NATIONAL CONFERENCE ON

RECENT ADVANCEMENTS IN ENGINEERING AND TECHNOLOGY(RAET'25)

21/03/2025 - 22/03/2025

PROCEEDINGS

ORGANISED BY

St. Thomas College of Engineering & Technology

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CSE01

Improved Parking Slot Using YOLOv3

Dr. Amitha I C, Fathimath Nehala T, Gopika Jayan, Najwa, Sneha K K
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ABSTRACT

The rise in urbanization and vehicle ownership has intensified parking challenges, resulting in traffic congestion, resource wastage, and security concerns. Existing parking systems lack real-time updates, seamless booking integration, and advanced security features, leading to inefficiencies and user dissatisfaction. This paper proposes a Parking Spot Allocation System utilizing YOLOv3 for real-time vehicle detection and parking lot monitoring. The system integrates advanced video analytics, dynamic occupancy updates, and a user-friendly booking platform to optimize parking operations. Key features include theft detection modules, geolocation-based recommendations, and review-based spot suggestions, ensuring user convenience and enhanced security. By leveraging YOLOv3's accuracy and speed, the system supports intelligent parking management, aligns with smart city objectives, and promotes sustainable urban mobility.

CSE02

PICKPERFECT: Coconut Maturity Detector and Harvester

Dr. Amitha I C, Aswin Ratheesh D K, Fathima Fiza C P, K Muhsin, Rena Haris V P

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ABSTRACT

Coconut farming often requires significant labor to determine the right time for harvesting and to pick the coconuts. This paper presents a new AI-based system designed to make this process easier. The system uses computer vision to analyze images of coconuts, assessing their ripeness based on color, texture, and size. A Convolutional Neural Network (CNN) classifies coconuts into different stages of maturity to ensure that only the right coconuts are harvested. The system includes a machine with adjustable arms that can climb trees and pick coconuts at various heights. These arms are manually controlled to guarantee that only mature coconuts are selected. The machine is designed to navigate the tree carefully to avoid damaging it or the coconuts. By combining AI with advanced machinery, this system aims to reduce labor costs, improve harvesting efficiency, and lessen the need for human intervention. It offers a more efficient and sustainable solution for coconut farming, enhancing overall Productivity.

CSE03

Brain Tumor Detection and Classification

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ABSTRACT

Brain tumors represent a significant health concern due to their potential to cause severe outcomes stemming from abnormal cell growth. This paper addresses critical gaps in brain tumor classification by proposing an advanced deep learning model capable of identifying multiple tumor types, including meningioma, glioma, pituitary tumors, and an additional type, space-occupying lesions. A key innovation of this model is its ability to detect multiple tumors within a single MRI scan, a feature essential for more accurate and comprehensive diagnostics. Building on previous research that achieved 99% accuracy for three primary tumor types in training and validation datasets, this study leverages a convolutional neural network (CNN) model trained on an expanded dataset of 5712 MRI images.To enhance model stability, precision, and generalizability, we implemented advanced deep learning techniques, including data augmentation, transfer learning with ResNet50, and regularization. This optimized approach not only refines the model's performance but also bolsters its applicability across varied clinical scenarios. Evaluation on a test set of 1311 images demonstrates the model's high class-specific accuracies (glioma: 98.33%, meningioma: 94.44%, no tumor: 100.00%, pituitary: 100.00%), and robust metrics including precision (0.983559), recall (0.983219), F1 score (0.983140), and AUC (ROC) (0.999038). By accurately identifying diverse tumor types and detecting multiple tumors in individual MRI scans, this model shows substantial potential in advancing early, reliable, and precise brain tumor diagnostics. These findings underscore the value of deep learning in surpassing traditional diagnostic methods, paving the way for future research on neural network-based classification systems for complex tumor detection and broadening the scope of automated medical imaging analysis.

CSE04

Early Disability Detection Using Multimodal Data: Combining Handwriting, Video and Neuro-Linguistic Programming

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ABSTRACT

Early detection of disabilities is crucial for effective intervention and improved outcomes. This project proposes a novel approach to identifying early signs of disabilities such as Autism Spectrum Disorder (ASD), Attention Deficit Hyperactivity Disorder (ADHD), and dyslexia through the integration of handwriting analysis, video analysis, and neuro-linguistic programming (NLP). Each method captures different aspects of behavior and cognition, enabling a comprehensive assessment. Existing approaches often face challenges like data imbalance and the difficulty of effectively integrating multiple data sources. To address these issues, this approach builds on traditional machine learning techniques like Support Vector Machines (SVMs) and ResNet-50 architecture for Convolutional Neural Networks (CNNs) , and integrates insights using advanced ensemble learning. Inspired by an adaptive genetic algorithm framework, classifiers such as Random Forest and Naive Bayes are weighted optimally to improve accuracy and ensure a balanced and precise fusion of diverse data sources. By uniting these techniques, the system offers a holistic, accurate tool for early disability detection, paving the way for personalized interventions and better care.

CSE05

Neonatal Ocular Analytics (NOA): AI-Enhanced ROP Staging and Prognostication

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ABSTRACT

The increasing survival rates of premature infants have amplified the need for effective and accessible solutions to monitor and manage Retinopathy of Prematurity (ROP), a potentially blinding ocular condition. Traditional screening methods, often reliant on specialized equipment and trained personnel, are complex and can lead to delays in diagnosis. This project introduces a web-based platform designed to streamline ROP detection and management through advanced deep-learning techniques. The system is trained using a dataset with multiple input models which includes MobileNet, Inception, VGG, AlexNet, DenseNet, ResNet and EfficientNet, to ensure accurate detection and staging of ROP. After training, the model that achieves the best accuracy is selected as the final model, which is then used to process infant eye images uploaded by users, delivering immediate diagnostic feedback and detailed information on the condition's implications.

To address challenges in rural areas, where healthcare infrastructure and awareness may be limited, the future implementation will integrate mobile phone-based ROP detection and telemedicine features. This approach aims to empower caregivers in remote locations to conduct screenings and receive remote consultations, improving accessibility and ensuring timely intervention for premature infants at risk of ROP, regardless of their geographic location.

CSE06

Automated Telegram Group Management System for Spam and NSFW Content Prevention

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ABSTRACT

In contemporary digital communication, ensuring the integrity of Telegram group communities presents significant challenges, particularly due to the proliferation of spam and NSFW (Not Safe For Work) content. The limitations of human administrators in continuously monitoring group activities necessitate an automated solution. This project introduces an automated Telegram group management system, developed using Node.js in conjunction with Python and JavaScript libraries, to efficiently detect and mitigate undesirable content. The proposed system integrates a bot administrator capable of real-time monitoring of all incoming messages, including text, images, and videos. Leveraging advanced algorithms and libraries, the bot analyzes each message to identify spam and NSFW content. Upon detection, the bot automatically deletes the offending message for all group members and removes the sender from the group. The system also addresses messages containing malicious external links or unauthorized group invitations. Additionally, the bot provides comprehensive support for administrative commands, enabling human administrators to perform key management tasks such as adding members, retrieving the group link, removing users, and issuing warnings. This solution ensures a secure and well-regulated communication environment for Telegram group communities.

CSE07

AI-Enhanced Remote Patient Monitoring and Emotion Recognition System using Android App

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ABSTRACT

This paper presents an AI-Enhanced Remote Patient Monitoring and Emotion Recognition System utilizing an Android application to revolutionize healthcare delivery and patient care, particularly for ICU patients. The proposed system integrates advanced artificial intelligence to continuously track vital signs, including body temperature, heart rate, and oxygen levels, while simultaneously analyzing facial emotions to assess the patient's emotional state. Designed to address limitations of traditional monitoring systems, which often overlook emotional health and real time remote access, this solution ensures comprehensive patient care through real-time data collection and IoT integration. Alerts are generated and transmitted to caregivers and healthcare professionals via a custom Android app, enabling timely interventions even when they are not physically present near the patient. This dual focus on physiological and emotional health offers a holistic approach to patient monitoring, bridging the gap between technology and compassionate care. The system's innovative architecture and user-friendly interface provide an efficient, scalable, and privacy-conscious solution to modern healthcare challenges.

CSE08

Decentralized Car Sharing System Using Blockchain

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ABSTRACT

Car-sharing systems are widely recognized for reducing the reliance on personal vehicles in urban areas, alleviating traffic congestion, and lowering pollution. However, traditional car-sharing platforms face significant security challenges, especially when transmitting sensitive user information over the internet. Centralized systems are prone to single point of failure, making them vulnerable to cyber-attacks that could compromise user data, payment information, and vehicle access. To enhance security and reliability, a decentralized approach using blockchain technology can be implemented. Blockchain's distributed ledger system eliminates the need for a central authority, ensuring that data is securely stored across multiple nodes, making it resistant to tampering and hacking. In a blockchain-based car-sharing scheme, each transaction, including vehicle bookings, payments, and user identity verifications, is recorded in an immutable ledger accessible to all participants. This transparency not only secures user data but also provides an audit trail for transactions, promoting trust among users. Additionally, the use of smart contracts can automate rental agreements and payments, reducing the need for intermediaries and ensuring that terms are fulfilled automatically.

By integrating blockchain, the car-sharing system becomes decentralized and more resilient to cyber threats, while also offering a streamlined and user-centric experience. This technological shift could help overcome the limitations of traditional car-sharing platforms and encourage more people to adopt shared mobility solutions, ultimately supporting sustainable urban transport goals.

CSE09

Real-Time Brain Stroke Detection System Based on CT Images Using Deep Learning

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ABSTRACT

This project focuses on creating a machine-learning solution designed for the early identification of strokes by analyzing brain CT images. The existing system employs a Bidirectional Long Short-Term Memory (BiLSTM) model, which has reached an impressive accuracy of 96.5% in detecting strokes and offering valuable insights to medical professionals. To improve upon this method, we are implementing a Convolutional Neural Network (CNN), recognized for its effective image processing capabilities. This CNN detects significant patterns in CT scans that may suggest stroke conditions, achieving an outstanding training accuracy of 99.00% and a validation accuracy of 98.00%, which highlights its reliability in interpreting complex stroke-related images. Furthermore, we have created an intuitive web interface using Flask, a Python web framework, that enables users to upload CT images effortlessly and receive immediate predictions. This functionality facilitates quick responses without requiring a database or backend server. These advancements aim to boost the overall efficiency of the system and enhance its applicability in actual clinical environments, with OpenCV providing critical support for image preprocessing.

CSE10

Detection and Staging of Breast Cancer

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ABSTRACT

The most prevalent and rapidly spreading disease in the world is breast cancer. Women are most frequently affected by breast cancer and is the second largest illness responsible for women's deaths. Breast cancer can be controlled with early detection. A breast lump, breast form changes, skin dimpling, fluid flowing from the nipple, a newly inverted nipple, or a red or scaly patch of skin can all be indicators of breast cancer. Yellow skin, shortness of breath, enlarged lymph nodes, and bone pain are possible symptoms in those whose disease has progressed far. The Existing System uses lightweight deep convolution neutral network algorithm for breast cancer detection. The Proposed System is designed for breast cancer detection using XG boost classifier and categorize breast cancer into different stages. Identifying the stages of cancer help us to understand how serious the cancer is, guide the best treatment options, and improve the chances of a better recovery for patients.

CSE11

VAE-Driven Cardiac Disease Prediction Using Multimodal Fusion

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ABSTRACT

Cardiac diseases, including Severe Left Ventricular Hypertrophy (SLVH), Dilated Left Ventricle (DLV) and Ejection Fraction (EF) abnormalities, contribute to significant morbidity and mortality worldwide. Early detection and accurate diagnosis are crucial for effective management and improved patient outcomes. Traditional diagnostic methods often rely on single modality data, which may overlook the complex nature of cardiac health. This paper proposes an advanced multimodal deep learning framework that integrates echocardiographic images with CXR structured data and CXR imagery to enhance prediction accuracy. By leveraging the complementary strengths of these diagnostic modalities, the system provides a more comprehensive understanding of cardiac health, aiding early detection of SLVH, DLV and EF abnormalities. The approach uses techniques like Variational Autoencoders (VAEs) for data fusion, EfficientNetB3 for feature extraction, and attention mechanisms like SE-Block and CBAM to focus on clinically relevant features. This framework addresses the limitations of single-modality analysis and enables timely clinical interventions, ultimately improving the management of cardiac diseases.

CSE12

Design for AI-Based Visual Stylist

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ABSTRACT

The AI Visual Stylist is an innovative project leveraging artificial intelligence and computer vision to transform the fashion industry by addressing challenges such as limited personalization, difficulty in understanding consumer preferences, and enhancing user experience. The system provides diverse styling options tailored to different location specific trends and fashion tastes, along with event-specific outfit recommendations for occasions like weddings, interviews, and casual outings. Additionally, it supports cultural and traditional styles to cater to regional fashion preferences. By combining AI-driven visual search, fashion detection, and personalized recommendation systems, the project aims to offer an inclusive and engaging user experience, bridging the gap between fast fashion trends and individual preferences while promoting creativity and innovation in styling.

CSE13

Personalised Cosmetic Dermatology Assistance Using AI

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ABSTRACT

Over the last decade, dermatology has made significant strides through the adoption of artificial intelligence (AI) technologies. While AI has been widely applied in medical dermatology for tasks such as screening and diagnosing serious skin conditions, its potential in cosmetic dermatology remains underexplored. This application highlights the use of AI and ML in beautification and cosmetology through digital skin condition analysis. It employs face scanning to assess skin type and offers options for skin analysis,
treatment recommendations, or cosmetic product suggestions, customized to individual needs and local weather via API integration. A face detection technique based on Multi-Task Cascaded Convolutional Neural Network (MTCNN) segments the face into four regions (forehead, cheeks, nose). A CNN estimates oiliness levels for each region, and ResNet classifies the skin type, enabling precise recommendations for safe, suitable products. By analyzing environmental factors, skin type, and customer preferences, the system delivers personalized and effective solutions to the needs of customer.By bridging the gap between dermatology and environmental context using Open Weather Map, this approach ensures personalized, accurate and customer-centric care in cosmetic dermatology.

CSE14

Smart Canteen: Mobile Solution for Streamlined Food Ordering and Management

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ABSTRACT

The conventional manual processes in food ordering and management in canteens frequently lead to inefficiencies such as prolonged wait times, inaccurate order fulfillment, and challenges in inventory monitoring. This paper introduces a comprehensive mobile application-based smart canteen system designed to address these issues by automating and enhancing the entire food service workflow. Key features of the proposed solution include realtime menu updates, customizable food preferences, seamless digital payment options, and intuitive order tracking. Additionally, the system incorporates advanced data analytics and machine learning algorithms to predict user preferences, optimize inventory management, and minimize food wastage. The Smart Canteen system is built on a scalable cloud-based architecture, ensuring high availability, performance, and robust data security. It also provides an admin dashboard for canteen operators to monitor sales, analyze customer behavior, and streamline operations. By implementing this innovative solution, canteens can significantly improve operational efficiency, enhance customer satisfaction through personalized services, and support sustainable practices by reducing overproduction and waste. The proposed system is not only a step toward digitization but also a model for leveraging technology to address real-world challenges in the food service sector.

CSE15

A Transparent Diagnosis Model for Diabetic Retinopathy and Glaucoma

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ABSTRACT

This project proposes an advanced diagnostic system that simultaneously detects Diabetic Retinopathy (DR) and Glaucoma using CNN architectures like DenseNet-169 and DenseNet-121 on the Google Colab platform. It aims to enhance diagnostic accuracy, provide early detection, and assess severity of the disease, thereby improving the patient's outcome . The system leverages cloud-based computation for scalability,efficiency and uses AI to determine the stage of the disease. The model will be trained and tested on a Kaggle dataset, ensuring comprehensive and reliable performance. In this work, we attempt to develop a computer-assisted tool to classify medical images of the retina in order to diagnose diabetic retinopathy quickly and accurately. A neural network, with CNN architecture, will be used. To train, validate, and test our proposed model, we are going to use a public dataset from the Kaggle website. The proposed model will be trained using 4000 images of normal retinas and 4000 images of abnormal diabetic retinas, and tested using 500 images of normal retinas and 500 images of abnormal diabetic retinas. This is to test the accuracy and efficiency of our system.

CSE16

Wall Crack Detection, Solution Recommendations and Early Mold Detection Using Image Processing

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ABSTRACT

This project presents a comprehensive wall crack and mold detection system, harnessing the power of a Convolutional Neural Network (CNN) to deliver accurate, real-time insights for building maintenance and structural integrity. By leveraging CNN-based advanced image processing and feature extraction techniques, the system can recognize a variety of crack types, such as masonry, shear, and corrosion cracks. Each identified crack type is linked to a specific solution, enabling users to take targeted action to prevent further deterioration. This precise categorization of cracks ensures that building administrators and homeowners can prioritize repairs and address the root causes, thereby reducing long- term costs associated with structural damage. In addition to crack detection, the system incorporates an early mold detection feature. Mold growth, often overlooked, can weaken structural materials, deteriorate indoor air quality, and lead to significant health risks. Early identification of mold enables prompt action, mitigating its spread and minimizing associated remediation expenses.

This dual-function system combines structural health monitoring with preventive maintenance, fostering a safer and more durable environment for occupants. Designed for use in mobile applications, this detection tool offers user- friendly access to a high-precision diagnostic tool, enhancing building resilience and safeguarding investments in both residential and commercial properties.

CSE17

Multimodel Age Estimation and Facial Deficiency Detection Using Voice and Image Analysis

Saritha Naryanan, Muhammad Shasin K, Muhammed Jasil V K, Najiya N P, Shaza Shamsudheen K

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ABSTRACT

Automated age estimation has traditionally relied on facial images, raising privacy concerns among users reluctant to upload personal photographs. In response, we propose a privacy-focused alternative: leveraging voice data for age estimation. This method provides a less invasive solution while maintaining accuracy and applicability across various contexts. Furthermore, for users comfortable sharing images, we enhance age prediction with AI models capable of identifying potential deficiencies (e.g., health indicators or emotional states), providing additional value. This hybrid approach not only addresses privacy concerns but also enriches the utility of AI-driven age estimation. By employing lightweight models suitable for embedded systems, our solution ensures efficient deployment without compromising user privacy or accuracy. To achieve this, we utilize Mel-Frequency Cepstral Coefficients (MFCC) for extracting voice features and Convolutional Neural Networks (CNN) for facial image analysis, both of which are effective in delivering accurate age predictions while remaining computationally efficient.

CSE18

TRIPSTER - An AI Powered Trip Companion

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ABSTRACT

The AI Trip Planner is an innovative travel planning solution that leverages artificial intelligence (AI) to provide personalized, intelligent, and comprehensive travel recommendations. In today's fast-paced world, travelers face a wide variety of options when planning a trip, from selecting destinations and routes to choosing accommodations and activities. The AI Trip Planner addresses this challenge by simplifying the process, offering a seamless and customized travel experience. Using advanced algorithms and machine learning techniques, the system delivers tailored suggestions for trip planning, ensuring that each user receives recommendations aligned with their specific preferences, budget, and travel constraints.

One of the core features of the AI Trip Planner is its route-based planning capability, which customizes travel routes and itineraries. This feature takes into account not only the user's preferred destinations but also their budget, ensuring that travel plans are both cost-effective and efficient. In addition, the AI Trip Planner integrates real-time weather monitoring, allowing the system to recommend destinations based on current weather conditions, thus optimizing the user's travel experience by avoiding unfavorable weather situations.

In addition, the AI Trip Planner incorporates map integration to offer seamless navigation throughout the journey. Users can view detailed routes, access live traffic updates, and find important points of interest, such as restaurants, hotels, and tourist attractions, all from a single platform.

By combining these features, the AI Trip Planner creates a comprehensive suite of travel services that enhance both the planning and execution phases of a trip. The system provides a personalized travel experience, real-time updates, and continuous support, acting not only as a travel planning tool but also as a reliable travel companion.

CSE19

JobSnap: An Automated Resume Rewrite and Applying System

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ABSTRACT

Jobseekers often face difficulties in tailoring their resumes to specific job descriptions and manually applying for multiple roles, which is time consuming and inefficient. To address this, we propose a system that automates the job-seeking process with an easy-to-use approach. Users can upload their resumes, and the system analyzes them to extract key details. It recommends top job positions that match the user's skills and experience and identifies relevant job listings using Naive Bayes Classifier. The system rewrites and optimizes resumes to align with industry standards and specific job requirements with the help of T5(text to text transfer transformer). It automates the process of applying to jobs, saving significant time and effort. By combining resume optimization, job recommendations, and automated applications, our system simplifies and streamlines the job search process for users.

CSE20

BOOST:Beginner's Optimal AI Strength Training

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ABSTRACT

BOOST (Beginners Optimal AI Strength Training) is an AI-powered fitness platform designed to support beginners by providing personalized workout plans, dietary recommendations, and real-time feedback. Utilizing human pose estimation technology, BOOST analyzes body movements and joint angles to ensure proper exercise form, minimize injury risk, and accurately count repetitions. Additionally, its AI-driven dietary guidance system generates customized meal plans based on individual fitness goals and activity levels. By integrating a food scanner powered by convolutional neural networks (CNN), BOOST identifies food items from images, offers nutritional details, and suggests healthy recipes, making meal planning more convenient.

To enhance user experience, BOOST includes an NLP-driven chatbot that delivers real-time assistance, motivation, and answers to fitness-related queries. Its hybrid recommendation system leverages signal processing and machine learning techniques like K-Nearest Neighbors (KNN) to adapt workout and nutrition suggestions to user progress. While challenges like pose estimation inaccuracies persist due to environmental factors and complex movements, BOOST addresses these limitations using advanced computer vision techniques for improved accuracy. Overall, BOOST combines cutting-edge AI technologies to create a comprehensive, user-friendly fitness solution that helps individuals achieve and maintain their health and wellness goals.

CSE21

Typing on An Invisible Keyboard Using Mediapipe and Neural Networks

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ABSTRACT

This paper presents a novel keyboard system that enables contactless typing by tracking and interpreting hand movements on a flat surface. The system, designed to improve hygiene, accessibility and convenience, is particularly suited for shared or mixed reality environments where traditional keyboards are impractical. The system uses a standard camera to capture user finger movements, employing Mediapipe's hand-tracking module to detect precise landmarks. From these landmarks, the system calculates 44 features, including angles and distances, which are fed into a neural network model. The model, trained with a Multi Layer Perceptron architecture, classifies 29 key classes, including the English alphabet, space, backspace, and static hand positions. Upon prediction, the system uses pyAutoGUI to register keystrokes and provides real-time feedback on the screen. This contactless solution offers a portable and adaptable input method, with promising applications in hygiene sensitive environments, public spaces, and mixed reality settings.

CSE22

LAI: A Model for Identifying Various Lung Abnormalities

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ABSTRACT

This project addresses the pressing need for robust frameworks capable of classifying and explaining AI-generated synthetic images, a rapidly growing domain with profound implications across various sectors. In an era marked by the proliferation of AIgenerated content, including deepfakes and synthetic imagery, there is an urgent demand for tools that can discern between authentic and manipulated visuals. The project offers a timely solution by leveraging advanced deep learning techniques and integrating novel features like random rotation data augmentation to enhance model resilience and interpretability. By providing insights into the decision-making process of classification models, the project not only ensures the integrity of digital content but also safeguards against misinformation and manipulation, thereby fostering trust and transparency in an increasingly digital society. In sectors such as media, cybersecurity, and forensics, where the authenticity of visual content is paramount, the project serves as a critical tool for detecting and explaining AI-generated synthetic images, contributing to the preservation of trust and the mitigation of potential harms associated with the proliferation of synthetic media.

CSE23

AI-Driven Monkey Detection and Repelling System for Campus Safety

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ABSTRACT

Animal intrusions pose significant challenges in agriculture and other sensitive areas, leading to property damage and safety concerns. Existing systems rely on passive sensors and sound analysis to identify and repel intruding animals. However, these systems are limited by their range, reliance on sound patterns or external interruptions like wind, rain, etc. which can lead to inaccuracies in animal identification, false alarms, and suboptimal repelling measures. The proposed system enhances this approach by integrating a camera and AI-based image recognition technology. This advanced system detects the presence of animals through visual input, accurately classifies them using AI algorithms, and deploys targeted countermeasures to effectively repel animals. In addition, it incorporates a GSM module to notify authorities of timely intervention, ensuring efficient management. By overcoming the limitations of sound-based systems, this project demonstrates the potential of AI and ML to develop innovative solutions to the challenges of animal intrusion. As an application, this system can be utilized to address monkey intrusions where their behavioral tendencies such as curiosity and aggression lead to conflict in sensitive areas such as college canteens, ensuring campus safety and security.

CSE24

An Alert System to Warn Drivers About Upcoming Overspeed Vehicle in Turning of Two Way Road

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ABSTRACT

This project presents an innovative alert system designed to enhance road safety by warning drivers about the impending approach of overspeeding vehicles on two-way roads, particularly at turns where visibility may be compromised. As traffic incidents frequently occur in these scenarios, the proposed system aims to mitigate the risk of collisions by providing timely alerts to drivers. The system integrates to continuously monitor vehicle speeds and detect oncoming traffic conditions. When an over speeding vehicle is identified approaching a turn, the system generates an alert that is communicated to nearby drivers through visual signals. This proactive warning mechanism enables drivers to make informed decisions, thereby reducing the likelihood of accidents. The effectiveness of the alert system was rigorously tested in various driving scenarios, simulating real world conditions to evaluate its reliability and responsiveness. Initial results indicate a significant reduction in potential collision risks, demonstrating the system's capability to enhance situational awareness for drivers. Additionally, the project explores the potential for integration with existing traffic management systems, further emphasizing the need for smart technologies in transportation safety. By contributing to the growing field of intelligent transportation systems, this project paves the way for further advancements in road safety technologies, ultimately aiming to create safer driving environments and reduce the incidence of traffic-related injuries and fatalities.

CSE25

An AI-Powered AR Game Platform for Hand-Drawn Sketch Recognition

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ABSTRACT

Augmented Reality (AR) systems like Google's Quick, Draw! and Microsoft's Azure Spatial Anchors have advanced in using computer vision and AI for interactive applications. However, these platforms face challenges in recognizing user drawings accurately due to variations in sketch styles, lighting conditions, and inconsistent rendering. Additionally, they often have steep learning curves, which impact user experience and accessibility. The main challenges of current systems include variability in user sketches, poor performance under different lighting, and non-intuitive interfaces, leading to frustrations like delayed responses and inaccurate recognition. These issues make existing systems less effective, especially when dealing with complex drawings in real-time. A comprehensive system is proposed that combines deep learning-based feature extraction, AR frame detection, AR rendering, game physics, and real-time processing. It also integrates mobile AR control synchronization and AI-powered hand gesture recognition. This platform enables users to play games like Sudoku, block games, and snake games from hand-drawn images, providing a seamless, real-time experience by combining computer vision, deep learning, and AR.

CSE26

A Survey of Advanced Strategies for Brand Protection in the Digital Landscape

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ABSTRACT

In the digital age, brands face a multitude of attacks that threaten their integrity and consumer trust. Brand protection is becoming increasingly important as businesses face a range of digital threats, including fraudulent websites, counterfeit products, and disinformation, all of which undermine consumer trust. Traditional AI-based solutions often struggle to keep up with the evolving nature of these threats. Many researchers are actively working to develop various detection and prevention techniques. This paper surveys existing brand protection methods, analyzing their effectiveness and limitations. It also provides a comparative evaluation of these solutions, highlighting the challenges that remain in effectively addressing the complexities of brand security in the digital age.

CSE27

Cookify: An Innovative Food Recipe Recommendation System Based on Regional Raw Ingredients

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ABSTRACT

In this study, a recipe recommendation system that makes recommendations based on input items, cuisine, and undesirable ingredients is examined. Human needs variety of nutrients from food to support their health, including several nutrients. So we introduce Cookify, pre-processes and analyzes a dataset of over several recipes using natural language processing in conjunction with additional machine learning approaches. By lemmatizing the ingredients, and transforming the ingredient lines to a list of ingredients, the dataset was cleaned and pre-processed. Cosine similarity was then used to evaluate the resultant dataset and determine pairwise similarities among all of the recipes. The best recipes were suggested according to textual or audio input. The system was developed using Python and several libraries, including Flask, Pandas, NumPy, NLTK, and Scikit-learn. The findings demonstrate that the system offers precise recipe suggestions and it's user reviews, enhancing the user experience for both recipe search and discovery.

CSE28

AI-Based Efficient Emotion Detection and Music Recommendation System

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ABSTRACT

In recent times, user experience is an important priority for users before using any music product and services, and also we live in a society where stress and mental health problems are prevalent. With the development and operation of big data, deep learning has taken more and more attention. As deep learning neural network, a convolutional neural network plays an extremely important part in face image recognition. In this proposed system, a combination of expression recognition technology of an convolutional neural network (CNN) with Haar Cascade algorithm and automatic music recommendation algorithm is developed to identify a model that recognizes facial expressions and recommends music according to corresponding mood.

The facial expression recognition model uses the Jonathan Oheix image dataset, comprises two separate folders specifically allocated for training and testing. After relating the matching expression, a content- grounded music recommendation algorithm is used to prize the point vector of the song and a cosine similarity algorithm is used to make the music recommendation. The users can also interact with an intuitive voice assistant that generates unique music suggestions through the use of personalized conversations with users. This exploration helps to ameliorate the practicality of the music recommendation system, and the affiliated results will also serve as a reference for the operation of the music recommendation system in areas similar as emotion parameter. By this system user experience can be enhanced and mental health monitoring can be done, and offers evidence that technology can enhance the quality of life.

CSE29

AI-CrowdStock: Smart Crowd Detection for Dynamic Stock Management

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ABSTRACT

This project proposes an innovative AI-driven framework for optimizing supermarket operations through real time crowd and customer behavior anal ysis. The system integrates advanced deep learning models, such as Convolutional Neural Networks (CNNs) and Gated Recurrent Units (GRUs), to monitor crowd density at strategic locations within the store. To enhance detection accuracy, Contrast Limited Adaptive Histogram Equalization (CLAHE) is employed for image preprocessing, while hyper parameter optimization is achieved using the Marine Predator's Algorithm (MPA) and the Chaotic Sooty Tern Optimizer.

Beyond crowd density monitoring,the system incorporates a novel feature to analyze customer actions involving product interactions. By detecting when customers return products to shelves and identifying the reasons such as dissatisfaction with the product or high pricing the framework enables dynamic adjustments. For instance, it can recommend price modifications or product improvements to increase sales and enhance customer satisfaction.
This real time decision making capability ensures optimal stock levels for popular products and provides actionable insights into customer preferences. The proposed solution demonstrates the potential of AI in transforming supermarket operations, paving the way for smarter inventory management and personalized shopping experiences.

CSE30

Real -Time Surveillance and Trespasser Classification on Railway Platforms

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ABSTRACT

Ensuring passenger safety and reducing railway platform accidents remain crucial. Traditional radar-based monitoring systems struggle with low spatial resolution, object differentiation, and reduced accuracy in crowded settings. We aim to address these challenges by introducing an advanced platform monitoring system using YOLOv8. The system detects unsafe behaviors, such as crossing safety lines, with superior object recognition, distinguishing humans from inanimate objects and identifying railway staff by uniforms or accessories. Incorporating YOLOv8 with SSD and RNN models allows for precise object detection, continuous tracking, and accurate prediction of movement patterns. Compared to radar-based methods, this system offers higher accuracy, faster response times, and adaptability to crowded or dynamic conditions. Key features include context-aware alerts, real-time multi-object tracking, and seamless CCTV integration. By leveraging AI driven detection and deep learning, this system enhances railway platform safety and minimizes risks.

CSE31

Time Table Management System

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ABSTRACT

The College Timetable Management System is designed to simplify the scheduling process for academic institutions. It automates the creation and management of timetables for courses, classrooms, and instructors. The primary goal of the system is to efficiently allocate resources, prevent scheduling conflicts, and optimize the use of available facilities. By doing so, the system helps to streamline administrative tasks and minimize errors that can arise from manual scheduling.

The system allows administrators to input various details, such as course data, instructor availability, and room constraints. Using these inputs, it generates conflict-free times tables based on predefined rules and preferences. This functionality ensures that scheduling issues are avoided, creating a smooth and predictable timetable that meets the needs of both instructors and student

Additionally, the timetable is made easily accessible to both students and faculty, promoting transparency and convenience. This feature enhances productivity by reducing the manual effort involved in timetable creation and ensuring that the entire scheduling process is more efficient. Ultimately, the College Timetable Management System improves the educational experience for all stakeholders, creating a more organized and effective learning environment.

CSE32

Exam Cell Automation System

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ABSTRACT

Project is developed for the college, to simplify examination hall allotment and seating arrangement manual work. It facilitates to access the examination information of a particular student in a particular class. The purpose of developing this seating arrangement system is to provide a way to allocate exam hall for each student without any clash. Mostly students are facing many problems for finding the exam hall, so a newly invented concept helps for the staffs to generate their exam hall arrangement easily. This project also allocates particular invigilator for particular hall. It is also very useful for the college where the software may generate the hall separation and concerned reports. Hence manual Excel sheet and paper work is automated based on their departments and register numbers.

CSE33

Dance Pose Detection and Correction Using Human Pose Analysis, Computer Vision and MediaPipe : A Review

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ABSTRACT

Being one of the oldest art forms in human history dance is an art form that originates from labor and is expressed with the help of body movements. These movements portray the dancer's emotions that the dancer wants the audience to understand. With the occurrence of the global pandemic of 2019, it was observed that there has been an increase in the adoption of online learning mediums for a wide range of resources including dance. As online learning markets got popular more dancers switched from traditional offline learning to online learning, however it is difficult for ordinary online classes to meet the requirements expected of a dance teacher. Also, the platform lacks the ability to capture accurate data about dance movements through video alone thus making it tough to gain insights into the dance features. Another demerit is the lack of interactive feedback and accurate assessment of the dance routine. Therefore, we decided to develop a system that overcomes these limitations by providing real-time detection and feedback generation. This study intends to provide an overview of the various approaches adopted to tackle this problem which includes the use of deep learning frameworks, neural networks, pose estimation algorithms, computer vision libraries and pre-built models of Mediapipe library.

CSE34

Smart Bus System: A Technological Approach to Public Transport Optimization

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ABSTRACT

With the increasing demand for efficient public transportation, smart bus systems are emerging as a solution to improve commuter experience and operational efficiency. This paper presents a comprehensive smart bus system integrating real-time tracking, automated ticketing, secure mobile payments, and passenger occupancy estimation. The system ensures seamless fare deduction, real-time passenger information, and IVR-based assistance for senior citizens. The proposed solution enhances accessibility, security, and efficiency in urban transport networks.

CSE35

A Review of Smart Traffic Management Systems Using Deep Learning and Edge Computing

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ABSTRACT

As cities grow and traffic becomes more complex, traditional traffic management systems struggle to keep up. This review explores recent advancements in smart traffic management systems that combine deep learning, edge computing, and IoT technology to create a real time adaptive system. Deep learning models, capable of real time vehicle detection and traffic flow prediction, help traffic systems make smarter, quicker decisions. By processing data directly on edge devices near traffic sources, edge computing reduces delays, which is especially crucial for prioritizing emergency vehicles in busy intersections. IoT adds connectivity between traffic signals, vehicles, and control centers, enabling real time adjustments that can smoothen the traffic flow and reduce congestion. Through examining the latest research, this paper identifies trends in smart traffic technology, outlines current challenges, and suggests future directions. Overall, the findings highlight how integrating intelligent models and localized computing can build the next generation of urban traffic systems that are more efficient, safe, and adaptable to any complex conditions.

CSE36

Real-Time Air-Writing Calculator Using Mediapipe and CNN

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ABSTRACT

In today's technology-driven world, there is a growing need for touchless and intuitive input methods, especially in environments where physical contact with devices is either impractical or undesirable. This project introduces a touchless air-writing calculator that allows users to write mathematical expressions in the air and receive real-time solutions. The system uses MediaPipe for hand identification and gesture tracking, and Convolutional Neural Network (CNN) for processing and translating gestures into mathematical equations and Python libraries for mathematical evaluation. Users draw numbers and operators in the air, which are processed and evaluated dynamically. By offering an innovative, hands-free alternative to traditional input devices, this project enhances usability in contexts such as smart environments and educational tools. This hand-free system offers a natural intuitive, and efficient approach to mathematical problem-solving, enhancing accessibility and user experience.

CSE37

Integrating Human Activity Recognition and Affective Computing for Elderly Well-Being: A Comprehensive Review

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ABSTRACT

This review explores the integration of Human Activity Recognition (HAR) and affective computing to improve elderly care. Affective computing evaluates emotional states using behavioral and physiological cues, while Human Activity Recognition systems use sensors and machine learning to track behaviors like walking and sleeping. When these technologies are combined, both mental and physical safety are guaranteed. This review paper explores state-of-the-art HAR techniques, including sensor-based and vision-based approaches, and advances in deep learning for emotion recognition. Multimodal data fusion strategies are examined to enhance robustness and accuracy. Key applications, such as fall detection, stress monitoring, and personalized interventions, are highlighted. The paper also addresses critical challenges, including data privacy, ethical considerations, and the need for interpretable models suitable for real-world deployment.

CSE38

Sustainable Maritime Route Optimization Using Machine Learning: A Comprehensive Review

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ABSTRACT

Maritime transport is a critical pillar of global trade but is also a significant contributor to carbon emissions. Sustainable shipping necessitates optimizing voyage routes to minimize fuel consumption and emissions while ensuring safe and efficient navigation. Recent advancements in machine learning (ML) have introduced data-driven solutions for maritime route optimization, leveraging vast datasets to improve predictive accuracy and operational efficiency. This review explores the application of deep learning, reinforcement learning, and hybrid AI models in optimizing ship navigation.

This paper examines methodologies such as transformer-based weather data models, convolutional neural networks (CNNs), and three-dimensional dynamic programming (3DDP) for precise route planning and fuel efficiency improvement. Additionally, we discuss the role of real-time weather forecasting, AIS data, and onboard sensor analytics in enhancing adaptive decision-making for fuel consumption and emissions reduction. Drawing on recent studies, including deep learning-based weather data reconstruction and energy-saving methods for ship routing, we highlight the integration of AI-driven models with traditional dynamic programming and heuristic algorithms. The findings underscore the potential of ML-driven, multi-objective route optimization frameworks in achieving the International Maritime Organization (IMO) goal of net-zero emissions by 2050. Future research should focus on integrating real-time meteorological risk assessment, reinforcement learning for dynamic routing, and collaborative AI frameworks to advance the sustainability of maritime transport.

CSE39

Machine Learning-Driven Pattern Recognition for Respiratory Disease Detection Using Spirometry Data and Hybrid SVM-KNN-CNN Models

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ABSTRACT

Respiratory illnesses, including chronic obstructive pulmonary disease (COPD) and other pulmonary conditions, are among the most widespread health challenges worldwide, highlighting the urgent need for advanced diagnostic systems. Early detection of COPD is crucial for establishing timely therapeutic strategies and personalized patient care. Epidemiological data on COPD and its severe impact on patient's health emphasize the need for advanced diagnostic tools. Traditional diagnostic methods may lack the precision required to detect early-stage COPD or to distinguish it from other respiratory diseases. This research aims to develop an adaptive and precise model for analyzing pulmonary audio data along with X-ray image to facilitate early COPD diagnosis. The goal is to enhance diagnostic accuracy by leveraging advanced machine learning techniques and feature extraction methods. In this study, Mel-Frequency Cepstral Coefficients (MFCCs) are used for feature extraction from pulmonary sound recordings. To address challenges related to dimensionality and computational complexity, Forward Feature Selection (FFS) is applied to identify the most relevant features. The classification approach synthesizes an SVM-KNN fusion model along with CNN-based models to reveal intricate patterns and boundaries in the data, making CNN useful for respiratory diagnostics. The COPD disease dataset serves as the foundation for all modeling and testing processes. X-ray images are collected and trained using CNN models. The implemented SVM-KNN-CNN fusion model in Python demonstrated exceptional performance, achieving an accuracy of 95% or greater. This level of accuracy highlights the model's capability to effectively differentiate between healthy and COPD-affected lungs. The developed framework significantly enhances the detection of COPD and the assessment of respiratory illness risk in patients. CNN-based models can significantly enhance COPD detection from lung X-rays, offering a non-invasive, fast, and cost-effective diagnostic tool. However, it should complement clinical tests like spirometry and physician expertise for accurate diagnosis.

CSE40

Exercise Detection and Correction Using Computer Vision and MediaPipe: A Review

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ABSTRACT

Being a very vital aspect of keeping one's body fit and healthy, exercise relies on correct body movements to obtain the intended outcome without any kind of injuries. Online training platforms for exercise and fitness have become highly popular in today's times due to their easy access and user-friendliness. However, such platforms often fail to provide the type of personal feedback, exact movement analysis, and engaging tests that are generally provided by conventional in-person training sessions. Since it is hard to ensure proper form in exercises because of this gap, it can neither be as effective nor as safe. This paper introduces Matrix, a state-of-the-art platform that incorporates the latest technology to accurately establish and analyze workout movement to evade the constraints stated above. Matrix uses 2D and 3D pose estimation techniques to ensure excellent motion tracking by the use of advanced algorithms that include CNN and RNN. To remove these limitations, this paper will present Matrix, which is a high-end platform that uses the most advanced technologies to provide the proper identification and analysis of exercise movements. Matrix will help in accurate motion tracking and over-excessive movement detection with the use of state-of-the-art algorithms like CNN and RNN along with 2D and 3D pose estimation approaches.

The platform recasts the definitions of online training in fitness with the help of powerful tools and libraries to carry out extensive analysis, real-time correction, and detailed feedback towards enhancing user involvement and safety.

CSE41

Vitamin Deficiency Prediction System

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ABSTRACT

Vitamin deficiencies are a prevalent health concern affecting millions worldwide, often leading to severe complications if left undiagnosed and untreated. Traditional diagnostic methods involve blood tests and clinical assessments, which can be costly, invasive, and inaccessible to many. To address this issue, the Vitamin Deficiency Prediction System presents an advanced, non-invasive, and cost-effective solution utilizing deep learning technology. This system leverages Convolutional Neural Networks (CNNs) to analyze images of specific body parts—such as lips, eyes, skin, tongue, and nails—where vitamin deficiencies typically manifest as visible symptoms. By detecting these physiological signs, the model classifies deficiencies in six essential vitamins: A, B, C, D, E, and K. The dataset used for training the model was meticulously curated through extensive research from trusted medical sources, ensuring reliable classification based on medically recognized symptoms. Image preprocessing techniques, including resizing, normalization, and augmentation (random flipping and rotation), were employed to improve model robustness and generalization. The system was trained using a dataset split into 70% training, 10% validation, and 20% testing, with Sparse Categorical Crossentropy as the loss function and Adam optimizer for optimal performance. Evaluation metrics such as accuracy, loss analysis, confusion matrices, and precision recall scores were used to assess the model's effectiveness. The trained model is stored as an H5 file, making it suitable for integration into mobile applications, web-based platforms, and healthcare management systems. This system aims to provide early detection of vitamin deficiencies, empowering individuals to take proactive measures to improve their health. The project paves the way for further enhancements, including an expanded dataset, higher accuracy models, and additional biomarkers to refine predictions. The Vitamin Deficiency Prediction System demonstrates the transformative potential of artificial intelligence in healthcare, offering an innovative approach to preventive medicine and public health awareness.

CSE42

Malware Analysis in IoT Devices

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ABSTRACT

Malware detection in IoT devices is challenging due to resource constraints and evolving threats. This study enhances classification performance using Linear Discriminant Analysis (LDA) and Firefly Optimization for feature selection. In Phase 1, models like Decision Tree, Random Forest, and Gaussian Na¨ıve Bayes showed lower F1-scores due to redundant features. Phase 2 improved performance, with Decision Tree and Random Forest excelling on LDA-transformed data, while Firefly Optimization enhanced Gaussian Na¨ıve Bayes. Results show that optimized traditional ML models achieve high accuracy with lower computational costs, offering an efficient solution for IoT malware detection.

CSE43

Carbon Dioxide Emission Prediction Using Machine Learning

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ABSTRACT

CO_2 emissions are a key driver of climate change, making it a critical global challenge. Accurate forecasting of CO_2 emissions is essential for policymakers and industries to implement effective mitigation strategies. This study explores machine learning and time series forecasting methods for predicting CO_2 emissions globally, by country and within the industrial sectors. Specifically, the ARIMA model is used for time series forecasting, while Random Forest is employed for predictive modelling based on key features. The models are trained and evaluated using historical emission data to assess their predictive accuracy and effectiveness. A comparative analysis highlights the strengths and limitations of these methods in emission forecasting. The findings of this study aim to support data-driven decision-making in climate policy and industrial sustainability initiatives.

CSE44

Animal Detection and Deterrence System

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ABSTRACT

Human-wildlife conflicts have become a growing concern, necessitating effective early warning systems to prevent potential harm to both humans and animals. This paper presents a machine learning-based Animal Detection and Deterrence System that utilizes TensorFlow's Inception v3 model for real time and pre-recorded video analysis. The system extracts frames using OpenCV and processes them through the trained Inception v3 model to identify animals. A key feature of the system is its ability to classify detected animals as either wild or domestic, ensuring that alerts are generated only for wild animals. Upon detection of a wild animal, the system triggers an alert sound to deter the animal and sends email notifications to forest officials. Additionally, a mobile application notifies users about sightings, enhancing situational awareness. The dataset for training the model is compiled from Google and Kaggle, covering various wild animals such as lions, tigers, bison, elephants, bears, and leopards, along with domestic animals like cats and dogs. The dataset is divided into training, testing, and validation subsets to improve model accuracy. This system aims to minimize human wildlife conflicts by providing timely alerts and deterrence measures, leveraging deep learning techniques for enhanced wildlife monitoring and safety.

CSE45

Student Engagement Detection in E-Learning

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ABSTRACT

This paper introduces a novel e-learning engagement system using multimodal analysis of student behaviour. By monitoring eye closure, head pose, and emotional expression, the system infers student attention levels. Critically, it employs randomly timed alerts that require active student response via an "I am listening" button, mitigating passive alert habituation. Initial findings indicate the potential for improved student engagement and learning outcomes.

CSE46

Optimized BB84 Implementation Using Qiskit for Enhanced Key Retention

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ABSTRACT

This study presents a Qiskit implementation of a modified BB84 quantum key distribution protocol. The original BB84 suffers from efficiency losses and requires public announcements of bases. Our approach eliminates the need for announcement and aims to improve the key retention rate from 50% to 100%. We have implemented this using the Qiskit library and the IBM Quantum Computing Platform with the help of HMAC-based on PRFs.

CSE47

A Machine Learning Approach to Fish Freshness and Recipe Recommendation

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ABSTRACT

Ensuring the freshness of fish is crucial for seafood consumers, as traditional methods based on sensory perceptions like smell and sight can be subjective and inconsistent, posing potential health risks. This paper introduces a mobile app that leverages the YOLOv8 (You Only Look Once) model to assess fish freshness in real-time through image analysis, specifically focusing on the fish's eye and its colour. By simply taking or uploading a picture of the fish, users receive instant, objective feedback on its freshness, assisting in informed purchasing decisions. The app also includes a personalized recipe recommendation feature, offering meal suggestions based on user preferences, including dietary requirements and cooking time. A customer review system allows users to rate seafood vendors on freshness and service, fostering marketplace transparency. This combination of features promotes safer seafood buying and enhances the cooking experience for consumers.

CSE48

EcoMap: A Citizen Science Approach to Biodiversity Mapping

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ABSTRACT

EcoMap is a mobile application that will bridge the gap between nature enthusiasts, researchers, and conservationists. Users can capture images of animals, plants, and other species during their travels and upload them with precise geolocation data. Once submitted, the images are reviewed by biodiversity experts who identify the species and update the data on an interactive heatmap. This map provides a dynamic visualization of biodiversity, fostering a deeper understanding of local ecosystems.

EcoMap promotes citizen science and community engagement through user participation in documenting biodiversity. Its features include real-time geotagging, draft saving even without an internet connection, and expert validation of information for accuracy, as well as user convenience. Future development would involve AI-driven species recognition and advanced data analytics, thus broadening its applicability for researchers and conservationists. In its quest to empower people to be part of the biodiversity preservation efforts, EcoMap offers a scalable, user-friendly platform that aids informed decision-making in conservation.

CSE49

PhenoDX AI

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ABSTRACT

Since the discovery of Facial Dysmorphology Novel Analysis (FDNA) by FDNA Inc, there has been a new wave of phenotyping tools that help in the accurate diagnosis of many rare diseases like Noonan Syndrome, CdLS etc. The idea behind the software is to leverage advanced ML algorithms as the system analyzes facial phenotypes to identify patterns related to genetic conditions, ability to provide cost effective, accurate and swift
diagnosis can uplift the healthcare sector.

CSE50

An Innovative Autoencoder-LSTM Framework Employing Attention Mechanism for Real-Time Network Anomaly Detection in Wireless Sensor Networks

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ABSTRACT

Anomaly detection is the process of identifying patterns or data points that significantly deviate from normal behavior in a dataset, often indicating errors, fraud, or cybersecurity threats. In wireless sensor networks (WSNs), anomaly detection is crucial for identifying potential cyber threats such as denial of service (DoS) attacks, intrusion attempts, and unauthorized access. Conventional intrusion detection systems (IDS), which rely on signature-based methods, often struggle to detect zero-day attacks and require frequent updates to remain effective. Additionally, existing machine learning (ML)-based approaches face challenges in handling high-dimensional traffic data, adapting to dynamic network patterns, and minimizing false alarms.

To address these limitations, this study proposes a novel autoencoder-long short-term memory (LSTM) framework with an attention mechanism for real-time anomaly detection in WSNs. The model utilizes autoencoders for feature selection and dimensionality reduction, while the LSTM network processes sequential dependencies in network traffic. The attention mechanism enhances interpretability by prioritizing critical characteristics. The proposed framework is evaluated on three benchmark datasets: KDDCup99, CICIDS2017, and UNSW-NB15, achieving an accuracy of 98.25% on UNSW-NB15, 96.93% on KDDCup99, and 97.86% on CICIDS2017. The results confirm the efficacy and robustness of the model in detecting anomalies while maintaining a low false positive (FP) rate. This study highlights the potential of deep learning (DL)-based IDS in securing WSNs, ensuring real-time threat detection with minimal computational overhead.

EC01

Pillport: An IoT Based Automated Medicine Dispenser

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ABSTRACT

The demand for efficient medication dispensing systems in public spaces, particularly in rural areas, remains a significant challenge. This paper presents an innovative IoT-based Automated Medicine Dispenser designed to address these challenges by automating the medication distribution process.The system integrates advanced technologies, including RFID,mobile applications, and automated dispensing machines, to ensure accurate and efficient medication delivery. Doctors and patients register on the app, after which patients are issued unique RFID cards. During consultations, doctors enter prescriptions, which are securely transmitted to a central backend system. Patients can then visit a dispensing machine, insert their RFID card for identity verification, and receive their prescribed medication. The system is designed with accessibility in mind, incorporating voice assistance through the app to guide users with limited technical knowledge. The machine operates sustainably using solar power, ensuring reliable functionality in areas with limited electricity. Additionally, patient data is securely stored to maintain privacy and confidentiality. The system also features a web-based interface that allows patients to request assistance, ensuring comprehensive support. This automated solution offers a scalable and sustainable approach to improving healthcare access, efficiency, and medication management in rural and underserved communities.

EC02

An IoT Water Monitoring,Treatment and Feeding System

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ABSTRACT

The system utilizes a network of sensors to continuously monitor key water parameters such as pH, ammonia levels, dissolved oxygen, temperature, and nutrient concentrations. Data collected by these sensors are processed in real-time using a microcontroller and transmitted to a central control unit for analysis and decision-making. Automated actuators and dosing systems are employed to adjust pH levels, nutrient dosages, and oxygenation based on sensor readings and preset thresholds.Furthermore, the system incorporates feedback loops to optimize feeding schedules and nutrient supplementation, ensuring balanced nutrition for both plants and fish while minimizing waste. This holistic approach not only enhances the health and growth of crops and fish but also improves overall system efficiency and sustainability.The integration of smart technologies in aquaponic systems not only addresses environmental concerns associated with conventional farming practices but also promotes resource efficiency and food security. Future advancements could focus on enhancing system scalability, integrating advanced data analytics for predictive maintenance, and expanding applicability in diverse agricultural and aquacultural settings.

EC03

IoT Based Smart Waste Management System

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ABSTRACT

Waste management remains a significant environmental challenge, demanding sustainable and intelligent solutions to minimize landfill dependency and promote resource recovery. This paper presents an IoT-Based Smart Waste Management System that integrates real-time monitoring, automated waste segregation, and efficient waste disposal techniques, ensuring a closed-loop approach to waste management. The Smart Waste Bin is designed with dedicated compartments for plastic, biodegradable waste, glass, and metal, enabling systematic segregation at the source. Ultrasonic sensors monitor the bin's fill levels, while gas sensors detect harmful emissions, including methane (CH_4) and ammonia (NH_3). An automated venting system ensures safe gas release, while a shredding mechanism reduces the volume of plastic and biodegradable waste, improving recycling efficiency. The bin is solar-powered, ensuring energy sustainability, and transmits real-time data on waste levels, gas emissions, and system status via Wi-Fi/GSM to a central monitoring platform. This data-driven approach enables municipalities to optimize waste collection schedules and implement timely interventions. Beyond collection and segregation, the system ensures responsible waste disposal by employing innovative processing techniques to maximize resource recovery.By integrating IoT-driven waste monitoring with effective waste treatment methodologies, this self-sustaining smart waste management system not only enhances waste collection efficiency but also ensures environmentally responsible disposal. The proposed solution aligns with global sustainability goals, reducing landfill usage while fostering a cleaner, resource efficient ecosystem.

TRACK ID: ECE ELECTRONICS AND COMMUNICATION ENGINEERING

EC04

ARMS:Automatic Ration Shop with RFID based Ration Card and IoT

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ABSTRACT

This paper aims to modernize the distribution of essential commodities like rice and kerosene by integrating automated dispensing with real-time inventory monitoring. Utilizing RFID- based ration cards for user authentication and quota verification, the system pulls data from Firebase IoT server. Once authenticated, rice is dispensed through a stepper motor-driven auger screw, while kerosene is released via a flow sensor-controlled solenoid valve, ensuring precise quantities. An IR proximity sensor detects containers to trigger dispensing, complemented by real-time stock notifications that alert administrators to low supplies. Users interact with a touchscreen interface and voice assistance for guided instructions. ThisIoT-enabled automated ration shop enhances transparency, accuracy, and user experience by minimizing manual intervention, ensuring efficient tracking and replenishment of inventory, and reducing stockouts and unauthorized access. By integrating RFID technology, interactive screens, and voice support, the system promotes digitalization in public distribution, providing a reliable and efficient method for commodity distribution.

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EC05

The Infant Guard: AI -Powered Smart Baby Monitoring System

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ABSTRACT

The Infant Guard is an Intelligent baby monitoring system that solves the vital challenges of infant care in contemporary homes. Conventional monitoring systems tend to lack real-time, all-around data crucial for guaranteeing infant safety and well-being. The system combines cutting-edge technologies, to offer round-the-clock monitoring of an infant's activity, sleep habits and surroundings. Some of its major features are posture detection, environmental monitoring, intrusion detection and cry analysis-all driven at its core by a Raspberry Pi 4B-and Tensor Flow is utilized for the image analysis that it employs in identifying abnormal sleep patterns and unsafe postures, providing the caregivers with real-time alerts on the web application. There are DHT22 sensors, PIR motion sensors, ultrasonic sensors and sound sensors for safety and comfort. The project demonstrates remarkable advances over existing systems in the area of functionality gaps, e.g., inability to predict patterns or risks beforehand. Aside from securing the infant, this solution alleviates parental stress and enhances parenting. It is scalable and can be used in larger applications in childcare facilities and health care facilities, hence potentially influencing public health policy. The Infant Guard is a futuristic design that signifies the future of childcare technology to provide parents with peace of mind and aid healthy infant development.

EC06

Smart Garden System

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ABSTRACT

This paper presents an advanced Internet of Things (IoT)-enabled smart garden system aimed at optimizing plant care while providing enhanced protection against wildlife intrusion.The system integrates intelligent irrigation through real-time soil moisture and pH monitoring,ensuring precise water management and continuous monitoring of plant health. Temperature sensors are incorporated to track environmental conditions, enabling dynamic and adaptive irrigation strategies.Additionally, an animal intrusion detection system is implemented, utilizing a laser diode,LDR module, and microwave radar sensor to provide timely alerts for prompt preventive actions. The system is designed with IoT connectivity to enable remote monitoring and real-time notifications, ensuring users are promptly informed of critical events, such as animal disturbances or irrigation failures. A dedicated mobile application facilitates user interaction, allowing for remote monitoring and control of the system.By combining automation, real-time data insights, and proactive protection, this smart garden system significantly enhances plant care efficiency and safeguards against external threats.

TRACK ID: CE **CIVIL ENGINEERING**

CE01

Waste Water Treatment by Using Adsorbent: Combining Rice Husk and Zeolite

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ABSTRACT

In response to the growing global concern over water pollution, this study investigates the potential of rice husk and zeolite as low-cost, sustainable adsorbents for wastewater treatment. Rice husk, an abundant agricultural waste product, and zeolite, a naturally occurring aluminosilicate mineral, were evaluated for their effectiveness in removing a variety of contaminants from wastewater, including heavy metals, organic compounds, and excess nutrients. The research focused on optimizing several critical parameters such as pH, temperature, contact time, and adsorbent dose through batch adsorption experiments. The results revealed that rice husk demonstrated significant potential for removing organic pollutants, while zeolite exhibited excellent efficiency in adsorbing metal ions through ion-exchange mechanisms. Comparative studies showed that the combined use of these two materials led to enhanced adsorption capacities, outperforming individual materials in terms of contaminant removal. Additionally, the materials were found to be environmentally friendly, cost effective, and capable of being sourced locally, thus offering a sustainable solution for wastewater treatment in developing regions. The findings highlight the importance of utilizing agricultural waste and naturally available minerals as viable alternatives to traditional treatment methods, contributing to both environmental conservation and the reduction of industrial treatment costs. This study underscores the potential of rice husk and zeolite as a practical solution to address the growing challenges of wastewater management.

Keywords: Zeolite, Rice Husk, Wastewater Treatment.

TRACK ID: CE **CIVIL ENGINEERING**

CE02

Partial Replacement of Coarse Aggregate by Waste Ceramic Tiles in Concrete

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ABSTRACT

Natural aggregates have risen dramatically as a result of increasing growth and innovation in the building field around us, and the production of solid waste from demolitions of structures has also expanded significantly. Restricted supply of natural aggregate and to minimize building waste, this waste material should have been repurposed. So much ceramic is seen throughout the building and development process, such as electric insulators, sanitary fittings, ceramic tiles, uneven bricks, and so on, yet these materials are readily reused in the construction field. Ceramic waste tiles may be used as a fine aggregate in the same way as ceramic tiles can be used as a partial substitute for coarse aggregate. In various percentages of the coarse aggregates were substituted with waste ceramic tiles. The mix design for M25 concrete mix was created by substituting broken ceramic tiles for coarse aggregates and cement at various percentages. Compressive strength and flexural strength test with varying percentages of ceramic waste tiles after 7 and 28 days of curing time have been carried out. It has been discovered that when the proportion of shattered tiles replaced rises, the workability improves. The strength of concrete is increased by up to 10% when ceramic coarse tile aggregate is used.

Keywords: Crushed tiles, Ceramic waste tile, and partial replacement.

TRACK ID: CE **CIVIL ENGINEERING**

CE03

Stabilization of Oil Contaminated Soil by Using Wheat Straw Powder

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ABSTRACT

Soil contamination due to oil spills presents a critical environmental challenge, impacting soil health, water quality, and biodiversity. This study explores the potential of wheat straw powder as a stabilizing agent for stabilizing oil contaminated1 soil. Wheat straw, a widely available agricultural residue, is examined for its ability to enhance soil properties. Wheat straw powder contains pozzolanic compounds that readily react with the oil contaminated soil in a bid to improve the engineering performance of soil. In their natural states, the soil samples were subjected to following laboratory tests, using standard procedures; Specific Gravity, Sieve Analysis, Atterberg's Limit, Water Absorption, Compaction Unconfined Compression (UCC) test, Hydrometer, Organic content, pH and Direct shear test. The wheat straw powder was added to the soil samples in 2%, 4%, 6% and 8%. In laboratory experiments, oil-contaminated soil samples were treated with varying proportions of wheat straw powder, were monitored over a specified period (7 days). This research underscores the viability of using wheat straw powder as an effective, sustainable, and cost-efficient for oil-contaminated soils, paving the way for its application in environmental restoration efforts.

Keywords: Wheat Straw Powder, Oil Contaminated Soil, Soil Stabilization.

TRACK ID: CE **CIVIL ENGINEERING**

CE04

Analysis of Microplastics in Waste Water Treatment Plant and its Disposal

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ABSTRACT

Microplastics, defined as plastic particles less than 5 mm in diameter, have become pervasive environmental contaminants, presenting significant challenges to wastewater treatment plants (WWTPs) and waste disposal systems. This study provides a comprehensive analysis of the presence and management of microplastics in WWTPs, focusing on their behavior during treatment processes and subsequent disposal strategies. Microplastics enter wastewater through various sources, including household products, industrial activities, and environmental runoff. Upon entering WWTPs, these particles are subjected to multiple treatment stages: primary (screening and sedimentation), secondary (biological treatment), and tertiary (advanced treatment technologies). However, conventional treatment methods are generally insufficient to fully remove microplastics, resulting in their accumulation in the treatment sludge. This study explores a novel method for managing microplastics by incorporating it into bitumen, presenting a sustainable approach to disposal. The research investigates the reuse of microplastics by blending it with bitumen, examining the potential benefits. Through laboratory experiments and analysis, this study evaluates the feasibility and effectiveness of this disposal method while considering its impact on the physical and mechanical properties of the asphalt mix. In this project, we investigate the presence and impact of microplastics within wastewater treatment plants (WWTPs) and explore sustainable disposal solutions to mitigate their environmental consequences.

Keywords: Crushed tiles, Ceramic waste tile, and partial replacement.

TRACK ID: CE CIVIL ENGINEERING

CE05

Stabilization of Dredged Soil Using GGBS

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ABSTRACT

Large quantities of dredged soil are generated during dredging activities, often creating disposal challenges and environmental concerns. Usually dredged materials is typically weak and unsuitable for construction purposes in its natural state. Ground Granulated Blast Furnace Slag (GGBS), a by-product of iron and steel industry, presents a sustainable solution for improving the properties of dredged soil. GGBS, known for its fine granular nature, reacts effectively as a stabilizer when mixed with soil, enhancing strength and durability while reducing environmental impact. This study focuses on utilizing GGBS to stabilize dredged soil and by improving the engineering properties of dredged soil. Dredged material is collected from two harbors namely Ponnani Harbor and Ayikara Harbor. GGBS is added to make the dredged material stronger, more stable, and better suited for construction. Dredged soil alone is often too weak or unstable to use, but upon carrying direct shear test with GGBS as admixture improves its strength. To evaluate how effective GGBS is as a stabilizer, we mixed it with dredged soil in different proportions (5%, 10%, 15%, and 20% by mass) and conducted the tests.

Keywords: Soil stabilization, GGBS, Dredged soil

CE06

Assessing the Impact of Urban Development on Solar Radiation and Shading: A Development Impact Analysis Approach

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ABSTRACT

Energy efficiency, sustainability, and urban design are all influenced by the distribution of solar radiation in cities, which is greatly influenced by urban expansion. Important information about how building structure and urban density affect solar exposure may be found in Development Impact Analysis (DIA). We can see and measure the impact of structures on solar exposure in their environment by utilising 3D modelling. By producing incredibly precise three-dimensional data on the city's topography, structures, and trees, Light Detection and Ranging (LiDAR) technology makes it possible to create a Digital Surface Model (DSM). In order to evaluate the effects of urban developments on sun radiation and shadows, this work focusses on 3D modelling of Chala ward using high-resolution LiDAR data. Informed decisions about urban energy planning will be supported by the created 3D model, which will make it easier to calculate sun exposure, shadow volumes, and rooftop suitability for solar panel installations.

Keywords: Development impact analysis, 3D modelling, LiDAR technology, Solar radiation.

TRACK ID: CE **CIVIL ENGINEERING**

CE07

The Use of Oil Palm Fiber as AN Additive Material In Concrete

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ABSTRACT

The incorporation of oil palm fiber (OPF) as an additive material in concrete presents a sustainable approach to improving mechanical properties while reducing agricultural waste. OPF, a by-product of the palm oil industry, has shown potential in enhancing tensile strength, ductility, and crack resistance, making it a viable alternative reinforcement material. This study examines the effects of OPF on the compressive strength, tensile strength, workability, and durability of concrete. The findings indicate that OPF improves tensile strength by bridging micro cracks and increasing energy absorption capacity, which enhances the material's resistance to dynamic loads. However, its effect on compressive strength varies, as excessive fiber content may introduce voids and reduce density, leading to a slight decrease in compressive strength. The presence of OPF also affects workability, requiring adjustments in mix design through the use of superplasticizers or optimized water-to-cement ratios. Additionally, OPF-modified concrete demonstrates improved durability by reducing shrinkage and increasing resistance to cracking. The study highlights the potential of OPF as an environmentally friendly and cost-effective reinforcement material in concrete, contributing to sustainable construction practices while addressing waste management challenges. Further research is recommended to refine mix proportions and assess long-term performance in different environmental conditions to ensure practical implementation in structural applications.

Keywords: Dynamic loads, Waste management challenges

TRACK ID: CE CIVIL ENGINEERING

CE08

GIS-Driven Spatial Decision Support System for Urban Waste Management – A Case Study

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ABSTRACT

Urban waste management is a crucial concern in rapidly growing cities, particularly Trivandrum Corporation, where population development and urbanisation have put a pressure on current waste disposal facilities. By combining geographic information systems (GIS) and spatial decision support systems, this study aims to improve urban solid waste management. Analysing the current waste management situation, locating waste collecting hotspots, determining land suitability for waste collection points, and calculating the necessary number of collection points required in the study area. The methodology involves extensive data collection, including administrative boundaries, building data, digital elevation models (DEM), and land use/land cover (LULC) maps. Spatial analysis tools in ArcGISPro were used to conduct hotspot analysis, land suitability mapping, and location-allocation analysis. The Analytical Hierarchy Process (AHP) was used to assign weights to various factors influencing site suitability, such as proximity to roads, slope, and distance from water bodies. The results highlight significant waste accumulation hotspots in central and eastern Trivandrum, driven by high population density and urban land use. Estimated number of waste collection points required in each ward using Central Public Health and Environmental Engineering Organization (CPHEEO) guidelines. Peripheral areas, with lower population density and non-urban land use, showed minimal waste generation. This study provides a complete framework for optimising urban waste management by technological integration and spatial analysis, with possible applicability in other cities facing comparable difficulties.

Keywords: Geographic Information Systems (GIS), ArcGIS, Analytical Hierarchy Process (AHP), Spatial analysis.

TRACK ID: CE **CIVIL ENGINEERING**

CE09

Partial Replacement of Cement with Waste Wood Ash in Concrete

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ABSTRACT

The partial replacement of cement with alternative materials is a sustainable approach in concrete technology aimed at reducing environmental impacts and conserving natural resources. This project investigates the feasibility of utilizing waste wood ash as a partial replacement for cement in concrete. The study evaluates the strength parameter, workability and durability of concrete by replacing cement at varying percentages (0%, 10%, 15%, 20%, and 25%) with wood ash. Concrete specimens, including cubes and beams, were cast and subjected to curing periods of 7th and 28th days to determine their compressive strength and flexural strength. The workability of the concrete mixes was assessed through slump cone tests and compaction factor tests, providing insights into the fresh concrete behaviour. The project explores how the incorporation of wood ash affects concrete properties and its suitability as a cement replacement material. Additionally, previous studies have highlighted that wood ash contains pozzolanic properties, which can enhance the durability and strength of concrete under certain conditions. This research aims to validate these findings and establish an optimum percentage for wood ash substitution without compromising concrete performance. The study contributes to the development of sustainable construction practices by promoting waste utilization, reducing cement consumption, and mitigating environmental pollution. The experimental results are expected to provide valuable insights into the potential of wood ash as an eco-friendly alternative in the concrete industry.

Keywords: Wood ash, Cement, Concrete mix, Sustainable construction

TRACK ID: CE **CIVIL ENGINEERING**

CE10

Planning, Analysis, Design, and Estimation of an Indoor Stadium at St. Thomas College of Engineering and Technology

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ABSTRACT

The project titled "Planning, Analysis, Design, and Estimation of Indoor Stadium at St. Thomas College of Engineering and Technology" focuses on delivering a functional and efficient indoor stadium by utilizing Building Information Modelling (BIM). The planning phase involved site selection and drafting the layout using AutoCAD, while the design and structural analysis were carried out in ETABS to ensure structural stability in compliance with IS codes. A detailed 3D model was developed in Revit, integrating architectural and structural components to visualize the building effectively. The model incorporates essential features such as change rooms, washrooms, and ramps for accessibility, emphasizing both functionality and safety. With the design and analysis phases completed, the project is set to proceed to the estimation phase, ensuring resource optimization and cost efficiency.

Keywords: BIM, Indoor stadium, Planning, Structural analysis, Design, Cost estimation, Civil engineering.

TRACK ID: ME MECHANICAL ENGINEERING

ME01

The Development and Simulation of an Electrical Yaw Control Mechanism for A Small Horizontal Axis Wind Turbine

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ABSTRACT

Renewable energy plays a vital role in attaining sustainable energy solutions. Wind energy, a form of renewable energy produces electrical power from the kinetic energy of moving wind using a wind turbine. There are mainly two types of wind turbine: Horizontal Axis Wind Turbine (HAWT) and Vertical Axis Wind Turbine (VAWT). Among this, the HAWTs are most commonly used for power generation at a larger scale. But for an urban rooftop setting, a small HAWT is ideal as they are more suitable for power generation in small and medium wind conditions. Such systems mainly use a passive yaw mechanism which often reacts to every minor change in the wind direction, causing frequent yaw movements thereby reducing its overall efficiency. So, in order to address these concerns, this study devel-ops an active yaw control incorporating a comparator and logic gate based mechanism which aims to reduce unnecessary yaw movements and facilitate optimal alignment with prevailing wind conditions. The control takes into consideration three critical parameters: speed of the wind, wind flow direction and the time through which the wind blows in a particular direction. MATLAB simulations were performed and results obtained demonstrated optimal yaw alignment. The future work involves fabricating and testing the system in an urban environment to validate its performance under real fluctuating wind conditions. Thus, this study contributes to advancements in small wind turbines in an urban setting offering a practical solution for effectively addressing the challenges posed by turbulent wind conditions.

ME02

Integration of Airfoil Based Flutter-Induced Wind Harvesting System in Buildings

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ABSTRACT

The rapid urbanization and the growing demand for renewable energy have spurred interest in innovative solutions for sustainable power generation. This project explores the potential of micro and small-scale wind-induced vibration technologies, specifically focusing on flutter-based, vortex-induced, and galloping mechanisms, to develop building integrated wind energy harvesting systems. By leveraging the unique vibrational responses of these mechanisms, the research aims to design and optimize compact energy harvesters that can be seamlessly incorporated into urban infrastructure. These systems are intended to harness wind energy in environments where traditional wind turbines are impractical, offering a viable solution for decentralized energy production in urban settings. The study focuses on such systems to assess the efficiency, durability, and scalability, with the ultimate goal of contributing to sustainable urban energy systems

ME03

Prediction Study of Pumped Storage Hydropower in Malankara Dam

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ABSTRACT

Pumped storage hydropower (PSH) is a reliable and efficient way to store energy and stabilize the power grid. It works by moving water between two reservoirs at different heights to store energy and generate electricity. In Kerala, the growing population and increasing energy demand make it challenging to maintain a steady and sustainable power supply. The state relies heavily on hydropower, but the availability of water changes with the seasons, leading to fluctuations in power generation. Kerala is also adding more renewable energy sources like solar and wind, which, although sustainable, are inconsistent and can affect grid stability. PSH can help solve these issues by acting as a large-scale energy storage system. It stores extra energy during low-demand periods and releases it during high demand times, ensuring a balanced energy supply. Kerala's diverse natural features, including its numerous reservoirs and varying elevations, make it an ideal location for PSH projects. This study explores the possibility of setting up a PSH system at Malankara Dam. The main goal is to calculate the maximum power that can be generated by using energy and mass balancing techniques, allowing for efficient power generation based on changing demand. The research also aims to assess the energy potential of the project and determine the best capacity for the system. By simulating how the PSH system would work, the study provides insights into its performance and efficiency in different situations.

TRACK ID: ME MECHANICAL ENGINEERING

ME04

Experimental Investigation and Optimization of Natural Fiber Reinforced Composite Matrix Using Ridge Guard and Phenol Formaldehyde

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ABSTRACT

This research explores the innovative use of natural fibers derived from ridge gourd (Luffa acutangula) to develop an eco-friendly board. The unique approach involves utilizing the inherent mesh structure of the dried ridge gourd fiber, layering it without chopping, and pressing it under high pressure to create a sustainable composite panel. Key aspects of this research include optimizing the pressing process to maintain the structural integrity of the fibers, exploring natural or minimal synthetic binders to ensure strong adhesion between layers, and conducting rigorous testing to assess mechanical strength, durability, and environmental impact. The study aims to provide a viable alternative to conventional wood-based medium density boards, contributing to sustainable material development with reduced carbon footprint and minimal environmental impact. The objective is to produce a board that not only offers comparable or superior mechanical properties to traditional Medium Density Fiberboard (MDF)

ME05

CFD Analysis of an Improved Slotted Helical Savonius Wind Turbine

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ABSTRACT

The growing challenges of global warming and climate change necessitate the adoption of renewable energy technologies. Among these, wind energy, particularly through vertical axis wind turbines (VAWTs) like the Savonius turbine, offers a sustainable and efficient solution. While these turbines are valued for their simplicity and ability to operate in low wind conditions, their efficiency is often constrained by aerodynamic limitations. This study focuses on the performance evaluation of a modified helical Savonius wind turbine with slotted blades and end plates compared to a conventional helical Savonius wind turbine. The modifications aim to enhance aerodynamic performance and increase the turbine's efficiency. The study employs computational fluid dynamics (CFD) simulations using Ansys 2024 R2 to analyse the flow behaviour and quantify the performance metrics, such as torque and power coefficient, under steady wind conditions. Results indicate that the modified slotted design significantly improves turbine performance, with a measurable percentage increase in power output compared to the conventional design. This improvement highlights the potential of innovative design modifications in overcoming traditional challenges associated with Savonius wind turbines.The findings contribute to the advancement of renewable energy technologies by optimizing the design of VAWTs, offering a sustainable solution for harnessing wind energy in urban and rural areas alike.

ME06

Development of an Induction-Heated Multi-Stage Pyrolysis Reactor for Biochar and Syngas Production

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ABSTRACT

Pyrolysis is a promising thermochemical process for converting biomass and plastic waste into valuable products such as biochar, syngas, and bio-oil. This study presents the design phase of an induction-heated pyrolysis reactor for the co-pyrolysis of coconut husk and high-density polyethylene (HDPE) with zeolite as a catalyst. The innovative induction heating mechanism ensures rapid and uniform heat distribution, overcoming the limitations of conventional heating methods, such as uneven temperature profiles and energy inefficiencies. The reactor is designed to optimize key operating parameters—including temperature, heating rate, and residence time—to enhance syngas and biochar yields while minimizing secondary reactions that degrade product quality. Coconut husk, a lignocellulosic biomass, presents challenges in conventional pyrolysis due to its fibrous structure and non-uniform heat transfer properties . The integration of induction heating technology enables precise thermal control, ensuring efficient decomposition and improved energy recovery. In addition to standalone pyrolysis, the co-pyrolysis of coconut husk with HDPE is explored to assess its impact on product composition and yield. HDPE, a widely used plastic, is a significant contributor to environmental pollution due to its poor biodegradability. Through co-pyrolysis with a zeolite catalyst, synergistic effects enhance syngas quality by increasing hydrogen (H2) and carbon monoxide (CO) production while reducing undesirable by-products such as tars. This study systematically evaluates the influence of temperature, residence time, and catalyst loading on selective biochar and syngas production, optimizing the process for industrial applications. Computational simulations indicate that the induction-heated reactor significantly improves heat transfer efficiency and reaction kinetics, leading to higher syngas yields and biochar with enhanced carbon content and porosity. The study highlights the potential of multi feedstock integration, demonstrating a scalable and sustainable approach to waste-to-energy conversion. Future work will focus on reactor scaleup, performance modeling, and techno-economic assessments to facilitate commercial adoption.

ME07

Numerical Analysis on Reservoir System Flow on Pumped Hydropower Storage

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ABSTRACT

Effectively managing water resources is essential, especially in reservoirs that support hydroelectric power generation . A well-managed reservoir ensures a steady water supply, maximizes energy production, and minimizes risks associated with fluctuating water levels. This study focuses on the Kuttiyadi Reservoir, using Modelica to simulate and analyze how water flows through the system under different conditions. By harnessing Modelica's capabilities, we aim to create a computational model that accurately reflects the reservoir's behavior in response to changing hydrological and operational factors.

To achieve this, we combine both lumped and distributed parameter models. The lumped model simplifies the system by averaging properties over specific sections, while the distributed model offers a more detailed look at how water moves spatially. This hybrid approach enhances predictive accuracy while keeping computational demands manageable, making it suitable for real- time applications.

Our model accounts for real-world challenges such as seasonal variations in inflow, the reservoir's shape and structure, sediment accumulation, and operational constraints like minimum and maximum storage levels. By simulating different scenarios, we can predict key parameters such as water levels, discharge rates, and hydroelectric energy output. These insights help optimize power generation while ensuring responsible water resource management.

A key strength of our Modelica-based approach is its flexibility and scalability. The ability to run real-time simulations enables decision-makers to adapt dynamically to environmental changes and operational needs. This research contributes to more efficient reservoir management, enhanced energy production, and sustains- able hydropower utilization. By leveraging advanced modelling techniques, we can develop smarter strategies to address the growing challenges of water resource management in the face of climate change and increasing energy demands.

TRACK ID: ME MECHANICAL ENGINEERING

ME08

Process Parameter Optimization in CNC Turning of Aluminium 2024 Using MATLAB

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ABSTRACT

Study represents a comprehensive framework for optimizing CNC turning of aluminium2024 it is widely used in the aerospace industry. Aluminium2024 is the combination of copper magnesium alloy. The main properties are high ductility and high strength. Objective of the work is to minimize production time, maximize surface quality and reduce tool wear. The project investigates the process parameters like cutting speed, feed rate depth of cut and tool geometry of aluminium2024. Genetic algorithms are employed to optimize process parameters. The optimized process parameters can be applied to improve CNC turning of aluminium2024 to obtain better surface finish..

TRACK ID: ME **MECHANICAL ENGINEERING**

ME09

Solar Rubber Sheet Dryer With Thermal Energy Storage

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ABSTRACT

The project emphasizes experimental investigation on the solar rubber sheet dryer with thermal energy storage, aimed at providing a sustainable and energy-efficient solution for drying rubber sheets in tropical or equatorial regions. The system utilizes solar thermal collectors to capture sunlight and convert it into heat, which is then used to dry rubber sheets placed in a specially designed drying chamber. The innovative use of thermal energy storage with paraffin wax, a phase change material (PCM), allows the system to store excess heat generated during the day and release it during periods of low sunlight, such as at night or on cloudy days. This ensures a continuous drying process, reducing reliance on external energy sources like electricity or fossil fuels. The project demonstrates the practical application of renewable energy technology in an industrial process, providing an eco-friendly, cost-effective alternative to traditional drying methods. The solar rubber sheet dryer with thermal energy storage not only improves energy efficiency but also enhances the overall quality of the dried rubber, making it an ideal solution for small to medium-scale rubber producers seeking to minimize environmental impact while improving productivity in society.

TRACK ID: ME MECHANICAL ENGINEERING

ME10

Design and Development of Portable Biogas Plant for Residential Food Waste Management.

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ABSTRACT

This paper focuses on the development of a portable biogas plant designed to address the growing challenge of residential food waste management. The system is engineered to transform household organic waste, such as food scraps and vegetable peels, into biogas and nutrient-rich slurry. Its compact, lightweight, and user-friendly design ensures easy integration into urban households where space is limited. Key features include portability, ease of installation, and durability achieved through the use of high-quality, weather-resistant materials. The biogas digester is optimized for efficient small-scale waste processing, providing a reliable source of energy for daily household activities, including cooking and heating. The nutrient rich slurry by product further enhances sustainability by serving as an organic fertilizer suitable for home gardens or plants. Extensive trials demonstrate significant reductions in food waste volumes, efficient biogas generation, and consistent energy output, making this system a practical and eco-friendly solution for residential waste management. By converting waste into energy and reusable by products, the portable biogas plant supports circular resource management and aligns with the global emphasis on sustainable living. This innovation contributes to environmental conservation by reducing greenhouse gas emissions, promoting energy self-sufficiency, and encouraging the adoption of renewable energy solutions at the household level.

ME11

Solar Based Beach Cleaning Robot

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ABSTRACT

Beaches are one of the most attractive tourist destinations in the world, cleaning of beaches is neglected by most of the government bodies. The main reason behind it takes up lots of resources and time. The housekeepers work manually by picking up garbage, it is difficult to clean the whole beach efficiently and in time. India has a 7517 km long coastline with nearly 70 famous beaches. We aim to design & fabricate a solar beach cleaning machine. This machine is designed for simple economic work and it will be easy to maintain and use. This machine has been designed by looking at the current situation of our beaches which are loaded with waste material. The government of India has decided to clean beaches & for that many projects are done on various beaches. The design of the project on using push operated trolly connected with a solar panel. This machine is utilized to collect waste like bottles, plastic, paper, medical wastes, metals, broken glass etc. If the wastes are not collected it may cause health problems or injuries. The machine is intended to be a sustainable and eco-friendly solution that can be easily used in various beach environments. The robot will be a push-operated trolley connected to a solar panel, making it energy-efficient and portable. The project aims to reduce beach pollution, improve public health, and protect marine life from the harmful effects of waste. Remotely controlled Beach cleaning machines will be very helpful to society.

ME12

A Novel Concept for Micro-Scale Wind Energy Harvesting Using Vortex-Induced Vibrations for Building Integration

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ABSTRACT

Renewable energy has a significant role in achieving sustainable energy solutions. Wind energy is one such source that generates electrical power from the kinetic energy of moving air through wind turbines. The application of wind energy in buildings has gained considerable interest. However, integrating wind turbines in built environments presents several challenges, including concerns over structural integrity, aesthetic and noise issues, higher costs, maintenance difficulties, and safety risks. To address these challenges, this study develops a novel concept of a micro-scale wind energy harvester to capture wind-induced vibrations, focusing specifically on vortex-induced mechanisms. This approach aims to provide a sustainable energy solution for decentralized energy production in urban environments. The system considers various parameters : Speed of the wind, the material of the oscillating plate, and the distance between the barrier and the oscillating plate. Physical prototypes will be developed and tested under controlled conditions by altering these parameters to analyze the performance of wind energy harvesters that utilize vortex-induced vibrations. Thus, this study offers valuable insights into the potential effectiveness of integrating such wind energy harvesters into urban infrastructures, providing a practical solution to address the challenges associated with it.

TRACK ID: ME MECHANICAL ENGINEERING

ME13

Development of Coconut oil and Milk Extractor for Domestic Application

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ABSTRACT

The traditional method of oil extraction mainly focuses on extracting oil from 15 to 25 kg of coconut, which is not suitable for household applications. Conventional techniques are often labor-intensive, time-consuming, and inefficient for individual users. So, the prime objective of the present work is to design and fabricate coconut oil and milk extractor for household applications which could extract oil and milk from 3 to 4 kg of coconut with efficiency and ease. This versatile machine incorporates additional functions such as rice mincing, egg beating, and onion slicing, offering various culinary uses. The built-in slicer allows for quick and precise cutting of vegetables and fruits, while the rice mincer ensures uniform grinding of rice for various applications. Additionally, the eggbeater simplifies the process of mixing and whipping, making it an essential tool for baking and cooking. The appliance is designed for user convenience, featuring a compact structure, easy-to-use controls, and durable materials to ensure longevity. By combining multiple kitchen functions into a single device, it eliminates the need for separate appliances, thereby saving space, reducing costs, and enhancing kitchen efficiency.

TRACK ID: ME MECHANICAL ENGINEERING

ME14

Uninterrupted Dryer for Coconut Drying

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ABSTRACT

The Uninterrupted Dryer for drying coconut is designed to enhance the efficiency of drying copra by utilizing solar energy during the day time and stored thermal energy during the night. This system consists of a cabinet dryer with multiple racks, capable of holding approximately 10 kg of coconuts. During the day, sunlight is harnessed to heat the cabinet directly, ensuring effective moisture removal. To enable continuous drying, paraffin wax is integrated as a thermal energy storage material (TESM), absorbing heat during the day time and releasing it at night to maintain a drying temperature above 50°C. This approach ensures uninterrupted drying, reducing dependence on conventional drying methods. Also, it provides better hygiene and better drying time. The system aims to provide an eco-friendly, cost-effective, and efficient solution for coconut farmers and copra producers, enhancing product quality and reducing post-harvest losses.

ME15

Design and Modeling of Automatic Drainage Cleaning System

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ABSTRACT

This project proposes an "Automatic Drainage Cleaning System (ADCS)" enhanced with IoT capabilities to replace manual drainage cleaning, mitigating health risks and improving efficiency. The ADCS utilizes a solar panel for sustainable power, an ultrasonic sensor and microcontroller-based circuit for real-time waste level monitoring, triggering local visual/audible alerts and remote notifications via a dedicated mobile application when the waste bucket nears capacity. The mobile app, connected through cloud services, provides remote monitoring of system status, battery levels, GPS location, and historical data analysis, empowering authorized personnel with timely information and control, thereby optimizing maintenance and ensuring continuous, automated drainage cleaning.

TRACK ID: ME MECHANICAL ENGINEERING

ME16

Design And Fabrication of Hexapod for The Inspection Through Horizontal Pipe

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ABSTRACT

The development of a hexapod robot for horizontal pipe inspection focuses on creating a six-legged robotic system capable of navigating confined cylindrical environments to assess structural integrity and detect anomalies. The fabrication process involves selecting appropriate materials and actuators to ensure durability and efficient locomotion. Lightweight materials like PLA are often chosen for the robot's body to balance strength and weight, while servo motors are commonly used to actuate the legs due to their precision and control capabilities.

Overall, the development of a hexapod robot tailored for horizontal pipe inspection offers a robust solution for monitoring and maintaining pipeline systems, reducing the need for manual inspections and enhancing safety and efficiency. The camera enables the hexapod to capture real-time data on the pipe's condition, identifying issues like corrosion, cracks, or blockages.

TRACK ID: ME MECHANICAL ENGINEERING

ME17

Design and Fabrication of Grass Washing and Draining Machine

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ABSTRACT

This paper presents an advanced grass-cutting, cleaning, disinfecting, and drying machine designed for zoo animal feed processing. The system integrates a conveyor-based automation process with three key functions: pneumatic cutting, multi-stage washing and disinfection, and controlled drying to ensure high-quality, hygienic, and nutritionally preserved grass feed. The cutting operation features a pneumatic up-and-down cutting system that enables precise, high-speed cutting tailored to different zoo animals. A Vertically actuated pneumatic blade efficiently performs coarse cuts for large herbivores, while adjustable settings allow for finer, precision cuts for smaller species. The system also incorporates moisture-sensitive controls that dynamically regulate blade speed and force based on grass texture, optimizing performance and reducing mechanical wear. Following the cutting process, the three-stage washing system ensures thorough cleaning, starting with a pre-wash to remove dirt and debris, followed by an animal-safe disinfectant wash to neutralize harmful pathogens, and a final rinse to eliminate residue. The drying mechanism then provides moisture control, preventing spoilage while preserving the seeds nutritional value. Designed specifically for zoo environments, the machine features automated quality control, energy-efficient operation, and customizable processing, optimizing feed safety, waste reduction, and sustainability. This innovation enhances zoo animal nutrition management, operational efficiency, and long-term environmental benefits, ensuring consistent and high-quality feed for a variety of species.

TRACK ID: ME MECHANICAL ENGINEERING

ME18

Fabrication of Flexible GFRP-Epoxy Reinforced Composite with PET Bottle Flakes and Bamboo Fibers

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ABSTRACT

The development of sustainable composite materials has become essential in addressing environmental concerns while maintaining performance and durability. This project focuses on the fabrication of a flexible glass fiber-reinforced polymer (GFRP)-epoxy composite, reinforced with PET bottle flakes and bamboo fibers to enhance mechanical properties, reduce waste, and promote sustainability. The process involves mixing epoxy resin (LY556) with hardener (HY951) and incorporating PET flakes and bamboo fibers into the resin matrix to improve adhesion, strength, and flexibility. The composite is designed to balance mechanical durability and lightweight characteristics, making it an efficient alternative to conventional materials. Mechanical testing, including tensile strength, flexural strength, impact resistance, and thermal stability, is conducted to assess its performance under various conditions. The results indicate that the composite demonstrates high strength, flexibility, and resistance to external forces, making it suitable for lightweight automotive components, flexible construction panels, sports equipment, and sustainable packaging solutions. With its eco-friendly composition, recyclability, and utilization of recycled materials, this composite presents a viable solution for industries aiming to reduce their carbon footprint while maintaining material efficiency and reliability.

TRACK ID: ME MECHANICAL ENGINEERING

ME19

Development of Sound-Reducing Composite Material Using Flax Fiber and Kenaf Fiber

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ABSTRACT

Noise pollution is a growing concern in various industries, necessitating the development of efficient sound-blocking materials. This study focuses on the development of a sound reducing composite material using kenaf and flax fibers, chosen for their high sound transmission loss and mechanical strength. The composite is fabricated using polyester resin as a matrix, reinforced with kenaf and flax fibers, along with cobalt accelerator, hardener, and silica powder to enhance structural integrity and curing efficiency. The study evaluates the mechanical and acoustic performance of the developed composite through impact, and sound transmission loss tests. The objective is to determine the effectiveness of natural fiber composites in blocking sound while maintaining structural durability, offering a sustainable alternative to conventional synthetic materials. This research contributes to the advancement of eco-friendly soundproofing solutions for applications in automotive, construction, and industrial sectors where noise reduction is critical.

TRACK ID: ME MECHANICAL ENGINEERING

ME20

Design and Fabrication of Magnetorheological Fluid Damper

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ABSTRACT

The main objective of our project is to design and fabricate the automobile suspension systems made of hydraulic magnetorheological dampers .Magnetorheological(MR) damper is an intelligent damper , which is used as automobile suspension for vibration semi-active control. A single piston rod MR damper with an accumulator is designed in order to satisfy the demand of a certain automobile front suspension. The damper structural parameters were obtained by integrated optimal design combining magnetic circuit and structure. Then the properties of the designed damper were investigated by the literature review , and the relationship between damping force , circuit and speed was fitted by the experimental results. This work provided a promising method for the experimental study and design on automobile suspension made of hydraulic MR damper.

TRACK ID: ME MECHANICAL ENGINEERING

ME21

Design and Fabrication of Solar Powered Lawn Mower

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ABSTRACT

The Solar-Powered Lawn Mower is an eco-friendly and efficient grass-cutting machine designed to operate using renewable solar energy. This prototype features a solar panel that charges a 12V, 7Ah battery, ensuring continuous power supply to the system. A dual-motor cutting mechanism is integrated into the design to enhance cutting efficiency, making it suitable for various lawn conditions. The power flow is managed through a solar charge controller, optimizing battery performance and protecting the electrical components. The mower includes a manual control switch to conveniently turn the motors on and off as needed. For structural integrity, the body of the mower is fabricated using 10mm multi wood panels and GI square pipes, ensuring durability and lightweight maneuverability. The system is supported by four 150mm wheels, allowing for smooth movement across lawns with minimal effort. By utilizing solar energy, this lawn mower not only reduces dependency on conventional power sources but also contributes to environmental sustainability, making it a cost-effective and user-friendly solution for modern lawn maintenance.

ME22

Development of 5s As a Safety Framework in Industrial Workspaces

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ABSTRACT

The 5S methodology, a structured approach to workplace organization, is widely recognized for its role in enhancing efficiency and productivity. However, its impact on workplace safety remains underexplored. This study investigates the strategic implementation of 5S from a safety perspective in an industrial setting, focusing on its contribution to hazard identification, risk mitigation, and accident prevention. By integrating 5S principles—Sort, Set in Order, Shine, Standardize, and Sustain—into safety management, industries can create a structured and disciplined work environment that minimizes workplace hazards and enhances operational safety. The research emphasizes how 5S fosters a proactive safety culture, reduces workplace incidents, and improves overall compliance with occupational health and safety standards.

This case study follows a qualitative research approach, utilizing direct observations, employee interviews, and safety audits to analyze the role of 5S in improving workplace safety. Data is collected from key stakeholders, including management and shop-floor employees, to assess the effectiveness of 5S implementation in reducing risks and enhancing safety protocols. The findings highlight the practical benefits of integrating 5S into industrial safety strategies, demonstrating its potential to create a safer, more organized, and regulation compliant work environment. This study provides valuable insights for industries seeking to strengthen their safety culture through structured workplace organization.