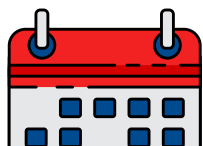




2nd Edition
INTERNATIONAL CONFERENCE ON

ADVANCEMENTS IN SCIENCE, ENGINEERING & TECHNOLOGY

ICASET 2026



**25-26
APRIL
2026**

ISBN NO:978-81-987389-3-6



978-81-987389-3-6

PROCEEDINGS
[ABSTRACTS]

ABOUT THE INSTITUTION

Ahalia School of Engineering & Technology (ASET), Palakkad, is a premier institution committed to excellence in technical education and research. Established in 2012, the institution is approved by the All India Council for Technical Education (AICTE) and affiliated with A. P. J. Abdul Kalam Technological University, Kerala. Located in the serene Ahalia Health, Heritage and Knowledge Village, the institution provides a conducive environment for academic learning, innovation, and holistic development. ASET is an ISO 9001:2015 certified institution, reflecting its commitment to quality education and continuous improvement. The institution has been accredited by the National Assessment and Accreditation Council (NAAC) in 2023, and the B.Tech programmes in Computer Science & Engineering and Electronics & Communication Engineering are accredited by the National Board of Accreditation (NBA) from January 2026, signifying adherence to high academic and professional standards. ASET offers a range of undergraduate programmes in engineering including Civil Engineering, Computer Science and Engineering, Electronics and Communication Engineering, Electrical and Electronics Engineering, Mechanical Engineering, and emerging areas such as Artificial Intelligence and Machine Learning. The institution also promotes research, industry interaction, and innovation-driven learning. With a strong emphasis on academic excellence, ethical values, and societal responsibility, ASET strives to develop competent professionals capable of addressing global challenges and contributing to technological advancement.

ABOUT ICASET 2026

The *International Conference on Advancements in Science, Engineering & Technology (ICASET 2026)* is a premier academic event organized by Ahalia School of Engineering & Technology, Palakkad, aimed at bringing together researchers, academicians, industry professionals, and students from across the globe to share and exchange knowledge in emerging areas of science, engineering, and technology. ICASET 2026 serves as a multidisciplinary platform for presenting innovative research findings, discussing contemporary challenges, and exploring future directions in various domains of engineering and applied sciences. The conference encompasses a wide spectrum of tracks including Civil Engineering, Computer Science & Engineering, Electronics & Communication Engineering, Electrical & Electronics Engineering, Mechanical Engineering, and other interdisciplinary fields. The conference features keynote addresses by distinguished experts, technical paper presentations, and interactive sessions that foster collaboration and intellectual exchange. All submitted papers undergo a rigorous peer-review process to ensure quality and relevance, and the accepted papers included in this proceedings volume reflect significant contributions to research and innovation. ICASET 2026 aims to promote research culture, strengthen academia-industry interaction, and provide a platform for young researchers to showcase their work. The conference is expected to inspire new ideas, encourage collaborative efforts, and contribute to the advancement of science and technology for societal benefit.

MESSAGE FROM THE PRINCIPAL

It is a matter of great pride and satisfaction to present the proceedings of the ***International Conference on Advancements in Science, Engineering & Technology (ICASET 2026)*** organized by Ahalia School of Engineering & Technology.

ICASET 2026 serves as a significant platform for researchers, academicians, industry experts, and students to disseminate their findings, exchange innovative ideas, and engage in meaningful discussions on emerging trends in science, engineering, and technology. The diverse range of papers included in this volume reflects the depth of research and the commitment of the contributors towards advancing knowledge in their respective fields.

I am confident that this compilation of scholarly works will serve as a valuable reference for researchers and practitioners, and will inspire further innovations and collaborations.

I extend my heartfelt appreciation to all authors for their valuable contributions, the reviewers for their meticulous evaluation, and the organizing committee for their dedicated efforts in bringing out this proceedings volume successfully.

I congratulate everyone involved and wish ICASET 2026 continued success in the years to come.



Dr. P R SURESH

Principal

Ahalia School of Engineering & Technology

Palakkad

ICASET 2026

INTERNATIONAL CONFERENCE ON
ADVANCEMENTS IN SCIENCE,
ENGINEERING & TECHNOLOGY 2026

**25th April
2026**



09.15 AM



VISVESVARAYA HALL



Dr. Arvind Ajoy

Dean ICSR, IIT Palakkad



**INSTITUTION'S
INNOVATION
COUNCIL**

(Ministry of HRD Initiative)

ICASET 2026

INTERNATIONAL CONFERENCE ON ADVANCEMENTS IN SCIENCE, ENGINEERING & TECHNOLOGY 2026

KEY NOTE SPEAKERS



Topic: "Driving Creativity for Innovation"

Nisha Nair

Clinical Associate Professor of Business Administration
University of Pittsburgh



25-04-2026, 10.00 am



Topic: "The Rise of AI Engineers: From Coders to System Thinkers".

Roji Philip

Sr. Director, AI & Automation
Speridian Technologies, Mumbai



25-04-2026, 11.00 am



Topic: "Trends in automotive electronics and embedded system"

Shamin Dudu

Section Head and Technical director
Bosch Global Software and Technologies Pvt Ltd
Bangalore



25-04-2026, 11.35 am



All keynote sessions will be held in online mode via Google Meet.

Organising Committee – ICASET 2026

Patron

- Dr. V. S. Gopal, Chairman, Ahalia Group

Conference Chair

- Dr. P. R. Suresh, Principal, ASET

Conference Co-Chair

- Dr. Krishna Kumar Kishor, Vice Principal, ASET & Executive Director, Ahalia Group

Department Conveners

- Dr. V. Balamurugan – Professor & Head, ECE
- Dr. C. Pradip – Professor & Head, EEE
- Dr. Bhavin K Bharath – Professor & Head, ME
- Dr. S. Gunasekaran – Professor & Head, CSE
- Dr. Mathew B. V. – Professor & Head, CE
- Mr. Sundar V – Professor & Head, AIML

Executive Conveners

- Dr. Rajeev N – Dean Academics
- Dr. Binoy Balan K – Professor & Head, S&H

Department Conference Coordinators

- Dr. Reshmi B – Associate Professor, CSE
- Mr. Manickavasagam A – Assistant Professor, EEE
- Mr. Jishnoop J – Assistant Professor, ME
- Dr. Aneesh K – Associate Professor, ECE
- Mr. Jayakrishnan R – Assistant Professor, CE
- Mrs. Reshma P. K – Assistant Professor, AIML

Publication & IT Support

- Mr. Lal S – Librarian
- Ms. Amrita Devadasan – Assistant Professor, CSE

International Advisory Committee

- Dr. Zakariya Kaneesamkandi – King Saud University, KSA
- Prof. Dr. Afsin GUNGOR – Akdeniz University, Turkey
- Dr. Mathew T Mathew – University of Illinois, Chicago, USA

- Dr. Narayanan Neithalath – Arizona State University, USA

National Advisory Committee

- Dr. Arun P – NIT Calicut
- Dr. Vinay Panicker – NIT Calicut
- Dr. Shanthakumar Mohan – IIT Palakkad
- Dr. N. Sendhil Kumar – NIT Puducherry
- Dr. A. M. Pradeep – IIT Bombay
- Dr. S. Murugan – NIT Rourkela
- Dr. Kiran Vijayan – IIT Kharagpur
- Dr. A. V. Prajeesh – VIT Vellore
- Dr. Vipin B – IIT Madras
- Dr. Santosh G. Thampi – NIT Calicut
- Dr. Kumaravel S – NIT Calicut
- Dr. J. Christopher Clement – VIT Vellore

Track Chair/In-Charge

Track	Discipline	Track Chair / In-Charge	Designation & Affiliation	
Track 1	Civil Engineering	Dr. Surya S S	Asistant Professor, Department of Civil Engineering, NSS College of Engineering, Palakkad	
Track 2	Computer Science & Engineering	Dr. Maya Mohan	Associate Professor, Department of Computer Science and Engineering NSS College of Engineering, Palakkad	
		Dr. Geethu Mary George,	HoD, Department of Computer Science & Engineering (Cyber Security), Jyothi Engineering College.	
Track 3	Electronics & Communication Engineering (ECE)	Dr. Sajitha A S	Associate Professor, Department of AI & DS Jyothi Engineering College, Thrissur	
Track 4	Electrical & Electronics Engineering (EEE)	Dr. Sujith S	Professor, Department of EEE NSS College of Engineering, Palakkad	
Track 5	Mechanical Engineering (ME)	Dr. B. Santhosh	Associate Professor, Department of Mechanical Engineering Amrita School of Engineering, Coimbatore	

Track 6	Others	Dr. E K Girisan	Dean, IQAC Head – Department of Computer Technology Sri Krishna Adithya College, Coimbatore Hon. Secretary – CSI, Coimbatore Chapter	
----------------	--------	-----------------	---	---

S.No	Abstract No.	Title	Authors	Page No.
CIVIL ENGINEERING				
1	CE-01	Performance Evaluation of a Multi-Media Filtration System for Household Greywater Reuse	Dr. B V Mathew, Neethu John; Greeshma K, Shahina K, Nitin Jitenderji C (BTech Students)	1
2	CE-02	Use of Near Surface Mounted and Externally Bonded Techniques for Structural Upgrading of Building	Sreya K S; Aswathy V, Akash B, Anushwal Krishna S, Anurudh R	1–2
3	CE-03	Traffic Congestion Mitigation and Signal Optimization in Palakkad Town	Jayakrishnan R; Aiswarya K, Ajanya R, Hrithika R, Niranjan R P	2
4	CE-04	Defluoridation of Water Using Electrocoagulation	Thejaswi S; Bhavana Prahladh, Sreeraghav	2–3
5	CE-05	Composite Gypsum Boards Reinforced with Agro-Industrial Wastes	Ayana S Devan; Akhil M, Akshaya Krishnan M, Rohith M, Akhil Krishnan MK	3
6	CE-06	Life Cycle Analysis of Pavement in Kanjikode Industrial Area for Next 15 Years	Vidhun N; Sulfath H, Nifa Thaslim M, Basudev P D	4
7	CE-07	Catalytic Pyrolysis of Polypropylene Using Eggshell-Derived CaO: Effect of Catalyst Loading on Fuel Yield and Quality	Vimal Raj J	4–5
8	CE-08	Performance Evaluation of an Integrated Ultrafiltration–Reverse Osmosis System for Municipal Wastewater Reuse in Industrial Applications	Vignesh S	5
9	CE-09	Flow modelling of aquifer for tracing out of contaminants in karst topography	Pradeepa F, Kavisri Manikannan M	5–6
COMPUTER SCIENCE & ENGINEERING				
10	CSE-01	PreviDict: An AI-Based Framework for Pre-Upload View Prediction and Content Optimization of YouTube Shorts	Javhara Sherin V; Anupama K T, Navarang S Manoj, Yash Krishna K P, Aswani N M, Arya A Surya	6–7
11	CSE-02	Integrating Human Activity Recognition and Affective Computing for Elderly Well-Being: A Comprehensive Review	Dona Maria Mani	7
12	CSE-03	Sustainable Route Planning in Maritime Transport Using Machine Learning: A Comprehensive Review	Aneesha K Jose	7–8

13	CSE-04	LURNZO: An AI-Based Technology Learning Platform	Lamiya Fathima; Ayisha Najiya P, Fathima Fidha C P, Sameeha T, Ruby Fathima A C	8
14	CSE-05	ASTHRA: An Adaptive AI Framework for Automated Bulk Document Synthesis	Midhun M; Dr. Reshmi B, Nithya S, Rithin B	9
15	CSE-06	Real-Time College Bus Tracking and Route Assistance System (BusMate)	Anagha S Anil; Aneeta P, Nandana R, Aiswarya K V, Dhanya P G	10
16	CSE-07	HealHer: Web Platform for PCOS/PCOD Risk Assessment & AI Health Assistance	Hareeshna T G; Amritha Devadasan, Ann Milena J, Diya Krishna M D, Teertha K K	10–11
17	CSE-08	Data Analysis with Generative AI: The D-Studio	CP Vishnu Subramanian; Atul Karthick CK, Naveen S	11
18	CSE-09	AI-Based Skin Disease Detection Using CNN	Neha U; Anisree P G, Nandhagopan M S, Prathyush P Nambiar, Muhammad Sahil K	11–12
19	CSE-10	Web App Security Analyzer with AI Framework	Nivedh V; Kavitha S, Milan Krishna, Kassim Noushin N	12
20	CSE-11	Breach Checker	Anirudh G Menon; Rishika, Hidhun Babu, Sreedev K A	12–13
21	CSE-12	Smart Vision: AI-Based Face Recognition Attendance System	Arjun Sunil; Harikrishna S, Sharon Manoj, Sukesh R	13
22	CSE-13	Skin Conseiller: Personalized Skincare for Indian Skin	Dhanya P; Amrita CJ, Sreelaya S, Varuna Varma V	13–14
23	CSE-14	Hybrid Post-Quantum Key Encapsulation for Mobile Messaging	Ajay M; Dhananjay Krishna S, R Gautham Krishna, Aswathy A	14
24	CSE-15	Explainable AI-Based Real-Time Phishing Detection	Nithya R; Alzeena A, Asha K, Riya Lakshmi S, Dr. Reshmi B, Dr. Gunasekaran S	14–16
25	CSE-16	Smart College Navigation System	Sreehari Athiyarath; Abhiram R, Mohammed Sanjiddh S, Ajuwad B	16

26	CSE-17	AI-Assisted UI Builder Reducing Design Ambiguity	Abhiram K; Vishnu VS, Poojitha S, Somya Ranjan Mohanty	16–17
27	CSE-18	AI Debugging Assistant using OCR & Local LLMs	D Haritha; Dharshin R, Afreen Yusaf, Keerthana Mohan	17
28	CSE-19	Rubik's Cube Solver Using Computer Vision & OpenCV	Sayuj S; Rahul R, Bholu Kumar D, Hashim E H	17–18
29	CSE-20	ImpactMatch: AI-Driven Volunteer Platform	Pavithra M; Sneha G, Asitha R Prajith, M Nisthula	18
30	CSE-21	Civic Fix: Digital Platform for Civic Grievance Management	Smrithi G Iyer; Muhammed Sherif I, N P Prajwalitha, Sreenish S	18–19
31	CSE-22	AI-Based Smart Interview Performance Analyzer	Saniya Fathima A; Anjal S, Afrah Fathima R, Varsha G	19
32	CSE-23	Automatic Exam Hall Seating Arrangement Using AI	Arya P M; Lidhin M, Neethu Suresh, Thansil Thanish K S	19
33	CSE-24	AI-Orchestrated Digital Fabrication Workflow	H A Rahulnath; Sumesh Balan	19–20
34	CSE-25	AI-BASED IMAGE AUTHENTICITY DETECTION SYSTEM	Akshaya M; Deepthy PS, Aryananda P, Sriparvathy C, Sayana V	20
35	CSE-26	YouTube Sentiment Analyzer using NLP	Gopika B; Aswan K Prakash, Nivedh A Nair, Rithu P	20–21
36	CSE-27	Lost and Found System	Adarsh A; Athul Krishna K, Midhun T Chandran	21
37	CSE-28	AI-Based Exam Evaluation System	Adhip Suresh; Sreeyesh Sunil Kumar, Abhijith PG, Mithun Yuvanah G	21–22
38	CSE-29	Smart Learn AI: Intelligent Study Assistant	Pranav Krishnan S; Nandana TA, Nikhil C, Sreeshankar KS	22–23
39	CSE-30	Personalized AI Chatbot for KTU CSE Students	Iffah Hussainbi S; Nasiba Rahana S, Arjitha A, Nikitha Jayan Nair	23
40	CSE-31	Realtime Collaborative Code Editor	Mrinal V; Midhun V, Mohammed Shahal A, Navaneeth Krishna M M	23–24
ELECTRONICS & COMMUNICATION ENGINEERING				

41	ECE-01	Brain Tumor Detection Using Multimodal MRI Scans with Deep Learning and Edge AI	Pooja P Menon; Subiksha S; Nikhil V; Mohammed Haddiq S; Dr. Leesha Paul; Dr. V. Balamurugan	24
42	ECE-02	Design and FPGA Implementation of a 32-bit RISC Processor Using Verilog HDL	Arya P R; Ashrin A; Athish R; Chaithra K C; Dr. Aneesh K; Dr. V. Balamurugan	24–25
43	ECE-03	A Compact Clover-Shaped Slot-Loaded Microstrip Patch Antenna for Sub-6 GHz Applications	Nandana N; Dr. V. Balamurugan; Mr. Sanish VS; Rijul R Das; Shakira U; Sivani PS	25
44	ECE-04	CATRON: A Cable Tunnel Inspection Robot	Dhanush P; Arya Sasikumar; Gowthami S; Mahitha M; Dr. V. Balamurugan; Swetha C	25–26
45	ECE-05	VLSI Architecture for Video Edge Detection	Aditya Kiran S R; Anirudh Sreejithesh; Ashik M; Jishnu R; Gayathri P S; Dr. V. Balamurugan	26
46	ECE-06	AI Powered Robot for Microplastic Detection and Extraction	Sreerag P; Sanu C S; Swetha R; Thripthi M; Ms. Vijitha Khan; Dr. V. Balamurugan	26–27
47	ECE-07	AI Powered Laser-Based Autonomous Rover for Weed Detection and Removal	Sooraj S; Sidharth K; Vineeth M; Muhammad Aslam KM	27
48	ECE-08	Solar Powered Oxygen Concentrator with Real-Time Monitoring and Battery Backup	Abhishek K V; Ajil J; Ajmal T A; Athul G; Vinod Kumar P; Dr. V. Balamurugan	27-28
49	ECE-09	Intelligent Front Desk Framework for Enhancing Patient Flow in Hospitals	Anamika S; Akshaya Sri P S; Mehrin Ayisha S; Manu S Vignesh; Dr. V. Balamurugan	28
50	ECE-10	Non-Contact Voltage Detector Gloves Using 555 Timer	Akhib Ahamed M; Darsan V; Ann Maria Neefa; Harishma Chandran	28-29
51	ECE-11	Real-Time ECG Monitoring and Analysis System Using Arduino	Ajil Madhav C K; Abhinandh PN; Ajay NJ; Ananthakrishnan S; M Mohammed Niyas	29

52	ECE-12	Automatic Indicator System Using ESP32 and GPS	Mohammed Irfan B; Prasin Krishna E; Sainul Abidh PS; Sree Vishnu S; Dr. V. Balamurugan; Ms. Gayathri P S	29-30
53	ECE-13	XRAY3D: Deep Learning-Based 3D Reconstruction from 2D Radiographs	Mridhul Krishna M; Muhammed Ibrahim S; Sabarinath M; Sriram G	30
54	ECE-14	Performance Analysis of Multiple FPGA Platforms Using Up and Down Counters	Anuja S; Akshaya A; Arya B; Arya R	30-31
55	ECE-15	Tomato Quality Classification	Chandru; Dr. Divya Mohan; Dr. V. Balamurugan; Sreelakshmi V; Rayan Gaffor; M Padmaja	31
ELECTRICAL & ELECTRONICS ENGINEERING				
56	EEE-01	Smart Infusion Pump Using IoT	Mohammed A; Karthika G; Rahul R; Ms. Rosu Varkeyachan; Akshay Kumar M	32
57	EEE-02	Fingerprint Electronic Voting Machine	Adithyan P; Midhun J	32-33
58	EEE-03	Design and Implementation of Smart Bag Tracking and Safety System for Kids	Babhitha Rosh B; Gowtham S; Hridya R; Rikas M; A. Manickavasagam	33
59	EEE-04	Design of Smart Oxygen Concentrator with Reduced Grid Reliance	Ajith M; Anirudh Reji; Fasir Ali; Sreya P; Ms. Lakshmi Suresh	33-34
60	EEE-05	Smart Home Illumination Using Smart Sensors and IoT	Neha Babu; Arjun A; Thejus Das V; Sudarsh S; Subin Chacko	35
61	EEE-06	Short-Term Load Forecasting in Smart Grid Using Dragonfly Algorithm with BPN	Sivakumar R; Pradip C; Manickavasagam A; John Alexis S; Muruganath Gopal Raj	35-36
MECHANICAL ENGINEERING				

62	ME-01	Performance Monitoring of a Savonius Vertical Axis Windmill	Prathyush M; Sadanandan R; Dr. Vivek Gopi; Karthikeyan V; Muhammed Kareem F; Ramith R	35
63	ME-02	Studies on the Production of Compressed Air Using Wave Energy-Based Air Compressor System	Akhilesh P; Rebin Husain M; Mohammed Noufal N; Naveen K, Dr.John alexis	36
64	ME-03	Parametric Study on the Vibration Characteristics of Neoprene Rubber Isolators	Anna Inasu Chungath; Charles Michael Augustine; Dawn Cletus Francis; Srutheesh T P	36-37
65	ME-04	Experimental Investigation of an Innovative System for Solar Desalination	Shabith A; Dr. P R Suresh	37
66	ME-05	Solar-Based Continuous Hot Water Supply System Enhanced with Phase Change Materials	Abhijith M M; Hrithikkrishna V D; Fevin Francis; Justin Thomas; Sarath Babu Ramachandran; Dr. Renjish Vijay	37-38
67	ME-06	Experimental Investigation of PLA-Based Natural Composites in 3D Printing	Adarsh S; Shiyas S; Vishnu M; Jishnoop Jayaprakash; Venkitesh K S	38-39
68	ME-07	Integration of Total Quality Management (TQM) in Mechanical Engineering Processes	Dr. Shinde Goba Devman; Dr. Sancheti Santosh D; Sancheti Dipak D	49
69	ME-08	Performance Evaluation of Various Feed Water Approaches in Passive Solar Still Desalination	D'Cotha J S; Suresh P R; Sajeesh P	40
70	ME-09	Acoustic Streaming Effects on the Atomization of a Spray	Kasif Ehsan; Aadil Kureshee; Deepak Kumar Mandal; S. Narayanan	40-41
71	ME-10	A Critical Summary on Drop Impact Icing and the Role of Superhydrophobic Surfaces in Anti-Icing Applications	K K Krishnaram; Rahul Sharma; A R Harikrishnan	41
72	ME-11	Next-generation lightning protection using conductive CFRP laminates	Mohan Kumar Pitchan, Balachandran	41-42
OTHERS				
73	OT-01	Data vs. Model Machine Learning Fairness Testing: An Empirical Study	Vithul M; Reshma P K; Sankar Krishna P; Sreya S; Darshan R M	42

74	OT-02	Regenerative Effects of α -Mangostin-Loaded ZnO Nanoparticles on Wound Healing: In Vitro and Zebrafish In Vivo Insights	Taniya Mary Martin; Meenakshi Sundaram Kishore Kumar	43
75	OT-03	Determining the Dominant Social Media Platform using Hexa Graph Topology and Matrix Representation	Santhiya S	43
76	OT-04	Analytical Computation of Atangana–Baleanu Differintegrals of Classical Special Functions	Prabha R; Sunitha K G; Sangeetha P S; Preeja V	44
77	OT-05	Graph Analytics for Large Scale Networks	Binoy Balan K; G. Murugananth; Rajitha M; Theertha K	44
78	OT-06	Comparative Structural Analysis of ERCO Ercoupe Wing Rib with Different Cut-Out Geometries	Dr. Ajith V S; Dr. Rajeev N; Fathima Fidha K; Geethika K G; Ardra P; Haritha R S	45

CE-01

PERFORMANCE EVALUATION OF A MULTI-MEDIA FILTRATION SYSTEM FOR HOUSEHOLD GREYWATER REUSE

Greeshma K, Neethu John, Shahina K, Dr. B V Mathew, Nitin Jitendergi C
Department of Civil Engineering, Ahalia School of Engineering and Technology, Palakkad, India.

Abstract— Water scarcity is becoming a serious concern in many regions, especially in water-stressed areas where sustainable water management is essential. A significant portion, nearly 50–70%, of domestic wastewater generated in households is greywater, which originates from bathrooms, wash basins and kitchens. In most situations, this greywater is discharged without any form of treatment, resulting in environmental pollution and unnecessary loss of potentially reusable water resources. This study presents the, development and performance evaluation of three laboratory-scale multi-media filtration systems constructed using locally available and low-cost natural materials. The systems were designed to function under simple gravity flow conditions, eliminating the need for electricity and making them suitable for decentralized household applications. The treated greywater was assessed for non-potable reuse purposes such as gardening and toilet flushing. To evaluate the effectiveness of the systems, important water quality parameters including pH, turbidity, total dissolved solids (TDS), total hardness, biological oxygen demand (BOD), chemical oxygen demand (COD), oil and grease, and E.coli were tested before and after treatment. The findings revealed a considerable reduction in pollutant levels across all systems, with System 2 exhibiting the highest overall removal efficiency. The results highlight the potential of low-cost multi-media filtration as a practical and sustainable solution for decentralized greywater treatment and reuse.

Keywords— Greywater treatment, Multi-media filtration, Water reuse, Sustainable water management, Gravity-based treatment

CE-02

USE OF NEAR SURFACE MOUNTING AND EXTERNALLY BONDING METHOD FOR STRUCTURAL UPGRADING OF BUILDING

Sreya K S, Anushwal Krishna S, Aswathy V, Anurudh R, Akash B
Department of Civil Engineering, Ahalia School of Engineering and Technology, Palakkad, India.

Abstract— Deterioration of reinforced concrete (RC) structures due to aging, environmental exposure, and increased service loads necessitates effective strengthening techniques to enhance structural performance and extend service life. Fiber Reinforced Polymer (FRP) systems have emerged as a promising solution for retrofitting because of their high strength-to-weight ratio, corrosion resistance, and ease of installation. This study investigates the effectiveness of two FRP



strengthening techniques, namely Near Surface Mounted (NSM) and Externally Bonded (EB) reinforcement, for upgrading RC beams. The structural condition of the selected beam was evaluated using Non-Destructive Testing (NDT) methods including Rebound Hammer, Ultrasonic Pulse Velocity, and Electrical Resistivity tests. Reinforced concrete beam specimens were prepared and strengthened using FRP materials to assess improvements in structural behavior. The study aims to compare the performance of NSM and EB techniques in terms of strength, durability, and applicability, providing insights for selecting appropriate retrofitting methods for existing RC structures.

Keywords— Reinforced concrete (RC), Fiber Reinforced Polymer (FRP), Near Surface Bonded (NSM), Externally Bonded (EB), Non-Destructive Test (NDT)

CE-03

TRAFFIC CONGESTION MITIGATION AND SIGNAL OPTIMISATION IN PALAKKAD TOWN

Aiswarya K, Ajanya R, Hrithika R, Niranjana RP, Jayakrishnan R

Department of Civil Engineering, Ahalia School of Engineering and Technology, Palakkad, India.

Abstract— With the focus being on improving the flow of traffic and reducing the number of delays that occur on the road, the study aims to evaluate the traffic congestion and the performance of the traffic signals in Palakkad. With the use of maps and newspaper articles, the study area was identified as the Kalmandapam Junction, which is known for its traffic congestion. To evaluate the congestion that occurs during the peak hour and the flow of traffic at the junction, various surveys were conducted. To suggest ways of reducing the traffic and improving the flow of traffic in the urban area, the data collected is used for simulation using PTV Vissim.

Keywords— Traffic Congestion, Signal Optimization, PTV VISSIM, Intersection Analysis, Delay Analysis

CE-04

DEFLUORIDATION OF WATER USING ELECTROCOAGULATION

Sreeraghav S, Neethu John, Bhavana Prahladh B, B V Mathew, Thejaswi S

Department of Civil Engineering, Ahalia School of Engineering and Technology, Palakkad, India.

Abstract - Excess fluoride in drinking water is an important environmental and public health concern in many parts of the world, and can lead to dental and skeletal fluorosis. The Defluoridation of drinking water is sometimes necessary to prevent excessive fluoride exposure. This research work investigates the removal of fluoride ions from water using electro-coagulation with aluminum electrodes(plates). In this case, a synthetic fluoride stock solution was prepared by dissolving the required amount of fluoride in 1000 ml of distilled water to get a 5 ppm solution. The experiment was carried out in an electro-coagulation system composed of a reactor tank, two

aluminum plate electrodes, and a direct current (DC) power supply. The applied voltage (15 V, 20 V, and 24 V), spacing between the electrode plates (1.5 cm, 2.0 cm, and 3.0 cm), and electrolysis time (30, 45, and 60 min) were varied. In the test of fluoride removal by the system, it was found that fluoride removal increased as the current voltage and electrolysis time increased. The efficiency of fluoride removal was greater when the distance between the electrodes was shorter, which was helpful for the treatment. The optimal electro-coagulation operating condition for maximum fluoride removal was 24 V applied voltage, 1.5 cm gap between the electrodes, and 60 min electrolysis time. This indicates that electro-coagulation is an effective and a simple Defluoridation process for water treatment.

Keywords— Defluoridation, Electro-coagulation, Aluminum plates, Fluoride removal, Applied voltage, Electrode spacing, Treatment time

CE-05

COMPOSITE GYPSUM BOARDS REINFORCED WITH AGRO-INDUSTRIAL WASTES

Akhil M, Rohith M, Ayana S Devan, Akhil Krishnan M.K., Akshaya Krishnan M
Department of Civil Engineering, Ahalia School of Engineering & Technology, Palakkad, India.

Abstract— The construction industry is one of the largest consumers of natural resources and contributes significantly to environmental degradation due to excessive extraction of raw materials and generation of waste. In recent years, there has been a growing interest in developing sustainable and eco-friendly construction materials that reduce environmental impact while maintaining adequate mechanical performance. Gypsum boards are widely used in the construction industry for interior wall partitions, false ceilings, and decorative panels due to their lightweight nature, fire resistance, and ease of installation. However, conventional gypsum boards possess limitations such as brittleness, low mechanical strength, and sensitivity to moisture. Agro-industrial wastes such as rice husk ash, coir fibres, and waste paper are generated in large quantities in agricultural regions. Disposal of these wastes often leads to environmental problems such as land pollution and greenhouse gas emissions. Utilizing these wastes in building materials offers a sustainable solution by converting waste into valuable construction products. This study focuses on the development of composite gypsum boards reinforced with agro-industrial wastes. Rice husk ash, coir fibres, and paper pulp were incorporated into gypsum boards to enhance mechanical properties and reduce the amount of gypsum required. The experimental procedure involved material collection, preparation, mix proportioning, moulding, and curing of composite boards. The results are expected to show improved flexural strength, better bonding, and enhanced durability compared to conventional gypsum boards. The proposed composite boards provide an eco-friendly alternative for non-structural construction applications.

Keywords— Gypsum board, Agro-industrial waste, Rice husk ash, Coir fibre reinforcement, Sustainable construction materials

CE-06

LIFE CYCLE ANALYSIS OF PAVEMENT IN KANJIKODE INDUSTRIAL AREA FOR NEXT 15 YEARS

Nifa Thaslim M, Basudev P D, Sulfath H, Beena Kumari I P, Vidhun N

Department of Civil Engineering, Ahalia School of Engineering and Technology, Palakkad, India.

Abstract— Flexible pavement performance in industrial areas is significantly affected by heavy traffic loading, subgrade properties, and environmental conditions. This study presents a life cycle analysis of flexible pavement in the Kanjikode Industrial Area, Kerala, over a 15-year design period. Field investigations and laboratory tests, including CBR and Atterberg limits, revealed weak subgrade conditions with CBR values ranging from 2.28% to 6.20% and medium plasticity. Traffic studies indicated a volume of 4443 vehicles per day, and future projections were carried out using standard growth models, with the compound method adopted as per IRC guidelines. Based on IRC:37, a strengthened pavement section was proposed with increased thickness, along with lime stabilization to improve subgrade strength and plastic modified bitumen to enhance durability. Life cycle cost analysis showed that the improved design, though having higher initial cost, is more economical in the long term due to reduced maintenance and extended service life. The study emphasizes the importance of integrating traffic analysis, soil improvement, and advanced materials for sustainable pavement design.

Keywords— Flexible pavement, life cycle analysis, CBR, traffic projection, lime stabilization, plastic modified bitumen, subgrade soil, pavement design, industrial roads, sustainability

CE-07

CATALYTIC PYROLYSIS OF POLYPROPYLENE USING EGGSHELL-DERIVED CaO: EFFECT OF CATALYST LOADING ON FUEL YIELD AND QUALITY

Vimal Raj J

Department of Civil Engineering, The Kavery Engineering College, Salem, India.

Abstract— The increasing accumulation of plastic waste and the growing demand for alternative energy sources have become major global challenges. Pyrolysis offers an effective method for converting non-biodegradable plastic into useful fuel products. In this study, calcium oxide catalyst derived from waste eggshells was utilized for the catalytic pyrolysis of polypropylene. Experiments were performed in a batch reactor under nitrogen atmosphere at 500 °C with catalyst loadings of 0, 5, 10 and 15 wt%. The results indicated that non-catalytic pyrolysis produced a liquid yield of about 59 percent, whereas catalytic pyrolysis significantly improved the yield. The optimum catalyst loading of 10 percent resulted in the maximum liquid yield of 70 percent along



with improved fuel quality. Increasing the catalyst loading to 15 percent reduced liquid yield to around 65 percent and increased gas production due to secondary cracking reactions. The produced oil showed a calorific value of 43.8 megajoule per kilogram, indicating its potential as an alternative fuel. The study demonstrates that eggshell-derived calcium oxide is an effective and sustainable catalyst for plastic waste conversion.

Keywords— Plastic waste, catalytic pyrolysis, calcium oxide, eggshell catalyst, liquid fuel, waste to energy

CE-08

PERFORMANCE EVALUATION OF AN INTEGRATED ULTRAFILTRATION–REVERSE OSMOSIS SYSTEM FOR MUNICIPAL WASTEWATER REUSE IN INDUSTRIAL APPLICATIONS

Vignesh S

Department of Environmental Engineering, The Kavery Engineering College, Salem, Tamil Nadu, India.

Abstract- This study evaluates the effectiveness of a full-scale integrated ultrafiltration (UF) and reverse osmosis (RO) system for wastewater reuse in industrial processes. Wastewater samples were collected from different stages of treatment, namely raw influent, outlet of the moving bed biofilm reactor (MBBR), ultrafiltration permeate, and reverse osmosis permeate. Important parameters like turbidity, total suspended solids (TSS), biochemical oxygen demand (BOD), chemical oxygen demand (COD), total dissolved solids (TDS), and total coliforms were analyzed. High removal efficiency was observed from the UF-RO system, resulting in permeate turbidity less than 0.4 NTU, BOD less than 2 mg/L, COD less than 7 mg/L, and TDS less than 60 mg/L. Water quality parameters satisfied the guidelines of the Central Pollution Control Board (CPCB) for industrial purposes. However, the study lacks detailed variability and statistical analysis. It appears that UF-RO systems have the potential for a reliable solution for the reduction of fresh water consumption in industrial processes.

Keywords: Wastewater recycling, Sustainable water management, Advanced water treatment, Water conservation, UF-RO system, Treated effluent quality

CE-09

FLOW MODELLING OF AQUIFER FOR TRACING OUT OF CONTAMINANTS IN KARST TOPOGRAPHY

Pradeepa F, Kavisri Manikannan M

Department of Civil Engineering, The Kavery Engineering College, Salem, Tamil Nadu, India



Abstract—Water resources in karst regions are highly vulnerable to contamination due to their complex subsurface flow characteristics. Aquifer flow modelling is an effective tool to understand groundwater movement, predict flow directions, and analyze contaminant transport mechanisms. This study focuses on modelling groundwater flow in karst topography and tracing the movement of contaminants using numerical modelling techniques. The study area includes regions of Tirunelveli and Thoothukudi districts, where unusual drainage patterns and subsurface formations have been identified through geophysical investigations such as Vertical Electrical Sounding (VES). The modelling was carried out using MODFLOW and MODEL MUSE integrated with GIS data to simulate groundwater flow and contaminant transport. Calcium was selected as the tracer contaminant based on geochemical analysis. The heterogeneous nature of karst formations, including fractures, conduits, and caverns, creates complex and unpredictable flow paths, making modelling challenging. The results indicate that groundwater flow is strongly influenced by geological structures such as the Achankovil shear zone, which acts as a boundary controlling flow direction. The contaminant tracing results show that calcium concentration increases towards the coastal region due to dissolution of limestone formations along the flow path. The study highlights that a significant quantity of freshwater is discharged into the sea through subsurface pathways, indicating the need for proper water management strategies. The findings emphasize the importance of aquifer modelling in understanding groundwater behaviour and in developing effective remediation and conservation measures in karst regions.

Keywords—Aquifer modelling, Karst topography, MODFLOW, MODEL MUSE, Groundwater flow, Contaminant transport, Calcium tracer, GIS

CSE-01

PREVIDICT: AN AI-BASED FRAMEWORK FOR PRE-UPLOAD VIEW PREDICTION AND CONTENT OPTIMIZATION OF YOUTUBE SHORTS

Javhara Sherin V, Anupama K T, Navarang S Manoj, Yash Krishna K P, Aswani N M, Arya A Surya

Department of Information Technology / Computer Science, Institute of Engineering and Technology, University of Calicut, Malappuram, Kerala, India.

Abstract— The rapid proliferation of short-form video platforms has created an ultra-competitive environment, where creators find it extremely difficult to assess the potential performance of videos until they are actually published. Most of the currently available tools only provide analytics about how a video performed after the content is published, thus providing little or no support to the creator at the time of content creation. In this paper, we present a system named PreviDict, which is based on artificial intelligence (AI) technologies and will be able to predict the expected view count for a post on a short-form video platform before the content is published. The proposed technique will use machine learning to analyze the metadata of the video (i.e., title, description, hashtags, thumbnail attributes) to give an estimate of the likely been popularity of the video after it is actually posted. In addition to providing a prediction of expected number of views for the video, PreviDict will generate content optimization suggestions that would help to maximize the video's reach and engagement. In addition to the above functionality, a societal impact analysis module is included that will allow PreviDict to categorize the class of each video based on its

potential impact, which will encourage responsible video production. Experimental tests of PreviDict have shown that the system provides reliable prediction accuracy and actionable insights, which will allow video creators to refine their video prior to posting it, as well as reduce uncertainty about the performance of their short-form video prior to posting them.

Keywords— Short-form videos, machine learning, view prediction, content optimization, societal impact

CSE-02

INTEGRATING HUMAN ACTIVITY RECOGNITION AND AFFECTIVE COMPUTING FOR ELDERLY WELL-BEING: A COMPREHENSIVE REVIEW

Ms Dona Maria Mani, Dr. R. Roopa Chandrika

*Research Scholar, Faculty of Engineering, Department of Computer Science and Engineering,
Karpagam Academy of Higher Education, Coimbatore, India*

*Assistant Professor, Faculty of Engineering, Department of Computer Science and Engineering,
Karpagam Academy of Higher Education, Coimbatore, India*

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

Keywords— HAR, affective computing, Machine learning(ML), deep learning(DL), facial expression recognition(FER), convolutional neural networks (CNN), recurrent neural networks (RNN), mixed reality (MR)

CSE-03

SUSTAINABLE ROUTE PLANNING IN MARITIME TRANSPORT USING MACHINE LEARNING: A COMPREHENSIVE REVIEW

Ms. Aneesha K Jose

Assistant Professor, Department of Computer, Rajagiri College of Management and Applied Sciences, Kakkanad, Kerala.

Abstract— Maritime transport underpins the global economy, handling over 80% of international trade by volume. However, its environmental footprint—particularly greenhouse gas emissions—



has triggered international regulations aimed at decarbonizing the sector. Sustainable route planning is central to addressing these challenges, and machine learning (ML) has emerged as a transformative enabler in this domain. This review synthesizes the current state-of-the-art in ML-based sustainable maritime route planning. It categorizes ML techniques including supervised, unsupervised, reinforcement, and deep learning, and evaluates their applications in emission prediction, fuel efficiency, route optimization, and real-time decision-making. Comparative analysis highlights their relative performance, trade-offs, and deployment feasibility. Finally, we outline open challenges such as uncertainty modeling, data quality, and integration with smart port systems, while proposing future research directions.

Keywords— Maritime transport, route optimization, machine learning, sustainable shipping, emission reduction, deep learning, reinforcement learning.

CSE-04

LURNZO: AN AI-BASED TECHNOLOGY LEARNING PLATFORM

Lamiya Fathima, Ayisha Najiya P, Fathima Fidha C P, Sameeha T, Ruby Fathima A C
Department of Information Technology, Institute of Engineering and Technology, University of Calicut, Malappuram, Kerala, India

Abstract— Conventional e-learning platforms often lack personalization, interactivity, and intelligent assessment mechanisms, limiting learner engagement and knowledge retention. This paper presents Lurnzo, an AI-driven technology learning platform designed to deliver adaptive, interactive, and self-paced education in domains such as Python programming, Flutter development, Cybersecurity, and Data Science. The proposed system integrates transformer-based sequence-to-sequence models for automated answer extraction and question generation with large language model capabilities for content refinement, coding question generation, and assessment enhancement. Learning materials are extracted from documents and processed through a natural language pipeline that generates conceptual questions, coding exercises, and multiple-choice assessments with minimal manual intervention. The platform incorporates a built-in coding environment with real-time evaluation, conversational AI assistance for concept clarification, and performance-based revision scheduling to reinforce understanding. Gamification features, including experience points, streak tracking, and achievement badges, promote sustained learner motivation. User interaction data are analyzed to generate adaptive learning paths and personalized revision recommendations, enabling a responsive and learner-centered educational experience. The proposed system demonstrates the potential of AI-integrated learning platforms to support scalable, automated, and outcome-oriented technology education.

Keywords— Transformer based Sequence-to-Sequence Model, Large Language Model, Natural Language Pipeline, AI Assistance, Gamification

CSE-05

ASTHRA: AN ADAPTIVE AI FRAMEWORK FOR AUTOMATED BULK DOCUMENT SYNTHESIS AND RESILIENT MODEL ORCHESTRATION

Midhun M, Nithya S, Rithin B, Dr. Reshmi B

*Department of Computer Science and Engineering, Ahalia School of Engineering & Technology,
Palakkad, Kerala, India*

Abstract— The manual generation of large-scale professional documents such as certificates, reports, and presentations represents a significant operational bottleneck in academic institutions and enterprises. This paper presents ASTHRA, an Adaptive AI Framework for Automated Bulk Document Synthesis and Resilient Model Orchestration. ASTHRA integrates Generative AI and Large Language Models (LLMs) through a credit-free, multi-provider API orchestration layer to automatically produce editable certificates, PowerPoint presentations (PPTX), and PDF reports from structured data inputs. A key contribution of this work is the Adaptive Model Switching Algorithm (AMSA), which dynamically monitors AI API provider health in real time and automatically reroutes bulk generation requests to alternative providers upon encountering rate-limit (HTTP 429) or service error (HTTP 500) responses, ensuring zero-interruption operation during high-volume batch tasks. The system further incorporates a Flutter-based conversational chat interface, multilingual document generation supporting twelve languages including Malayalam, Tamil, and Hindi, and a post-editing module that allows iterative AI-assisted refinement of generated content. Developed using a rigorous Git-based Feature-Branch Software Configuration Management workflow, ASTHRA was evaluated against manual workflows, demonstrating a reduction in generation time from approximately 240 minutes to under 3 minutes for a batch of 100 documents, with 100% automated failover reliability and a mean System Usability Scale score of 82.5 (Excellent). The system demonstrates that production-quality AI document automation is practically achievable within institutional environments using freely available API tiers.

Keywords— Generative AI, Document Automation, API Failover, Bulk Synthesis, Model Orchestration, LLM, Flutter, Git DevOps, Multilingual NLP, Adaptive Systems

CSE-06

REAL-TIME COLLEGE BUS TRACKING AND ROUTE ASSISTANCE SYSTEM: BUSMATE

Anagha S Anil, Nandana R, Aneeta P, Dhanya P G, Aiswarya K V

*Department of Computer Science Engineering, Ahalia School of Engineering & Technology,
Palakkad, India*

Abstract— Students in many educational institutions depend on college buses for daily transportation. However, the lack of real-time information about bus locations and trip statuses creates confusion and causes students to miss buses. This paper presents *BusMate*, a real-time college bus tracking and route assistance system developed as a mobile application. The system

allows drivers to share live bus locations using smartphone GPS, while students can track the current bus location and view trip status through the application. The application is built using the Flutter framework, with Firebase as the backend for authentication and real-time data synchronization. The system supports three main user roles: administrator, driver, and student. Additional features like alternative route suggestions and issue reporting improve transportation coordination on campus. The proposed system shows how to effectively combine mobile application development, cloud services, and location-based technologies to improve college transportation management.

Keywords: college bus tracking, GPS, Flutter, Firebase, route assistance, mobile application

CSE-07

HEALHER: A COMPREHENSIVE WEB-BASED PLATFORM FOR PCOS/PCOD RISK ASSESSMENT, MENSTRUAL CYCLE PREDICTION, AND AI-DRIVEN HEALTH ASSISTANCE

Ann Milena J, Diya Krishna M D, Hareeshna T G, Teertha K K, Amritha Devadasan
*Department of Computer Science Engineering, Ahalia School of Engineering & Technology,
 Palakkad, Kerala, India*

Abstract—

Polycystic Ovary Syndrome (PCOS) and Polycystic Ovarian Disease (PCOD) are among the most prevalent endocrine disorders affecting women of reproductive age, often leading to long-term metabolic, reproductive, and psychological complications if left unaddressed. Despite their widespread occurrence, early identification remains limited due to lack of awareness, irregular symptom patterns, and insufficient access to structured healthcare tools. This paper presents HealHer, a comprehensive web-based health application designed to assist users in understanding, monitoring, and managing menstrual health while identifying potential indicators of PCOS/PCOD risk. The proposed system integrates multiple functionalities, including user profiling, symptom-based assessment, menstrual cycle tracking, predictive analytics, and personalized lifestyle recommendations. A structured questionnaire-based evaluation mechanism is employed to analyze user-reported symptoms such as irregular cycles, dermatological changes, and hormonal indicators. Based on this analysis, the system generates an assistive health report that highlights possible risk levels and provides actionable insights.

Additionally, the platform incorporates a cycle prediction module that estimates future menstrual cycles, ovulation windows, and fertility phases using date-based computational logic. To enhance user engagement and provide continuous support, an AI-powered chatbot is integrated using external API services, enabling real-time interaction and guidance. The system is implemented using a modern web technology stack comprising HTML, CSS, and JavaScript for the frontend, Node.js for backend processing, and PostgreSQL for data management. By combining health informatics, predictive modeling, and conversational AI, HealHer aims to bridge the gap between awareness and preventive care, offering an accessible and scalable solution for women's health management.

Keywords— PCOS, PCOD, Menstrual Health, Cycle Prediction, Health Informatics, Web Application, AI Chatbot, Preventive Healthcare, Personalized Recommendation Systems

CSE-08

DATA ANALYSIS WITH GENERATIVE AI: THE D-STUDIO

C P Vishnu Subramanian, Naveen S, Happy A, Atul Karthick CK

*Department of Computer Science Engineering, Ahalia School of Engineering & Technology,
Palakkad, India*

Abstract— D-Studio is an intelligent, automated data analysis application that streamlines the entire analytics lifecycle—from data ingestion and cleaning to visualization and reporting. It supports multiple data sources and leverages machine learning for advanced insights, enabling users to make data-driven decisions with minimal manual effort. With a user-friendly interface and scalable architecture, D-Studio caters to both technical and non-technical users, offering real-time dashboards, mobile access, and secure cloud storage. Its robust error handling and performance optimization ensure reliability and efficiency across diverse analytical tasks.

Keywords: Automated Data Analysis, Data Cleaning, Visualization, Machine Learning, Dashboard, Cloud Storage

CSE-09

AI-BASED SKIN DISEASE DETECTION SYSTEM USING CONVOLUTIONAL NEURAL NETWORKS

Neha U, Nandagopan M S, Prathyush P Nambiar, Muhammed Sahil K

*Department of Computer Science Engineering, Ahalia School of Engineering & Technology,
Palakkad, India*

Abstract— Skin diseases are among the most prevalent health conditions worldwide, affecting individuals across all demographics. Early and accurate diagnosis is essential to prevent severe complications and ensure timely treatment. Traditional diagnostic methods rely heavily on dermatologists' visual examination, which is subjective, time-consuming, and constrained by specialist availability, particularly in rural areas. This paper presents an Artificial Intelligence-based Skin Disease Detection System that leverages Convolutional Neural Networks (CNNs) to classify skin lesions from digital images. The system is trained on the HAM10000 benchmark dataset and incorporates image preprocessing techniques including resizing, normalization, and augmentation to enhance model generalization. A transfer-learning approach using MobileNetV2 is employed and fine-tuned for seven skin disease categories. Grad-CAM heatmaps are generated to provide explainability by highlighting discriminative regions in the input image. The system achieves an overall classification accuracy of 93.7%, demonstrating strong potential as a decision-support tool for preliminary skin disease screening and telemedicine applications.

Keywords— convolutional neural network, skin disease detection, deep learning, transfer learning, MobileNetV2, HAM10000, Grad-CAM, medical image classification, telemedicine

CSE-10

WEB APP SECURITY ANALYZER WITH AI FRAMEWORK

Nivedh V, Milan Krishna, Kassim Noushin N, Ms Kavitha S

Computer Science Engineering, Ahalia School of Engineering & Technology, Palakkad, India

Abstract— Web applications have become critical in modern digital services but are frequent targets for cyber-attacks. This paper proposes a Flutter-Based Web Application Vulnerability Scanning Framework that automates the detection and analysis of security weaknesses. The system integrates popular tools such as Nmap, Nikto, and the Metasploit Framework for comprehensive scanning, while an AI module classifies vulnerabilities, provides human-readable explanations, suggests fixes, and prioritizes risks. The framework consolidates scan results, highlighting open ports, vulnerable services, and insecure endpoints, and presents them through a user-friendly GUI. By automating these tasks, the framework reduces manual effort, increases efficiency, and makes web application security accessible to developers, administrators, and security professionals.

Keywords— Web Application Security, Vulnerability Scanning, Flutter, AI-Assisted Analysis, Nmap, Nikto, Metasploit, GUI Automation.

CSE-11

WEB-BASED SYSTEM FOR DETECTING LEAKED PERSONAL DATA – BREACH CHECKER

Anirudh G Menon, Sreedev K A, Ms.Rishika, Hidhun babu

Computer Science Engineering, Ahalia School of Engineering & Technology, Palakkad, India

Abstract— With the rapid expansion of digital platforms and online services, users frequently share sensitive personal information such as email addresses and phone numbers. This increased data sharing has resulted in a higher risk of data breaches and unauthorized exposure of personal information. Many users remain unaware that their credentials may already exist in leaked databases obtained from compromised websites or cyber attacks.

This paper proposes a web-based system for detecting leaked personal data using machine learning techniques. The system allows users to check whether their email address or phone number has been exposed in known data breaches. The application integrates machine learning models with publicly available breach datasets and secure APIs to identify potential data leaks efficiently. The frontend of the system is developed using HTML, CSS, and React to provide an interactive interface, while the backend uses Python and JavaScript to process requests and analyze breach data. The proposed solution improves user awareness about digital privacy by providing fast and reliable breach detection without storing sensitive user information. The system encourages users to take preventive actions such as changing passwords, enabling two-factor authentication, and strengthening their cybersecurity practices.

Keywords— Data Breach Detection, Cybersecurity, Web Application Security, Data Privacy, API-Based Detection, Personal Data Protection.

CSE-12

AI-BASED FACE RECOGNITION ATTENDANCE SYSTEM: A CONTACTLESS APPROACH FOR EDUCATIONAL AND CORPORATE ENVIRONMENTS

Arjun Sunil, Harikrishna S, Sharon Manoj, Sukesh R

*Department of Computer Science Engineering, Ahalia School of Engineering & Technology,
Palakkad, India*

Abstract— Traditional attendance systems rely on manual methods that are time-consuming and prone to errors. This paper proposes an AI-Based Face Recognition Attendance System that automates attendance logging using computer vision and deep learning techniques. The system utilizes Open CV for real-time face detection and the DeepFace framework for facial recognition. Captured video frames are compared with a locally stored database of registered users. Once verified, the system automatically records attendance in CSV or Excel format while preventing duplicate entries. The offline architecture ensures data privacy and reliability. The proposed system provides a fast, secure, and contactless solution for attendance management in educational institutions and corporate environments.

Keywords— Face Recognition, Automated Attendance, Deep Learning, Computer Vision, OpenCV, DeepFace.

CSE-13

SKIN CONSEILLER PERSONALIZED SKINCARE FOR INDIAN SKIN

Ms.Kavitha S, Sreelaya S, Amrita C J, V Varuna varma, Dhanya P

*Computer Science and Engineering, Ahalia School of Engineering and Technology, Palakkad,
Kerala, India*

Abstract— In recent years, increasing environmental pollution, lifestyle changes, and climatic variations have significantly impacted skin health, leading to a growing demand for personalized skincare solutions. However, access to dermatological expertise for routine skincare remains limited for a large population. This project proposes Skin Conseiller, an AI-assisted mobile application designed to provide personalized, non-medical skincare guidance tailored to Indian skin types and seasonal conditions. The proposed system integrates facial image analysis and a medically informed questionnaire to assess basic skin attributes such as oiliness, dryness, acne tendency, and sensitivity. Based on the combined analysis, the application recommends suitable skincare routines and cosmetic products including cleansers, moisturizers, serums, and sunscreens. These products are made available within the application through an integrated product-selling module, enabling users to purchase skincare items aligned with their individual needs. Seasonal variations and lifestyle factors are also considered to improve the relevance and effectiveness of recommendations. The novelty lies in its dual-method assessment, seasonal adaptation, and

dermatologist-aligned product guidance, offering personalization absent in existing solutions. The application aims to support informed skincare decisions in a user-friendly manner and is purely assistive, not performing medical diagnosis or treatment.

Keywords— Artificial Intelligence, Skin Analysis, Image Processing, Mobile Application, Personalized Skincare, Convolutional Neural Network, Recommendation System, MongoDB Database, Node.js Backend.

CSE-14

HYBRID POST-QUANTUM KEY ENCAPSULATION FOR MOBILE MESSAGING: A KYBER512–AES-GCM IMPLEMENTATION

Dr. S. Gunasekaran, Dhananajay Krishna S., H. A. Rahulnath, R. Gautham Krishna, Ajay M.,
 Aswathy A

Ahalia School of Engineering and Technology, Palakkad, Kerala, India

Abstract— The quantum computing risk to classical cryptographic schemes requires an urgent transition to post-quantum solutions. This paper introduces the full design and implementation of QGuard, a production-level secure messaging application that integrates CRYSTALS-Kyber512 (NIST ML-KEM) for post-quantum secure key encapsulation with AES- 256-GCM for efficient symmetric encryption. We describe a three- step implementation strategy: (1) user registration with automatic Kyber512 keypair generation, (2) hybrid encryption with per-message session keys encapsulated using Kyber, and (3) decryption with private-key isolation on local devices. The system utilizes a native C Kyber512 implementation integrated with Flutter/Dart via Foreign Function Interface (FFI) bridges, enabling cross-platform deployment with native execution speed. Firebase Firestore is used for cloud storage of ciphertexts and public keys, while private keys are stored only on local devices. Performance assessment on five different mobile devices shows sub-millisecond cryptographic latency, with Kyber512 keypair generation 807 times faster than RSA-2048. The implementation offers 128-bit post-quantum security based on Module-LWE hardness assumptions and perfect forward secrecy with ephemeral per-message session keys. This paper shows the feasibility of post-quantum cryptography in resource-constrained mobile settings and offers a reference implementation for quantum-secure messaging applications.

Keywords— Post-Quantum Cryptography, CRYSTALS-Kyber, ML-KEM, Hybrid Encryption, AES-GCM, Secure Messaging, Flutter FFI, Mobile Cryptography, Key Encapsulation Mechanism, Forward Secrecy

CSE-15

EXPLAINABLE AI-DRIVEN REAL-TIME PHISHING DETECTION USING MACHINE LEARNING

Dr. S Gunasekaran, Asha K, Dr. Reshmi B, Nithya R, Alzeena A, S Riya Lakshmi

Ahalia School of Engineering and Technology, Palakkad, Kerala, India

Abstract— PhishGuard's browser extension is using Chrome Manifest V3 to carry out the blocking of the URLs prior to the users accessing the site. PhishGuard's browser extension can



carry out the real-time assessment of the security threats using two methods. It can verify the URL address using the JSON file containing the whitelisted and blacklisted URLs. It can also query the information using the backend. PhishGuard's browser extension normalizes the URLs to assess the security risk associated with the access to the URL. Due to the fact that all the sub-paths and parameters of the access URL end up providing the same site rating, PhishGuard's back-end processing is required to perform the URL analysis when the complexity of the URL being accessed is greater than the PhishGuard browser extension can perform in a standard way.

PhishGuard utilizes the CatBoost Machine learning model to process the URLs via the back-end. PhishGuard requires the usage of SHAP(SHapley Additive exPlanations) for its main function because it can allow the users to understand the hidden prediction processes using its system which calculates the individual feature contributions. It presents the results to the user in the form of explanations which can show the missing HTTPS links and the excessive suspicious keywords in the URL, together with the complete visual representation. It requires the backend processing to perform the URL analysis when the complexity is greater than the standard operational capability. It processes the URL via the backend using the CatBoost Machine learning model. It utilizes the balanced data set to train the model.

the CatBoost machine literacy model which uses a balanced dataset of 150000 URLs in its training process. The model has shown a high accuracy rate of more than 97 percent coupled with prediction capabilities ranging from 30 to 50 milliseconds.

PhishGuard uses SHAP (SHapley Additive exPlanations) as a tool in its main function because SHAP helps users understand how predictions are made by enabling users to understand the predictions by using a system in which SHAP calculates how each feature is contributing to a prediction. The results are presented in a way in which users can understand by using human explanations in which users can see what is missing in terms of HTTPS links and too many keywords in a way in which users can understand.

The web dashboard is a part of the system in which users can operate as well as being the main part of the system in which users can carry out literacy activities. A user can carry out their own testing using the system as well as having access to medical examination results and being able to operate their own domain permissions.

The web dashboard has XAI elements which users can analyze and includes XAI elements which show users how different elements contribute to a prediction using cascade maps and bar maps and decision maps.

The reason PhishGuard uses two league scanning is because they want to offer users the best experience possible. The reviews of the extension of the system operate at high speeds as well as having the objective of stopping plate attacks in their tracks while the reviews of the dashboard operate in a way in which users can have a complete graphical output of what they have found. PhishGuard has a high level of machine literacy as well as a high level of user interface in which users can operate in a way in which there is fail-open error running as well as whitelisting

in a way in which users can have enterprise security in a way in which users can operate easily as consumers

Keywords— Phishing Detection, Explainable Artificial Intelligence (XAI), Machine Learning, Cybersecurity, Real-Time Detection, URL Classification, CatBoost, SHAP, Browser Extension Security, Web Security.

CSE-16

SMART COLLEGE NAVIGATION SYSTEM

Sreehari Athiyarath, Mohammed sanjith s, Abhiram r, Ajuwad b
Dept of CSE, Ahalia School of Engineering and Technology, Palakkad, India

Abstract - Indoor navigation remains a significant challenge due to the limitations of GPS in enclosed environments. This paper presents an Augmented Reality (AR)-based indoor navigation system developed using Unity and ARCore. The proposed system enables users to search for rooms or events and provides real-time navigation guidance through AR overlays. Virtual directional arrows are rendered on the camera feed to guide users efficiently within indoor spaces. Additionally, the system displays contextual information such as room details and schedules. The solution enhances user experience by integrating real-world environments with digital navigation aids, making it suitable for campuses, offices, and event venues.

Keywords - Augmented Reality, Indoor Navigation, Unity, ARCore, Pathfinding, AR Foundation

CSE-17

CODE FLOW STUDIO

Abhiram K, Vishnu VS, Poojitha S, Somya Ranjan Mohanty, Keerthi M
Computer Science and Engineering, Ahalia School of Engineering and Technology, Palakkad, India

Abstract— This paper presents an innovative AI-assisted system designed to transform hand-drawn user interface (UI) sketches into functional Flutter code. Addressing the inherent ambiguity in sketch-based UI generation, our core contribution is a novel human-in-the-loop AI clarification mechanism. This mechanism actively engages the user by posing targeted questions when the AI encounters uncertainties, ensuring that the final generated UI precisely aligns with the user's original intent. This interactive approach significantly mitigates misinterpretations and enhances the accuracy of the generated UI, thereby streamlining the development process and reducing iterative design cycles. We demonstrate the system's effectiveness through key features such as dynamic color customization, image handling, and real-time UI preview, achieving a UI accuracy of 91% and a 45% improvement in ambiguity reduction.

Keywords— AI-assisted UI design, sketch-to-code, human-in-the-loop AI, Flutter, UI generation, interactive clarification, Gemini API.

CSE-18

OVERLAY-BASED AI DEBUGGING ASSISTANT USING OCR AND LOCAL LLMs FOR REAL-TIME ERROR INTERPRETATION

D Haritha, Dharshin R, Afreen Yusaf, Keerthana Mohan

Department of CSE, Ahalia School of Engineering and Technology, Palakkad, India

Abstract- With developers constantly switching between terminal outputs, documentation resources, and external assistance platforms, software debugging is a major bottleneck in contemporary development workflows. This frequent context switching reduces overall productivity and imposes significant cognitive overhead. We present an overlay-based debugging assistant that captures terminal error messages using Optical Character Recognition (OCR), processes them using locally hosted Large Language Models (LLMs) via Ollama, and provides prompt explanations along with remedial recommendations via an integrated multimodal interface. Operating as a persistent screen overlay, the system eliminates the necessity for application switching or IDE transitions. An OCR accuracy of 94.2%, a mean response latency of 3.8 seconds, and successful debugging resolution in 81.3% of cases were obtained from experimental validation using 75 different Python error instances. The architecture ensures that proprietary code stays within local infrastructure and provides contextually aware debugging guidance while prioritizing privacy preservation through full offline operation. In a unified, developer-focused framework, this study offers a novel synthesis of screen capture technology, optical character recognition, and local language model inference.

Keywords: debugging assistance, optical character recognition, large language models, overlay interface, Ollama, developer productivity, context switching reduction, real-time error analysis

CSE-19

RUBIK'S CUBE SOLVER USING COMPUTER VISION AND OPENCV

Dr Gunasekaran S, Sayuj S, Mr Rahulnath, Rahul R, Hashim E.H, Bholu kumar D

Department of CSE, Ahalia School of Engineering and Technology, Palakkad, Kerala

Abstract— Solving a Rubik's Cube by hand takes practice, patience, and strong logical thinking, which can be difficult for beginners. This paper introduces an automated Rubik's Cube solver that uses computer vision and OpenCV to simplify the process. The system captures real-time images of the cube through a camera and analyzes them to identify the colors on each face. Once the cube's configuration is recognized, an efficient solving algorithm determines the sequence of moves needed to solve it. These steps are then displayed visually, making it easy for users to follow along. This project highlights how computer vision, image processing, and algorithms can be combined to solve real-world problems in an intuitive way.

Keywords- Computer Vision, OpenCV, Rubik's Cube, Image Processing, Kociemba Algorithm

CSE-20



IMPACTMATCH: AI-DRIVEN TRANSPARENT VOLUNTEER PLATFORM

Dr Gunasekaran S, Sneha G, Dr. Reshmi B, Asitha R Prajith, Pavithra M, M Nisthula

Department of CSE, Ahalia School of Engineering and Technology, Palakkad, Kerala

Abstract— Impact Match is an AI-driven digital platform designed to connect volunteers, NGOs, and communities through intelligent skill-based matching. The system uses artificial intelligence to recommend suitable volunteering opportunities based on user skills, interests, availability, and location. Blockchain technology ensures transparency and provides tamper-proof digital certificates for verified volunteer contributions, improving trust and social impact.

Keywords— Artificial Intelligence, Volunteer Matching, Blockchain, NGOs, Social Impact.

CSE-21

CIVIC FIX: A WEB-BASED DIGITAL PLATFORM FOR CIVIC GRIEVANCE MANAGEMENT

Muhammed Sherif I, N P Prajwalitha, Smrithi G Iyer, Sreenish S

Dept of CSE, Ahalia School of Engineering and Technology, Palakkad, India

Abstract— Urban cities are often plagued with common problems such as potholes, lack of waste management, nonworking street lamps, and leaking water. This paper discusses how Civic Fix is designed and subsequently implemented to allow users to report and follow-up on civic issues reported by other citizens. Citizens can submit their complaints (along with photographs and locations that show exactly where the issue is) to the local civic authority through Civics Fix. The Platform allows for numerous features including real time tracking of the complaint status, notification to users when the complaint status changes, and categorization of each complaint based upon the nature of the complaint so that there is an accountability to resolution and for the purposes of faster solutions. The ultimate goal of Civic Fix is to create an efficient method of communication between civic agencies and citizens to increase citizen engagement and improve the management of urban regions..

Keywords— Civic issues, Urban management, Complaint reporting system, Real-time tracking, Citizen engagement, Waste management, Infrastructure maintenance, Smart city solutions, Location-based services, Public grievance system, Notification system, Digital governance

CSE-22

INTERVUE AI

Anjal S, Varsha G, R.Afrah fathima, Dr. S. Gunasekharan, Saniya fathima.A

Department of Computer Science and Engineering, Ahalia School of Engineering and Technology, Palakkad, Kerala

Abstract— This paper presents an AI Based Smart Interview Performance Analyzer that evaluates resumes, speech responses, and facial expressions using Machine Learning and Natural Language



Processing. The system provides automated feedback on communication skills, technical relevance, and confidence level to improve interview preparation.

Keywords— Artificial Intelligence, Machine Learning, Natural Language Processing, Interview Evaluation, Resume Analysis

CSE-23

AUTOMATIC EXAM HALL SEATING ARRANGEMENT USING AI

Arya PM, Lidhin M, Neethu Suresh, Thansil Thanish K S

Department of CSE, Ahalia School of Engineering and Technology, Palakkad, India

Abstract -The Exam Hall Seating Arrangement using Artificial Intelligence is a system designed to automate and optimize student seat allocation during examinations. It replaces manual methods by generating efficient and fair seating plans based on predefined constraints such as avoiding adjacent seating of similar subjects and maximizing space utilization. The front end is developed using HTML and CSS for a simple user interface, while the back end uses Python with the Flask framework to implement the core logic. MongoDB is used for storing student and seating data. This system reduces human effort, minimizes errors, and improves the overall efficiency of exam management.

Keywords - Artificial Intelligence, Exam Hall Seating, Seat Allocation, Automation, Python Flask, HTML, CSS, MongoDB, Optimization, Web Application

CSE-24

TOWARDS AN AI-ORCHESTRATED DIGITAL FABRICATION WORKFLOW: BRIDGING THE FRAGMENTATION GAP IN FABLAB MANUFACTURING PIPELINES

H A Rahulnath, Sumesh Balan

Department of Computer Science and Engineering, Ahalia School of Engineering and Technology, Palakkad, Co-founder, BlackCanvaAI, California

Abstract— Digital Fabrication Laboratories (FabLabs) put serious manufacturing hardware, 3D printers, laser cutters, CNC routers, PCB mills, within reach of students, makers, and entrepreneurs who would otherwise never touch them. The hardware story is, at this point, largely solved. The software story is not. Getting from a design idea to machine-ready files still requires navigating four disconnected software environments, each speaking its own file format, with no mechanism to keep the geometry consistent across all of them. This is not a minor inconvenience; in our pre-deployment study it cost practitioners an average of 4.7 hours per complete three-modality build, and 78% of attempts required at least one revision cycle due to dimensional errors discovered at the bench. This paper lays out that problem precisely, surveys what AI tools currently exist across additive manufacturing, vector/subtractive fabrication, and PCB design, and introduces FabOrchestrator, a deployed multi-agent system we built on our own production coding-agent infrastructure. You give it a single natural language or multimodal prompt; it gives back a

validated, machine-ready file bundle: STL/OBJ for the printer, SVG/DXF for the laser cutter, and a KiCAD-compatible netlist for the PCB. The backend is a Next.js/Node.js stack on AWS Fargate, with OpenCode handling agent execution inside Daytona-sandboxed workspaces. We tested the system across 120 fabrication tasks. Cross-modal dimensional consistency reached 91.3%, 3D mesh validity was 87.6%, laser path correctness hit 96.2%, and PCB DRC pass rate came in at 78.4% after one round of SPICE-loop iteration. We are transparent about where the system falls short, organic geometry remains hard, PCB verification is computationally intractable in the general case, and we describe how those limits are communicated clearly to users rather than papered over.

Keywords— digital fabrication, FabLab, large language models, text-to-3D, PCB design automation, multi-agent systems, workflow orchestration, software-defined manufacturing, agentic coding

CSE-25

AI-BASED IMAGE AUTHENTICITY DETECTION SYSTEM

Akshaya M, C Sriparvathy, Deepthy PS, Aryananda P, Sayana V

Computer Science Engineering, Ahalia School of Engineering & Technology, Palakkad, India

Abstract- The rapid advancement of artificial intelligence has enabled the creation of highly realistic synthetic images, raising concerns about misinformation, digital forgery, and trust in visual content. As AI-generated images become more widespread, distinguishing them from real images has become a critical challenge. This paper presents an AI-based image authenticity detection system that classifies images as real or AI-generated using deep learning. The system utilizes transfer learning with a pre-trained convolutional neural network (CNN) to automatically extract features, reducing the need for manual intervention. A labeled dataset of real and synthetic images is used to train the model for accurate and efficient performance. Implemented using Python and TensorFlow, with a Streamlit-based interface for real-time classification, the system provides a reliable and scalable solution for image authenticity verification in research and real-world applications.

Keywords- Artificial Intelligence, Image Authenticity, Deep Learning, CNN, Transfer Learning, Digital Forensics, Image Classification

CSE-26

YOUTUBE SENTIMENT ANALYZER USING NATURAL LANGUAGE PROCESSING

Dr Gunasekaran S, Gopika B, Ms.Dhanya P G, Nivedh A Nair, Aswan K Prakash, Rithu P
Department of CSE, Ahalia School of Engineering and Technology, Palakkad, Kerala

Abstract— The YouTube Sentiment Analyzer is a website that analyzes what people say about YouTube videos, helping creators, researchers, and analysts understand public opinion in today's



content-heavy world. It collects comments from videos and uses Natural Language Processing (NLP) to classify them as positive, negative, or neutral. The system also extracts keywords, analyzes emojis, and groups comments to provide deeper insights. It presents results through visualizations like word clouds and pie charts, and can generate summaries of audience opinions. Additionally, it includes a chatbot for user interaction. The frontend is built with React.js, while the backend uses Python Flask, making the platform fast, efficient, and easy to use without manual effort, while improving accuracy.

Keywords— Sentiment Analysis, YouTube Comments, Natural Language Processing, Machine Learning, Chatbot, Data Visualization, Flask, React

CSE-27

LOST AND FOUND SYSTEM

Adarash A, Midhun T Chandran, Athul krishna K, Mr.H.A.Rahulnath

Dept of CSE, Ahalia School of Engineering and Technology, Palakkad, Kerala

Abstract — The Lost and Found Management System is a web-based application developed to efficiently manage and track lost and found items within an institution. Traditional methods rely on manual records such as registers and notice boards, which are inefficient, unorganized, and prone to human errors. These limitations often lead to poor tracking of items and reduced chances of recovery. The proposed system provides a centralized digital platform that enables users to report lost or found items, search for items using advanced filtering, and submit claims through a structured process. The front end is developed using HTML, CSS, and JavaScript to provide a responsive and user-friendly interface. The backend is implemented using Node.js with the Express framework, which efficiently handles server-side logic and manages multiple user requests concurrently. MySQL is used as the relational database for storing structured data such as user details, item information, and claim records.

To improve the efficiency of item discovery, the system incorporates a smart matching mechanism using MySQL full-text search combined with ranking techniques. This approach analyzes user queries, assigns relevance scores to stored items, and returns results in an ordered manner based on similarity.

Keywords— Lost and Found System, Web Application, Item Tracking, Full-Text Search, Smart Matching, Node.js, MySQL, Claim Management, Data Management

CSE-28

AI-BASED EXAM EVALUATION SYSTEM

Dr. Gunasekaran S, Ms. Deepthy PS, Adhip Suresh, Sreeyesh Sunilkumar, Mithun Yuvanah,
Abhijith PG

Dept. of CSE, Ahalia School of Engineering and Technology, Kerala, India

Abstract— This paper presents the design and implementation of an AI-based exam evaluation system that automates the assessment of both objective and subjective answers through a web-based platform. The system enables teachers to create examinations, define answer keys, and monitor student performance, while students can attend scheduled exams and submit descriptive responses. The evaluation engine employs keyword extraction, semantic similarity analysis, and logical correctness checks to award full or partial marks based on the relevance of each response. Experimental results confirm accurate grading for objective questions and reasonable accuracy for subjective answers, alongside significant reductions in teacher workload and evaluation time. The paper discusses system architecture, implementation details, observed limitations, and future directions for improvement.

Keywords— Artificial Intelligence, Exam Evaluation, Natural Language Processing, Machine Learning, Semantic Similarity, Subjective Answer Grading, Web Application, Keyword Matching

CSE-29

SMART LEARN AI AN INTELLIGENT STUDY ASSISTANT

Nikhil C, Nandana T A, Pranav Krishnan S, Sreeshankar K S, Ms Keerthi M, Dr Gunasekaran S
Computer Science and Engineering, Ahalia School of Engineering and Technology, Palakkad, Kerala, India

Abstract— Smart Learn AI is an advanced, AI-powered educational assistant designed to enhance personalized learning experiences and improve academic performance. Leveraging technologies such as artificial intelligence, machine learning, and natural language processing, the system adapts to individual learning styles, pace, and preferences, providing tailored educational support to students across diverse domains. The primary objective of Smart Learn AI is to bridge the gap between traditional learning methods and modern, technology-driven education systems. It functions as a virtual tutor that can assist students in understanding complex concepts, generating summaries, answering questions, and recommending customized study plans. By analyzing user interactions and performance data, the system continuously refines its recommendations to ensure optimal learning outcomes. One of the key features of Smart Learn AI is its intelligent content delivery mechanism. The platform provides interactive learning materials, including quizzes, flashcards, and concept explanations, which are dynamically adjusted based on the learner's progress and comprehension level. Additionally, it incorporates real-time doubt-solving capabilities, enabling students to receive instant explanations and clarifications, thereby reducing dependency on external resources.

Keywords— Artificial Intelligence (AI), Personalized Learning, Intelligent Tutoring System, Machine Learning, Natural Language Processing (NLP), Adaptive Learning, Learning Analytics

CSE-30

PERSONALIZED AI ASSISTANT CHATBOT FOR KTU CSE STUDENTS

Ms Keerthy M, Arjitha A, Iffah Hussainbi S, S Nasiba Rahana, Nikitha Jayan Nair
Ahalia School of Engineering and Technology, Palakkad, Kerala

Abstract- The quick growth of Artificial Intelligence (AI) and Natural Language Processing (NLP) has opened up new ways to change options in the field of personalized education. This paper discusses the design, development, and assessment of an AI-powered academic assistant chatbot that is specific to a certain field only for students in Semester 6 who are studying Computer Science and Engineering (CSE) at APJ Abdul Kalam Technological University Kerala, India, University (KTU). The proposed chatbot includes conversational AI systems, knowledge of deep academic fields, context injection that takes into account the syllabus, analysis of previous year question (PYQ) patterns and adaptability personalization mechanisms that make answers fit the person's unique the learning needs and testing patterns of KTU engineering students' pupils. The system uses a Retrieval-Augmented Generation (RAG) architecture enhanced by a prompt engineering layer that limits and puts all AI responses in context within the curriculum framework. The chatbot helps students with a lot of different things, such as answering questions in real time, making notes for each module, making personalized study plans, helping with coding and labs, and giving advice on mini-projects. Experimental findings and usability assessments demonstrate a notable enhancement in student readiness, a decrease in pre-examination anxiety, and heightened contentment with AI-assisted educational support. This study adds to the growing body of research on educational AI systems that are tailored to specific fields. It also presents a structure that can be used to create semester-specific academic assistants for a wide range of engineering programs.

Keywords— Artificial Intelligence, Educational Chatbot, Natural Language Processing, Retrieval-Augmented Generation, KTU, Personalized Learning, Exam Preparation, Prompt Engineering, Academic AI, Domain-Specific Chatbot

CSE-31

COEDIT: REAL-TIME COLLABORATIVE CODE EDITOR

Dr. S Gunasekaran, Ms. Anisree P G, Midhun V, Mohammed Shahal A, Mrinal V, Navaneeth
 Krishna M M

Dept of CSE, Ahalia School of Engineering and Technology, Palakkad, India

Abstract— Collaborative software development is becoming increasingly common in modern programming environments. This paper describes the design and implementation of a Collaborative Code Editor that allows multiple users to edit a given source code file simultaneously. It uses a function-level locking feature that allows users to lock certain sections of code to prevent conflicts. This feature is important to enhance real-time collaboration among users.

Keywords— collaborative code editor, real-time collaboration, CRDT, distributed systems, software development tools

ECE-01

BRAIN TUMOR DETECTION USING MULTIMODAL MRI SCANS WITH A DEEP LEARNING ALGORITHM AND EDGE AI

Dr. Leesha Paul, Subiksha S, Dr. V Balamurugan, Mohammed Haddiq S, Pooja P Menon, Nikhil V

Department of Electronics and Communication Engineering, Ahalia School of Engineering and Technology, Palakkad, India

Abstract— The most important task of medical imaging is to identify the brain tumor at the earliest stage and proceed with the correct treatment, based on the MRI images. In order to enhance the quality of generated objects and the effectiveness of the calculation, a high-level deep learning-based model of automated tumor classification will be adopted in this project to apply the state-of-the-art neural network models, i.e., MobileNet and VGG16. The simplified model-complexity tradeoff enabling lightweight MobileNet architecture to be deployed in real-time and the capability of the deep VGG16 based architecture to learn more details with high fidelity and precision classification results are realised. The system will identify two brain MRI images tumor and non-tumor. The classification networks rely on the MobileNet and VGG16 networks to maximize the accuracy and to reduce the computation resources. MobileNet offers a smaller version that can be implemented on edge computing and mobile hardware, with shorter inference time at the cost of the deeper layers, however VGG16 has additional layers, which make the features extracted by it more detailed and can be more easily classified. Potential improvement of the methodology is a better timely diagnosis and elimination of invasiveness of diagnostic measures. A combination of the models and real-time diagnostic devices will allow clinicians to improve clinical decision making and this will translate to improved tumor detection.

Keywords— The authors in the present study care about identifying the correlation between Brain Tumor, MRI, and MobileNet and VGG16, Deep Learning, and Accuracy.

ECE-02

DESIGN AND FPGA IMPLEMENTATION OF A 32-BIT RISC PROCESSOR USING VERILOG HDL

Arya P R, Chaithra K C, Ashrin A, Aneesh K, Athish R, V. Balamurugan
Department of Electronics and Communication Engineering, Ahalia School of Engineering and Technology, Palakkad, India

Abstract— Creating a processor from the ground up is frequently one of the best strategies to comprehend how digital technology functions. In this work, an FPGA was used to create a basic 32-bit CPU that was built using Verilog HDL. A simple datapath connects the architecture's well-known parts, which include a Program Counter, Register File, Arithmetic Logic Unit, and Control Unit. Before being included into the entire processor, each module was created and tested separately. The design was built on a Xilinx Artix-7 FPGA utilizing the Basys 3 development

board following functional simulation. Basic arithmetic and logical operations could be accurately performed by the CPU. With 25 LUTs, 29 slice registers, and 21 slices, hardware consumption stayed comparatively low. The architecture appears to be sufficiently efficient for FPGA-based CPU development, as seen by the measured power consumption of roughly 0.124 W.

Keywords— FPGA, Basys 3, Artix 7, Verilog HDL.

ECE-03

A COMPACT CLOVER-SHAPED SLOT-LOADED MICROSTRIP PATCH ANTENNA FOR SUB-6 GHZ APPLICATIONS

Nandana N, Sivani P S, Rijul R Das, Mr. Sanish V S, Shakira U, Dr. V. Balamurugan
Department of Electronics and Communication Engineering, Ahalia School of Engineering and Technology, Palakkad, Kerala, India

Abstract— A compact single-element antenna for wireless communication applications operating in the sub-6 GHz frequency band is presented. The antenna is designed on a low-cost dielectric substrate to achieve efficient impedance matching, adequate bandwidth, and stable radiation characteristics. Performance evaluation is carried out in terms of reflection coefficient (S11), gain, and radiation pattern. The results indicate that the antenna maintains an S11 value below -10 dB across the desired operating band, ensuring effective power transfer. The radiation pattern is observed to be nearly omnidirectional with satisfactory gain, making it suitable for practical wireless communication systems. Owing to its simple structure, compact size, and ease of fabrication, the proposed antenna is well suited for integration into modern communication devices. In addition, the design can be extended as a fundamental element for advanced multi-element antenna systems, including MIMO configurations.

Keywords— Single-element antenna, Sub-6 GHz, Reflection coefficient (S11), Impedance matching, Radiation pattern, Gain, Wireless communication, Compact antenna, MIMO systems.

ECE-04

CATRON: A CABLE TUNNEL INSPECTION ROBOT

Arya Sasikumar, Mahitha M, Dhanush P, Ms. Swetha C, Gowthami S, Dr. V. Balamurugan
Department of Electronics and Communication Engineering, Ahalia School of Engineering and Technology, Palakkad, Kerala, India

Abstract— CATRON, the cable tunnel inspection robot aims to scrutinize and continuously monitor the conditions inside tunnels by using advanced sensors and specialized integrated HD cameras. These sensors help in identifying potential hazards, such as the presence of gas leakages, abnormal temperature levels, fluctuations in humidity, or any physical obstacles that may disrupt normal operations. It is also capable of disseminating live data and real-time video feeds to remote monitoring stations through cloud integration. By automating the inspection process, the robot



reduces human risk by eliminating the need for manual entry into potentially dangerous tunnels. Furthermore, the system's preventive maintenance allows for the early detection of faults or deformity, and ensuring uninterrupted operation of cable systems.

Keywords— Tunnel inspection, hazard detection, gas leaks, temperature and humidity monitoring, obstacle detection, integrated sensors, live video streaming, remote monitoring, cloud integration, Raspberry Pi, motor control, preventive maintenance, real-time data, safety, cost-effective solution.

ECE-05

VLSI ARCHITECTURE FOR VIDEO EDGE DETECTION

Aditya Kiran S R, Jishnu R, Anirudh Sreejithesh, Gayathri P S, Ashik M, Dr. V. Balamurugan
*Dept. of Electronics and Communication, APJ Abdul Kalam Technological University,
Palakkad, Kerala, India*

Abstract— Applications like object recognition, scene comprehension, and video surveillance depend heavily on edge detection in the field of video processing. Effective hardware architectures that can manage the computational demands of edge detection algorithms while guaranteeing low power consumption are necessary for real-time video data processing. A novel VLSI (Very-Large-Scale Integration) architecture for real-time video edge detection is presented in this paper. The suggested architecture seeks to achieve a balance between resource-efficient implementation and high-performance edge detection. To increase computational speed, it makes use of parallel processing and optimized data flow. To guarantee seamless video stream processing, extra care is taken with memory management and data buffering. The architecture is implemented on Artix 7 and Spartan 3E FPGA and is based on Canny edge detection algorithms. The proposed architecture is also implemented on GPP to validate the performance of the VLSI architecture.

Keywords— Canny edge detector, bilateral filtering, FPGA-based designs, image denoising.

ECE-06

AI POWERED ROBOT FOR MICROPLASTIC DETECTION AND EXTRACTION

Sanu C S, Thripathi M, Sreerag P, Ms Vijitha Khan, Swetha R, Dr. V. Balamurugan
Department of Electronics and Communication Engineering, Ahalia School of Engineering and Technology, Palakkad, Kerala, India

Abstract - Microplastic pollution in water bodies has become a growing environmental concern due to its harmful effects on aquatic ecosystems and human health. Typical monitoring methods are generally slow and do not provide real-time detection.

In this work, a floating robot system that is powered by an artificial intelligence is presented to locate and eliminate microplastics from water. Monitoring water quality parameters such as pH, cloudiness, temperature, and harmful gases simultaneously. The system includes sensors, camera-based image processing and GPS tracking for real time monitoring. And mapping of polluted areas. The gathered data is fed into the cloud dashboard, where it can be monitored and analysed remotely. The recommended approach provides a speedy and automatic means of monitoring water quality without interruption. Environmental protection.

Keywords— Applications of microplastics, water quality monitoring, artificial intelligence and floating robots, monitoring, sensor integration.

ECE-07

AN AI POWERED LASER-BASED AUTONOMOUS ROVER FOR WEED DETECTION AND REMOVAL

Muhammed Aslam KM, Vineeth M, Sidharth K, Dr V Balamurugan, Sooraj S
*Dept. of Electronics and Communication, APJ Abdul Kalam Technological University,
 Palakkad, Kerala, India*

Abstract— The AI Laser Weed Removal Rover is an autonomous precision agriculture system designed to detect and eliminate weeds without the use of chemical herbicides. The system integrates artificial intelligence, embedded control hardware, and laser-based actuation to deliver an environmentally sustainable weed management solution. A Raspberry Pi 5 handles real-time image acquisition and weed classification using a MobileNetV2-based PyTorch model, while an ESP32 microcontroller manages motor actuation, stepper scanning, and laser firing. The rover autonomously navigates agricultural fields, detects weeds via AI inference, and applies a targeted 7-second laser burst to eliminate them. A web-based interface provides live video streaming, manual override, and emergency stop functionality, making the system suitable for smart and precision farming applications.

Keywords— precision agriculture, weed detection, laser actuation, Raspberry Pi 5, ESP32, MobileNetV2, PyTorch, autonomous rover, embedded systems, smart farming

ECE-08

SOLAR POWERED OXYGEN CONCENTRATOR WITH REAL TIME MONITORING AND BATTERY BACKUP

Abhishek K V, Athul G, Ajil J, Vinod Kumar P, Ajmal T A, Dr. V. Balamurugan
*Dept. of Electronics and Communication, APJ Abdul Kalam Technological University,
 Palakkad, Kerala, India*

Abstract— This paper presents a solar-powered oxygen concentrator designed to improve the reliability of oxygen therapy in power-constrained environments. The system integrates a 200W



solar panel, battery, and inverter to ensure uninterrupted operation during power outages. An AOF1010 ultrasonic oxygen sensor is used for real-time monitoring of oxygen purity and flow rate, with data processed using an Arduino-based system. The proposed work enhances conventional concentrators by adding energy backup and monitoring capabilities without modifying the core oxygen generation mechanism. Experimental results demonstrate stable oxygen output and effective system performance. Future work focuses on automated oxygen flow regulation and integration of physiological sensors for intelligent oxygen delivery.

Keywords— Oxygen Concentrator, Solar Power, Real-Time Monitoring, Arduino, Healthcare, Automation

ECE-09

INTELLIGENT FRONT-DESK FRAMEWORK FOR ENHANCING PATIENT FLOW IN HOSPITALS

Akshaya Sri P S, Mehrin Ayisha S, Anamika S, Dr. V. Balamurugan, Manu S Vignesh
Department of Electronics and Communication Engineering, Ahalia School of Engineering and Technology, Palakkad, Kerala, India

Abstract— Hospitals often run into delays not because of lack of doctors but due to messy front desk routines that slow everything down. The Intelligent Front Desk Framework tries to ease that first step by letting patients register themselves and be directed to the right department without much confusion. It runs on a simple Raspberry Pi 4B with a touchscreen and is built using Python, which keeps the setup relatively affordable. Patients enter their symptoms and basic details, and the system then decides where they should go and issues a token for consultation. All data is stored in Firebase, so staff can access it easily and manage both patient and doctor information through a separate interface. It does not solve every problem, yet it reduces waiting and cuts some of the repetitive work at reception.

Keywords— Patient registration, hospital automation, patient flow, department allocation, Raspberry Pi, Python, Firebase, token generation.

ECE-10

NON-CONTACT VOLTAGE DETECTOR GLOVE USING 555-TIMER

Akhib Ahammed M, F Ann Maria Neefa, Darsan V, Harishma Chandran, Dr. V. Balamurugan
Electronics and Communication Engineering, Ahalia School of Engineering and Technology, Palakkad, Kerala, India

Abstract— The increasing need for electrical safety in both domestic and industrial environments has led to the development of efficient voltage detection systems. This project presents the design and implementation of a non-contact voltage detector integrated into wearable gloves using a 555 timer IC. The system operates by sensing the electric field generated around live conductors



without requiring direct physical contact, thereby ensuring user safety. A sensing probe embedded within the glove detects the presence of an alternating electric field, which is then amplified and processed through a signal conditioning stage. The conditioned signal is applied to the 555 timer IC, configured to generate an output signal upon detection. This output activates an indicator such as an LED or buzzer, providing a clear and immediate alert to the user regarding the presence of voltage. The proposed system offers a simple, cost-effective, and reliable solution for non-contact voltage detection. By integrating the detection mechanism into wearable gloves, the design enhances portability and practical usability, making it suitable for electricians, maintenance personnel, and safety applications. The project demonstrates an effective approach to improving electrical safety using basic electronic components.

Keywords— Non-contact voltage detection, capacitive sensing, 555 timer IC, electrical safety, wearable device, AC voltage sensing, embedded systems.

ECE-11

REAL-TIME ECG MONITORING AND ANALYSIS SYSTEM USING ARDUINO

Abhinandh P N, Ananthakrishnan S, Ajay N J, M Mohammed Niyas, Ajil Madhav C K
*Electronics and Communication Engineering, Ahalia School of Engineering and Technology,
Palakkad, India*

Abstract— This project presents a real-time ECG monitoring system using Arduino, MAX30003, and Python. It acquires, processes, and displays cardiac signals, detects abnormalities through feature analysis, and provides live waveform and pulse rate visualization. The system offers a cost-effective solution for continuous heart monitoring.

Keywords— ECG Monitoring, Arduino, MAX30003, Biomedical Signal Processing, Heart Rate Detection, Real-Time Monitoring, Signal Analysis, Healthcare System

ECE-12

AUTOMATIC INDICATOR SYSTEM USING ESP32 AND GPS

Ms. Gayathri P S, Prasin Krishna E, Dr. V. Balamurugan, Sainul Abidh P S, Mohammed Irfan B,
Sree Vishnu S
*Dept. of Electronics and Communication, Ahalia School of Engineering and Technology,
Palakkad, India*

Abstract— The GPS Based Automatic Turn Indicator System is designed to automatically detect vehicle turning direction and activate the corresponding turn indicator without manual intervention. The system uses an ESP32 microcontroller along with a GPS module to continuously



monitor the vehicle's geographical position and heading direction. By analyzing changes in the heading data obtained from the GPS, the system determines whether the vehicle is turning left or right. When a turn is detected, the ESP32 triggers the appropriate LED indicator to signal the direction of the turn. This system aims to improve road safety by reducing the chances of drivers forgetting to activate turn indicators manually. The hardware setup includes an ESP32 development board, GPS module, LEDs for turn indication, and a power supply system using a battery and buck converter. The software is developed using the Arduino IDE and utilizes GPS data processing to determine directional changes in real time. The proposed system demonstrates a simple, cost-effective, and reliable solution for implementing automatic turn indication in vehicles. With further development, this system can be integrated into smart vehicles and advanced driver assistance systems to enhance driving safety and convenience.

Keywords— ESP32, Global Positioning System (GPS), Automatic Turn Indicator, Vehicle Safety, Embedded Systems, Real-time Tracking, ADAS.

ECE-13

XRAY3D: DEEP LEARNING–BASED 3D RECONSTRUCTION FROM 2D RADIOGRAPHS

Mridhul Krishna M, Sriram G, Muhammed Ibrahim S, Dr. Divya Mohan, Sabarinath M
Department of Electronics and Communication Engineering, Ahalia School of Engineering and Technology

Abstract— Medical imaging plays a crucial role in today's healthcare. X-ray imaging is widely used because it is affordable and easy to access. However, traditional X-rays only provide two-dimensional views of three-dimensional body structures, which complicates accurate diagnosis. This paper presents XRAY3D, a system based on deep learning that generates 3D bone structures from a single 2D X-ray. The process includes image preprocessing, bone segmentation, depth estimation with physics-based modeling, and 3D surface reconstruction using Poisson methods. The backend is built with Fast API, PyTorch, and Open3D. The frontend utilizes Next.js and Three.js for interactive visualization. This system enables real-time 3D visualization, improving spatial understanding and providing a more affordable alternative to CT imaging, especially in resource-limited areas.

Keywords— X-ray, 3D Reconstruction, Deep Learning, Medical Imaging, Computer Vision, Poisson Reconstruction

ECE-14

PERFORMANCE ANALYSIS OF MULTIPLE FPGA PLATFORMS USING UP AND DOWN COUNTERS

Akshaya A, Arya B, Anuja S, Arya R, Dr. Aneesh K

Department of Electronics and Communication Engineering, Ahalia School of Engineering and Technology, Palakkad, India

Abstract— Field Programmable Gate Arrays (FPGAs) are commonly employed in the implementation of digital systems due to their flexibility, reconfiguration, and high performance. In this paper, the performance analysis of various Field Programmable Gate Arrays is performed using a comparative approach, considering 4-bit up and down counters as the basis of the implementation. The counters are designed using Verilog HDL, which are then implemented on different FPGA platforms, including Basys 3, Nexys 4 DDR, Boolean Board, Black Board, and PYNQ Z2. Before the hardware implementation, the designs are simulated and verified using the Xilinx Vivado environment. The performance analysis is conducted based on the parameters, including the utilization of the Look-Up Table, power consumption, and timing analysis. The results show the effect of the architecture of the Field Programmable Gate Arrays, considering the simplicity of the hardware platforms, which provide better performance in the implementation of small-scale designs, while the complexity of the platforms provides flexibility in the implementation of complex designs.

Keywords— FPGA, Verilog HDL, Up Counter, Down Counter, LUT Utilization, Power Analysis, Timing Analysis

ECE-15

TOMATO QUALITY CLASSIFICATION

*Dr. Divya Mohan, Rayan Gaffor, Dr. V. Balamurugan, S Chandru, M Padmaja, Sreelakshmi V
 Electronics and Communication Engineering, Ahalia School of Engineering and Technology,
 Palakkad, India*

Abstract— Automated tomato quality categorization is crucial for enhancing post-harvest management and guaranteeing reliable delivery of fresh fruit. A deep learning-based method for classifying tomatoes into four different quality classes—Unripe, Ripe, Old, and Damaged—is presented in this work. Using a Kaggle dataset of tagged images, we examine how well sophisticated neural architectures do this categorization problem. Although conventional convolutional neural networks (CNNs) have been extensively employed for comparable image-based evaluations, we suggest an improved approach that combines two cutting-edge models: ResNet, a hybrid model that combines a Random Forest classifier and the Swin Transformer, is renowned for its capacity to extract intricate visual information via residual learning. While the Random Forest enhances decision-making through ensemble learning, the Swin Transformer uses a hierarchical attention mechanism to capture both local and global picture characteristics. This combination strategy tackles issues including uneven lighting, variations in variety, and varying degrees of ripeness among samples. In order to provide a dependable and scalable solution for automated tomato quality assessment, with potential applications in supply chain optimization and smart farming, we measure each model's performance using accuracy, precision, recall, and F1-score.

Keywords— CNN, Resnet, Swin Transformer, Random Forest, Deep Learning, Image Classification.

EEE-01

SMART INFUSION PUMP SYSTEM

Mohammed A; Karthika G; Rahul R; Ms. Rosu Varkeyachan; Akshay Kumar M
Electrical and Electronics Engineering, Ahalia School of Engineering and Technology, Palakkad, India

Abstract— Intravenous infusion therapy is a fundamental clinical procedure used for delivering fluids, nutrients, and medications directly into a patient's bloodstream. Although conventional infusion pumps are widely used, they still rely heavily on manual supervision, increasing the risk of dosage errors, delayed response to complications, and higher workload for healthcare professionals. This paper presents the design and implementation of a smart infusion pump that integrates embedded systems, biomedical sensors, and Internet of Things (IoT) technology to enhance patient safety and infusion accuracy. The proposed system is built around an ESP32 microcontroller and incorporates sensors for temperature, heart rate, oxygen saturation (SpO₂), pressure, and fluid weight measurement using a load cell. Real-time sensor data is continuously analyzed to regulate fluid flow through solenoid valves, while abnormal conditions automatically trigger alarms and safety mechanisms. Wi-Fi connectivity enables remote monitoring, data logging, and centralized supervision of infusion therapy. Experimental testing demonstrates reliable operation, accurate dosage delivery, and effective safety responses. The proposed solution offers a cost-effective and scalable alternative to commercial smart infusion pumps, making it suitable for deployment in resource-constrained healthcare environments.

Keywords— Infusion Pump, IoT, Biomedical Sensors, ESP32, Healthcare Monitoring

EEE-02

FINGERPRINT ELECTRONIC VOTING MACHINE

Adithyan P, Vaisakh RS, Amjith K, Midhun J
Electrical and Electronics Engineering, Ahalia School of Engineering and Technology, Kerala, India

Abstract— The Fingerprint-Based Electronic Voting Machine is a secure and efficient voting system designed to eliminate electoral fraud and ensure transparency in the voting process. This system uses biometric fingerprint authentication to verify the identity of voters before allowing them to cast their vote. Each voter's fingerprint data is pre-registered and stored in a secure database. During voting, the system scans the fingerprint and compares it with the stored data to authenticate the voter. Voting is permitted only if the fingerprint matches the registered record,

thereby preventing duplicate voting and impersonation. The system is developed using a microcontroller-based platform integrated with a fingerprint sensor module and a digital display interface. Once authenticated, the voter can select their preferred candidate, and the vote is securely recorded in the system memory. This method enhances election security, reduces manual errors, and minimizes the need for paper ballots.

Keywords— Biometrics, Voting System, Fingerprint Sensor, Security, Microcontroller

EEE-03

DESIGN AND IMPLEMENTATION OF SMART BAG TRACKING AND SAFETY SYSTEM FOR KIDS

Babhitha Rosh B; Gowtham S; Hridya R; Rikas M; A. Manickavasagam
Electrical and Electronics Engineering, Ahalia School of Engineering and Technology, Kerala, India

Abstract— This project presents the design and implementation of a Smart Bag Tracking and Safety System for kids using Internet of Things (IoT) technology. The system is developed using an ESP32 microcontroller integrated with a Neo-6M GPS module, SIM800L GSM module, temperature sensor, and an SOS emergency switch. It provides real-time location tracking and sends SMS alerts with a Google Maps location link to predefined contacts during emergency situations. The device is compact, low-cost, and powered by a rechargeable 3.7 V battery with a buck converter. The proposed system offers an effective solution for improving student safety and basic health monitoring.

Keywords— IoT, GPS Tracking, GSM Module, Child Safety, Emergency Alert System

EEE-04

DESIGN OF SMART OXYGEN CONCENTRATOR WITH REDUCED GRID RELIANCE

Ajith M; Anirudh Reji; Fasir Ali; Sreya P; Ms. Lakshmi Suresh
Electrical and Electronics Engineering, Ahalia School of Engineering and Technology, Kerala, India

Abstract— The increasing demand for reliable medical oxygen supply, especially during emergencies and in remote areas, highlights the need for energy-efficient and self-sustaining oxygen generation systems. This paper presents the design of a smart oxygen concentrator with reduced grid reliance, aimed at ensuring uninterrupted oxygen delivery while minimizing dependence on conventional electrical power. The proposed system integrates renewable energy



sources, such as solar photovoltaic panels, with an intelligent energy management unit to power the oxygen concentrator. A microcontroller-based monitoring system continuously observes oxygen purity, flow rate, battery status, and power availability, enabling automatic switching between solar power, battery storage, and grid supply when required. The system also incorporates IoT-based monitoring for real-time data tracking and alerts to ensure safe operation and timely maintenance. By optimizing energy consumption and utilizing renewable energy resources, the proposed design improves reliability, reduces operational costs, and enhances accessibility of oxygen therapy in rural and off-grid healthcare facilities. The implementation of this smart oxygen concentrator contributes to sustainable healthcare infrastructure while ensuring continuous oxygen supply during power interruptions.

Keywords— Oxygen Concentrator, Renewable Energy, IoT, Solar Power, Healthcare System

EEE-05

SMART HOME ILLUMINATION USING SMART SENSORS AND IOT

Neha Babu, Arjun A, Thejus Das V, Subin Chacko, Sudarsh S

Electrical and Electronics Engineering, Ahalia School of Engineering and Technology, Kerala, India

Abstract— The project involves the design and implementation of an IoT-based smart home system using the ESP32 microcontroller to optimize energy efficiency and safety. The system integrates an LDR for ambient light detection and a DHT22 for climate monitoring. Key features include automatic lamp dimming via a TRIAC circuit, relay-controlled cooling fans, and remote management through the Blynk IoT platform. For enhanced safety, the design includes a dedicated earth fault detection circuit to protect users from electrical ground leaks.

Keywords— IoT, Smart Home, ESP32, LDR, DHT22, Energy Efficiency, Home Automation

EEE-06

SHORT – TERM LOAD FORECASTING IN SMART GRID USING DRAGONFLY ALGORITHM WITH BPN

Sivakumar R, Pradip C, Manickavasagam A, John Alexis S, Muruganath Gopal Raj

Computer Science Engineering / Electrical and Electronics Engineering / Mechanical Engineering,

Nehru Institute of Engineering and Technology, Coimbatore & Ahalia School of Engineering and Technology, Kerala, India

Abstract— Short-term load forecasting plays a vital role in the reliable and economical operation of smart grids. Accurate predictions of electricity demand help grid operators schedule generation



efficiently, maintain grid stability, and reduce operational costs. This paper presents a new approach that combines the Dragonfly Algorithm with a Backpropagation Neural Network for short-term load forecasting. The Dragonfly Algorithm, inspired by the swarming behavior of dragonflies, is used to determine optimal initial weights for the neural network, improving learning efficiency and forecasting accuracy. The proposed model is validated using real microgrid load data, achieving a mean absolute percentage error (MAPE) of 1.48%, outperforming conventional neural networks and other optimization techniques such as genetic algorithms and particle swarm optimization. The system demonstrates strong performance during peak demand periods and offers fast computation with reliable accuracy, making it a practical solution for smart grid operations.

Keywords— Load Forecasting, Smart Grid, Dragonfly Algorithm, Neural Network, Optimization, Microgrid

ME-01

PERFORMANCE MONITORING OF A SAVONIUS VERTICAL AXIS WINDMILL

Sadanandan R, Vivek Gopi, Karthikeyan V, Muhammed Kareem F, Prathyush M, Ramith R
*Department of Mechanical Engineering, Ahalia School of Engineering and Technology,
Palakkad, India*

Abstract— The project presents the design and implementation of a windmill performance monitoring system that uses real-time sensing and data analysis. The system is designed to continuously monitor wind speed, generated voltage, and current behaviour of the Savonius vertical-axis windmill, along with a comparison of actual and expected power. The system is equipped with a Pro Range Pulse NPN Wind Speed Sensor (SN-3000-FSJT-NPN, Polycarbonate) for accurate wind speed measurement. The four-blade windmill is coupled to a 12V DC Dynamo by a spur gear assembly supported by two F204 bearings. The generated voltage is sensed using a voltage sensor. The data collected, including wind speed, generator voltage, and current characteristics obtained from the ESP32, are processed in Python for continuous performance monitoring. The proposed system enables early performance assessment and preventive maintenance, thus improving the reliability and efficiency of small-scale wind energy systems. This project demonstrates effective integration of renewable energy monitoring, IoT-enabled embedded systems, and data analytics, making it suitable for educational, research, and small-wind-power applications.

Keywords—

Vertical Axis Wind Turbine (VAWT), Wind Speed Monitoring, Embedded System (ESP32), Performance Analysis, IoT-Based Monitoring, Data Analytics (Python), Renewable Energy Systems

ME-02

STUDIES ON THE PRODUCTION OF COMPRESSED AIR USING WAVE ENERGY BASED AIR COMPRESSOR SYSTEM

Dr. John Alexis S, Rebin Husain M, Akhilesh P, Mohammed Noufal N, Naveen K
*Department of Mechanical Engineering, Ahalia School of Engineering and Technology,
 Palakkad, India*

Abstract— Ocean waves represent a significant source of renewable energy that can be harnessed for sustainable power generation. This work focuses on the design and fabrication of a wave-driven air compression system that converts the vertical motion of sea waves into useful compressed air energy. The system utilizes a floating buoy to capture wave motion, which is then transmitted through a mechanical power transmission arrangement including a chain and sprocket drive, gear mechanism, and a reciprocating compressor adapted from a discarded internal combustion engine. The air compressed by the system is collected and stored in a pressure tank for later use in pneumatic applications such as spray painting, cleaning operations, and small-scale industrial activities. Experimental testing shows that wave motion with an average height of approximately 0.7 m is sufficient to operate the mechanism and produce compressed air within the storage tank. The developed system demonstrates a cost-effective, environmentally friendly, and renewable approach for utilizing wave energy in coastal regions.

Keywords— Wave energy, Renewable energy, Air compressor system, Buoy mechanism, Mechanical power transmission, Pneumatic energy storage, Ocean wave energy conversion

ME-03

PARAMETRIC STUDY ON THE VIBRATION CHARACTERISTICS OF NEOPRENE RUBBER ISOLATORS

Anna Inasu Chungath, Srutheesh T P, Charles Michael Augustine, Rojin Mathews, Dawn Cletus Francis

Department of Mechanical Engineering, Christ College of Engineering, Thrissur, India

Abstract— This paper studies the influence of geometric configuration on the vibration isolation performance of neoprene-based elastomers. Conventional isolator designs primarily focus on material properties, while the effect of geometry on dynamic behaviour is often overlooked. In this work, three different geometries such as square blocks, ring, and strips were designed with a constant material volume of 72,000 mm³ and uniform thickness to ensure a fair comparison. A numerical modal analysis was performed using ANSYS to determine the natural frequencies under a constant payload of 11 kg. The results showed a significant shift in natural frequency from 16.44 Hz for the square configuration to 21.68 Hz for the strip configuration. To understand this variation of natural frequency, the concept of shape factor was employed, which had a direct relationship



between geometry, stiffness, and natural frequency. Experimental validation was carried out on the square configuration using a vibration shaker setup. The measured resonance frequency of approximately 16.0 Hz closely matched the numerical result, confirming the accuracy of the simulation model. The study demonstrates that geometric modification alone can effectively tune the vibration response without altering material properties or mass. These findings highlight the importance of geometry-driven design in elastomeric isolators and provide a practical approach for optimizing vibration isolation performance in engineering applications.

Keywords— Vibration isolation, Neoprene Rubber, Shape Factor, Natural Frequency, Transmissibility

ME-04

EXPERIMENTAL INVESTIGATION OF AN INNOVATIVE SYSTEM FOR SOLAR DESALINATION

Amrithesh Krishna R, Arjun S, Shabith A, Prabijith R, Dr. P R Suresh
*Department of Mechanical Engineering, Ahalia School of Engineering and Technology,
Palakkad, Kerala, India*

Abstract— Water scarcity is becoming a major problem around the world due to rapid population growth, climate change, and the limited availability of fresh water. One promising way to address this issue is desalination, which converts salty water into drinking water, but common methods like reverse osmosis and multi-stage flash distillation consume a lot of energy. To overcome this, solar still desalination offers a simpler and more eco-friendly solution by using sunlight to purify water. In this study, a basic single-basin solar still was first tested to understand how it performs under normal conditions. Then, improvements were made to increase its efficiency, such as adding paraffin wax as a phase change material (PCM) to store heat and using fins inside the basin to enhance heat transfer. The PCM helps by storing excess heat during the day and releasing it later, allowing water evaporation to continue even when sunlight reduces. Throughout the experiment, important factors like water temperature, glass temperature, surrounding temperature, water output, and efficiency were measured and analyzed. The results clearly showed that the modified solar still produced more fresh water than the conventional one, making it a practical, low-cost, and sustainable solution for areas facing water shortages.

Keywords— Solar still desalination, phase change material (PCM), finned absorber, renewable energy desalination, solar thermal distillation, water scarcity solution

ME-05

SOLAR-BASED CONTINUOUS HOT WATER SUPPLY SYSTEM ENHANCED WITH PHASE CHANGE MATERIALS

Abhijith M M, Hrithikkrishna V D, Fevin Francis, Justin Thomas, Sarath Babu Ramachandran,
 Dr. Renjish Vijay
*Department of Mechanical Engineering, Vidya Academy of Science and Technology, Thrissur,
 Kerala, India*

Abstract— This study investigates the design and performance of a solar water heating system integrated with Phase Change Material (PCM) for efficient thermal energy storage. The system incorporates evacuated tube collectors to heat water, which subsequently transfers heat to the PCM via an immersion coil heat exchanger. During periods of solar availability, the PCM stores thermal energy by undergoing a phase change, while during non-sunshine periods, it releases the stored heat to sustain water temperature. Experimental analysis reveals that 11 kg of PCM melts in approximately 28 minutes at an inlet water temperature of 75 °C and a flow rate of 1 L/min. Furthermore, during the absence of solar radiation, the system increases water temperature from 32 °C to 50 °C, demonstrating effective thermal energy recovery. The results confirm that PCM integration significantly improves system efficiency and ensures a reliable hot water supply under intermittent solar conditions.

Keywords— Phase change material, Solar water heater, Paraffin wax, Stearic acid, Evacuated tube

ME-06

EXPERIMENTAL INVESTIGATION OF PLA BASED NATURAL COMPOSITES IN 3D PRINTING

Jishnoop Jayaprakash, Adarsh S, Shiyas S, Vishnu M, Venkitesh K S
*Department of Mechanical Engineering, Ahalia School of Engineering and Technology,
 Palakkad, India*

Abstract— This study presents an experimental investigation on the development and characterization of a biodegradable composite filament for 3D printing applications. With increasing environmental concerns associated with conventional petroleum-based plastics, the research focuses on integrating natural materials such as sisal fiber and wood flour with polylactic acid (PLA) to produce an eco-friendly alternative. The composite filament was fabricated through a systematic process involving fiber preparation, chemical surface treatment, compounding, and extrusion using a twin-screw extruder. The developed filament was further processed using fused deposition modeling (FDM) techniques under controlled parameters. Mechanical and physical properties of the printed specimens were evaluated through standardized tests including tensile, flexural, compressive, and impact testing as per ASTM standards. Additional assessments such as water absorption and fire retardation were also conducted to determine material performance. The results indicate that the incorporation of natural fibers influences the strength, durability, and environmental compatibility of the filament, demonstrating its potential as a sustainable material for additive manufacturing. This work contributes to the advancement of green manufacturing by promoting the use of biodegradable composites in 3D printing technologies.

**Keywords—**

Biodegradable composites, 3D printing, Polylactic acid (PLA), Natural fiber reinforcement, Sisal fiber, Wood flour, Composite filament, Additive manufacturing, Mechanical properties, Sustainable materials, Fused Deposition Modeling (FDM), Eco-friendly materials

ME-07

INTEGRATION OF TOTAL QUALITY MANAGEMENT (TQM) IN MECHANICAL ENGINEERING PROCESSES

Shinde Goba D, Sancheti Santosh D, Sancheti Dipak D

*Mechanical Engineering, SNJB's Shri H.H. J.B. Polytechnic / SNJB's Late Sau. K.B. Jain
College of Engineering, Chandwad, Maharashtra, India*

Abstract— Total Quality Management (TQM) is a comprehensive concept of an organization-wide philosophy, which seeks to enhance every aspect of a company on a continuous basis. When it comes to mechanical engineering, TQM provides a systematized method of improving manufacturing systems, production planning, quality control, maintenance engineering, and lean operations. This paper explores the systematic approach to the implementation of TQM principles in the process of mechanical engineering, and the paper will discuss how such tools as Statistical Process Control (SPC), Failure Mode and Effects Analysis (FMEA), Six Sigma, and Kaizen could be integrated into the engineering process in order to get high quality products and high efficiency of the process. An integrated model of TQM integration is suggested and demonstrates the interrelation between leadership commitment, process standardization, customer focus, and continuous improvement. The analysis of traditional and TQM-based mechanical engineering approaches is provided in a structured table. An example of an Indian manufacturing case study representative of the automotive components industry has also been discussed in the paper where significant changes in the reduction of defects, cycle time, and the overall equipment effectiveness (OEE) were observed after the introduction of TQM. The major obstacles such as organizational resistance, lack of resources, and skills gaps are discussed. The results show that the implementation of TQM has a significant positive impact on the performance of the mechanical engineering process and competitiveness, especially regarding Industry 4.0 and smart manufacturing paradigms.

Keywords—Total Quality Management, Mechanical Engineering, Statistical Process Control, Six Sigma, Lean Manufacturing, Kaizen, Continuous Improvement

ME-08

PERFORMANCE EVALUATION OF VARIOUS FEED WATER APPROACHES IN PASSIVE SOLAR STILL DESALINATION

D'Cotha J.Sa, Suresh P. R., Sajeesh P

Department of Mechanical Engineering, SCMS School of Engineering and Technology, Kerala,



Department of Mechanical Engineering, Ahalia School of Engineering and Technology, Kerala,
Department of Mechanical Engineering, NSS College of Engineering, Palakkad, Kerala.

Abstract— Access to safe drinking water is a growing global challenge driven by rapid industrialization, population growth, and climate change. Solar desalination has emerged as a sustainable, decentralized solution for water purification, particularly in remote and arid regions. A critical yet often overlooked factor governing the efficiency of solar stills is the feed water management approach — the manner in which brackish or saline water is introduced, maintained, and circulated within the still. This study reviews various feed water strategies employed in solar still systems, including no feed water addition, periodic addition at fixed intervals, continuous flow systems, spray-type feeding, addition of dye and saline solutions, and preheating of feed water prior to introduction into the basin. The findings indicate that shallow water depths, preheated feed water, and controlled replenishment intervals consistently yield higher distillate outputs. Preheating techniques using solar collectors, heat pipes, and other thermal systems significantly enhance productivity. Spray feeding and thin film techniques further improve heat and mass transfer rates. The results highlight that optimizing feed water temperature, depth, and replenishment frequency plays a crucial role in improving solar still performance. This work emphasizes the importance of feed water management in enhancing the efficiency of solar desalination systems and supports the development of sustainable and energy-efficient water purification technologies.

Keywords— Solar desalination, Feed water management, Passive solar still, Water depth, Preheating, Spray feeding, Continuous flow system, Distillate yield, Thermal efficiency, Sustainable water treatment, Renewable energy, Water purification

ME-09

ACOUSTIC STREAMING EFFECTS ON THE ATOMIZATION OF A SPRAY

Kasif Ehsan, Aadil Kureshee, Deepak Kumar Mandal, S. Narayanan
Department of Mechanical Engineering, IIT (ISM) Dhanbad, India

Abstract— This paper presents an experimental investigation of the effect of acoustic excitation frequency on fuel spray cone angle at two injection pressures using Particle Image Velocimetry (PIV). Five test conditions are examined: injection pressures of 30 bar and 40 bar, each subjected to acoustic streaming at frequencies of 30 Hz and 200 Hz (at 30 bar), and 30 Hz, 100 Hz, and 200 Hz (at 40 bar). Spray cone angle is extracted from PIV images using intensity-based thresholding and edge-fitting algorithms implemented in MATLAB. The measured cone angles are: 16.48° (30 bar, 30 Hz), 22.46° (30 bar, 200 Hz), 18.67° (40 bar, 30 Hz), 18.75° (40 bar, 100 Hz), and 19.77° (40 bar, 200 Hz). A notable finding is the pressure–frequency interaction: at low acoustic frequency (30 Hz), the higher injection pressure (40 bar) produces a wider cone angle, while at 200 Hz this trend reverses, with the 30 bar condition producing the wider cone. The higher cone angle enhances the atomization of the spray. This cross-over behaviour is attributed to competing effects of injection momentum and acoustic radiation force on the spray boundary.

Keywords— Fuel Spray, Particle Image Velocimetry (PIV), Acoustic Excitation, Acoustic Streaming, Spray Cone Angle, Injection Pressure, Atomization

ME-10

A CRITICAL SUMMARY ON DROP IMPACT ICING AND THE ROLE OF SUPERHYDROPHOBIC SURFACES IN ANTI-ICING APPLICATIONS

K K Krishnaram, Rahul Sharma, A R Harikrishnan

*Department of Mechanical Engineering, Birla Institute of Technology and Science Pilani,
Rajasthan, India*

Abstract— Icing is a widespread natural occurrence that has strong physics behind it. A complete understanding of this phenomenon is still far off, despite much research on icing and ice accretion [1,2]. Icing has various beneficial effects on technical applications, especially in the areas of thermal energy storage systems, freezing desalination for freshwater harvesting, and cryopreservation of food and biological samples [3–5]. It has several detrimental effects, though. Because of this, icing poses a serious risk to many technological applications, especially those in the aviation, marine, and power transmission sectors, which results in significant energy waste. This circumstance has prompted research into anti-icing or de-icing techniques. This review discusses the droplet impact icing studies conducted so far. Also, the role of super hydrophobic surfaces as the potential anti-icing surface has been discussed in this review.

Keywords— Droplet, Impact, Icing, Anti-Icing, Super hydrophobicity

ME-11

NEXT-GENERATION LIGHTNING PROTECTION USING CONDUCTIVE CFRP LAMINATES

Mohan Kumar Pitchan, Balachandran

Head, Research & Development, Akimera-Ave Chimera-France, Bengaluru, India
 Director, Corporate & Industries Relations, Amrita Vishwa Vidyapeetham, Coimbatore, India

Abstract—Carbon fibre reinforced polymer (CFRP) composites are widely used in modern aerospace structures due to their high strength-to-weight ratio and superior mechanical performance. However, their relatively low electrical conductivity makes them highly susceptible to lightning strike damage. This study focuses on enhancing the electrical conductivity of CFRP laminates to improve lightning strike protection performance. Various conductive enhancement techniques such as copper mesh integration, carbon nanotube (CNT)-filled resins, graphene coatings, and hybrid conductive architectures are evaluated based on their electrical, thermal, and

structural performance. A coupled electromagnetic–thermal mathematical model is developed to simulate lightning current diffusion and associated Joule heating within anisotropic CFRP laminates. The results indicate that increasing through-thickness conductivity significantly reduces localized heating and minimizes matrix degradation and delamination. Hybrid conductive systems combining CNT interlayers and surface coatings provide the most uniform current distribution and improved damage resistance. Analysis of experimental data shows that conductive nanofiller-enhanced CFRP significantly reduces damage area and improves residual mechanical strength compared to conventional laminates. The study also discusses manufacturing challenges, inspection requirements, and certification aspects for aerospace applications. The findings suggest that optimized conductive CFRP architectures can serve as lightweight and efficient alternatives to traditional metallic lightning protection systems in next-generation aircraft structures.

Keywords—Conductive CFRP, Lightning strike protection, Carbon nanotubes, Graphene, Aerospace composites, Joule heating

OT-1

DATA VS. MODEL MACHINE LEARNING FAIRNESS TESTING: AN EMPIRICAL STUDY

Reshma P K, Sreya S, Vithul M, Darshan R M, Sankar krishna P
*Department of Artificial Intelligence and Machine Learning
 ASET, Palakkad, India*

Abstract— Machine learning systems are increasingly deployed in high-stakes domains such as healthcare, finance, and hiring, where fairness is critical. However, bias can arise from both data and model design, leading to discriminatory outcomes. This paper presents an empirical study comparing data-centric and model-centric approaches to fairness testing. The study evaluates how dataset imbalance, feature selection, and model architecture influence fairness metrics such as demographic parity, equal opportunity, and disparate impact. Experiments are conducted using multiple classifiers including Logistic Regression, Random Forest, and Neural Networks on benchmark datasets. Results indicate that data-level interventions such as re-sampling and re-weighting significantly improve fairness, while model-level techniques provide additional but limited gains. The study concludes that fairness is primarily a data problem, with model adjustments acting as secondary optimization. Ethical considerations and implications for responsible AI deployment are also discussed.

Keywords— machine learning fairness, bias detection, data bias, model bias, ethical AI, fairness metrics, classification

OT-2

REGENERATIVE EFFECTS OF α -MANGOSTIN-LOADED ZnO NANOPARTICLES ON WOUND HEALING: IN VITRO AND ZEBRAFISH IN VIVO INSIGHTS

Taniya Mary Martin, Meenakshi Sundaram Kishore Kumar*

Department of Anatomy, Zebrafish Facility

Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences (SIMATS), Saveetha University, Chennai-600077, Tamil Nadu, India

Abstract— Introduction: α -Mangostin, a key bioactive compound derived from the peel of *Garcinia mangostana*, is known for its wound-healing potential. This study aims to evaluate the synergistic effects of α -Mangostin-derived zinc oxide nanoparticles (α -Mangostin-ZnO NPs) on wound healing, with emphasis on antimicrobial, anti-inflammatory, antioxidant, and molecular mechanisms.

Keywords— α -Mangostin, Zinc Oxide Nanoparticles, Wound Healing, Antimicrobial Activity, Anti-inflammatory, Antioxidant, Zebrafish Model, Nanomedicine

OT-3

DETERMINING THE DOMINANT SOCIAL MEDIA PLATFORM USING HEXAGRAPH TOPOLOGY AND MATRIX REPRESENTATION

S. Santhiya

Assistant Professor

Department of Science and Humanities

Easa College of Engineering and Technology

Tamil Nadu, India

Abstract— The application of hexagraph topology combined with matrix representation provides a systematic framework for analyzing social media platforms. This approach enables researchers to study platform usage patterns, relationships, and user interaction behaviors in a structured manner. By modeling social media networks using hexagraph structures and representing their connections through matrices, complex interactions between platforms can be analyzed more effectively. Applying this methodology across different social media platforms allows researchers to compare levels of connectivity, engagement, and interaction patterns. Such analysis helps in identifying platforms that are more interconnected, exhibit higher engagement rates, or demonstrate unique usage behaviors. The insights derived from this approach are valuable not only for academic research but also for practical applications in social media marketing, digital strategy development and platform management.

Keywords— Social Media, Hexa Graph Topology, Matrix Representation

OT-4

ANALYTICAL COMPUTATION OF ATANGANA–BALEANU DIFFERINTEGRALS OF CLASSICAL SPECIAL FUNCTIONS

Sunitha.K.G, Sangeetha.P.S, Preeja.V, Prabha.R*
Department of Science & Humanities
Ahalia School of Engineering and Technology, Palakkad, India

Abstract— In this paper, we investigate the Atangana–Baleanu (AB) differintegrals of several special functions, including trigonometric, exponential, and hyperbolic functions. The AB differintegral represents a relatively recent class of fractional operators characterized by non-local and non-singular kernels, and it satisfies important properties such as the semigroup property. The fractional derivatives are obtained by employing the Riemann–Liouville fractional integral formulation, together with the known expression for the fractional integral of a power function. The proposed approach enables the computation of AB differintegrals for a broad class of functions belonging to $L^1[a, b]$, for all orders α satisfying $0 < \alpha < 1$. Furthermore, the normalization function $B(\alpha)$ can be suitably chosen to ensure that the operator satisfies desired analytical properties. The results presented in this work contribute to the growing body of research on fractional calculus with non-singular kernels and provide useful insights into the behavior of special functions under AB fractional operators.

Keywords—Atangana Baleanu fractional derivatives, Mittag Leffler kernel, Normalisation function

OT-5

GRAPH ANALYTICS FOR LARGE-SCALE NETWORKS

Binoy Balan K., G. Murugananth, Rajitha M., Jishnu P., Theertha K.
Department of Science and Humanities / Department of Electrical and Electronics Engineering
Ahalia School of Engineering and Technology, Palakkad, Kerala

Abstract— The rapid proliferation of digital technologies has led to the generation of massive datasets, with unstructured data forming the vast majority. Traditional data analysis techniques, which rely on structured data streams, are often inadequate for modeling these complex systems. This paper provides a comprehensive overview of graph analytics as applied to large-scale networks. By representing complex systems—such as social relationships, scientific data, and sensor grids—as mathematical graphs, structural and behavioral insights can be extracted. This article reviews fundamental network models, key centrality measures, the significance of cliques and clustering coefficients, and prominent algorithmic approaches for community detection, including relevant mathematical formulations and algorithmic complexities.

Keywords— Graph Analytics, Unstructured Data, Centrality Measures, Community Detection, Clustering Coefficients

OT-6

COMPARATIVE STRUCTURAL ANALYSIS OF ERCO ERCOUCPE WING RIB WITH DIFFERENT CUT-OUT GEOMETRIES

Dr. Ajith V S, Dr. Rajeev N, Fathima fidha k, Geethika k g, Ardra p, Haritha r s
Associate Professor, Dept. of Aeronautical Engineering, Jawaharlal College of Engineering and Technology, Lakkidi, Palakkad

Dean Academics & Professor, Ahalia School of Engineering and Technology, Palakkad
UG students, Dept. of Aeronautical Engineering, Jawaharlal College of Engineering and Technology, Lakkidi, Palakkad

Abstract— The structural efficiency of aircraft components is important to enhance performance, weight reduction, and safety. The wing rib is one of these components that help in the maintenance of the airfoil shape, as well as passing the aerodynamic loads to the primary structural members. The paper under discussion is based on the structural investigation of a wing rib of the ERCO Erco Coupe aircraft to examine how various cut-out shapes impact its performance. The wing rib design was based on a plane that was situated in the hangar and designed using CAD software. It was introduced with three cut-out patterns of circular, elliptical and rectangular to minimize the structural weight. Under the same loading and boundary conditions, Finite Element Analysis (FEA) was conducted to analyze the distribution of stress, deformation and strain features of each configuration. The findings revealed that the use of cut-outs has a tremendous effect on structural behaviour of the wing rib. The rib with no cut-outs exhibited little deformation and stress, but was relatively heavier. The elliptical cut-out was one of the altered designs that had enhanced structural performance characterized by reduced stress concentration and controlled deformation. Conversely, the circular cut-out caused more deformation and stress, which implies that it was not as stiff when compared to the rectangular cut-out which had a localized stress in the corners. All in all, the research finds that cut-out geometry is an important aspect in the achievement of weight reduction and structural integrity. The cut-out shape is an elliptical shape which offers a good balance between strength and weight and is therefore the best design out of the cases under consideration. The results of this work help to create light and efficient aircraft constructions and form a basis of further optimization investigations.

Keywords— Wing Rib, Cut-Out Geometry, Finite Element Analysis, Stress Distribution, Structural Optimization, Deformation Analysis, Aircraft Structures, Weight Reductio