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ABSTRACT BOOK

CTFC 2025

CONFERENCE ON TECHNOLOGIES FOR FUTURE CITIES

CONFERENCE ON TECHNOLOGIES FOR FUTURE CITIES
CTFC2025

THEME: 2030 AGENDA FOR SUSTAINABLE DEVELOPMENT

12TH – 13TH DECEMBER, 2025

7TH IN SERIES

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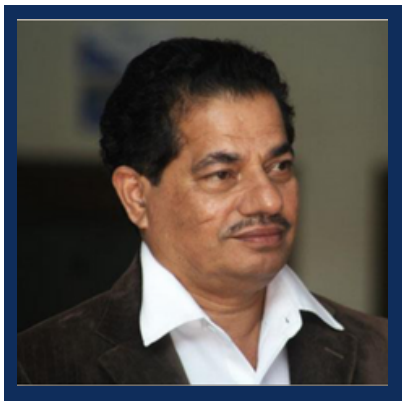

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Chairman & CEO, MES

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A NATION BETTER TAUGHT, IS A NATION BETTER EMPOWERED

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CTFC 2025

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THEME : 2030 AGENDA FOR SUSTAINABLE DEVELOPMENT

12th - 13th December 2025

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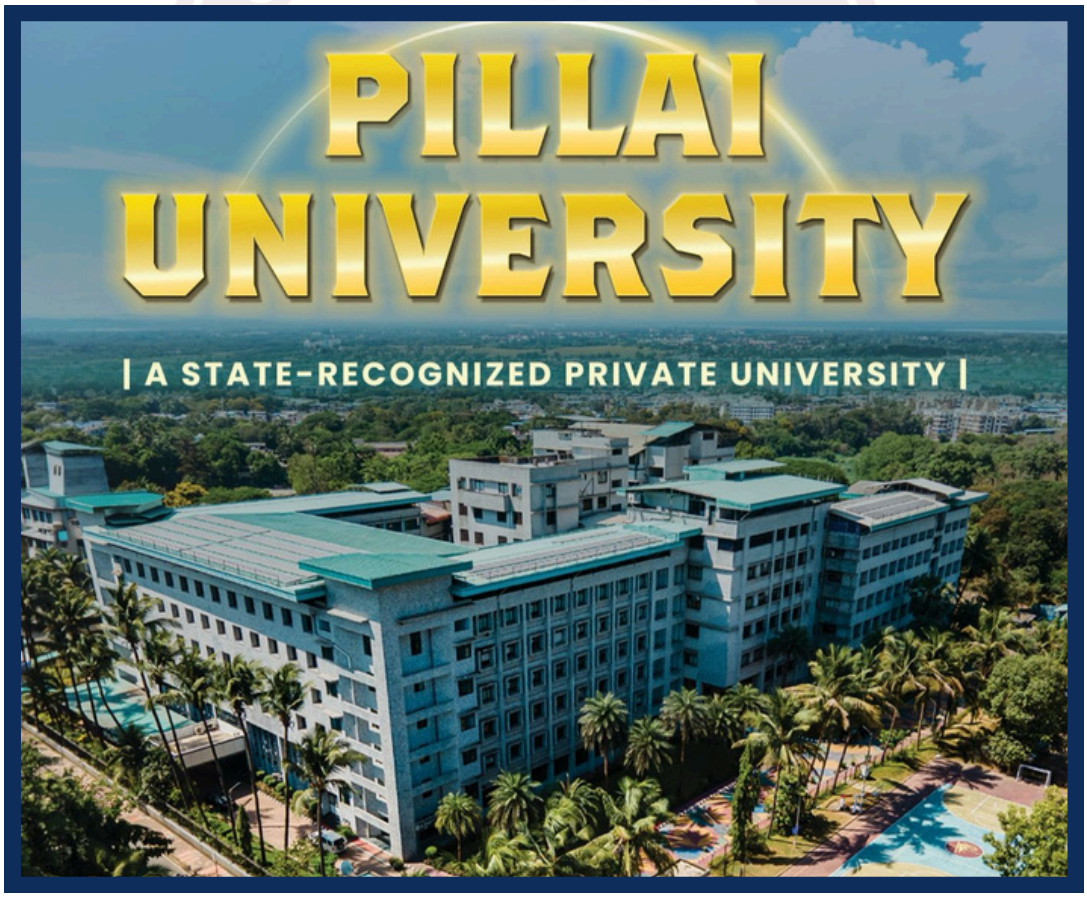
ABOUT PILLAI SCHOOL OF ENGINEERING UNDER PILLAI UNIVERSITY

Pillai School of Engineering (Formerly Pillai College of Engineering - PCE), was established in the year 1999 with a cherished desire to mold engineers in developing new age technology with respect for the environment. This objective is fulfilled by equipping our students with cutting edge technology through quality education, practical training, and industry interaction. We are located amidst a beautiful green campus in Navi Mumbai and offer Undergraduate, Postgraduate and Research programs in Engineering. We are recipients of several National and International awards and grants. The excellent infrastructure, well equipped laboratories, experienced faculties along with magnificent atmosphere and ambience makes us an ideally suited institution for growth and development of soul and mind.



PRINCIPAL'S ADDRESS

Dr. Sandeep Joshi
Principal
Pillai School of Engineering, New Panvel

In rapidly developing nations like India, urban expansion often leads to challenges such as inadequate infrastructure and environmental pressures resulting from unplanned growth. In response, scientists and engineers worldwide are exploring technological solutions to build smarter, more sustainable cities. Aligned with this vision, Pillai School of Engineering organizes Conferences on Technologies for Future Cities, focusing on innovative software, hardware, and governance approaches to support sustainable urban development.

I am delighted to welcome all participants to this conference, a platform that brings together innovative research and emerging ideas across diverse engineering disciplines. The work presented here reflects exceptional standards of technological innovation, methodological rigor, and relevance to evolving industrial and societal needs. These contributions strengthen our institution's commitment to promoting excellence in engineering education, research, and sustainable development. I sincerely commend all researchers and delegates for their dedication, and I encourage continued efforts toward creating impactful and future-oriented engineering solutions.

ABOUT CTFC 2025

Cities in developing countries are rapidly expanding. India has 438 cities with a population of more than 100,000 people, accounting for 11% of the world's cities. It is expected that the urban population will be doubled in next 25 years. Unfortunately, the development is unplanned and chaotic, resulting in inequitable distribution of public services, costly housing, a lack of adequate streets and roads, and insufficient open spaces. Scientists and engineers all over the world are looking for technological solutions to problems such as poor urban planning, non-availability of affordable housing, deficiency in water supply or electricity, unorganized traffic, poor quality public transport and parking facilities, poor healthcare system, waste management, air and water pollution, etc.Pillai School of Engineering has taken a timely lead and has started a series of conferences on "Technologies for Future Cities" to examine some of the challenges raised above.The inaugural conference took place on January 8-9, 2019, followed by an alternating cycle of a one-day consortium and a full conference each year. There were about dozen invited talks followed and about 250 scientists and engineers attended the conference. The full details of the conferences are available on www.futurecities.mes.ac.in.

ABOUT PANVEL, NAVI MUMBAI

Panvel, the first Municipal Corporation of Raigad, is a historic town known for its lakes, temples, forts, and proximity to a wildlife sanctuary. Strategically located on the outskirts of Mumbai, it is emerging as Maharashtra's key transportation hub, well-connected by road, rail, and air. The conference venue, Pillai School of Engineering, New Panvel, is easily accessible via direct local trains from major Mumbai stations and is approximately 90 minutes from Mumbai airport. Travelers can reach the venue from Chhatrapati Shivaji Maharaj International Airport, with both domestic and international terminals offering convenient access.The conference venue, Pillai School of Engineering, New Panvel, is easily accessible via direct local trains from major Mumbai stations and is approximately 90 minutes from Mumbai airport.

CTFC 2025

CONFERENCE ON TECHNOLOGIES FOR FUTURE CITIES

THEME : 2030 AGENDA FOR SUSTAINABLE DEVELOPMENT

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Conference on Technologies for Future Cities 2025 (CTFC-2025)

12th - 13th December 2025

Program Schedule

Time	Activity	Venue
Day 1: 12th December 2025		
8.30 - 9.30am	Registration Breakfast	Reception AreaOld Canteen Area
9.30 - 11.15am	<u>Inauguration</u> Welcome Address by Dr. Sandeep Joshi, Principal Inaugural Address by Chief Guest Dr. Sachin Kore, Director, VJTI Mumbai Keynote Address by Guest of Honor Dr. Archis Yawalkar, aSai Viswa speciality Chemicals	Auditorium 7th Floor
11.15 - 11.30am	Tea Break	
11.30am - 12.15pm	Plenary Talk 1 - Dr. Sajeev Nair, CEO, Asian School of Science and Engineering Technology	
12.15 - 1.00pm	Plenary Talk 2 - Dr. Ajit Salvi, Director, RCUES of AIILSG, Mumbai	
1.00 - 2.00pm	Lunch	Old Canteen Area
2.00 - 3.30 pm	Parallel Session of Contributed Oral Papers Session A- Digital Transformation in Cities [Paper ID-6,35,43,42,54,66,90] Session B - Environmental & Social Impacts [Paper ID-12,19,39,80,82,98] Session C - Environmental & Social Impacts [Paper ID-17,18,64,88,93, 84] Session D - Future Urban Infrastructure [Paper ID-50,85,91]	G-501 G-502 G-503 G-504
3.30 - 4.15pm	Plenary Talk 3 - Mr. Neil Sawant, Founder & CEO, NUOS	Auditorium 7th Floor
4.15 - 5.00pm	Plenary Talk 4 - Dr. Chitrarekha Kabre, SPA, New Delhi	
5.00 - 5.30pm	Networking and High Tea	Old Canteen Area
5:30pm Onwards	SPIC MACAY Concert Flute Recital by Pt.Ronu Mazumdar	Auditorium

Conference on Technologies for Future Cities 2025 (CTFC-2025)

12th - 13th December 2025

Program Schedule

Time	Activity	Venue
Day 2: 13th December 2025		
9:00 – 10:00am	Registration Breakfast	Reception AreaOld Canteen Area
10.00 - 10.45am	Plenary Talk 5 - Mr. Gaurav Sharma, Meta Infotech Limited	Auditorium 7th Floor
10.45 - 11.30am	Plenary Talk 6 - Dr. Kamal C. Vora, Program Director, NAMTECH	
11.30-11.45am	Tea Break & Networking	5th Floor
11.45 am - 1.00pm	Parallel Session of Contributed Oral Papers Session E- Digital Transformation in Cities [Paper ID-31,53,59,60,86] Session F - Environmental & Social Impacts [Paper ID-9,32,46,58,62,72,77] Session G - Future Urban Infrastructure [Paper ID-24,33,34,38,40,45]	G-501 G-502 G-503
1.00 - 2.00pm	Lunch	Old Canteen Area
2.00 - 3.30pm	Poster Session [Paper ID:21,48,49,78,94,95,99,102]	Stilt Area
3.30 - 4:00pm	Startup Innovator's Forum - Dr. Seema Regi, Mr. Vishal Stephen	Auditorium 7th Floor
4.00 - 4.45pm	Plenary Talk 7 - Mr. Milind Kamble, TCS	
4.45 - 5.30pm	ValedictoryPrize DistributionAddress by Chief GuestVote of thanks	
5.30 - 6.00pm	Networking and High Tea	Old Canteen Area

CTFC 2025

CONFERENCE ON TECHNOLOGIES FOR FUTURE CITIES

THEME : 2030 AGENDA FOR SUSTAINABLE DEVELOPMENT

CHIEF GUEST

Dr. Sachin Kore
Director, VJTI Mumbai

KEYNOTE ADDRESS

Dr. Archis Yawalkar,
CEO, aSai Viswa speciality Chemicals

PLENARY TALKS

Dr. Sajeev Nair
CEO, Asian School of Science and Engineering Technology

Dr. Ajit Salvi
Director,
Regional Centre for Urban & Environmental Studies (RCUES) of AIILSG, Mumbai

Mr. Neil Savant
Founder & CEO at NUOS Home Automation

Dr. Chitrarekha Kabre
SPA, New Delhi

Mr. Gaurav Sharma
Meta Infotech Limited

Dr. Kamal C. Vora
Program Director, NAMTECH

Mr. Milind Kamble,
Tata Consultancy Services (TCS)

CTFC 2025

CHIEF GUEST

Dr. Sachin Kore
Director, VJTI Mumbai

KEYNOTE ADDRESS

Dr. Archis Yawalkar,
CEO, aSai Viswa speciality Chemicals

PLENARY TALKS

Common Skills for All – Self-Empowerment, Life Skills, and Interpersonal Strength

Dr. Sajeev Nair
CEO, Asian School of Science and Engineering Technology

Abstract

Many corporate professionals often believe that skills such as self-empowerment, life skills, and interpersonal strength are essential only for those working in organizations, factories, plants, or offices. However, I personally believe these skills are vital for everyone — from kindergarten children, school and college students, undergraduates, graduates, and research scholars to homemakers, artists, sports professionals, and individuals across every walk of life.As we all know, life skills such as problem-solving, critical thinking, effective communication, decision-making, creative thinking, interpersonal relationships, self-awareness, empathy, and coping with stress and emotions are fundamental to personal and professional growth. While the level of proficiency may differ between children and adults, the importance of these skills remains universal.Developing such skills is essential because it helps us enhance the attributes and qualities crucial for effective performance — not only in the workplace but in every sphere of life. By continuously developing these abilities, we embark on a journey of personal growth that empowers us to reach our fullest potential and achieve our goals efficiently and meaningfully.

PLENARY TALKS

Environmental and Social Impacts in Cities: The Role of Social Equity and Sustainable Energy Solutions

Dr. Ajit Salvi
Director,
Regional Centre for Urban & Environmental Studies (RCUES)
of All India Institute of Local Self Government (AIILSG), Mumbai

Abstract

India's rapid urbanization is reshaping its social, environmental, and energy landscapes, creating both unprecedented opportunities and deepening vulnerabilities. With over half the global population now living in cities and India projected to host nearly double the current urban residents by 2050, the pressures on urban ecosystems, infrastructure, and public health continue to intensify. Heatwaves, air pollution, service deficits, energy poverty, and expanding informal settlements demonstrate that environmental burdens are not evenly distributed; they disproportionately impact low-income and marginalized communities. Incidents such as Mumbai's heat wave and Delhi's severe air-pollution episodes highlight how climate and environmental stresses intersect with social inequities, amplifying health risks and economic hardship for the urban poor. This paper examines the intertwined challenges of environmental degradation, unequal access to basic services, and the uneven distribution of clean energy benefits across Indian cities. It evaluates how deficits in housing, drainage, water supply, sanitation, and electricity undermine resilience, while fossil-fuel dependency and rising energy demand further strain urban systems. Drawing on national datasets, city-level assessments, and emerging clean-energy innovations, the study identifies pathways through which sustainable energy solutions such as rooftop solar, energy-efficient buildings, decentralized systems, and digitalized grids can advance both climate goals and social justice.

By centering social equity within the clean-energy transition, Indian cities can reduce emissions, enhance resilience, lower household energy costs, and improve health outcomes for the most vulnerable groups. The paper proposes an implementable roadmap for city governments, emphasizing institutional capacity, equitable access, participatory planning, and integrated financing mechanisms. Ultimately, the research argues that building socially inclusive and energy-secure cities is essential for achieving Sustainable Development Goals commitments, India's Net-Zero 2070 vision, and the broader goal of Viksit Bharat 2047.

PLENARY TALKS

Devices to Decisions: Leveraging IoT for Smart Automation and Digital Innovation

Mr. Neil Savant
Founder & CEO at NUOS Home Automation

Abstract

As cities evolve into complex, interconnected systems, the Internet of Things (IoT) has emerged as a foundational technology enabling data-driven urban transformation. This plenary session explores the broad potential of IoT to connect physical devices with digital intelligence, supporting smarter decision-making and automated city services. The talk will outline the opportunities created when sensors, networks, and analytics converge—ranging from operational efficiency to new digital services that enhance urban living. It will also touch upon the considerations that accompany widespread IoT adoption, including security, governance, interoperability, and the need for human-centric design. By presenting key ideas, current trends, and future possibilities, this session aims to provide a holistic view of how IoT can serve as a catalyst for innovation in the cities of tomorrow.

PLENARY TALKS

Regenerative Design Approach for the Built Environment

Dr. Chitrarekha Kabre
SPA, New Delhi

Abstract

Over the past half-century, a discourse emphasizing that the environmental health of our earth is profoundly affected by the design of our built environment has emphatically shaped high-performance (green) building practices and associated building regulations (standards and codes), building environmental assessment methods and sustainability assessment systems. The trajectory of environmentally responsive design as applicable to the built environment delineates the transition from technological (high-performance) design paradigm to biocentric (ecological) design paradigm, Figure 1. It is professing a sustainability framework in synergy with nature or ecosystem not only to preserve the environment but also to revitalize and regenerate to have net positive environmental benefits for the living world. This implies a living or whole-systems approach, a more expansive notion of the built environment, one where dynamic relationship exists between a greater number of built and unbuilt elements and where a balance, sustainable relationship between these elements is explored and harnessed. The systems approach in the present context is a much-needed call for building professionals to redefine architecture and adopt principles of regenerative design and examine how it does (or does not) relate to their everyday practice. Mies van der Rohe said that ‘less is more’; in the present context a better way of putting it may be, as Alexandro Tombazis says, ‘less is beautiful.

PLENARY TALKS

From Smart to Secure: Cyber Defence for the Cities of Tomorrow

Mr. Gaurav Sharma
Meta Infotech Limited

Abstract

The talk will explore how cybersecurity will shape the success and safety of smart cities, focusing on India's Smart Cities Mission. It will outline the rise of digitally connected urban infrastructure through Integrated Command and Control Centres and highlight India's efforts within a global smart-city market worth hundreds of billions of dollars. Against the backdrop of escalating cyber threats like ransomware, IoT attacks, and data breaches, the vulnerabilities in urban systems and governance will be discussed. The session will conclude with a roadmap built on four pillars — policy and governance, secure architecture, resilience, and skills — stressing that cybersecurity by design is vital for building safe, trusted, and future ready smart cities.

PLENARY TALKS

Smart Mobility in Smart Cities

Dr. Kamal C. Vora
Program Director, NAMTECH

Abstract

The rapid transformation of urban mobility in Asia is driven by rising consumerism, digitalization and economic growth, resulting in challenges such as congestion, pollution, safety concerns and increased energy demand. This presentation explores how Smart Mobility—enabled by electric vehicles, shared mobility models, connected platforms, intelligent transportation systems and autonomous driving technologies—can address these issues and support the development of sustainable smart cities. It highlights global and Asian mobility trends, the shift toward ACES (Autonomous, Connected, Electric & Shared) solutions, advancements in vehicle connectivity (V2V, V2I, V2X), and the integration of AI-driven systems for safety, efficiency and user-centric experiences. The talk also presents technological building blocks such as ADAS, sensor fusion, autonomous navigation and the evolution of electric and autonomous vehicles. Finally, it emphasizes ecosystem collaboration across industry, academia and skill development communities to drive innovations that enable safe, accessible, efficient and environmentally responsible mobility for the future.

PLENARY TALKS

Challenges and Opportunities in the Development of Smart Cities

Mr. Milind Kamble,
Vice President & Delivery Centre Head
Tata Consultancy Services Ltd.

Abstract

The evolution of smart cities stands at the intersection of technology, urban planning, and community engagement, presenting both significant challenges and promising opportunities for researchers and practitioners. This plenary session will explore the multifaceted journey of smart city development worldwide, drawing lessons from both successful implementations and notable failures. While cities like Singapore and Barcelona have pioneered the integration of digital infrastructure, data-driven governance, and citizen-centric services to enhance urban living, others have struggled to overcome barriers such as inadequate funding, fragmented leadership, and privacy concerns. Failed projects, including cities in Asia and Middle East highlight the pitfalls of top-down planning, lack of community involvement, and unsustainable economic models.Key challenges in smart city development include securing robust and scalable technology, ensuring equitable access, maintaining data privacy, and fostering cross-sector collaboration. At the same time, large number of opportunities in leveraging artificial intelligence, the Internet of Things, and sustainable practices to create cities that are resilient, inclusive, and adaptive to future needs. India provides opportunities in terms of developing such smart cities anew at the same time creating engineering jobs for engineers such as you. The talk will make the participants to think not only of a career but also making a smarter future and better India and world.

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Paper ID: FUI5012

CARPOOL CONNECT: BRIDGING COMMUTERS THROUGH WEB-BASED RIDE-SHARING SOLUTIONS

Nikhil Maurya, Anurag Shetye, Chinmay Desai, Shravan Bishnoi & Shweta Ashtekar
(Ramrao Adik Institute of Technology Navi Mumbai, India)

Abstract

As urban traffic congestion, pollution levels, and fuel cost have increased, sustainable transport s olutions have become the need of the hour. This manuscript deliberates the in- depth conception, s tructural organization, and the progressive real-time implementation of an intelligent carpooling platform which allows record matching of rides of direction and schedules of drivers and passengers. In view of location-service, road- optimization, and machine-learning-based matching logic, the technology seeks to reduce the distance traveled to be able to fill the ride capacity to the maximum and thus ensure the overall efficiency of the system.This platform is also bolstered with a solid user authenti cation, a reputation-based trust mechanism, and an adaptive scheduling workflow that guarantees reliability and safety. Moreover, its architecture is modular and scalable and is hence s upported by an interactive real-time ride management system through which users can post rides, s earch for rides, and manage ongoing trips without any hitch. In the same way, a metrics dashboard allows monitoring of the user activity, performance, and system estimations of traffic congestion and carbon emission reductions.The outlined system thus, intends to solve paramount questions of urban mobility through the provision of a convenient, trustworthy, and environmentally conscious carpooling solution. The platform has been put to the test in different scenarios to check its usability, performance, and reliability and thus, it is highly probable that it can be further developed into mobile apps and connected with public transit networks.

Keywords: Carpooling, Ride-sharing, Route Optimization, Machine Learning, Real-time Matching, Sus tainable Transporta- tion, Geolocation, Microservices Architecture

Paper ID:
FUI2405

SUSTAINABLE URBAN INFRASTRUCTURE: PROFESSIONAL PERSPECTIVES ON SELF-CURING CONCRETE IN MUMBAI METROPOLITAN REGION

Dada Subhash Patil, Fauwaz Abdul Majid Parkar
(Anjuman-I-Islam's Kalsekar Technical Campus, Panvel, Navi Mumbai)

Abstract

Conventional curing of structural concrete requires substantial volumes of potable water, creating sustainability concerns in water-scarce regions such as Mumbai Metropolitan Region (MMR). The continued reliance on such water intensive practices conflicts with the objectives of resource efficiency and urban resilience. Self-Curing (Internally Cured) concrete has emerged as an innovative alternative, capable of reducing external water demand during hydration. Its application directly contributes to sustainable development goals, particularly in water conservation and construction sustainability.To assess professional perceptions, a structured questionnaire survey was designed targeting civil engineering practitioners. The instrument was circulated among professionals working within the MMR. A total of 105 valid responses were received, encompassing 15 multiple choice questions on awareness, applicability, and perceived benefits of Self-Curing concrete. The data set reflects the perspectives of practicing engineers engaged in diverse infrastructure projects across MMR. Further, M30 grade concrete mix was prepared. A set of 3 cubes (150 mm x 150 mm x 150 mm) was placed under water for 28 days' curing; three sets, each having 3 cubes with 0.3%, 0.4% and 0.5% dosages of Self-Curing additive Super Absorbent Polymer (SAP) were placed in an open air to self-cure. Survey analysis revealed that over 95% of respondents strongly supported the inclusion of Self-Curing concrete in municipal and national codes. Respondents also emphasized its potential role in achieving sustainable infrastructure and smart city initiatives. The findings highlight a clear professional consensus on the necessity of adopting Self-Curing concrete in Indian construction practice. It is recommended that policy makers and municipal authorities integrate Self-Curing concrete into codes and guidelines to promote long term sustainability in urban infrastructure. 28 days' compressive strength test results on M30 grade concrete revealed that the SAP-incorporated samples exhibited strength on par with the water-cured sample.

Keywords: Self-Curing concrete, sustainable development, water conservation, smart city, standard codes

Paper ID: FUI3307

DESIGN, DEPLOYMENT, AND VALIDATION OF SMART SAFETY GEAR FOR RISK MITIGATION FOR BUILDING SUSTAINABLE URBAN INFRASTRUCTURE

Anushka Bhatt, Karthik Nagarajan and Raju Narwade
(Pillai HOC College of Engineering and Technology, Rasayani)

Abstract

The Construction Industry has always been allied with high-risk construction activities due to its fast pace of infrastructure development, and as a result of which the safety of workers has become a grave concern. Recent research developments indicate that integration of advanced technology within the conventional safety equipment used in the conventional process of construction presents a promising solution for risk management in real-time on various multifunctional sites [12], [21], [22].The main focus of this research was to highlight and appraise how wearable safety devices can be implemented while confronting these safety issues and also building sustainable infrastructure. The device operates on a range of cautiously chosen environmental and physiological sensors that detect the various threats common on a construction site, thereby reducing the occurrence of accidents, and draft mitigation strategies, thereby enabling advancements in safety practices within construction industry.The research methodology was implemented in different phases, which includes preliminary literature review, identification of Research gaps, prototype development of various smart sensors for temperature, motion, and gaseous emissions, deployment of a prototype in varied site circumstances for testing its effectiveness in hazard detection, natural performance, and user experience being recorded. These visibly reduced incidence rates and improved safety were confirmed through Field validation. These findings are a clear indication that enhancement of workers' well-being through smart safety wear can be a monumental breakthrough in construction safety practice norms.

Keywords: smart safety gear, sensors, Personal Protective Equipment (PPE), sustainable building, urban infrastructure

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Paper ID: FUI3809

CRITICAL ANALYSIS OF PROJECT DELAYS IN BUILDING CONSTRUCTION SECTOR IN THE INDIAN CONTEXT: A COMPREHENSIVE REVIEW

Mr. Shivraj Patil and Dr. Karthik Nagarajan
(Pillai HOC College of Engineering and Technology, Rasayani)

Abstract

Construction delays remain a persistent challenge within the Indian building sector, affecting project timelines, cost performance, and stakeholder satisfaction. This study provides a comprehensive review of literature published between 2010 and 2025, identifying the primary causes, patterns, and mitigation strategies related to project delays. Delay factors are categorized into client, contractor, consultant, and external , related causes, covering issues such as inadequate planning, labour shortages, design revisions, funding constraints, and regulatory hurdles. The review also evaluates the adoption of modern project management approaches, including Building Information Modelling (BIM) and Lean Construction, within the Indian context. Findings indicate that while research is abundant in infrastructure sectors (highways, rail transport, and energy projects), limited attention has been given to institutional buildings and affordable housing. The study concludes that enhanced stakeholder coordination, integrated planning frameworks, and sector , specific delay models are vital for improving project delivery outcomes across India’s diverse construction landscape.

Keywords: Construction, Delays, India, Infrastructure, Project Management

Paper ID: FUI3408

RETROFITTING AND STRENGTHENING WITH BRASS COATED STEEL FIBRE CONCRETE

Mr. Mukesh Nanuram Meena, Mr. Raju Narwade and Dr. Karthik Nagarajan
(Pillai HOC College of Engineering and Technology, Rasayani)

Abstract

The objective of the High strength concrete study is to determine various types of material effects at a high temperature with content of Brass coated steel fibers effects on the workability, engineering properties, and ductility enhancement of concrete. Different-Different mixture of concrete were prepared and tested using various types and sizes of brass coated steel fibers at the designed compressive strength of concrete of 80 to 100 MPa. The post-cracking tensile strength (usually greater than 8 MPa).Steel fiber-reinforced is high-performance concrete is an important type of concrete reinforcement for fire resistance, strengthening of existing structure and retrofitting. Steel fibers reinforcement can improve the engineering properties of concrete, including compressive, tensile, and flexural strength; ductility; impact and abrasion resistance, shear strength, crack resistance, shock resistance, and anti-seepage. Fire resistance is a very important and compulsory design parameter that must be considered when selecting materials because this shall be a determinant to reduce some impacts received by the structure in a fire situation, thus increasing safety and life of structure. In general, concrete structures present a decay in mechanical resistance while also causing fragmentation of the concrete and thus exposing the bar reinforcements that are in its interior, aggravating the structure's stability. The combination use of steel fibers reinforcement indicates that the residual engineering properties after being exposed to high temperatures is higher for concretes with the addition of steel fiber than the conventional concrete. The incorporation of steel fibers reinforcement into concrete can also inhibit crack formation and propagation, as well avoid the occurrence of explosive spalling at high temperatures. The creep behavior at high temperature is a major concern of concrete in Chemical Industry, Fire resistance, and Industrial building etc. Target temperature of concrete is around 600°C during fire. The study shows that short-term creep of Reactive powder concrete (RPC) increases considerably above 600°C and the increase under the same loading ratios at 700°C and 900°C is approximately 6 and 8 times as that of short-term creep at 120°C, respectively. However, at higher temperature, the increase in strain rate become noticeable. The use of Brass coated steel fibre in concrete with GGBS is protective structures against fire and extreme loading conditions (e.g. high-velocity impact and blast), which is attributed to its advantages of higher tensile strength and better energy absorption capability compared to normal concrete. For testing the concrete specimen, the sizes of the cube used is 150 mm x 150 mm x 150 mm. The flow and characteristics during the fresh concrete were also examined by conducting the slump cone test, compaction or air removal test etc. All the cube samples have been cured in the water for 7th and 28th days for the destructive compressive strength test as per IS 456:2000. Based on result, it was concluded that the optimum percentage of steel fiber was 8% of total dry material and size 13 mm length used which has recorded the highest compressive strength at 28th days of Micro-Concrete and R.C.C. concrete during test.

Keywords: Steel brass coated Fiber, GGBS, High strength concrete, Micro Concrete.

Paper ID: FUI4511

OPTICAL FIBRE CONCRETE: THE FUTURE OF SUSTAINABLE URBAN INFRASTRUCTURE

Mr. Mukesh Patil, Dr. Karthik Nagarajan and Mr. Raju Narwade
(Pillai HOC College of Engineering and Technology, Rasayani)

Abstract

Concrete is widely used in construction because it is strong, durable, and long-lasting. However, one of its major drawbacks is that it does not allow light to pass through, which increases the need for artificial lighting and results in higher energy consumption. To overcome this issue, a new type of material called Optical Fiber Decorative Concrete (OFDC) has been developed. In this material, thin optical fibers are placed inside the concrete mix so that light can travel through it without reducing its overall strength.The main aim of this study is to design and test OFDC as a material that serves both structural and decorative purposes. Unlike normal concrete, OFDC combines strength with partial transparency, attractive appearance, and energy-saving benefits. It can be used in many creative and architectural applications such as wall panels, floors, façades, tables, and decorative products.This research focuses on finding the right amount and arrangement of optical fibers to allow good light transmission while keeping the concrete strong. The experimental work was done using OPC 53-grade cement, standard aggregates, and polymer optical fibers of 2 mm diameter. The fiber content was varied from 2% to 8% by volume, and sample panels of size 234 × 110 × 40 mm were made and cured for 28 days. Tests were carried out to measure compressive strength, workability, water absorption, and light transmission using a lux meter.The results showed that when the fiber content was between 4% and 6%, the panels achieved a good balance between strength and transparency. Within this range, the concrete panels allowed enough natural light to pass through, which could reduce the need for artificial lighting by about 15–20%.Overall, this research demonstrates that Optical Fiber Decorative Concrete can make conventional concrete more sustainable, visually appealing, and energy-efficient. It opens up new possibilities for modern architecture and interior design by merging aesthetics with functionality.

Keywords: Optical Fibre Decorative Concrete, Light-Transmitting Concrete, Energy Efficiency, Sustainable Materials, Urban Infrastructure.

Paper ID: FUI4010

A CRITICAL REVIEW ON THE SEISMIC BEHAVIOR OF GEOMETRICALLY IRREGULAR HIGH-RISE BUILDINGS

Shreeshail Panchu Gaikwad and Karthik Nagarajan
(Pillai HOC College of Engineering and Technology, Rasayani)

Abstract

The rising demand for high-rise buildings has encouraged architects and engineers to adopt unconventional forms that often depart from traditional symmetry and uniformity. These modern configurations—featuring setbacks, re-entrant corners, torsional asymmetry, and uneven distributions of mass and stiffness—introduce geometric irregularities that significantly affect seismic behaviour. Such discontinuities create stress concentrations that intensify under earthquake loading, interrupting the uniform transfer of lateral forces and leading to torsional response, differential floor movement, and localized structural distress. This paper reviews the influence of these irregularities on the seismic performance of tall buildings by examining analytical approaches such as the Equivalent Static Method (ESM), Response Spectrum Analysis (RSA), and Time History Analysis (THA). Earlier studies consistently show that irregular buildings are subjected to higher base shear, increased inter-storey drift, and a greater likelihood of damage than their regular counterparts. The review also compares the seismic response of regular versus irregular structures and highlights gaps in recent research, particularly those relating to nonlinear behaviour, soil–structure interaction, and the role of contemporary damping systems. The findings indicate the importance of addressing geometric configuration at the conceptual design stage and adopting advanced analytical procedures like Performance-Based Seismic Design (PBSD) to achieve more reliable assessments of seismic performance. The discussion further suggests that updates to current seismic codes are necessary to better accommodate the complex geometries prevalent in modern high-rise construction, and that careful consideration of geometric irregularity can lead to improved structural ductility and enhanced seismic safety.

Keywords: Geometric Irregularity, Seismic Performance, High-Rise Buildings, Dynamic Analysis, Structural Irregularity

Paper ID: FUI8616

MECHANICAL DESIGN AND STRUCTURAL INTEGRATION OF A SOLAR-POWERED EV CHARGING STATION FOR TWO-WHEELER

Payal Gharat, Omkar Ambelkar, Harsh Akhade, Narendra Pandey and Jisha Satheesh
(Pillai College of Engineering, New Panvel)

Abstract

This paper presents the mechanical design, structural analysis, and material comparison of solar-powered EV charging station for campus application accommodating five two-wheelers. The design aims at a small canopy (6.690 m × 3m footprint) with framed PV modules, a 48 V battery bank, and 5 charger pedestals. Using site data for Panvel (New Panvel, Navi Mumbai -latitude ≈ 18.99° N). We selected the optimal panel tilt angle (19°), determined the sizes of supporting channels and verticals for worst-case wind and dead loads, evaluated five candidate materials (IS2062 mild steel, AISI 1020, galvanized steel, Al 6061-T6, and SS 304), and calculated the corresponding stresses and factors of safety (FOS). The analysis identifies SHS 100×100×4 mm vertical columns and SHS 50×50×3 mm purlins as suitable options for steel and aluminium structures, ensuring FOS ≥ 2.0 under conservative loading conditions. The paper also includes detailed design calculations, section checks, baseplate and anchor verifications, fabrication guidelines, and corrosion protection recommendations. The final design is economically optimized for campus installation and validated using a recommended SolidWorks and Matlab simulation protocol.

Keywords: Solar canopy, EV charging, mechanical design, structural analysis, Panvel, factor of safety.

Paper ID: FUI8515

SMARTFARMX: AI-POWERED AGRICULTURE PLATFORM

Yash Rotkar, Aditya Pillai, Sanket Patil, Varun Iyer and Dr. Aditi Bhateja
(Pillai College of Engineering, New Panvel)

Abstract

Modern agriculture faces critical challenges in managing plant health and accessing timely, localized crop guidance amidst climate variability and resource constraints. SmartFarmX addresses these issues through an AI-driven, farmer-centric platform that unites two innovative modules. First, farmers can upload images of affected plants via a mobile interface, where a ResNet-50 deep learning model analyzes leaf patterns to identify diseases (e.g., blight, rust) and recommend eco-friendly treatments. Second, the platform integrates a multilingual chatbot with voice assistant supporting Hindi, Marathi, and English. Farmers can ask queries like “Which crops thrive in monsoon?” and receive season-specific recommendations based on weather trends, regional practices, and market demands. By combining computer vision for disease diagnosis and a voice-driven interface for crop planning, SmartFarmX prioritizes real-time, actionable insights while eliminating reliance on soil sensors. Designed for low-resource environments, the system operates offline and runs on affordable smartphones, ensuring inclusivity for rural communities. This innovation bridges cutting-edge AI with practical farming needs, fostering sustainability, productivity, and informed decision-making Index Terms—AI in agriculture, crop recommendation, plant disease classification, multilingual NLP.

Keywords: AI in agriculture, crop recommendation, plant disease classification, multilingual NLP.

Paper ID: DTC5322

AI-POWERED CONVERSATIONAL DATABASE SYSTEM

Sharayu Ghorpade, Dhanashree Tidke, Sanika Sangave, Shivansh Kukreti, Prof.Ajit Saraf
(Pillai College of Engineering, New Panvel)

Abstract

This paper presents a privacy-preserving conversational database system that enables non-technical users to interact with PostgreSQL databases using natural language queries, addressing critical data privacy challenges identified in recent AI-driven database optimization research [V Panwar]. Unlike traditional NL-to-SQL systems that require full data access, our approach leverages a schema-only methodology where Google Gemini 2.0 Flash receives only database structure metadata (table names, columns, data types, primary and foreign keys) without exposure to actual data values. The system integrates Next.js, Flask, Supabase-hosted PostgreSQL, and role-based access control (RBAC) with JWT authentication to ensure secure query execution. Testing on the Chinook database with 50-100 queries demonstrates 90% accuracy for simple SELECT statements and 75% for joins, while maintaining zero data leakage to external AI services. The system additionally provides automated chart generation from query results, eliminating traditional dashboard dependencies.

Paper ID: DTC5927

A SURVEY ON ETHICAL ARTIFICIAL INTELLIGENCE FOR JOURNALISM: AN INNOVATIVE STEP TOWARDS DIGITAL CITIES INFRASTRUCTURE

Pooja Bhise
(Pillai College of Engineering, New Panvel)

Abstract

Artificial Intelligence (AI) refers to the simulation of human intelligence processes by machines, especially computer systems. These processes include learning, reasoning, problem-solving, perception, and language understanding. Making sure that AI systems behave morally, responsibly, and in alignment with human values is the goal of AI ethics i.e. Ethical AI. Journalism is the activity of collecting, verifying, and presenting news and information to the public through various media such as newspapers, television, radio, and digital platforms. Traditional journalism refers to the practice of gathering, verifying, and reporting news through established media channels such as newspapers, radio, and television. But when AI is introduced in the journalism domain it will have major positive and negative consequences. Moving towards the Digital cities, focus should be on AI in journalism and getting ready with the changing world of journalism. It will have a great impact on society as well as human beings' day-to-day life. This survey will give insights of Journalism in the AI era. During this journey the world will come across impacts, effectiveness and limitations that can be faced by each one as a reader, policymaker or journalist etc.

Keywords: Artificial Intelligence, AI ethics, Journalism, Traditional journalism

Paper ID: DTC3515

SMART INFRASTRUCTURE MONITORING: PARAMETRIC AND COMPARATIVE ANALYSIS OF BRIDGE DEFLECTION USING VIBRATING WIRE STRAIN GAUGES

Mrs. Karishma Gavand, Dr. Karthik Nagarajan, Mr. Raju Narwade
(Pillai HOC College of Engineering and Technology, Rasayani)

Abstract

In order to accurately assess deflection under vehicular loading, this study examines a smart bridge health monitoring framework that combines vibrating wire strain gauges (VWSGs), finite element simulation, and artificial intelligence-based prediction. The main obstacles to bridge monitoring—scour, temperature fluctuations, fatigue, corrosion, and impact effects—as well as the shortcomings of traditional wired sensing technologies are highlighted in a review of the literature covering the previous 20 years. When combined with wireless sensor networks for real-time monitoring, VWSGs exhibit exceptional robustness, accuracy, and long-term stability. Accelerometer-based VWSG instrumentation was used to gather experimental field measurements from the bridge deck under various vehicle weights and speeds. Analytical baselines for modal and dynamic responses were established through SAP2000 simulations. Dynamic deflection, which peaks close to mid-span and increase with vehicle speed and axle load, is consistently greater than static deflection, according to comparative analysis. The Dynamic Amplification Factor (DAF) exceeded IRC limits, ranging from 1.00 to 2.35. Ultimately, using field and FEM data, a CNN-based prediction model was created that maintained DAF prediction error within ±0.05 and achieved nearly perfect accuracy ($R^2 \approx 0.99$ vs. field). The findings confirm that bridge diagnostics are greatly improved when VWSGs, FEM simulation, and AI-based prediction are combined. This allows for proactive maintenance and real-time decision-making for smart infrastructure systems.

Keywords: Bridge health monitoring, vibrating wire strain gauges, deflection monitoring.

Paper ID: DTC0605

PROACTIVE COLLISION AVOIDANCE USING DASHCAMS

Shivani Patel, Priyanka Ramachandran, Aditya Surve, and Neha Katre
(Dwarkadas J. Sanghvi College of Engineering, Mumbai)

Abstract

The increasing number of vehicles on the road has intensified concerns about traffic safety, particularly in accident-prone areas where timely intervention is crucial. Conventional accident response systems primarily depend on post-incident reporting, leading to delays that can exacerbate the severity of injuries and damage. To overcome these limitations, this study presents a proactive accident detection system that utilizes dash-cam footage to analyze real-time traffic conditions and predict potential collisions and accidents. By utilizing computer vision techniques and deep learning models, the system continuously monitors road environments, detects anomalies, and issues early warnings to drivers. The system demonstrated strong performance, with a reported accuracy of greater than 0.87 in distinguishing dangerous vs. safe events and 0.85 in assigning collision class type, successfully issuing early warnings in various challenging scenarios, including low-light conditions, poor weather, and sudden lane incursions, as confirmed by both real-world testing and Unity3D simulations. This research significantly contributes to improving road safety and minimizing response delays by shifting the focus from reactive measures to proactive accident prevention.

Keywords: Accidents, Anomaly Detection, Collisions, Computer Vision, Intelligent Surveillance, YOLOv5

Paper ID:
DTC6431

INTELLIGENT VEHICLE MONITORING SYSTEM

Tanmay Salavkar, Srushti Wategaonkar, Ashwin Pillai, Harsh Rao, Deepa Ekhande
(Pillai College of Engineering, New Panvel)

Abstract

With the advent of Internet of Things (IoT) technologies and On-Board Diagnostics (OBD) systems in modern vehicles has enabled continuous real-time data collection from vehicular sensors paving new way for predictive maintenance. In this paper, we have summarised architectures of various recent research papers by assessing the way they get vehicular parameters-either using OBD-II data or external sensors, preprocessing techniques applied on those data and how they gained useful insights for the data. Apart from traditional architecture, this paper also proposes a newer architecture, to enhance data collection, onboard vehicle maintenance and secure transmission of data to the cloud.

Keywords: Internet of Things (IOT), OnBoard Diagnostics (OBD), Machine Learning(ML), Fleet Management, Predictive Maintenance, Vehicle Monitoring, CANBus.

Paper ID:
DTC5423

BLOCKCHAIN-ENHANCED AUTOMATION IN CONSTRUCTION: SMART CROWD FUNDING CONTRACTS

Mr. Ashish Purushottam Kulkarni, Mr. Raju Narwade, Dr. Karthik Nagarajan, Ms. Rajashri Narwade
(Pillai HOC College of Engineering and Technology, Rasayani)

Abstract

This research introduces a new way to improve crowdfunding using blockchain technology. Crowdfunding is a popular method for supporting projects, but there are concerns about how funds are managed. To solve this, we propose a system that uses blockchain from Ethereum, along with smart contracts. These smart contracts help project creators and investors work together in a fair and secure way. Our main goal is to make crowdfunding better for everyone involved. With smart contracts, creators can set rules for how funds are used, and investors can have a say in decisions. This gives investors more control over their money. This blockchain-based system brings benefits like clear transactions, protection against fraud, and better accountability. By using Ethereum, we ensure that all transactions are secure and easy to track. Smart contracts also speed up tasks like giving out funds and making decisions. We built a prototype using Ethereum's tools to show how this can work. Through real examples, we show that blockchain can make crowdfunding more trustworthy and efficient. In conclusion, our research offers a fresh solution to the problems in crowdfunding. By using blockchain and smart contracts, we can reshape crowdfunding to be fairer, more secure, and more effective. This work contributes to the ongoing conversation about blockchain's impact and provides a real solution to improve crowdfunding for everyone.

Keywords: Blockchain; Smart Contracts; Ethereum; Meta-Mask; Construction Industry, Crowdfunding.

Paper ID: DTC8637

SIGN BRIDGE: SIGN LANGUAGE TRANSLATOR

Aditya Chandgaonkar, Aayush Mankar, Abhijeet Chaurasia, Dr. Ravi Biradar
(Pillai College of Engineering, New Panvel)

Abstract

This work presents SIGNBRIDGE, a browser-based system for real-time sign language recognition that integrates MediaPipe Holistic landmark extraction with a lightweight ONNXRuntime encoder for prototype-based retrieval. The system is trained and evaluated on the publicly available iSign CSLRT dataset hosted on Hugging Face, which contains approximately 7,050 sign videos across multiple gesture classes. For the current implementation, a subset of 500 preprocessed sequences was used for training and validation to establish a working prototype. Each gesture sequence is represented as a fixed-length window of pose, hand, and face landmarks, normalized for scale and position. The encoder model was trained for 50 epochs using a metric-learning objective to cluster embeddings of the same gesture while separating different ones. After training, class prototypes were computed by averaging embeddings per class, and the encoder was exported to ONNX for client-side deployment. At inference, the system captures live landmarks, encodes them into embeddings, and retrieves the nearest prototype using cosine similarity. To ensure robustness, the implementation incorporates an idle/background class, confidence thresholding with margin checks, and temporal smoothing via a vote buffer. Internal evaluations on the iSign CSLRT subset demonstrate stable recognition of the trained vocabulary in natural motion, suppression of idle false positives, and elimination of repetitive output loops. This implementation highlights the feasibility of deploying sign language recognition entirely in the browser, making SIGNBRIDGE a reproducible and accessible foundation for future accessibility tools and research in gesture-based human–computer interaction.

Keywords: Mediapipe, ONNXRuntime, iSign CSLRT.

Paper ID: DTC4219

HATE SPEECH AND CYBERBULLYING DETECTION ON SOCIAL MEDIA: A SYSTEMATIC REVIEW OF METHODS, DATASETS, AND CHALLENGES

Sheetal P. Gawande, and Sharvari S. Govilkar
(Pillai College of Engineering, New Panvel)

Abstract

In today's digital era, Social Media plays a vital role in shaping everyday life, influencing shopping trends, business decisions, political discourse, and social awareness. These platforms are founded on the principle of freedom of expression, empowering people to share their opinions and ideas. On the darker side this openness is exposed to Hate Speech, cyberbullying which lead to serious real-world consequences such as psychological harm, social polarization, erosion of trust, and even violence. Just as responsible citizens contribute to physical safety, responsible netizens play a crucial role in ensuring cyber safety and digital well-being within future smart cities. This survey aims at the role of Natural Language Processing (NLP) to safeguard this digital landscape. The study systematically reviews research papers from IEEE, ACM, Elsevier, and other reputable sources, providing valuable insights, key challenges in this domain.

Keywords: Social Media, Natural Language Processing(NLP), Cyber Crime, future cities.

Paper ID: DTC9039

HOME AUTOMATION USING CUSTOM 32-BIT RISC-V BASED FPGA PROCESSOR

Vrushali Thorat, Suchit Pillai, Chirag Wadkar, Gopalkrishna Siddabattula, Dr. Ravi Biradar
(Pillai College of Engineering, New Panvel)

Abstract

This paper presents the design and implementation of a custom 32-bit RISC-V processor with a 5-stage pipeline architecture deployed on a Xilinx Spartan-3A FPGA. The processor is designed to control and automate home appliances through a flexible and open-source hardware architecture. The use of the RISC-V instruction set provides scalability, customizability, and cost efficiency compared to proprietary microcontrollers. The FPGA platform enables real-time performance with parallel hardware execution and easy reconfiguration. The proposed system successfully demonstrates real-time control of household devices such as lighting, fans, and sensors. Experimental evaluation shows that the processor achieves stable operation with acceptable timing performance and moderate FPGA resource utilization, making it a suitable candidate for low-cost and energy-efficient smart home systems.

Keywords: RISC-V, FPGA, Spartan-3A, Home Automation, Embedded Systems, Pipeline Processor

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Paper ID: DTC4320

DETECTION AND CLASSIFICATION OF MICROWASTE IN TEMPLE ENVIRONMENT

Vaishnavi Dhane, Purva Chaudhari,Karpagavalli Subramanian
(Pillai College of Engineering, New Panvel)

Abstract

Waste management remains a significant urban challenge, particularly in high-footfall areas such as temples, where large volumes of offerings and ritual materials accumulate daily. Currently, temple waste is primarily managed manually, with workers separating and disposing of debris by hand. However, no automated system exists that can efficiently identify, classify, and segregate mixed temple waste—particularly micro-waste—without human interaction. This gap emphasizes the necessity for an automated smart waste-segregation system based on computer vision and deep learning. The proposed system is trained on four critical classes—floral waste(leaves and flowers), plastic wrappers, plastic caps, and ritual waste(coconut shells and incense sticks)—which are frequently observed in religious environments and are among the major contributors to drainage problems. The finalization of the ML model is accomplished by comparing a few established image-processing approaches, such as KNN, SVM, and classical CNN-based classifiers,YOLOv8 to assess their performance on diverse temple-waste photos. However, these systems battled with issues like overlapping objects, micro-waste detection, and excessive background clutter. According to the results, YOLOv8 outperformed other algorithms in terms of detection accuracy and localization precision. Experiments with our proprietary dataset demonstrate that the model can accurately identify and localize small-scale waste items in congested and complicated temple settings. The proposed technique not only presents a new application domain for YOLOv8, but it also provides a useful tool for enhancing cleanliness and promoting sustainable waste management practices in religious and cultural settings.

Keywords: YOLOv8, Object Detection, Deep Learning, Temple Micro Waste Management, Environmental Sustainability.

Paper ID: DTC3114

A VALIDATED PREDICTIVE MODELING AND HIGH-THROUGHPUT FRAMEWORK FOR DATA-DRIVEN DESIGN OF CALCIUM PHOSPHATE BIOMATERIALS

Prajakta Subhedar, Divya Padmanabhan, Richa Agrawal
(Pillai College of Engineering, New Panvel)

Abstract

A critical limitation in biomaterials science is the absence of a systematic, predictive computational methodology for characterizing calcium phosphate compounds, which significantly delays the design and discovery of therapeutic materials. This paper introduces an integrated, validated platform that merges theoretical modelling with laboratory experimentation to address this deficiency. We established a statistical approach using a Python-based workflow to perform an extensive in-silico screening of 58 distinct calcium phosphate structures. This process yielded simulated X-ray Diffraction (XRD) patterns, which allowed for the prediction of intrinsic, defect-free crystallite sizes, typically ranging from 2 to 14 nm. To ensure the model 's validity, we synthesized the specific biomaterial whitlockite (magnesium-substituted hydroxyapatite) and conducted empirical XRD analysis to determine its true crystallite size and crystallinity index. Our analysis confirmed a statistically strong correlation between the idealized computational predictions and the data derived from the physical samples. Although experimental materials displayed larger crystallite dimensions (27 to 56 nm) due to real-world synthesis factors, the coherence of the results with existing literature on monocrystalline biomaterials successfully validates the predictive capacity of our statistical framework. By successfully integrating theoretical computational modelling and empirical verification, this unified methodology presents a robust, data-driven instrument. It is poised to accelerate the systematic design and characterization of advanced calcium phosphate compounds, offering significant potential for future medical research and clinical applications.

Keywords: Calcium phosphate compounds, python workflow, whitlockite, synthetic XRD, computational modeling

Paper ID:
DTC6028

S.A.A.R.: A CONVERSATIONAL AI PLATFORM

Sanika Tamboli, Aryay Mansukh, Ayush Tandel, Ritesh Salve, Rubina Shaikh
(Pillai College of Engineering, New Panvel)

Abstract

This paper presents the development of S.A.A.R., an advanced conversational AI platform designed to interpret, process, and respond to user inputs through both speech and text. The system integrates multiple artificial intelligence components such as speech recognition, natural language processing (NLP), decision mapping, and task automation within a unified and modular architecture. S.A.A.R. leverages asynchronous multithreading to enable real-time interaction while maintaining smooth system performance. The platform employs machine learning-driven language understanding to analyze user intent and perform context-specific operations such as system control, information retrieval, and web-based query responses. Experimental results demonstrate that the proposed architecture provides a scalable, efficient, and extensible framework for building intelligent personal assistants using open-source technologies.

Keywords: Artificial Intelligence, Conversational Agent, Speech Recognition, Natural Language Processing, Automation, Real-time Search, Machine Learning, Decision Mapping Model.

Paper ID: ESI0902

SUSTAINABLE RESIDENTIAL AIR CONDITIONING SYSTEM

Dr. Dinesh Balasaheb Uphade,Mr. Pranav Ravindra Khairnar,Mr. Om Keda Mundaware, Ms. Aditi Vijay Jadhav
(MVPS's Karmaveer Adv. BG Thakare College of Engineering, Nashik)

Abstract

The proposed project focuses on the design and development of a sustainable residential air conditioning system using thermoelectric cooling (TEC) technology. Unlike conventional vapor compression systems, the TEC-based system operates without compressors or refrigerants, offering a compact, noiseless and eco-friendly solution. The prototype utilizes 35 TEC1-12715 modules arranged in series to provide effective cooling for a 3.048 m × 3.048 m × 3.048 m room. The heat sinks and forced convection fans ensure efficient heat dissipation, while the hot side heat can be recovered for applications such as water heating, further enhancing energy efficiency. The system's performance is evaluated in terms of temperature reduction, power consumption and Coefficient of Performance (COP), with results compared to conventional AC systems. The cooling COP is 5 and above for expected low temperature range of 2 to 10oC. The study demonstrates the feasibility of TEC modules for residential cooling, emphasizing energy efficiency, sustainability and potential integration with renewable energy sources such as solar power.

Keywords: Sustainable cooling; Coefficient of performance; Energy efficiency; Smart cooling.

Paper ID: ESI1203

THE ROLE OF ENGINEERS TO MEET THE OBJECTIVES OF SUSTAINABLE DEVELOPMENT GOALS

Avinash G. Shaligram,Dr Dinesh B. Uphade
(Experiqs Pvt. Ltd., RBTIC Building, IIT Bombay)
MVPS's Karmaveer Adv. BG Thakare College of Engineering, Nashik)

Abstract

The United Nations Sustainable Development Goals (SDGs) provide a global framework for ending poverty, protecting the planet, and ensuring prosperity for all by 2030. Engineers play a pivotal role in achieving these objectives by designing, building, and maintaining the products and systems that underpin modern society. This paper explores the contributions of engineers across multiple SDGs, including clean water and sanitation (SDG 6), affordable and clean energy (SDG 7), industry, innovation and infrastructure (SDG 9), sustainable cities and communities (SDG 11), climate action (SDG 13), good health and well-being (SDG 3), quality education (SDG 4), and responsible consumption and production (SDG 12). Special emphasis is placed on emerging technologies like energy-efficient heat pumps, renewable energy systems, and smart urban solutions. Also initiatives for climate change mitigation are covered as this is a major issue being faced in the world currently. The study highlights how engineers integrate innovation, resource efficiency, ethical practice, and cross-disciplinary collaboration to advance sustainable development. Future research should focus on adopting AI, IoT, and green technologies to further improve the impact of engineering on global sustainability.

Keywords: Sustainable Development Goals (SDGs); Engineers' role; Technologies and systems, Renewable energy; Heat pumps; Smart cities; Climate action.

Paper ID: ESI1705

PERFORMANCE ANALYSIS OF MOTOR SYSTEM IN POWERTRAIN AND ITS OPTIMIZATION FOR ELECTRIC VEHICLES

Mr. Jaslok B. Pandey, Dr. Gajendra V. Patil, Dr. Mariappan.D. Nadar
(Pillai HOC College of Engineering and Technology, Rasayani, India)

Abstract

In-depth analysis and assessment of electric vehicle (EV) power trains are covered in this literature study, which emphasizes the critical need for increased efficiency. As the global automotive industry shifts to electrification, it is imperative to optimize the design and operation of electric vehicle power trains. Key performance metrics are analysed using the literature survey. The results of the literature review examine the effects of driving conditions and vehicle dynamics on the motor and power train performance. These publications provide a comprehensive analysis of the many motor technology types now in use, highlighting their respective research needs, approaches, and future prospects. In order to mimic motor performance under different operating situations and make it easier to identify important design factors, advanced modelling approaches are examined.

Keywords: EVs Power Train, Motor Maintenance, Design Optimization, Thermal management

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Paper ID: ESI1806

FLOW-INDUCED VIBRATION ANALYSIS EVALUATING FAILURE CONDITIONS IN HEAT EXCHANGER TUBES

Mayuresh Naikwade , Dr. Gajendra Vasantrao Patil , Dr. Marriapan. D. Nadar
(Pillai HOC College of Engineering and Technology, Rasayani, India)

Abstract

Flow Induced Vibration (FIV) is a critical concern in shell-and-tube heat exchangers, often governing the operational reliability and lifespan of tubes. This paper presents an extensive analysis framework to predict the lifespan of heat exchanger tubes subjected to FIV, encompassing detailed calculation procedures for tube design and vibration analysis, supported by a representative numerical example. Key failure mechanisms such as turbulent buffeting, vortex shedding, fluid-elastic instability, and acoustic resonance are investigated with respect to their operational criteria. Using validated formulas and experimental parameters, the study offers insights into vibration amplitudes, natural frequencies, and damping considerations necessary for effective lifespan prediction and mitigation strategies. Results highlight the dominant modes of failure and provide recommendations for design optimization to prevent premature tube failures.

Keywords: Flow Induced Vibration (FIV),Heat Exchanger Tubes,Shell-and-Tube Heat Exchanger, Vibration Analysis, Tube Lifespan Prediction, Turbulent Buffeting, Vortex Shedding.

Paper ID: ESI1907

WATER FOOTPRINT CALCULATOR: AN INTERACTIVE WEB-BASED SOLUTION

Divyam Navin, Harshsingh Negi, Atharva Palve, Dikshant Phulpagar, Anandkumar Pardeshi, and Rakhi Bhadkamkar
(Fr. C Rodrigues Institute of Technology, Navi Mumbai, India).

Abstract

Global water scarcity is an issue whose consequences are felt by over two billion people. However, despite this, awareness of the patterns of water consumption is still very low at the individual level. This research paper describes the development of a web-based Water Footprint Calculator that uses the latest technologies and artificial intelligence to bridge the awareness gap. The system takes the data of people's lifestyles by means of a user-friendly multi-step form and, after receiving the data, it applies scientifically verified coefficients. The out- put is shown through Chart.js, and Google Gemini API integration helps to give conservation suggestions that are both personalized and AI-pow-ered. The paper presents a reliable, expandable, and AI-driven tool as a major contribution to sustainable water use with a proven behavioral impact.

Keywords: Water Footprint, Sustainability, Artificial Intelligence, Google Gemini API, Environmental Awareness, Personalized Recommendations

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Paper ID: ESI3210

IMPACT ASSESSMENT OF MONSOONAL RAINFALL ON RIVER DISCHARGE REGIMES: THE VASHISTHI ESTUARY PERSPECTIVE

Bhakti Kadam
(Pillai HOC College of Engineering and Technology Rasayani)

Abstract

River discharge monitoring is an essential aspect of hydrological science and water resources engineering, as it provides critical insights into the flow dynamics of river systems. Discharge, defined as the volume of water flowing past a given point in a river over a set period. Accurate and continuous monitoring of discharge supports the development of hydrological models, informs infrastructure planning, and underpins effective disaster preparedness strategies. It begins by outlining the theoretical basis of river discharge, including the hydrological cycle, catchment hydrodynamics, and the relationship between precipitation, runoff, and stream flow. Traditional measurement techniques such as the velocity-area method, float method, and use of weirs and flumes are examined for their reliability and limitations. In contrast, the increasing use of advanced technologies such as Acoustic Doppler Current Profilers (ADCPs), satellite remote sensing, radar altimetry, and telemetry-based monitoring networks is highlighted, showing how these tools enable more precise, real-time, and spatially extensive data collection. The paper also discusses the role of gauging stations, and the importance of maintaining long-term hydrological datasets.

Paper ID: ESI3911

BREATHESAFE – PREDICTIVE ANALYSIS OF AIR POLLUTION LEVELS

Anushka Jadhav, Indrajit Joshi, Shweta Ashtekar, Sampada Gupta, Siddharth Joisar
(R.A.I.T., Dr D Y Patil deemed to be University,Navi Mumbai)

Abstract

The Air Quality Index is a good indication tool for the monitoring of air quality in smart cities and the assessment of the cleanliness or pollution level of air. Predictions of AQI values can facilitate people and authorities in taking precautionary steps like avoiding exposure to the outdoors on days when pollution levels are high. This study will look into the analysis of data and machine learning to forecast AQI by using previous pollution data, weather patterns, and environmental factors. A number of models have been trained and compared, which include a neural network to capture intricate non-linear correlations, XGBoost for efficient gradient boosting, Random Forest Regressor for robustness, and Linear Regression as the baseline. Results prove the potential of advanced models in real-time environmental monitoring and public health awareness, where models from an ensemble and deep learning yield better accuracy and reliability in predicting trends in air quality. Future iterations may consider regional or seasonal differences in air quality.

Keywords : Pollution levels,Linear Regression,Random Forest Regressor,Neural Network,Forecast AQI.

Paper ID: ESI4612

DESIGN AND DEVELOPMENT OF CONCRETE ROAD DIVIDER BLOCK USING E-WASTE BY GEOMETRIC INTERLOCKING TECHNIQUE

Miss.Chaitali R.Kulkarni, Dr.Karthink Nagarajan, Mr.Raju Narwade
(Pillai HOC College of Engineering &Technology, Rasayani)

Abstract

From International analysis, India has secured the fifth number in the world's most E-waste generating countries list. Annually, approximately 2 million tons of waste generates. It comprises roughly 70 percent of total waste including 12 percent from the telecom industry, 8 percent waste from medical business, and 7 percent is from electronics. Moreover, the government, society as well as the private sector produce nearly 75 percent of electronic waste which includes individual household waste, merely 16percent. In day-to-day life, a large amount of E-waste consumes the vast majority of usable land and this may lead to several deleterious effects on human life as well as on the eco-system. This E-waste should be recycled to make it more innovative and less harmful. Certainly, Many E- waste consists of elements that can be useful to make any material long-lasting and cheap. Therefore, to cease E-waste at some level were trying to make it useful in the Construction field.In this experiment will be conducted on concrete block the laboratory where we will replace coarse aggregate in concrete with E-waste like PCB (Printed Circuit Board).By using the above E-waste materials, we will create various specimens of concrete using different percentages of E-waste. The grade of concrete will be M20 and the variation of E- waste will be 0%, 15%, 20% respectively. After, using all materials we will create concrete blocks in the lab on which compressive test will be conducted with different days of curing like 7,28 days respectively. Based on the results of the tests, we will consider the specimen whose strength and durability are high as compared to others. The E-WASTE DIVIDER BLOCK will be manufactured by using respective proportion which can be useful in daily life.

Keywords: E-waste (PCB),Concrete, Compressive Strength, E-waste divider block.

Paper ID: ESI5815

REVIEW ON CONSTRUCTION DISPUTES: A NOVEL APPROACH TO REDUCTION AND RESOLUTION

Mrs. Arathy H Menon,Dr. Karthik Nagarajan
(Pillai HOC College of Engineering &Technology, Rasayani)

Abstract

The construction industry is prone to conflicts due to the high budgets and long durations of projects, which often involve uniqueness. The projects are handled by many people at various stages of the project; the chances of miscommunication and misunderstanding are high, which can lead to disputes. In this paper, a study is conducted on the resolution and reduction of disputes. In the resolution of disputes, different methods are explained and compared, including mediation, arbitration, conciliation, litigation, adjudication and ADR methods. Reduction of disputes can be done by various methods, which are compared here. Litigation is expensive and lengthy compared to other methods; arbitration is short. ADR methods are safe, and mediation, conciliation and adjudication are the most acceptable ways to resolve disputes. Prediction of disputes is also discussed, which includes technological approaches. This paper aims to provide an overall study of prediction, reduction, and resolution of disputes for the successful completion of the projects.

Keyword: Dispute, Prediction, Reduction, Resolution

Paper ID: ESI7223

DEVELOPMENT AND PERFORMANCE EVALUATION OF MAIZE FIBRE REINFORCED POLYSULFONE COMPOSITE MEMBRANES FOR WATER

Jweshvari Vidyadhar Tupe, Divya Padmanabhan, S. M. Khot
(Fr. C. RIT Vashi and Pillai College of Engineering, New Panvel)

Abstract

The shortage of freshwater is becoming a critical issue all over the world. Most of the freshwater reservoirs are below the earth's surface. Additionally, abundantly available seawater is unsuitable for human consumption and for industrial and agricultural uses. Therefore, there is a need for water filtration and desalination. Membrane technology can be used for different characteristic separation processes. The popularity of membrane technology is increasing due to the less consumption of energy. In the present work, Composite Membranes have been developed using polysulfone (Psf) as a base material, N-methyl-2-pyrrolidone (NMP) is used as a solvent, and Polyvinylpyrrolidone (PVP) used for the formation of pores. Pore size plays an important role in water filtration as the permeability of water through the composite membrane is the main parameter to check its performance. Natural occurring fibres can be used as an additive to enhance the performance of the composite membrane. Date palm leaves, coconut coir, agave, maize fibers, and mango leaves can be used as the additive material. The powder or ash of these materials can be used to form dopes for composite membranes. This work involves the use of powder of maize fibres along with the Polysulfone (Psf), N-methyl-2-pyrrolidone (NMP) and Polyvinylpyrrolidone (PVP). Five dopes of the material were prepared with different compositions of additive powders. The weight of powder added was 0.05%, 0.1%, 0.15%, 0.2% and 0.25% of the total weight of the solution. The permeability of water was checked at a pressure of 2 bar, and it was found that the highest water flux for maize fibre membrane is 670.61 LMH. This permeability result was higher than that of other natural fibre reinforced membranes developed.

Keywords: Filtration, Water permeability, Natural Material.

Paper ID: ESI6417

MIX DESIGN OPTIMIZATION AND PERFORMANCE EVALUATION OF BRICKS MADE OF WASTE RED BRICK AGGREGATE AND SHREDDED PLASTIC

Pranav Bhandari, Noopur Alshi, Devhuti Matte, Sagar Swami, Kartavya Waghchoure, Shivam Verma, Ankit Asher
(Sardar Patel College of Engineering, Mumbai)

Abstract

With rising environmental concerns, this study addresses the high volume of construction and demolition waste from red bricks by exploring the potential of utilizing waste red bricks as a construction material. The methodology integrates recycled red brick aggregate with plastic waste to improve material properties and reduce landfill accumulation. Through lab trials, material properties (including a critical 24% water absorption of raw RBA) were evaluated, and Shredded PET plastic was confirmed as the optimal reinforcement. The research provides a comprehensive overview of the technical viability of these sustainable materials, contributing to environmentally responsible construction practices in India.

Keywords: Waste Red Bricks, Sustainable Construction, Recycled Materials, Construction Waste, Material Performance

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Paper ID: ESI6216

ECONOMIC AND ENVIRONMENTAL LIFE CYCLE COST OF RECYCLED CONCRETE PRODUCTS

SHRUTIKA GAWADE
(Pillai HOC college of Engineering & Technology, Rasayani)

Abstract

This research investigates the environmental and economic benefits of using recycled concrete aggregates (RCA) in the production of paver blocks, cover blocks, and kerb stones. A Life Cycle Cost Analysis (LCCA) was conducted, revealing a 20-30% reduction in material procurement costs when using RCA compared to traditional aggregates. The study also highlights substantial savings in transportation and disposal costs, with RCA reducing transportation costs by 30% and disposal costs by 50%. Environmental assessments showed a reduction in carbon emissions by 20-25% when RCA was used, along with a significant decrease in resource depletion and landfill waste. Mechanical testing of RCA products demonstrated that paver blocks, cover blocks, and kerb stones with up to 60% RCA maintained acceptable performance, with compressive strength ranging from 30 to 35 N/mm², suitable for medium traffic applications. This study provides strong evidence that RCA is a cost-effective and environmentally sustainable alternative to conventional construction materials.

Keywords: Life Cycle Cost Analysis (LCCA), Recycled Concrete Aggregates (RCA), Environmental Impact, Sustainable Construction.

Paper ID: ESI7726

SUPERLATTICE-INDUCED PHOTOLUMINESCENCE IN PULSED LASER DEPOSITED $ZnO_{1-x}S_x$ THIN FILMS: CORRELATION OF SAED, EDAX, and TEMPERATURE-DEPENDENT MICRO-PHOTOLUMINESCENCE STUDIES

S. H. Deulkar and Jow-Lay Huang
(Pillai College of Engineering, New Panvel, Navi Mumbai, India)
(National Cheng Kung University, Tainan 701, Taiwan, Republic of China)

Abstract

Zinc oxysulfide ($ZnO_{1-x}S_x$), a ternary mixed-anion semiconductor, offers unique opportunities for bandgap engineering between ZnO (3.37 eV) and ZnS (3.68 eV). In this work, ZnOS thin films synthesized by pulsed laser deposition (PLD) at substrate temperatures of 723 K and 813 K were comprehensively characterized using transmission electron microscopy with selected area electron diffraction (SAED), energy-dispersive X-ray analysis (EDAX), and temperature-dependent micro-photoluminescence (μ-PL) spectroscopy. SAED patterns revealed distinct superlattice reflections with satellite spots, confirming nanoscale periodic ordering within a cubic lattice structure (a = 5.357 Å), contracted from bulk ZnS (5.408 Å) due to oxygen incorporation. EDAX analysis validated stoichiometric Zn:O:S composition consistent with the ZnOS phase. Temperature-dependent μ-PL measurements (77–297 K) using 325 nm laser excitation revealed characteristic emissions at 387.6 nm, 392.2 nm, and 404.4 nm—the latter two absent in pure ZnO and ZnS—attributed to miniband transitions within the superlattice structure. Varshni analysis yielded E(0) = 3.325 eV, $\alpha = 6.5\times10^{-4}$ eV/K, and β = 215 K, confirming bandgap shrinkage driven by electron–phonon coupling. The combined structural and optical evidence conclusively establishes the formation of a ZnOS superlattice phase with unique electronic structure and optical fingerprints, demonstrating its potential for UV–blue optoelectronic applications.

Keywords: Zinc oxysulfide, superlattice, pulsed laser deposition, SAED indexing, temperature-dependent photoluminescence, Varshni analysis, miniband transitions

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Paper ID: ESI8228

ROOP: VIRTUAL TRY-ON APP

Siddhi P. Paradhi,Gaurav Jha,Saniya R. Jitekar,Satyaja Shivthare,Dr. Monika Bhagwat
(Pillai College of Engineering, Panvel, Navi Mumbai)

Abstract

This project showcases ROOP, a mobile app that innovates the online fashion retail experience with features like AI-powered virtual try-on, personalized color analysis, and a thrift shopping experience focused on sustainability. The system consists of a three-stage deep learning pipeline that uses a U-Net model for body segmentation, a Geometric Matching Module for clothing warping, and attention-based synthesize clothing for photorealistic visualization of clothing fit. Skin tone classification achieved 94 percent accuracy utilizing Support Vector Machine and Random Forest classifiers to provide personalized color suggestions. The thrift marketplace uses Convolutional Neural Networks to verify the quality of second- hand garments in an automated way. Developed with React Native, users can upload images of themselves, visualize garments, and receive pre-authenticated thrift items through one interface.

Keywords: Virtual try-on, generative adversarial networks, computer vision, sustainable fashion, deep learning, mobile application, skin tone analysis, thrift verification

Paper ID: ESI8832

HYBRID SOLAR DRYERS FOR SUSTAINABLE AGRICULTURAL DEVELOPMENT: TECHNOLOGY, PERFORMANCE, AND ALIGNMENT WITH SUSTAINABLE DEVELOPMENT GOALS

Hemant V Chavan, Kaushal Prasad
(Finolex Academy of Management and Technology, Ratnagiri)

Abstract

Hybrid solar dryers (HSDs) represent an innovative integration of solar energy with auxiliary heat sources such as biomass, biogas, or electricity, enabling reliable and efficient drying of agricultural products. This technology addresses critical challenges in post-harvest processing, including intermittency of solar radiation, contamination risks, and energy inefficiency in traditional methods. By ensuring continuous operation and controlled environmental conditions, HSDs enhance product quality, reduce drying times, and minimize post-harvest losses, which can reach up to 40% in developing regions. This survey paper provides a comprehensive review of HSD design principles, operational mechanisms, performance metrics from recent case studies, and their profound alignment with the United Nations Sustainable Development Goals (SDGs), particularly SDGs 2 (Zero Hunger), 7 (Affordable and Clean Energy), 12 (Responsible Consumption and Production), and 13 (Climate Action) ,. Drawing on experimental data, computational analyses, and socioeconomic evaluations, the paper highlights HSDs' potential to bolster food security, rural economies, and climate resilience. Key findings indicate that HSDs can achieve 20-50% reductions in energy consumption and drying times compared to open-sun methods, with thermal efficiencies exceeding 60% in optimized designs, Future directions include scaling HSD adoption through policy incentives and advanced materials for broader impact in sustainable agri-processing.[1][2][3][4][5][6][7]

Key words: Hybrid solar dryer, sustainable development goals

Paper ID: ESI9836

BIOFIELD SCAN: A MEASURE OF ENERGY FIELD

Shilpa Mondkar, Richa Agrawal and Shreedevi Kulkarni
(Pillai College of Engineering, New Panvel)

Abstract

This paper provides a thorough overview of the theoretical concept of the Biofield, which is defined as an invisible energy field that encompasses living systems and is based on the constant motion of matter and energy as proposed by Albert Einstein. It also describes the historical development of electro-magnetic and biofield research, pointing out that physiological activities like heart and brain function emit measurable electromagnetic energy that forms the Biofield. Finally, it thoroughly reviews various existing and emerging technologies designed to measure the Biofield, such as Kirlian photography and Gas Discharge Visualization (GDV), highlighting their principles, applications, and limitations.

Keywords: Biofield, Biophoton and Electromagnetic field.

Paper ID: ESI9334

Hot Air Simulation in A Drying Cabinet of PVT System

Meeta S. Vedpathak, Anmol Pratap Singh, Om Borate, Oomez Aslam Kapdi, Taufiq Bharde, Dr. Sandeep Joshi
(Pillai College of Engineering, New Panvel)

Abstract

In this paper the behaviour of airflow inside a drying cabinet is studied by using a computational fluid dynamics (CFD) analysis. The drying cabinet is designed for drying the leafy vegetables. The hot air required for drying is taken from the solar panel. The simulation was done using SolidWorks Flow Simulation to study flow trajectory, velocity distribution, and turbulence patterns. The drying cabinet has four inlets at the bottom and exhaust at the top for air extraction. Three simulation iterations were performed to study the effect of different inside geometry of the cabinet and boundary condition on airflow performance. In the first iteration, uneven flow and localised recirculation were observed due to strong central suction. The second iteration, tray design was changed to reduce central obstruction which result in improved uniformity and reduced turbulence. In first two iterations 5 fans were used at the top for air exhaust. In the final iteration a single fan is used which enhanced the mixing of air. The comparative analysis demonstrates that geometric optimization and fan configuration significantly influence airflow uniformity and efficiency.

Keywords: Drying cabinet, PVT system, Computational Fluid Dynamics (CFD), SolidWorks Flow Simulation, Enclosure Design.

Paper ID: ESI8027

A CONTEXT-AWARE INTERVENTION SYSTEM BASED ON FUSED DROWSINESS AND STRESS MODELS

Umar Khan, Kashif Khan, Pratiksha Patil
(School of Technology Management and Engineering, SVKM's Narsee Monjee Institute of Management Studies, Navi Mumbai, India)

Abstract

Cognitive fatigue, a composite state of drowsiness and mental stress, significantly impairs productivity and well-being in knowledge workers. Current productivity tools are often static, such as timers, or are passive "perception- only" monitors that lack context-awareness and fail to provide timely, relevant interventions. This paper introduces a novel, closed-loop intervention system designed to bridge this gap. The system's architecture is composed of three core subsystems: a perception subsystem, a fusion engine, and a context-aware decision engine. First, we develop and validate high-accuracy machine learning models for vision-based drowsiness detection and physiological stress detection using wearable sensor data. Second, a fusion engine synthesizes the outputs from these models into a single, temporally stable fatigue score and state using a weighted, smoothed average with state hysteresis. Finally, a decision engine leverages this real-time fatigue state, along with user-defined task context (e.g., task priority, cognitive load), to trigger intelligent and timely interventions, such as recommending a break or suggesting a task switch. The primary novelty of this work lies in its complete integration of real-time, multimodal psychophysiological sensing with context-aware decision-making, creating an adaptive system that moves beyond passive monitoring to active, personalized support.

Keywords: cognitive fatigue, context-aware systems, drowsiness detection, human-computer interaction, multimodal fu- sion, stress detection, wearable sensors.

Paper ID: ESI8430

A SUSTAINABLE NATURAL COMPOSITE MATERIAL FOR AUTOMOTIVE APPLICATIONS

Komal Kadam, Atharv Shinde,Jayendra Sankpal, Harsh Giri,Divya Padmanabhan
(Pillai College of Engineering, New Panvel, Navi Mumbai, India)

Abstract

This project focuses on making an eco-friendly composite material using sugarcane bagasse fibers and epoxy resin. The main goal is to study how different fiber-to-resin ratios (8:1, 11:1, and 14:1) affect the strength and stiffness of the final material. The sugarcane bagasse fibers were cleaned, dried, and mixed with Araldite AW106IN epoxy resin and hardener HV953IN in the given proportions. The samples were made according to ASTM D790 standards and tested using a three-point bending test to measure their flexural strength. Theoretical strength values were calculated using the Rule of Mixtures, which predicts how strong the composite should be based on the amount of fiber and resin used. The 8:1 ratio sample showed the best performance, with a flexural strength of 38 MPa. When compared with the theoretical value obtained from the Rule of Mixtures, the experimental result was slightly lower but still close, confirming good accuracy and strong bonding between fiber and resin. The study proves that sugarcane bagasse can be used as a natural reinforcing material to make lightweight and sustainable composites, which can be applied in areas like automobile body parts, reducing waste and supporting environmentally friendly engineering solutions.

Keywords: Sustainable Bagasse-epoxy composite, Flexural strength, Rule of Mixtures.

Paper ID: DTC2109

SIMPLIFYING HEALTH INSURANCE THROUGH AI: POLICY ANALYSIS AND GUIDANCE

Sana Zakir Shaikh, Amrut Bhagwan Patankar, Talha Siddique, Prof. Renuka Chimankare
(Anjuman-I-Islam Kalsekar Technical Campus New Panvel)

Abstract

Making wise financial choices is critical for every- one, especially when it involves health insurance, where both your money and well-being are at stake. Health insurance policies can be tough to navigate, with hidden terms like co-pays, room rent limits, sub-limits, and coverage. If these terms are overlooked, policyholders risk receiving reduced claim benefits, leading to unexpected financial burdens. To address this challenge, we propose a comprehensive AI-driven insurance platform designed to ensure transparency and simplify decision- making for users. Traditional platforms either lack transparency or present information in a scattered and unorganized manner [8]. Our framework bridges this gap by offering a centralized and user-friendly solution. Key features include a personalized policy dashboard, detailed insights into company performance, claim support with step-by-step guidance, and a branch locator for nearby offices. On the personalized dashboard, policyholders are also able to upload their receipts, through which we can analyze hospital charges; if hospitals are selling certain items at excessively high prices, we can inform them that customers are leaving, thereby guiding them. Additionally, customers can be connected to IRDAI through community reviews so that IRDAI can keep a proper check on companies. Through Agentic AI, the platform will also recommend policies with insights from Reddit reviews, as the platform is trusted by lakhs of people, to give policyholders a clear picture [12]. The platform also provides in-depth explanations of riders, addons, and top-ups. An intelligent policy comparison system tailors' recommendation based on the user's budget, age, coverage requirements, and city. To further enhance accessibility, the system integrates an Agentic AI assistant capable of answering user queries with multilingual support. The platform is built using MCP server, MongoDB, React, and Supabase. Overall, the proposed solution improves policy transparency, enhances user decision-making, and simplifies the claim process, demonstrating how AI can transform the health insurance ecosystem [7], [15].

Keywords: Health Insurance, Artificial Intelligence, Policy Analysis, Transparency, AI Agent, FinTech

Paper ID: DTC9440

A HYBRID HEURISTIC–MACHINE LEARNING APPROACH FOR ABUSE DETECTION USING THE TWITTER HATE SPEECH DATASET

Vedant Ranjeet Kawade
(Pillai College of Engineering, New Panvel, Navi Mumbai)

Abstract

In today's world, social media platforms such as Twitter, Facebook, Instagram, and Reddit serve as the primary means of communication. Unfortunately, this has led to the widespread use of abusive or hateful language online. Automatic detection of such language is critical, as manually curating rules for every variation of slang or abusive term is infeasible. This research introduces a hybrid heuristic–machine learning framework designed to improve abuse detection accuracy using the Twitter Hate Speech dataset. A heuristic preprocessing module first normalizes slangs and abbreviations through a custom-built Python dictionary, transforming them into standard language before feeding into ML models. The preprocessed data is vectorized using TF-IDF and augmented with engineered features such as sentence length and bad word counts. Among multiple models tested—Random Forest, Support Vector Machine, and Random Forest—Random Forest achieved the best accuracy of 96% with an F1-score of 0.83. The results show that intelligent preprocessing significantly enhances detection performance.

Keywords: Hate Speech Detection, Machine Learning, Heuristic Preprocessing, Twitter Dataset, Text Classification.

Paper ID: DTC9541

INVESTIGATING KEY PARAMETERS INFLUENCING CATAPULT RANGE: A DATA-DRIVEN APPROACH TO PERFORMANCE OPTIMIZATION

S. H. Deulkar,Dhruva Poojary, Gayatri Das, Divyanshu Goswami and Durga Rao
(Pillai College of Engineering, New Panvel, Navi Mumbai)

Abstract

This study explores the fundamental mechanics of catapults designed and constructed by participants from approximately 50 schools during a competition. Using available materials such as ice cream sticks, rubber bands, and ping pong balls, students engineered catapults to achieve maximum horizontal range. Despite the diverse designs, common influential parameters emerged as key determinants of performance. Initial linear regression models yielded negative R^2 values, necessitating a shift to nonlinear modelling. Subsequent attempts with polynomial regression failed to produce satisfactory results. Ultimately, applying corrections for the angle of release (45 degrees) and selecting the best-performing range from multiple trials significantly improved performance prediction. After outlier removal and model refinement, the Gradient Boosting model achieved an R^2 of 0.8674 and RMSE of 0.8629, effectively capturing the dominant influence of arm length, net extension, and force parameters. This study underscores the importance of model refinement and appropriate data preprocessing for achieving accurate predictive models in engineering design experiments.

Paper ID: DTC7834

MANOSAHYOG: A COMPREHENSIVE MENTAL HEALTH SUPPORT APPLICATION WITH AI-DRIVEN PERSONALIZATION AND PROFESSIONAL INTEGRATION

Grahish Grahish, Kartik Dubey, Sushant Lale, Adnan Qureshi, Deepa Ekhande
(Pillai College of Engineering, New Panvel, Navi Mumbai)

Abstract

Mental health issues such as anxiety and depression are becoming increasingly common due to rising societal pres- sures, excessive digital exposure, and limited access to affordable therapy. Traditional mental health services are often hindered by high costs, long wait times, and social stigma. To address these challenges, ManoSahyog is proposed as a mobile-based so- lution that integrates artificial intelligence with human-centered care. The application offers a multilingual chatbot powered by BERT and GPT-2, mood prediction models using ARIMA and LSTM, and mental health assessments via SVM. These tools are complemented by personalized recommendations and scheduled one-on-one sessions with licensed psychologists and psychology interns. A user survey involving 50 college students revealed that 81% are receptive to digital mental health support, and 65% prefer mobile applications for such services. Additional features include therapeutic music, interactive games, daily routines, and exercises aimed at managing symptoms of depression. Ensuring data privacy and integrity, ManoSahyog employs AES-256 en- cryption, follows GDPR standards, and incorporates blockchain technology for secure record-keeping. This paper presents the overall design, functional modules, and implementation roadmap of ManoSahyog, benchmarking its performance and capabilities against existing mental health platforms such as Wysa, Woebot, and Replika. By blending AI-powered tools with direct access to trained professionals and interns, ManoSahyog strives to make mental health support more inclusive, scalable, and accessible to diverse populations.

Keywords: Mental Health, Mobile Application, Artificial Intelligence, Natural Language Processing, Professional Therapy

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Paper ID: DTC9943

INTELLI LAB SUITE FOR LAB MANAGEMENT AND ANALYTICS

Musti Sri Sahithi, Saya Mumbaikar, Neelanjana Nambiar, Nousheen Sayed
(Pillai College of Engineering, New Panvel, Navi Mumbai)

Abstract

This project represents the Smart Lab system that modernizes laboratory management. It incorporates a smart notice board, automated attendance tracking, and automation of fans through a web portal. Attendance is based on QR code. Teachers can manage and monitor attendance and access multiple services through web portals. Experimental results show an average QR recognition delay of 5 seconds, fan control response time of 1 second via the web portal. Compared to the traditional systems, this smart system reduces record keeping errors, transparency, and enables real time tracking of laboratory activities.

Keywords: Smart Lab, QR Code Attendance, Web Portal, AWS Database, Schedule Management, Notice Board, Dot-Matrix Display, Real-time Feedback.

Paper ID: DTC4921

PORTABLE ANTENNA FOR RADIO ASTRONOMY

Aditi A. Patil, Shravan V Shetty, Arnav A. Sapate, Ajit Saraf
(Pillai College of Engineering, New Panvel, Navi Mumbai)

Abstract

This work presents a design and implementation of a Portable Antenna System for Radio Astronomy to autonomously detect and track radio signals from celestial objects, such as solar activity in the form of flares and bursts. The system uses the Ku-band frequency range (~12 GHz) and is low-cost, compact, and mobile for small-scale research and educational purposes. For this, a parabolic dish antenna with an integrated LNBF is utilized for receiving the signal and an RTL-SDR module for capturing and processing received signals. The motion control and automation algorithm of the antenna are handled by an ESP32 microcontroller. NEMA stepper motors are utilized for elevation control, and mecanum wheels offer azimuthal rotation along with omnidirectional movement. The system automatically scans and orients itself in the direction of optimal signal strength. Experimental validation uses a local RF emitter. The design exhibits a low-cost, portable, and smart antenna platform for radio astronomy purposes.

Keywords: Portable antenna, radio astronomy, Ku-band, SDR, ESP32, mecanum wheels, automation.

Paper ID: ESI4813

WASTE SEGREGATION MONITORING SYSTEM FOR URBAN BODIES

Mr.Vedant Nilesh Shinde,Mr.Atharv Sanjay Patil,Mrs.Aditi Rajesh Sarvankar,Mr.Nitesh Vasant Dangar, Dr. Karthik Nagarajan
(Pillai HOC College of Engineering & Technology, University of Mumbai, India)

Abstract

Rapid urbanization and industrialization have drastically increased the generation of solid waste in urban areas. Traditional waste collection and sorting mechanisms are inefficient, unhygienic, and non-real-time.The present research suggests an IoT Waste Segregation Monitoring System based on sensor technology,data analysis, and public participation.The proposed Smart Dustbin uses moisture, infrared, and gas sensors to sort out waste automatically into wet, dry, and dangerous categories.Real-time data transmission via Wi-Fi or GSM enables municipal bodies to monitor waste volumes and optimize collection.The incorporation of a 'Green Points' reward scheme prompts citizens to dispose off waste in an appropriate way.Prototype testing ensured correct segregation and effective IoT communication.The project contributes to sustainable urban development through effective recycling, reduced health risks, and engaged community participation.

Keywords: Waste segregation, Smart dustbin, Internet of Things (IoT), Sensor technology, Smart city, Citizen engagement.
