental conditions, and driver behavior, this system aims to enhance road safety and reduce accident rates. The proposed model not only predicts high-risk zones but also assists traffic authorities in making data-driven decisions.

ROAD CRACK DETECTION USING YOLO ALGORITHM

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ABSTRACT

Effective and precise detection of road cracks is essential for prompt maintenance and safety management within transportation infrastructure. Conventional road inspection techniques are often labor-intensive, time-consuming, and susceptible to human error. This paper introduces an automated road crack detection system that leverages the You Only Look Once (YOLO) versions 8 and 11 algorithms—cutting-edge deep learning models designed for real-time object detection. YOLOv8 features an enhanced architecture that provides superior speed and accuracy compared to earlier versions, making it particularly adept at identifying fine and irregular crack patterns on road surfaces. Building on YOLOv8's success, YOLOv11 introduces advanced improvements in detection efficiency, handling more complex crack patterns and ensuring even greater precision and recall metrics.

Both models are trained on a carefully curated dataset of annotated road images and are assessed using metrics such as precision, recall, and mean average precision (mAP). Experimental findings indicate that YOLOv8 and YOLOv11 deliver exceptional detection performance while ensuring real-time processing capabilities, thus presenting robust and scalable solutions for monitoring road infrastructure. These proposed methods significantly improve the efficiency of road maintenance systems by automating the crack detection process with minimal computational demands.

AUTOMATED HELMET DETECTION FOR MOTORCYCLIST USING DEEP LEARNING

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Abstract

Motorcycles serve as a prevalent mode of transportation. Nevertheless, riding a motorcycle entails significant risks, particularly when appropriate safety gear is not utilized. Helmets represent one of the most essential safety measures for individuals on two wheels, and failing to wear them can lead to serious injuries. At present, numerous researchers are concentrating on the detection of traffic violators; however, they have not yet succeeded in identifying the details of the individuals involved, as this necessitates the use of high-resolution cameras. This study categorizes the dataset into two groups: riders with helmets and riders without helmets. This paper introduces an automatic helmet detection system for motorcyclists utilizing deep learning techniques. To identify whether a rider is wearing a helmet, we employ the object detection algorithm known as YOLO. We have explored two versions of this algorithm, specifically YOLO v8 and v11. Both models were trained using a dataset comprising images of riders with and without helmets. Following the training process, we obtained the respective weights for each model. The dataset was gathered from real-time observations as well as online sources. We conducted a comparative analysis of both YOLO versions to determine which one achieved higher accuracy. The results indicated that YOLO v8 achieved an accuracy rate of 96%, while YOLO v11 reached 94%.

AI POWERED ACCESSIBILITY FOR ENABLING EFFECTIVE COMMUNICATION FOR HEARING AND SPEECH IMPAIRED IN VIRTUAL PLATFORMS

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Abstract

This project aims to create an AI-powered system to bridge the communication gap between hearing and speech-impaired individuals and hearing individuals in virtual meetings. The system features a Sign Recognition Module (SRM) for sign language interpretation, a Speech Recognition and Synthesis Module (SRSM) for text conversion, and an Avatar Module (AM) for visually translating speech into sign language. Integrated into platforms like Zoom and Microsoft Teams, this system enhances inclusivity and enables seamless, real-time communication for diverse users.

AI-DRIVEN HEALTHCARE SYSTEM FOR DOCTOR RECOMMENDATION AND VIDEO CONSULTATION BASED ON FACIAL EXPRESSION AND SPEECH ANALYSIS

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ABSTRACT:

Telehealth refers to the use of digital technologies to provide healthcare services remotely, enabling patients to consult with healthcare providers without needing to visit physical healthcare facilities. While telehealth offers the convenience of remote access, it faces significant challenges in delivering holistic care, as it often lacks the ability to gauge a patient's emotional well-being or mental state during consultations. Current telehealth systems also fail to offer personalized doctor recommendations tailored to the specific needs of each patient, relying instead on more generalized care approaches. This project introduces an AI-powered healthcare system designed to overcome these limitations by integrating advanced machine learning techniques. It utilizes Temporal Convolutional Neural Networks (TCNN) for facial expression recognition to assess emotional states and Convolutional Neural Networks (CNN) for speech recognition to capture vocal patterns. Furthermore, Natural Language Processing (NLP) is employed to understand the semantic content of patient speech, enabling a comprehensive analysis of both emotional and physical well-being. A key feature of the system is the use of content-based filtering to recommend healthcare professionals best suited to the patient's condition, ensuring a more tailored approach to treatment. The integration of secure video consultation services allows for real-time monitoring and assessment of the patient's facial expressions and speech patterns during

the consultation. The system also includes a feedback mechanism to continuously improve doctor recommendations and overall patient care. By providing personalized recommendations and real-time emotional insights, this AI-driven solution addresses the shortcomings of traditional telehealth services. This innovative system marks a significant step forward in telehealth, combining machine learning with human-centered care to deliver a better remote healthcare experience.

SMART PHONE BASED WOMEN SAFETY APPLICATION WITH LOCATION TRACKING AND EMERGENCY RESPONSE

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ABSTRACT:

The Women Safety Application is a mobile-based solution designed to enhance the personal security of women by providing real-time awareness of potentially unsafe areas. The core objective of this project is to develop an intuitive and accessible application that uses previously recorded data to help users identify and avoid high-risk locations. Through a dynamic safety map that is continuously updated with admin-verified and crowdsourced data, the app allows users or administrators to input information about dangerous areas, including descriptions, latitude, longitude, and notable incident details. With GPS-based location tracking, the application alerts users when they are within a 3-kilometer radius of any marked unsafe zone, allowing them to make informed decisions about their travel routes. In addition to proximity alerts, the application offers a user-friendly interface that can be operated by individuals of all ages, making it widely accessible. Users can choose to reroute or notify emergency contacts when entering potentially risky areas. The platform also fosters community engagement by allowing users to submit safety reports based on personal experiences, thereby contributing to a safer public environment. By combining geolocation features with safety data, the Women Safety Application not only empowers women with situational awareness but also encourages a collaborative approach to public safety. It serves as a dependable real-time safety companion, especially for urban and semi-urban settings where heightened vigilance is essential.

CONSUMER ELECTRICITY CONSUMPTION PREDICTION USING MACHINE LEARNING

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ABSTRACT:

The prediction of consumer electricity consumption plays a pivotal role in modern energy management systems, aiming not only to optimize energy use but also to minimize wastage and promote sustainability. As global electricity demand continues to rise, driven by urbanization, population growth, and technological advancements, the need for accurate, data-driven forecasting models management, ensuring a balanced and stable power grid while also supporting the integration of renewable energy sources. The proposed machine learning framework not only promises to deliver reliable consumption forecasts but also highlights key consumption drivers, offering strategic advantages in both operational planning and policy-making. Ultimately, this approach contributes to building a smarter, more sustainable energy ecosystem for the future.

PREDICTING NEIGHBORHOOD-LEVEL RESIDENTIAL CARBON EMISSIONS FROM STREET VIEW IMAGES USING COMPUTER VISION AND MACHINE LEARNING

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Abstract

Traditional methods often overlook the detailed street environment, which can lead to inaccurate predictions. By utilizing SVIs, we classified over 30 streetscape elements to capture features that influence CEs. Our machine learning model, particularly the Random Forest algorithm, demonstrated a high accuracy ($R^2 = 0.8$) in predicting CEs at a 1 km grid level. The findings indicate that higher visibility of buildings and fences correlates with increased emissions, while more greenery is associated with lower emissions. This research highlights the potential of SVIs as a reliable data source for urban carbon emissions modeling, providing valuable insights for urban planners to develop sustainable strategies aimed at reducing carbon footprints in rapidly urbanizing areas.

DINEFLOW – RESTAURANT MANAGEMENT WITH SMART ORDER PROTECTION

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Abstract

The Pre-Food Booking Web Application is a smart solution designed to reduce food waste, manage crowd flow, and improve convenience in food ordering systems, especially in places like college canteens, corporate cafeterias, and event venues. Through this platform, users can pre-book their meals by selecting a suitable time slot and making an online payment in advance. The system ensures freshly prepared food, reserved exclusively for the user, and promotes timely pickup with an auto-cancellation mechanism.

E-RATION SHOP WITH WEB APPLICATION USING ML

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Abstract

The E-Ration Shop integrated with a web application using machine learning (ML) aims to modernize the distribution of essential commodities in public distribution systems (PDS). Traditional ration shops face challenges such as inefficiency, mismanagement, and lack of transparency, leading to difficulties for beneficiaries. This system leverages ML and web technologies to address these issues by creating a smart and user-centric solution for ration distribution. The proposed system incorporates a web application for seamless user interaction and ML algorithms to optimize operations. The web application allows users to register, verify their eligibility, and track ration allotments in real-time. Integrated ML models analyze user consumption patterns and supply chain data to predict demand, optimize inventory, and minimize wastage. Biometric authentication ensures secure and transparent transactions, eliminating fraudulent activities. Key features include dynamic allocation of rations based on real-time data, alerts for stock replenishment, and personalized recommendations for beneficiaries. The system also supports multilingual interfaces for accessibility and provides detailed reports for administrators to improve decision-making. This smart E-Ration Shop fosters an efficient, transparent, scalable PDS, benefiting users and administrators. Integrating ML into the supply chain enhances resource management, reduces manual errors, and ensures equitable distribution of resources. The system not only modernizes the rationing process but also aligns with the broader goals of digital transformation and social welfare. With its focus on innovation and efficiency, the E-Ration Shop is a step toward addressing the challenges of traditional PDS while leveraging the

potential of ML and web technologies to build a sustainable and user-friendly ecosystem.

REAL-TIME AIR QUALITY MONITORING USING IOT AND MACHINE LEARNING

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Abstract

Air quality monitoring is a critical aspect of safeguarding public health and ensuring environmental sustainability. With rapid urbanization, industrialization, and the growing number of vehicles, pollution levels in cities have increased significantly, posing serious health risks to the population. Traditional air quality monitoring methods, often reliant on a limited number of fixed stations, are insufficient to capture the dynamic and localized nature of air pollution. Therefore, there is a growing need for real-time, scalable, and cost-effective solutions. This project aims to develop a comprehensive real-time air quality monitoring system utilizing the Internet of Things (IoT) and machine learning technologies. The system is designed to collect continuous data on key air quality parameters such as PM2.5, PM10, carbon dioxide (CO2), carbon monoxide (CO), nitrogen dioxide (NO2), and volatile organic compounds (VOCs) using network of low-cost, high-sensitivity sensors. The collected data is transmitted via wireless communication (Wi-Fi/GSM) to a centralized cloud server, where it is preprocessed, cleaned, and analyzed. Machine learning algorithms are employed to detect pollution patterns, predict future air quality trends, and trigger real-time alerts when air quality deteriorates beyond safe thresholds. This predictive capability empowers users, policymakers, and environmental agencies to take proactive measures. The system features an intuitive user interface through mobile and web applications, ensuring that real-time information is accessible to both the general public and authorities. Additionally, the system's modular and scalable design makes it ideal for city-wide deployments, enabling the creation of smart city infrastructures. It also serves as a valuable tool for researchers by providing rich datasets for further environmental analysis. The project not only enhances awareness about the harmful effects of air.

SMART QUEUELESS SHOPPING GENERETION WITH QR IN SUPER MARKET

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ABSTRACT

Traditional supermarket shopping often involves long queues at billing counters, leading to customer dissatisfaction and operational inefficiencies. These bottlenecks not only cause delays but also contribute to a poor shopping experience, affecting overall customer retention. In today's digital era, where convenience and speed are prioritized, the integration of smart technologies has become essential in retail operations. This project introduces a **"Smart Queueless Shopping System"** powered by QR codes, aimed at revolutionizing the in-store shopping experience. In this system, each product in the supermarket is labeled with a unique QR code. Customers use a dedicated mobile application to scan the QR codes of the products as they add items to their cart. As scanning occurs, a real-time digital bill is automatically generated and updated within the app, eliminating the need for physical billing at checkout counters. After completing their shopping, customers can finalize their purchase through secure digital payment gateways integrated into the app. This process allows them to exit the store directly, bypassing traditional checkout lines entirely. In addition to enhancing the customer experience, the system also supports operational efficiency for the supermarket by reducing manpower requirements at billing counters and minimizing human error during the checkout process.To further optimize store operations, machine learning algorithms are employed to analyze consumer shopping patterns, predict peak shopping hours, recommend personalized offers, and optimize product placement within the store. Predictive analytics also assist in inventory management by forecasting demand trends, helping supermarkets maintain optimal stock levels and reduce wastage. By leveraging QR technology and machine learning, the proposed Smart Queueless Shopping System modernizes the retail shopping experience, enhances customer satisfaction, streamlines operations, reduces operational costs, and paves the way for fully automated smart retail environments.

SMART BLOCKCHAIN CONTRACTS ON POST OFFICE ACCOUNT PORTAL

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Abstract

The rapid evolution of blockchain technology presents transformative opportunities for enhancing security, efficiency, and transparency across traditional financial systems. One such application is in the modernization of post office account management. This study focuses on implementing Smart Blockchain Contracts in post office savings schemes, aiming to overcome the existing inefficiencies, security vulnerabilities, and manual processing challenges that plague conventional systems. By leveraging blockchain's decentralized and immutable nature, the proposed system automates crucial financial operations such as account registration, recurring deposits, interest calculation, fund transfers, and maturity payouts, significantly minimizing human intervention and reducing the risk of errors or fraudulent activities. Through the deployment of smart contracts, the system ensures that transactions are executed based on predefined conditions without manual oversight, thereby enhancing consistency, operational speed, and accuracy. Blockchain integration guarantees data integrity, with every transaction recorded transparently on a distributed ledger accessible to authorized stakeholders, enabling real-time verification and fostering greater trust among users. Additionally, the proposed system incorporates IoT-enabled kiosks within post office premises to facilitate seamless physical interactions while ensuring data is synchronized instantly with the blockchain network.

VISUAL SEARCH ENGINE FOR E-COMMERCE WITH DEEP CONVOLUTION

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Abstract

The rapid and continuous growth of e-commerce platforms has significantly transformed the way consumers shop, making search functionalities a crucial aspect of enhancing the user experience. Traditional search engines, which primarily rely on text-based queries, have become increasingly limited, especially when dealing with visually distinctive products that are difficult to describe accurately using words. This is particularly true for categories like fashion, furniture, and other lifestyle products where the appearance of items plays a central role in decision-making. In response to these limitations, the concept of **visual search** has emerged as an innovative solution, enabling users to search for products by using images instead of relying solely on textual descriptions. This paper presents a **Visual Search Engine for E-Commerce**, built upon the powerful capabilities of **Deep Convolutional Neural Networks (CNNs)**. The proposed system allows users to upload an image of a product they are interested in, and it retrieves similar products from a vast e-commerce database by comparing visual features rather than textual tags or descriptions. Leveraging the power of deep learning, the proposed system is capable of identifying intricate visual patterns and features in images, ensuring highly accurate and relevant product matching. By analyzing visual data, the system overcomes the challenges faced by traditional search engines that often struggle to accurately match products based on ambiguous or incomplete textual descriptions. CNNs, known for their strength in image recognition tasks, play a central role in the feature extraction process, enabling the system to analyze the texture, shape, and color of products to generate feature vectors that represent each product uniquely. The implementation of CNNs ensures that the visual search engine not only delivers more accurate results but also improves the speed and efficiency of the

search process, outperforming traditional methods that rely on keyword matching.

The paper demonstrates the potential and feasibility of integrating deep learning techniques into e-commerce platforms, highlighting how CNN-based visual search engines can significantly enhance the user experience. Users benefit from a more intuitive way of discovering products, as they can simply upload an image and find visually similar items without needing to rely on text-based searches. Furthermore, by improving the relevance of search results, the system has the potential to drive higher engagement and sales conversion rates, making the e-commerce platform more competitive in a crowded marketplace. This research provides insight into the significant impact that visual search powered by deep learning can have on product discovery, with implications for the future of e-commerce, where customer satisfaction and convenience are paramount.

GOVERNMENT EXAM CANDIDATE AUTHENTICATION USING ARTIFICIAL INTELLIENCE

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Abstract

This project presents an automated verification system for government examinations, designed to enhance the integrity and efficiency of the candidate identification process. Utilizing advanced biometric technologies, including facial recognition and iris scanning, the system aims to address current challenges related to identity verification, particularly the risk of impersonation. The proposed solution employs Haar Cascade classifiers for real-time facial detection and recognition, ensuring quick and accurate identification of candidates before entering examination halls. By integrating multiple biometric measures, the system enhances security and reduces the likelihood of fraudulent activities, fostering a fair environment for all participants. The project also highlights the importance of a seamless user experience, ensuring that candidates can undergo verification swiftly without unnecessary delays. Through rigorous testing and validation, the effectiveness of the system is demonstrated, showcasing its potential for widespread implementation in government examinations. This innovative approach not only streamlines the verification process but also aligns with current technological trends, paving the way for more secure examination methodologies. Ultimately, this project aims to contribute significantly to the evolution of

IMPLEMENTING A CLOUD BASED DISASTER RECOVERY SOLUTION FOR BUSINESSES

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Abstract

In today's digital landscape, the security of data is paramount, particularly for organizations that rely heavily on information technology. This project focuses on developing a robust dual-server architecture comprising a main server and a backup server to ensure data integrity and availability. The primary function of the main server is to handle regular data storage and processing, serving as the operational backbone for the organization. However, recognizing the increasing prevalence of cyber threats, the system incorporates a secondary backup server designed to take over seamlessly in the event of an attack or data breach. The architecture utilizes a real- time data synchronization mechanism, ensuring that all information stored on the main server is simultaneously mirrored on the backup server. This redundancy mitigates the risk of data loss due to unexpected incidents such as hacking attempts, system failures, or natural disasters. The backup server remains dormant during normal operations but is activated immediately when a threat is detected, allowing for a swift recovery process. This dual approach not only protects sensitive information but also minimizes downtime, thereby maintaining business continuity. Moreover, the project explores the implementation of security protocols that monitor for suspicious activities in real-time, providing an additional layer of protection. By employing encryption and secure access controls, the system aims to safeguard data from unauthorized access while ensuring that legitimate users can efficiently retrieve and manage their information. The effectiveness of the proposed system will be evaluated through a series of penetration tests and simulations, demonstrating its resilience against various attack vectors. In conclusion, this project presents a forward-thinking solution to data security challenges faced by modern organizations. By leveraging a dual-server architecture with real-time synchronization and robust security measures, it ensures that critical data remains protected and accessible, ultimately fostering trust and reliability in digital operations. This innovative approach not only addresses current security concerns but also lays the groundwork for future advancements in data management and protection strategies.

DESIGN OF EFFICIENT ENERGY STORAGE SYSTEM TO INTEGRATE RENEWABLE ENERGY SOURCE TO SUPPORT IN GRID

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Abstract

The integration of renewable energy source into the power grid is a key strategy for achieving sustainable energy system but it comes with the challenges related to the variability and intermittency of renewable energy. A key solution to these challenges is the design of an efficient energy storage system (ESS) that can store excess energy generated during peak production periods and release it during times of high demand or low generation. The proposed energy storage system focuses on optimizing the performance of battery storage technologies, such as lithium-ion, flow batteries to efficiently store renewable energy. By incorporating real-time data from IOT-based monitoring system the ESS can respond dynamically to changes in grid demand, renewable energy generation and storage levels, ensuring that energy is available when needed and preventing energy waste. In this paper the system is designed to insights allow for optimized scheduling of energy storage and distribution, reducing the reliance on fossil-fuel-based back up generation. The intelligent management of the ESS also helps in peak shaving and load levelling, ensuring that the grid instability. Moreover, the use of energy storage system in conjunction with renewable sources can enhance grid resilience by providing backup power during outages or unexpected fluctuations in generation. In the conclusion the design of an efficient energy storage system is crucial to the successful integration of renewable energy into the grid.

Keywords: battery storage technoligies, lithiun-ion ,flow battery, or solid-state batteries, ESS(Energy Storage System),fossil fuels,MPPT(Maximum power point tracking),

WİRELESS POWER TRANSFER FOR ENERGY EFFİCİENT BRUSHLESS DC MOTOR PUMP İN ISOLATED ENVİRONMENT

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Abstract

The article introduces a Wireless Power Transfer (WPT) system designed for Brushless DC (BLDC) motor-pump, contributing to SDG 7 by enhancing energy efficiency, reliable performance and promoting sustainable energy management in sealed inline pumping scenarios. The system efficiently transmits power wirelessly from a source to BLDC motor, eliminating the need for a dedicated motor control unit on the secondary side. Also, the primary WPT controller manages the speed and direction of the BLDC motor. It uses six LC tuning circuits and three orthogonal channels on the secondary side, regulating the secondary side inverter. Field-Oriented Control (FOC) ensures accurate direction and velocity regulation. The system uses the stagnation point of the Back EMF of the stator windings to determine the rotor position wirelessly, maintaining performance despite fluctuations in operating conditions. The prototype of 48 V, 500 W WPT BLDC motor pump system shows a remarkable system efficiency of 87.6% and maintains a rotational speed of 3000 rpm at a range of 100 mm.

Keywords—Wireless power transmission, Brushless DC motors, Field-Oriented Control (FOC), Back EMF, Resonant circuit.

IMPACT OF DEAD-TIME ON INVERTERS IN WIRELESS POWER TRANSFER SYSTEMS USİNG A HYBRİD FOA-MHFAN APPROACH

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Abstract

The effect of dead time in wireless power transmission systems on inverters encompasses increased switching losses, electromagnetic interference, and system instability,. Dead-time increases switching losses in inverters, leading to wasted energy and decreased efficiency. This manuscript proposes an investigation into the effect of dead-time on inverters in wireless power transmission System. The proposed method is the joint operation of both the Fox-inspired optimization algorithm (FOA) and Multi-scale Hypergraph-based Feature Alignment Network (MHFAN). Hence it is named as FOA-MHFAN. The major objective of the proposed technique is to minimize power losses, improve overall system efficiency. The proposed FOA is used to optimize the WPT system at the resonant frequency. MHFAN approach enables accurate predictions regarding the impact of dead-time on system performance. From the result, it concludes that the power loss of the proposed methods becomes 46.43W. In the existing methods, like Jellyfish search optimization (JSO), Seagull Optimization Algorithm (SOA), Object oriented Analysis (OOA)the power loss becomes 56.53 W, 78.45 W and 87.32 W respectively. The findings indicate that the proposed method increases efficiency by 92 % and minimize the error by 3.2 % compared to other existing techniques

SMART LIGHTNING ARRESTER WITH ENERGY HARVESTING AND EARLY WARNING SYSTEM FOR ENHANCED SAFETY IN FIREWORK INDUSTRY

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Abstract

This study presents a novel lightning protection and energy harvesting system tailored for fireworks facilities. Integrating an Early Streamer Emission (ESE) lightning arrester with a Slayer exciter, the system captures and regulates lightning energy, which is stored using supercapacitors and rechargeable batteries. Enhanced grounding techniques employing natural materials and real-time monitoring via Arduino Uno ensure system stability and safety. The solution not only mitigates lightning-induced hazards but also supports sustainable energy utilization in high-risk industrial environments.

SMART ENERGY HARVESTING SYSTEM USING EMI AND THERMAL ENERGY FROM TRANSMISSION LINES WITH IOT MONITORING

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Abstract

This project introduces a novel smart energy harvesting system that captures electromagnetic interference (EMI) and thermal energy from transmission lines, converting them into usable electrical power. It employs RF-to-DC converters and thermoelectric generators (TEGs) for energy capture, while DC-DC choppers regulate voltage for storage in supercapacitors and batteries. An Arduino microcontroller manages real-time monitoring, supported by an ESP8266 module for IoT-based remote data transmission. AI and machine learning algorithms predict energy output and optimize storage efficiency. This system offers a sustainable, data-driven solution for industrial environments, integrating renewable energy harvesting with intelligent energy management to enhance grid resilience and reduce power wastage.

OPTIMAL RECONFIGURATION OF DISTRIBUTION NETWORK CONSIDERING LOAD VARIATION USING CHAMELEON SWARM OPTIMIZATION ALGORITHM

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Abstract

Efficient reconfiguration of power distribution networks plays a crucial role in enhancing reliability, minimizing losses, and improving overall system performance. This paper presents a novel approach for the optimal reconfiguration of distribution networks by considering dynamic load variations using the Chameleon Swarm Optimization (CSO) Algorithm. The proposed method leverages the adaptive nature of the CSO algorithm to intelligently search for optimal network configurations, ensuring minimized power losses and improved voltage profiles under varying load conditions. Comparative analyses with established optimization techniques demonstrate the superior performance of the CSO approach in achieving enhanced efficiency and stability. Simulation results validate the effectiveness of the proposed strategy, highlighting its potential application in modern power distribution systems.

DRIVING–CHARGING INTEGRATED CONTROLLER FOR ELECTRIC VEHICLES

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Abstract

Motor driving technology and battery charging technology are the two core technologies of electric vehicles (EVs). They have a profound impact on the performance and mileage of EVs. Based on the topology of a traditional EV motor controller, this study employs the time-sharing multiplexing insulated gate bipolar transistor (IGBT) power module form to expand the functions of the motor controller. This paper proposes an integrated driving–charging controller structure that enables the controller to realize the motor driving and on-board charging simultaneously. A decoupling analysis was performed at the topology level, mathematical models of two bidirectional converters in the integrated topology were established, and a reasonable control strategy for the double-closed-loop control system was designed. The simulation system was built in Simulink, and the simulation results verified the effectiveness of the system topology control strategy. We made an integrated controller experimental platform based on TMS320F28335. A resistive load simulated the power battery to verify the charging mode, and a 5 kW permanent magnet synchronous motor (PMSM) was used to verify the driving mode. The experimental results demonstrated the driving–charging integrated controller's feasibility for electric vehicles.

SMART ENHANCEMENT OF ELECTRIC V2V COMMUNICATION SYSTEM USING IOT IN ITS

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Abstract

This project enhances electric Vehicle-to-Vehicle (V2V) communication using IoT within Intelligent Transportation Systems (ITS). It employs sensors like GPS, cameras, IR, and accelerometers to monitor vehicle status and surroundings in real time. A central controller processes the data and wirelessly transmits alerts to nearby vehicles via Wi-Fi. This setup improves road safety through collision avoidance, speed control, and obstacle detection. The system also optimizes traffic flow and energy usage using live data. It aims to support smart, connected, and sustainable mobility in urban environments.

OPTIMAL ALLOCATION OF EV CHARGING STATIONS IN DISTRIBUTION NETWORKS

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Abstract

The widespread spread of electric vehicles requires the establishment of charging stations (EVCSs), and this is considered a large load on the network. This gives priority to distributing the stations in a way that reduces the load on the network, and in parallel, re-planning the network and supplying it with the necessary energy to maintain energy efficiency and power quality. Total energy loss minimization, voltage deviation minimization, and voltage stability index improvement are the considered power quality indices in the multi-objective function. Vehicle to grid (V2G) feature, distributed generation units (DG), and capacitor banks are used for improving system performance, by injecting the required active and reactive power. In addition, the initial and running costs of V2G, DG units, and capacitor banks are considered in the multi-objective function. The optimal sizing and allocation of charging stations, V2G, DG units, and capacitor banks are performed using a proposed Self-Adaptive Multi-Population Elitist JAYA (SAMPE-JAYA) algorithm and checked using the genetic algorithm (GA). The proposed algorithm is tested using various scenarios, two standard IEEE test systems. To emphasize the effectiveness and applicability of the proposed algorithm, it is applied on a real-world distribution system. To accommodate the optimal allocation of EVCS, which constitute 80.7 % and 78.9 % of the base active load for the IEEE 33 and 69 bus systems, respectively.

OPTIMAL POWER FLOW OF POWER SYSTEM WITH LOCATION MARGINAL PRICE USING BROWN BEAR OPTIMISATION

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Abstract

Consideration of transmission line capacity and the optimal power flow (OPF) determines the locational marginal price (LMP), which in turn determines the performance and profitability of a producing unit. Reducing the total cost of the generators can lead to a drop in the market price of electricity. It is recommended to use numerical and repetition based approaches for solving power flow equations due to their nonlinear nature. A novel optimizer named as brown-bear optimization algorithm (BOA)is introduced to solve economic dispatch problem(EDP) which is an important problem of optimal operation of power system.

GREY WOLF OPTIMIZATION ALGORITHM BASED ECONOMIC DISPATCH

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Abstract

Economic Load Dispatch is a problem of determining the output power of each generating unit of the power system such that the total fuel cost is minimum by considering all the system constraints like generation limits, valve point loading effects, etc. The problem of determining the outputs of the generating units at minimum cost is known as Optimal Power Flow (OPF) problem.The project is to obtain the feasible solution of optimal generation cost for the power system by using Whale Optimization Algorithm(WOA).WOA is most advanced and fastest method for optimization problem and can be implemented for any generated bus data in power system.

HYBRIDIZATION OF INTERNAL COMBUSTION ENGINE MOTORCYCLE WITH ELECTRIC VEHICLE TECHNOLOGY

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Abstract

This project explores the hybridization of internal combustion engine (ICE) motorcycles with electric vehicle (EV) technology to create a dual-power solution aimed at reducing emissions, enhancing fuel efficiency, and maintaining performance standards. The proposed hybrid system is a parallel hybrid configuration that allows the ICE and the electric motor to operate independently or in conjunction. The design incorporates modern battery technology, efficient electric motors, and a custom control system to intelligently switch between power modes.

The project details component selection, system integration, software control development, prototype fabrication, and real-world testing. The prototype demonstrates improved mileage and lower emissions while retaining the performance and operational characteristics of conventional motorcycles. This hybrid concept is tailored to suit the transportation needs of urban users in developing regions. Extensive simulations, performance assessments, and cost analysis further affirm the viability of the design.

SOLAR ION PROPULSION HARNESSING ELECTRIC FIELDS FOR DEEP SPACE TRAVEL

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Abstract

This project introduces a hybrid solar-powered ion propulsion system for deep space missions. It combines solar arrays, lithium-ion batteries, and RTGs for continuous energy supply. Ion thrusters accelerate charged particles to achieve high propellant efficiency. This allows faster interplanetary travel and supports heavier payloads. Future research will optimize thrust, power usage, and thermal control. The system is scalable and suited for missions like asteroid mining and outer planet exploration.

A NOVEL INDEX BASED CONGESTION MITIGATION AND VOLTAGE STABILITY ENHANCEMENT IN POWER SYSTEM LINE OUTAGES USING FACTS DEVICES IN HYBRID ELEPHANT HERDING OPTIMIZATION - MARINE PREDATORS ALGORITHM

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Abstract

This study presents a novel approach for congestion mitigation and voltage stability enhancement in power systems using FACTS (Flexible AC Transmission Systems) devices during N-1 line outage and N-2 outage scenarios. We employed a hybrid optimization algorithm combining Elephant Herding Optimization (EHO) and Marine Predators Algorithm (MPA) to address the challenges posed by line outages in various power networks, including the IEEE 118 Bus System, and IEEE 300 Bus System. The performance of FACTS devices such as Static Synchronous Compensators (STATCOM), Thyristor Controlled Series Capacitors (TCSC), and Unified Power Flow Controllers (UPFC) was evaluated through numerical simulations., the EHO-MPA hybrid algorithm demonstrated superior performance compared to other algorithms in minimizing total power loss and maintaining voltage stability across the tested systems. This research highlights the effectiveness of advanced optimization techniques and FACTS technology in enhancing the reliability and stability of power systems, providing valuable insights for future applications in real-time grid management. Overall, the findings suggest that integrating these methodologies can effectively address the growing challenges in modern power system operations, ensuring a more resilient electrical infrastructure.

MULTI-OBJECTIVE PLANNING MODEL OF WIND SOLAR PV BATTERY STORAGE-BASED DERS IN SMART GRID DISTRIBUTION SYSTEM

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Abstract

The Bi-level Multi-Objective Planning Model of Solar PV-Battery Storage-Based DERS in Smart Grid Distribution System is a research paper that proposes a planning model for the implementation of distributed energy resources (DERs) in a smart grid distribution system. The model is designed to optimize the deployment of solar PV and battery storage systems in the grid, while taking into account various technical, economic, and environmental factors. The proposed planning model is based on a bi-level multi-objective optimization approach, which considers both the objectives of the utility and the objectives of the DER owners. The upper-level objective is to minimize the total cost of energy supply to the grid, while the lower-level objective is to maximize the revenue of the DER owners. The model is implemented using a genetic algorithm, which is used to search for the optimal solution. The model is also capable of considering the uncertainties associated with solar PV and battery storage systems, such as weather conditions and battery degradation. The results of the study show that the proposed planning model can effectively optimize the deployment of solar PV and battery storage systems in a smart grid distribution system. The model is also shown to be robust to various uncertainties associated with DERs, such as weather conditions and

battery degradation. Overall, the proposed planning model provides a valuable tool for the implementation of distributed energy resources in a smart grid distribution system. By optimizing the deployment of DERs, the model can help to reduce the cost of energy supply, while also improving the reliability and environmental performance of the grid.

SECOND-ORDER POWER FACTOR CORRECTION IN BLDC MOTOR USING A BUCK-BOOST CONVERTER

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Abstract

Power Factor Correction (PFC) is crucial for improving the efficiency and power quality of motor drive systems. This paper proposes a second-order PFC technique for a 1 HP Brushless DC (BLDC) motor system using a Buck-Boost converter. The Buck-Boost converter is designed to maintain a constant DC-link voltage while shaping the input current to be in phase with the input voltage, achieving a high-power factor of 0.998. The second-order control approach provides faster dynamic response and improved stability compared to traditional first-order methods, ensuring better handling of load variations and disturbances. A sensorless control technique based on back-EMF zero-crossing detection is implemented for reliable and cost-effective BLDC motor operation, eliminating the need for physical position sensors. Detailed simulations and experimental validations demonstrate the effectiveness of the proposed system, showing significant improvements in Total Harmonic Distortion (THD) reduction, enhanced input power quality, and efficient motor performance across different operating conditions. This solution is highly suitable for applications requiring compactness, high reliability, and strict adherence to power quality standards, such as electric vehicles, industrial automation, and energy-efficient water pumping systems. The proposed method offers an effective pathway for the development of advanced PFC-enabled BLDC motor drives

Keywords— Power Factor Correction (PFC), Brushless DC (BLDC) Motor, Buck-Boost Converter, Second-Order Control, Sensorless Drive.

A MODULE-INTEGRATED ISOLATED SOLAR MICRO INVERTER

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Abstract

This paper presents a module-integrated isolated solar microinverter with pseudo-dc link. The studied grid-tied micro inverters can individually extract the maximum solar power from each photovoltaic panel and transfer to the ac utility system. High conversion efficiency and high maximum power point tracking accuracy can be achieved with the studied pseudo-dc link topology. The operation principles and design considerations of the studied solar inverter are analyzed and discussed. A laboratory prototype is implemented and tested to verify its feasibility.

Index Terms—Maximum power point tracking (MPPT), module-integrated isolated solar microinverter, pseudo-dc link

DC–DC CONVERTER FOR PV TRANSFORMERLESS DVRS WITH COUPLED THREE-WINDING INDUCTOR/ SWITCHING CAPACITOR IN HYBRID RENEWABLE ENERGY GRID SYSTEMS

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Abstract

The converter concept may be used in a photovoltaic system to boost efficiency. The recommended design allows for a lift converter with appropriately connected inductors to maxim- ise voltage gain advantage. It has advantages such as continuous input current, high efficiency, and three-winding coupled inductors, which are typically used to increase voltage gain. Soft switching is a technique that is employed to reduce diode losses and voltage stress at the switch, as well as to help ensure that reverse recovery diodes do not cause problems. To compensate for voltage sag, voltage swell, and disruption in the single-phase power distribution network, this paper provides a three-winding accompanied inductor-based high-gain DC–DC converter provided transformer less dynamic voltage restorer (TDVR). The maximum power point tracking (MPPT) control algorithm is used to extract the maximum power that can be extracted from the PV array. High boosting gain is provided by the cascaded DC–DC boost converters that enable the TDVR. Because additional active and passive components are used in the cascaded connection of DC–DC converters, efficiency is decreased. By lowering the number of energy conversion stages and the number of passive and active components, the suggested MPPT is intended to increase efficiency. This converter uses a single switch, which is essentially controlled by a process known as Zero Current Switching (ZCS) since it has diodes in it. Because the proposed converter is used in a single power switch,

there are less losses in switching and voltage stressors, which leads to a better voltage gain and efficiency. A transformer-free, highly efficient DC–DC converter is covered in this study in addition to prospects for renewable energy.

Keywords: three-winding coupled inductor, DC–DC converter, voltage control, voltage fluctuations, switching frequency.

AN INTEGRATED CHARGER OF WIRELESS POWER TRANSFER, ONBOARD CHARGER, AND AUXILIARY POWER MODULE FOR ELECTRIC VEHICLES

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Abstract

The rapidly developing electric vehicles (EVs) calls for improvement in the charging system for the high-voltage (HV) and low-voltage (LV) batteries in EVs. In the conventional EV charger, wireless power transfer (WPT), onboard charger (OBC), and auxiliary power module (APM) are three separate structures. This article proposes an integrated charger for WPT, OBC, and APM by sharing power conversion stages with the advantages of cost effectiveness and high-power density. The transformer of OBC can be seen as two strongly coupled coils, and the secondary-side coil can be loosely coupled with the transmitting coil of the WPT system, serving as a receiving coil. A transformer can be employed on the receiving side to integrate the APM with WPT. In this way, the receiving coil, the compensation network, and the power electronics converter can be shared. The integrated structure can work in three modes. In the first mode (wireless charging mode) and the second mode (conductive charging mode), the utility delivers power to the HV and LV batteries simultaneously. In the third mode (HV-LV mode), the LV battery is charged by the HV battery through APM.

OPTIMIZED TRANSMISSION DESIGN FOR POWER-EFFICIENT IRS-ASSISTED UPLINK NOMA SYSTEMS

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Abstract

Implementing intelligent reflecting surfaces (IRS) towards non-orthogonal multiple access (NOMA) networks paves the way for new opportunities to improve spectrum efficiency and energy output. The purpose of this study is to develop a methodology for power reduction for an uplink IRS-assisted NOMA system that operates under quality-of-service (QoS) limitations. By using semi-definite relaxation (SDR), researchers are able to reduce the difficult non-convex challenge into an entity that is more manageable. This is accomplished by simultaneously maximizing consumer transmit power as well as IRS phase shifts. The findings of the simulation demonstrate that the suggested scheme greatly decreases power consumption in comparison to both conventional and benchmark systems. This demonstrates the significance that IRS plays in the development of environmentally friendly wireless communication.

SECURE AND LOW-COST AUTHENTICATION FOR IOMT-ENABLED REMOTE HEALTHCARE SYSTEM

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Abstract

Continuous patient health monitoring is essential in hospitals to guarantee prompt emergency response. An Internet of Things-based real-time patient health monitoring system that enables nurses to keep an eye on several patients from a single nursing station is presented in this study. The system makes use of an ESP32 microcontroller that is linked to a number of health sensors, such as blood pressure, heart rate, temperature, respiration rate, and blood glucose monitors. Every measured parameter is sent to a Firebase database in the cloud, from which a real-time dashboard may be accessed at the nurse station through a web application. When serious medical issues are identified, the technology also connects with a smart watch that nurses wear, sending them immediate emergency notifications. The suggested approach guarantees ongoing health monitoring for better medical management, improves patient care efficiency, and speeds up emergency response times.

DUAL WASH PRO: A MODULAR DUAL-DRUM WASHING MACHINE FOR SMART, SUSTAINABLE LAUNDRY SOLUTIONS

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Abstract

The *Dual Wash Pro* is a modular hybrid washing system that addresses the increasing need for multifunctional, eco-friendly, and user-friendly laundry solutions. It combines both impeller and agitator mechanisms. Automation is facilitated through voice command interfaces and smart sensors that determine load characteristics and optimize water and energy usage. The system includes energy-efficient brushed DC motors and rechargeable, environmentally friendly detergent cartridges to maximize sustainability. Modular parts, such as interchangeable drums and adjustable control panels, allow for user flexibility and repair. Prototype testing shows a 30% decrease in water usage and a 25% reduction in energy consumption over traditional models, as well as increased accessibility for users with disabilities and the elderly. The *Dual Wash Pro* is a model of creative thinking in the direction of inclusive, sustainable appliance design, advancing the development of intelligent home systems.

SMART PEN AND DIGITAL PAD FOR STUDENTS WITH SPECIFIC LEARNING DISABILITIES (SLD)

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Abstract

A Smart Pen and Digital Pad designed for students with Specific Learning Disabilities (SLD) helps improve writing, note-taking, and organization. By integrating pressure sensors, speech recognition, and cloud storage, the system offers real-time feedback to support independent learning. This innovation enhances academic performance, reduces anxiety, and boosts confidence. The solution is affordable, user-friendly, and tailored to the needs of SLD students. It aims to transform education by empowering both students and educators.

THAWF SENSE: ARTIFICIAL INTELLIGENCE FOR POULTRY MANAGEMENT SYSTEM

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Abstract

The poultry industry faces challenges in maintaining optimal environmental conditions and resource management, which directly affect animal productivity and well-being. Traditional monitoring methods are labour-intensive and prone to inefficiency. This article presents IoT-based poultry farming and automation systems to optimize environmental control and resource allocation. The system uses the Raspberry Pi Pico-W Microcontroller and integrates sensors into temperature, humidity, air quality, water level, supply level, and automatic control of heating, cooling, exhaust fan, water pump, and feeder. The real-time data is transferred to a Firebase database and visualized via a web dashboard. This allows remote monitoring and predicted temperature and humidity analysis. The system uses linear regression for environmental predictions to improve positive decision-making. Experimental results show improved environmental stability, reduced manual interventions, and improved resource efficiency targeting modern smart agricultural practices.

Keywords: IoT, Poultry Farming, Automation, Sensor Networks, Predictive Analytics, Firebase, Raspberry Pi Pico W, Environmental Monitoring, Smart Farming

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SMART CROP PROTECTION AND ALERT SYSTEM FOR DETECTING WILD ANIMALS

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Abstract

In agricultural fields and residential areas, wild animal intrusions pose significant threats

Crops and property. The detection of these intrusions has traditionally relied on manual Observation, which is impractical and inefficient. To address this challenge, we propose a solution that utilizes the YOLOv8 algorithm for real-time detection of wild animals in agricultural fields and home environments. YOLOv8, known for its high accuracy and speed in object detection tasks, is applied to monitor areas, ensuring prompt identification of animals that could potentially cause damage. Our system not only detects the presence of wild animals but also classifies their type and tracks their movements in the monitored area. The system automatically triggers alert Messages, notifying the concerned parties through various communication channels.The integration of this intelligent surveillance system provides a proactive solution to safeguard crops from wild animal threats, ensuring better protection and minimizing potential damage.

AUTOMATED IRRIGATION SYSTEM FOR PADDY UTILIZING SENSORS

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Abstract

The aim of our project is to develop a smart irrigation system specifically designed for paddy, flood irrigation crops using precision farming techniques. By incorporating advanced technologies, the system utilizing (water level sensor & Rain drop sensor) for accurately measuring the level of water in paddy field and rain drop sensor is used to find rainfall. The primary function of a raindrop sensor is to determine when it is raining and how much rainfall has occurred, helping automate systems like irrigation to avoid overflow in field. It is an innovative and efficient approach to make the specific water level need of paddy growth, it integrates and analyses sensors data to monitor the paddy water level and weather conditions. Automated irrigation controllers use real-time data to adjust water applications, it ensuring accurate distribution and reducing waste of water. The farmers can monitor/control the irrigation remotely through the mobile device. This innovative approach promotes sustainable agriculture, boosts crop growth, and conserves water resources.

AUTOMATED AND DECENTRALIZED CLOUD BASED WATER LEVEL AND QUALITY AUDIT SYSTEM USING IoT

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Abstract

This work proposes an IoT and Blockchain based, distributed system, for automated measuring and monitoring of water level and check the water quality in the rural area water tanks. The proposed water level audit system here is designed to be fully decentralized by using the Ethereum Block Chain to store and retrieve the data recorded by IoT sensors. Thus, data integrity is provided without the need for a Trusted Third Party (TTP) and data is collected and captured automatically without any manual operations needed. We use water level sensors and pH sensors to collect the real-time data for the audit. The system automatically monitors the water level and turn ON/OFF the water supply. If there is any change in pH value, Turbidity value, then the water supply will turn OFF automatically.

INTEGRATED TRAIN SAFETY SYSTEM WITH OBSTACLE DETECTION AND SOS ALERTS

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Abstract

In Railway safety is vital for preventing accidents and minimizing fatalities. This paper proposes an Integrated Train Safety System equipped with ultrasonic sensors, a seismic sensor, GSM communication, and SOS alerts. Ultrasonic sensors detect obstacles up to 500 meters ahead, while seismic sensors detect track faults. In case of detection, automatic braking is applied and alerts are sent via GSM along with GPS location. An SOS system enhances passenger safety. Powered by Arduino UNO, this scalable and cost-effective solution ensures real-time monitoring, rapid response, and improved operational security.

GPS TRACKING SYSTEM FOR GOVERNMENT BUS

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Abstract

Public transportation systems face challenges in providing real-time bus tracking, accurate passenger count, and seamless stop requests. This project proposes a Smart IOT-Based Bus Tracking and Passenger Management System using Arduino, GPS, and IOT to enhance commuter convenience and efficiency. A GPS module continuously tracks the bus location. Manually update the seat count. The system is connected to the IOT cloud, where passengers can access real-time bus location updates and availability status. Commuters can send a virtual stop request via a website, which is transmitted to the bus unit. The bus module consists of an Arduino Uno, ESP8266 (or another IOT module), and a display unit to show stop requests for the driver. When a request is received, the system calculates the nearest stop and alerts the driver. Additionally, it sends periodic updates on bus location, estimated arrival time, and passenger count to the cloud. This system improves transparency, efficiency, and accessibility in public transportation, reducing waiting times and enhancing passenger convenience. Future enhancements may include AI-based route optimization and predictive arrival time estimation based on traffic data. Smart IOT-Based Bus Tracking and Passenger Management System using Arduino, GPS, and IOT to enhance bus operations and passenger convenience. The GPS module continuously tracks the bus location.

IOT AND ML-BASED FIRE ACCIDENT PREVENTION SYSTEM FOR ELECTRIC VEHICLES USING SUPERCAPACITORS AND THERMOGEL COOLING

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Abstract

This project presents an innovative safety system for electric vehicles (EVs) aimed at preventing battery fires caused by thermal runaway. The system leverages real-time monitoring through sensors that track critical battery parameters such as temperature, voltage, and current. When abnormal heating is detected, the system employs a machine learning model to predict potential fire hazards. In response to high temperatures, it switches the power source to supercapacitors, enabling the vehicle to reach a safe location. Simultaneously, it sends emergency alerts to users via a cloud-based IoT platform. If the battery continues to overheat beyond a critical threshold, an automated thermogel cooling mechanism is activated to suppress fire risks. This integrated approach enhances EV safety by combining IoT, AI, and advanced thermal management solutions, ensuring a proactive and cost-effective solution suitable for both personal and public EVs.

PUBLIC TOILET MAINTENANCE USING IOT

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Abstract

Health Hub is a smart IoT-based healthcare and hygiene monitoring system designed to improve environmental cleanliness in public health facilities. Utilizing sensors such as the MQ-4 gas sensor for pollution detection and IR sensors for door activity, the system intelligently manages fan/light control and automates sanitation through a water cleaning module. Controlled by an Atmel microcontroller and connected to the cloud via NodeMCU, it enables real-time monitoring and remote alerts to municipal authorities. Key features include a mini servo motor for automated door operation and a mini water pump for cleaning purposes, making it a complete solution for maintaining hygiene in critical public spaces. This reduces maintenance costs, optimizes resource consumption, and enhances sanitation standards through real-time monitoring and predictive maintenance, providing a cost-effective and scalable solution for public restrooms.

EFFECTIVE IMAGE PRE PROCESSING THROUGH HYBRIDIZATION APPROACH

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Abstract

Image Pre-processing processes are used to boost the image quality before interpreting into an application. This determines a new intensity value for the output image by analysing a small region around each pixel in the input image. Several algorithms are used in these pre- processing methods. Contrast and enhancement are key metrics for evaluating the quality of medical images. This paper's primary goal is to enhance image quality through resolution enhancement and denoising. Noise negatively impacts most imaging techniques, reducing their quality and accuracy. Effective denoising and improved augmentation methods are essential for preserving the edges and contour details in medical images. The integration of algorithms such as CLAHE, AHE, HE, and BDA is the focus of this paper. The performance of these techniques is assessed using parameters such as block size, clip limits, and tiles. The results indicate that effective denoising and resolution enhancement techniques are crucial for image pre- processing.

Keywords: Pre-processing, pixel, Brightness, contrast, hybridization, Enhancement, Block size, Clip limit, Clip tiles, histogram.

RAILWAY TRACK MONITORING SYSTEM USING COMPUTER VISION AND IMAGE PROCESSING

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Abstract

Railway track cracks are a primary factor in train derailments, and they present immense dangers to infrastructure and passenger safety. The conventional inspection process is manual, time-consuming, and susceptible to human error. This article proposes an automated system for monitoring railway track cracks based on computer vision, image processing, deep learning, and IoT to achieve real-time crack detection. A high-resolution camera module takes track images, which are processed through grayscale conversion, edge detection, and morphological processing to make cracks more visible. A Convolutional Neural Network (CNN) deep learning model is utilized for precise crack classification. The identified anomalies are sent to a cloud-based IoT platform via MQTT/HTTP protocols, allowing real-time monitoring and immediate alerts to railway authorities. Experimental testing proves 96.5% accuracy, far better than conventional edge detection. The system improves railway track safety, decreases manual intervention, and gives a scalable predictive railway maintenance solution.

Keywords— Railway track monitoring, Crack detection, Computer vision, Image processing, Deep learning, IoT, Real-time monitoring.

SMART VEGETABLE PRICE MONITORING: DATA COLLECTION, ANALYSIS, VISUALIZATION AND INSIGHTS FOR FARMERS

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Abstract

This paper presents a smart vegetable price monitoring system designed to support local farmers by providing real-time data collection, price trend analysis, visual insights, and demand-based suggestions. By leveraging data analytics and visualization tools, the system enables farmers to understand market dynamics, forecast future prices, and make better selling decisions. This project bridges the information gap in agricultural pricing and contributes to smarter, data-driven farming practices.

EMERGENCY ALERT SYSTEM

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Abstract

Emergency alarms are critical safety systems designed to alert individuals to potential dangers such as fires, natural disasters, intrusions, or hazardous material leaks. These systems use audible, visual, or digital signals to prompt immediate evacuation, protective action, or response. Advanced emergency alarms often integrate sensors, control panels, and communication networks to detect threats automatically and relay real-time information to emergency responders. Their effectiveness depends on timely activation, reliability, and user awareness. As technology evolves, modern alarm systems increasingly incorporate smart features, such as remote monitoring and AI-based threat detection, enhancing public safety across various environments.

PROSPECT OF MORINGA SEED OIL AS A SUSTAINABLE BIODIESEL FUEL IN INDIA

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Abstract

Drumstick is one of the most widely cultivated crops in tropical and sub-tropical areas in the world. The common name is drumstick which contains 6 to10 seeds. The matured seeds yield 38 - 40% of colorless and odorless vegetable oil. The oil contains concentrated oleic acid which has the potential to be used as a biodiesel. The study reviewed the prospect of Drum stick seed oil as a source of alternative transport fuel in India. The distributions, habitat, growth, production, oil extraction and biodiesel conversion techniques are briefly discussed. The literatures available on engine performance test and emission studies are also summarized for better understanding of the prospect of the Drum stick as a sustainable and alternative source of transport fuel. A review of the literatures indicates that Drums tick oil could be one of the prospective sources of biodiesel in India. Further studies are recommended on issues such as engine combustion characteristics, emission parameters, environmental impact and economic analysis of the species before it can be considered for commercial application.

PRINCIPLE STUDIES ON NANOSTRUCTURES

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Abstract

Nanostructures open new possibilities to mold the mechanical, chemical, magnetic and electronic properties of materials and, at present, there is strong demand for basic understanding of nanostructures. Nano objects are different from both atoms and bulk materials, thereby providing an interface between physics, chemistry, material sciences, engineering and biology. For example, the length scale of typical nanostructures allows a direct use in many systems, including the human body. Clusters containing a few atoms have been investigated for many decades, both theoretically and experimentally. The electronic structure of atomic clusters was traditionally treated by real-space methods based on various approaches from tight-binding (TB) to density-functional methods. The methods of calculations of electronic structure of bulk materials use periodic boundary condition and k-space representation. Nanostructures include 100–100000 atoms and do not exhibit periodicity, so that their first-principle study is a very challenging problem. Direct atomistic treatment of real nanodevices is very difficult due to the large number of atoms. The free-electron model, tight binding approaches and order density functional approach have all been applied to the Nanoscale geometries to study their electronic properties. The choice of an approach depends on the degree of compromise between numerical and conceptual tractability on the one hand and quantitative accuracy on the other.

NUMERICAL MODELING OF MICROMECHANICAL FINITE ELEMENT ANALYSIS OF RUBBER-CNT COMPOSITES

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Abstract

This study explores the multiscale modeling and mechanical characterization of synthetic rubber and its nanocomposites reinforced with single-walled carbon nanotubes (SWCNTs). Uniaxial tensile tests on ASTM D-412C specimens provided Mooney–Rivlin constants, validated via nonlinear FEA in ANSYS. A micromechanical RVE approach integrated SWCNTs with a hyperelastic rubber matrix, modeling interfaces using variable-stiffness spring elements. The SWCNTs, defined as nonlinear beams, exhibited a Young's modulus of 936 GPa. Simulation results revealed enhanced stiffness and toughness in the nanocomposites, with stress–strain behavior aligning with the rule of mixtures under ideal bonding. This work provides a robust framework for analyzing advanced rubber nanocomposites in engineering applications.

Keywords—SWCNTs; Micromechanical; RVE, FE-Analysis; rubber nanocomposites.

FE ANALYSIS OF THIN LAMINATED COMPOSITE PLATE WITH CUTOUT UNDER AXIAL COMPRESSION

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Abstract

Fiber-reinforced laminated composite plates with cutouts are widely used in engineering applications for weight reduction and functionality, yet they are prone to buckling under axial compression. This study analyzes the buckling behavior of thin laminated FRP plates with central circular cutouts using linear eigenvalue buckling analysis via the finite element method in ANSYS, employing Shell181 elements. The model is validated against benchmark literature and shows strong agreement in critical load and mode shapes. A comprehensive parametric study examines the effects of boundary conditions, lay-up configuration and orientation, plate aspect ratio, and cutout size. Results indicate that clamped boundaries and anti-symmetric lay-ups enhance buckling resistance, while larger cutouts diminish it. The study provides insights for optimizing the structural design of composite plates to improve stability under compressive loads.

Key words: Laminated composite plates, FRP, Buckling and Axial Compression

MACHINABILITY STUDIES ON STAINLESS STEEL (SS304) UNDER NEGATIVE POLARITY OF ELECTRICAL DISCHARGE MACHINING PROCESS

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Abstract

To improve machining qualities of the surface, non-traditional machining processes have been widely applied in diverse of application. Normally, the NTM processes are removed unwanted materials with aid of various energies such as mechanical, thermal, chemical and electrode chemical etc. At present scenario, electrical discharge machining (EDM) is extensively used to machine the hard material with application of electro chemical energy. Hence, in this investigation, the AISI 304 stainless steel is machined with help of copper electrode using EDM. Different machining parameters such as current, pulse on time and pulse off time are controlled to achieve better machining characteristics. The series of experiments is planned using central composite design of response surface methodology. The machining characteristics such as materials removal rate (MRR) and surface roughness (SR) are considered. Effect of machining parameters on MRR and SR are studied through surface plot constructed by RSM. Analysis of variance (ANOVA) is carried out to identify the dominating factors that affecting the MRR and SR. The regression values of MRR and SR are 96.89% and 97.56% respectively indicating an empirical relationship between the parameters and responses. F values of lack of fit for MRR and SR were 3.14 and 2.89 which are smaller than the standard values. Hence, both model MMR and SR were adequate. Current was found as a significant parameter on the response followed by pulse on time and pulse off time. It was observed that MRR and SR increased with increasing of current and pulse on time regardless

of pulse off time. Increased current and pulse on time generated strengthened ionization temperature that removed more quantity of materials from the workpiece. Due to ionization temperature, more craters and voids are formed that made surface irregular and hard. Hence, SR increased. At lower current and pulse on time, mild cracks and globules are formed due to its insufficient spark intensity.

Keywords: EDM, MRR, SR, RSM, ANOVA.

AUTOMATED EFFECTIVE SOLAR TRACKING SYSTEM

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Abstract

By ensuring that solar panels are always facing the sun, the automatedEffective solar trackin g system project seeks to improve solar panel efficiency.An automated solar tracking syste m can optimize the efficiency and output of solar panels by keeping them in continuous align ment with the sun's location throughout the day.By tracking the sun's trajectory across the sk y, this technique enables solar panels to capture more of the sun's energy and produce more p ower.In order to maximize solar panel performance and more efficiently capture clean, rene wable energy from the sun, the project integrates hardware and software components.It helps create a brighter future and is a step toward sustainable energy solutions.

Keywords: solar energy, power generation, solar tracking system, and use of renewable energy sources.

PERFORMANCE EVALUATION OF BIOMASS DRYER FOR DRYING AMLA

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Abstract

The effective use of heat energy is the primary determinant of the drying process' quality. Due to its low running costs, solar drying has become a significant method for drying agricultural products. However, their utility is restricted when the sun isn't shining. Due to its ability to dry materials both during the day and at night, a biomass drier is among the most straightforward drying methods. This experimental study outlines the design and fabrication of a biomass dryer with a waste heat recovery unit suitable for the small-scale Amla drying. The setup incorporates a biomass heater for generating hot air, a waste heat recovery unit, a blower for air circulation, and a drying chamber to accommodate the products for drying. The various performance parameters of the biomass dryer, including overall system efficiency, were calculated based on the drying process involving 55 kg of Amla per batch. The dryer demonstrates the capability to consistently produce hot air within the temperature range of 70 to 75°C. Performance analysis revealed a notable reduction in moisture content from 87.1% to 4.5% within a 7-hour timeframe for biomass drying, compared to nearly 12 hours required for open sun drying, whereas it takes 9 hours in waste heat recovery dryer. By utilising the contributing factor to an appropriate overall system efficiency of 14.82%, it is possible to maintain a consistent

temperature throughout the drying tray. With its straightforward design and appropriateness for use in small-scale amla processing enterprises for nearby farmers, this biomass dryer is a good substitute for electric and traditional dryers.

Keywords: Biomass dryer; sustainable energy; Waste heat recovery unit, Drying time, Moisture content

EFFECT OF PROCESS PARAMETERS ON DEPOSITION RATE AND SURFACE ROUGHNESS OF ELECTRO DISCHARGE COATING ON AA7075 ALUMINIUM ALLOY

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Abstract

Nowadays, surface modification techniques are a big part of making metals and alloys better on the outside. Even though various metals and alloys are coated using surface modification techniques, improving the surface properties of the light alloys is difficult. To improve the surface properties of light alloys, electro-thermal techniques, namely electro discharge Coating (EDC), are suitable. Hence, in this investigation, a tungsten disulfide (WS_2) copper (Cu) composite coating was developed on AA7075 using electro discharge deposition. The WS_2 Cu composite electrodes were manufactured by the powder metallurgy method. The effects of discharge current, pulse on time, and pulse off time on deposition rate (DR) and surface roughness (SR) have been studied. Tests were carried out according to the design matrix generated by central composite design in response surface methodology (RSM). An ANOVA was performed to determine the optimum parametric conditions for the responses. Pulse off time was the dominating parameter followed by discharge current and pulse on time for attaining the best response. Higher values of current, pulse on time, and pulse off time led to higher DR and SR values. Higher discharge current produced sufficient spark strength that melted both the tool electrode and the workpiece. The lower setting of parameters offered smooth roughness due to the even spark distribution. At a current of 4 A, bigger craters were

observed due to the higher spark intensity that made the surface hard. The uneven mass was produced with a deeper shallow crater, resulting in a poor surface.

Keywords: Surface modification/ EDC/ DR/ SR/ Powder metallurgy

IOT BASED WATER LEAK DETECTION SYSTEM FOR SMART CITIES

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Abstract

Early detection and reporting of leakage in water remains one of the major challenges for developing countries' water distribution firms. This paper introduces a nature-inspired search technique for optimizing the detection of leaked pipeline location for the Ghana Water and Sewage Services Company. The developed method combines IoT-edge computing devices with a nature-inspired algorithm based on the behavior of the Kestrel bird to efficiently map and follow leaked pipelines. The algorithm then uses the location information such as distance, geographic coordinates, and direction when a leakage alarm is activated to help workers locate the source of the leakage. The algorithm created was tested and compared with previously defined and randomly generated locations as per latitude and longitude coordinates. It was additionally compared with the BAT algorithm to show better performance in finding the best distance and precise mapping of leakage points. Since water is an essential asset that needs efficient management, the solution proposed serves to address a major problem associated with water losses through undiagnosed leakage in distribution networks.

A CRITICAL REVIEW OF TECHNOLOGY READINESS LEVELS AND COMMERCIALIZATION PATHWAYS OF CCUS SYSTEMS FOR SUSTAINABLE CLIMATE MITIGATION

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Abstract

The rapid expansion of the energy and industrial sectors has significantly increased stationary CO_2 emissions, intensifying concerns about global warming and the urgent need to achieve climate mitigation goals by 2050. In this context, this paper presents a concise review of the current state of carbon capture, utilization, and storage (CCUS) technologies through a general technical assessment. Particular focus is given to identifying the technology readiness level (TRL) of each key component within the CCUS system, providing insights into their maturity and commercialization pathways. The study also emphasizes the various CO_2 capture types from flue gases and the separation methods employed. Additionally, valuable data from major R&D projects at different scales are analyzed to highlight progress and gaps. This critical review identifies the challenges hindering the advancement of low-TRL technologies and outlines strategies to facilitate their transition to commercial application. Ultimately, the paper aims to support the global scaling and implementation of effective CO_2 emission reduction initiatives.

FUTURE TRENDS OF 3D PRINTING TECHNOLOGIES IN AEROSPACE AND DEFENSE: ADVANCED MATERIALS

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Abstract

Additive manufacturing is revolutionising the aerospace and defence sectors, propelled by the need for lightweight components, complex designs, and accelerated production timelines. The use of cultured materials such as composites, high-performance alloys, ceramics, and functionally graded materials has significantly increased the capabilities of 3D printing technologies, allowing for the manufacture of long-lasting components suitable for severe conditions. The study looks at the changing landscape of 3D printing in aerospace and defence, with an emphasis on technological advancements and the creation of next-generation materials. It examines the most recent advances in printing processes such as powder bed fusion (PBF) and directed energy deposition (DED), explores present and evolving applications, and assesses the challenges associated with material qualification, regulatory standards, and large-scale manufacturing. The study presents a complete review of the mechanical, thermal, and functional properties of these materials using comparative analysis, providing practical insights for stakeholders looking to integrate advanced additive manufacturing into aerospace and defence systems.

Keywords:3D Printing, Additive Manufacturing, Aerospace, Defense, Advanced Materials, Emerging Material Trends, Metal Alloys, High-Performance Polymers, Composite Materials, Process Innovations, Material Certification, Future Manufacturing Trends.

SMART PIPELINE WATER LEAK DETECTION SYSTEM USING IOT FOR A SUSTAINABLE FUTURE

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Abstract

Clean water is a limited resource for human life and is prone to wastage due to leakage of the distribution pipes in major cities. Leakage of water pipes is a serious issue across the globe of which most of the water distribution authorities are struggling to identify the location of the fault. This leakage problem can be caused by various reasons like breakage of the pipelines as a result of aging or continuous constructions within urban cities such as Dar es salaam, in turn as a result of that instance, the authorities responsible for distribution encounter difficulty to detect the cause and facilitate them to act. Thus, the objective of this project was to create an IoT-based water leakage detection system. The prototype was created with two sensors placed at the source and receiving points to detect the flow rate of water. The outcome showed that the amount of water produced at the beginning point can be equated with the other end to see whether there is any leakage. More emphasis on distance calculation could yield interesting results that consider more studies on IoT monitoring systems.

NANO - COMPOSITE MATERIALS: AN INTRODUCTION TO THEIR TYPES AND APPLICATIONS

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Abstract

In today's world, it is nearly impossible to envision life without nanotechnologies, particularly nano-materials. This review article aims to present an overview of the definitions, classifications, and applications of both nano-materials and nano-composites. Nano-composites vary based on their matrix and nano-material phases, giving rise to a wide range of material types suited for different applications. Additionally, various reinforcement forms — such as particles, fibers, and sheets — offer distinct properties and uses. These advanced materials find applications across a broad spectrum, from everyday uses to highly specialized technological fields.

Keywords: Nano-technology, Nano- composites, MMC, CMC, PMC.

DETECTING WILD LIFE WITH ANDROID AND IOT

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Abstract

Interference of wildlife into habitat without prior knowledge is known to be destructive for both human beings and animals. Human interactions with wildlife are defining experience of human existence. These interactions can be positive or negative. The main aim of the proposed system is to detect wild animals. This system uses long-range PIR sensors and ESP32CAM Wi-Fi module to detect the movement of the animal and capture image for wild animal detection and send signal to the controller. This signal is transmitted to mobile application, which is an alert to farmers and forest department immediately. This system also uses image detection module so if the animal is entered in the target area the camera will capture image and the image detection module will detect for presence of wild animal. The proposed system endeavors to prevent casualties that occur in areas having high human and wild animals interaction.

Index Terms - Mobile application, IoT device, microcontrollers ,motion detection sensor, image detection using tensor flow Machine learning module.

ENHANCEMENT OF MECHANICAL PROPERTIES OF EPDM RUBBER COMPOSITES THROUGH PARTIAL REPLACEMENT OF CARBON BLACK WITH NANOCELLULOSE

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Abstract

Elastomers, notably EPDM rubber composites are crucial materials in various engineering applications due to their excellent elasticity, static and dynamic load-bearing capacity and resistance to harsh environmental conditions. EPDM rubber is widely utilized in automotive, mechanical, civil, and other industries in products like tires, seals, vibration dampers and mounts. This study explores the development of EPDM rubber composites with partial replacement of carbon black (CB) by nanocellulose (NC), aiming to enhance mechanical properties while addressing the limitations of CB such as environmental impact and availability. The effects of varying filler content on the composite's torque values, viscosity, crosslinking characteristics, mechanical performance and cure properties are analyzed. Results indicate that EPDM composites with 54phr-CB and 6phr-NC exhibited the best mechanical performance, with improved tensile strength, modulus and elongation at break, highlighting the synergistic reinforcement effect of the hybrid filler system. This work provides a promising alternative to traditional CB-based formulations, demonstrating the potential of NC as an effective bio-nano filler in elastomeric applications.

FLOATING OFFSHORE WIND TURBINE

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Abstract

Floating offshore wind turbines (FOWTs) represent a transformative solution in the renewable energy sector, offering the potential to harness wind energy in deep-water regions where traditional fixed-bottom turbines are not feasible. These turbines are designed to be buoyant, supported by floating platforms anchored to the seabed, enabling them to operate in deeper waters with higher and more consistent wind speeds. This abstract explores the key advancements in FOWT technology, including innovations in platform design, materials, and anchoring systems, which contribute to increased stability and efficiency. Furthermore, it examines the environmental impact of deploying floating turbines, assessing potential ecological disruptions and strategies to minimize adverse effects. The integration of FOWTs into the global energy mix is poised to address the increasing demand for clean energy while reducing dependence on fossil fuels. By overcoming the challenges of cost, reliability, and scalability, FOWTs are positioned to play a crucial role in the future of offshore wind energy generation.

EXAMINE THE MECHANICAL PROPERTIES AND IMMERSION CORROSION BEHAVIOR OF ALUMINUM 8011 HYBRID NANO COMPOSITES

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Abstract

The Study focuses on analyzing the mechanical properties of Al-8011 hybrid nanocomposites with Scandium (Sc) and Zinc Oxide (ZnO). The Composite material has been prepared by Stir Ultrasonic Assisted casting technique. Al-8011 as matrix, Scandium (Sc) rare earth as a alloying element Zinc Oxide (ZnO) As reinforcements. Scandium and Zinc Oxide both have been mixed in different proportions in the Aluminum matrix. Both reinforcement constituents were added in different combinations. Al-8011 was extensively applied in aircraft engine and wings. For further enhancement of properties for increasing its applicability.

FUEL PRODUCTION FROM NON-RECYCLABLE PLASTICS THROUGH THERMAL TREATMENT

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Abstract

The production of bio-oil from plastic waste through the thermal degradation process is a sustainable and innovative approach that addresses both environmental and waste management challenges. The term "thermal degradation" refers to a chemical process that occurs when a material is subjected to heat. The physical and chemical characteristics of the material can change as a result of this decomposition, frequently leading to a loss of integrity or usefulness. Temperature, exposure time, the presence of additional materials, and the basic characteristics of the material itself all affect the degree and kind of thermal degradation. Pyrolysis is one of the thermal degradation processes that involve heating organic materials in the absence of oxygen, leading to the decomposition of complex organic compounds into simpler products, including bio-oil. In this study, healthcare waste, which typically consists of various organic materials such as medical plastics, syringes, bandages, and medical glucose bottles among other disposable items, is considered. Among these, medical glucose bottles are chosen as feedstock for pyrolysis due to their significant contribution to daily waste in the medical field and their negligible environmental and human health concerns. The pyrolysis process involves heating the medical glucose bottles to high temperatures between 400 and 500 °C in a controlled environment. This conversion process results in the production of bio-oil, char, and gases from the medical glucose bottles. The maximum yield rate of medical glucose bottle waste (MGBW) oil at 450°C of heating temperature will be solid (21%), liquid (27%), and gas

(43%), with a calorific value of 42.5 MJ/kg, which is comparable to diesel. The bio-oil obtained from this process has several potential applications, such as in furnaces, and it can also be suitable for CI engines as an alternative fuel.

Keywords: Thermal Degradation Process, Pyrolysis, Medical Plastic Wastes, Bio-Oil, Medical Glucose Bottle

LONG-TERM ANALYSIS AND FORECAST OF MONSOONAL RAINFALL CORRELATION BETWEEN NORTHEAST MONSOONS AND SOUTHWEST MONSOONS OVER KARAIKAL, PUDUCHERRY (UT), INDIA

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Abstract

This study investigates the long-term correlation between Southwest Monsoon (SWM) and Northeast Monsoon (NEM) rainfall over Karaikal, Puducherry (UT), India, using 72 years of monthly rainfall data (1951–2022) sourced from the India Meteorological Department. The correlation was computed using Karl Pearson's method across both the total period and cyclic 11-year intervals to explore variability. The results revealed a consistently weak and statistically insignificant correlation between the two monsoon systems, with the overall Pearson correlation coefficient recorded at $r = -0.0266$, and $r = -0.1312$ during the recent six-year period (2017–2022). These findings suggest that NEM and SWM rainfall patterns behave independently in this region. Hypothesis testing further confirmed a significant difference in the mean rainfall of the two seasons, supporting the conclusion of dissimilar rainfall behavior. The study also forecasts that this negligible correlation trend is likely to persist through 2033. Future investigations are proposed to extend this analysis to adjacent coastal regions to better understand regional rainfall dynamics and Behaviour.

MNO_2/POROUS NANORODS FOR SUPERCAPACITOR APPLICATIONS

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Abstract

In the work, MnO_2 nanoparticles were synthesized by simple facile hydrothermal method. The structural, morphological, elemental distributions, functional, surface area, electrochemical and magnetic properties of the synthesized nanoparticles were analyzed by XRD, SEM/EDX, FTIR, XPS, BET, CV and VSM measurements. XRD confessed that the tetragonal structure of bare MnO_2. The crystallite size of MnO_2 nanoparticles obtained at $MnCl_2$: $KMnO_4$ (0.5: 0.4 M) was found to be 9.2 nm. The presence of O-Mn-O functional group was observed at 714 cm^{-1}. The electrochemical behavior of nanorod like MnO_2 nanoparticles showed a higher specific capacitance of 303.60 Fg^{-1}at lower scan rate of 10 mV s^{-1}. The M-H loop of MnO_2 nanoparticles showed the paramagnetic behavior at room temperature.

Keywords: Nanorods, Hydrothermal method, Tetragonal and Paramagnetic.

INVESTIGATION OF SPECTRAL AND OPTICAL PROPERTIES ON DOPANT CONCENTRATION OF NI BASED $BATIO_3$ CERAMICS

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Abstract

Pure barium titanate (BTO) perovskite ceramics, 1 % and 3 % nickel (Ni) doped BTO ceramics were synthesized by solid-state reaction. Structural, morphological, optical, and magnetic characteristics were analyzed by X-ray powder diffraction (XRD), Fourier infrared spectroscopy (FTIR), UV-vis-spectrophotometer (UV). In XRD patterns by using Scherrer formula the crystalline size of BTO perovskite ceramics, 1 % and 3 % Ni-doped BTO ceramics was determined as 7.87 nm, 4.67 nm and 15.54 nm. FTIR spectra revealed the presence of functional groups. The UV-visible absorption spectra of pure BTO, 1 % and 3 % Ni-doped BTO perovskite ceramics shows that the absorption peak at 388 for all three samples of pure BTO, 1 %, and 3 % Ni-doped BTO perovskite ceramics may arise due to band-to-band changeover in BTO perovskite ceramics. The absorption peak at 388 for all three samples of pure BTO, 1 %, and 3 % Ni-doped BTO perovskite ceramics may arise due to band-to-band changeover in BTO perovskite ceramics.

Keywords: perovskite structure, barium titanate, bandgap value, ceramics