



# SRM MADURAI



COLLEGE FOR ENGINEERING AND TECHNOLOGY

(Approved by AICTE, New Delhi | Affiliated to Anna University, Chennai)

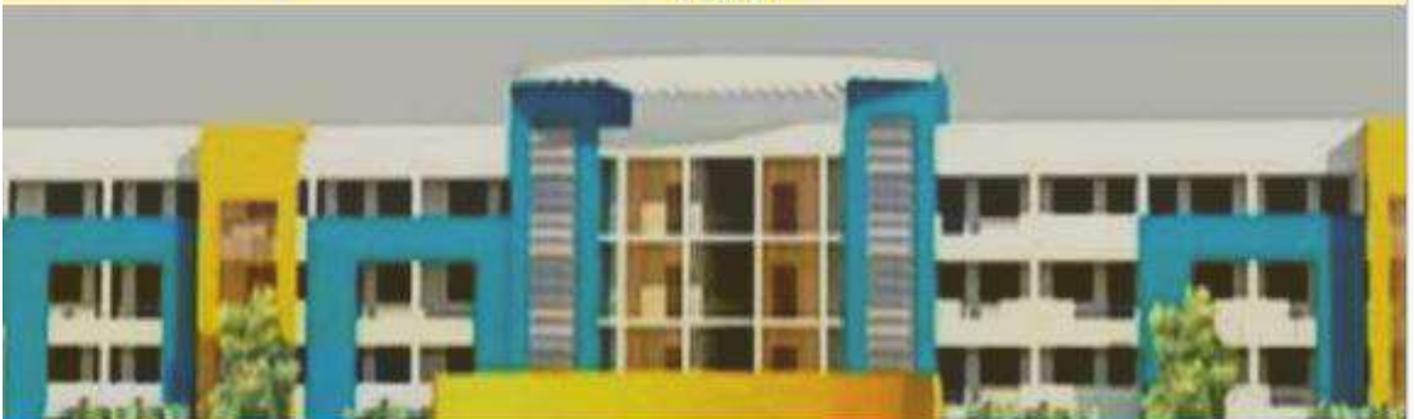
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## INTERNATIONAL CONFERENCE

**ENGINEERING HORIZONS:  
INNOVATION, ADVANCEMENTS, AND SUSTAINABILITY  
(ICON: EHIAS'25)  
MAY 16 - 17, 2025**

# PROCEEDINGS

# SRM



### GUEST EDITORS

**Dr. S. Durairaj**  
Organizing Chairman

**Dr. S. Sambath**  
Organizing Secretary



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**SRM MADURAI**  
**COLLEGE FOR ENGINEERING AND TECHNOLOGY**  
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## **INTERNATIONAL CONFERENCE**

Engineering Horizons: Innovation, Advancements, and Sustainability

**(ICON: EHIAS'25)**

**16 - 17 May, 2025**

## **COPYRIGHT PAGE**

**Conference Title:** ICON: EHIAS'25 – International Conference on Engineering Horizons: Innovation, Advancements, and Sustainability

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SRM Madurai College for Engineering and Technology, Tamil Nadu, India

**Disclaimer:**

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**Dr. RAVI PACHMUTHU**

**Chairman (SRM Group)**



**Message**

It brings me great pride and pleasure to witness SRM Madurai College for Engineering and Technology continuing the legacy of the SRM Group through impactful academic events such as ICON: EHIAS'25 – Engineering Horizons: Innovation, Advancements, and Sustainability. International Conferences like this play a pivotal role in shaping the future of engineering by fostering innovation, encouraging interdisciplinary collaboration, and inspiring young minds to contribute to a more sustainable world.

The theme, "Embracing Diversity, Innovation, and Sustainability", resonates deeply with SRM's commitment to inclusive education, cutting-edge research, and social responsibility. I extend my heartfelt congratulations to the organizers, participants, and collaborators for orchestrating this global academic exchange. Let us continue to empower engineers to become architects of a better tomorrow.

**Dr. RAVI PACHMUTHU**

**Dr. R. PADMA PRIYA**

**Chairman, SRM Madurai College for Engineering and Technology**



**Message**

It is with immense pleasure that I welcome you all to ICON: EHIAS’25, an initiative that truly embodies the spirit of innovation and the pursuit of engineering excellence at SRM Madurai College for Engineering and Technology (SRM MCET). In a rapidly transforming world, the role of engineers is evolving—not only to solve technical challenges but also to lead society toward a sustainable and equitable future.

This international conference serves as a vibrant platform for exchanging knowledge, encouraging novel ideas, and building global partnerships. I applaud the efforts of our SRM MCET’s faculty members, and organizing team for creating a space that celebrates diversity in engineering thought and action.

Wishing all participants an enlightening and enriching experience.

**Dr. R. PADMA PRIYA**

**Ms. R. HARINI**

**Correspondent,**

**SRM Madurai College for Engineering and Technology**



### Message

Warm greetings to all esteemed participants, researchers, academicians, industry experts, and students joining us for ICON: *EHIAS'25 – Engineering Horizons: Innovation, Advancements, and Sustainability*.

We, at SRM Madurai College for Engineering and Technology firmly believe that education is not only about acquiring knowledge but also about cultivating a spirit of inquiry, responsibility, and innovation. In alignment with the SRM Group's commitment to academic excellence and global demands, this conference stands as a testament of our vision of empowering future-ready engineers who are both technically proficient and socially conscious.

The theme “*Embracing Diversity, Innovation, and Sustainability*” holds significant importance in today's world. As we navigate unprecedented technological and environmental transformations, it is essential to instil a mind-set that values inclusivity, forward-thinking, and long-term impact. Through ICON: EHIAS'25, we aim to adopt an ecosystem of collaboration between academia, industry, and research communities across the globe.

My best wishes to our committed faculties, organizing committee, and student volunteers, whose unwavering commitment has made this international conference a true star. I encourage all participants to make the most of this opportunity—share your insights, connect with like-minded peers and challenging conventional notions in order to create a better engineering future.

Wishing everyone a productive and memorable experience at the conference.

**Ms. R. HARINI**

**Dr. R.VENKATESH BABU**

**Director - Academics and Administration  
SRM Group of Institutions**



Message

It gives me immense pleasure in wishing good luck to all participants, delegates, and distinguished speakers joining us for the International Conference “Engineering Horizons: Innovation, Advancements, and Sustainability (ICON: EHIAS’25)”, organized at SRM Madurai College for Engineering and Technology. SRM MCET believes in nurturing an environment where innovation thrives, interdisciplinary ideas flourish, and sustainability remains at the core of engineering progress. This conference, with the theme “Embracing Diversity, Innovation, and Sustainability”, is a testament to our commitment to shaping the future of engineering education, research, and practice through global collaboration and knowledge exchange.

ICON: EHIAS’25 provides a unique platform for researchers, industry professionals, and academicians to come together, share their insights, and address pressing global engineering challenges. The diverse subthemes and focused areas reflect the dynamic nature of the field and the urgent need for responsible, inclusive, and forward-looking engineering solutions. I am confident that the interactions and outcomes from this conference will inspire with novel ideas with impactful collaborations, and contribute to real-world advancements.

I would like to express my sincere appreciation to the organizing committee, contributors, and participants from across the globe whose dedication have made this event possible. May ICON: EHIAS’25 serve as a catalyst for academic excellence, sustainable development and technological innovation.

Wishing you all a highly engaging and enriching conference experience.

Warm regards,

A handwritten signature in green ink, appearing to read 'R. Venkatesh Babu', written in a cursive style.

Dr. R.VENKATESH BABU



**SRM MADURAI**  
**COLLEGE FOR ENGINEERING AND TECHNOLOGY**  
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**Principal: Dr. S. Durairaj M.E., Ph.D., PDF., FIE**

10.05.2025



**Message**

It gives me great pleasure to extend a warm welcome to all delegates, speakers, authors, and participants of the International Conference “*Engineering Horizons: Innovation, Advancements, and Sustainability (ICON:EHIAS’25)*”, hosted by SRM Madurai College for Engineering and Technology (SRM MCET). This conference reflects our institution's continued dedication to academic excellence, meaningful dialogue, and global collaboration in the field of engineering and technology.

*ICON: EHIAS’25*, with its central theme of “*Embracing Diversity, Innovation, and Sustainability*”, provides an excellent opportunity to discuss current challenges and explore forward-looking solutions. The conference has been designed to encourage in-depth discussions on a wide spectrum of emerging technologies and design methodologies, while also addressing the importance of sustainability, ethical responsibility, and interdisciplinary cooperation in engineering practices.

SRM MCET believes in creating platforms where knowledge is shared freely, ideas are exchanged meaningfully, and participants are inspired to think beyond traditional boundaries. We are proud to host such an event that not only focuses on academic and technical excellence but also promotes responsible innovation for the betterment of society. We continuously strive to support the intellectual and professional development of our students and faculty through initiatives such as this conference.

I wish the conference grand success and look forward to its lasting contributions to the academic and industrial communities.

A handwritten signature in green ink, appearing to be 'S. Durairaj'.

**Dr. S. Durairaj**  
Organizing Chairman - ICON: EHIAS’25



**SRM MADURAI**  
**COLLEGE FOR ENGINEERING AND TECHNOLOGY**  
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**Dr. S. Sambath, M.E., Ph.D.**

10.05.2025

**Vice Principal**



**Message**

I take immense pride in welcoming you all to “**ICON: EHias’25 – Engineering Horizons: Innovation, Advancements and Sustainability**” a truly global celebration of knowledge, creativity, and sustainability in engineering. As Vice Principal of SRM MCET, it gives me great delight to witness our institution serving as a catalyst for intellectual exchange and anticipating the solutions. This conference brings together a vibrant synthesis of thoughtful leaders, knowledgeable researchers and delighted students from across all disciplines.

The role of engineers, today, is more than just deciphering technical problems - it is about envisioning a world that is all-encompassing, sustainable, and resilient. **ICON: EHIAS’25** reflects the transformation and provides a rich platform for academic discourse, international collaboration, etc., and also this conference helps our students’ community to develop not just subject expertise but also global awareness, communication skills and ethical grounding.

I congratulate the organizing committee and my sincere gratitude to the participants and the scholars whose presence adds immense value to this initiative. I hope you will find this conference to be inspiring, engaging, and thought-provoking. I am confident that **ICON: EHIAS’25** will offer valuable insights, encourage collaborations, and lead to new ideas that can positively impact our engineering ecosystem.

With regards,

A handwritten signature in blue ink, appearing to read 'S. Sambath', with a horizontal line underneath.

**Dr. S. Sambath,**  
Organizing Secretary - **ICON: EHIAS’25**



**FACULTY OF MECHANICAL AND MANUFACTURING ENGINEERING**

☎ 07 4537700/7702/7703

Our Reference : UTHM/FKMP/500-16/2 Jld. 8(7)

Date : 07<sup>th</sup> May 2025

Preface – ICON: EHIAS'25

It gives me great pleasure to extend my warmest greetings to all participants of the International Conference on Engineering Horizons: Innovation, Advancements, and Sustainability (ICON: EHIAS'25), organized by SRM Madurai College for Engineering and Technology.

The theme of this conference is both timely and significant. As the world navigates complex challenges in climate change, digital transformation, and industrial automation, engineering innovation must play a leading role in shaping a sustainable future. ICON: EHIAS'25 offers a vital platform for researchers, academics, and industry practitioners to engage in meaningful discourse, share groundbreaking ideas, and forge collaborations that can drive transformative change.

Emerging trends such as Artificial Intelligence, Smart Manufacturing, Green Technologies, and Circular Economy principles are redefining the engineering landscape. These developments underscore the importance of interdisciplinary research and innovation-led strategies to achieve resilience and sustainability in our systems and infrastructure.

I commend the organizers for creating this opportunity to bring together global minds to share their knowledge and inspire future directions in engineering. I am confident that the insights and outcomes from this conference will contribute significantly to both academic scholarship and practical advancement.

Wishing the organizers and participants a productive and successful conference.

Warm Regards,

**PROF. IR. DR. YUSRI YUSOF**

Faculty of Mechanical and Manufacturing Engineering  
Universiti Tun Hussein Onn Malaysia



**ANNA UNIVERSITY**  
REGIONAL CAMPUS  
Kanyakumari National Highways, Keelakuilkudi  
MADURAI -625 019

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**Dr. K. Lingadurai**  
**Professor / Mechanical**  
**&**  
**DEAN**



Message

It gives me immense pleasure to be associated with the International Conference "**Engineering Horizons: Innovation, Advancements, and Sustainability (ICON: EHIAS'25)**", organized by **SRM Madurai College for Engineering and Technology**. This conference stands as a testament to the institution's dedication to fostering academic excellence and promoting global collaboration in the engineering domain.

The theme "**Embracing Diversity, Innovation, and Sustainability**" is both timely and vital, given the current global challenges that call for interdisciplinary approaches and sustainable engineering solutions. The topics covered from digital twin technologies to sustainable infrastructure and ethical engineering practices reflect the dynamic and evolving nature of our field. I commend the organizers for curating such a broad and forward-looking agenda. The inclusion of emerging technologies and the emphasis on practical outcomes, such as commercialization and skill development, highlight the conference's potential to shape the future of engineering education and practice.

I extend my warm wishes to all the participants, researchers, and organizing members. May this conference ignite new ideas, enhance valuable collaborations, and pave the way for innovations that are not only intelligent but also inclusive and responsible.

Let this event be a beacon for the engineering community - one that inspires continuous learning and a shared commitment to building a better, more sustainable world.

**Dr. K. Lingadurai**

**Mr. CLIFTON REDDY**

**Manager – Software Development- DevOps**



It is a pleasure to extend my warm greetings to all participants of *EHIAS'25 — Engineering Horizons: Innovation, Advancements, and Sustainability*, hosted by **SRM Madurai College for Engineering and Technology**. This international conference arrives at a defining moment, where engineering and technology are rapidly transforming industries, lifestyles, and global priorities.

The conference’s thematic focus on innovation, advancements, and sustainability is both timely and essential. In today’s landscape, the convergence of technologies such as Artificial Intelligence, Quantum Computing, Big Data, IoT, and Robotics is unlocking new possibilities across every discipline. At the same time, the emergence of smart materials, digital twin applications, and advanced communication systems like 5G are reshaping how we design, build, and interact with our environment.

I am particularly pleased to see the conference tracks addressing diverse yet interconnected areas — from modern physics frameworks and materials sciences to simulation modeling, real-time data analytics, and secure communication systems. Topics such as cybersecurity, machine learning, blockchain, wearable technologies, and cyber-physical systems reflect the forward-looking vision of this event. By fostering interdisciplinary dialogue and encouraging technology transfer, *EHIAS'25* stands as a meaningful platform for driving collaborative research and impactful solutions.

Over these two days of learning and knowledge exchange, I trust that participants will engage in valuable discussions, gain fresh perspectives, and form connections that lead to lasting contributions in engineering and beyond for the betterment of society.

I extend my sincere best wishes to the organizers, speakers, and delegates for a successful and inspiring conference.

**Clifton Reddy**

A handwritten signature in black ink, appearing to read "Clifton Reddy". The signature is stylized and fluid, with a long horizontal stroke at the end.

Manager - Software Development, DevOps

Sr. Member IEEE, BCS Fellow, PMP, PRINCE2, ITIL-Foundation, SAFe Architect, Green Software for Practitioners

## **VISION AND MISSION OF THE INSTITUTION**

### **VISION**

To become a centre of excellence in preparing engineering professionals with excellent technical, scientific research, and entrepreneurial abilities to contribute to the society.

### **MISSION**

M1: Providing a comprehensive learning environment.

M2: Imparting state-of-the art technology to fulfil the needs of the students and Industry.

M3: Establishing Industry – Institute alliance for bilateral benefits.

M4: Promoting Research and Development activities.

M5: Offering student lead activities to inculcate ethics, social responsibilities, entrepreneurial, and leadership skills.

## INSTITUTE PROFILE

### SRM MADURAI COLLEGE OF ENGINEERING AND TECHNOLOGY (SRM MCET)

*Empowering Innovation Through Quality Education*

SRM Madurai College of Engineering and Technology (SRM MCET), established in 2009, is a private engineering institution affiliated with Anna University, Chennai, and is part of the prestigious SRM Group of Educational Institutions.

#### Vision

To become a center of excellence in engineering and management education, promoting innovation, ethical values, and a global outlook.

#### Mission

- Deliver quality technical education with a student-centric approach
- Foster research, innovation, and entrepreneurship
- Strengthen industry-academia collaboration
- Nurture leadership, ethical conduct, and holistic development

#### Dynamic and Qualified Faculty

SRM MCET is committed to delivering quality education through a student-focused approach. The institution boasts a highly qualified and dynamic faculty comprising seasoned academicians, researchers, and industry professionals. Faculty members actively engage in:

- Research and innovation projects
  - Consultancy and industry collaboration
  - Continuous professional development and training
- They employ **modern teaching methods** such as:
- ICT-enabled smart classrooms
  - Project-based learning
  - Industry-integrated pedagogy

This ensures that students are exposed to current industry practices and emerging technologies.

#### Programs Offered

SRM MCET offers a wide range of **Undergraduate (UG)** and **Postgraduate (PG)** programs tailored to meet current and future industry needs.

#### Programs Offered

Degree	Specializations
B.E.	Civil Engineering
B.E.	Mechanical Engineering
B.E.	Electrical & Electronics Engineering
B.E.	Electronics & Communication Engineering
B.E.	Computer Science and Engineering
B.E.	CSE – Cyber Security
B.E.	CSE – AI & Machine Learning

B.Tech	Information Technology
B.Tech	Artificial Intelligence & Data Science
M.E	VLSI
M.E	Engineering Design
MBA	General Management

### Campus Infrastructure

The SRM MCET campus is designed to support academic excellence and student well-being, featuring:

- Smart classrooms with modern AV systems
- Hi-tech laboratories and computer centers
- A well-stocked central library
- 24/7 high-speed Wi-Fi across campus
- Separate hostels for boys and girls
- Canteen with hygienic and healthy food options
- Sports complex

### Industry Partnerships and Training

SRM MCET emphasizes **real-world readiness** through collaborations with leading industry players and academic incubation centers. Key partners include:

Industry Partner	Focus Area
Infosys	IT & Professional Training
L&T Edutech	Engineering Skill Development
Vodafone (VOIS)	Communication and Networking
IPCS GLOBAL	Engineering Skill Development
Land Coordinates Technology	Drone Survey Technology
Karuda Aerospace	Drone Technology
VI Microsystems	Embedded Systems
Anna University Incubation Centre	Innovation & Entrepreneurship

These partnerships provide students with internships, live projects, workshops, and placement opportunities.

### Location and Accessibility

SRM MCET is located in a serene and accessible area:

- **Address:** Chinthamani Nedungulam Road, Pottapalayam, Sivaganga District, Tamil Nadu, 630612
- **Contact:** +91 78457 75188 / +91 78457 76188
- **Website:** [www.srmmcet.edu.in](http://www.srmmcet.edu.in)

## **INTERNATIONAL ADVISORY COMMITTEE**

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- **Mr. Ramkumar Rajavel**, Senior Software Engineer, USA

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- **Dr. B. Surendran**, NIT, Puducherry
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- **Er. N.K. Vijay**, AtkinsRealis, Chennai, Tamil Nadu
- **Er. R. Pandurangan**, TAFE, Bhopal, Madhya Pradesh
- **Er. Krishna Nivetha**, Patwari Baker's P. Ltd, Madurai, Tamil Nadu



## ORGANIZING COMMITTEE

**Organizing Chairman :** Dr. S. Durairaj

**Organizing Secretary :** Dr. S. Sambath

**Joint Secretaries:** Dr. K. Balamurugan, ASP/ Mechanical Engineering

Dr. S. J. Ssubhashini, ASP/ Computer Science and Engineering

Dr. R. Ashok Kumar, ASP/ Mechanical Engineering

Dr. R. Lakshmi, ASP, Computer Science and Engineering (AIML)

S. No.	Committee Name	Composition	Faculty Name	Dept
1	<b>Event Management Committee</b>	Organizing Secretary & Joint Secretaries	<b>Dr. S. Sambath</b>	<b>Vice Principal</b>
			Dr. K. Balamurugan	Mech
2	<b>Technical Paper Review Committee</b>	Organizing Secretary & Joint Secretaries	<b>Dr. S. Sambath</b>	<b>Vice Principal</b>
			Dr. K. Balamurugan	Mech
			Dr. S. J. Subhashini	CSE
			Dr. R. Ashok Kumar	Mech
3	<b>Invitation, ID Card and certificate Committee</b>	HoD, Joint Secretary & 2 Nos. of Student	<b>Dr. Callins Christiyana</b>	<b>CSE</b>
			Dr. S.J.Subhashini	CSE
4	<b>Banner and Sign Board Committee</b>	Faculty & 2 Nos of Student	<b>Dr. R. Sathis Kumar</b>	<b>Physical Director</b>
5	<b>Registration &amp; Conference Kit Committee</b>	HoD, Joint Secretary & 2 Nos. of Student	<b>Dr.R. Deepalakshmi</b>	<b>AIDS</b>
			Dr.R.Lakshmi	AIML
6	<b>Reception Committee</b>	Faculty & 2 Nos of student	<b>Dr. P.Gandhimathi</b>	<b>S &amp; H</b>
			Dr.S.Nagalakshmi	Civil
7	<b>Chief Guest Hospitality Committee</b>	Faculty & 2 Nos of student	<b>Dr. R. Krishnakumar</b>	<b>Civil</b>
			Dr.A.N.Balaji	Mech
8	<b>Stage and Venue (Auditorium + 2venues) arrangement &amp; Management Committee</b>	HoD, Faculty and 2 Nos of Student	<b>Dr. M.Pandi (Auditorium)</b>	<b>AIML</b>
			Dr. A.L. Subramanian (Seminar Hall 1)	S & H
			Dr. T. Prem Kumar (Seminar Hall 2)	Mech
9	<b>PA Systems, Power Supply for all three Venues</b>	Faculty & 2 Nos of Student	Dr. M.Anantha Kumar (Auditorium)	S&H
			Dr. R.J. Venkatesh (Seminar Hall 1)	ECE
			Dr. R. Naganathan (Seminar Hall -2)	S&H

S. No.	Committee Name	Composition	Faculty Name	Dept
10	<b>Session Coordination Committee</b>	HoD's, Faculty & Stud	Session 1A – Dr. V. Jeyabalaji	Mech
			Session 1B - Dr.P. Tharcis	ECE
			Session 1C - Dr. L.Selvam	Cyber
			Session 2A - Dr. R. Ashok Kumar	Mech
			Session 2B – Dr. C. Vimalarani	EEE
			Session 2C – Dr. C. Callins Christina	CSE
			Session 3A – Dr. R. Deepalakshmi	AIDS
			Session 3B – Dr. K. Balamurugan	Mech
			Session 3C – Dr. S. Senthil Rani	ECE
			Session 4A – Dr. M. Pandi	AIML
			Session 4B – Dr. A.N. Balaji	Mech
			Session 4C – Dr. S. Karthick	ECE
			Session 5A – Dr. P. Sabarinath	Mech
			Session 1A – Dr. V. Jeyabalaji	Mech
Session 1B - Dr.P. Tharcis	ECE			
11	<b>Publications &amp; Proceedings Committee</b>	Joint Secretary	<b>Dr. K. Balamurugan</b>	<b>Mech</b>
12	<b>MOC</b>	HoD, Faculty	<b>Dr.J. Jeyaranjani</b>	<b>IT</b>
			Dr. S. Sabareesh	Mech
			Dr. B. Nandhini	MBA
13	<b>Media Committee</b>	Faculty & 4 Nos of Student	<b>Dr. B. Bhuvaneshwari</b>	<b>ECE</b>
14	<b>Publicity Committee</b>	Faculty	<b>Mr. B.Anburaj</b>	<b>ECE</b>
			Mr. J. Bimal Roy	S&H
15	<b>Finance &amp; Budget Committee</b>	Joint Secretary	<b>Dr. S.J. Subhashini</b>	<b>CSE</b>
16	<b>IT Services Committee (Online Day)</b>	HoD, System Admin, and Faculty	<b>Dr. L. Selvam</b>	<b>Cyber</b>
			Mr. T. Jai Sunder	System Admin

S. No.	Committee Name	Composition	Faculty Name	Dept
17	<b>Memento, Transport &amp; Remuneration Committee</b>	Joint Secretary , Faculty & 2 Nos of student	<b>Dr.R.AshokKumar</b>	Mech
			Dr. P Sabarinath	Mech
18	<b>Sustainability &amp; Green Committee</b>	HOD, Faculty & 2 Nos of student	<b>Dr. V. Jeyabalaji</b>	<b>Mech</b>
			Mr. J.Bimal Roy	S&H
19	<b>Post Conference Evaluation Committee</b>	Organizing Secretary & Joint Secretaries	<b>Dr. S. Sambath</b>	<b>Vice Principal</b>
			Dr. K. Balamurugan	Mech
			Dr. S. J. Subhashini	CSE
			Dr. R. Ashok Kumar	Mech
			Dr. R. Lakshmi	AIML
20	<b>Discipline Committee</b>	HoD, Faculty & 2 Nos of Student	<b>Dr. M. Dhamodaran</b>	<b>ECE</b>
			Dr. S. Anitha	S&H
			Dr. S.RajKumar	S&H
			Dr R. Sathish Kumar	PD
21	<b>Lunch and Refreshment Committee for Participants</b>	Joint Secretary ,Faculty & 2 Nos of Student	<b>Dr.R.Ashokumar</b>	<b>Mech</b>
			Dr.K.Indira	S&H
			Dr.G.Aninthitha	CSE
			Dr.N.J.Venkatesh	Mech
			Dr. R. Sathis Kumar	PD
22	<b>Decoration Committee</b>	Faculty & 2 Nos of Student	<b>Dr.M. Sangeetha</b>	<b>IT</b>
			Dr. C.Prithiviraj	Civil
			Dr.B. Eanest Jebasingh	Mech
23	<b>Transport Committee</b>	Transport In charge, Faculty & 2 Nos of student	<b>Dr. S.Sabareesh</b>	<b>Mech</b>
			Mr. S. Saravana Kumar	Transport



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## CONFERENCE SCHEDULE

### International Conference on “ENGINEERING HORIZONS: INNOVATION, ADVANCEMENTS, AND SUSTAINABILITY (ICON: EHIAS’25)” 16<sup>th</sup> & 17<sup>th</sup> May, 2025

<b>DAY - 1 (16<sup>th</sup> May, 2025)</b>						
<b>Inaugural Function          (9:30 AM – 10:30 AM)</b>						
<b>Day</b>	<b>Keynote Speaker Session 1</b>					
1	<b>Conference Chief Guest</b>  <b>Timing:</b> <b>10:45 – 11:45 AM</b>	<b>Prof. Ir. Dr. Yusri Yusof</b> Professor Universitiy Tun Hussein Onn Malaysia (UTHM)  <b>Topic:</b> Smart retrofit Strategies: Integrating Legacy systems into Sustainable Manufacturing for Industry 4.0				
<b>Paper Presentation [36 Papers],          Day 1 &amp; Session 1</b>						
<b>Day</b>	<b>Time</b>	<b>Session</b>	<b>Chair</b>	<b>Co-Chair</b>	<b>Papers</b>	<b>Duration</b>
	11:45 AM – 01:15 PM	Session 1A	<b>Dr. K. Lingadurai,</b> Professor & Dean, Anna University Regional Campus, Madurai	Dr. V. Jeyabalaji, HoD/ Mech	36	90 Min
		Session 1B	<b>Dr. D. Helena Margaret,</b> Asso. Professor, ECE Alagappa Chettiar Government College of Engg. & Tech, Karaikudi	Dr. P. Tharcis, HoD / ECE		
		Session 1C	<b>Mr. R. Sunder</b> GM Global IT tech Services Head – COE, TVS SCM, Madurai	Dr. L. Selvam, HoD/ CSE[CS]		
<b>Day</b>	<b>Keynote Speaker - Session 2</b>					
1	<b>Keynote Speaker</b>  <b>Timing:</b> <b>2:00 PM - 3:00 PM</b>	<b>Dr. S.P. Sivaprakasam</b> Professor, Department of Mechanical Engineering, NIT-Trichy <b>Topic:</b> Beyond Equations: The art of creativity and innovations in Engineering				

<b>Paper Presentation [36 Papers], Day 1 &amp; Session 2</b>						
<b>Day</b>	<b>Time</b>	<b>Session</b>	<b>Chair</b>	<b>Co-Chair</b>	<b>Papers</b>	<b>Duration</b>
1	03:15 PM - 04:30 PM	Session 2A	<b>Dr. S.P. Sivaprakasam,</b> Professor, Mechanical Engg. NIT-Trichy	Dr. R. Ashok Kumar, ASP/ Mech	36	75 Min
	03:15 PM - 04:30 PM	Session 2B	<b>Dr. G. Lakshminarayanan,</b> Professor, ECE, NIT-Trichy	Dr. C. Vimalarani, HoD / EEE		
	03:15 PM - 04:30 PM	Session 2C	<b>Dr. Latha Parthiban,</b> Professor, CSE, Pondicherry University	Dr. Callins Christiyana HoD, CSE		
<b>DAY -2</b>						
<b>Day</b>	<b>Keynote Speaker Session 1</b>					
2	<b>Keynote Speaker</b>  <b>Timing:</b> <b>09:00 PM -10:00 AM</b>	<b>Mr. Clifton R,</b> Staff Programmer Analyst, American National insurance Company, Galvston, Texas, USA  <b>Topic:</b> Greening the Stack: Sustainable AI and Tech Infrastructure from Dev to Deploy				
<b>Paper Presentation [36 Papers], Day 2 &amp; Session 3</b>						
<b>Day</b>	<b>Time</b>	<b>Session</b>	<b>Chair</b>	<b>Co-Chair</b>	<b>Papers</b>	<b>Duration</b>
2	10:15 AM - 11:45 AM	Session 3A	<b>Dr. Suresh Joseph,</b> Professor, CSE, Pondicherry University	Dr. R. Deepalakshmi, HoD, AIDS	36	90 Min
	10:15 AM - 11:45 AM	Session 3B	<b>Dr. R. Arockia Kumar,</b> Asso. Prof. Mechanical Engg, NIT - Warangal	Dr. K. Balamurugan, ASP/ Mech		
	10:15 AM - 11:45 AM	Session 3C	<b>Dr. Hosimin Thilagar,</b> Professor, EEE & Former Director of Academic Courses, Anna University, Chennai	Dr. S. Senthil Rani, ASP/ECE		
<b>Paper Presentation [36 Papers], Day 2 &amp; Session 4</b>						
<b>Day</b>	<b>Time</b>	<b>Session</b>	<b>Chair</b>	<b>Co-Chair</b>	<b>Papers</b>	<b>Duration</b>
2	11:45 AM - 01:15 PM	Session 4A	<b>Dr. Narendran Rajagopalan,</b> Asso. Professor, CSE, NIT Puducherry	Dr. M.Pandi, HoD/ CSE[AIML]	36	90 Min

	11:45 AM - 01:15 PM	Session 4B	<b>Dr. L. S. Raju,</b> Professor, Mechanical Engg, NITTTR- Bhopal, Madhya Pradesh	Dr. A.N. Balaji, Prof./ Mech		
	11:45 AM - 01:15 PM	Session 4C	<b>Dr. A. John,</b> Asso. Prof, ECE, Military College of Telecommunications, Indore, Madhya Pradesh	Dr. S. Karthick, AP / ECE		
<b>Paper Presentation [10 Papers], Day 2 &amp; Session 5</b>						
<b>Lunch Break 1:15 PM to 2:00 PM</b>						
Day	Time	Session	Chair	Co-Chair	Papers	Duration
2	02:00 AM - 03:00 PM	Session 5A	<b>Dr. K. Venkat Rao,</b> Professor, Mechanical Engg. NITTTR- Kolkotta, West Bengal	Dr. P. Sabarinath, ASP/ Mech	10	60 Min
	03:00 PM - 3:30 PM	<b>Validatory Function</b>				



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**International Conference on**  
**“Engineering Horizons: Innovation, Advancements and Sustainability”**  
**(ICON: EHIAS’25) MAY 16 - 17, 2025**  
**DAY 1 (16.05.2025): OFFLINE**

Session Title & Timing		Venue	Chair	Co- Chair
Session 1A & 11:45 AM – 01:15 PM		Auditorium	<b>Dr. K. Lingadurai</b>	<b>Dr. V. Jeyabalaji</b>
			Professor & Dean, Anna University Regional Campus, Madurai	HOD / MECH, SRM MCET
S.No.	Paper ID	Title of the Paper & Authors		
1.	ICON-018	<b>GRAPHENE-BASED MATERIALS FOR ENERGY-EFFICIENT ELECTRONICS AND PHOTONICS</b> <i>C.Muthusamy, K.Arunprasath, P.Mathan, M.Radhakrishnaveni</i>		
2.	ICON-019	<b>BIOMIMETIC MATERIALS FOR SUSTAINABLE AND ECO-FRIENDLY ENGINEERING SOLUTIONS</b> <i>AM.Shanawaz, K.Arunprasath, P.Rajeswaran, Lavish Kumar Singh,</i>		
3.	ICON-023	<b>3D-PRINTED METAL ALLOYS FOR ADVANCED MANUFACTURING AND STRUCTURAL APPLICATIONS</b> <i>Dr Ramesh , Arun selva Kumar T</i>		
4.	ICON-034	<b>AERODYNAMIC ANALYSIS OF BLENDED WING BODY (BWB) AIRCRAFT FOR FUEL EFFICIENCY AND PERFORMANCE ENHANCEMENT</b> <i>M.V. Mahesh Babu, K.Balamurugan</i>		
5.	ICON-037	<b>ENHANCING MACHINING EFFICIENCY OF 13-8 MO STAINLESS STEEL THROUGH OPTIMIZATION OF CUTTING PARAMETERS</b> <i>Dr. J. Rajesh Babu, Dr. S. Thanga Kasi Rajan, D.K.Yogeshbabu, G.Naveen, P.Tharun Ram</i>		
6.	ICON-038	<b>DEVELOPMENT OF INTERACTIVE EDUCATIONAL SOFTWARE FOR REFRIGERATION SYSTEMS TO ENHANCE VIRTUAL THERMODYNAMICS LEARNING</b> <i>N. Rajkumar, G.S.Santha Venkatesh, B. Yuvaraj, T.B.Sathish, P.Tharun Ram</i>		
7.	ICON-179	<b>EXPERIMENTAL INVESTIGATION OF TRIBOLOGICAL PROPERTIES OF BIO-BASED, NANO-PARTICLES</b> <i>Balamurugan M, Murugapoopathi S</i>		
8.	ICON-193	<b>GLYCEROL PLASTICIZED CORN STARCH BIOPLASTIC FOR FOOD PACKAGING APPLICATION</b> <i>G. Manoj Kumar, C.Thenraj , R.TamilAmuthan, D.Ramachandran</i>		
9.	ICON-215	<b>CASE STUDY ON ARTIFICIAL INTELLIGENCE IN HEALTHCARE IN INDIA</b> <i>J. Benila Pearl, B. EanestJebasingh</i>		
10.	ICON-068	<b>INVESTIGATION OF HYDROGEN STORAGE MECHANISMS IN METAL HYDRIDES AND POROUS CARBONACEOUS MATERIALS FOR ENERGY SYSTEMS</b> <i>M. Prabakaran, H. Ganesh</i>		
11.	ICON-022	<b>NANO-COATINGS AND SURFACE ENGINEERING FOR CORROSION RESISTANCE IN HARSH ENVIRONMENTS</b> <i>Dr.Bharathi Mohan M P , Prem Kumar M, Dr.Neelakrishnan S</i>		
12.	ICON-191	<b>INVESTIGATION ON MECHANICAL PROPERTIES OF HYBRID COMPOSITE FOR PARAPET ROOF</b> <i>G. Manoj Kumar, P Hariharan, S Hari Kiran, M Maheshwaran</i>		



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Session Title & Timing		Venue	Chair	Co- Chair
Session 1B & 11:45 AM – 01:15 PM		Seminar Hall - I	<b>Dr. D. Helena Margaret</b>	<b>Dr. P. Tharcis</b>
			Asso. Professor, ECE, Alagappa Chettiar Government College of Engg. & Tech, Karaikudi	HOD / ECE, SRM MCET
S.No.	Paper ID	Title of the Paper & Authors		
1.	ICON-217	<b>IOT BASED CAR PARKING SYSTEM</b> <i>Nitheeshwaran M, Surya Siddarth K S, Vijheyakumar S G</i>		
2.	ICON-243	<b>IDENTIFICATION AND PREVENTION OF CYBERATTACKS IN INDUSTRIAL SMARTGRID</b> <i>Sivakumar R, Manjusri S, Padmini Priyadharshini S, Sahanaa R, Haritha D</i>		
3.	ICON-255	<b>A DATA-DRIVEN FRAMEWORK FOR EARLY DETECTION OF MENTAL HEALTH DECLINE IN STUDENTS USING BEHAVIORAL TREND ANALYSIS</b> <i>Akshaya Prabha P, Akila S, Sangeetha</i>		
4.	ICON-137	<b>SMART TWO WHEELER LOCKING SYSTEM USING RFID TECHNOLOGY</b> <i>M.Chinthaikkiniyan M.Kishore, G.Saranya, K.Gokul Ramnath</i>		
5.	ICON-138	<b>DETECTION OF DIABETIC RETINOPATHY USING SVM CLASSIFICATION AND TEXTURE-BASED FEATURE EXTRACTION</b> <i>B.Buvaneswari, K.Karthikadevi</i>		
6.	ICON-141	<b>AI-ENABLED OPTIMIZATION TECHNIQUES IN VLSI DESIGN: A PATH TOWARD HIGH PERFORMANCE AND ENERGY EFFICIENCY</b> <i>C.Vimalarani, P.Deepamangai, S.Saravanakumar</i>		
7.	ICON-176	<b>REAL TIME SMART FARMING ANALYSIS</b> <i>M.Kiruthiga, K. Latha, C.Kajal Krishna, S.Almas Marjiya, K.Divya</i>		
8.	ICON-240	<b>PLANT DISEASE PREDICTION BY MACHINE LEARNING</b> <i>R.Nivethitha, Dr.J.Sivasankari, Mrs.S.MariaSobana, S.Sangamithra, K.Vishwa</i>		
9.	ICON-269	<b>MULTIAGENT EMBEDDED ARCHITECTURE FOR IOT-BASED INTELLIGENT VEHICLE NETWORKS</b> <i>Dr.S.C.Sivaprakash, M.Prasath, G.Sivaneshwaran, V.S.Yooghasurya, G.R.Yogeshwaran</i>		
10.	ICON-273	<b>SECURE IoT INTEGRATION WITH MACHINE LEARNING FOR SEAMLESS WIRELESS COMMUNICATION</b> <i>Prof.S.Selvakumar, M.R.Aadeessh, K.S.Hariharan, B.J.Akash, S.Aadhavan</i>		
11.	ICON-292	<b>REAL-TIME BUS TRACKING AND ARRIVAL PREDICTION SYSTEM WITH WEB INTERFACE</b> <i>Dr.S.R.Naresh, Harisankar A S, Aravind S A, Divahar B, Harishivdass C M</i>		
12.	ICON-309	<b>VISION TRANSFORMER-BASED APPROACH FOR ABNORMALITY DETECTION IN WIRELESS CAPSULE ENDOSCOPY</b> <i>B.K. Hemalatha, D. Mangala Jothi, S.Priyadharshini, M.Varshini</i>		



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Session Title & Timing		Venue	Chair	Co- Chair
Session 1C & 11:45 AM – 01:15 PM		Seminar Hall - II	<b>Mr. R. Sunder</b>	<b>Dr. L. Selvam</b>
			GM Global IT tech Services Head – COE, TVS SCM, Madurai	HOD / CSE(CS), SRM MCET
S.No.	Paper ID	Title of the Paper & Authors		
1.	ICON-189	<b>SWIN TRANSFORMER-BASED MACHINE LEARNING MODEL FOR COVID-19 DIAGNOSIS USING CHEST X-RAY IMAGES</b> <i>I.Muthu Meenatchi, Dr.G.Ramesh, Suriya.N, K.Vimal Adithan</i>		
2.	ICON-194	<b>OPTIMIZING CLOUD RESOURCE COSTS UNDER UNCERTAINTY</b> <i>Saranya T, Roobalakshmi N B, Deniffa Valency R, Roshini S J, Nanthetha Sri C S</i>		
3.	ICON-195	<b>WILDLIFE ANIMAL ACTIVITY DETECTION USING MACHINE LEARNING</b> <i>Deepika sri R, Mahaswetha M, Punitha S, Ruthranayaki D</i>		
4.	ICON-196	<b>REAL TIME AIR QUALITY MONITORING USING IoT AND MACHINE LEARNING</b> <i>Deepika E, Prisha M, Sowmiya M</i>		
5.	ICON-249	<b>OPTIMIZING URBAN TRAFFIC FLOW WITH LSTM-BASED REINFORCEMENT LEARNING IN A SECURE INTELLIGENT TRANSPORTATION FRAMEWORK</b> <i>M. Nithya, Dr. S. Jegadeesan, B. Anburaj</i>		
6.	ICON-251	<b>ENHANCED MARKET BASKET ANALYSIS USING FREQUENT PATTERN MINING TECHNIQUES</b> <i>Sangeetha S, Priyanga K R, Thivyaprabha, Sadhana M K, Kabilan B, Yogalakshmi</i>		
7.	ICON-254	<b>RESEARCH ON THE MODEL OF COORDINATED DEVELOPMENT BETWEEN INTERACTION DESIGN CONCEPT AND VISUAL COMMUNICATION DESIGN</b> <i>Dr. EdwinDhas P, Muthukumaran.S, Suresh.M, Derek Jose G</i>		
8.	ICON-256	<b>INTELLIGENT INTEGRATION OF IOT AND MACHINE LEARNING FOR ENHANCED CONTROL AND MONITORING IN MECHANICAL SYSTEMS</b> <i>Dr.S.IIankumaran, R.JyothiShree</i>		
9.	ICON-258	<b>INTELLIGENT SIGNAL PROCESSING IN IOT NETWORK FOR MEDICAL APPLICATIONS</b> <i>V.Kaviya, P.SriRajarajeswari</i>		
10.	ICON-262	<b>QUANTUM-INSPIRED DIFFERENTIAL EVOLUTION: A NOVEL APPROACH FOR ENHANCED GLOBAL OPTIMIZATION</b> <i>Venkata Lakshmi, K.S.Keerthiga, R.S.Nivetha</i>		
11.	ICON-267	<b>LIVESTREAM LICENSE PLATE DETECTION USING GAN</b> <i>Subitha.R, Vasuki.E, Kaleeswari.K</i>		
12.	ICON-268	<b>AUTOMATED CAR DAMAGE RECOGNITION AND COST ESTIMATION USING CNN</b> <i>Amesh J, Usha Rani</i>		



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Session Title & Timing		Venue	Chair	Co- Chair
Session 2A & 03:15 PM – 04:30 PM		Auditorium	<b>Dr. S.P. Sivaprakasam,</b> Professor, Mechanical Engg. NIT-Trichy	<b>Dr. R. Ashok Kumar</b> ASP / MECH, SRM MCET
S.No.	Paper ID	Title of the Paper & Authors		
1.	ICON-014	<b>SMART MATERIALS FOR SELF-HEALING STRUCTURES IN ENGINEERING</b> <i>S.Paramasivan, K.Arunprasath, Anish Praveenson, Kathiresan, Thirumalaikumar, Thillaimani</i>		
2.	ICON-016	<b>HEALTHCARE DIAGNOSTICS THROUGH AI-APPLICATIONS</b> <i>B.Muthuchozharajan, V.Kannadhasan, M.Pradeep, G. Manikandaraja, K.Arunprasath, S.Rinsan Udayar</i>		
3.	ICON-017	<b>ADVANCED NANOMATERIALS FOR HIGH- PERFORMANCE ENGINEERING APPLICATIONS IN AEROSPACE</b> <i>Y.CarlinCalaph, , K.Arunprasath, S.Paramasivan, P.Muthuraj</i>		
4.	ICON-059	<b>RENEWABLE ENERGY SOLUTIONS FOR GREEN BUILDING DEVELOPMENT IN URBAN AREAS</b> <i>V T Vimalananth, Mohd Suhaib Enoos Khan, Udhayavasan K, N Mukilarasan</i>		
5.	ICON-062	<b>A REVIEW ON THE MATERIALS, PROCESSING AND PERFORMANCE STUDY OF ASBESTOS FREE BRAKE LINERS</b> <i>Vijayasankar Vinayak Arun Sankar, Govindasamy Naveen, Murugan Anand, Kanagaraj Sanjay, Kanagalingam Rahul, Paramasivam Suresh</i>		
6.	ICON-063	<b>HIGH-ENERGY SUPERCONDUCTORS FOR ENERGY STORAGE</b> <i>Dr A. Karpagaraj, Dr. Ramesh R, Dr A Parthiban, Arun selva kumar T</i>		
7.	ICON-073	<b>SUSTAINABLE WASTE MANAGEMENT SYSTEMS POWERED BY IOT AND AI IN SMART CITIES</b> <i>R.Muthudineshkumar, T.Balamurugan, S.Ganeshmani, R. Kumaresan, S.Jaisankar</i>		
8.	ICON-074	<b>WASTE HEAT RECOVERY TECHNOLOGIES FOR SUSTAINABLE INDUSTRIAL ENERGY UTILIZATION</b> <i>Dr.R.Muthudineshkumar, Gokulraj B.V, Dr.S.Jaisankar, P.Rajasekaran , Dr.S.Samy</i>		
9.	ICON-082	<b>OPTIMIZATION OF NANO FLUID PROPERTIES FOR IMPROVED HEAT TRANSFER IN SOLAR THERMAL SYSTEMS</b> <i>Mukilarasan Nedunchezhiyan , Aron G Biju, Ugea Menon, V.T. Vimalananth</i>		
10.	ICON-210	<b>ANTI-MICROBIAL COATING FOR HEPA FILTER USING COPPER PARTICLES</b> <i>Dr. T.Prabakaran , Abishekkumar S</i>		
11.	ICON-088	<b>-MULTIPLE VARIABLES EFFECT ON MHD JEFFREY FLUID FLOW PAST A VERTICAL PLATE EMBEDDED IN POROUS MEDIUM</b> <i>N.Balaji , M.Krishnadarshini</i>		
12.	ICON-209	<b>ANALYSIS OF MATERIAL SA106 PIPE AFTER POST WELD HEAT TREATMENT</b> <i>Dr. C. Ramesh ,Dinakar K, Abik Kumar V, Gowshan S</i>		



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**DAY 1 (16.05.2025): OFFLINE**

Session Title & Timing		Venue	Chair	Co- Chair
Session 2B & 03:15 PM – 04:30 PM		Seminar Hall - I	<b>Dr. G. Lakshminarayanan,</b>	<b>Dr. C. Vimalarani</b>
			Professor, ECE, NIT-Trichy	HOD / EEE, SRM MCET
S.No.	Paper ID	Title of the Paper & Authors		
1.	ICON-231	<b>ML BASED SMART GLOVE For SIGN LANGUAGE TRANSLATION</b> <i>E. Thangadeepiga, A. G. Yakshagaraj, R. M. Subash Natrayan, R. Sibisudhan</i>		
2.	ICON-285	<b>SMART MESS MANAGEMENT SYSTEM: AN INNOVATIVE SOLUTION TO REDUCE FOOD WASTE IN HOSTELS</b> <i>Meenakshi L , Dharaniprabhu S, Gokula Kanna C, Goplakrishnan I</i>		
3.	ICON-289	<b>A COMPARATIVE STUDY ON FIRE FIGHTING VEHICLE PERFORMANCE FOR METROPOLITAN AND INDUSTRIAL FIRE MANAGEMENT</b> <i>L.Meenakshi, M.J.Bala Prasanna, G.M.Dheeraj Methun, T.S.Dinesh Kumar</i>		
4.	ICON-290	<b>IOT-BASED REAL-TIME TEMPERATURE AND HUMIDITY MONITORING SYSTEM FOR PERISHABLE GOODS USING ESP32 AND BLYNK</b> <i>Dr.P.Karpagavalli, Abijith K S, Aswin Baabu K S, Bharathkumar M</i>		
5.	ICON-291	<b>EFFICIENT E-COMMERCE AND INVENTORY MANAGEMENT SYSTEM USING WEB TECHNOLOGIES</b> <i>Dr.P.Karpagavalli, Dinesh Kumar R, Jai Ashik Ram K S , Nageshwaran P</i>		
6.	ICON-021	<b>ENERGY HARVESTING MATERIALS FOR AUTONOMOUS AND IOT-DRIVEN</b> <i>Dr.Bharathi Mohan M P, Sudarshan R ,Dr.NeelaKrishnan S</i>		
7.	ICON-211	<b>PERFORMANCE ENHANCEMENT OF A NEW TYPE LOUVER FIN HEAT EXCHANGER FOR ELECTRONICS COOLING APPLICATIONS</b> <i>Hemath Kumar A ,Imayavan D. Kamesh M P</i>		
8.	ICON-020	<b>HIGH-TEMPERATURE SUPERCONDUCTORS FOR ENHANCED POWER TRANSMISSION AND ENERGY STORAGE</b> <i>Dr.Bharathi Mohan M P , Sabari Nathan S ,Dr.Neelakrishnan S</i>		
9.	ICON-108	<b>UTILIZATION OF GFRP, STEEL SLAG, AND RUBBER TIRE WASTE AS REPLACEMENTS FOR FINE AGGREGATE IN CONCRETE WITH VARYING MIXING RATIOS</b> <i>J. Thavaseelan, S. Karthikeyan, R. Venkada Lakshmi</i>		
10.	ICON-031	<b>CFD SIMULATION FOR EVALUATING CROSSWIND STABILITY OF SUVs</b> <i>G.S. Samy, M. Vikash, C. Sibi, V.T. Vimalananth</i>		
11.	ICON-242	<b>THE APPROVAL HUB FOR ENTREPRENEURS</b> <i>Dr. V.Vijayaraghavan</i>		



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**DAY 1 (16.05.2025): OFFLINE**

Session Title & Timing		Venue	Chair	Co- Chair
Session 2C & 03:15 PM – 04:30 PM		Seminar Hall - II	<b>Dr. Latha Parthiban</b>	<b>Dr. Callins Christiyana</b>
			Professor, CSE, Pondicherry University	HOD / CSE, SRM MCET
S.No.	Paper ID	Title of the Paper & Authors		
1.	ICON-257	<b>FEDERATED LEARNING AND DEEP LEARNING IN CLOUD COMPUTING FOR SECURITY</b> <i>N Nithish Kumar; Sudhakar A, Koushik Kumar M, Dr.S.Saravanakumar</i>		
2.	ICON-266	<b>WI-BLUSEC: A PORTABLE MULTI-PROTOCOL WIRELESS SECURITY AUDITING AND PENETRATION TESTING DEVICE</b> <i>Yasir A, Dr.K.R.Saranya</i>		
3.	ICON-272	<b>AI BASED PLANT DISEASE DETECTION USING LIVE MOBILE CAMERA</b> <i>Ramana C, Usha Rani K</i>		
4.	ICON-274	<b>A NOVEL FRAMEWORK FOR OPTIMIZING THE EDGE NETWORK NODE FOR WEARABLE DEVICES</b> <i>Pravin Kumar D, Allwin Joel V, Ananth M, Dhanush Kumaran P V Y, Dharshini T S</i>		
5.	ICON-275	<b>IOT SENSOR FUSION ALGORITHM FOR REAL TIME APPLICATIONS</b> <i>Pravin Kumar D, *Dhivya S , Akash A, AyyanarK, Eswar M S</i>		
6.	ICON-281	<b>INTELLIGENT CKD DETECTION : INTEGRATING IOT ,CLOUDCOMPUTING , AND BIG DATA IN HEALTHCARE SYSTEM</b> <i>Yoheswari S, Vishva Sruthi N K, Sanjay Harish P, Sanjana S</i>		
7.	ICON-294	<b>BRIDGING THE SOCIETY-GOVERNMENT GAP AN INTELLIGENT CHATBOT SOLUTION BY USING MACHINE LEARNING</b> <i>Mathavan M R, Subramanian E , Anuradha K</i>		
8.	IOCN-313	<b>QUANTUM MACHINE LEARNING AND POST-QUANTUM CRYPTOGRAPHY POWERED DIGITAL TWINS FOR REAL-TIME BANKING SYSTEM SECURITY</b> <i>M V Cibistha, R Loshana, C Gomathipriya, K K Kanishka, Dr.S.Subashini</i>		
9.	ICON-120	<b>IMPACT OF INNOVATIVE HEALTHCARE TECHNOLOGIES ON PATIENT CARE</b> <i>J. Benila Pearl ,M.Palanivel Rajan</i>		
10.	ICON-204	<b>LANDFILL LEACHATE TREATMENT USING A METHOD OF COAGULATION FOR ENHANCED ENVIRONMENTAL SAFETY</b> <i>Rajkumar R , Jawahar K</i>		
11.	ICON-241	<b>INTELLIGENT IRRIGATION SYSTEM WITH SOIL MOISTURE SENSING AND AUTOMATED WATER DELIVERY</b> <i>Kalusuraman G, Shakthi Sree V S, Sivasankari Hanshika P, Semmozhi V</i>		
12.	ICON-142	<b>INTEGRATION OF ARTIFICIAL NEURAL NETWORK AND GIS FOR URBAN MASTER PLANNING IN TAMIL NADU</b> <i>G.Alagu Murugan, D.Jayasree, Dhivakar</i>		



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**DAY 2 (17.05.2025): ONLINE**

Session Title & Timing		Session Link	Chair	Co- Chair
Session 3A & 10:15 AM – 11:45 AM		<a href="https://meet.google.com/gby-ehdg-qgc">https://meet.google.com/gby-ehdg-qgc</a>	<b>Dr. Suresh Joseph</b>	<b>Dr. R. Deepalakshmi,</b>
			Professor, CSE, Pondicherry University	HOD / AIDS, SRM MCET
S.No.	Paper ID	Title of the Paper & Authors		
1.	ICON-028	<b>WEARABLE HEALTH MONITORING DEVICES: ENGINEERING SOLUTIONS FOR REAL-TIME PATIENT CARE</b> <i>Kavin Francis Xavier, Murugesan Shanmugavelu, Anitha P, Pradeepa K, Bharathiraja Nagu</i>		
2.	ICON-029	<b>AI-POWERED DIAGNOSTICS: TRANSFORMING HEALTHCARE THROUGH INTELLIGENT ENGINEERING SYSTEMS</b> <i>Pradeepa K , Kavin FrancisXavier, Murugesan Shanmugavelu, Sudhakar G, Bharathiraja Nagu</i>		
3.	ICON-036	<b>AI-BASED THREAT DETECTION FOR BETTER CYBERsecurity</b> <i>A. Chinnamahammad Bhasha, T. Sreedhar, K.Raghavendra Sai</i>		
4.	ICON-042	<b>SMART CITIES: LEVERAGING IOT AND AI FOR SUSTAINABLE URBAN GROWTH</b> <i>K.Akshaya, K.Pavithra, Dr B. Narayana Babu, J.Nagarjuna</i>		
5.	ICON-058	<b>EXPLORING THE DEEP LEARNING MODEL APPLICATIONS IN IMAGE PROCESSING TECHNOLOGIES AND ADVANCEMENTS</b> <i>Mahalakshmi Sampath, Kajal Choudhary, Keerti Sachan, Arushi Saxena, Mansi Panwar</i>		
6.	ICON-146	<b>HEALTHCARE WEARABLE IOT DEVICES WITH AI DIAGNOSTICS</b> <i>Hema Rajini N</i>		
7.	ICON-147	<b>THE ROLE OF BIG DATA IN HUMAN RESOURCES AND SOCIAL SECURITY IN PUBLIC MANAGEMENT</b> <i>Dr. B.Suresh Kumar, Dr.D.Jayaraj</i>		
8.	ICON-148	<b>GRAPH CONVOLUTIONAL NEURAL NETWORKS FOR MULTI-BEHAVIOR RECOMMENDATION SYSTEMS</b> <i>S.Abarna, Dr. S. Punitha (Deputed)</i>		
9.	ICON-149	<b>AUTOMATED VISUAL ASSESSMENT FOR DATA SCIENCE AND ANALYTICS</b> <i>Dr.Jeyakarthic M, K Harisha Chari</i>		
10.	ICON-151	<b>OPTIMIZATION ALGORITHMS FOR SUSTAINABILITY THROUGH AI</b> <i>Dr N. Subalakshmi</i>		
11.	ICON-152	<b>AUTONOMOUS MEDICAL TREATMENT ASSISTANCE USING ML AND ROBOTICS</b> <i>Dr. S. RajaKumaran</i>		
12.	ICON-153	<b>HEART DISEASE PREDICTION USING MLTECHNIQUES</b> <i>Dr. R. Ponnusamy, Dr. R. Visalakshi</i>		



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Session 3B & 10:15 AM – 11:45 AM		<a href="https://meet.google.com/as-cvyj-thu">https://meet.google.com/as-cvyj-thu</a>	<b>Dr. R. Arockia Kumar</b>	<b>Dr. K. Balamurugan</b>
			Asso. Prof. Mechanical Engg, NIT - Warangal	ASP / MECH, SRM MCET
S.No.	Paper ID	Title of the Paper & Authors		
1.	ICON-013	<b>A REVIEW ON STUDY THE DYNAMIC CHARACTERISTICS OF AN AUTOMOBILE DOOR PANEL MADE FROM HYBRID FIBERREINFORCED POLYMER HONEYCOMB</b> <i>R.Haridass, N. Balamurugan, S. Guhan, K. Sanjay, P. A .Suryaprasath</i>		
2.	ICON-015	<b>NANOSTRUCTURED MATERIALS FOR NEXT-GENERATION ENERGY STORAGE: DESIGN, SYNTHESIS, AND APPLICATIONS</b> <i>M. E. Annadorai, M. Ramakrishna, G. Sudharsan Reddy, B. Rajasekhar, Ch.V S R Satya Prasad</i>		
3.	ICON-040	<b>BIO-INSPIRED ROBOTICS: HARNESSING NATURE’S SOLUTIONS FOR ADVANCED TECHNOLOGICAL SYSTEMS</b> <i>K. Reddy Narasimhulu, C. Ramesh Ajay, P.Sneha, C. Kalyani</i>		
4.	ICON-054	<b>COMPOSITE MATERIALS FOR LIGHTWEIGHT, HIGH-STRENGTH STRUCTURES IN AUTOMOTIVE DESIGN</b> <i>A.Adinarayanan, R.Sohan Sourya, D.Nishant, G.S.Samy</i>		
5.	ICON-056	<b>INVESTIGATION OF SOLID PARTICLE EROSION IN ALUMINIUM REINFORCED WITH CASHEW NUT ASH</b> <i>Yallamati , Abshalomu, Y.Jyothi</i>		
6.	ICON-072	<b>ADVANCEMENTS AND APPLICATIONS OF SANDWICH COMPOSITE STRUCTURES IN MODERN INDUSTRIES: A REVIEW</b> <i>M. E. Annadorai, M. Ramakrishna, Y. Jyothi, K. Arunkarthikeyan</i>		
7.	ICON-078	<b>SECURING IOT ECOSYSTEMS WITH PRIVACY-PRESERVING PROTOCOLS AND MACHINE LEARNING</b> <i>B. Deepika, S M Hussain Basha, M. 28amatha, N. Uttez, A.Chinnamahammad Bhasha</i>		
8.	ICON-079	<b>DEEP REINFORCEMENT LEARNING MODELS FOR RESILIENT AUTONOMOUS ROBOTIC SYSTEMS</b> <i>V. Dharani Dharan, M. Munaswamy, A.Chinnamahammad Bhasha</i>		
9.	ICON-084	<b>IMPACT OF FISCHER-TROPSCH SYNTHETIC FUELS ON ENGINE PERFORMANCE AND EMISSIONS IN HEAVY-DUTY VEHICLES</b> <i>V T Vimalananth, Udhayavasan K, A Mohd Suhaib Enoos Khan, G S Samy</i>		
10.	ICON-089	<b>ACCELERATING INNOVATION IN MATERIALS SCIENCE USING MACHINE LEARNING IN MATERIALS DISCOVERY</b> <i>K. Baranidharan, M. Uthayakumar</i>		
11.	ICON-131	<b>OPTIMIZATION OF 3D PRINTING PARAMETERS FOR ENHANCED MECHANICAL PROPERTIES OF PLA-4%CU COMPOSITES FABRICATED VIA FDM</b> <i>K. Arunkarthikeyan, M. Mohammed Asif, K. Balamurugan, Garikapati.Pruthvi Raju, A.Chinnamahammad Bhasha</i>		
12.	ICON-132	<b>PERFORMANCE AND ANALYSIS OF WAVE SPRING FOR TWO-WHEELER SHOCK ABSORBER</b> <i>K.Arunkarthikeyan, M.Mohammed Asif, K.Balamurugan, Garikapati.Pruthvi Raju, M.E.Annadorai</i>		



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Session 3C & 10:15 AM – 11:45 AM		<a href="https://meet.google.com/apm-yiso-xkm">https://meet.google.com/apm-yiso-xkm</a>	<b>Dr. Hosimin Thilagar</b>	<b>Dr. S. Senthil Rani</b>
			Professor, EEE Anna University, Chennai	ASP / ECE, SRM MCET
S.No.	Paper ID	Title of the Paper & Authors		
1.	ICON-043	<b>ADVANCED MACHINE VISION FOR QUALITY CONTROL IN INDUSTRIAL AUTOMATION: A DEEP LEARNING APPROACH</b> G.Sai, Nelakurthi.Pavithra, D. Vijaya Kumar Reddy, O.HariKrishna		
2.	ICON-046	<b>PREDICTIVE MAINTENANCE FRAMEWORK FOR SMART URBAN INFRASTRUCTURE</b> K.Devarajulu Reddy, V. Priyanka Reddy, M. Rakesh Reddy, A.Sedrak Reddy, B.Ravitheja		
3.	ICON-047	<b>ADVANCEMENTS IN REMOTE SENSING SMART CITIES FOR SUSTAINABLE URBAN DEVELOPMENT</b> G.Bhanu Prakash Reddy, Mohammad Abrar taha Shaik, J.Mounika, M.Maneesha		
4.	ICON-048	<b>PIONEERING APPLICATIONS OF MXENES AND TWO-DIMENSIONAL MATERIALS IN ELECTRONICS AND PHOTONICS</b> N. Sravan Kumar, T.M. Ranjith Kumar, D. Esha Reddy, B. L. Venkatesha		
5.	ICON-049	<b>HARVESTING SYSTEMS FOR IOT-ENABLED SUSTAINABLE APPLICATIONS</b> G.Yaswanth, Lavanya sanagari, Ganesh, K.Sandeep		
6.	ICON-055	<b>BIOMEDICAL ENGINEERING INNOVATIONS IN DRUG DELIVERY SYSTEMS FOR TARGETED THERAPIES</b> Anand Anbazhagan, Murugesan Shanmugavelu, Kavin FrancisXavier, Pradeepa Karuppaiah, Bharathiraja Nagu		
7.	ICON-140	<b>OPTIMIZED SCHEME USING RETINAL VESSEL SEGMENTATION WITH MODIFIED UNET MEDICAL IMAGE PROCESSING</b> T.Chitra, R.Tharani and R.Ashok Kumar		
8.	ICON-271	<b>DESIGN AND ANALYSIS OF WEARABLE FRACTAL ANTENNA ON JEAN SUBSTRATE FOR WIRELESS APPLICATIONS</b> T. Sampath, A.Kavitha		
9.	ICON-150	<b>BIG DATA METHOD FOR ENERGY CONSUMPTION IN SMART HOMES</b> Dr. K Kavitha, Dr. Jeyakarthic M		
10.	ICON-099	<b>ANALYZING CANCER SURVIVAL USING THE WEIBULL METHOD</b> P. Manohar, G. Madhav Krishna, A. Chinnamhammad Bhasha		
11.	ICON-222	<b>ANALYTICAL APPROXIMATION OF A TIME-DELAY MODEL FOR PEST CONTROL IN COCONUT TREES BY HOMOTOPY PERTURBATION METHOD</b> Jenitta E, Senthamarai R		
12.	ICON-282	<b>IMIDAZOLIUM IONIC LIQUID WITH GRAPHENE AND GRAPHENE OXIDE FOR WATER SPLITTING APPLICATIONS: A DFT STUDY</b> K. Hussain Basha, Srinivasadesikan Venkatesan		



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Session 4A & 11:45 AM – 1:15 PM		<a href="https://meet.google.com/sji-wnpi-iib">https://meet.google.com/sji-wnpi-iib</a>	<b>Dr.Narendran Rajagopalan</b>	<b>Dr. M.Pandi</b>
			Associate Professor, CSE, NIT Puducherry	HOD / CSE(AIML), SRM MCET
S.No.	Paper ID	Title of the Paper & Authors		
1.	ICON-080	<b>ENHANCING HEALTHCARE WITH WEARABLE IOT DEVICES AND AI-POWERED DIAGNOSTICS</b> <i>Dr. P. Victor Paul</i>		
2.	ICON-185	<b>AN EFFICIENT NON-INVASIVE APPROACH FOR ANEMIA DETECTION USING EMPIRICAL CNN RESNET50 ARCHITECTURE</b> <i>Nitin Ujgare, Aditi Katala, Janhavi Bhambare, Mansi Nikam, Darshana Dusing</i>		
3.	ICON-197	<b>CYBER DECEPTION HONEYPOTS: AI-POWERED INTRUSION DETECTION AND DECEPTION MECHANISMS</b> <i>Harini.M, Krishna Jothi. S, Sree Hari Preetha. M, Lucky Malathi. L</i>		
4.	ICON-229	<b>HANDS-FREE COMPUTING: AN EYE-BASED VIRTUAL MOUSE FOR THE DISABLED</b> <i>A.Senthil Murugan, R.Senthil Babu, A.Sivaranjani, Roger Jeas Smith J, S.Manoj Kumar</i>		
5.	ICON-230	<b>INTELLIGENT ECG ANALYSIS: HYBRID DEEP LEARNING FOR ARRHYTHMIA CLASSIFICATION</b> <i>Prem Patel, Pradeep K C, Vijayakumar K P</i>		
6.	ICON-239	<b>GUARD MASK: USING MACHINE LEARNING TO EFFICIENTLY IDENTIFY FACE MASK</b> <i>Boya Madhuri, Tejeshwini. M, Nithya Kalyani. A, Yenugula Shirisha, Musturu Pranavi</i>		
7.	ICON-261	<b>PERFORMANCE ANALYSIS OF TASK SCHEDULING ALGORITHMS IN CLOUD COMPUTING ENVIRONMENTS</b> <i>K. Pradeep, Pavithra Uthrah R.K, Lohita Lakshmi L.S, K.P.Vijayakumar</i>		
8.	ICON-263	<b>LEAF SENSE: SMART LEAF DISEASE DETECTION SYSTEM</b> <i>N Madhuri, K. Yagna Sree, Nithya Kalyani A, B.Divyapriya, V Mounika</i>		
9.	ICON-296	<b>BRAKE PAD COATING TO ENHANCE THE WEAR RATE WITH AI ASSISTED</b> <i>Celishius M, Kalai Gowri K, Ashwin S, Viswa Bharathiyar B, Ponsundar AG, Manikandaraja G</i>		
10.	ICON-300	<b>ENHANCING MECHANICAL PERFORMANCE OF BAGASSE COMPOSITES WITH GLASS FIBER REINFORCEMENT AND ALKALI TREATMENT</b> <i>Harishkumaran M, Harishkumar S U, Sakithyan Muthu R, Dharun Venket S R, Manikandaraja G</i>		
11.	ICON-303	<b>AI-POWERED CORROSION PREDICTION AND SURFACE ANALYSIS OF MARINE-GRADE ALLOYS WITH GRAPHITE AND PTFE COATINGS</b> <i>Agarshna. R, Karthick. R, Vaishnaavi. S, Neelesh. R, Srihari. A, Dr. G. Manikandaraja</i>		
12.	ICON-307	<b>AN AUTOMOBILE AIR POLLUTION MONITORING SYSTEM USING MACHINE LEARNING</b> <i>Vadlamudi Venkata Charan, Chityala Vishnu Vardhan Reddy, Potla Mokshagna, Jane Rubel Angelina Jeyaraj, Nagineedi Pavani</i>		



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Session 4B & 11:45 AM – 1:15 PM		<a href="https://meet.google.com/vyu-xvyj-yfh">https://meet.google.com/vyu-xvyj-yfh</a>	<b>Dr. L. S. Raju</b>	<b>Dr. A.N. Balaji</b>
			Professor, Mechanical Engg, NITTTR-Bhopal, Madhya Pradesh	Professor / MECH, SRM MCET
S.No.	Paper ID	Title of the Paper & Authors		
1.	ICON-136	<b>A REVIEW ON STUDY THE DYNAMIC CHARACTERISTICS OF AN AUTOMOBILE DOORPANEL MADE FROM HYBRID FIBERREINFORCED POLYMER HONEYCOMB</b> <i>R.Haridass, N.Balamurugan, S. Guhan, K.Sanjay, P.ASuryaprasath</i>		
2.	ICON-221	<b>FABRICATION OF FUNCTIONALLY GRADED MATERIALS (FGMS) FOR MECHANICAL COMPONENTS IN ADDITIVE MANUFACTURING VIA LASER POWDER BED FUSION: A REVIEW</b> <i>Dinesh Singh Yadav,Dr. L.S. Raju</i>		
3.	ICON-234	<b>STUDIES ON DRY SLIDING WEAR BEHAVIOUR OF GRAPHITE FILLED CARBON FIBER EPOXY</b> <i>Dr. CH. Siva Rama Krishna, M. Naveen , M. Dilip kumar, M. Sri Harsha, Prashant Singh</i>		
4.	ICON-235	<b>FABRICATION AND TESTING OF COMPOSITE MATERIAL MADE UP OF PRAWN SHELL POWDER</b> <i>Dr. K.S.Raghuram, A.Ganesh, Ch.Ganith Raj, B.Madhu, Ch.Mohith Eshwar, A.Manohar</i>		
5.	ICON-236	<b>EXPERIMENTAL INVESTIGATION OF MECHANICAL PROPERTIES OF RAMIE, ARECA AND JUTE FIBER REINFORCED COMPOSITES</b> <i>Kottamsetty Vivek Varma, Banala Durga Vara Kumar, Bonda Arvind, BondiMahesh, Rapeta Sundara Ramam</i>		
6.	ICON-238	<b>MECHANICAL, MICROSTRUCTURAL CHARACTERIZATION AND OPTIMISATION OF FSAM-PROCESSED ZE41 MG NANOCOMPOSITE</b> <i>S Swetha, Dr Y.Jyothi</i>		
7.	ICON-252	<b>MECHANICAL AND THERMAL CHARACTERIZATION OF KEVLAR FIBER/GRAPHENE/SIC/AL<sub>2</sub>O<sub>3</sub> NANOPARTICLES REINFORCED EPOXY COMPOSITES</b> <i>Muniranjith Kumar , Jyothi</i>		
8.	ICON-012	<b>UTILIZING LEAD WASTE AND RICE HUSK ASH IN CONCRETE: INSIGHTS FROM EXPERIMENTAL STUDY ON COMPRESSIVE STRENGTH</b> <i>Hariharan, N, S. Varadharajan, Purushotham G Sarvade</i>		
9.	ICON-024	<b>PERFORMANCE EVALUATION OF FLY ASH-BASED SIFCON REINFORCED WITH HOOKED-END STEEL FIBERS FOR SUSTAINABLE HIGH-STRENGTH APPLICATIONS</b> <i>N.Susmitha, Karthikeyan Muniraj, Dasari Sai Vishnu Babu, Shaik Mustafa,Molla Baji</i>		
10.	ICON-067	<b>COMPRESSIVE BEHAVIOR OF SIFCON WITH DOLOMITE CEMENT REPLACEMENT AND DUAL FIBERS</b> <i>N. Susmitha, Payel Chaudhuri ,Karthikeyan,Muniraj</i>		
11.	ICON-186	<b>SUSTAINABLE CEMENTITIOUS BINDERS: A COMPARATIVE ANALYSIS OF SUGARCANE BAGASSE ASH AND FLY ASH IN SIFCON MIXES</b> <i>N. Susmitha, Payel Chaudhuri, Karthikeyan Muniraj</i>		



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			Associate Professor, ECE, Military College of Telecommunications, Indore, Madhya Pradesh	ASP / ECE, SRM MCET
S.No.	Paper ID	Title of the Paper & Authors		
1.	ICON-052	<b>NEXT-GENERATION CERAMICS FOR AEROSPACE: ULTRAHIGH-TEMPERATURE AND LIGHTWEIGHT MATERIAL EXPLORATION</b> <i>Guggilla Vinay, Bachina Harish Babu, M. Venkata Ramana, Shaik Amjad</i>		
2.	ICON-053	<b>AUTONOMOUS ROBOTICS IN SMART AGRICULTURE THROUGH IOT AND DEEP LEARNING</b> <i>Gopal Mishra, B. Santosh, D. Vishnu Vardhan, Dr. B. Harish Babu</i>		
3.	ICON-060	<b>ADVANCEMENTS IN SELF-HEALING POLYMERS AND COMPOSITES FOR DURABLE MATERIAL DEVELOPMENT</b> <i>Bangla Aryan, Bachina Harish Babu, T. Srinivas Rao, Shaik Amjad</i>		
4.	ICON-061	<b>ADVANCEMENTS AND APPLICATIONS OF UNMANNED AERIAL VEHICLES (UAVS) IN DEFENSE SECTORS</b> <i>S. Karthik, K. Indra Sri Surya, M. Murali Goud , Dr. B. Harish Babu</i>		
5.	ICON-069	<b>NUMERICAL ANALYSIS OF UNSTEADY MHD HEAT AND MASS TRANSFER FLOW THROUGH A POROUS MEDIUM WITH TIME-DEPENDENT PERMEABILITY</b> <i>Dhananjay Wagh, Devam Patel, Darshan Mali, Nisheet Medha</i>		
6.	ICON-083	<b>MAGNETIC NANOFLUIDS FOR ACTIVE HEAT TRANSFER CONTROL IN SMART THERMAL SYSTEMS</b> <i>Mukilarasan Nedunchezhiyan , Ugea Menon, Arom G Biju, G.S Samy</i>		
7.	ICON-093	<b>ADVANCED NANOMATERIALS FOR REVOLUTIONARY ENERGY STORAGE AND ENVIRONMENTAL APPLICATIONS</b> <i>G.S. Samy, K. Jai Surriya, A.V. Sreenandh, D.Vishwa, R. Muthudineshkumar</i>		
8.	ICON-183	<b>OPTIMIZATION OF REGENERATIVE COOLING PROCESS IN LIQUID ROCKET ENGINES</b> <i>Nishad Bhavsar, Devansh Soni, Arya Warule</i>		
9.	ICON-032	<b>APPLICATION OF FRICTION STIR WELDING IN AUTOMOTIVE MANUFACTURING: CHALLENGES, SOLUTIONS, AND FUTURE PROSPECTS</b> <i>G.S. Samy, G. Thomas, V Kailashnath, N. Mukilarasan, P. Karthikeyan</i>		
10.	ICON-298	<b>DEVELOPMENT AND EVALUATION OF SUSTAINABLE RICE HUSK/GLASS FIBER COMPOSITES FOR INDUSTRIAL APPLICATIONS</b> <i>S Santhosh, Revanth K, Aravindh Krishnan T, Balaji B, Adithya R, Manikandaraja G</i>		

## **KEYNOTE ADDRESS: 1**

### **SMART RETROFIT STRATEGIES: INTEGRATING LEGACY SYSTEMS INTO SUSTAINABLE MANUFACTURING FOR INDUSTRY 4.0**

**Prof. Yusri Yusof**, Universitiy Tun Hussein Onn Malaysia (UTHM), Malaysia

#### **1. Introduction**

The fourth industrial revolution (Industry 4.0) is transforming the global manufacturing landscape through the integration of intelligent digital systems, Internet of Things (IoT), Artificial Intelligence (AI), and cyber-physical systems. Despite these advances, many organizations, especially SMEs and educational institutions, still rely on legacy equipment that lacks the connectivity and intelligence required for modern production environments. Rather than replace these assets, smart retrofit strategies offer a more sustainable, cost-effective solution by upgrading existing systems to meet current digital standards.

This talk outlines strategic methods and practical implementations for retrofitting legacy systems, demonstrating how sustainable manufacturing goals can be achieved through innovative, localized solutions. It also highlights key projects, outcomes, and intellectual contributions that support the integration of legacy machines into digital ecosystems.

#### **2. Background of Research**

The ongoing Fourth Industrial Revolution (Industry 4.0) has introduced a major paradigm shift in manufacturing, emphasizing connectivity, intelligence, and automation. However, a significant challenge lies in the fact that a majority of industrial equipment in use today, particularly in small and medium-sized enterprises (SMEs), remains non-digital legacy systems reliable in operation but disconnected from the digital ecosystem. To bridge this technological gap without resorting to cost-intensive equipment replacement, retrofitting legacy systems has emerged as a practical and sustainable alternative. Retrofitting enables the transformation of conventional machines into smart, connected devices capable of participating in digital manufacturing ecosystems. This research focuses specifically on retrofitting an industry legacy 3-axis CNC machine (manufactured in 1992) to meet modern Industry 4.0 expectations. The core of this retrofitting research lies in converting a traditional CNC machine originally designed for isolated, standalone operation into an integrated smart manufacturing

node. This transformation is achieved by embedding modern technologies that allow real-time communication, adaptive control, and performance analytics.

### 2.1 Before vs. After Benefits: Strategic Gains from Smart Retrofitting

The transition from legacy systems to digitally connected manufacturing environments is not merely a technological upgrade it represents a paradigm shift in operational philosophy, production efficiency, and organizational agility. Table 1 is a detailed comparison of the before and after conditions, illustrating the tangible benefits achieved through smart retrofit strategies:

**Table 1: Before vs. After Benefits: Strategic Gains from Smart Retrofitting**

Aspect	Before Retrofit (Legacy Condition)	After Retrofit (Smart Industry 4.0 Condition)
Connectivity	Machines operate in isolation with no real-time communication or data sharing.	Machines are IoT-enabled, facilitating real-time monitoring, remote access, and system integration.
Vendor Dependence	Proprietary CNC systems limit customization and incur high maintenance and upgrade costs.	Open-source and modular systems reduce vendor lock-in, enabling flexibility and local customization.
Data Utilization	Manual logbooks or disconnected data sources; no real-time feedback for decision-making.	Sensor data feeds cloud dashboards and analytics engines, allowing data-driven decisions.
Operational Visibility	Limited visibility into machine performance, usage patterns, or downtime causes.	Real-time dashboards provide full operational transparency and alerts for proactive maintenance.
Maintenance Approach	Reactive maintenance leads to unexpected breakdowns and productivity loss.	Predictive maintenance using sensor analytics minimizes unplanned downtime and extends machine life.

System Integration	Machines operate in silos with no linkage to enterprise systems like ERP, MES, or SCADA.	Seamless integration with enterprise-level systems enables smart scheduling, inventory sync, etc.
Scalability & Futureproofing	Difficult to scale or adapt due to rigid hardware and outdated control software.	Scalable and upgradable via plug-and-play modules and software updates.

## 2.2 Justification and Strategic Value

Smart retrofitting bridges the technological gap without the financial burden of complete equipment replacement. This transformation unlocks competitive advantages by enabling:

- i. **Operational Cost Savings:** Through reduced downtime, improved machine efficiency, and minimized reliance on proprietary vendors.
- ii. **Agile Manufacturing:** By integrating data streams and real-time insights, manufacturers can respond quickly to demand fluctuations or disruptions.
- iii. **Workforce Enablement:** Human-machine collaboration is enhanced through digital interfaces and training, aligning with upskilling and reskilling goals.
- iv. **Sustainability Goals:** Monitoring and optimizing energy and resource consumption supports green manufacturing initiatives.

By demonstrating measurable benefits in pilot-scale projects, such as the retrofitted Pro-light CNC milling machine, this approach has proven effective in modernizing legacy infrastructure across academia and industry alike. It also supports Malaysia’s broader National Policy on Industry 4.0 (Industry4WRD), particularly in enhancing SME readiness and building local innovation capacity.

## 3. Previous Projects

Our efforts in smart retrofit research have been strongly supported by national innovation initiatives, particularly through the Science Fund and Prototype Research Grant Scheme (PRGS) provided by the Malaysian government. These funding mechanisms enabled the development, testing, and validation of prototype solutions tailored for local industries. One of our key achievements was the third-party technical verification conducted by SIRIM Berhad, Malaysia’s leading industrial research and standards organization. The verification report was titled: “Verification of Retrofitted Prolight 3-Axis Milling Machine in Adapting Industry 4.0 Technology” University Tun Hussein Onn Malaysia (UTHM), by Machine Design Section,

Machinery Technology Centre, SIRIM Berhad. This external validation adds a high level of credibility and national recognition to the project, emphasizing its potential for scalability and adoption in industrial environments.

### **3.1 Retrofitted Pro-light 3-Axis Milling Machine for Industry 4.0**

The project involved the transformation of a conventional Pro-light 3-axis CNC milling machine into a digitally enabled system capable of supporting Industry 4.0 functions. The retrofit strategy incorporated: The upgraded machine was not only cost-effective but also successfully demonstrated smart manufacturing capabilities such as predictive maintenance, machine learning-based optimization, and production data analytics all essential pillars of Industry 4.0. This initiative proved that low-cost retrofitting of existing machines is a viable strategy for SMEs and training institutions aiming to transition into digital manufacturing ecosystems.

### **3.2 Development of Industrial Revolution 4.0 Research Lab Framework**

To complement the technical upgrade, a comprehensive framework was designed for establishing Industry 4.0 research and learning ecosystem. The framework, implemented at the UTHM Digital Manufacturing Laboratory, now functions as a living lab and pilot site for smart manufacturing strategies, offering a scalable model for replication across Malaysia and the Southeast Asian region.

## **4. Current Project**

The current work focuses on retrofitting an Industry Legacy 3-Axis CNC Machine (manufactured in 1992). The machine, originally limited to basic NC codes. This project demonstrates that even machines over 30 years old can be repurposed into valuable assets under Industry 4.0, thus saving costs and reducing electronic waste. The strategic retrofitting of legacy CNC machines aligns with the broader objectives of Industry 4.0, offering numerous benefits:

- i. **Operational Efficiency:** Enhances machine performance and accuracy in manufacturing processes.
- ii. **Cost-Effectiveness:** Economical upgrade path preserving capital investments.
- iii. **Sustainability:** Reduces waste and resource consumption by extending machinery lifespan.
- iv. **Predictive Maintenance:** Real-time analytics reduce downtime and maintenance costs.
- v. **Enhanced Decision-Making:** Data analytics optimize production and resource allocation.

## **5. Key Deliverables and Way Forward**

The outcomes of the previous and current projects serve as a benchmark for wider adoption.

The following deliverables have been successfully achieved:

- i. Completion of CNC machine pilot production line (3-axis retrofitted unit).
- ii. Machine control performance testing on both pilot and commercial-scale models in real factory environments.
- iii. Machining quality and client acceptance tests conducted in the field.
- iv. Commercialization of locally developed CNC control software, enabling local industry independence from expensive proprietary systems.
- v. Upskilling and reskilling training programs for digitalization, targeting technicians, educators, and engineers.

## **6. Intellectual Property Contribution**

The innovations from this research and development effort culminated in a national intellectual property contribution; Patent Application Number: PI 2019006848, Remote-Control System for a Machining Process. This patent covers the core remote operation strategies that are integral to smart retrofit implementations. It represents Malaysia’s commitment to advancing homegrown technologies for sustainable manufacturing.

## **7. Conclusion**

Smart retrofit strategies are crucial for bridging the gap between conventional and modern manufacturing systems. Rather than discarding functional but outdated equipment, industries can unlock new capabilities by integrating sensors, connectivity, and control intelligence. This not only aligns with sustainability principles by reducing waste but also ensures resilience and adaptability for future industrial challenges.

Through a combination of applied research, real-world testing, intellectual property generation, and education-based outreach, smart retrofitting has become a proven pathway to enable sustainable digital transformation—especially in resource-constrained settings.

## **KEYNOTE ADDRESS: 2**

### **BEYOND EQUATION: THE ART OF CREATIVITY AND INNOVATION IN ENGINEERING**

**Prof. S P Sivapirakasam**, Professor, Department of Mechanical Engineering, National Institute of Technology-Tiruchirappalli.

Engineering is often perceived as a domain of rigid logic, governed by formulas, calculations, and empirical data. However, the history of engineering — and indeed its most revolutionary advancements — reveal a deeper truth: engineering is also a profoundly creative endeavour. It is in the fusion of imagination with analysis, and of intuition with experimentation, that truly transformative solutions are born. This key note speech explores the essential role of creativity in engineering, not as a complementary skill, but as a core pillar of problem-solving and innovation. Drawing on examples from history, nature, and modern technological progress, it invites the reader to reconsider the boundaries of engineering thought — beyond the equation and into the realm of the possible.

#### **The Role of Creativity in Engineering**

Creativity, in its simplest form, is the capacity to produce something novel and useful. It involves imagination, lateral thinking, and a willingness to question existing assumptions. In engineering, creativity allows us to solve problems that may not have a clear precedent, to improve designs that have stagnated, and to approach constraints as opportunities rather than limitations. Traditional engineering education emphasizes analysis, precision, and methodology. While these are indispensable, they often underplay the importance of intuitive insight, empathetic design, and divergent thinking — all hallmarks of creativity. As global challenges grow in complexity and interdependence, engineers must increasingly draw from the creative well to envision sustainable, scalable, and human-centric solutions.

#### **Understanding the Creative Process**

Creative engineering is not a matter of sudden inspiration alone. Like any technical process, innovation follows identifiable stages. A widely accepted model includes four primary steps:

1. **Empathy** – Understanding the user’s needs and problems from their perspective.
2. **Ideation** – Generating a broad range of ideas, without immediate judgment.
3. **Prototyping** – Translating ideas into tangible forms to explore their viability.
4. **Testing** – Evaluating and refining solutions based on feedback and real-world constraints.

These stages are not strictly linear; often, the process involves looping back, iterating, and refining. The key lies in balancing analytical rigor with imaginative exploration.

### **Creativity Through Empathy: The Washing Machine Story**

Consider a mundane yet transformative innovation: the washing machine. Prior to mechanization, washing clothes was laborious, time-consuming, and physically demanding. Early inventors empathized with this everyday struggle. Rather than seeking complex theoretical breakthroughs, they focused on reducing human effort — a classic application of the empathy stage. From the earliest hand-cranked models to today’s intelligent, sensor-based systems, the evolution of washing machines reflects a deepening understanding of user convenience, ergonomics, and environmental efficiency. Each advancement was not merely technical; it was creative — driven by the desire to simplify life and enhance dignity in daily tasks.

### **Rethinking the Obvious: The Airless Tyre**

Another compelling example of engineering creativity is the development of the airless tyre. The traditional pneumatic tyre is prone to punctures and demands constant maintenance. While incremental improvements have been made over time, the breakthrough came when engineers challenged the fundamental assumption: what if a tyre didn’t require air at all? This reimagining led to non-pneumatic tyres, which use resilient materials and unique internal structures to absorb shocks and maintain integrity. These tyres are already used in demanding environments such as military vehicles and space rovers. Their existence exemplifies how questioning core assumptions can lead to radical solutions.

### **The Art of Integration: Creativity as Connection**

Creativity is not only about inventing from scratch. Often, it is about connecting existing technologies in a way that redefines user experience. The smartphone is a case in point. Before 2007, we already had mobile phones, cameras, music players, and internet-enabled devices. Yet it took a creative leap to integrate them seamlessly into one intuitive interface. This approach of creative integration has influenced content consumption as well. Traditional television confined viewers to scheduled programming. The arrival of on-demand streaming — led by platforms like Netflix — turned that model on its head. Today, viewers decide what to watch, when to watch, and how to watch. The success of these services wasn’t purely technical; it lay in understanding evolving consumer behavior and designing accordingly.

### **Biomimicry: Learning from Nature**

Nature, with its 3.8 billion years of trial and error, remains one of the richest sources of creative inspiration. The practice of biomimicry — emulating nature’s strategies — has yielded

numerous engineering marvels. **VELCRO**, for instance, was invented after the Swiss engineer George de Mestral observed how burrs clung to his dog’s fur. The hook-and-loop mechanism found in those tiny burrs became the basis for a fastening system now ubiquitous in clothing, aerospace, and medicine. Similarly, **gecko feet**, with their remarkable adhesion due to microscopic hair structures, have inspired dry adhesives used in robotics and space missions. These adhesives function without glue or suction, mimicking the gecko’s ability to cling and release with precision. In high-speed rail systems, the **Kingfisher bird** became the unlikely muse for solving the tunnel boom problem. Engineers modelled the nose of the train on the bird’s beak, which allows it to dive into water with minimal splash. This biomimetic design reduced air resistance and noise, while improving speed and energy efficiency. Another noteworthy example is **Whale Power’s wind turbine blades**, which replicate the tubercles on humpback whale fins. These grooves help delay airflow separation, allowing turbines to operate efficiently even at low wind speeds. Again, a creative application of natural design led to measurable engineering gains.

### **The New Age of Creative Engineering**

Engineering today sits at a pivotal intersection of sustainability, digital transformation, and social impact. Problems such as climate change, urban congestion, and resource scarcity demand imaginative approaches. Take **electric vehicle (EV) charging** in India, for instance. While EV adoption is rising, the supporting infrastructure — charging stations, grid stability, and service availability — lags behind. Traditional solutions are not enough. We need to consider unconventional ideas such as:

- **Mobile solar-powered charging vans**, capable of reaching remote areas.
- **Battery swapping booths**, similar to ATMs, where users exchange discharged batteries for fully charged ones.
- **“Charge & Chai” stations**, leveraging India’s widespread network of tea stalls to double as community charging hubs.

Even more futuristic is the idea of **dynamic or online charging**, where vehicles draw power while in motion — akin to trains receiving current from overhead lines. Though technically challenging, such ideas push the boundaries of what's possible.

### **Addressing Urban Congestion with Imagination**

Urban traffic is another arena where creativity must intervene. Our cities are growing faster than our roads. Traffic congestion not only causes delays but also contributes to fuel wastage, pollution, and stress. Technical solutions may include AI-powered traffic management systems, multi-level roadway designs, and compact vehicle formats. But creative thinking opens even more ambitious avenues - vertical mobility, personal drones, or even teleportation portals. While some

may sound like science fiction today, many of tomorrow’s breakthroughs will emerge from ideas that were once considered too bold to pursue.

### **Challenges that Await Creative Solutions**

At the heart of every engineering challenge lies a human need. Today, we face two urgent issues:

1. **Overflowing landfills** — demanding innovative waste reduction, reuse, and repurposing strategies.
2. **Lack of access to clean drinking water** — especially in rural and underserved regions.

Both problems require more than just technical fixes. They require empathy, local engagement, policy coordination, and most importantly, a creative approach to design and implementation.

### **Final Reflections: Beyond the Formula**

To practice engineering is to engage with complexity — physical, social, and ecological. Equations, simulations, and standards provide the scaffolding. But creativity builds the bridge between present reality and future potential. Creative engineers are not those who disregard logic, but those who go beyond it. They start with observation and empathy, draw inspiration from diverse domains, and are unafraid to reimagine the familiar. Whether it's rethinking a tyre, reshaping energy use, or redesigning systems based on nature, their work affirms a central truth: engineering is as much an art as it is a science. In closing, the next wave of engineering innovation will be led not only by the best coders or designers, but by those who dare to ask different questions, connect unexpected dots, and keep humanity at the heart of their work.

## **KEYNOTE ADDRESS: 3**

### **GREENING THE STACK: SUSTAINABLE AI AND TECH INFRASTRUCTURE FROM DEV TO DEPLOY INTRODUCTION**

**Mr. Clifton Reddy**, Staff Programmer Analyst, American National Insurance Company, Texas, USA.

It’s a privilege to be here today to discuss a topic of growing importance — the intersection of climate action and the digital technology industry. As professionals in this space, we hold a unique responsibility and opportunity to address one of the defining challenges of our time: the climate crisis. Today, I’d like to explore how our work in software can contribute meaningfully to global sustainability efforts, and how practical frameworks and community initiatives are making this vision a reality. Our conversation will cover the urgency of climate action in our field, the principles and practices of green software, practical frameworks for carbon reduction, the importance of ethical AI development, integrating sustainable DevOps practices including scientific calculations within pipelines, and the role of community and collaboration in driving lasting change.

#### **The Urgency of Climate Action in Technology**

The climate crisis is not a distant threat; it’s an immediate, global issue affecting ecosystems, economies, and communities worldwide. While conversations about emissions often focus on sectors like manufacturing, agriculture, and transportation, digital technology has rapidly become a significant contributor to global greenhouse gas emissions. Data centers, cloud infrastructure, artificial intelligence, and blockchain technologies consume vast amounts of energy much of it still derived from fossil fuels. According to estimates from the International Energy Agency, data centers alone are responsible for approximately 1% of the world’s total electricity demand. As cloud computing, streaming services, and machine learning models continue to expand, their energy consumption and associated carbon emissions are expected to grow without intervention. Recognizing this impact is the first step. As stewards of the digital age, we must re-evaluate the sustainability of our systems and processes, ensuring that we reduce our environmental footprint while continuing to drive innovation.

#### **Defining Green Software**

Green software refers to software solutions developed with an intentional focus on energy efficiency, low carbon emissions, and environmental responsibility. It involves the

application of principles, tools, and practices aimed at minimizing the environmental impact of software throughout its lifecycle from coding and deployment to operation and retirement.

This emerging discipline seeks to transform how we build, deploy, and manage applications by prioritizing sustainability alongside performance and security. Green software challenges the notion that technology is inherently clean and encourages us to acknowledge and address the environmental costs associated with digital systems.

*Key aspects of green software development include:*

- Energy-efficient code design
- Carbon-aware application deployment
- Sustainable infrastructure selection
- Monitoring and optimization of runtime energy use
- Lifecycle planning for software maintenance and decommissioning

By embedding these principles into our development processes, we can create digital systems that are more sustainable, efficient, and socially responsible.

### **Practical Frameworks and Tools**

To help navigate this challenge, several frameworks and methodologies have been established to quantify and reduce the carbon footprint of software. One example is a standardized specification for calculating software carbon intensity, which considers factors such as:

- Energy consumption during software operation
- The efficiency of hardware and cloud infrastructure used
- The source of electricity (renewable vs. non-renewable)

By measuring these elements, technologists can make informed decisions about optimizing their applications, choosing greener hosting environments, and adopting carbon-aware computing practices. Practical measures such as efficient coding techniques, resource optimization, and mindful cloud service usage can significantly reduce emissions. These small yet impactful changes collectively contribute to a more sustainable digital ecosystem.

Additionally, the integration of carbon efficiency metrics into software performance dashboards enables organizations to actively track and manage the environmental impact of their digital services, aligning operational performance with climate objectives.

### **Integrating AI Ethics and Environmental Responsibility**

Recent research, such as the paper "Bridging the Gap: Integrating Ethics and Environmental Sustainability in AI Research and Practice," highlights the growing consensus that AI development must simultaneously address both ethical and environmental concerns.

This includes considering energy consumption, fairness, transparency, and long-term societal impact when designing AI systems.

The paper advocates for integrating environmental sustainability metrics alongside ethical frameworks to ensure AI systems align with climate goals without compromising societal values. This dual focus ensures that while AI continues to transform industries and economies, it does so in a manner that is both socially equitable and environmentally responsible.

For instance, energy-intensive AI models should be evaluated not only for their accuracy or performance but also for their carbon footprint and social impact. Strategies to achieve this include:

- Adopting efficient machine learning architectures
- Deploying models in regions with renewable-powered data centers
- Encouraging interdisciplinary research between technologists, ethicists, and climate scientists

The research also emphasizes multi-stakeholder collaborations, policy alignment, and public-private partnerships as essential strategies to address these dual challenges. This holistic approach is crucial for building an AI industry that is not only innovative but also aligned with the broader goals of sustainable development and climate justice.

### **Integrating Scientific Calculations into DevOps Pipelines**

As we advance our cloud-native and AI solutions, another critical opportunity lies in embedding scientific calculations — including carbon emissions estimates and energy efficiency assessments — directly into our DevOps pipelines. By automating the monitoring and reporting of sustainability metrics during the continuous integration and continuous delivery (CI/CD) process, teams can make proactive adjustments to improve environmental performance.

These calculations can assess:

- The carbon footprint of a new software release or deployment
- The energy efficiency of different compute configurations or regions
- Trade-offs between model accuracy, compute resource usage, and emissions in AI model training and deployment

Integrating such metrics into DevOps not only supports operational sustainability but also enforces accountability and transparency. Developers, testers, and release managers receive real-time feedback on the environmental impact of their decisions, encouraging more carbon-conscious practices without sacrificing agility.

This integration can be achieved through plugins or extensions to popular CI/CD tools that track runtime energy usage, calculate associated carbon emissions based on regional energy grids, and offer recommendations for greener alternatives. Embedding sustainability into automated pipelines ensures it becomes a natural part of the software delivery workflow, rather than an afterthought.

### **Building a Green Technology Community**

Addressing climate change through technology is not a task for individuals alone. It requires a collective effort from the global tech community. By fostering collaborative projects, open-source initiatives, and educational programs, we can accelerate the adoption of green software practices and develop innovative solutions to complex environmental challenges.

Creating inclusive, diverse communities around green technology is equally crucial. Climate justice demands that sustainable innovations benefit all, especially those most vulnerable to environmental risks. As technologists, we have the power and responsibility to ensure that the digital solutions we create are equitable and accessible.

Initiatives like carbon-aware cloud computing, sustainable DevOps practices, and environmentally responsible AI research groups are already making an impact. By participating in these efforts, contributing to shared knowledge bases, and mentoring emerging green technology advocates, we help strengthen the collective capacity of our industry to respond to the climate crisis.

### **Conclusion and Call to Action**

In conclusion, the climate crisis demands urgent and collective action from all sectors — including ours. Integrating sustainability into software development, AI research, digital infrastructure management, and DevOps pipelines is not only possible; it’s essential.

By embracing green software practices, adopting carbon measurement frameworks, integrating scientific calculations into automated workflows, participating in community-driven initiatives, and considering both ethical and environmental dimensions of emerging technologies like AI, we can reduce the environmental impact of our work and drive meaningful change within our industry.

The time to act is now. I invite each of you to explore these concepts further, advocate for sustainable practices within your organizations, and consider how your unique skills and experiences can contribute to a greener, more equitable future.

Paper ID: ICON-012

## Utilizing Lead Waste and Rice Husk Ash in Concrete: Insights from Experimental Study on Compressive Strength

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**Abstract:** The incorporation of agricultural and industrial wastages (AIW) like Rice Husk Ash (RHA) and 99.99 % pure Lead waste (LW) [RHALW] in concrete as a partial replacement for traditional materials such as cement of about 15% with that of RHA and initially fine aggregate has been substituted with LW extracted from the electronic waste (EW) has garnered attention as a potential sustainable solution to address both environmental and construction challenges (CC). This study explores the influence of RHALW on the mechanical properties, durability, and environmental footprint of concrete. RHALW, processed to meet particle size and chemical reactivity standards, was integrated at varying proportions to replace cement and fine aggregate (FA). Comprehensive experimental evaluations were conducted to determine the compressive strength (CsT). The results reveal that incorporating RHALW in controlled proportions up to 10 % enhances the (CsT) of concrete by up to 12.45% compared to conventional mixes, attributable to improved particle packing and pozzolanic activity. However, exceeding optimal replacement levels led to strength reduction due to improper bonding and potential leaching risks. This research highlights the dual benefits of utilizing RHALW in concrete—reducing environmental pollution (EP) and conserving natural resources—while addressing critical challenges related to safety and long-term performance. The findings provide actionable insights for integrating RHALW in sustainable construction practices, offering a pathway for advancing circular economy (CE) principles in the construction industry. Future studies are recommended to optimize mix proportions and assess long-term field performance.

**Keywords:** Rice Husk Ash and Lead Waste, Electronic waste, Environmental Pollution, Compressive Strength, Construction Challenge, Circular Economy

Paper ID: ICON-013

## A Review on Study the Dynamic Characteristics of an Automobile Door Panel made from Hybrid Fiber Reinforced Polymer Honeycomb

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**Abstract:** This study examines the dynamic performance of an automobile door panel constructed using hybrid Fiber-Reinforced Polymer (FRP) honeycomb materials. With the automotive industry constantly seeking lighter, stronger, and more vibration-resistant components, hybrid FRP honeycomb structures offer a promising solution by combining the strength and durability of synthetic fibers with the sustainability and cost-effectiveness of natural fibers. By focusing on dynamic characteristics such as vibration damping, natural frequency, and impact resistance, this investigation provides valuable insights into how fiber type, orientation, and resin composition affect the performance of hybrid FRP honeycombs in real-world automotive applications. Experimental tests and computational simulations are used to evaluate the panel's response to dynamic loads, with findings showing significant potential for reducing weight without compromising safety or comfort. The results from this study are intended to support the development of next-generation automotive components that are both lightweight and high-performing, particularly in terms of vibration control and overall structural integrity.

**Keywords:** Jute fiber, Glass fiber, Epoxy Resin LY556, Hardener HY951, Acetone.

Paper ID: ICON-014

## Smart Materials for Self-Healing Structures in Engineering

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**Abstract:** Recent advancements in self-healing materials have demonstrated significant potential in civil engineering, particularly for infrastructure durability and sustainability. Studies indicate that self-healing concrete infused with bacterial agents can autonomously seal micro-cracks within 7 to 28 days, reducing permeability and enhancing structural integrity. Similarly, polymer-based self-healing materials embedded with microcapsules containing healing agents have shown a 60-80% recovery in mechanical properties after damage. Composite materials incorporating shape-memory alloys and hydrogels have also exhibited self-repairing capabilities, enabling bridges and roads to withstand extreme environmental conditions and prolonged stress. However, challenges such as cost-effectiveness, large-scale implementation, and durability under cyclic loading remain significant hurdles. To address these limitations, this study proposes a multi-functional hybrid self-healing material system that integrates microbial healing agents, polymeric microcapsules, and nano-engineered reinforcements. The methodology involves embedding a dual-action healing mechanism: bio-mineralization using *Bacillus subtilis* for crack sealing and microcapsule-based polymer release for enhanced mechanical recovery. Additionally, carbon nanotube-enhanced cementitious composites will be explored to improve electrical conductivity and enable real-time damage sensing. The integration of AI-driven predictive modeling will facilitate structural health monitoring, optimizing self-healing efficiency based on environmental and load conditions. Preliminary experimental results suggest that the hybrid material system can improve crack closure rates by 45% compared to conventional self-healing concrete, while polymer-based microcapsules extend service life by up to 30% in high-traffic infrastructure. By combining multiple self-healing mechanisms with smart sensing technologies, this approach aims to revolutionize sustainable construction practices, reducing maintenance costs and minimizing environmental impact. The proposed method will be validated through large-scale field trials, ensuring practical feasibility in real-world applications.

**Keywords:** Smart materials; Self-healing structures; Civil engineering; Infrastructure; Polymers; Composites.

Paper ID: ICON-015

## Nanostructured Materials for Next-Generation Energy Storage: Design, Synthesis, and Applications

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**Abstract:** Nanostructured materials have emerged as transformative elements in the development of next-generation energy storage technologies. The unique properties of these materials, such as high surface area, tunable electronic structures, and enhanced ion transport capabilities, enable significant improvements in power density, energy density, and life cycle. This study explores the design and synthesis of nanostructured materials, including nanocomposites, porous frameworks, and 2D materials, specifically tailored for applications in lithium-ion batteries, supercapacitors, and solid-state batteries. Emphasis is placed on scalable fabrication techniques, novel architectures, and the integration of these materials into practical energy storage devices. The research also highlights the role of advanced characterization techniques and computational modeling in understanding material performance and guiding further optimization. These developments are intended to fulfill the increasing demand for energy storage technologies that are long-lasting, efficient, and sustainable.

**Keywords:** Nanostructured materials, Energy storage, Lithium-ion batteries, Supercapacitors, Solid-state batteries.

Paper ID: ICON-016

## Healthcare Diagnostics through AI-Applications

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**Abstract:** Healthcare diagnostics powered by AI applications is transforming the way medical professionals approach disease detection and treatment. With the exponential growth of healthcare data, machine learning (ML) and artificial intelligence (AI) are increasingly being integrated into diagnostic tools to enhance accuracy, efficiency, and patient outcomes. AI models can process and analyze vast datasets, such as medical images, genetic information, and patient history, to identify patterns and make predictions that were once beyond human capacity. Techniques like deep learning (DL) have shown remarkable success in diagnosing conditions such as cancer, cardiovascular diseases, and neurological disorders by identifying subtle biomarkers that are difficult for the human eye to detect. These AI applications support doctors by offering more precise and rapid diagnoses, reducing the chances of human error, and optimizing treatment plans tailored to individual patients. Additionally, AI-driven diagnostic tools enable remote monitoring, telemedicine, and assist in predicting disease outbreaks, thus improving accessibility and efficiency in healthcare delivery. However, challenges remain in the form of data privacy, regulatory standards, and the need for continuous validation of AI models to ensure reliability and safety in clinical settings. As the field of AI in healthcare diagnostics continues to advance, the potential for better patient outcomes and more personalized care is immense. The integration of AI offers a promising future where healthcare systems can become more proactive, accessible, and effective, reshaping the landscape of global health diagnostics.

**Keywords:** Explainable AI, Healthcare Diagnostics, Machine Learning, Medical Applications, Predictive Analytics.

Paper ID: ICON-017

## Advanced Nanomaterials for High-Performance Engineering Applications in Aerospace

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**Abstract:** Advanced nanomaterials are revolutionizing aerospace engineering by significantly enhancing structural performance, thermal resistance, and durability. These materials, including carbon nanotubes (CNTs), graphene, and nanocomposites, exhibit exceptional mechanical properties such as a high strength-to-weight ratio, making them ideal for lightweight yet robust aerospace structures. Their superior thermal and electrical conductivity further enable advancements in propulsion systems, thermal protection, and multifunctional aerospace components. This paper deals the development, properties, and integration of these nanomaterials in aerospace applications. Key areas of focus include their use in aircraft and spacecraft structural components, advanced coatings for thermal and electromagnetic shielding, and reinforcement in composite materials to improve mechanical strength and fatigue resistance. Additionally, the paper explores the role of nanomaterials in next-generation propulsion technologies, such as fuel-efficient engines and hypersonic vehicles, where extreme environmental conditions demand innovative material solutions. Despite their potential, challenges such as large-scale manufacturing, material consistency, and integration into existing aerospace systems hinder widespread adoption. Addressing these issues requires advancements in synthesis techniques, cost-effective production methods, and rigorous testing to meet stringent aerospace standards. The paper also discusses emerging trends, including self-healing nanomaterials, smart sensors, and AI-assisted material design, which are poised to further expand the applications of nanotechnology in aerospace engineering.

**Keywords:** Nanomaterials; Aerospace engineering; High performance; Carbon nanotubes; Graphene; Nanocomposites

Paper ID: ICON-018

# Graphene-Based Materials for Energy-Efficient Electronics and Photonics

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**Abstract:** Graphene-based materials are emerging as revolutionary components in energy-efficient electronics and photonics due to their exceptional electrical conductivity, mechanical strength, and thermal stability. This study explores the potential of graphene and its derivatives in next-generation electronic and photonic devices, including transistors, sensors, and light-emitting diodes (LEDs). The unique properties of graphene, such as high electron mobility and broadband optical absorption, enable faster processing speeds, lower power consumption, and miniaturization of electronic systems. Additionally, the integration of graphene-based transparent conductive electrodes in optoelectronic devices enhances efficiency and durability compared to traditional materials like indium tin oxide (ITO). However, challenges in large-scale production, including defect control and uniformity in chemical vapor deposition (CVD) methods, limit widespread adoption. Recent advances in hybrid graphene composites and functionalized graphene derivatives offer promising solutions to overcome these limitations. This paper discusses the latest fabrication techniques, challenges in scalability, and innovative applications of graphene in electronic and photonic devices, highlighting its transformative role in sustainable and high-performance technology development.

**Keywords:** Graphene; Energy efficiency; Electronics; Photonics; Transistors; Sensors

Paper ID: ICON-019

# Biomimetic Materials for Sustainable and Eco-Friendly Engineering Solutions

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**Abstract:** Biomimetic materials, inspired by natural processes and structures, offer sustainable and eco-friendly solutions to modern engineering challenges. By mimicking natural properties such as self-cleaning surfaces, energy-efficient designs, and lightweight yet durable structures, these materials contribute to environmentally responsible engineering practices. This paper explores the development and application of biomimetic materials across various sectors, including construction, transportation, and energy. It highlights how biomimetic approaches enhance sustainability by reducing energy consumption, minimizing waste, and optimizing material efficiency. Challenges such as scalability, cost-effectiveness, and material longevity are also discussed, along with future research directions in biomimetic engineering.

**Keywords:** Biomimetic materials; Sustainable engineering; Eco-friendly; Natural structures; Energy efficiency; Environmental impact

Paper ID: ICON-020

## High – Temperature Superconductors for Enhanced Power Transmission and Energy Storage

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**Abstract:** High-temperature superconductors (HTS) have revolutionized power transmission and energy storage by eliminating electrical resistance, significantly improving efficiency. This study focuses on the advancements in HTS materials, particularly yttrium barium copper oxide (YBCO), and their applications in power grids, superconducting motors, transformers, and energy storage systems. The proposed method involves analyzing the critical current density, transition temperature, and flux pinning characteristics of YBCO under varying thermal and magnetic conditions. Experimental results indicate that YBCO maintains superconductivity up to 92 K, with a critical current density of 1.5 MA/cm<sup>2</sup> at 77 K under zero field conditions. Flux pinning enhancements using nano-inclusions improved the critical current density by 30 percent, increasing performance under applied magnetic fields. The findings demonstrate a 40 percent reduction in energy losses in superconducting cables compared to conventional copper conductors, along with a 25 percent increase in power transmission efficiency. Additionally, superconducting magnetic energy storage systems using YBCO exhibited a 15 percent higher energy density and 20 percent faster response times than conventional storage technologies. Despite these benefits, challenges such as high fabrication costs, complex cryogenic cooling requirements, and material brittleness hinder large-scale adoption. This study underscores the potential of HTS in modern energy systems and suggests future research directions, including cost-effective fabrication techniques and improved thermal stability, to facilitate widespread commercialization.

**Keywords:** High-temperature superconductors; Power transmission; Energy storage; Efficiency; YBCO; Electrical resistance

Paper ID: ICON-021

## Energy Harvesting Materials for Autonomous and IoT-Driven

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**Abstract:** Energy harvesting materials are crucial for powering autonomous systems and IoT devices by capturing ambient energy from their surroundings, such as vibration, light, and heat. This paper examines the development of advanced energy harvesting materials, including piezoelectric, thermoelectric, and photovoltaic materials, and their integration into IoT-driven systems. It explores the potential of these materials in enabling self-sustaining devices, reducing the need for batteries, and improving the efficiency of autonomous systems in applications ranging from wearables to remote sensors. Additionally, this review highlights the latest advancements, identifies existing research gaps, and discusses the challenges that must be addressed to achieve efficient and scalable energy harvesting for IoT applications. The paper also explores the role of hybrid energy harvesting technologies and AI-assisted power optimization in enhancing the viability of self-powered IoT networks.

**Keywords:** Energy harvesting; IoT; Autonomous systems; Piezoelectric; Thermoelectric; Self-sustaining devices  
Abstract

Paper ID: ICON-022

## Nano-Coatings and Surface Engineering for Corrosion Resistance in Harsh Environments

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**Abstract:** Corrosion usually takes place and degrades material surfaces based on environmental chemistry. There are several popular ways of decreasing corrosion rates to improve the lifetime of materials and devices. The application of nanotechnology in the corrosion protection of metals has recently gained momentum. As recently determined, some methods may incorporate nanostructured materials processing approaches. These include surface treatment methods, nanocomposite thin film coatings, top layer coatings and thermal barrier coatings. A polymer nano-coating can effectively combine the benefits of organic polymers, such as elasticity and water resistance, to that of advanced inorganic materials, such as hardness and permeability. Environmental impact can also be improved by utilizing nanostructure particulates in coatings and eliminating the requirement of toxic solvents. Nano-coatings have also proven to be effective alternative to chromate treatment of metallic substrate, which is hazardous due to the presence of toxic hexavalent chromium. This article provides a clear picture of patents on the technologies currently available with a special emphasis on nanocoatings and reports some of the preliminary investigations on the corrosion-resistance performance of nanocoatings and their applications.

**Keywords:** Nanotechnology, sol gel, coatings, thin films, corrosion protection, nanocoatings.

Paper ID: ICON-023

## 3d-Printed Metal Alloys for Advanced Manufacturing and Structural Applications

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**Abstract:** The use of 3D-printed metal alloys is revolutionizing advanced manufacturing and structural applications by enabling the production of complex geometries with high precision and minimal material waste. This paper explores the potential of metal additive manufacturing, highlighting key materials such as titanium, aluminum, and steel alloys, which are widely utilized in aerospace, automotive, and medical industries. The advantages of 3D-printed metal alloys, including enhanced design flexibility, significant weight reduction, and cost efficiency, are discussed in depth. However, challenges such as porosity, residual stresses, and microstructural inconsistencies remain key concerns affecting mechanical performance. The latest innovations, including hybrid manufacturing techniques, nanostructured metal printing, AI-driven process optimization, and sustainable production methods using recyclable materials, are examined as potential solutions to these challenges. Furthermore, advancements in laser powder bed fusion and electron beam melting are improving material integrity and scalability, facilitating broader industrial adoption. By addressing these challenges, 3D-printed metal alloys continue to push the boundaries of engineering applications, promising increased efficiency, sustainability, and customization in manufacturing. This review aims to provide a comprehensive analysis of the current state of 3D metal printing, its ongoing technological advancements, and its future impact on next-generation engineering solutions. Continued research and innovation in this field will play a crucial role in optimizing production processes and expanding the application scope of metal additive manufacturing.

**Keywords:** 3D printing; Metal alloys; Advanced manufacturing; Structural applications; Aerospace; Precision

Paper ID: ICON-024

## Performance Evaluation of Fly Ash-Based SIFCON Reinforced with Hooked-End Steel Fibers for Sustainable High-Strength Applications

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**Abstract:** Slurry Infiltrated Fibrous Concrete (SIFCON) is an advanced cementitious composite known for its superior ductility, impact resistance, and high strength. The influence of fiber content, fly ash replacement ratio, and matrix composition are analyzed. The unique material finds application in construction projects where endurance under adverse circumstances and magnificent mechanical qualities are essential. Because of its exceptional durability and resilience to impact and fatigue, this study investigates the flexural performance of fly ash-based SIFCON with hooked-end steel fibers in varying percentages (1%, 3%, 5%, 7%, & 9%). By using fly ash in place of some of the cement and adapting the fiber composition for better structural performance, the research seeks to improve sustainability. Simply supported beams are subjected to three-point bending tests to evaluate parameters such as load-carrying capacity, deflection characteristics, crack propagation, and energy absorption. The results indicate that increasing steel fiber content enhances flexural strength and toughness, with the optimum performance observed at 8% fiber volume. However, beyond this percentage, workability issues and fiber clustering negatively impact uniform stress distribution. The study concludes that fly ash-based SIFCON with optimized fiber reinforcement is a promising solution for sustainable and high-strength structural applications, particularly in flexural members

**Keywords:** Compression Strength Test & Split Tensile Strength Test.

Paper ID: ICON-028

## Wearable Health Monitoring Devices: Engineering Solutions for Real-Time Patient Care

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**Abstract:** Wearable health monitoring devices are transforming patient care by enabling real-time physiological data collection and analysis, improving chronic disease management, early disease detection, and personalized health interventions. These devices integrate advanced biosensors, wireless communication technologies, and artificial intelligence (AI) to track critical health parameters such as heart rate, blood pressure, glucose levels, and oxygen saturation. Research findings indicate that AI-assisted wearable monitoring can improve early disease detection rates by 87% and reduce hospital readmissions by 30%. Studies on continuous glucose monitoring (CGM) systems reveal a 40% reduction in severe hypoglycemic episodes among diabetic patients, while AI-powered arrhythmia detection in smartwatches achieves an accuracy of 98.3%. Additionally, remote patient monitoring using wearable IoT devices has been shown to lower emergency hospital visits by 25% and enhance medication adherence by 60%. Despite these advancements, challenges remain in data security, sensor accuracy, and regulatory compliance. This paper explores the engineering solutions driving wearable health monitoring devices, focusing on sensor integration, power management, data transmission, and AI-enhanced diagnostics. The findings underscore the transformative potential of wearable health technology in improving patient outcomes and optimizing healthcare resource utilization.

Paper ID: ICON-029

# AI-Powered Diagnostics: Transforming Healthcare through Intelligent Engineering Systems

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**Abstract:** Artificial Intelligence (AI)-powered diagnostic systems are revolutionizing healthcare by enhancing accuracy, efficiency, and accessibility. This study explores AI-driven medical imaging, predictive analytics, and real-time decision support, demonstrating significant advancements across radiology, pathology, and cardiology. A convolutional neural network (CNN)-based diagnostic system achieved 96.5% accuracy in detecting lung abnormalities, surpassing radiologists' 87.2% accuracy, while an AI-driven predictive analytics model for diabetes, trained on 100,000 patients, attained 94.8% precision and 92.3% recall, enabling early intervention. Additionally, AI-enhanced ECG analysis for arrhythmia classification achieved an F1-score of 97.1%, significantly reducing false positives. AI-powered diagnostics can lower diagnostic errors by 30-40%, improve efficiency by reducing diagnosis time by up to 50%, and enhance patient outcomes through intelligent decision-making. Despite challenges in data privacy and regulatory compliance, AI's potential to transform diagnostics through explainable AI, federated learning, and multi-modal data fusion is paving the way for more accurate, efficient, and personalized healthcare solutions.

**Keywords:** AI diagnostics; Machine learning; Deep learning; Healthcare systems; Medical imaging; Personalized treatment

Paper ID: ICON-031

# CFD Simulation for Evaluating Crosswind Stability of SUVs

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**Abstract:** The aerodynamic stability of Sport Utility Vehicles (SUVs) under crosswind conditions is critical for ensuring passenger safety and enhancing vehicle performance. This study employs Computational Fluid Dynamics (CFD) simulations to evaluate the impact of crosswinds on the aerodynamic stability of SUVs. A detailed SUV model was analyzed under various wind angles and speeds using a Reynolds-averaged Navier-Stokes (RANS) approach with turbulence modeling. The study focuses on understanding the aerodynamic forces and moments generated by crosswinds, including side force, lift force, and yawing moment. Simulations were conducted using both steady-state and transient approaches to capture the dynamic effects of wind gusts. The impact of vehicle geometry, such as roof height, side mirrors, and rear design, was systematically investigated to identify critical areas contributing to aerodynamic instability. Results revealed that sharp edges and large vertical surfaces significantly increase aerodynamic forces, compromising crosswind stability. Strategies for improving stability, such as modifying roof designs, introducing aerodynamic spoilers, and optimizing underbody flow, were proposed and validated. Key findings indicate that streamlined modifications can reduce yawing moments by up to 15%, improving the vehicle's response to crosswind conditions. This research provides a comprehensive framework for the aerodynamic analysis of SUVs under crosswind scenarios, offering insights into design improvements for better stability and safety. Future work will include experimental validation of simulation results and extending the study to dynamic driving conditions such as cornering and overtaking under crosswind influence.

Paper ID: ICON-032

# Application of Friction Stir Welding in Automotive Manufacturing: Challenges, Solutions and Future Prospects

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**Abstract:** Friction Stir Welding (FSW) has gained significant attention in the automotive manufacturing industry due to its ability to join lightweight materials such as aluminum alloys with superior mechanical properties and minimal distortion. This research investigates the application of FSW in automotive manufacturing, focusing on the challenges associated with its implementation and the potential solutions to optimize its use in mass production. Key challenges include tool wear, heat generation, material compatibility, and process control, which can affect the quality and efficiency of welded joints. Through experimental and numerical studies, this research aims to identify the critical factors influencing the FSW process in automotive applications, including material selection, joint design, and welding parameters. Potential solutions to these challenges, such as advanced tool design, optimized process parameters, and hybrid welding techniques (e.g., combining FSW with laser or arc welding), are explored to enhance weld quality and reduce manufacturing costs. The study also highlights the advantages of FSW in producing lightweight and high-strength automotive components, contributing to the industry's goal of producing fuel-efficient and environmentally sustainable vehicles. Future prospects for the widespread adoption of FSW in automotive manufacturing, including its integration with automated and flexible manufacturing systems, are discussed. This research provides insights into overcoming the technical challenges of FSW and highlights its potential for revolutionizing automotive manufacturing processes.

**Keywords:** Friction Stir Welding, Automotive Manufacturing, Lightweight Materials, Process Optimization, Hybrid Welding Techniques.

Paper ID: ICON-034

# Aerodynamic Analysis of Blended Wing Body (BWB) Aircraft for Fuel Efficiency and Performance Enhancement

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**Abstract:** Narrow-body airliners are known for their high fuel consumption and significant drag forces, which adversely affect their overall performance. To address these challenges, a new concept known as the Blended Wing Body (BWB) has been introduced. The BWB design reduces wetted area and form drag, particularly at the wing-body junction. In addition, the super critical airfoil, primarily developed to delay wave drag in the transonic speed range, is incorporated into the design. Specifically, the NASA SC(2)-0714 airfoil is chosen for this study, and a new 3-D BWB model is created using SolidWorks 2017. Computational Fluid Dynamics (CFD) analysis is performed on the model at an inlet freestream velocity of 250 m/s, with angles of attack (AOA) ranging from 0° to 35° using STAR CCM+13, R8 software. The  $k-\omega$  SST turbulence model is employed for the analysis, and various aerodynamic properties such as lift, drag, lift coefficient, drag coefficient, and moments are calculated for each AOA. The results show that the lift-to-drag ratio, a key performance metric, is maximized at 0° AOA, with a value of 15.116. Additionally, the critical AOA, beyond which the aircraft may stall, is found to be 25°, higher than that of conventional narrow-body airliners. The study demonstrates the improved performance and aerodynamic properties of the new BWB model.

**Keywords:** Blended Wing Body (BWB), aerodynamic analysis, CFD, lift-to-drag ratio, supercritical airfoil, angle of attack

Paper ID: ICON-036

## AI-Based Threat Detection for Better Cybersecurity

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**Abstract:** Cybersecurity threats are growing rapidly with the advancement of digital technologies. Traditional security methods often fail to detect and respond to evolving cyber threats in real time. Artificial intelligence (AI) has emerged as a powerful tool to enhance cybersecurity by automating threat detection and response. Machine learning (ML) and deep learning (DL) algorithms can analyze large datasets, identify unusual patterns, and predict cyberattacks with high accuracy. Studies show that ML-based models achieve 92-99% accuracy in detecting malware and phishing attacks, while deep learning techniques improve intrusion detection accuracy to 97.5%. AI-driven security systems can detect and mitigate threats in less than 2 milliseconds, significantly reducing response time compared to traditional methods. Additionally, AI enhances real-time monitoring and strengthens security frameworks by adapting to new attack strategies while reducing false positive rates to less than 5%, compared to 20-30% in rule-based security systems. This paper explores the role of AI in modern cybersecurity, focusing on threat detection, risk mitigation, and response mechanisms. By integrating AI into cybersecurity, organizations can build more resilient and adaptive defense systems against emerging cyber threats, ensuring better protection for individuals and businesses in the digital age.

**Keywords:** Cybersecurity; Artificial Intelligence; Threat Detection; Machine Learning; Deep Learning

Paper ID: ICON-037

## Enhancing Machining Efficiency of 13-8 Mo Stainless Steel through Optimization of Cutting Parameters

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**Abstract:** Machining various materials using conventional water-soluble cutting oils presents challenges due to poor machinability characteristics. Several technologies have been developed to address this issue, with minimum quantity lubrication (MQL) being the most widely adopted due to its advantages over conventional cooling methods. This study focuses on the benefits of MQL compared to conventional cooling. The process parameters for machining 13-8 Mo Stainless Steel were analyzed, revealing that MQL provided superior machining performance. Additionally, Grey Relational Analysis (GRA) was employed to determine the optimal solution, confirming that MQL offers a more effective machining environment for 13-8 Mo Stainless Steel.

**Keywords:** Minimum quantity lubrication (MQL), conventional water soluble cutting oils, machining, 13-8 Mo Stainless Steel.

Paper ID: ICON-038

# Development of Interactive Educational Software for Refrigeration Systems to Enhance Virtual Thermodynamics Learning

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**Abstract:** Educational tools play a crucial role in the teaching process by facilitating faster calculations and enhancing the comprehension of complex concepts. The virtual laboratory introduced in this study aims to support the education of mechanical engineering students in thermal sciences. Given that mechanical engineers are often tasked with the operation, selection, and design of thermal machines and systems that involve various types of fluids and energy processes, this area of study is particularly important. This paper outlines the development and methodology of RefriTerm, a computational tool created within the Matlab environment, designed to perform energy analysis of refrigeration systems. To ensure the accuracy and reliability of the results, thorough validation and verification tests were conducted. The findings reveal that RefriTerm offers an intuitive interface that is both easy to use and understand. This tool enhances students' understanding of refrigeration systems, thereby contributing to more effective teaching and learning in this critical area.

**Keywords:** Educational tool, refrigeration, Matlab, software, learning.

Paper ID: ICON-040

# Bio-Inspired Robotics: Harnessing Nature's Solutions for Advanced Technological Systems

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**Abstract:** Bio-inspired robotics, also referred to as biomimicry, harnesses principles from nature to develop advanced robotic systems that surpass traditional designs in agility, efficiency, and adaptability. By emulating the movement, structure, and behavior of living organisms, these robots achieve superior functionality in diverse applications. This paper explores the fundamental principles of bio-inspired robotics, including biomechanics, sensory integration, and adaptive learning. It further examines key applications in medicine, such as robotic prosthetics and surgical assistants, in agriculture for precision farming and automated pest control, and in search-and-rescue missions where autonomous navigation and terrain adaptability are critical. Despite these advancements, significant challenges remain, particularly in material selection, energy efficiency, and the complexity of replicating biological intelligence in artificial systems. Addressing these challenges through interdisciplinary research will be crucial in unlocking the full potential of bio-inspired robotics.

**Keywords:** Bio-inspired robotics; Biomimicry; Nature; Advanced technology; Robotics; Agility

Paper ID: ICON-042

# Smart Cities: Leveraging IoT and AI for Sustainable Urban Growth

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**Abstract:** *The Internet of Things (IoT) is rapidly transforming various domains, including industrial automation, healthcare, commercial enterprises, household applications, and intelligent devices. Its convergence with image processing technologies is expanding, leading to innovative solutions for enhanced safety and efficiency. The growing complexity of IoT-driven systems and smart sensors enables advanced human interaction, facilitating improved security measures. In this study, we focus on recognizing individuals through image-based identification techniques and analyzing their behavioral patterns using computational intelligence. As this field presents significant challenges, developers must implement automated or semi-automated frameworks that minimize direct user interaction while ensuring accuracy and reliability. Our research explores diverse strategies to optimize these processes by integrating IoT-enabled devices with intelligent image processing methodologies for superior outcomes.*

**Keywords:** *IoT; Face Recognition; Smart Home; Image Processing; Security*

Paper ID: ICON-043

# Advanced Machine Vision for Quality Control in Industrial Automation: A Deep Learning Approach

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**Abstract:** *Deep learning-powered machine vision systems are redefining quality control in industrial automation. This research focuses on defect detection in manufacturing processes, achieving a 98% accuracy rate and reducing inspection times by 70%. By employing convolutional neural networks (CNNs) and real-time imaging, machine vision systems identified subtle defects that traditional methods often overlooked. The study also analyzed the impact of automation on reducing operational costs, noting a 20% cost reduction. These systems' scalability and flexibility make them suitable for diverse industrial applications, from electronics to automotive manufacturing. The findings underscore the transformative potential of machine vision in enhancing production quality and efficiency, supporting the evolution of smart factories.*

**Keywords:** *Machine vision; Quality control; Industrial automation; Deep learning; Computer vision*

Paper ID: ICON-046

## Predictive Maintenance Framework for Smart Urban Infrastructure

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**Abstract:** An AI-powered predictive maintenance framework is essential for sustaining smart urban infrastructure. This study details a machine learning-based framework for detecting and mitigating system failures in urban utilities. By analyzing large-scale data from IoT sensors, the framework identifies patterns that signal potential issues, enabling preemptive actions. Results indicate a 40% reduction in maintenance costs and a 60% improvement in system uptime, attributed to early failure detection and optimized resource allocation. The framework also proved effective in diverse urban contexts, from transportation networks to water distribution systems. By enhancing the reliability of critical infrastructure, this approach supports sustainable urban development and improved quality of life. The study highlights the potential of predictive maintenance frameworks to transform urban infrastructure management and foster resilient cities.

**Keywords:** Predictive Maintenance, Smart Urban Infrastructure, AI Framework, IoT Sensors, System Uptime, Resource Optimization

Paper ID: ICON-047

## Advancements in Remote Sensing Smart Cities for Sustainable Urban Development

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**Abstract:** The rapid urbanization of the global population has necessitated the development of smart cities that leverage advanced technologies to address challenges related to sustainability, resource management, and quality of life. Artificial Intelligence (AI) has emerged as a pivotal technology driving innovations in smart city development, enabling the optimization of urban systems through data-driven decision-making, automation, and predictive analytics. This paper explores the advancements in AI-driven solutions for sustainable urban development, focusing on how AI applications in transportation, energy management, waste management, and environmental monitoring can significantly enhance the efficiency and sustainability of urban infrastructures. AI technologies such as machine learning, deep learning, and neural networks are increasingly being integrated into urban systems to facilitate intelligent traffic management, improve energy consumption, and monitor air quality in real-time. Additionally, AI-driven predictive models are being utilized for demand forecasting, smart grid management, and optimizing the allocation of resources, thereby reducing environmental impact and promoting sustainable living. Furthermore, the paper investigates the role of AI in citizen engagement, including the use of smart sensors and IoT devices for gathering data that contributes to informed policy-making and urban planning. Through case studies and examples of AI implementations in leading smart cities, this paper highlights the challenges, opportunities, and future directions for AI-driven urban development. The integration of AI into city infrastructure has the potential to transform urban environments, making them more resilient, adaptive, and capable of meeting the demands of a growing global population while promoting sustainability.

**Keywords:** AI-driven solutions; Smart cities; Sustainable urban development; Machine learning; Resource management; Predictive analytic

Paper ID: ICON-048

## Pioneering Applications of MXENES and Two-Dimensional Materials in Electronics and Photonics

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**Abstract:** MXenes, a family of two-dimensional (2D) transition metal carbides and nitrides, are at the forefront of research due to their unique properties such as metallic conductivity, hydrophilic surfaces, and tunable optical characteristics. This study explores their integration into cutting-edge electronic devices, including transparent electrodes, supercapacitors, and photonic sensors. Advanced synthesis techniques, such as chemical vapor deposition (CVD) and wet chemical etching, are discussed for large-scale production. The role of surface terminations (e.g., -OH, -F, and -O groups) in modifying electronic and thermal properties is highlighted. Challenges such as oxidation stability and interfacial engineering are addressed, with potential solutions including hybrid material systems and encapsulation techniques. Future research directions emphasize their role in flexible electronics, wearable technology, and energy-efficient devices, establishing MXenes as indispensable materials for next-generation applications.

**Keywords:** MXenes, Transition Metal Carbides, Transparent Electronics, Photonic Sensors, Hybrid Materials

Paper ID: ICON-049

## Harvesting Systems for IoT – Enabled Sustainable Applications

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**Abstract:** Energy harvesting systems are essential for powering IoT devices in sustainable applications, especially in remote or off-grid environments. By capturing energy from environmental sources such as solar, vibrations, temperature gradients, or radiofrequency, these systems provide a continuous power supply to low-power IoT sensors and devices without the need for batteries. This paper explores the various energy harvesting technologies, including piezoelectric, thermoelectric, and photovoltaic systems, highlighting their integration into IoT networks for efficient, self-sustaining applications in areas such as environmental monitoring, smart cities, and industrial automation.

**Keywords:** Energy harvesting; IoT; Sustainable applications; Power supply; Environmental sources; Low-power devices

Paper ID: ICON-052

## Next-Generation Ceramics for Aerospace: UltraHigh-Temperature and Lightweight Material Exploration

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**Abstract** - This research meant studying the aesthetics of multiple pieces in contemporary Iraqi ceramics, how the artist was able to transform them into tools and tools that have aesthetic and expressive value, and how he presented its surfaces, shapes and display space, and the researcher divided the research into four chapters, in the first chapter presented the research problem And he came to the question: What are the aesthetics of multiple pieces in contemporary Iraqi ceramics? The researcher defined the goal of the research, which is: Learn about the aesthetics of multiple pieces in contemporary Iraqi ceramics. The second chapter, which consists of two topics, is as follows: In the first topic: Constructing the technical composition from modernity to post-modernity. In the second topic: Displaying the aesthetic values in contemporary Iraqi ceramics. As for the third chapter, the researcher analyzed the works of some Iraqi potters according to the descriptive and analytical method.

Paper ID: ICON-053

## Autonomous Robotics in Smart Agriculture through IoT and Deep Learning

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**Abstract:** The integration of autonomous robotics, Internet of Things (IoT), and deep learning is revolutionizing smart agriculture by enhancing productivity, efficiency, and sustainability in farming practices. Autonomous robots equipped with IoT sensors and deep learning algorithms are capable of performing various agricultural tasks such as planting, monitoring crop health, pest control, and harvesting with minimal human intervention. IoT devices enable real-time data collection from the environment, including soil moisture, temperature, and crop conditions, which is essential for making data-driven decisions. Deep learning algorithms are used to process and analyze this data, identifying patterns and anomalies to optimize farming practices, predict crop yields, and detect early signs of diseases or pests. Autonomous robots, guided by these insights, can perform tasks like precision irrigation, targeted pesticide application, and autonomous harvesting, which reduces resource waste and minimizes environmental impact. This paper explores the role of IoT and deep learning in the development of autonomous robotic systems for smart agriculture, focusing on their ability to improve efficiency, reduce labor costs, and promote sustainable farming practices. The potential for autonomous robotics in agriculture to transform the industry and ensure food security in the face of growing global demand is also discussed.

**Keywords:** Autonomous robotics; Smart agriculture; IoT sensors; Deep learning; Precision farming; Sustainable agriculture

Paper ID: ICON-054

## Composite Materials for Lightweight, High-Strength Structures in Automotive Design

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**Abstract:** Composite materials, known for their lightweight and high-strength properties, are increasingly being used in automotive design to enhance fuel efficiency, performance, and safety. This paper explores the role of composites, including carbon fiber reinforced polymers (CFRP) and glass fiber reinforced polymers (GFRP), in the automotive industry. Studies have shown that incorporating CFRP can reduce vehicle weight by up to 50%, leading to a 6-8% improvement in fuel efficiency. GFRP, while not as strong as CFRP, offers cost-effective alternatives with improved durability and corrosion resistance. The research highlights how composite materials contribute to crashworthiness, as CFRP structures can absorb up to 40% more impact energy compared to traditional steel counterparts, enhancing occupant safety. This study also addresses key challenges associated with the adoption of composites in mass production, including high material costs, complex manufacturing processes, and difficulties in recyclability. Advanced manufacturing techniques such as resin transfer molding (RTM) and automated fiber placement (AFP) have shown promise in reducing production costs and increasing scalability. Furthermore, hybrid composite solutions, incorporating multiple fiber types, have demonstrated potential in optimizing performance and cost-efficiency. Researchers continue to explore sustainable bio-composites and nanocomposites as alternatives to traditional carbon-based fibers. The findings suggest that with continued advancements in cost-effective production methods, recycling technologies, and material hybridization, composite materials can revolutionize the automotive industry by providing lightweight, durable, and sustainable solutions for next-generation vehicle designs. This paper provides a comprehensive analysis of the role of composite materials, examining their benefits, challenges, and future prospects in the evolving landscape of automotive manufacturing.

**Keywords:** Composite materials; Automotive design; Lightweight structures; High strength; CFRP; GFRP

Paper ID: ICON-055

## Biomedical Engineering Innovations in Drug Delivery Systems for Targeted Therapies

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**Abstract:** Biomedical engineering has revolutionized drug delivery systems, enabling targeted therapies that enhance efficacy and minimize adverse effects. This review explores recent advancements in drug delivery technologies, including nanocarriers, smart polymers, hydrogels, and bioengineered cell-based approaches. The integration of artificial intelligence and computational modeling further enhances the precision and efficiency of these systems. The paper highlights current challenges, research gaps, and future perspectives in the field of targeted drug delivery. Despite the numerous innovations, challenges such as scalability, regulatory approval, and biocompatibility remain significant hurdles. Addressing these limitations through interdisciplinary research will be crucial for the widespread adoption of targeted drug delivery techniques.

**Keywords:** Drug delivery systems; Targeted therapies; Nanomedicine; Controlled release; Biomedical engineering; Therapeutic outcomes

Paper ID: ICON-056

## Next-Generation Medical Imaging, Engineering Solutions for Early Detection and Diagnosis of Diseases

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**Abstract-** In recent days around the world people are affected by many different kinds of diseases and identifying these diseases at an early stage and treat them in a proper way is important to save the lives. Traditional methods for identifying these diseases and treat them will be a very long process and took huge amount of time. This leads to increase the loss of reasonable number of lives around the world. To address this issue and diagnosis of diseases at an early stage trying to introduce an Engineering solutions. Next-generation medical imaging technologies, such as high-resolution MRI, PET scans, and 3D ultrasound, are revolutionizing early detection and diagnosis of diseases. These technologies offer enhanced sensitivity, accuracy, and resolution, enabling earlier intervention and better patient outcomes. This paper explores the engineering solutions behind these imaging advancements, focusing on signal processing, machine learning integration, and the development of new contrast agents. It also discusses the potential of these technologies to improve diagnostic capabilities across a wide range of medical conditions, from cancer to neurological disorders.

**Keywords-** Medical imaging; Early detection of disease; Signal processing; MRI; PET; Machine learning; Diagnostic technologies; Early disease diagnosis; Signal processing; cancer; neurological disorders.

Paper ID: ICON-058

## Exploring the Deep Learning Model Applications in Image Processing Technologies and Advancement

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**Abstract:** Image processing involves transforming images to improve visual data for human interpretation or machine analysis. In digital systems, images are represented as pixel arrays and processed using computational methods. Its applications span two key areas: enhancing visual quality for human observation and enabling machine perception for tasks like object detection and autonomous navigation. Recent breakthroughs in deep learning, particularly Convolutional Neural Networks (CNNs) and Generative Adversarial Networks (GANs), have reshaped the field. Advanced techniques such as super-resolution (e.g., SRCNN), image inpainting (e.g., U-Net with CSA layers), and segmentation (e.g., PNet) highlight the potential of AI-driven solutions in domains like medical imaging and self-driving cars. Future advancements may focus on semi-supervised learning to reduce reliance on labeled data, fostering more adaptable and scalable approaches.

**Keyword:** Image processing, Pixel, CNN, GAN, Edge detection, Super-resolution.

Paper ID: ICON-059

## Renewable Energy Solutions for Green Building Development in Urban Areas

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**Abstract:** Urbanization has led to an unprecedented rise in energy demand, necessitating sustainable and efficient energy solutions. The proposed Hybrid Urban Renewable Energy System (HURES) integrates solar, wind, and geothermal energy with AI-driven smart energy management to optimize energy generation and utilization in urban green buildings. This study evaluates the feasibility, performance, and benefits of HURES, highlighting its potential to enhance energy efficiency, reduce carbon emissions, and improve economic viability. The results demonstrate that HURES achieves up to a 45% increase in overall efficiency compared to standalone renewable systems while reducing carbon emissions by 60%. AI-driven load balancing and predictive maintenance further enhance reliability and cost-effectiveness, cutting down the payback period by 30%. By addressing the limitations of individual renewable sources, HURES presents a scalable and adaptable framework for urban energy sustainability. The findings underscore the need for hybrid solutions in meeting global decarbonization goals while ensuring energy security in urban environments. Future research and pilot implementations are essential to refine system adaptability across diverse urban landscapes. This study contributes to the advancement of integrated renewable energy solutions, paving the way for smarter and more resilient urban energy systems.

**Keywords:** Renewable energy; Green buildings; Urban development; Solar energy; Sustainability; Clean energy

Paper ID: ICON-060

## Advancements in self-Healing Polymers and Composites for Durable Material Development

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**Abstract:** Self-cleaning coating in nano-technology is getting pace in the globalization because now customer wants the products which are sustainable and less hazardous or time taking. The water droplets can work to collect dirt and residue just by rolling over the fabric surface. The objective of the study is to develop self-cleaning property in textile materials such as 100% cotton fabric is chosen to investigate the effect of self-cleaning finish. The grey cotton fabric is treated with fluorinated water repellent finish, after application of finish fabric is dried in stenter frame at 100°C for 2 mins, and then spray test method is applied to check the water repellent finish. After the analysis of results, it is concluded that a simple cotton fabric can have self-cleaning properties.

**Keywords:** Gossypium, Self-Cleaning, Nanotechnology, Water repellent

Paper ID: ICON-061

## Advancements and Applications of Unmanned Aerial Vehicles (UAVs) in Defense Sectors

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**Abstract:** Unmanned Aerial Vehicles (UAVs), commonly referred to as drones, are aircraft that operate without an onboard human pilot. This paper explores the evolution of UAV technology from conventional aircraft to Unmanned Aircraft Systems (UAS), examining their classification, deployment, market structure, regulatory frameworks, and applications in defence and civil sectors. The development of advanced UAV technologies focuses on enhancing intelligent capabilities and facilitating seamless interaction between human operators and robotic platforms. These advancements provide significant opportunities for improved operational efficiency, offering a safer and more effective alternative to human soldiers in hazardous war zones. UAVs have become invaluable in scenarios where human involvement poses risks, including reconnaissance, disaster management, and surveillance operations. By leveraging cutting-edge innovations, UAVs are transforming various industries and military operations, ensuring precision, reliability, and adaptability in challenging environments. This paper highlights the potential of UAVs as a disruptive technology, reshaping traditional approaches in both defence and civilian applications.

Paper ID: ICON-062

## A Review on the Materials, Processing and Performance Study of Asbestos Free Brake Liners

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**Abstract:** The gradual removal of asbestos from vehicle brake pad materials has spurred a great deal of research and development into safer substitutes. Furthermore, when compared to asbestos, brake pads made of bio-fillers have demonstrated superior performance. The various compositions of brake pad materials and production processes are discussed in this paper. The effects of common binders, such as epoxy resin and brake pads made of phenolic resin, on mechanical, tribological, and thermal performance were rigorously examined. Thus, in the last ten years, a variety of brake shoes and pads have emerged in the brake friction market, each with a distinct composition that does the same function and makes the claim that it is superior to others. When compared to traditional brake pads it has been found that using natural fibers as reinforcement offers superior braking performance. New paths to "Net Zero" will be made possible by this research.

**Keywords:** Brake pad, Composite material, Comprehensive strength, Eco-friendly material, Hardness, Natural fibre, Thermal conductivity, Water absorptivity

Paper ID: ICON-063

## High-Energy Superconductors for Energy Storage

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**Abstract:** High-energy superconductors are emerging as a promising solution for energy storage systems, offering significant advantages over traditional storage methods. Superconductors, materials that exhibit zero electrical resistance when cooled below a critical temperature, are gaining attention for their ability to store and transfer large amounts of energy with minimal loss. The integration of high-energy superconductors into energy storage technologies could revolutionize applications ranging from power grids to electric vehicles and renewable energy systems. One of the most promising applications of high-energy superconductors is in the development of superconducting magnetic energy storage (SMES) systems. These systems utilize powerful magnetic fields created by superconducting coils to store energy efficiently. Due to the lack of electrical resistance, SMES systems can discharge energy almost instantly, making them ideal for providing grid stability and load balancing. Furthermore, they can help integrate intermittent renewable energy sources such as wind and solar into the power grid by storing excess energy during peak production times and releasing it when demand increases or generation drops. Challenges in implementing high-energy superconductors include the need for cryogenic cooling systems, which are costly and complex. Advances in high-temperature superconductors (HTS), which operate at higher temperatures, are helping to mitigate this issue, but more research is still needed to improve their efficiency, scalability, and cost-effectiveness. The potential of high-energy superconductors in energy storage offers a pathway toward more efficient, sustainable, and reliable energy systems, contributing to the advancement of clean energy solutions and the global effort to combat climate change.

**Keywords:** High-temperature superconductors; Power transmission; Energy storage; Efficiency; YBCO; Electrical resistance

Paper ID: ICON-067

## Compressive Behavior of SIFCON with Dolomite Cement Replacement and Dual Fibers

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**Abstract:** SIFCON (Slurry Infiltrated Fibrous Concrete) is an advanced cement-based composite known for its superior mechanical performance. This study explores the use of dolomite powder (DP) as a partial replacement for mortar to enhance the strength and durability of materials under harsh conditions. The research primarily examines the physical properties and binding efficiency of calcined dolomite powder. Two types of steel fibers were utilized: the first was a hooked-end steel fiber measuring 50 mm in length and 1.0 mm in diameter, with an aspect ratio (L/d) of 100. The second type consisted of waste tire steel wire scrap (WTSWS), sourced from rubber industries and processed to eliminate impurities. The study investigates various cement replacement ratios to evaluate performance, sustainability, and longevity in demanding environments. The mix design included dolomite (0%, 10%, 15%, 20% & 25%), hooked-end steel fibers (0%, 2%, 4%, 6%, 8%), and WTSWS as a partial substitute for hooked-end fibers (2%, 4%, 6%, 8%). The primary goal of this research is to assess the viability of incorporating recycled tire steel fibers in SIFCON. Scanning Electron Microscopy (SEM) was used to examine the morphological characteristics of the dolomite powder, allowing for thorough observations of surface texture, particle structure, and micro-level abnormalities. The structural alterations caused by calcination were evaluated with particular care. The study also looked at the calcined dolomite's physical properties, such as fineness, particle packing, and retention capacity, all of which have an impact on the rheological and mechanical performance of cementitious mixtures. Mechanical strength tests, including compression tests, were conducted to evaluate performance. By optimizing the composite's mechanical properties while prioritizing sustainability and cost-efficiency, this study represents a significant move toward utilizing entirely waste-based materials in SIFCON production.

Paper ID: ICON-068

# Investigation of Hydrogen Storage Mechanisms in Metal Hydrides and Porous Carbonaceous Materials for Energy Systems

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**Abstract** - Hydrogen storage is a critical component in advancing clean energy systems, addressing the challenges of low volumetric density and high pressure requirements. This research focuses on investigating metal hydrides and porous carbonaceous materials as potential hydrogen storage media. Metal hydrides such as magnesium hydride and complex hydrides are synthesized and modified to enhance hydrogen absorption/desorption kinetics through doping and nanosizing. Porous carbon materials, including activated carbons and graphene derivatives, are developed with tailored pore structures to maximize adsorption capacity. Advanced characterization techniques, such as pressure-composition isotherms and thermogravimetric analysis, are utilized to evaluate storage performance. Computational modeling aids in understanding hydrogen-metal interactions and adsorption phenomena. Results reveal that hybrid systems combining metal hydrides with carbon frameworks exhibit synergistic effects, achieving improved storage efficiency under moderate conditions. This study offers insights into optimizing materials for hydrogen economy applications.

**Keywords** - Hydrogen Storage, Metal Hydrides, Porous Carbon, Energy Systems, Kinetics, Adsorption

Paper ID: ICON-069

# Numerical Analysis of Unsteady MHD Heat and Mass Transfer Flow through a Porous Medium with Time-Dependent Permeability

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**Abstract:** This research paper aims to investigate the unsteady hydromagnetic heat and mass transfer (MHD) flow of an electrically conductive, incompressible viscous fluid past an infinite vertical porous plate, embedded in a porous medium with time-dependent permeability. The study considers the effect of a uniform magnetic field acting perpendicular to the flow and accounts for temporal fluctuations in the permeability of the porous medium. The problem is solved numerically using the finite element method, analyzing velocity, temperature, and concentration fields. Additionally, the expressions for skin friction, the Nusselt number, and the Sherwood number are presented in tabular form for clarity.

**Keywords:** Unsteady MHD flow, Porous medium, Time-dependent permeability, Heat and mass transfer, Finite element method, Oscillatory suction velocity

Paper ID: ICON-072

## Advancements and Applications of Sandwich Composite Structures in Modern Industries: A Review

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**Abstract:** Sandwich composites, consisting of two strong outer layers and a lightweight core, offer an exceptional combination of high strength-to-weight ratio, thermal insulation, and energy absorption. These materials are increasingly used in aerospace, automotive, construction, marine, and defense industries, where their lightweight yet durable nature contributes to improved performance, fuel efficiency, and sustainability. In aerospace, they enhance fuel efficiency and payload capacity with reduced weight, while in construction, they enhance energy efficiency with insulated panels, and in marine, they withstand harsh environments. Different sandwich structures, like honeycomb cores, are used in aerospace for their strength-to-weight ratio, foam cores in automotive applications for crash energy absorption, and balsa wood or PVC foam cores in marine environments for water resistance. Sandwich composites are also expanding in the medical, electronics, and sports industries. Their lightweight and biocompatible properties benefit medical devices, while in electronics, they reduce weight without sacrificing protection. In sports, they provide energy-absorbing properties for equipment. Future advancements in core materials and outer skins, supporting emerging fields such as renewable energy, electric vehicles, and space exploration. This review highlights the necessity and wide-ranging applications of sandwich composites, emphasizing their growing role in current and future technological innovations.

**Keywords:** Sandwich Composites, Sandwich structures, strength-to-weight ratio, lightweight, Modern applications

Paper ID: ICON-073

## Sustainable Waste Management Systems Powered by IoT and AI in Smart Cities

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**Abstract:** Sustainable waste management remains a critical challenge in urban areas, necessitating innovative technological interventions to enhance efficiency and environmental sustainability. The integration of the Internet of Things (IoT) and Artificial Intelligence (AI) has transformed traditional waste management systems by enabling real-time monitoring, predictive analytics, and intelligent decision-making. IoT-enabled sensors provide continuous data on waste levels, facilitating dynamic scheduling and route optimization for waste collection. AI-driven algorithms process this data to minimize fuel consumption, reduce operational costs, and improve resource allocation. Additionally, advanced machine learning models enhance recycling strategies by automating waste segregation and improving waste diversion rates. This study explores the impact of IoT and AI technologies in revolutionizing waste management systems, with a focus on their sustainability benefits, cost-effectiveness, and contribution to reducing urban pollution. Experimental evaluations and case studies demonstrate that AI-optimized waste collection strategies can reduce fuel consumption by up to 30% and increase recycling efficiency by 40%, underscoring the potential of smart waste management in achieving sustainable urban development.

**Keywords:** Sustainable waste management, IoT, AI, Smart cities, Recycling; Efficiency.

Paper ID: ICON-074

## Waste Heat Recovery Technologies for Sustainable Industrial Energy Utilization

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**Abstract:** Waste heat recovery (WHR) technologies play a pivotal role in enhancing energy efficiency and promoting sustainability across various industrial sectors. Industrial processes, including manufacturing, power generation, and chemical production, generate significant amounts of waste heat that, if left unutilized, contribute to energy inefficiencies and increased greenhouse gas emissions. The integration of advanced WHR systems enables the capture and conversion of this excess thermal energy into usable power, thereby reducing primary energy consumption and operational costs. This study explores the latest advancements in WHR technologies, including thermoelectric generators, organic Rankine cycle systems, heat exchangers, and phase-change materials, which facilitate efficient energy conversion across different temperature ranges. The effectiveness of these technologies is evaluated based on efficiency improvements, energy savings, economic feasibility, and environmental impact. Additionally, AI-driven optimization techniques and IoT-based predictive maintenance strategies are discussed, demonstrating their potential in maximizing WHR system performance. Experimental studies and case analyses reveal that optimized WHR systems can enhance overall industrial energy efficiency by up to 30%, reduce CO<sub>2</sub> emissions by 25%, and achieve a return on investment within five years for high-energy-consuming sectors. Despite these benefits, challenges such as capital costs, system integration complexities, and material limitations remain significant barriers to large-scale adoption. This paper provides a comprehensive assessment of WHR innovations, their applications in key industries, and the potential pathways for future research and development. The findings underscore the critical role of WHR technologies in achieving energy sustainability and mitigating industrial carbon footprints, reinforcing their necessity for the transition toward greener industrial operations.

Paper ID: ICON-078

## Securing IoT Ecosystems with Privacy-Preserving Protocols and Machine Learning

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**Abstract:** As the Internet of Things (IoT) continues to proliferate across industries and everyday applications, ensuring the security and privacy of interconnected devices and data has become a critical concern. The vast amount of sensitive information generated by IoT devices, coupled with their widespread use, creates an attractive target for cyberattacks. To address these challenges, privacy-preserving protocols and machine learning (ML) techniques are emerging as effective solutions for securing IoT ecosystems. Privacy-preserving protocols, such as encryption, anonymization, and secure multi-party computation, help protect user data from unauthorized access and mitigate potential breaches. Meanwhile, machine learning algorithms can detect anomalies, identify security threats, and enhance intrusion detection systems by continuously learning from data patterns and behaviors in real-time. ML models, such as supervised learning, unsupervised learning, and deep learning, can also predict potential vulnerabilities and optimize security measures dynamically. This paper explores the integration of privacy-preserving protocols with machine learning to secure IoT ecosystems, focusing on their applications in data protection, threat detection, and secure communication. By combining these approaches, IoT systems can maintain high levels of security and privacy, ensuring the safe deployment of IoT technologies across various sectors, including healthcare, smart cities, and industrial automation.

Paper ID: ICON-079

## Deep Reinforcement Learning Models for Resilient Autonomous Robotic Systems

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**Abstract:** Deep reinforcement learning (DRL) enables resilient decision-making in autonomous robotic systems operating in dynamic environments. This paper highlights DRL models for improving adaptability and task efficiency, achieving a 45% increase in task success rates. By training robots through simulated environments, DRL models developed advanced problem-solving capabilities, including navigation, object manipulation, and collaboration. The study also examined the robustness of these models in unpredictable scenarios, demonstrating a 30% improvement in resilience compared to traditional algorithms. Additionally, DRL approaches optimized energy consumption, enhancing operational sustainability. The findings suggest that DRL has the potential to redefine robotic applications in industries ranging from logistics to healthcare, emphasizing its role in creating resilient and intelligent autonomous systems.

**Keywords:** Deep reinforcement learning; Autonomous robots; Resilience; Robotics systems; AI models

Paper ID: ICON-080

## Enhancing Healthcare with Wearable IoT Devices and AI-Powered Diagnostics

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**Abstract:** The integration of wearable Internet of Things (IoT) devices and Artificial Intelligence (AI) in healthcare is revolutionizing patient care by enabling continuous monitoring and providing real-time diagnostics. Wearable IoT devices, such as smartwatches, fitness trackers, and medical-grade sensors, collect vast amounts of health data, including heart rate, blood pressure, temperature, and glucose levels. When coupled with AI-powered analytics, this data can be processed and analyzed to detect early signs of health issues, predict potential medical conditions, and offer personalized treatment recommendations. AI algorithms, including machine learning and deep learning, enhance the accuracy and speed of diagnostics by identifying patterns in complex health data that might be overlooked by human practitioners. These systems not only assist in real-time decision-making but also enable remote monitoring, reducing the need for frequent in-person visits and ensuring continuous care. Furthermore, AI-powered predictive models can help optimize treatment plans, leading to more efficient resource utilization and improved patient outcomes. This paper explores the advancements in wearable IoT devices and AI diagnostics, highlighting their potential to transform healthcare by providing timely, data-driven insights, enhancing patient engagement, and fostering a more proactive approach to health management.

**Keywords:** Wearable IoT devices; AI-powered diagnostics; Healthcare; Machine learning; Predictive models; Remote monitoring.

Paper ID: ICON-082

## Optimization of Nano fluid Properties for Improved Heat Transfer in Solar Thermal Systems

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**Abstract:** Nanofluids, engineered by dispersing nanoparticles into conventional base fluids, offer enhanced thermophysical properties, making them highly suitable for advanced solar thermal systems. This study focuses on the optimization of nanofluid properties to improve heat transfer efficiency in solar thermal collectors. Various nanoparticles, including metal oxides ( $Al_2O_3$ ,  $TiO_2$ ) and carbon-based materials (graphene, CNTs), were dispersed in water and ethylene glycol-based fluids using ultrasonic and chemical stabilization methods to ensure uniform dispersion and stability. The thermophysical properties of the nanofluids, such as thermal conductivity, specific heat, viscosity, and density, were experimentally measured and analyzed. Solar simulator experiments were conducted to assess the performance of the nanofluids in flat-plate and parabolic trough solar collectors under controlled radiation and flow conditions. Optimization techniques, such as response surface methodology (RSM), were employed to identify the ideal nanoparticle type, concentration, and fluid properties that maximize heat transfer rates without significantly increasing pumping power. Results demonstrated that optimized nanofluid formulations could achieve a 20–35% enhancement in thermal efficiency compared to conventional fluids, with graphene-based nanofluids exhibiting the highest performance due to their superior thermal conductivity. However, the trade-offs involving viscosity and stability were addressed to ensure long-term operational feasibility. The study also highlighted the role of nanofluids in reducing collector stagnation temperature and enhancing overall energy capture efficiency.

Paper ID: ICON-083

## Magnetic Nano Fluids for Active Heat Transfer Control in Smart Thermal Systems

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**Abstract:** Magnetic nanofluids, also known as Ferro fluids, have emerged as advanced materials for active heat transfer control in smart thermal systems due to their tunable thermal and rheological properties under the influence of an external magnetic field. This study investigates the potential of magnetic nanofluids to enhance heat transfer performance in dynamic thermal environments. Synthesized by dispersing magnetic nanoparticles, such as  $Fe_3O_4$ , in a base fluid with suitable surfactants, these nanofluids exhibit remarkable stability and responsiveness to magnetic fields. The thermophysical properties of the magnetic nanofluids, including thermal conductivity, viscosity, and specific heat capacity, were experimentally characterized. Heat transfer performance was analyzed using a magnetically controlled heat transfer loop under various operating conditions. Parameters such as magnetic field intensity, nanoparticle concentration, and flow rate were optimized to achieve maximum heat transfer efficiency. Results demonstrated that the application of a magnetic field significantly enhanced thermal conductivity and heat transfer rates, with up to a 40% improvement compared to conventional fluids. Furthermore, the ability to dynamically modulate heat transfer by adjusting the magnetic field intensity underscores the potential of these nanofluids for use in adaptive cooling and heating systems. The study also evaluated the stability and long-term performance of magnetic nanofluids, highlighting their suitability for industrial applications. The findings provide valuable insights into the integration of magnetic nanofluids in smart thermal systems for applications in electronics cooling, automotive thermal management, and renewable energy systems. Future research will focus on scalability, environmental impact, and the development of advanced nanoparticle synthesis techniques to further enhance performance.

Paper ID: ICON-084

## Impact of Fischer-Tropsch Synthetic Fuels on Engine Performance and Emissions in Heavy-Duty Vehicles

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**Abstract:** Fischer-Tropsch (FT) synthetic fuels, derived from biomass, natural gas, or coal, offer a promising alternative to conventional petroleum-based fuels due to their potential to reduce emissions and enhance engine performance. This study evaluates the impact of FT synthetic fuels on engine performance and emissions in heavy-duty diesel vehicles. A comprehensive experimental analysis was conducted using a single-cylinder heavy-duty engine under various load and speed conditions. FT synthetic fuels were characterized for their physical and chemical properties, including density, viscosity, cetane number, and calorific value, to establish a comparative baseline against conventional diesel. Combustion analysis was carried out to determine ignition delay, heat release rate, and combustion efficiency. Emission measurements, including nitrogen oxides (NO<sub>x</sub>), carbon monoxide (CO), unburnt hydrocarbons (UHC), and particulate matter (PM), were conducted using advanced exhaust gas analyzers. The results indicated that FT fuels exhibited superior combustion characteristics due to their high cetane number and low sulfur content, leading to improved thermal efficiency and a significant reduction in NO<sub>x</sub> and PM emissions. Additionally, the near-zero aromatic content of FT fuels contributed to cleaner combustion and lower soot formation. However, minor increases in CO and UHC emissions were observed under specific operating conditions, warranting further optimization of engine control parameters. This study highlights the potential of FT synthetic fuels as a viable alternative for heavy-duty applications, addressing both performance and environmental concerns. Future work will focus on lifecycle analysis, economic feasibility, and the integration of FT fuels into existing fuel distribution systems.

**Keywords:** Clean Energy Technology, Combustion Efficiency, Emission Reduction, Fischer-Tropsch Fuels, Heavy-Duty Engines, Synthetic Fuels.

Paper ID: ICON-088

## Multiple Variables Effect on MHD Jeffrey Fluid Flow Past a Vertical Plate Embedded In Porous Medium

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**Abstract:** This study investigates the unsteady magnetohydrodynamic mixed convection flow of a Jeffrey fluid over an inclined, permeable, moving plate, considering the effects of thermal radiation, heat generation, thermophoresis, and a homogeneous chemical reaction, under variable suction conditions. The governing equations are solved using the regular perturbation technique. Solutions for the velocity, temperature, and species concentration distributions are derived, leading to expressions for skin friction, Nusselt number, and Sherwood number. The influence of various physical parameters on these quantities is analyzed and presented through graphs and tables. Key findings reveal that the velocity increases with higher Jeffrey fluid presence and permeability, while opposite trends are observed with the magnetic, radiation, and chemical reaction parameters.

**Keywords:** Magnetohydrodynamics; Mixed convection; Jeffrey fluid; Thermal radiation; Heat generation; Chemical reaction

Paper ID: ICON-089

## Accelerating Innovation in Materials Science using Machine Learning in Materials Discovery

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**Abstract:** Machine learning (ML) is transforming materials research by facilitating the swift discovery and enhancement of innovative materials. This study employs machine learning in conjunction with a lot of experiments and computational techniques, such as density functional theory (DFT), to predict properties such as a material's mechanical strength, thermal stability, and electrical conductivity. Algorithms such as random forests, support vector machines, and neural networks are used to analyse extensive datasets and reveal patterns. Emphasis on feature engineering, extracting characteristics such as atomic radius and electron density to improve forecast accuracy. Case studies demonstrate the discovery of lightweight structural alloys and high-efficiency catalysts, which reduced reliance on trial-and-error approaches. Challenges include data quality, model interpretability, and generalizability by suggesting the establishment of open-access databases and explainable AI models to close existing gaps.

**Keywords:** Machine Learning, High-Throughput Materials, Prediction Models, Lightweight Alloys, Data Analytics

Paper ID: ICON-093

## Advanced Nanomaterials for Revolutionary Energy Storage and Environmental Applications

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**Abstract:** Advanced nanomaterials are at the forefront of innovation, revolutionizing energy storage and environmental applications by offering high-performance, lightweight, and sustainable solutions. In the realm of energy storage, materials such as graphene, carbon nanotubes, and nanostructured electrodes have enabled the creation of next-generation batteries and supercapacitors with enhanced capacity, improved charge-discharge cycles, and extended lifespans. Simultaneously, nanomaterials have emerged as critical components in environmental technologies, addressing challenges in water purification, pollution mitigation, and renewable energy generation. Their unique properties, including high surface area, exceptional conductivity, and tunable functionality, make them ideal for tackling pressing global issues related to energy demand and environmental sustainability. This paper delves into the fundamental properties, recent advancements, and transformative applications of advanced nanomaterials, underscoring their pivotal role in shaping a sustainable future.

**Keywords:** Nanomaterials; Energy storage; Environmental applications; Graphene; Sustainability.

Paper ID: ICON-099

## Analyzing Cancer Survival using the Weibull Method

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**Abstract:** The Weibull distribution is widely used in statistical analysis, particularly in fields requiring modified versions for specific applications, such as cancer survival studies. A more generalized variant, known as the Beta Exponentiated Modified Weibull (BEMW) distribution, integrates multiple distributional forms into a single density function with additional parameters. This distribution encompasses 19 lifetime distributions, offering a flexible selection for cancer-related research. Its hazard function provides practical forms, making it highly effective for reliability analysis. Parameters can be estimated using methods like Maximum Likelihood Estimation and the Least Squares Method. Originally introduced as a lifetime distribution, BEMW has been extensively applied to model and analyze survival data across various disciplines. Numerous studies have explored cancer patient survival using models such as the Weibull Distribution (WD), Modified Weibull Distribution (MWD), and Exponentiated Modified Weibull Distribution (EMWD). In this study, the BEMW distribution, as a more generalized approach, is employed to model the expected survival time of liver cancer patients.

**Keywords:** Weibull distribution; Beta Exponentiated Modified Weibull; cancer survival analysis; hazard function; Maximum Likelihood Estimation; liver cancer modeling.

Paper ID: ICON-108

## Utilization of GFRP, Steel Slag, and Rubber Tire Waste as Replacements for Fine Aggregate in Concrete with Varying Mixing Ratios

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**Abstract:** In recent years, global warming and environmental degradation have raised significant concerns, largely driven by industrial emissions of greenhouse gases. This has led to the depletion of natural resources, prompting a need for more sustainable practices. One such approach is the use of waste materials to reduce environmental impact. Materials like glass fiber reinforced polymer (GFRP) waste, steel slag, and rubber tire waste have emerged as potential alternatives in construction, particularly in concrete production. GFRP, a thermoset polymer, is commonly disposed of in landfills at the end of its life cycle, while steel slag, a by-product of steelmaking, presents challenges in waste management. Additionally, millions of discarded rubber tires pose a severe environmental threat, affecting landfills and groundwater. However, when integrated into concrete, these materials can enhance its mechanical and physical properties. This study explores the use of GFRP, steel slag, and rubber tire waste as partial replacements for natural aggregates in concrete. Fine aggregates were replaced with steel slag and coarse aggregates with rubber tire waste in varying proportions. The goal was to determine the optimal percentages of these materials that maximize the performance of concrete. The study involved testing the compressive and split tensile strengths of concrete specimens at 7 and 28 days of curing. The results indicated the influence of these waste materials on the concrete's properties, and the findings were discussed in terms of strength and durability improvements.

**Keywords:** GFRP, Steel slag, Rubber tyre waste, Compressive strength test, Tensile test

Paper ID: ICON-120

## Impact of Innovative Healthcare Technologies on Patient Care

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**Abstract:** Healthcare as an industry has undergone continuous transformation which has led to faster adoption of new practices and technologies. Medical advancements known as healthcare innovations which combine novel technologies processes and products seek to enhance healthcare delivery through better accessibility and affordability as well as operational efficiency can radically transform both patient welfare and medical operations. According to a report by Bain & Company and HealthQuad India's healthcare innovation market has a potential growth trajectory that expects to reach about \$60 billion by the end of Financial Year (FY) 2027-2028 and pharma services alongside healthtech innovations will power 80% of this expected growth. Hospitals must invest strategically in appropriate technology solutions that advance patient care quality yet control operational expenses alongside regulatory adherence. Healthcare institutions operate under persistent market pressure to maintain pace with innovative advancements while conducting technology gap analysis and developing strategies that adhere to market requirements. This research examines the present technological systems implemented in hospitals alongside their effects on patient care delivery. Healthcare's future will be defined by ongoing advancements that merge present-day medical care resulting in enhanced patient outcomes.

**Keywords:** Healthcare, Innovation, Patient Care, Technology

Paper ID: ICON-131

## Optimization of 3D Printing Parameters for Enhanced Mechanical Properties of PLA-4%Cu Composites Fabricated via FDM

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**Abstract:** In this study, the physical properties of Poly Lactic Acid (PLA)-4%Cu composites fabricated using Fused Deposition Modeling (FDM) are investigated, emphasizing the influence of 3D printing parameters. The study evaluated the impacts of varying layer height (LH), bed temperature (BT), and nozzle temperature (NT) on density, compressive strength, tensile strength, and flexural strength. The results indicated that bed temperature substantially influenced density, which varied from 3.484 g/cm<sup>3</sup> to 4.063 g/cm<sup>3</sup> due to different cooling rates. ANOVA revealed that LH, with a 94.55% contribution, was the most significant factor affecting density. Higher interfacial adhesion and tensile strength, up to 53.4 MPa, were observed at lower NTs and LHs. Additionally, higher NTs and moderate LHs significantly improved both compressive strength and flexural strength, reaching maximum values of 32.15 MPa and 63.84 MPa, respectively. Validation was established using regression models that predicted key characteristics with less than 5% error. Furthermore, multi-response optimization using the Simple Additive Weighting (SAW) method combined with Taguchi's quality loss function identified the optimal printing parameters (NT = 185°C, BT = 55°C, LH = 0.12 mm) for the best overall mechanical performance.

Paper ID: ICON-132

## Performance and Analysis of Wave Spring for Two-Wheeler Shock Absorber

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**Abstract:** This study investigates the performance of wave springs compared to traditional helical springs in two-wheeler shock absorbers. The analysis focuses on key parameters such as maximum shear stress, Von Mises stress, and deflection. Results indicate that wave springs exhibit a maximum shear stress of 469.87 N/mm<sup>2</sup>, representing an 11.51% reduction compared to the helical spring's 15.81 N/mm<sup>2</sup>. Similarly, the Von Mises stress for wave springs is 809 N/mm<sup>2</sup>, a 1.22% decrease from the 819 N/mm<sup>2</sup> observed in helical springs. Most notably, wave springs show a significant reduction in deflection, measuring 5.83 mm, which is 82.78% less than the 33.61 mm deflection seen in helical springs. These findings emphasise the superior performance of wave springs, highlighting their potential to enhance stability and efficiency in shock absorption applications.

**Keywords:** Composite of wave spring; Rear suspension system; Design of wave spring; Wave spring analysis.

Paper ID: ICON-136

## A Review on Study the Dynamic Characteristics of an Automobile Door Panel Made From Hybrid Fiber Reinforced Polymer Honeycomb

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**Abstract:** This study examines the dynamic performance of an automobile door panel constructed using hybrid Fiber-Reinforced Polymer (FRP) honeycomb materials. With the automotive industry constantly seeking lighter, stronger, and more vibration-resistant components, hybrid FRP honeycomb structures offer a promising solution by combining the strength and durability of synthetic fibers with the sustainability and cost-effectiveness of natural fibers. By focusing on dynamic characteristics such as vibration damping, natural frequency, and impact resistance, this investigation provides valuable insights into how fiber type, orientation, and resin composition affect the performance of hybrid FRP honeycombs in real-world automotive applications. Experimental tests and computational simulations are used to evaluate the panel's response to dynamic loads, with findings showing significant potential for reducing weight without compromising safety or comfort. The results from this study are intended to support the development of next-generation automotive components that are both lightweight and high-performing, particularly in terms of vibration control and overall structural integrity.

**Keywords:** Jute fiber, Glass fiber, Epoxy Resin LY556, Hardener HY951, Acetone.

Paper ID: ICON-137

## Smart Two Wheeler Locking System Using RFID Technology

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**Abstract:** In this paper, a Smart Two-Wheeler Locking System is presented that employs a solenoid lock mechanism to lock the front tire rim of a two-wheeler vehicle. Locking and unlocking are done under the control of RFID technology with a unique RFID tag by the owner of the vehicle. In order to offer more features to users, an Android application is designed. The locking system is communicated with by this application to provide a user-friendly interface and maintain the vehicle's security. The system is made efficient, reliable, and easy to use, and a contemporary solution is offered to provide better safety and management of two-wheeler vehicles in parking areas. The paper describes the design, implementation, and operational advantages of the system and its capability to prevent theft and provide better vehicle tracking in cities.

**Keywords:** solenoid lock mechanism, RFID, Parking

Paper ID: ICON-138

## Detection of Diabetic Retinopathy using SVM Classification and Texture-Based Feature Extraction

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**Abstract:** Diabetic Retinopathy (DR) is one of the leading causes of blindness in adults, primarily due to long-term diabetes affecting the retinal blood vessels. Early detection is critical in preventing vision loss. In this study, a hybrid approach for detecting DR using texture-based feature extraction and Support Vector Machine (SVM) classification is proposed. Features are extracted from retinal images using Gray Level Co-occurrence Matrix (GLCM) and then classified using an SVM with a radial basis function (RBF) kernel. Simulation was carried out in MATLAB, and the system achieved an accuracy of 97.97%, sensitivity of 97.59%, and specificity of 97.80%, which outperforms existing methods. This paper aims to provide an efficient and reliable method for DR detection using image processing and machine learning.

**Keywords:** Diabetic Retinopathy, Texture-Based Feature Extraction, GLCM, Support Vector Machine, SVM, MATLAB

Paper ID: ICON-140

# Optimized Scheme using Retinal Vessel Segmentation with Modified UNET Medical Image Processing

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**Abstract:** Image segmentation could also be contentinvisualization and internet appliance observation with applications like scenery, make sense ofmedicinalmodel examination, automation discrimination, and recorded supervision, enlarge actuality, and encoding, included in countless residue.Due to the efficacy of models based on deep learning in a wide range of vision applications, recent research has concentrated primarily on developing techniques for segmenting images using these models.A learning model for medical segmentation was developed in this study using a modified convolution neural network that resembles a U-net. Improved U-net can also differentiate between different skin tones because it has mastered rich feature representation for a larger variety of images.We compare the differences, challenges and strengths of several models based on deep learning to evaluate the datasets broadly utilized the most our findings, and contrast potential commands for further study in this region.This article advances a preside over macular area repository processing method utilize artificial - based nonnegative matrix factorization (NMF) and three proportion adjust exploration-Net Planning.A down sample is used to regress the model to its true form in order to enhance the three max-pooling layers and increase accuracy. The image resolution as improve after encoding using up sampling.

**Keywords:** CNN, MultipleSclerosis, FCN, Nonnegative Matrix Factorization (NMF)

Paper ID: ICON-141

# AI-Enabled Optimization Techniques in VLSI Design: A Path toward High Performance and Energy Efficiency

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**Abstract:** The world of Very Large-Scale Integration (VLSI) design is undergoing a paradigm shift, driven by the relentless demand for faster, more powerful, and energy-efficient electronic devices. Traditional design methodologies are facing unprecedented challenges in meeting these evolving demands. In this landscape, Artificial Intelligence (AI) has emerged as a transformative force, revolutionizing VLSI design. This paper discusses the role of AI-enabled optimization techniques in VLSI, focusing on performance optimization, energy efficiency, and complexity management. Through validation and results, the paper highlights AI's contributions to enhancing chip performance, optimizing power consumption, and automating design cycles. The paper also explores future trends such as quantum computing and 3D integration in VLSI.

**Keywords:** VLSI Design, AI Optimization, Machine Learning, Low Power, Energy Efficiency, Layout Optimization, Circuit Complexity

Paper ID: ICON-142

## Integration of Artificial Neural Network and GIS for Urban Master Planning in Tamil Nadu

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**Abstract:** Urbanization in Tamil Nadu has led to significant economic growth and industrialization, putting immense pressure on urban infrastructure. This study integrates Geographic Information Systems (GIS) and Artificial Neural Networks (ANN) to optimize urban land use planning for the Ariyalur Local Planning Area. Using multi-temporal satellite data, thematic layers such as land use, transportation networks, proximity to water bodies, and slope analysis were generated. GIS-based weighted overlay analysis and ANN-driven site suitability assessments were conducted to allocate urban land use categories efficiently. The ANN model demonstrated increased accuracy in predicting urban expansion patterns, offering a cost-effective alternative to traditional planning methods. The findings suggest that AI-driven approaches can enhance urban planning decision-making, ensuring sustainable development and efficient resource allocation.

**Keywords:** Urban Planning, Geographic Information Systems (GIS), Artificial Neural Networks (ANN), Master Plan, Remote Sensing, Sustainable Development.

Paper ID: ICON-146

## Healthcare Wearable IOT Devices With AI Diagnostics

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**Abstract:** The integration of wearable Internet of Things (IoT) devices and Artificial Intelligence (AI) in healthcare is revolutionizing patient care by enabling continuous monitoring and providing real-time diagnostics. Wearable IoT devices, such as smartwatches, fitness trackers, and medical-grade sensors, collect vast amounts of health data, including heart rate, blood pressure, temperature, and glucose levels. When coupled with AI-powered analytics, this data can be processed and analyzed to detect early signs of health issues, predict potential medical conditions, and offer personalized treatment recommendations. AI algorithms, including machine learning and deep learning, enhance the accuracy and speed of diagnostics by identifying patterns in complex health data that might be overlooked by human practitioners. These systems not only assist in real-time decision-making but also enable remote monitoring, reducing the need for frequent in-person visits and ensuring continuous care. Furthermore, AI-powered predictive models can help optimize treatment plans, leading to more efficient resource utilization and improved patient outcomes. This paper explores the advancements in wearable IoT devices and AI diagnostics, highlighting their potential to transform healthcare by providing timely, data-driven insights, enhancing patient engagement, and fostering a more proactive approach to health management.

**Keywords:** Wearable IoT devices; AI-powered diagnostics; Healthcare; Machine learning; Predictive models; Remote monitoring

Paper ID: ICON-147

# The Role of Big Data in Human Resources and Social Security in Public Management

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**Abstract** The big data system was formed as a result of the growth of information technology. This article examines the language of India's network security governance policy through the lens of big data, develops a big data processing methodology, examines the important portion of the rule, examines the current difficulties, and offers improvement recommendations. This study uses the Google data management engine to obtain information on networks security incidents and regulations in 2020. All rules are examined to guarantee the correctness and relevance of a contents. The findings of the study demonstrate use of big data in information security management is focused on regulatory levels, regulations, and techniques. The rise of big data and technological advancements have posed new difficulties to social security. Sustaining social protection must adapting to a computer era's evolution, and taking the effort to be using big data to construct a more efficient social welfare system is critical. Nevertheless, big data study has mostly focused on technology and procedures, with minimal examination of the information's own cognition. Networks are a significant element of socioeconomic development, as well as an expansion of real people's lives.

**KEYWORDS:** Big Data, Network Security, Maintenance and Management, Human Resource management

Paper ID: ICON-148

# Graph Convolutional Neural Networks for Multi-Behavior Recommendation Systems

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**ABSTRACT:** Different recommendation algorithms, which often use only single type of user-item engagement, are plagued by imbalanced datasets and cold start problems. Multi-behavior recommendations, which makes advantage of a variety of customer interaction including click and favourites, can be a good option. Early attempts at multi-behavior suggestion tried to consider for the varying levels of effect each behaviour has on the target behaviour. They also disregard the meanings of behaviours, which are implicit in multi-behavior information. Because of these two flaws, the information isn't being completely utilized to improve suggestion performance on the specific behaviour. In this paper, we take a novel response to the situation by creating a unified network to capture multi-behavior information and displaying the MBGCNN model (Multi-Behavior Graph Convolutional Neural Network). MBGCNN may effectively overcome the constraints of prior studies by learning behaviour intensity via the user item dissemination level and collecting behaviour interpretation via the items dissemination level. Practical derives from various data sets back up our model's order to leverage multi-behavior data. On real methods, our approach beats the average background by 25.02 percent and 6.51 percent, respectively. Additional research on cold-start consumers supports the viability of our suggested approach.

**KEYWORDS:** Multi-behavior-Recommendations, Collaboration Filter, Graph Convolutional Neural Networks

Paper ID: ICON-149

# Automated Visual Assessment for Data Science and Analytics

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**Abstract** Data visualisation is a technique for extracting information from massive amounts of data. For their assumption, software engineers constantly generate multiple visualisations from datasets. Evaluating databases with a large number of characteristics may be time-consuming and error-prone. The objective of this study is to use optimal datasets from several sources to automatically propose attractive visualisation patterns. It helps you save time by reducing the amount of time you spend on low-value visualisations and displaying suggested patterns.

Keywords: Big data; Database; Query optimizer; Data science ; visualization ; Data analyst

Paper ID: ICON-150

# Big Data Method For Energy Consumption In Smart Homes

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**Abstract:** With the development of the Internet of Things (IoT), Low Data Rate-Personal Area Networks (LR-WPAN) have been deployed for different applications. Now comes the need to integrate these networks in search of greater connectivity, performances, and geographic coverage. This integration is facilitated by the recent deployment of low power wide area networks (LPWAN) in the licensed bands, especially narrowband IoT (NB-IoT) and long-term evolution for machine type communications (LTE-M), which are standardized technologies that will continue evolving as part of the fifth generation (5G) specifications. This paper proposes a design methodology for combined networks using LR-WPAN and LPWAN technologies. These networks are combined at the device level using a cluster-tree topology. An example is shown here, where an existing IEEE 802.15.4 network is combined with NB-IoT. To this end, new dual nodes are incorporated, acting as cluster heads. The paper discusses the different aspects of formation and operation of the combined network. A dynamic link selection (DLS) algorithm is also proposed, based on which cluster headers dynamically determine the preferred link, depending on link quality and type of traffic. Extensive simulations show that the DLS algorithm significantly increases battery life on dual nodes, which are the nodes with the highest power demands.

Keywords: low power wide area networks; NB-IoT; DLS algorithm

Paper ID: ICON-151

## Optimization Algorithms for Sustainability through AI

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*Abstract—The digital twin is defined as a digital illustration that helps to depicts a physical article through virtual representation. They are helpful in understanding the properties of fabricated materials. The origin of additive manufacturing plays a significant role in the application in the 3D printing technology and its various fields. The 3D printing technology helps to obtain optimized output since they are time consuming and adopts the trial and error method in the process. The digital twin helps in the virtual demonstration of physical objects through the real time implementation through the physical and virtual space with the interconnection of data. This involves the frictional design and architectural layout for integration and finally obtaining the digital models. This includes the exchange of physical components to the real time implementation and information. The physical object is simulated, evaluated, determined and controlled within the virtual ecosystem. Hence the digital twin plays an important role in the 3D printers and enhances higher accuracy.*

*Keywords—digital twin, physical object, virtual space, 3D printing technology, additive manufacturing, internet of things*

Paper ID: ICON-152

## Autonomous Medical Treatment Assistance Using ML and Robotics

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**Abstract:** *The integration of robotics and machine learning is transforming the landscape of autonomous medical diagnosis and treatment assistance. Robotic systems equipped with AI algorithms can assist healthcare professionals by providing accurate, real-time diagnostics, minimizing human error, and enhancing treatment precision. Machine learning models, trained on vast amounts of medical data, enable robots to recognize patterns and anomalies in patient health, facilitating early diagnosis and personalized treatment plans. Autonomous robotic systems are increasingly used for tasks such as surgery assistance, drug delivery, rehabilitation, and patient monitoring. These systems adapt to each patient’s unique condition, optimizing therapeutic strategies and improving outcomes. This paper examines the role of robotics and machine learning in autonomous medical diagnosis and treatment, highlighting their potential to revolutionize healthcare delivery, reduce costs, and enhance patient care.*

**Keywords:** *Robotics; Machine learning; Autonomous diagnosis; Medical treatment assistance; AI in healthcare; Patient monitoring*

Paper ID: ICON-153

## Heart Disease Prediction Using ML Techniques

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**ABSTRACT:** The heart Coronary disease (CAD), which results from coronary disappointment and cardiovascular collapse, is caused by atherosclerosis in the coronary arteries. An invasive, costly, time-consuming, and unusually precise technique called angiography is performed to confirm the existence of CAD. Therefore, specialists are urged to use other methods, such as AI computations that might analyses cardiac sickness and assess its reality using non-nosy clinical data. We present a unique cream strategy for CAD end in this research using relationship-based correlation based feature subset (CFS) selection with particle swarm optimization (PSO) search method and K-Means clustering algorithms. Supervised learning algorithms such as multi-layer perceptron (MLP), multinomial logistic regression (MLR), fuzzy unordered rule induction algorithm (FURIA) and C4.5 are used to illustrate CAD examples. Clinical data from the Department of Cardiology at the Indira Gandhi Medical College in Shimla, India, which includes 26 characteristics and 335 events, was used to evaluate our methodology. Our approach's efficacy in precisely diagnosing CAD is evaluated using performance metrics like accuracy, sensitivity, specificity, and area under the receiver operating characteristic curve (AUC-ROC), indicating its potential to provide a dependable substitute for invasive diagnostic procedures.

**Keywords:** Heart Disease, Machine Learning, Predictive Modeling, Medical History

Paper ID: ICON-176

## Real Time Smart Farming Analysis

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**Abstract:** Agriculture is the backbone of global food production, yet it faces challenges such as climate variability, soil degradation, and inefficient resource utilization. Ensuring optimal soil health and environmental conditions is critical for maximizing yields and sustainable farming practices. Traditional methods of monitoring soil parameters and weather conditions are labor-intensive and lack real-time insights. To address these limitations, an automated solution integrating IoT and sensor technology emerges as a viable approach. The Real time Smart Farming Analytic System measures essential soil nutrients (NPK), temperature, and humidity, providing real-time data for informed decision-making. The system displays data on an LCD screen and transmits it remotely using communication protocols such as Wi-Fi, LoRa, and Zigbee, ensuring reliable data transmission over long distances. By leveraging AI-powered recommendations and weather forecasts, it aids in optimizing irrigation, fertilization, and pest control strategies. Additionally, it supports automated fertilizer dispensers for precise nutrient application. Designed for energy efficiency and ease of installation, the Crop Guard System enhances productivity, minimizes resource wastage, and promotes sustainable agricultural practices. In modern agriculture, integrating technology with traditional farming practices has become essential for improving productivity, efficiency, and sustainability. A Real-Time Smart Farming Analytic System leverages advanced technologies such as the Internet of Things (IoT), Artificial Intelligence (AI), and Big Data Analytic to provide farmers with actionable insights.

**Keywords:** Agriculture, crop health, IoT, real-time monitoring, sensor technology, precision farming, automated fertilization, sustainable practices, AI-powered recommendations, wireless communication.

Paper ID: ICON-179

## Experimental Investigation of Tribological Properties of Bio-Based, Nano-Particles

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**Abstract:** This study explores the Tribological Properties of bio based, Nanoparticles, at resynthesized by dispersing nanoparticles in nonedible oils, for potential applications in continued lubrication. The Nanoparticles were prepared using Graphene and Jatropha oil through 0.25%, and 0.50% of base oils. Friction and wear tests were conducted using a tribometer against counter face material under various conditions. The Nano particles demonstrated improved lubricity, attributed to the syncretic effects of nanoparticles and vegetable oils. The finding suggest that bio based ,Nano particles as promising eco-friendly alternatives to conventional lubricants, offering enhanced tribological properties and reduced environmental impact.

**Keywords:** Nanoparticles, Tribology, Environmental, Bio-based oils.

Paper ID: ICON-183

## Optimization of Regenerative Cooling Process in Liquid Rocket Engines

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**Abstract:** One of the most challenging aspects of rocket engines is the thermal management of all the components and the system. These systems are expected to produce this immense thrust with an impressive amount of energy in a very short impulse of time. The generation of thrust happens through conversion of this energy from combustion. The process of combustion and conversion of this energy faces very critical values of temperature involving cooling problems throughout all parts of the engine, mainly the walls of the combustion chamber and the throat of the nozzle. The propulsion system requires cooling of all parts of the engine and regenerative cooling is the most predominantly used cooling method in today's day. Regenerative cooling refers to high velocity coolant which flows through the coolant channels or tubes which are lined typically in a spiral manner around the combustion chamber and nozzle which reduces their wall temperature. The coolant is fed into the combustion chamber either injected directly or through a gas generator. Traditionally, approximately square cross sectional cooling channels have been used for the process. However, recent studies have shown that by increasing the coolant channel height-to-width aspect ratio and varying the height of the coolant channel throughout the surface area, the rocket combustion chamber gas-side wall temperature can be reduced significantly without an increase in the coolant pressure drop. Our project aims to optimize the established model by obtaining the highest heat flux between gas side wall and coolant for a particular configuration and overcome the shortcoming it faces. Our methodology involves an extensive literature survey followed by numerical simulation of our theoretical model which is required to gain insightful results of our model.

**Keywords:** Aspect Ratio, Coolant channel, Heat flux, Regenerative cooling

Paper ID: ICON-185

## An Efficient Non-Invasive Approach for Anemia Detection Using Empirical CNN ResNet50 Architecture

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**Abstract:** Anemia impacts approximately 1.62 billion people globally, with women and children in poor and developing countries being the most vulnerable. Although it is one of the most prevalent conditions with critical health implications, anemia remains undetected in resource-poor settings as diagnostic tools remain inaccessible. This research work presents a non-invasive approach for anemia prediction using a deep learning architecture to classify three different physiological features: nails, palms, and eye conjunctiva. The proposed work utilizes a baseline ResNet50 model, with anemia classification determined through a majority voting mechanism. ResNet50 demonstrated superior validation accuracy across all datasets, achieving 97.81% for nails, 94.69% for palms, and 95.62% for eye conjunctiva, with corresponding validation losses of 6.92%, 12.93%, and 18.59%. These results highlight its effectiveness in feature extraction and classification compared to other baseline models. The implementation of FastAPI improves scalability and real-time performance, making it ideal for both clinical and remote healthcare applications. The proposed system provides a cost-effective, non-invasive diagnostic solution, overcoming traditional blood test limitations and improving accessibility in underserved regions.

**Keywords:** Anemia Detection, Deep Learning, NailResNet, PalmResNet, and EyeResNet..

Paper ID: ICON-186

## Sustainable Cementitious Binders: A Comparative Analysis of Sugarcane Bagasse Ash and Fly Ash in SIFCON Mixes

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**Abstract:** Slurry-infiltrated fibrous Concrete (SIFCON) is an advanced high-performance material known for its exceptional strength, ductility, and impact resistance. The cement industry faces significant environmental challenges, emitting 0.73 to 0.99 tons of CO<sub>2</sub> per ton of cement produced, primarily due to variations in fuel types, production methods, and clinker-to-cement ratios. Each ton of cement requires the mining of 1.5 tons of raw materials, which impacts ecosystems. To mitigate these issues, exploring sustainable alternatives to cement is crucial. This study investigates the effect of replacing cement with Fly ash FA and Sugarcane Bagasse Ash (B.ASH) in SIFCON while incorporating varying percentages of hooked-end steel fibers (1%, 2%, 3%, and 4% by volume). By recording these mass changes relative to temperature or time, the method provides crucial insights into the sample's thermal stability, decomposition patterns, and compositional changes. research aims to enhance sustainability by reducing cement consumption while maintaining or improving mechanical properties. Experimental tests, including compressive strength and Split tensile strength, are conducted to evaluate the performance of the modified SIFCON. The results indicate that increasing the steel fiber content improves strength and ductility, is increased with increasing the fiber percentages observed at fiber volume. Beyond this percentage, workability issues arise, affecting uniform fiber distribution. The study concludes that fly ash-based SIFCON reinforced with hooked-end steel fibers offers a viable solution for sustainable and high-strength construction applications.

**Keywords:** Compression Strength Test & Split Tensile Strength Test.

Paper ID: ICON-189

## Swin Transformer-Based Machine Learning Model for COVID-19 Diagnosis Using Chest X-ray Images

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**Abstract:** The rapid and accurate diagnosis of COVID-19 is essential for effective patient management and controlling the spread of the virus. Traditional deep learning models, including Convolutional Neural Networks (CNNs) and Vision Transformers (ViTs), have demonstrated promising results in medical image classification. However, these models often suffer from high computational costs and lack hierarchical feature learning. In this study, we propose a **Swin Transformer-Based Machine Learning Model** for COVID-19 detection using chest X-ray images. The Swin Transformer introduces a **shifted window mechanism** that enables efficient feature extraction while maintaining global context awareness. Our method is evaluated on benchmark COVID-19 X-ray datasets, comparing its performance with conventional CNNs and standard ViT models. Experimental results demonstrate that the Swin Transformer achieves superior accuracy, robustness, and computational efficiency, making it a viable alternative for real-world deployment in clinical settings. Furthermore, we enhance interpretability by leveraging explainable AI (XAI) techniques to provide insights into the model's decision-making process. The proposed approach presents a scalable and effective solution for automated COVID-19 diagnosis, contributing to improved diagnostic workflows in healthcare applications.

**Keywords:** Swin Transformer, COVID-19 Diagnosis, Chest X-ray, Deep Learning, Medical Imaging, Vision Transformer, Explainable AI

Paper ID: ICON-191

## Investigation on Mechanical properties of Hybrid composite for Parapet roof

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**Abstract:** This research explores the mechanical characteristics of a hybrid composite composed of jute, sisal, glass fiber, epoxy resin, and Prosopis juliflora powder. The composite was prepared via hand layup and tested by tensile, flexural, compression tests and scanning electron microscopy (SEM). Simulation with ANSYS Workbench gave information on total deformation, equivalent stress, and strain under a tensile loading of 500N. Mechanical testing revealed the five-layered composite to possess higher performance through a flexural strength of 115.47 MPa, ultimate tensile strength (UTS) of 36.62 N/mm<sup>2</sup>, and compressive strength of 37.7 N/mm<sup>2</sup>. The research draws attention to the promise of such a hybrid composite as a renewable substitute for asbestos in parapet roofing to solve environmental and health issues as well as with potential applications in lightweight structural engineering.

Paper ID: ICON-193

# Glycerol Plasticized Corn Starch Bioplastic for Food Packaging Application

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**Abstract:** Bioplastics produced from renewable resources have gained extensive popularity as eco-friendly alternatives to conventional plastics. The synthesis, characterization, and application of glycerol-plasticized corn starch bioplastic were investigated in this research. The incorporation of glycerol plasticizer has been reported to enhance the processability and flexibility of the starch films. The influence of different concentrations of glycerol on the mechanical, thermal, and barrier properties of the bioplastics was evaluated. Results indicate that increased glycerol content increases elongation at break but decreases tensile strength and hydrophilic properties. The study illuminates the glycerol concentration optimization for biodegradable packaging. Furthermore, biodegradability tests confirm that the bioplastics degrade well in natural environments, adding to their sustainable capacity.

**Keywords:** Bioplastics, Corn Starch, Glycerol, Food Packaging, Sustainable Materials, Biodegradability, Plasticizer

Paper ID: ICON-194

# Optimizing Cloud Resource Costs under Uncertainty

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**Abstract:** We provide an optimization framework for reducing Cloud platforms offer user-friendly dashboards and streamlined tools cloud resource expenditure with uncertain spot prices and fluctuating demand [1]. We suggest 2 algorithms: one where future demand is known and the other where it is not, guaranteeing costs within a factor of 2 of the optimum[4]. Experimental results indicate our method to be within 20% of Integer Linear Programming solutions[8], proving its efficiency in real-world applications.

**Keywords:** Cloud Computing, Cost Optimization, Instance Pricing, Spot Instances, Reserved Instances, On-Demand Instances, Algorithm Design, Integer Linear Programming (ILP), Cloud Resource Management.

Paper ID: ICON-195

# Wildlife Animal Activity Detection Using Machine Learning

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**Abstract:** The increasing incidence of animal intrusions on railway tracks poses serious risks to both wildlife and human life. To address this challenge, this paper proposes a deep learning-based real-time detection system designed specifically for railway environments. The system employs DenseNet-121, an advanced Convolutional Neural Network (CNN), to accurately identify and classify wild animals captured through surveillance cameras installed along railway tracks. DenseNet-121 was chosen for its dense connectivity, efficient feature reuse, and ability to overcome the vanishing gradient problem. With a relatively smaller number of parameters compared to other deep learning models, DenseNet-121 ensures efficient training while maintaining high accuracy. The model is further enhanced with data augmentation techniques to improve its generalization capability and reduce overfitting. An automated alert mechanism is integrated into the system, which sends immediate notifications to nearby railway authorities via SMS when an animal is detected in the danger zone. This enables timely action to prevent accidents and protect both passengers and animals. The proposed system was evaluated using a substantial volume of data from benchmark datasets. It achieved an average classification accuracy of 98%, a mean Average Precision (mAP) of 77.2%, and a high processing speed of 170 Frames Per Second (FPS). These results demonstrate the system's reliability and efficiency in real-time railway applications, making it a promising solution for enhancing safety in wildlife-sensitive railway zones.

Paper ID: ICON-196

# Real Time Air Quality Monitoring using IoT and Machine Learning

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**Abstract:** The Real Time Air pollution is a growing concern affecting public health and environmental sustainability. This project presents a Real-Time Air Quality Monitoring System that leverages IoT-based virtual sensor data, the OpenWeather API, and Machine Learning models to predict air pollutant concentrations, particularly Nitrogen Dioxide (NO<sub>2</sub>). The system integrates modules for real-time data collection, data fusion, preprocessing, and predictive modeling using XGBoost and LSTM algorithms. Sensor and weather data are processed to forecast NO<sub>2</sub> levels, while interactive web-based visualizations display temperature, humidity, wind speed, and pollution indicators. The system also includes a user-friendly frontend built with HTML, JavaScript, and a Flask backend, offering real-time alerts, map interaction for location-based insights, and chart-based visual analytics. This approach enhances decision-making by providing accurate, location-specific air quality insights and contributes to proactive pollution management. The framework is scalable and can be extended to include additional pollutants, mobile app deployment, and real hardware integration for real-world impact.

Paper ID: ICON-197

## Cyber Deception Honeypots: AI-Powered Intrusion Detection and Deception Mechanisms

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**Abstract:** Cyber deception honeypots are an advanced security mechanism designed to mislead and analyze attackers. As cyber threats become more sophisticated, traditional security measures are no longer sufficient. Deception-based techniques, such as honeypots, provide a proactive approach to detecting and mitigating cyber intrusions. This paper explores the design and implementation of AI-powered honeypots that integrate machine learning models for intrusion detection and GPT-4 for generating deceptive responses. The proposed system comprises multiple components, including an AI-based deception module, an intrusion detection system (IDS), and a logging framework. By simulating real-world vulnerabilities, these honeypots attract attackers, monitor their behavior, and collect critical forensic data. The AI-driven deception mechanism ensures that responses appear authentic, keeping attackers engaged while preventing actual system compromise. This research highlights the advantages of deception technology in cybersecurity, particularly in enhancing threat intelligence and forensic analysis. We also discuss the ethical considerations of deploying honeypots, including privacy concerns and legal implications. Our findings demonstrate that AI-powered honeypots significantly improve security defenses by increasing attacker dwell time and providing real-time insights into malicious activities. Future enhancements to this system could involve adaptive learning, where deception tactics evolve based on attacker behavior. Additionally, integrating advanced threat intelligence sources could further strengthen the effectiveness of AI-driven honeypots in mitigating modern cyber threats.

**Keywords:** Cyber Deception, Honeypots, Intrusion Detection System, AI, Machine Learning, GPT-4, Cybersecurity Intelligence, Digital Forensics.

Paper ID: ICON-204

## Landfill Leachate Treatment Using a Method of Coagulation for Enhanced Environmental Safety

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**Abstract:** Municipal Solid Waste (MSW) management is a critical challenge faced by urban areas worldwide due to the increasing volume of waste generated by growing populations and urbanization. Effective MSW management encompasses the collection, transport, treatment, and disposal of waste materials in ways that minimize their impact on human health and the environment. One of the significant concerns associated with MSW management is the generation of leachate, a highly polluted liquid formed when water percolates through waste materials in landfills. Leachate contains various organic and inorganic pollutants, including heavy metals, ammonia, and pathogens, posing severe risks to groundwater and surface water quality if not adequately managed. Understanding the characteristics, formation, and potential environmental impacts of leachate is essential for developing effective treatment and management strategies. Recent advances in leachate treatment technologies aim to mitigate these environmental threats while ensuring sustainable waste management practices. This Project work explores the current trends, challenges, and innovative solutions in managing leachate from municipal solid waste, highlighting the need for integrated and adaptive approaches in addressing this complex issue.

Paper ID: ICON-209

## Analysis of Material SA106 Pipe after Post Weld Heat Treatment

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**Abstract:** ASME SA 106 Grade B pipe fabric, also known as API 5L Grade B Pipe, is frequently utilised in the oil and gas industry for distribution channels that have quite high weight and temperature, particularly for gas and steam conveyance lines. During operation, damage and spills are frequently caused by seismic earthquakes and other external forces. It's crucial to consider and investigate the quality of the final welded joint as well as the optimum welding procedure. The hardness and quality of the welded connection of 6 inch schedule pipe 80 API 5L Grade B are assessed in this study using a combination of Gas Tungsten Bend Welding (GTAW) and ASME SA 106 Review B channels fabric. The material characteristics and microstructural alterations of ASTM A106 Grade B carbon steel pipes following post-weld heat treatment (PWHT) are examined in this work. A crucial procedure for reducing residual stresses, enhancing mechanical qualities, and lowering the possibility of weld-related flaws in welded components is PWHT. The study focusses on investigating how various PWHT factors, like temperature and time, affect the microstructure, hardness, and tensile strength of A106 pipes, which are frequently used in high-temperature and high-pressure applications. The findings demonstrate that appropriate PWHT improves the material's ductility and significantly lowers residual stresses. It also refines the grain structure, which improves the overall performance of the welds. Furthermore, it was discovered that changes in temperature and PWHT duration affected the welded joints' hardness and toughness, with ideal circumstances finding for boosting the material's resistance to failure and cracking. The results offer important new information about how PWHT contributes to the dependability and longevity of welded A106 steel pipes in crucial engineering applications.

**Keywords:** GTAW, Tensile strength, PWHT, Residual stress soaking timing.

Paper ID: ICON-210

## Anti-Microbial Coating for HEPA Filter Using Copper Particles

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**Abstract:** In a variety of industrial settings, such as cleanroom manufacturing, food processing, pharmaceuticals, and healthcare, maintaining air free of microorganisms is crucial. High Efficiency Particulate Air filters work well at capturing airborne particles, but they don't actively destroy microorganisms, which could eventually cause bio-contamination on the filter surface. In order to improve microbial resistance without sacrificing filtration efficiency, this study describes the creation of an antimicrobial coating for HEPA filter media based on copper. A controlled coating technique was used to apply copper particles. When compared to uncoated controls, the coated filters demonstrated a significant microbial inhibition in their evaluation of antimicrobial efficacy against *Staphylococcus aureus* and *Escherichia coli*. Tests of airflow performance verified that the coating had no negative effects on filter efficiency or pressure drop. The safety of the coating was further confirmed by a leachability assessment, which showed no discernible release of copper particles during simulated airflow. The findings demonstrate how copper-coated HEPA filters can be used in air filtration systems across industrial sectors as a scalable, safe, and efficient way to control microorganisms.

**Keywords:** HEPA filter, Copper particles Antimicrobial coating, Air filtration, Industrial air purification, Microbial inhibition, Copper-based antimicrobial, Filter surface modification, Cleanroom applications, Leachability analysis

Paper ID: ICON-211

## Performance Enhancement of a New Type Louver Fin Heat Exchanger for Electronics Cooling Applications

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**Abstract:** In the rapidly evolving field of electronics, ensuring efficient thermal management is crucial to maintaining performance and reliability. As electronic devices become more powerful, their heat generation increases, necessitating advanced cooling solutions. One promising approach is the development of innovative heat exchangers. This essay focuses on a new type of louver fin heat exchanger designed specifically for electronics cooling applications. The louver fin heat exchanger is a compact and highly efficient system that enhances heat transfer by increasing surface area and promoting turbulent airflow. Unlike traditional fin designs, this novel configuration incorporates a series of angled slits, or louvers, which disrupt laminar flow and induce secondary flows. This results in enhanced convective heat transfer and more effective cooling of electronic components. To optimize performance, various geometric and operational parameters of the heat exchanger are analyzed. These include louver angle, fin pitch, and flow rate. Computational fluid dynamics (CFD) simulations and experimental studies are used to evaluate thermal performance, pressure drop, and overall efficiency. The findings reveal that the new louver design significantly improves heat dissipation while maintaining a compact form factor, making it ideal for space-constrained electronics.

Paper ID: ICON-215

## Case study on Artificial Intelligence in healthcare in India

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**Abstract:** This case will seek to show how AI is disrupting and transforming the Indian healthcare sector and the opportunities it presents in meeting some of the challenges in accessibility, cost and quality. India has a population over 1.4 billion; there are significant disparities in the quality of health care between rural and urban regions. The article draws on real-world examples, which illustrate how AI applications such as AI4Rx, Aravind Eye Hospital and Systems Ltd.'s Diabetic Retinopathy Screening, and Apollo Hospitals' Cardiac Risk Scoring are making a difference. By interviewing key stakeholders in the healthcare industry and analyzing the activities of public and private entities, this paper seeks to identify some of the benefits, challenges, and potential ethical dilemmas associated with the use of AI in this sector. The study reveals that several barriers affect adoption, including infrastructure, training, and levels of trust, particularly concerning rural doctors and patients. They offer recommendations to the policy makers, technologists and the health care providers on how best to harness AI in the health care system of India.

**Keywords:** Artificial Intelligence, Healthcare, Diagnosis, clinical analytics

Paper ID: ICON-217

## IoT Based Car Parking System

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**Abstract:** With rapid urbanization and the increasing number of vehicles on the road, parking has become a significant challenge, particularly in metropolitan areas. Traditional parking systems rely on manual supervision, ticketing, and cash payments, leading to inefficiencies such as congestion, time wastage, and unauthorized parking. The IoT-based Car Parking System provides a smart, automated, and user-friendly solution by integrating ESP32 microcontroller, IR sensors, I2C module, LCD display, and a lithium-ion battery to enhance the parking experience. This system employs multiple IR sensors to detect the presence of vehicles in parking slots. These sensors send real-time data to the ESP32 microcontroller, which processes the information and updates the availability status. The LCD display provides on-site users with visual feedback about vacant and occupied parking spaces, ensuring efficient navigation. Additionally, the I2C module facilitates seamless communication between components, optimizing data transfer and processing speed. Users can check real-time parking slot availability via a mobile application, reducing the time spent searching for parking. The system integrates automated entry and exit management through RFID, License Plate Recognition (LPR), or QR-based authentication, eliminating the need for manual intervention. This enhances security and ensures a smooth and secure parking process. The integration of cloud-based storage allows authorities to monitor, analyze, and optimize parking space usage effectively. Furthermore, digital payment options provide a hassle-free transaction experience, eliminating the need for physical cash or tickets. Security features such as CCTV surveillance and motion sensors prevent unauthorized access and parking violations. The implementation of this system reduces fuel consumption and emissions by directing drivers to available spots efficiently, contributing to a sustainable urban environment. Overall, the IoT-based Car Parking System utilizing ESP32, IR sensors, and cloud-based monitoring offers an innovative solution to parking challenges, enhancing user convenience while promoting smart city development in commercial hubs and public parking spaces.

Paper ID: ICON-221

## Fabrication of Functionally Graded Materials (FGMs) for Mechanical Components in Additive Manufacturing via Laser Powder Bed Fusion: A Review

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**Abstract:** Functionally Graded Materials (FGMs) are advanced composites composed of two or more materials with gradually varying composition or structure, leading to tailored mechanical performance across the component. These materials are particularly valuable in mechanical applications where varying thermal, structural, or wear properties are required within a single part. Additive Manufacturing (AM), and specifically Laser Powder Bed Fusion (LPBF), has emerged as a powerful tool for the fabrication of FGMs due to its precision and capability to produce complex geometries with controlled material distribution. This review focuses on recent progress in the development and characterization of FGMs for mechanical components using LPBF, covering a range of material systems such as metal-metal, metal-ceramic, ceramic-ceramic, and metal-organic combinations. Key challenges in FGM fabrication such as intermetallic compound formation, mismatches in thermophysical properties, and inconsistent dilution rates across gradient interfaces are examined, along with current solutions and mitigation strategies. The paper concludes with a discussion on future research directions to improve the reliability, scalability, and mechanical performance of FGMs in industrial applications. This review aims to provide a comprehensive reference for advancing the design and production of FGMs for high-performance mechanical components.

Paper ID: ICON-222

# Analytical Approximation of a Time-Delay Model for Pest Control in Coconut Trees by Homotopy Perturbation Method

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**Abstract:** A system of nonlinear delay differential equations on the dynamics of pest management utilizing predator in coconut leaves is analyzed. The rugose spiraling whitefly, also known as RSW, is a significant pest that offers a significant risk to the coconut tree, which is sometimes referred to as the "tree of life". This pest threatens not only the long-term viability of coconut agriculture but also the lives of farmers. To better understand the effectiveness of natural control mechanisms, our model considers the dynamics between pest population and their predator (*Pseudomallada astur*), incorporating time delay. The influence of parameters on the dynamics of the system was investigated by sensitivity analysis. The numerical simulation of the proposed system is also discussed. Using the homotopy perturbation method, approximate analytical solutions achieve good agreement with numerical method for all feasible parameter values. Our goal in doing this analysis is to provide insight into sustainable pest management and to assess the efficiency of the homotopy perturbation method in solving delay differential equations.

**Keywords:** Rugose spiraling whitefly, Delay differential equation, *Pseudomallada astur*, Homotopy perturbation method, Sensitivity analysis

Paper ID: ICON-229

# Hands-Free Computing: An Eye-Based Virtual Mouse for the Disabled

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**Abstract:** In today's digital era, human-computer interaction (HCI) plays a crucial role in communication, education, and professional tasks. However, individuals with physical disabilities face significant challenges in using conventional input devices such as keyboards and mice, which limits their access to technology. This research presents an innovative eye-based virtual mouse system designed to provide a hands-free computing experience for individuals with motor impairments. Our system leverages computer vision and machine learning techniques to track eye movements and translate them into cursor control, enabling users to navigate and interact with a computer screen efficiently.

The proposed system utilizes a webcam-based eye-tracking mechanism that detects pupil movement and blinking patterns to perform various functions such as cursor movement, left-click, right-click, and scrolling. The core methodology involves image processing, feature extraction, and gaze estimation to accurately map the user's eye position to screen coordinates. OpenCV and deep learning models are employed to improve gaze tracking accuracy, while a robust calibration algorithm ensures adaptability across different users. Unlike traditional gaze-tracking devices that rely on specialized hardware, our approach is cost-effective, as it only requires a standard webcam, making it accessible to a broader audience.

To evaluate system performance, extensive testing was conducted on multiple users with varying levels of motor disabilities. Key performance metrics such as response time, accuracy, and ease of use were analyzed. The results indicate that the proposed system achieves high precision in gaze tracking, with an average accuracy exceeding 90% for cursor control and an intuitive user experience. Furthermore, the system supports customizable sensitivity settings, allowing users to adjust responsiveness based on individual preferences.

*By eliminating the need for external physical devices, this hands-free computing solution enhances digital accessibility and promotes inclusivity in technology. The system has potential applications beyond disability assistance, including gaming, virtual reality (VR), and hands-free control in medical environments. Future work will focus on enhancing system robustness, reducing latency, and incorporating artificial intelligence (AI) models for adaptive gaze tracking.*

*This research contributes to the field of assistive technology and human-computer interaction, offering a practical, affordable, and efficient alternative to traditional input methods for individuals with disabilities. By integrating computer vision, AI, and accessibility-driven design, this system paves the way for a more inclusive digital world where everyone, regardless of physical limitations, can fully engage with technology.*

**Keywords:** Eye Tracking, Virtual Mouse, Hands-Free Computing, Assistive Technology, Computer Vision, Human-Computer Interaction (HCI).

Paper ID: ICON-230

## Intelligent ECG Analysis: Hybrid Deep Learning for Arrhythmia Classification

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**Abstract:** *As cardiovascular diseases continue to rise, this is a pressing need for accurate, efficient, and scalable diagnostic tools. Electrocardiogram (ECG) signals play a crucial role in detecting cardiac issues, particularly arrhythmias, which can be life-threatening if left undiagnosed. This project aims to develop a hybrid deep learning model specifically designed for ECG arrhythmia classification, emphasizing a balance between high classification accuracy and computational efficiency for real-time application. Electrocardiogram (ECG) analysis is pivotal in detecting cardiovascular conditions, particularly arrhythmias, which, if unmonitored, may lead to severe complications or mortality. This project addresses the limitations of traditional ECG interpretation by developing a machine-learning model for automated arrhythmia classification. Leveraging insights from the paper "Deep Learning-Based ECG Arrhythmia Classification: A Systematic Review," this project combines convolutional neural networks (CNNs) for feature extraction with transformers for capturing sequence dependencies and improving interpretability. The model is optimized for real-time applications, ensuring it is lightweight and computationally efficient, making it suitable for wearable devices and continuous monitoring applications. The effectiveness of the hybrid model is evaluated on widely used ECG datasets, aiming to bridge the gap between high-performance diagnostics and practical, deployable solutions.*

*This project proposes a hybrid architecture that utilizes convolutional neural networks (CNNs) for robust feature extraction and transformer-based attention mechanisms to improve interpretability by focusing on significant ECG segments. Combining these techniques aims to create an optimized model suitable for clinical settings and wearable devices, offering an accessible and effective solution for arrhythmia detection. The model's performance will be evaluated using standard metrics, including accuracy and F1-score, and compared against existing deep learning architectures. Future work will focus on further optimization for deployment on edge devices to enhance the scalability of ECG-based health monitoring systems*

**Keywords:** CNN, cardiovascular diseases, Electrocardiogram

Paper ID: ICON-231

## AI-Powered Smart Glove for Sign Language Translation

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**Abstract:** Millions of speech-impaired individuals rely on sign language for communication, but most people are unable to understand it, creating a significant communication barrier. This paper presents an AI-powered smart glove that translates sign language gestures into text and speech in real-time. The system integrates flex sensors and an MPU6050 IMU sensor to capture hand movements, which are processed using Random forest model deployed on an ESP32 microcontroller. The recognized gestures were transmitted to a smartphone via Bluetooth, where a Text-to-Speech (TTS) system converts the recognized text into speech. The proposed system improves accuracy using TinyML optimization and enhances battery efficiency with low-power ESP32 modes.

**Keywords:** Smart glove, Sign Language Recognition, Random Forest, Machine Learning, ESP32, Bluetooth Communication, Tinyml.

Paper ID: ICON-234

## Studies on Dry Sliding Wear Behaviour of Graphite Filled Carbon Fiber Epoxy

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**Abstract:** Polymers and their composites are emerging as a major alternative products to metal-based and alloy-based ones in many common and advanced engineering applications. The feature that makes polymer composites so promising and useful in industrial applications is their mechanical properties like high strength-to-weight ratio, corrosion resistant, tailorability etc. The comparative performance of carbon fiber composite with influence of Graphite filler were experimentally investigated under varying applied load, sliding distance and sliding velocity by using a pin-on-disc apparatus. The influence of graphite content (0-3 wt%), and normal load (10-40 N) on wear rate, frictional coefficient, and surface morphology was investigated. This procedure helps in quantifying and understanding the dry sliding wear behaviour of graphite-filled carbon fiber epoxy composites, providing valuable data for improving the design and performance of components used in automotive, aerospace, and other high-wear applications. Few properties of Graphite filled carbon fiber epoxy are High strength and stiffness, Thermal conductivity, Low thermal expansion, Light weight, Corrosion and chemical Resistant, Tailorability.

**Keywords:** Carbon fiber, Graphite, Pin on disc apparatus, Tailorability, Epoxy, Wear Behavior, Corrosion resistant, Coefficient of Friction.

Paper ID: ICON-235

## Fabrication and Testing of Composite Material Made Up of Prawn Shell Powder

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**Abstract:** Prawns are an extremely good source of protein, yet are very low in fat and calories, making them a very healthy choice of food. In this article, we have discussed about the use of the biodegradable wastes as a composite material. The discarded waste of the prawn shell wastes are used for making a composite material. Composite material consists of matrix and reinforcement. In this article, the particulate reinforcement used is prawn shell powder and the matrix used is lapatoxy - SP 100 resin along with hardener (Grand stone). The reinforcement used is prawn shell powder is mixed to the matrix taken in the fixed ratios. In this article, the composite material is fabricated and is tested for hardness. It is a discarded waste that can be easily available in the environment. Also, it is bio-degradable, even during its decomposition it releases nutrients into the environment that are used by trees. These composites cause no harm to nature and are ecofriendly. They do not require any site to grow the raw material used as the reinforcement. They possess high strength, toughness, can withstand loads, hardness etc. Composite materials are a substitute for conventional plastics and possess higher mechanical properties than those materials.

**Keywords:** Composite material, Prawn shell powder, Grand stone- lapatoxy resin and hardener, strength of composite materials.

Paper ID: ICON-236

## Experimental Investigation of Mechanical Properties of Ramie, Areca and Jute Fiber Reinforced Composites

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**Abstract:** This study investigates the mechanical properties and performance of Ramie, Areca and Jute fiber reinforced composites. The composites were fabricated using a hand lay-up method. The resin used in this study are epoxy. The mechanical tests like tensile, impact and hardness tests will be used to find the mechanical properties and performance of NFRC'S. According to ASTM [American Society for Testing and Materials] standards the mechanical tests are followed. This research contributes to the development of eco-friendly composite materials that align with current sustainability goals. The synthetic fibers non -degradable and more expensive. By using the Areca, Ramie and Jute fiber reinforced composite materials we can overcome the drawbacks of synthetic fibers. Including **tensile strength, impact resistance** among them, each fiber type was combined with a polymer matrix through hand lay-up and compression molding techniques to fabricate composite samples.

**Keywords:** Natural fiber composites, Ramie fiber, Areca fiber, Jute fiber, Mechanical properties, Hardness strength, Tensile strength, Impact resistance, Epoxy resin

Paper ID: ICON-238

# Mechanical, Microstructural Characterization and Optimisation of FSAM-Processed ZE41 Mg Nanocomposite

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**Abstract:** Friction stir additive manufacturing (FSAM) enables defect-free, multi-layered builds of magnesium alloys at relatively low process temperatures, preserving fine-grained microstructures and exceptional mechanical properties. ZE41 Mg alloy, reinforced with ceramic nanoparticles (e.g., Al<sub>2</sub>O<sub>3</sub>, SiC, TiC), exhibits improved hardness, tensile strength, fatigue life, and creep resistance over conventional casting or extrusion routes. This expanded review synthesizes recent studies on FSAM of ZE41 nanocomposites, covering process–structure–property relationships, quantitative comparisons across key parameters, and emerging optimisation techniques. A comparative table highlights core findings from leading works, complete with in-cell citations. Finally, we identify critical research gaps and propose targeted future study titles.

**Keywords:** FSAM, ZE41 Mg alloy, nanocomposite, mechanical properties, microstructure, optimisation, research gaps.

Paper ID: ICON-239

# Guard Mask: Using Machine Learning To Efficiently Identify Face Mask

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**Abstract:** The COVID-19 outbreak has reaffirmed the relevance and necessity of real-time surveillance tools for protecting the health of the population. In doing so, this research presents a system for detecting face masks which is based on deep neural networks, especially Convolutional Neural Networks (CNN) and YOLO deep learning framework. Through the use of video surveillance and image processing algorithms, the number of images required to accurately identify individuals who are either wearing or not wearing a mask is significantly lowered compared to the standard mask detection approaches. The deployment focuses on sound methods for data capture, annotation and processing to enhance prediction. As a result, they achieve performance accuracy of 96%, revealing that the system is effective in controlling the spread of the virus by enabling close monitoring of people. Aiming to improve performance, future enhancements will include physical distancing metric and evaluation of several CNN architectures.

**Keywords:** COVID-19, face mask detection, deep learning, Convolutional Neural Networks, YOLO, real-time monitoring, public health.

Paper ID: ICON-240

## Plant Disease Prediction Machine Learning

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**Abstract:** The agriculture sector has faced significant challenges due to the increasing prevalence of plant diseases, leading to yield loss and economic setbacks. Automated disease detection systems leveraging advancements in computer vision and deep learning techniques offer promising solutions to address these challenges. This paper proposes a methodology for plant disease detection using Support Vector Machine (SVMs). The proposed system begins with the collection of a comprehensive dataset comprising images of healthy plants and plants affected by various diseases. Preprocessing techniques such as image augmentation and normalization are employed to enhance the dataset quality and mitigate overfitting. Subsequently, a SVM architecture is designed and trained on the dataset to learn discriminative features for accurate disease classification. The effectiveness of the proposed approach is evaluated through rigorous experimentation and performance analysis. The trained model demonstrates high accuracy, sensitivity, and specificity in detecting plant diseases across diverse species and conditions. Furthermore, the system's computational efficiency enables real-time or near-real-time deployment in agricultural settings, facilitating timely disease diagnosis and intervention. Overall, the proposed plant disease detection framework utilizing SVMs offers a reliable and scalable solution to mitigate the impact of plant diseases on agricultural productivity. By enabling early and accurate detection, this system has the potential to revolutionize crop management practices, leading to improved crop yields, reduced pesticide usage, and sustainable agricultural practices.

**Keywords:** Support Vector Machine, overfitting

Paper ID: ICON-241

## Intelligent Irrigation System with Soil Moisture Sensing and Automated Water Delivery

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**Abstract:** India continues to rely on traditional irrigation methods that are often inefficient and highly dependent on manual observation and farmer experience. These methods frequently result in water wastage and suboptimal crop yields due to varying climatic and geographical factors. To address this issue, we propose a smart and automated irrigation system capable of detecting soil moisture levels and delivering precise amounts of water to crops. The system also includes an alert mechanism through a buzzer and is controlled via a dedicated Android application. This application allows farmers to remotely monitor soil conditions and water requirements, ensuring efficient use of water resources and improved crop health. Our work focuses on designing a reliable, user-friendly solution requiring minimal human intervention. This paper details the design, implementation, and operational results of the proposed system, showcasing its potential to modernize agricultural practices in India.

**Keywords:** Smart Irrigation system, Home Gardening System, Soil Moisture Detection, Automatic Plant Watering, BuzzerSystem, Arduino, Mobile Application

Paper ID: ICON-242

## The Approval Hub for Entrepreneurs

*Abstract: In today's rapidly evolving digital landscape, organizations often face challenges managing complex, multi-level approval processes that require coordination across departments and timely responses. Manual approval systems are susceptible to delays, miscommunication, and human errors, often resulting in operational inefficiencies and poor user experience. To address these issues, we propose a streamlined, intelligent solution that automates and centralizes approval management within a digital ecosystem.*

Paper ID: ICON-243

## Identification and Prevention of Cyberattacks in Industrial Smartgrid

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*Abstract: The growing reach and deep integration of information and communication technology (ICT) tools have heightened the vulnerability of power networks to both physical and cyberattacks. A coordinated cyber-physical (CP) attack can cause greater disruption to Internet of Things (IoT)-based smart grid (SG) operations than separate physical or cyberattacks. This paper presents a coordinated CP attack design framed as a constrained optimization problem, which is solved using the Ensemble Learning algorithm. Given the increased reliance of network operations on state variables, the attack aims to maximize the deviation of the estimated state variables from their pre-attack values while concealing its effects. The physical attack design incorporates practical constraints, such as limited access to critical lines for launching the attack. The two-stage attack strategy first identifies an optimal network topology to amplify the physical attack's impact, then initiates a communication-layer attack to obscure the physical attack's consequences at the control center. As a result, the control measures to mitigate the attack's impact are not activated, potentially leading to a system shutdown. Testing the proposed scheme on IEEE 14, 30, and 57-bus benchmark power systems demonstrates its effectiveness in disrupting the state estimation (SE) process at a reduced attack cost.*

**Keywords:** Cyber-Physical Attacks (CP Attacks), Smart Grid (SG), Internet of Things (IoT), State Estimation (SE), Ensemble Learning Algorithm

Paper ID: ICON-249

## Optimizing Urban Traffic Flow with LSTM-Based Reinforcement Learning in a Secure Intelligent Transportation Framework

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**Abstract:** The increasing strain on urban environments due to excessive use of private vehicles has highlighted the need for smarter transportation solutions. This research proposes a novel paradigm within the Intelligent Transportation System (ITS), aiming to conserve fossil fuels and promote environmental sustainability. A Long Short-Term Memory (LSTM)-based intelligent learner is developed to predict areas with high demand for vehicles, thereby optimizing the deployment of public transport resources. This predictive system helps in reallocating vehicles from low-demand areas to high-demand zones, reducing unnecessary vehicle usage. This traffic data is transmitted to a cloud server via localized proximity-based clustering. In the cloud, an intelligent agent powered by reinforcement learning processes real-time traffic flow information from multiple sources to predict optimal routes for registered users. To further enhance efficiency, a dynamic scheduling algorithm is proposed, ensuring smoother operations within the complex transportation network. The proposed system has been evaluated using real-time transportation data from major cities. Experimental results demonstrate significant improvements over existing methods, achieving up to 87% increased usage of public transport. Results indicate significant improvements in traffic management, including reduced vehicle waiting time, decreased fuel consumption, and lower carbon dioxide emissions.

**Keywords:** LSTM, ultrasonic sensor, proximity services, cluster, cloud server, reinforcement learning

Paper ID: ICON-251

## Enhanced Market Basket Analysis Using Frequent Pattern Mining Techniques

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**Abstract:** This study explores the use of Exploratory Data Analysis (EDA) and the FP-Growth algorithm to extract association rules from a supermarket transactional dataset. EDA plays a crucial role in the early stages of data analysis by applying statistical methods and visual tools to examine the data, reveal trends, and spot any irregularities. In this work, EDA was used to gain insights into customer buying habits, understand item distribution, and uncover relationships between different products. Following this, the FP-Growth algorithm was used to identify frequent itemsets within the dataset. Known for its efficiency, FP-Growth constructs a compact FP-tree structure, which allows it to discover frequent patterns without generating numerous candidate sets—making it faster and more scalable than algorithms like Apriori. The algorithm was applied to transaction records, with each transaction representing a group of items bought by a customer. The objective was to uncover common combinations of items that are typically purchased together. These insights can help businesses make informed decisions around product bundling, stock management, and personalized marketing. The association rules generated through this analysis offer a deeper understanding of consumer behavior and can support strategies aimed at improving product placement, boosting sales, and enhancing overall business outcomes.

**Keywords:** Data mining, frequent pattern discovery, association rule extraction, Apriori algorithm, FP-Growth method, support metric, confidence measure.

Paper ID: ICON-252

# Mechanical and Thermal Characterization of Kevlar Fiber/Graphene/SiC/Al<sub>2</sub>O<sub>3</sub> Nanoparticles Reinforced Epoxy Composites

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**Abstract:** The incorporation of graphene, silicon carbide (SiC), and aluminum oxide (Al<sub>2</sub>O<sub>3</sub>) nanoparticles into composite matrices has led to the development of materials with enhanced mechanical, thermal, and impact properties. These hybrid composites have gained significant attention in various industries due to their exceptional performance characteristics, including high tensile strength, increased hardness, superior impact resistance, and enhanced thermal stability. This study focuses on the comparative analysis of these composites, with particular emphasis on their suitability for applications such as ballistic-resistant armor, lightweight vehicle panels, aircraft structural parts, and electronic enclosures. Despite their promising properties, challenges remain, particularly in optimizing nanoparticle ratios, improving dispersion techniques, and integrating smart sensing technologies for real-time monitoring. Furthermore, the scalability of manufacturing processes and the sustainability of these materials through effective recycling methods are critical areas requiring attention. This paper discusses the current state of research on graphene, SiC, and Al<sub>2</sub>O<sub>3</sub> nanoparticle-reinforced composites, highlights existing research gaps, and outlines future directions for development to ensure their broader application in advanced engineering sectors.

**Keywords:** Graphene-reinforced composites; SiC nanoparticles; Al<sub>2</sub>O<sub>3</sub> nanoparticles; Mechanical properties; Thermal stability; Smart composites

Paper ID: ICON-254

# Research on the model of coordinated Development between interaction design concept and visual communication design

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**Abstract:** Mobile devices are becoming ubiquitous. People take pictures via their phone cameras to explore the world on the go. In many cases, they are concerned with the picture-related information. Understanding user intent conveyed by those pictures therefore becomes important. Existing mobile applications employ visual search to connect the captured picture with the physical world. However, they only achieve limited success due to the ambiguity nature of user intent in the picture—one picture usually contains multiple objects. By taking advantage of multitouch interactions on mobile devices, this paper presents a prototype of interactive mobile visual search, named TapTell, to help users formulate their visual intent more conveniently. This kind of search leverages limited yet natural user interactions on the phone to achieve more effective visual search while maintaining a satisfying user experience. We make three contributions in this work. First, we conduct a focus study on the usage patterns and concerned factors for mobile visual search, which in turn leads to the interactive design of expressing visual intent by gesture. Second, we introduce four modes of gesture-based interactions (crop, line, lasso, and tap) and develop a mobile prototype. Third, we perform an in-depth usability evaluation on these different modes, which demonstrates the advantage of interactions and shows that lasso is the most natural and effective interaction mode. We show that TapTell provides a natural user experience to use phone camera and gesture to explore the world. Based on the observation and conclusion, we also suggest some design principles for interactive mobile visual search in the future.

Paper ID: ICON-255

# A Data-Driven Framework for Early Detection of Mental Health Decline in Students Using Behavioral Trend Analysis

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**Abstract:** Mental health challenges among students often go unnoticed until they escalate, making early detection critical. This study presents a data-driven framework that leverages self-reported behavioural trends to detect early signs of mental health decline in students. A unique survey form was designed and distributed to 17 students, capturing multidimensional behavioural data including mental exhaustion, sleep disturbances, motivation levels, emotional withdrawal, and intrusive thoughts. These qualitative responses were then mapped to numerical scores through carefully constructed frequency and Likert scale functions. Using this transformed dataset, a logistic regression for binary classification and a decision tree model to interpret the relative importance of each behavioural feature was implemented. The logistic regression model achieved a strong AUC of 1.0, while the decision tree yielded interpretable insights, despite a lower AUC. Additional statistical tests such as t-tests and chi-square analysis were used to explore significant associations between variables like emotional withdrawal and overall risk. The results reveal that specific behavioural patterns especially related to emotional regulation and social disengagement—serve as strong predictors of early mental health decline. This approach demonstrates that even with a small dataset, meaningful insights can be extracted using a thoughtful blend of psychology-informed data collection and machine learning. The framework holds potential for proactive mental health monitoring in academic institutions.

**Keywords:** Mental health, simulated dataset, Exploratory Data Analysis (EDA), Logistic Regression, Decision Trees, AI-enabled

Paper ID: ICON-256

# Intelligent Integration of IoT and Machine Learning for Enhanced Control and Monitoring in Mechanical Systems

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**Abstract:** This research investigates the synergistic integration of the Internet of Things (IoT) and machine learning techniques to augment control and monitoring capabilities in mechanical systems. As industries increasingly embrace automation and connectivity, the convergence of IoT and machine learning offers a promising avenue for optimizing the performance of mechanical systems. The study focuses on developing intelligent solutions that enhance real-time control mechanisms and provide advanced monitoring functionalities. Key aspects include the deployment of IoT sensors for data acquisition, the utilization of machine learning algorithms for predictive analytics, and the implementation of adaptive control strategies. The proposed framework aims to improve efficiency, reduce downtime, and enhance the overall reliability of mechanical systems in diverse applications. Through a comprehensive analysis of case studies and experimental validations, this research aims to contribute valuable insights into the intricate interplay between IoT, machine learning, and mechanical engineering, paving the way for the next generation of intelligent and adaptive systems.

**Keywords:** IoT; Mechanical Systems; Sensors; Machine learning; Algorithm; reliability

Paper ID: ICON-257

# Federated Learning and Deep Learning in Cloud Computing for Security

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**Abstract:** The Abstract Concerns regarding data security, privacy, and regulatory compliance have grown as a result of the growing reliance on cloud computing for data storage and processing. Due to the requirement for centralized data aggregation, traditional centralized machine learning approaches frequently expose themselves to data breaches and privacy violations. When Deep Learning (DL) and Federated Learning (FL) are combined, a robust decentralized solution that makes collaborative, secure model training without exposing raw data is made possible. This paper looks into how FL and DL work together to make cloud computing environments more secure. While maintaining the confidentiality of the data, we investigate how this integration makes real-time threat detection, intrusion prevention, and secure access control simpler. The paper also addresses important technical issues like communication latency, data heterogeneity, and adversarial attacks. Furthermore, we review advanced privacy-preserving techniques, including differential privacy and homomorphic encryption, that enhance the resilience of federated deep learning systems. We demonstrate how effectively federated deep learning safeguards cloud-based infrastructures through IoT, healthcare, and finance case studies. Building cloud ecosystems that are scalable, secure, and privacy-compliant is a promising direction, according to our findings.

**Keywords:** Federated Learning, Deep Learning, cloud computing, cloud security, data privacy, treat detection.

Paper ID: ICON-258

# Intelligent Signal Processing in IoT Network for Medical Applications

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**Abstract:** Monitoring of blood pressure becomes vital during anesthesia and other critical situation. A substantial research has been carried out to detect cardiovascular disease by analyzing the parameters such as ECG, BP, respiratory (RSP) cycle, Photoplethysmography (PPG) measurement, etc., which help in health monitoring of the patient. BP control is very significant in the lifespan of every individual. If it goes out of the boundary, then runs a risk of heart attack increases. The heart is responsible for purification and circulation of blood in the whole body by myocardium muscle. For analyzing the cardiac activity of the subject, ECG and arterial blood pressure signals are very important which are related to each other. Regular monitoring of the anaesthetic drug dosage during a surgical procedure is required to ward off the patient's inter-operative awareness but some time delay may happen and it is really serious for the patient life during anesthesia. Induced TD situation can't be analyzed using ordinary Z-transform due to fractional time delay condition which requires the emerging techniques to handle the condition effectively. Further, chaos analysis is used to find the optimal trajectory of the ECG dataset which helps in segregating the noise, distortion, noncardiac components, etc. Mean square error (MSE) and Root mean square error (RMSE) have been used for examining the output.

**Keywords:** blood pressure; heart attack; ECG; MSE; RMSE;

Paper ID: ICON-261

## Performance Analysis of Task Scheduling Algorithms in Cloud Computing Environments

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**Abstract:** Cloud computing is a technology that uses the internet (the cloud) to make computing services like databases, storage, apps, and processing power available. Instead of relying on local computers or physical machines, customers can make use of these resources at any time and from any location. They have increased the flexibility to develop and adjust. Businesses are now able to meet new demands while spending less on infrastructure and accomplishing more. Cloud computing environments require task scheduling as an essential requirement to achieve peak efficiency together with maximum performance output. This paper studies five metaheuristic algorithms namely ACO(Ant Colony Optimization), PSO(Particle Swarm Optimization), GA(Genetic Algorithm), GWO& WOA(Hybrid of Grey wolf and Whale Optimization) for task scheduling purposes. The study implements Grey Wolf Optimization in combination with Whale Optimization Algorithm to optimize energy efficiency and makespan duration as well as Quality of Service quality. The hybrid system unites the GWO algorithm's swift convergence ability with WOA's worldwide search feature to achieve better local and global exploration and exploitation control. The experimental results demonstrate the scheduled optimization achievements through the application of the developed hybrid approach.

**Keywords:** Task scheduling, Cloud computing

Paper ID: ICON-262

## Quantum-Inspired Differential Evolution: A Novel Approach for Enhanced Global Optimization

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**Abstract:** Quantum-Inspired Differential Evolution (QDE) is introduced as a novel algorithm to enhance the global optimization capabilities of classical Differential Evolution (DE). Addressing DE's challenges with premature convergence and limited exploration, QDE integrates quantum computing principles by representing individuals as qubits, allowing for superposition and increased diversity. The algorithm employs quantum rotation operators for mutation and crossover, dynamically guiding the search towards promising regions. After evolution, a measurement process extracts classical solutions for fitness evaluation. Experimental results on benchmark functions like Sphere, Rastrigin, and Ackley demonstrate that QDE achieves superior optimization performance, improved exploration, and better avoidance of local minima compared to classical DE, JADE, and standard QEA. This study highlights the potential of quantum-inspired techniques in evolutionary optimization and suggests future research into adaptive quantum strategies and real-world applications of QDE.

**Keywords:** Quantum computing, Qubits, Evolutionary Algorithm, DE

Paper ID: ICON-263

## Leaf Sense: Smart Leaf Disease Detection System

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**Abstract:** This project aims to create a machine learning solution for identifying diseases in plant leaves using ML technology. It uses sensors, image masking tools, and machine learning algorithms for assessing and monitoring the health status of plants at an interval of time. Such a system would be able to handle the worst diseases of all the plants due to advanced machine learning models with which it will be able to detect them within time, so that crop management is enhanced. Other main features include rapid disease detection, automatic alert notification, and aggregation and storage of data for analysis. This underlines the need of the agricultural society to input the idea from the old culture of farming into AI and ML-based intelligent solution. Through these, they would be in a position to come up with better decisions in relation to sustainable agriculture more so in respect to disease detection feature through the other application used on their cell phones.

**Keywords:** World Vegetation, Plant Disease, Peace and Liberty, Moscow or Siberia, Late Blight, Potatoes.

Paper ID: ICON-266

## Wi-BluSec: A Portable Multi-Protocol Wireless Security Auditing and Penetration Testing Device

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**Abstract:** In an era of increasing wireless connectivity, the need for accessible and effective security auditing tools is critical. This paper presents Wi-BluSec, a portable, multi-protocol device designed to assess and enhance the security of Wi-Fi and Bluetooth networks. Wi-BluSec integrates a range of functionalities including wireless scanning, reconnaissance, penetration testing, GPS-based data logging, and real-time traffic monitoring within a compact, standalone system. Built on a modular architecture and featuring a touchscreen-driven interface, it enables users to simulate attacks such as deauthentication floods, beacon frame spoofing, rogue access point creation, and Bluetooth spam in a controlled environment. The device also supports geolocation mapping of wireless networks via GPS integration, with persistent data storage enabled through SD card logging. Intended for cybersecurity professionals, network administrators, and academic researchers, Wi-BluSec serves as a valuable educational and operational tool, promoting a deeper understanding of wireless vulnerabilities and fostering proactive network defense strategies. The results demonstrate Wi-BluSec's capability to effectively replicate common wireless threats, enabling practical, ethical security assessments. Its open, extensible design lays the groundwork for future enhancements to meet evolving cybersecurity challenges.

**Keywords:** Wireless Security, Wi-Fi Penetration Testing, Bluetooth Vulnerabilities, Portable Security Device, Cybersecurity Education, Wireless Network Auditing

Paper ID: ICON-267

## Live Stream License Plate Detection Using GAN

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**Abstract:** In this paper, we present The Livestream License Plate Detection using GAN project is an advanced real-time vehicle surveillance system that leverages GAN for accurate car plate recognition. This system processes live video streams to detect car plates, using GAN models to enhance plate images ensuring high precision even in low-resolution or motion-blurred frames. YOLO object detection is integrated for rapid plate identification, enabling seamless recognition from dynamic video feeds. A standout feature of this system is its automatic speed detection and fine generation mechanism. By calculating vehicle speed based on time-stamped location data, the system instantly issues fines for over speeding, with amounts determined by the severity of the violation. An alert system notifies authorities of detected violations, ensuring swift action. This project offers a modern solution for traffic management, law enforcement, and public safety, combining AI-powered detection, automated fine enforcement, and real-time monitoring into a single, efficient platform.

Paper ID: ICON-268

## Automated Car Damage Recognition and Cost Estimation using CNN

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**Abstract:** This venture makes a speciality of improving automobile harm assessment performance and user enjoy via the improvement of an AI-powered net utility. The machine is designed to streamline workflows for customers via automating tasks inclusive of harm detection, severity type, and restore cost estimation. It leverages Convolutional Neural Networks (CNN) and Detectron2 to accurately discover and phase broken automobile elements, whilst offering customers with detailed results, such as envisioned restore prices derived from a predefined dataset. The application further complements performance via doing away with manual inspections, reducing processing time, and improving accuracy. constructed with Flask for backend improvement, it guarantees seamless statistics handling and scalability. ultimately, the integration of advanced AI and facts analytics improves selection-making and operational results, supplying a reliable solution for insurance automation, car services, and fleet control.

**Keywords:** Vehicle Damage Detection, Convolutional Neural Networks (CNN), Detectron2, Repair Cost Estimation, Image Preprocessing, Flask Framework, Insurance Automation.

Paper ID: ICON-269

## Multi-Agent Embedded Architecture for IoT-Based Intelligent Vehicle Networks

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**Abstract:** Integrated computation technologies, including like Internet of Things (IoT), Multi-Agent Systems (MASs), and automotive networking, can be employed to combine these principles to deliver a variety of Internet of Vehicles (IoV) applications. The main goal of this article is to show the combination of MASs with the IoT or that IoV in a novel paradigm within its Cypher Physically System (CPS) for intelligent car applications. When using MASs in conjunction with scattered computational architectures, such as IoV can achieve higher efficiency. On the other hand, however, there are fewer academic papers and fewer media study efforts with the merging of concepts such as MAS, IoT, and IoV. The suggested combination is based on knowledge, adaptability, assertivity and reactivity independently, which can be used in wireless sensor paradigms to bring new remedies. And smart products will explore new advances and diverse capacities in terms of mobility challenges. In addition, because it provides reliable, adaptable, efficient, but intelligent solutions in the automotive network, IoT offers an appropriate atmosphere for connection with MASs concepts and programs. Furthermore, the combination of MASs with IoT and cognitive conditions could result in wireless sensor solutions that are scalable, automated and intelligent. As part of the work, various limitations and problems of the suggested integrated technique are discussed, as well as possible work directions.

**Keywords:** Cross Networks; IoT; IoV; Cypher Physical System; Multi Agent System

Paper ID: ICON-271

## Design and Analysis of Wearable Fractal Antenna on Jean Substrate for Wireless Applications

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**Abstract:** Research in new antenna designs has been stimulated by the demand for thin and flexible antennas in wireless and wearable communication applications. This article addresses the design and development of a multiband fractal antenna suitable for contemporary wireless applications. The proposed antenna herein is suitable for various wireless communications standards since it can function at 3.35 GHz, 5.80 GHz, and 6.71 GHz. To provide flexibility and ruggedness and integrate smoothly with wearable and conformal devices, a denim substrate is employed. Fractal geometry provides extreme miniaturization without sacrificing radiation efficiency and impedance matching. With identical radiation characteristics over operating bands, the antenna has gain of 5.66, 4.72 and 4.41dB. Performance validation, including radiation pattern measurement, directivity, and return loss (S11), validates its application in small and multifunction wireless communication devices.

**Keywords:** Multiband antenna, fractal antenna, conformal, wireless antenna.

Paper ID: ICON-272

# AI Based Plant Disease Detection Using Live Mobile Camera

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**Abstract:** This project presents the development of a smartphone-based, AI-powered system designed to assist farmers in detecting plant diseases in real time. By leveraging deep learning techniques specifically Convolutional Neural Networks (CNN) the system analyzes images captured through a mobile device's live camera feed to accurately identify and classify plant diseases. In addition to CNN, variations such as YOLO (You Only Look Once) for real-time object detection, MobileNetV2 for lightweight and efficient classification, ResNet for deep feature extraction, and Efficient Net for optimized performance are considered to enhance detection speed and accuracy. The mobile application provides farmers with an easy-to-use interface, delivering instant feedback, disease identification, and recommended treatments. Field testing with local farmers demonstrated the system's ability to detect early-stage infections and prevent significant crop loss. This approach addresses the limitations of traditional methods that rely heavily on expert intervention and delayed diagnosis. Furthermore, the project lays the foundation for future enhancements, including IoT integration, cloud-based analytics, and voice support, and impactful solution in the evolution toward AI-driven smart agriculture.

**Keywords:** Plant Disease Detection, Convolutional Neural Network (CNN), YOLO, MobileNetV2, Res Net, Efficient Net, Real-Time Image Classification, Smartphone Application, Deep Learning, Artificial Intelligence in Agriculture

Paper ID: ICON-273

# Secure IoT Integration with Machine Learning for Seamless Wireless Communication

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**Abstract:** Traditional Radio-Frequency Systems (RFS) authentication architectures enable secure data transmission within web findings indicated that these mechanisms may not preclude an adversary from capturing hidden IDs or asymmetric encryption via the infiltrative, side channel, learning, and computer assaults. Physical Uncountable Functions (PUCF), on the other contrary, could use manufacturing system deviations to automatically detect microchips, rendering a PUCF-based system remarkably resilient and safeguard at an economical price. They provide RFS- PUCF, a deep neural network-based framework which level processes authentication of wireless nodes, by using consequences of intrinsic variability on RFS attributes of the remote controls (Tx), discovered through in-situ supervised learning at the wireless sensors (Tx). A suggested technique made use of existing asymmetric RFS communication infrastructure but does not necessitate the accumulation of any unique transistor for PUCF invention or semantic segmentation. At the gateway, Rx assumes an entire load of device identification, analogous to how a human listener's brain functions. A framework can distinguish up to 4800 transceivers with a reliability of 99.9% under differing channel quality, without any need for conventional preambles, according to experimental results, which include process performance at a predetermined 65 nm threshold voltage, as well as attributes like LO misalignment and I-Q disparity discovered using a generative model with 52 hidden nodes. A suggested technique can be utilized as a standalone safety mechanism or as an element of a biometric authentication framework.

**Keywords:** Radio Frequency Functions; Machine Learning; Internet of Things; Physical Uncountable Functions; Authentication

Paper ID: ICON-274

## A Novel Framework for Optimizing the Edge Network Node for Wearable Devices

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**Abstract:** As a new computing paradigm, edge computing emerges in various fields. Many tasks previously relied on cloud computing are distributed to various edge devices that cooperate to complete the tasks. However, circumstantial factors in the edge network become more complex than those in cloud computing. Consequently, there is instability that cannot be ignored in the cooperation between the edge devices. In this article, we propose a novel framework to optimize Edge Network (EDN), called EDN-Opt, to improve the performance of edge computing tasks. Specifically, we first define the evaluation metrics for cooperation. Next, Real datasets obtained from elderly people and their wearable sensors is used for demonstrating the performance of the proposed framework. The extensive experimentation also helps in validating the efficiency of the proposed optimization algorithm.

**Keywords:** Edge computing; wearables device; Optimization; effectiveness;

Paper ID: ICON-275

## IoT Sensor Fusion Algorithm for Real Time Applications

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**Abstract:** This work proposes an improved particle swarm optimization (PSO) method to increase the measurement precision of multi-sensors data fusion in the Internet of Things (IOT) system. Critical IOT technologies consist of a wireless sensor network, RFID, various sensors and an embedded system. For multi-sensor data fusion computing systems, data aggregation is a main concern and can be formulated as a multiple dimensional based on particle swarm optimization approaches. The proposed improved PSO method can locate the minimizing solution to the objective cost function in multiple dimensional assignment themes, which are considered in particle swarm initiation, cross rules and mutation rules. The optimum seclusion can be searched for efficiently with respect to reducing the search range through validated candidate measures. Experimental results demonstrate that the proposed improved PSO method for multi-sensor data fusion is highly feasible for IOT system applications.

**Keywords:** Multi-sensors; data fusion; PSO; RFID; IOT system

Paper ID: ICON-281

## Intelligent CKD Detection: Integrating IoT, Cloud Computing, and Big Data in Healthcare System

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**Abstract:** Chronic Kidney Disease (CKD) is a pressing global health challenge that requires precise and early diagnosis. To address this, CKD-Predict employs machine learning models like Random Forest and XGBoost to deliver accurate risk assessments. The system prioritizes thorough data processing, including handling missing values, using the CKD dataset to ensure reliability. A Flask-powered web platform offers medical professionals an intuitive interface for real-time predictions. The tool's dynamic machine learning model evolves over time, enhancing accuracy as new data is integrated. By enabling early identification of at-risk patients, CKD-Predict supports timely medical intervention, improving treatment strategies and patient outcomes. Designed to process data efficiently and generate practical insights, this adaptable solution equips healthcare providers with a scalable resource to combat CKD globally, fostering better patient care and quality of life.

Paper ID: ICON-282

## Imidazolium Ionic Liquid with Graphene and Graphene Oxide for Water Splitting Applications: A DFT Study

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**Abstract:** The synergistic effect between ionic liquid-graphene (IL-G) and ionic liquid-graphene oxide (IL-GO) systems were investigated for their potential application as catalysts for water splitting, using Density Functional Theory (DFT) at the B3LYP/6-31G(d,p) level in the gas phase. We calculated the interaction energy (IE) and HOMO-LUMO gap for both systems. The interaction analysis reveals that the IL-G system exhibits an interaction distance of 3.439 Å between the ionic liquid and graphene, while the IL-GO system shows a shorter interaction distance of 2.344 Å, indicating the presence of a strong hydrogen bond in the latter. The calculated binding energy for IL-GO is significantly more favourable as -15.47 kcal/mol, compared to -0.731 kcal/mol for IL-G, suggesting stronger binding in the IL-GO complex. Furthermore, the IL-GO system exhibits a lower HOMO-LUMO gap (0.302 eV) than IL-G (0.819 eV), indicating improved light absorption potential in the visible region. Global reactivity descriptors also support the superior reactivity of the IL-GO system, with lower hardness (0.15 eV) and higher softness (1.41 eV<sup>-1</sup>) relative to IL-G. Mulliken charge and Natural Bond Orbital (NBO) analyses confirm enhanced charge transfer in the IL-GO complex. These findings highlight the critical role of oxygen-containing functional groups in graphene oxide in enhancing photocatalytic performance, making the IL-GO system a promising platform for water-splitting applications.

**Keywords:** DFT, Imidazolium Ionic liquid, Graphene, Graphene oxide, Water splitting, FMO.

Paper ID: ICON-285

## Smart Mess Management System: An Innovative Solution to Reduce Food Waste in Hostels

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**Abstract:** The Smart Mess Management System aims to reduce food wastage in college hostels and canteens through a digital meal pre-booking platform integrated with an automated vending machine. Students must book meals at least 2.5 hours in advance—day scholars with online payment and hostel students without, as their meals are fee-covered. During collection, students authenticate via transaction ID or roll number on the vending machine, which dispenses the pre-booked meal. A penalty system discourages repeated no-shows by tracking attendance and applying restrictions after two missed pickups. This system ensures meals are prepared and distributed based on actual demand, reducing excess food and manual effort. By combining pre-booking, automation, and accountability, it promotes efficient, sustainable mess operations and enhances the overall dining experience in educational institutions.

**Keywords:** Smart Vending Machine, IoT-Based Automation, ESP32, Contactless Payment Integration

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## A Comparative Study on Fire Fighting Vehicle Performance for Metropolitan and Industrial Fire Management

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**Abstract:** Fire fighting vehicles are essential for rapid fire suppression in urban and industrial settings, where operational demands differ significantly. Urban vehicles prioritize maneuverability and quick response in dense environments, while industrial vehicles require high-capacity systems for hazardous and large-scale fires. Design parameters such as pump efficiency, mobility, and equipment specialization directly influence performance. This paper presents a comparative analysis of fire fighting vehicle performance across metropolitan and industrial applications. Key metrics like response time, operational efficiency, and technological integration are evaluated. The study aims to guide future design enhancements and strategic deployment for improved fire management outcomes.

Paper ID: ICON-290

## IoT-Based Real-Time Temperature and Humidity Monitoring System for Perishable Goods Using ESP32 and Blynk

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**Abstract:** Maintaining the right temperature and humidity levels is crucial when storing or transporting perishable items like food or medicine. This project introduces a smart, IoT-based monitoring system designed to tackle this challenge using an ESP32 microcontroller and a DHT22 sensor. The system continuously measures temperature and humidity, displays the data on an LCD screen, and transmits it in real time to a mobile app through the Blynk platform. Users can remotely view the conditions and set a temperature threshold via the app. If the temperature rises above this threshold, a buzzer alert is triggered, and the system sends a push notification to the user's phone. This solution is cost-effective, easy to deploy, and ideal for improving the safety and reliability of cold chain logistics and storage environments.

**Keywords:** Temperature, Humidity, DHT22, ESP32, Blynk, Cold Chain Logistics

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## Efficient E-commerce and Inventory Management System using Web Technologies

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**Abstract:** Inventory management is the backbone of efficient warehouse operations in modern e-commerce platforms. This paper presents a web-based warehouse management system that enables real-time product stock tracking, low-stock alerting, and dual-role access for both warehouse administrators and customers. Developed using HTML, JavaScript, and Bootstrap, and powered by localStorage for persistent data handling, the system allows warehouse owners to create, edit, and delete product entries while maintaining stock levels. Customers can browse available products and place orders with built-in quantity validation to prevent errors and stock mismatches. A key feature is the dynamic tracking of product quantities and serial numbers, ensuring consistent data flow across admin and user interfaces. This lightweight, browser-based solution is especially suited for small to medium-scale operations needing efficient inventory oversight without relying on external databases.

**Keywords:** Inventory Management, Stock Tracking, Web Application, Admin Dashboard, LocalStorage, E-commerce

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## Real-Time Bus Tracking and Arrival Prediction System with Web Interface

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**Abstract:** Public transportation is essential for daily commuting, but unnecessary waiting often leads to time wastage, especially for students. This study presents a web-based system integrated with Google Maps to display real-time bus locations and routes. Users can conveniently access live updates, schedules, and routes from any location via the internet. A QR code scanning feature at bus stops further enhances accessibility by allowing instant access to bus information. This system improves visibility into public transit, helping users plan their journeys more efficiently. The integration of live tracking and QR technology offers a user-friendly, comprehensive solution to reduce wait times.

Paper ID: ICON-294

## Bridging the Society-Government Gap an Intelligent Chatbot Solution by using Machine Learning

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**Abstract:** In an era dominated by digital connectivity, the role of technology in facilitating transparent communication between citizens and government entities is crucial. This project focuses on developing an intelligent chatbot to enhance citizen engagement by providing accessible information on government schemes and eligibility criteria. The chatbot will serve as a user-friendly platform, offering comprehensive details on various programs and dynamically assessing users' eligibility through embedding models of machine learning which is used for doing the scheme searches. The intuitive interface and diverse scenario handling will ensure a seamless experience for citizens, allowing them to navigate and interact effortlessly. Additionally, the chatbot will employ engagement strategies such as personalized recommendations to keep citizens informed and connected with relevant government initiatives. This initiative aims to bridge the gap between the government and the public, promoting transparency and fostering a digitally connected and informed society.

**Keywords:** Machine learning, Chat Bot, Government Scheme, Digital, Citizen

Paper ID: ICON-296

## Brake Pad Coating to Enhance the Wear Rate with AI Assisted

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**Abstract:** Brake pads are crucial components in automotive braking systems, yet they are prone to significant wear due to continuous friction during operation. Improving the wear resistance of brake pads is essential to enhance performance, extend service life, and reduce maintenance costs. This research investigates the application of metallic coatings to commercially available brake pads to mitigate wear. Metals such as chromium, nickel, and cobalt alloys were deposited using advanced surface coating techniques to form a protective layer. To efficiently optimize the choice of coating materials and process parameters, an AI-assisted model was developed. Machine learning algorithms, including Random Forest and Support Vector Machines (SVM), were trained on experimental data to predict wear behavior under various conditions. The AI system identified optimal coatings that provided superior wear resistance without compromising braking efficiency. Experimental validation confirmed the predictions, showing a significant reduction in wear rates. This study demonstrates that integrating AI with material science can streamline the design of high-performance brake pads, offering a smarter, faster, and more sustainable approach to developing future braking systems with enhanced durability and safety.

**Keywords:** Brake Pad, Metal Coatings, AI-Assisted Optimization, Machine Learning, Surface Engineering

Paper ID: ICON-298

## Development and Evaluation of Sustainable Rice Husk/Glass Fiber Composites for Industrial Applications

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**Abstract:** This study investigates the mechanical and thermal properties of composite materials synthesized from chopped glass fiber and rice husk, incorporating varying percentages (0.5%, 1%, and 1.5%) of rice husk, along with epoxy resin and 1% graphene oxide. The hand lay-up technique was employed for the fabrication of these composites. The resulting materials were characterized using Fourier Transform Infrared Spectroscopy (FTIR) to analyze the chemical structure, X-ray Diffraction (XRD) for crystallinity assessment, Thermogravimetric Analysis (TGA) to evaluate thermal stability, and wear tests to determine wear resistance. The findings indicate that the incorporation of rice husk and graphene oxide significantly enhances the mechanical properties and thermal stability of the epoxy resin matrix, suggesting a promising approach for developing sustainable composite materials with improved performance.

**Keywords:** materials, epoxy resin, glass fiber, rice husk, graphene oxide, mechanical properties, thermal stability, wear resistance.

Paper ID: ICON-300

## Enhancing Mechanical Performance of Bagasse Composites with Glass Fiber Reinforcement and Alkali Treatment

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**Abstract:** This study investigates the enhancement of mechanical properties in bagasse-based composites through the incorporation of glass fiber reinforcement and alkali treatment. Bagasse, a by-product of sugarcane, is a widely available natural fiber with potential as a reinforcement material in composite fabrication. Glass fibers, known for their high strength and stiffness, were used as a secondary reinforcement to improve the overall mechanical properties. Additionally, alkali treatment (NaOH) was applied to the bagasse fibers to enhance their compatibility with the epoxy matrix and improve interfacial bonding. The composites were fabricated using the hand lay-up technique, and the mechanical properties were evaluated in terms of tensile strength, flexural strength, and impact resistance. The results showed that the alkali-treated bagasse composites with glass fiber reinforcement exhibited superior mechanical performance compared to untreated bagasse composites. The study suggests that the combined use of alkali-treated bagasse fibers and glass fiber reinforcement can be an effective method for improving the performance of natural fiber composites, making them suitable for applications in automotive, construction, and other industries.

**Keywords:** Bagasse, glass fiber, alkali treatment, composite materials, mechanical properties, reinforcement, epoxy matrix, hand lay-up technique.

Paper ID: ICON-307

## An Automobile Air Pollution Monitoring System using Machine Learning

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**Abstract:** In today's world, most of the population travels by motor vehicle to reach their destination. The pollutants released by these motor vehicles will increase the level of pollution in the environment. PM2.5, PM10, and NO, NO2, NOx, NH3, CO, SO2, O3, Benzene, Toluene, and Xylene are the primary defilements. Individuals genuinely must know the degree of contamination in their environmental factors and make a stride towards battling against it. In this paper, the Random Forest classifier, the Cat Boost Classifier, Logistic Regression, and the Decision Tree Classifier are used to train the data set. The poison level in the climate is addressed by the information here. This system predicts whether the air is polluted or not based on the values contained in the dataset.

**Keywords:** Random Forest Classifier, Decision Tree classifier, Cat Boost classifier, Logistic Regression classifier, Particle matter.

Paper ID: ICON-309

## Vision Transformer-Based Approach for Abnormality Detection in Wireless Capsule Endoscopy

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**Abstract:** In recent years, the integration of advanced deep learning architectures has significantly improved the performance of image classification systems. This project proposes a novel hybrid deep learning framework that combines Convolutional Neural Networks (CNN), Vision Transformers (ViT), and Long Short - Term Memory (LSTM) networks to enhance feature extraction, representation, and classification of visual data. These heterogeneous feature vectors are concatenated and further refined through an LSTM network that learns sequential feature dependencies. The final classification is performed using a fully connected layer followed by softmax activation. Experimental evaluations demonstrate that this integrated approach yields high classification accuracy and improved generalization across diverse datasets. The proposed architecture is particularly well-suited for complex image classification tasks in fields such as medical imaging, surveillance.

**Keywords:** Wireless capsule endoscopy, abnormalities detection, accuracy

Paper ID: ICON-313

## Quantum Machine Learning and Post-Quantum Cryptography Powered Digital Twins for Real-Time Banking System Security

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**Abstract:** In the fast-changing digital banking era, security is a top priority because of increasing cyber threat sophistication and the looming threat of quantum computing. This paper introduces a new quantum-secure digital twin framework for securing real-time banking systems, incorporating digital twin technology, edge computing, quantum machine learning (QML), and post-quantum cryptography (PQC). The process includes ongoing real-time data gathering from banking systems for building a dynamic digital twin that is used for simulation and threat analysis. Edge computing provides localized and low-latency threat detection through the use of QML algorithms, while PQC protects sensitive information against quantum attacks. Adaptive responses and a learning feedback loop are used in the system to provide it with improving resilience. All this makes the system greatly improve fraud detection, risk prediction, and security simulations. The model proposed guarantees security of data, quick response to anomalies, and readiness for potential quantum-era issues, making it a strong and secure banking system.

**Keywords:** Digital Twin, Banking Security, Quantum Machine Learning (QML), Edge Computing, Post-Quantum Cryptography (PQC), Anomaly Detection, Real-Time Threat Detection, Adaptive Security, Cyber security, Financial Technology

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100	ICON-238	Swetha	MECH	VFSTR Univesity	Andhra pradesh	India
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102	ICON-240	Vishwa K	ECE	Vaigai College of Engineering	TAMILNADU	India
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106	ICON-249	NITHYA.M	IT	M kumarasamy college of engineering	TAMIL NADU	INDIA
107	ICON-251	Sangeetha	CSE	Velammal College Engineering and Technology	Tamilnadu	INDIA
108	ICON-252	Muniranjith Kumar , Jyothi	Mech	VFSTR Univesity	Andhra Pradesh	India
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119	ICON-268	Amesh	CSE	K L N COLLEGE OF ENGINEERING	Tamil Nadu	India
120	ICON-269	PRASATH	ECE	K L N COLLEGE OF ENGINEERING	Tamil Nadu	India
121	ICON-271	SAMPATH	ECE	Chennai Institute of Technology	Tamil Nadu	India

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125	ICON-275	Dhivya	CSE	K L N COLLEGE OF ENGINEERING	Tamilnadu	India
126	ICON-281	VISHVA SRUTHI	CSE	K L N COLLEGE OF ENGINEERING	TAMILNADU	INDIA
127	ICON-282	Dr. Srinivasadesikan Venkatesan	Chemistry	VFSTR Univesity	Andhra Pradesh	India
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129	ICON-289	DHEERAJ METHUN	ECE	K L N COLLEGE OF ENGINEERING	Tamilnadu	India
130	ICON-290	ABIJITH	ECE	K L N COLLEGE OF ENGINEERING	TAMILNADU	INDIA
131	ICON-291	Jai Ashik Ram	ECE	K L N COLLEGE OF ENGINEERING	Tamilnadu	India
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138	ICON-307	Venkata Charan	AIML	kalasalingam university	A.P	India
139	ICON-309	D.MANGALA JOTHI	ECE	Mangayarkarasi college of engineering	Tamil Nadu	India
140	ICON-313	CIBISTHA	CSE	K.L.N. College of Engineering, Pottapalayam, Sivagangai	Tamil Nadu	India

## **ABOUT INSTITUTION**

SRM Madurai College for Engineering and Technology is another milestone division of SRM Group of Educational Institutions. This initiative has a team of Highly Qualified, well-experienced, and Committed Faculty chosen from both Academic and Industrial backgrounds. It aims at providing world-class education through its state-of-the-art infrastructure to produce Competent Professionals of global standards with ennobling characteristic traits to uplift and serve humankind.

## **ABOUT THE CONFERENCE**

The Two-Day Hybrid International Conference titled "Engineering Horizons: Innovation, Advancements, and Sustainability (ICON: EHIAS'25)" was conducted by SRM Madurai College for Engineering and Technology (SRM MCET) on 16 - 17 May, 2025. This distinguished global event brought together Researchers, Academicians, Industry Professionals, and Scholars from a wide spectrum of Engineering Disciplines to deliberate on innovative solutions to contemporary challenges, with a strong emphasis on sustainable development. Centered around the theme "Embracing Diversity, Innovation, and Sustainability," the conference served as a vibrant platform for interdisciplinary engagement and scholarly exchange. It facilitated the dissemination of forward-thinking research, fostered cross-sector collaboration, and provided critical insights aligned with emerging trends in technological innovation, digital transformation, and socially responsible engineering practices.

## **EHIAS'25 OBJECTIVES**

To,

- Facilitate technology transfer and commercialization.
- Encourage interdisciplinary collaboration for solving complex challenges.
- Showcase cutting-edge technologies and design methodologies. Explore sustainable practices in engineering and materials.
- Discuss ethical and social considerations of engineering progress.
- Strengthen ties between academia and industry.
- Highlight solutions for global engineering challenges. Advance digital twin and simulation applications.
- Create an Impact through Networking & Communications.