eSmarTA 2025

The 5th International Conference on Emerging Smart Technologies and Applications

The 5th International Conference on Emerging Smart Technologies and Applications (eSmarTA-2025)

August 5 – 6, 2025 | Ibb university, Ibb, Yemen

The 5th International Conference on Emerging Smart Technologies and Applications (eSmarTA-2025)

5-6 August 2025

Ibb University,
Ibb, Yemen.

"Smart Horizons: Innovating for a Sustainable Future"

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CONFERENCE HONORARY CHAIR MESSAGE

It gives us great pleasure at Ibb University to welcome our esteemed guests—researchers, experts, and academics—participating in the 5th International Conference on Emerging Smart Technologies and Applications (eSmarTA-2025), held on our campus from August 5–6, 2025, under the theme: "Smart Horizons: Innovating for a Sustainable Future".
Hosting this distinguished scientific event, conducted in hybrid format (ONSITE + ONLINE), in collaboration with the Yemen Research Foundation, and with technical sponsorship from the IEEE Yemen Subsection, as well as support from several national sponsors, reflects the University's vision of promoting scientific research, embracing digital transformation, and strengthening academic openness to the world—while contributing to building a more innovative and sustainable future.

eSmarTA-2025 serves as a unique academic platform, encompassing ten major thematic tracks that cover a broad spectrum of disciplines and innovations, including: Artificial Intelligence and Data Science, Internet of Things, Cybersecurity, Software Engineering, Mechatronics and Robotics, Intelligent Communication Systems, Smart Industrial Systems, Smart Renewable Energy-Based Power Systems, Image Processing and Computer Vision, and Business Information Technology. Additional key topics include: Deep Learning, Edge Computing, Smart Cities, Generative AI, Large Language Models (LLMs), Feature Engineering, and Real-Time Systems.

This year's edition has witnessed remarkable engagement from the global academic community, with a round 200 full research papers submitted. A total of 86 high-quality papers accepted and published in IEEE Xplore, indexed by Scopus, marking a significant scientific achievement and enhancing the conference's position on the international research map.

The conference also features four distinguished international keynote speakers and two prominent national speakers, enriching the sessions with cutting-edge insights and recent advancements in their respective fields.

The continued success and growing participation in this conference reflects a rising awareness of the importance of keeping pace with global digital transformations. It places a responsibility on academic institutions in developing countries to intensify their efforts in enhancing curricula, fostering research partnerships, and embedding a culture of innovation across higher education systems—ultimately producing graduates equipped to compete and contribute to a smarter, more sustainable future.

In conclusion, we extend our sincere thanks and appreciation to the Yemen Research Foundation for its strategic partnership, and to our valued sponsors—Public Telecommunication Corporation, Yemen International Telecommunications Corporation (TeleYemen), and Al-Manar Hospital—for their generous support. We also deeply value the dedication and hard work of the scientific and organizing committees, and everyone who contributed to the success of this scholarly endeavor despite the prevailing challenges.

We pray that this conference will be crowned with success and that its outcomes and recommendations will make a meaningful contribution to advancing scientific research and sustainable development in Yemen, the Arab region, and the world at large.

Prof. Dr. Nasser Mohammed Al-Hujaili
President of Ibb University

YEMEN RESEARCH MESSAGE

Dear guests, brothers and sisters,

We're truly happy to welcome you to this pioneering and distinguished conference. Thanks to the efforts of many among you, this event is the fifth time it's held in Yemen—each time with more trust and success. Without your help, we couldn't have reached this far. You've been a great source of strength, and through your involvement, we overcame many challenges—emotional, financial, and logistical.

As the team behind *Yemen Research*, we worked hard to hold these series of international scientific conferences in our beloved country Yemen, giving researchers from Yemen and around the world a strong platform to share their recent research. Through this, we show the world that we, as Yemeni researchers, continue to create knowledge, innovate, and stay up to date—despite all the difficulties around us. We still believe in a happy Yemen, by God's will.

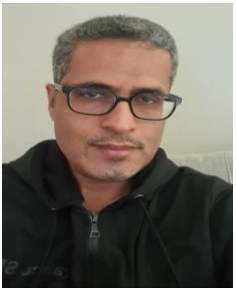
Today, the **5th International Conference on Emerging Smart Technologies and Applications (eSmarTA-2025)** is honored to have Ibb University as a key co-organizer for the second time. They've supported us with full commitment, helping make this event possible despite the tough situation in the country. We deeply thank the university staff, especially **Prof. Dr. Nasr Mohammed Al-Hujaili**, President of Ibb University and honorary chair of the conference. Our thanks also go to our technical sponsor, the **IEEE Yemen Subsection**, for its ongoing support throughout this series of conferences. We also want to thank the other sponsors: Ministry of Communications and Information Technology represented by Yemen Telecomm Company, and TeleYemen, and Al-Manar Hospital – Ibb. Your help means so much, and we wish you continued success.

Gentlemen and Ladies, we hope you enjoy and benefit from all parts of the conference—from keynote talks by international and local speakers, to the paper discussion sessions. The accepted research papers will be published by **IEEE** and indexed in **Scopus**. We encourage you to share ideas and knowledge in fields like artificial intelligence, data science, mechatronics, ICT, cybersecurity, renewable energy, and more.

Once again, we welcome everyone and hope you enjoy your stay in beautiful Ibb—Yemen's tourism capital during its finest season, full of nature and blessed with rain.

Asso. Prof. Dr. Redhwan Qasem Shaddad
Head, Yemen Research

CONFERENCE GENERAL CHAIR MESSAGE



Welcome Address by the Conference Chair
eSmarTA-2025—International Conference on Emerging Smart Technologies and Applications
Theme: "Smart Horizons: Innovating for a Sustainable Future"
Location: Ibb University, Yemen

Distinguished Guests, Respected Colleagues, Esteemed Researchers, Ladies and Gentlemen,

It is with great honor and immense pleasure that I welcome you all to eSmarTA-2025, the International Conference on Emerging Smart Technologies and Applications, hosted this year by Ibb University here in the heart of Yemen. As the conference chair, I am delighted to see such a vibrant gathering of minds from across the globe—all united by a common purpose: to shape a smarter, more sustainable, and resilient world through innovation.

This year's theme, **"Smart Horizons: Innovating for a Sustainable Future,"** reflects both our ambition and our responsibility. In a time marked by rapid technological change and global challenges—from climate change to cybersecurity threats, from digital inclusion to AI ethics—we are called not just to innovate, but to innovate with purpose.

This version of the eSmarTA conference receives around 200 submissions with only one extended deadline. The number of accepted papers reached only 83 papers with an acceptance rate of 41.5%. A number of 400 reviewers have participated in this version from more than 15 countries, which reflects the reputation and professionalism of the review process. Moreover, the participating authors are from more than 30 countries worldwide.
At eSmarTA-2025, we are proud to present a rich and diverse program including keynotes from global thought leaders and cutting-edge research in AI, IoT, edge computing, cybersecurity, smart cities, and engaging discussions bridging academia, industry, and policy.

Hosting this international forum at Ibb University is especially meaningful. It sends a clear message: excellence in research and innovation knows no geographic boundaries. Despite the many challenges Yemen has faced, our commitment to education, science, and sustainable progress remains steadfast.

I would like to extend my heartfelt thanks to the Technical Program Committee and reviewers for ensuring a high-quality conference and to the organizing committee and volunteers for their tireless efforts, our keynote speakers, authors, and presenters for sharing their insights, and, of course, our partners and sponsors, whose support made this event possible.

To all participants—I encourage you to take full advantage of the sessions, network with fellow attendees, and engage in the stimulating exchange of ideas. Let this conference not only enrich your research but also inspire new collaborations that reach beyond borders. On behalf of the entire organizing team, I am proud to officially declare eSmarTA-2025 open.

Thank you, and I wish you all a successful and inspiring conference.

Asso. Prof. Dr. Murad Rassam
General Chair, eSmarTA-2025

IEEE YEMEN SUBSECTION CHAIR MESSAGE

On behalf of the IEEE Yemen Subsection, I am honored to welcome you to the 5th International Conference on Emerging Smart Technologies and Applications (eSmarTA-2025), held in a hybrid format—on-site at Ibb University and virtually—on August 5 and 6, 2025.

IEEE is the world's largest technical professional organization, with over 486,000 members in more than 190 countries. More than 67% of IEEE members are based outside the United States, including over 189,000 student members. IEEE supports a global network of 347 sections, 2,815 chapters, 3,613 student branches, and 670 affinity groups such as Young Professionals (YP), Women in Engineering (WIE), and Life Members (LM).

The IEEE Yemen Subsection is part of this global community. Since its formation, the subsection has worked to connect researchers, students, and professionals across Yemen to the latest trends in science and technology. It provides a local platform for networking, technical collaboration, and professional development. The subsection also supports student branches, hosts technical workshops, and participates in organizing and sponsoring scientific conferences across the country.

eSmarTA-2025 is technically sponsored by the IEEE Yemen Subsection, as part of our ongoing commitment to support quality research, innovation, and professional development in Yemen and the region. The aim is to encourage impactful research and bring together innovators who are addressing real-world challenges through smart technologies.

The theme of this year's conference, "Smart Horizons: Innovating for a Sustainable Future," reflects our shared commitment to using technology as a driver of positive change. eSmarTA-2025 is more than a conference—it is a space for dialogue, collaboration, and forward-looking ideas that bring together academics, industry experts, and emerging researchers from Yemen and beyond.

This year's conference has seen remarkable participation and contributions:

- **Submitted Papers:** around 200 papers were submitted.
- **Accepted Papers:** 83 papers were accepted for final presentation.
- **International Participation**: Researchers from approximately 32 countries around the world are participating.

I would like to express my deep gratitude to the organizing committee for their tremendous efforts in organizing this conference. I also extend my thanks to the sponsors who have made this event possible.

I am confident that the eSmarTA-2025 Conference will be successful and make significant contributions to the field of smart technology, not only in Yemen but globally.

We look forward to a productive and inspiring conference.

Prof. Dr. Abdulqader M. Mohsen
Chair, IEEE Yemen Subsection

PROGRAM COMMITTEE CHAIR MESSAGE

On behalf of the Program Committee, I warmly welcome participants to the 5th International Conference on Smart Modern Technologies and Their Applications (esmarTA-2025). This hybrid event, hosted at Ibb University from 5th-6th August 2025, convenes global experts to advance transformative technological innovations.

Now in its fifth year, esmarTA-2025 reaffirms its status as a premier international forum for researchers to present cutting-edge advancements in smart technologies, address global challenges, and chart sustainable development pathways.

Ibb University proudly hosts this event, building on its successful stewardship of the 2nd Conference in 2022. Our partnership with Yemen Research Organization demonstrates our commitment to scientific excellence and technological leadership amid national challenges.

This year features exceptional engagement:

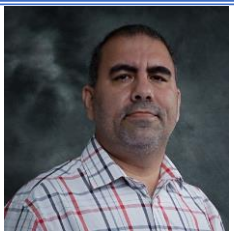
- 200 submissions through rigorous IEEE peer review
- 83 accepted papers for publishing in IEEE Xplore and SCOPUS indexing
- Contributors from 32 countries
- Insights from 6 renowned keynote speakers and will feature 4 parallel sessions.

Conference Tracks: Artificial Intelligence & Data Science • Mechatronics & Robotics • Internet of Things • Image Processing & Computer Vision • Cybersecurity • Smart Communication Systems • Business IT • Software Engineering • Intelligent Industrial Systems • Renewable Energy Systems • Related Smart Technologies
esmarTA-2025 fosters academia-industry synergy, enabling cross-border knowledge exchange and collaboration.

I extend profound gratitude to our sponsors and Ibb University leadership especially our Chancellor Prof. Dr. Nasr Mohammed Al-Hojili for unwavering support; and all participants. We anticipate a high-impact conference with enduring scholarly value.

Asso. Prof. Dr. Farhan Nashwan
Chair, Program Committee eSmarTA-2025

TECHNICAL COMMITTEE CHAIR MESSAGE



It is my distinct honor and pleasure to welcome you to what promises to be a landmark event. Under the unifying theme, "Smart Horizons: Innovating for a Sustainable Future," eSmarTA-2025 stands as a vital platform to ignite discourse, foster collaboration, and showcase groundbreaking advancements in the rapidly evolving landscape of smart technologies.

This conference, convened both on-site at Ibb University in Yemen and virtually, embodies a commitment to bridging geographical divides and fostering a truly global exchange of knowledge. We are particularly excited to delve into critical areas such as Artificial Intelligence, machine learning, big data analysis, and their diverse applications spanning health informatics, IoT, cybersecurity, and beyond. These domains are not merely academic pursuits; they are the very bedrock upon which sustainable, intelligent societies will be built.

eSmarTA-2025 is more than a forum for paper presentations; it is a catalyst for professional growth and collaborative synergy. For established researchers, it offers an unparalleled opportunity to disseminate cutting-edge findings and forge new partnerships with international peers and industry leaders. For students and emerging scholars, it provides an invaluable stage to present their research, gain critical feedback, and be inspired by the luminaries shaping our technological future, including our distinguished keynote speakers: Professor Dr. Mario Gongora, Associate Professor Dr. Anazida Zainal, Associate Professor Dr. Haifa Touati, Associate Professor Dr. Abuljalil Alabidi, Dr. Sze Sing Lee, and Dr. Fathey Mohammed. Their collective expertise represents the frontline of innovation across diverse technological frontiers.

Our aim is to cultivate an environment where diverse perspectives converge to address shared challenges, particularly in strengthening the relationship and cooperation between academia and industry. By fostering these vital connections, eSmarTA-2025 will serve as a launchpad for impactful research that translates directly into real-world solutions for sustainable development.

I extend my heartfelt invitation to all participants to engage actively, share insights, and contribute to the vibrant intellectual tapestry of eSmarTA-2025. Together, let us explore the boundless "Smart Horizons" and collectively innovate for a truly sustainable future.
Sincerely,

Asso. Prof. Dr. Abdulrazak Yahya
Chair, Technical Committee eSmarTA-2025

Keynote Speaker I:

Prof. Dr. Mario Gongora

De Montfort University, UK

Keynote title: *"AI and Use of Land: Responsible deployment and risk management"*

Brief Profile

Professor in Applied Intelligent Systems and a Faculty Enterprise Lead, School of Computer Science and Informatics, De Montfort University. He is a leading expert in artificial intelligence, specializing in data analysis, complex system modeling, and AI-driven optimization. He earned his MSc and PhD from the University of Warwick and is currently the Faculty Enterprise Lead at DMU. His research focuses on evolutionary computing and machine learning, with applications in large-scale data processing and natural system modeling. He also leads a spinout company, bringing AI solutions to industry, particularly in behavior simulation and process optimization. Through strong industry partnerships, he bridges academic research with real-world impact.

Keynote Speaker II:

Assoc. Prof. Dr. Anazida Zainal

Universiti Teknologi Malaysia, Malaysia

Keynote title: "*Smart AI, Safer Finance - How Artificial Intelligence is Redefining Financial Crime Prevention"*

Brief Profile

Anazida Zainal (Member, IEEE) received the B.Sc. degree in computer science from Rutgers University, New Brunswick, NJ, USA, in 1990, and the M.Sc. degree in computer science and the Ph.D. degree in computer science and network security from Universiti Teknologi Malaysia (UTM), Malaysia, in 2000 and 2011, respectively. She is currently an associate professor with the Faculty of Computing, and she previously led the Information Assurance and Security Research Group and has supervised many postgraduate students in developing AI-driven solutions for cybersecurity. Her research interests include cyber threat intelligence, security analytics, network security, and anomaly detection.

Keynote Speaker III:

Assoc. Prof. Dr. Haifa Touati

Faculty of Sciences of Gabes, Tunisia

Keynote title: "*AI-Powered Security for the Future Internet: Reinforcement Learning-Based Attack Detection in Named Data Networking"*

Brief Profile

Dr. Touati is an Associate Professor (HDR) in Computer Science at the Faculty of Sciences of Gabes, Tunisia. She currently serves as the head of the research lab "Hatem Bettahar IReSCo-Math" at the same institution, leading a dynamic team of researchers focused on distributed systems, networking, security, communication, and mathematics. Dr. Touati is the co-founder and former coordinator of the Professional Master's degree in Security and Networking, and she also coordinated the Research Master's degree in Computer Science and Networking at the Faculty of Sciences of Gabes. Most recently, in 2023, she served as a visiting professor at the Conservatoire National des Arts et Métiers (CNAM) in Paris, France. She received her HDR from the National School of Computer Science (ENSI), Tunisia, in 2021. Her teaching interests include computer networks, cybersecurity, and emerging technologies. Dr. Touati has served as a keynote speaker and panelist at numerous international conferences, and she is actively involved in various reputable international conference technical program committees. In addition, she is a dedicated reviewer for several high-impact journals and conferences. Her current research interests encompass future Internet architectures, cybersecurity, blockchain, and artificial intelligence. Dr. Touati is the author of more than 60 peer-reviewed papers in renowned international journals and conferences.

Keynote Speaker IV:

Assoc. Prof. Dr. Abuljalil Alabidi

Sana'a Community College, Yemen

Keynote title: "*Potential and Challenges of Renewable Energy in Yemen for a Sustainable Future"*

Brief Profile

Dr. Abuljalil is an associate professor in the Department of Mechatronic Engineering at Sana'a Community College and the Department of Mechanical Engineering—College of Engineering—Sana'a University—Yemen. He received a Bachelor's degree in Mechanical Engineering – Sana'a University – Yemen in 1999. In 2003 he obtained a Master's degree in Air Conditioning and Refrigeration Engineering – Al-Balqa Applied University – Hashemite Kingdom of Jordan. He received his PhD in Renewable Energy—Solar Energy Research Institute—National University of Malaysia—Malaysia in 2014 in the field of renewable energy. Previously, he served as a Vice Dean of Academic affair in Sana'a Community College from 2016 to 2018. He is a member of the World Society for Sustainable Energy Technologies (WSSET). He was listed as one of the world's top 2% scientists published by Stanford University's and Elsevier's platform for 2021, 2022, 2023, and 2024, respectively. He published 36 scientific papers in local and international scientific conferences, as well as international scientific journals. He also worked as a scientific reviewer for some international scientific journals. His research interests include renewable energy and solar energy—thermal energy storage, energy conservation strategies, reducing gas emissions, and air conditioning and refrigeration systems.

Keynote Speaker V:

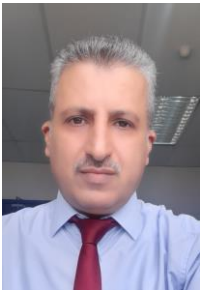
Dr. Sze Sing Lee

Newcastle University, Singapore

Keynote title: "*Boost Inverters for Single-Stage DC–AC Power Conversion"*

Brief Profile:

Dr. Sze Sing Lee received the B.Eng. (Hons.) and Ph.D. degrees in Electrical Engineering from Universiti Sains Malaysia, Malaysia, in 2010 and 2013, respectively. From 2014 to 2019, he was a lecturer/assistant/assistant professor at the University of Southampton Malaysia Campus. From 2018 to 2019, he was a visiting research professor at Ajou University, South Korea. He is currently an Assistant Professor and Degree Program Director of Electrical Power Engineering at Newcastle University in Singapore. His research interests include power converter/inverter topologies and their control strategies. Dr. Lee is an Associate Editor of the IEEE Transactions on Industrial Electronics and a Guest Associate Editor of the IEEE Transactions on Power Electronics. He is a Chartered Engineer registered with the Engineering Council, UK, and currently serves as a Professional Review Interviewer and International Professional Registration Advisor.



Keynote Speaker VI:

Dr. Fathey Mohammed

Sunway University, Malaysia

Keynote title: "*Redefining Research Ethics for the AI Era: Challenges, Choices, and Change"*

Brief Profile:

Dr. Fathey Mohammed is a Senior Lecturer in the Department of Business Analytics at Sunway University, Malaysia. He earned his Ph.D. in Information Systems from Universiti Teknologi Malaysia (UTM), Johor, Malaysia. His research initially focused on technology innovation, particularly in cloud computing, social media, and blockchain applications. Over time, he has shifted his focus to business analytics, exploring the use of AI to support automation and decision-making in businesses. His work examines how data-driven technologies enhance operational efficiency, optimize business strategies, and drive digital transformation. Dr. Mohammed has an extensive publication record, with over 70 Scopus-indexed scientific papers published in prestigious journals and international conferences. His editorial contributions include overseeing the publication of more than 12 books with Springer and serving as a guest editor for several Scopus-indexed journals. Additionally, he has held key leadership roles in international conferences, including Conference Chair, Program Chair, and Publication Committee Chair.

The table below shows the general program of the eSmarTA-2025

Note: All times in GMT time +3

Opening Ceremony & Conference Program of eSmarTA-2025
5-6 August 2025

Opening Ceremony
Tuesday: August 5th, 2025 (8:45 – 15:00), Mankathah Hall

08:00 – 08:45	Registration and Reception
08:45 – 08:50	Quran Kareem
08:50 – 09:00	National Anthem and Palestine Anthem
09:00 – 09:10	Talk of eSmarTA2025 Honorary Chair and Ibb University President, **Prof. Dr. Nasr Alhgeli**
09:10 – 09:20	Talk of Yemen Research Organization, **Dr. Redhwan Shaddad**
09:20 – 09:30	Talk of IEEE Yemen Subsection, **Prof. Dr. Abdulqader Abadi**
09:30 – 09:40	Talk of eSmarTA-2025 General Chair, **Dr. Murad Rassam**
09:40 – 09:50	Talk of Ministry of Education and Scientific Research **Dr. Hatim Al-Doa's**
09:50 - 10:00	Talk of Governorate Speech **Abdulwahid Salah**
10:00 – 10:20	**Refreshment (ONSITE)**
10:20 – 11:00	Keynote speech entitled " Potential and Challenges of Renewable Energy in Yemen for a Sustainable Future" **by Assoc. Prof. Dr. Abuljalil Alabidi, Sana'a Community College, Yemen**
11:00– 11:40	Keynote speech entitled " AI-Powered Security for the Future Internet: Reinforcement Learning-Based Attack Detection in Named Data Networking" **Assoc. Prof. Dr. Haifa Touati, Faculty of Sciences of Gabes, Tunisia**
11:40– 12:20	Keynote speech entitled " AI and Use of Land: Responsible deployment and risk management" **by Prof. Dr. Mario Gongora, De Montfort University, UK**
12:20 – 13:00	**Break and Lunch (ONSITE)**
12:30 – 15:00	**Parallel Sessions**

Paper Presentation Schedule

Session I

Tuesday: August 5th, 2025 (12:15 – 15:00), Location: Mankhatha Hall

Time	Paper ID	ONSITE Chaired by	Prof. Dr. Khaled Alsoufi
			Dr. Adel Alofairi
		ONLINE Chaired by	Dr. Abdulrazak Y. Alhababi
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12:45– 13:00	83	***Enhancement of Scholarship Decisions Precision Using Support Vector Machine Algorithm*** *Al-Dilami, Almuaalemi, Redwan, Al-Zohairi, Mareh*	
13:00– 13:15	103	***Developing a Specialized Question Answering Model for the Yemeni Middle School Curriculum Using NLP Techniques*** *Abdulqawi, Naji, Hasan, Abdullqawi, Aofairi*	
13:15– 13:30	110	***Environmental Condition Impacts On PV Systems In Yemen Based On Fuzzy Logic Technique: A Case Study*** *Alkebsi, Albouthigy*	
13:30– 13:45	114	***Smart Information Systems for Enhanced Employee Performance*** *Amgad Saeed Khaled*	
13.45– 14:00	85	***Designing and Simulating an MPPT Solar Charger Using Machine Learning*** *Al-Wazer, Al-Sharif*	
14:00– 14:15	95	***Hybrid Time Series Forecasting for Semiconductor Demand: A Comparative Analysis of Prophet-Based Ensemble Models for Smooth and Erratic Demand Patterns*** *Haidarah, Lim, Al-Huda*	
14:15– 14:30	104	***The AI Revolution in Industry: A Review of Its Usage in Reverse Logistics Returns Prediction*** *Alkhorasani, Alawag*	
14:30-14:45	139	***Phishing Attack Detection Using Whale Optimization Algorithm-Based Feature Selection*** *Mosleh Abualhaj, Sumaya Al-Khatib, Alhamza Alalousi, Mohammad Hiari and Mahran Al Zyoud*	

Session II

Tuesday: August 5th, 2025 (12:15 – 15:00), Location: Hall (1)

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			Eng. Ahlam Enan
		ONLINE Chaired by	Dr. Abdullah Almogahed
12:30– 12:45	7	***EHEIM: A New Approach for Mining High Utility Itemsets from Quantitative Databases*** A. Younis, M. Hayder, A. Ghaib, A. Abdul Jabbar	
12:45– 13:00	15	***Improving Breast Cancer Prediction Using Adaptive Synthetic Sampling: A Study on the Coimbra Dataset*** Alsabry, Shujaaddeen, Mosleh	
13:00– 13:15	17	***Enhanced Crack Detection with Limited Annotations: A Mixed Supervision Algorithm With Multi Attention Network*** Al-Maqtari, Peng, Al-Huda, Al-Antari, Algburi	
13:15 – 13:30	20	***Solar Panel Dust Detection: An Efficacy Analysis and Optimization using Deep Learning based Techniques*** Aslam, Hussain, Iqbal, Yasir, Tripura	
13:30– 13:45	23	***Enhancing Startup Success Prediction Using Optimized Bagging Tree Model with Bayesian Hyperparameter Tuning*** Algawani, Alsabry	
13:45– 14:00	28	***Are Machine Learning Approaches Bringing an End to Empirical Models? Case of reference evapotranspiration and relative humidity*** Elhachimi, Belaqziz, Khabba	
14:00 – 14:15	42	***Heart Disease Classification Using Machine Learning Techniques: An Impact Analysis of GridSearchCV-based Optimization*** Hussain, Yasir, Iqbal, Tripura, Aslam.	
14:15 – 14:30	55	***Optimized Machine Learning Approach for Breast Cancer Detection Using ADASYN and Feature Selection*** Jasim, Jasim, Ibrahim	
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Tuesday: August 5th, 2025 (12:15 – 15:15), Location: Hall (3)

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		ONLINE Chaired by	Dr. Redhwan Saleh
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13:00– 13:15	111	***AI-Driven Aerial Corrosion Detection: Capabilities, Limitations, and Future Directions.*** Alharbi, Alqudsi, Alharbi	
13:15– 13:30	132	***Advancements in Robotic Arm Technologies: Precision, Intelligence, and Cross-Sector Applications*** Saleh, Alqudsi, Al-Hajj, Abdullah, Nasser, Amrani	
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Tuesday: August 5th, 2025 (12:15 – 15:00), Location: Gradute Studies Hall

Time	Paper ID	ONSITE Chaired by	Dr. Ayedh Alshobati
			Dr. Nada Al-Humidi
		ONLINE Chaired by	Dr. Akrem Almohamdi
			Dr. Nabel Mohammed
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12:45– 13:00	54	***Theoretical Framework for Efficient UV-Relay Selection in IoUT Using Hybrid NN-GA Model with MCDM Approach*** Sayed Ali, A. Saeed, Khider Eltahir, Barakat, Saeed	
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13:15– 13:30	115	***Design of a Wideband Circular Microstrip Patch Antenna for Ka-Band 5G Wireless Communications*** Abdo, Abdalwali, Gaid, Mohammed, Alomari, Saeed, Saeed	
13:30– 13:45	120	***Microstrip Antenna Design for W-Band with Enhanced Return Loss Performance Using Slots and Parasitic Elements*** Alsolihy, Gaid, Abdo, Saeed, Alomari, Saeed	
13:45– 14:00	179	***Alsamhi, Nashwan, Al-Qatf, Saif, Curry, Kumar. When SemCom Meets Drones for Supporting 6G: Drone Dataspace Use Case*** Alsamhi, Nashwan, Al-Qatf, Saif, Curry, Kumar	
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14:30– 14:45	105	***Enhancing University Admissions through Scalable and Fair Machine Learning Models: A Case Study from Yemeni Universities*** Yousef, Ghallab, Alameri, Al-Dowail, Al-Taweel, Al-Adimi	
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Wednesday: August 6th, 2025 (8:00 – 13:30),
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08:00 – 08:20	Registration
08:20 – 09:00	Keynote speech entitled " Smart AI, Safer Finance - How Artificial Intelligence is Redefining Financial Crime Prevention" **by Prof. Dr. Anazida Zainal, Universiti Teknologi Malaysia, Malaysia**
09:00 – 09:40	Keynote speech entitled " Boost Inverters for Single-Stage DC–AC Power Conversion" **by Dr. Sze Sing Lee, Newcastle University, Singapore**
09:40 – 10:20	Keynote speech entitled "Redefining Research Ethics for the AI Era: Challenges, Choices, and Change" by **Dr. Fathey Mohammed, Sunway University, Malaysia.**
10:20 – 10:30	**Refreshment (ONSITE)**
10:30 – 13:15	**Parallel Sessions**
13:15 – 13:30	**Close and Distribute Certificates**
13:30 – 14:00	**Lunch (ONSITE)**

eSmArTA 2025 The 5th International Conference on Emerging Smart Technologies and Applications

Paper Presentation Schedule

Session I

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		ONLINE Chaired by	Dr. Abdulrazak Y. Alhababi
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10:45– 11:00	190	***SDN and NFV: A State-of-the-Art Comparative Study of Architectures, Techniques, and Applications*** Mahmood Molhi, Abdulrahman Abutaleb, Thabit Zahary	
11:00– 11:15	184	***New Approach for Network Threat Detection and Prevention Using Real-time Data Analysis and Deep Learning*** Abdulrahman Abutaleb, Zahary, Althor, Homid, Alammari, Al-Watary, Rafeeq, Al Zubeiri	
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12:00– 12:15	109	***AlphaFold-Based Protein-Protein Interaction Prediction Methods Classification*** Faisal, Alofairi, Abdulaziz Mohsen	
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12:30– 12:45	124	***Navigating GenAI in Malaysian Universities: Use, Problems, and Challenges*** Al-Kumaim, Hassan, Mohammed, Saleh	
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		ONLINE Chaired by	Dr. Abdullah Almogahed
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11:00– 11:15	32	***Real-Time Phishing Attack Detection Using Machine Learning*** Alhemyari, Hassan, Saeed, Alselwi, Alhemyari	
11:15– 11:30	38	***Enhancing DDoS Detection in Software-Defined Networking with Explainable Ensemble Models: A Comprehensive Approach Using SHAP Values*** Radhwan A. A. Saleh, Abdulsalam F. A. Al-Bashiri and Bothina A. Q. Saleh	
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11:45– 12:00	64	***Enhancing Cybersecurity in Cyber-Physical Systems: an Explainable AI Approach for Intrusion Detection*** Abbas Jasim Al-Hchaimi, Ali Hussien, Raad Muhsen, Mohammed, Ali Abd Alradha Alsaidi, Yousif Alhasnawi, Adnan Shareef	
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EHEIM: A New Approach for Mining High Utility Item sets from Quantitative Databases

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Abstract—High-Efficiency Itemset Mining (HEIM) is an essential task of data mining, focusing on identifying itemsets that are most profitable for the costs of investment. Upon application to dense databases, these algorithms like HEPMiner and MHEI have shown high efficiency, memory and scalability which still poses a challenge. This paper presents a new algorithm called Efficient High-Efficiency Itemset Miner (EHEIM), which effectively integrates several advanced pruning strategies and tighter upper bounds to help in minimizing the mining computational cost. We provide a thorough comparative study of EHEIM with HEPMiner, MHEI and MHEI-without-pruning and show that EHEIM outperforms these algorithms for all three metrics of interest (execution time, memory consumption and number of generated candidates). Extensive evaluations of EHEIM on diverse datasets, ranging from dense to sparse databases, demonstrate its effectiveness and showcase the potential of EHEIM for real-world applications.

Keywords— *Data Mining, High-Efficiency Itemset Mining, Quantitative Databases, Pruning Strategies, Upper Bounds.*

Improving Breast Cancer Prediction Using Adaptive Synthetic Sampling: A Study on the Coimbra Dataset

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Abstract—Class imbalance remains a significant challenge in breast cancer classification, leading to biased predictive models that favor the majority class. Addressing this issue is crucial for improving early detection and diagnostic accuracy. This study investigates the impact of Adaptive Synthetic Sampling (ADASYN) on the performance of various machine learning models for breast cancer prediction using the Breast Cancer Coimbra Dataset (BCCD). A total of 36 machine learning models, including decision trees, support vector machines (SVMs), k-Nearest Neighbors (KNNs), neural networks, and ensemble based methods, were trained and evaluated both before and after applying ADASYN. Performance was assessed using accuracy as the primary metric. The findings demonstrate that balancing the dataset significantly enhances classification performance, with Subspace KNN achieving the highest accuracy (91.7%) after ADASYN. However, some models, such as Linear SVM and certain neural networks, exhibited performance declines, highlighting the varying impact of synthetic oversampling across different algorithms. This study underscores the importance of data preprocessing techniques in medical diagnostics, demonstrating that adaptive oversampling can improve predictive accuracy but requires careful model selection. Future research should explore hybrid balancing techniques and feature selection methods to further enhance classification robustness.

Keywords— *Classification, Machine Learning, Imbalanced Data, Predictive Models, Imbalance Dataset, Oversampling.*

Enhanced Crack Detection with Limited Annotations: A Mixed Supervision Algorithm With Multi Attention Network

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Abstract—Crack detection is essential for maintaining the structural integrity and safety of infrastructures such as roads and buildings. However, traditional manual inspection methods are inefficient, while existing machine learning approaches rely on large-scale labeled datasets, which are both costly and time-intensive. To address this challenge, we propose an enhanced Mixed Supervised Learning (MSL) algorithm, which improves performance and reduces dependence on extensive labeled data by integrating multiple learning techniques. Additionally, we introduce an enhanced deep learning model, Efficient Multiscale Transformer v2 (EMTv2), which leverages multiscale feature extraction and advanced attention mechanisms to improve crack classification and segmentation. The enhanced MSL algorithm achieves competitive segmentation accuracy while utilizing only 25% of the labeled data required by conventional weakly supervised learning methods, surpassing state-of-the-art models across three benchmark datasets. Our approach significantly enhances both efficiency and segmentation quality, providing a scalable and practical solution for real-world crack detection applications.

Keywords— *Crack Detection, Mixed Supervised Learning, Image Segmentation.*

Solar Panel Dust Detection: An Efficacy Analysis and Optimization using Deep Learning based Techniques

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Abstract— Monitoring and cleaning solar panels is an essential task in countries where output power loss due to dust accumulation is among the highest rates. Therefore, it is crucial to develop an optimal procedure for monitoring and cleaning these panels to increase module efficiency, reduce maintenance costs, and reduce the use of resources. To the best of our knowledge, this is the first research to perform a comprehensive performance analysis using seven pre-trained Convolutional Neural Networks (CNNs) such as VGG16, VGG19, InceptionNet, MobileNet, MobileNetv2, Xception, and ResNet50 CNNs to detect dust in solar panel images. The problem is formulated as binary classification, as the dataset used in this research includes clean and dusty solar panel images. The study conducted a comprehensive performance analysis of the solar panel's dust classification task. The study also fine-tunes the hyperparameters to enhance the performance of the best-performing model during implementation, thereby further enhancing its performance. Numerous performance evaluation metrics have been implemented, including accuracy, precision, recall, F1 score, and AUC score. MobileNet can classify clean and dusty solar panels with initial accuracy (83.6%) After the hyperparameter tuning using learning rate and batch size, the model achieved 86.7% accuracy, which has been improved as compared to the initial performance.

Keywords— *Solar Panel Dust; Dust Detection; Transfer Learning; Deep Learning*.

A Review of Quantum Internet Architecture

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Abstract— In recent years, with the great development in the field of quantum in general, including quantum encryption and quantum communications, in addition to the quantum internet (QI) in particular, it has become noticeable that scientific research has increased in these fields, especially the QI, due to its security, reliability and high performance features that are better than the current internet. In this study the researchers shed more light on the QI and discuss the most important previous studies that touched on QI. Also, in this study the principles of the QI are discussed and how these principles help in the communication process between any two points or qubits. On the other hand, the study discussed the architectures of building the QI and what simulations are used in building each architecture.

Keywords— *Quantum Computing, QI, Architecture. Principles, Architecture.*

Enhancing Startup Success Prediction Using Optimized Bagging Tree Model with Bayesian Hyperparameter Tuning

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Abstract—Predicting startup success remains a complex and high-stakes challenge in entrepreneurship and investment analysis. This study introduces an Optimized Bagging Tree Model enhanced through Bayesian Hyperparameter Tuning to improve classification accuracy in imbalanced startup datasets. A structured machine learning pipeline—comprising data preprocessing, feature selection, and model training—was applied to evaluate the model against standard classifiers such as Decision Trees, Support Vector Machines (SVMs), and Neural Networks. The proposed approach achieved a notable accuracy improvement, increasing from 64.7% to 85.9%, particularly in identifying failed startups, which are often misclassified due to class imbalance. Feature analysis revealed that factors such as investment relationships, funding milestones, and business network characteristics significantly influence startup outcomes. While the proposed model demonstrated superior predictive performance, the study acknowledges limitations related to dataset imbalance and the exclusion of broader economic and policy variables. Future research is encouraged to explore advanced deep learning methods and integrate macroeconomic indicators to enhance model generalizability. These findings support the development of more reliable, data-driven decision making tools for investors, entrepreneurs, and policymakers operating in uncertain, high-risk environments.

Keywords*—Startup Success Prediction, Machine Learning, Bagging Tree Model, Bayesian Hyperparameter Tuning, Ensemble Learning, Venture Capital.*

Securing Digital Images: A Review of Modern Stganographic Techniques

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Abstract— With the advancement of digital communication, the demand for secure transmission of information related to sensitive data has also increased. Image steganography, which is considered the art of concealing some data in digital images, has been one of the most essential areas of research in meeting such demands. The paper deals with a review on the state-of-the-art stenographic techniques with a strong concentration on their security aspects. We will go over various methods of embedding hidden information within images, analyze various strengths and weaknesses of those techniques, and discuss common attacks and their countermeasures. The state-of-the-art in recent contributions is considered as well, with future research directions emphasized in an effort to increase both the security and robustness of image steganography.

Keywords— *Image steganography, Least Significant Bit (LSB) manipulation Discrete Cosine Transform (DCT), Steganalysis.*

Security and Privacy Enhancement in 6G IoT Devices Using Blockchain

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Abstract—In the modern era, the usefulness of sixth-generation (6G) based devices and other devices of the Internet of Things will greatly increase. In distant and sensitive places, aerial surveying is the main application for these instruments. It is concerning that, as technology has advanced, problems with information control and stalking have gotten worse. The approach to enhance the security and privacy of device data based on a 6G network is presented in this study using Blockchain Technology (BCT). An Internet of Things (IoT) application is implemented in a virtual 6G device monitoring system to assess the suggested design. Penta-tope-based Elliptic curve cryptography and SHA are used to secure data storage privacy for the technical information regarding device instructions, authentication, integrity, and 6G device reactions. This information is saved in a cloud platform. Afterward, the information is kept on a public blockchain powered by Ethereum to facilitate smooth BCT transactions. The Ganache platform for BCT, which guarantees data security and privacy, is used by this system. Furthermore, an Ethaline Meta mask wallet is needed to conduct BCT transactions. Thus, the suggested methodology aids in safeguarding data against ciphertext attacks, plaintext attacks, and stalkers. The outcomes validate the proposed approach's security and efficiency compared to the state-of-the-art.

Keywords— *Internet of Things (IoT), 6G, Blockchain, Security, Privacy, and BCT.*

Are Machine Learning Approaches Bringing an End to Empirical Models? Case of Reference Evapotranspiration and Relative Humidity

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Abstract—In the face of advancements in data-driven approaches, specifically artificial intelligence (AI) models, concerns are raised about the future of traditional empirical modeling. AI-driven models proved to be more effective in learning complex patterns while being easy to implement, data- and computationally efficient. From an environmental science perspective, where these challenges are significant, this study evaluates machine learning and empirical modeling for two tasks: (i) reference evapotranspiration (ETo) estimation and (ii) relative humidity (RH) estimation. The study is conducted using data sourced from two automatic weather stations (AWSs) located in two agricultural flat regions: R3, in Morocco and Davis, in California, United States. The in-situ data includes air temperature (Ta) and RH. Additionally, dew point temperature (Td) data were sourced from the Copernicus ERA5-Land Reanalysis product, and daily extraterrestrial radiation (Ra) was estimated based on latitude and the day of the year. The study compared the empirical models Hargreaves-Samani (HS) and Magnus formula, two established and extensively used as a subcomponent in various environmental science modeling software, versus the CatBoost ensemble machine learning model in predicting daily ETo and hourly RH. CatBoost was fed and trained on the same input parameters used in the empirical models to (i) predict ETo given Ta and Ra and (ii) predict RH given Ta and Td. The output was then compared to Penman-Monteith ETo and in-situ RH for the two scenarios, respectively. The results show that CatBoost outperformed HS and Magnus. For ETo, CatBoost had an RMSE of 0.01 and 0.18 mm.day-1, while HS had 0.57 and 0.89 mm.day-1 for R3 and Davis, respectively. Similarly, for RH, CatBoost surpassed Magnus in all metrics, specifically evident in the RMSE values of 6.99 and 9.18% versus 11.02 and 12.93%, for R3 and Davis, respectively. While the study confirms the assumption that AI-driven modeling is here to stay, questions about stochasticity, explainability, adherence to physics-ground truth, and reliability should be further investigated.

Keywords—*data-driven modeling, artificial intelligence, empirical models, Hargreaves-Samani, Magnus equation.*

Investigating the Influential Role of Determinants Affecting the Acceptance of Cryptocurrency

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Abstract— Cryptocurrency enables fast, secure, and low-cost financial transactions without requiring approval from third parties. While its global recognition is growing, its acceptance remains scare. However, a great deal of studies has been conducted in the acceptance of cryptocurrency, limited number of studies have highlighted the key drivers affecting the acceptance of cryptocurrency. This research intends to explore the factors influencing the acceptance of cryptocurrency. Using the Unified Theory of Acceptance and Use of Technology (UTAUT) extended with technology awareness, security, and trust, a survey was conducted with 280 respondents. Structural Equation Modelling (SEM) was employed to analyse the data. The results indicated that performance expectancy, social influence, facilitating conditions, technology awareness, and security were all found to significantly affect the acceptance of cryptocurrency. However, trust had insignificantly influenced the acceptance of cryptocurrency. The findings also provide vital insights and strategies for cryptocurrency users, offering a crucial examination for stakeholders and professionals keen on understanding the underlying dynamics of cryptocurrency acceptance.

Keywords— *Cryptocurrency, acceptance, performance expectancy, technology awareness, security, trust.*

Real-Time Phishing Attack Detection Using Machine Learning

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Abstract— Phishing attacks remain a significant threat in the field of cybersecurity, with attackers employing deceptive techniques to extract sensitive information from individuals and organizations. Traditional detection approaches, such as blacklists and heuristic-based methods, often fail to counter newly emerging phishing strategies. This study proposes a real-time phishing URL detection system utilizing machine learning. The system is based on 29 URL features, categorized into four groups: Address Bar-Based Features, Abnormal-Based Features, HTML & JavaScript-Based Features, and Domain-Based Features. Nine machine learning algorithms were evaluated, including Logistic Regression, Decision Tree, CatBoost, K-Nearest Neighbors, Naive Bayes, Support Vector Machine (SVM), Random Forest, Gradient Boosting, and XGBoost, using a balanced dataset of 12,000 URLs, comprising malicious URLs from PhishTank and legitimate ones from Tranco. Among the models, CatBoost achieved the highest performance with an accuracy of 98.4%. The CatBoost model was subsequently integrated into both a browser extension and a web-based interface for real-time phishing detection. The browser extension includes performance-enhancing features such as URL caching, which reduces redundant analysis of previously verified URLs, thereby improving system responsiveness and usability. This system demonstrates the effectiveness of machine learning in strengthening online security and provides a practical foundation for future research in phishing detection and prevention.

Keywords— *Phishing Detection, Machine Learning, Real-Time Detection, Browser Extension, URL Features, CatBoost.*

A Supervised Lightweight and Efficient U-network for Skin Lesion Segmentation

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Abstract—Complex and computationally intensive models excel in segmentation tasks. However, they are impractical for resource-limited medical devices with restricted computing power. As a result, lightweight models have been developed as a solution, demonstrating promising performance. Yet, due to their architectural design and the diverse sizes and structures of skin lesions, these models struggle with inaccurate segmentation caused by feature loss during the feature extraction process. To unravel the improper segmentation, we propose a lightweight method that improves segmentation performance. Explicitly, our model is a U-network that applies various attention blocks. The network comprises spatial and channel attention to facilitate our model in focusing on the key features and innovative dilated spatial efficient attention to increase the balanced efficiency and performance of the model. In addition, an innovative pooling to improve feature retention and local variation reduction, and a channel attention skip connection to connect encoder-decoder features. We incorporate these modules and produce an efficient lightweight skin lesion segmentation network. Compared to standard UNet, our proposed model reduced more parameters by 29x, computational complexity by 17x and 2.64% and 1.44% improvement in mean Intersection over Union and Dice coefficient, respectively. Furthermore, we experimentally compare the performance of our method with other lightweight and large methods in the ISIC2017 and ISIC2018 skin lesion datasets. The results demonstrate that our proposed model attains improved performance with a 1.88% mean Intersection over Union and 0.65% Dice coefficient improvement compared to a LeaNet lightweight model.

Keywords— *Lightweight network, Segmentation, Skin cancer, Supervised.*

Enhancing DDoS Detection in Software-Defined Networking with Explainable Ensemble Models: A Comprehensive Approach Using SHAP Values

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Abstract— Software-defined networking (SDN) has become a vital tool for controlling modern networks, but its centralized architecture makes it vulnerable to Distributed Denial of Service (DDoS) attacks, which may overwhelm the SDN controller and disrupt normal traffic. The article presents four Explainable Ensemble Models—CatBoost, LightGBM, Random Forest, and XGBoost—that improve DDoS detection in SDN systems by increasing accuracy, robustness, and interpretability. By using SHAP (Shapley Additive Explanations) values, these models provide transparency into decision-making processes, allowing network supervisors to better understand and trust the mod els' predictions. Evaluations of performance demonstrate near perfect accuracy, with CatBoost and XGBoost slightly exceeding the others. Metrics such as accuracy, sensitivity, precision, and F1 score ranged between 0.9999 and 1.0000, demonstrating their efficiency in DDoS detection. This study fills a critical gap in explainable AI (XAI) for DDoS detection by emphasizing the importance of transparent, high-performing models in strength ening SDN security, providing not only accurate predictions but also valuable insights into feature importance and model behavior, ultimately improving overall network resilience.

Keywords— *—Explainable Artificial Intelligence (XAI), En semble Model, DDOS Detection, Software-defined networking (SDN).*

Heart Disease Classification Using Machine Learning Techniques: An Impact Analysis of GridSearchCV-based Optimization

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Abstract— At present, cardiovascular disease has the potential to affect a substantial portion of the global population. The study performs the heart disease classification using several machine-learning algorithms. This study implements numerous machine learning machine learning techniques, such as Logistic Regression, K-Nearest Neighbors (KNN), Decision Tree, Extreme Gradient Boosting (XGBoost), Naïve Bayes, Support Vector Classifier (SVC), and Ensemble models. Additionally, the identification of the most effective parameters is essential for the development of a high-accuracy model and the improvement of predictive performance. Consequently, this study implements GridSearchCV for optimization. It assesses all parameters of the chosen model that have been specified and determines the optimal parameters by analyzing the data. The results suggest that GridSearchCV improves the efficacy of various machine-learning models. The performance assessment in the research was conducted using accuracy, F1 score, and AUC score. Using GridSearchCV, the majority of models maintained their accuracy. Nevertheless, the accuracy of the Decision Tree and Random Forest has improved, with the Random Forest experiencing a +0.0492 increase. KNN experienced a modest boost of +0.0128, while Decision Tree and Random Forest experienced considerable enhancements (+0.0733 and +0.0414, respectively) in the F1 Score, which exhibited the most variability. GridSearchCV demonstrated marginal improvements in the AUC Score of Random Forest (+0.0185) and SVC (+0.0039). Conversely, XGBoost experienced a slight decrease in its AUC Score (-0.0038), while KNN experienced a slight decrease of -0.0114. The results suggest that GridSearchCV improves the efficacy of these models.

Keywords— *Heart Disease Classification; Disease Classification; Machine Learning; GridSearchCV; Impact Analysis.*

Advancements and Challenges in VTOL UAVs Configurations and Emerging Trends

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Abstract— This paper explores both the promise and challenges of Vertical Take-Off and Landing (VTOL) UAVs, which blend the hovering ability of multirotor platforms with the extended range and speed of traditional fixed-wing aircraft. These adaptable aircraft are poised to revolutionize sectors including urban air transportation, operations in remote areas, and delivery systems. Yet their development isn't without hurdles—they face compli cated propulsion design issues, require better energy storage solutions, must integrate safely with existing air traffic, and need new urban infrastructure to support their operations. Progress in self-piloting capabilities, artificial intelligence, and clear reg ulatory guidelines is also crucial for their widespread adoption. Unlocking the full capabilities of VTOL UAVs will demand cooperation between scientists, designers, government officials, and business stakeholders. While these aircraft show remarkable potential, their successful future depends on addressing these challenges through technical innovation, collaborative efforts, and thoughtful regulation.

Keywords— *Hybrid Aircraft, Unmanned Aerial Systems, eVTOL, Autonomous Aerial Robots, Drones.*

Malware Detection Using Transfer Learning with ResNet-50: An Image-Based Approach

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Abstract—Recent developments in the field of cybersecurity and deep learning have introduced new and innovative approaches to malware classification. Older malware detection methods struggle to keep up with modern threats due to advanced obfuscation and packaging techniques. In this study, we use a publicly available dataset where PE (Portable Executable Files) files were pre-converted to RGB images, allowing us to leverage deep learning techniques for malware classification. The proposed method relies on a pre-trained ResNet-50 convolutional neural network (CNN) to extract high-level features and classify malware families. In our experiments, the pre-trained ResNet-50 network was adapted to image-based malware detection and recognition using transfer learning techniques. The dataset called the Blended Malware Image Dataset is used, which holds a huge variety of malware families. Experiments result shows that our study unravels state-of-the-art classification accuracy and surpasses in classification performance with traditional machine learning models employed in the original study. These results demonstrate that the potential of image-based malware classification by deep learning may be a step toward stronger/automated cybersecurity solutions.

Keywords*— Malware Classification, Transfer Learning, Deep Learning, ResNet-50, Convolutional Neural Networks (CNNs), Image-Based Malware Detection, Threat Detection.*

Hybrid optical color-image encryption via Computational ghost imaging based orthogonal patterns

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Abstract— Computational ghost imaging encryption (CGIE) technique suffers from high computational power needs, long encryption and reconstruction times, the system's linearity, and the large number of patterns transmissions that limit its applications. In this paper, we propose a CGIE method based on discrete cosine transform (DCT) and Hadamard basis patterns. by leveraging the sparsity of DCT transform to extract the most important information (low frequency) and encrypting it with CGIE, then XORing and scrambling the other coefficients with chaotic maps. In addition, using Hadamard basis patterns to improve the quality of the reconstruction and eliminating the key transmission by scrambling the Hadamard matrix according to the hash value from SHA256. Simulation results demonstrate that the encryption system offers a high level of security and a large key space with high key sensitivity. This provides valuable insights for image encryption and expands the implementation of CGI in cryptosystems.

Keywords— *Chaotic Maps, DCT, Ghost Imaging, Image Encryption, Optical Encryption.*

Theoretical Framework for Efficient UV-Relay Selection in IoUT Using Hybrid NN-GA Model with MCDM Approach

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Abstract—Routing protocols are one of the most crucial strategies for ensuring successful network operations on the Internet of Underwater Things (IoUT). By ensuring optimal data transmission in difficult underwater environments, clustering energy-efficient routing protocols based on relay assistants can extend the network lifetime. A theoretical modeling for selecting underwater vehicles (UVs) to serve as relays between cluster heads (CHs) and surface base stations (SBS) is presented in this paper. The proposed model is based on a hierarchical hybrid neural network (NN) and genetic algorithms (GA) with the multi-criteria decision making (MCDM) technique. The proposed study's objective is to find the best UVs for IoUT network to optimize routing decisions and energy efficiency. The proposed model performs well in reducing the number of dead UNs and CHs overheads after using the best selected UVs to serve as relay in modified SEP protocol.

Keywords— *IoUT, Relay Nodes, Underwater Vehicles (UVs), Neural Networks (NN), Genetic Algorithm (GA), MCDM, TOPSIS, Energy Efficiency, Routing Optimization.*

Optimized Machine Learning Approach for Breast Cancer Detection Using ADASYN with Feature Selection

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Abstract—Breast cancer remains a major health concern globally. Machine learning offers promising tools for early diagnosis, but challenges such as class imbalance, redundant features, and improper hyperparameter tuning limit performance. This study proposes an optimized machine learning framework that integrates Adaptive Synthetic Sampling (ADASYN) to handle class imbalance, applies Recursive Feature Elimination (RFE) and Principal Component Analysis (PCA) for feature selection, and uses GridSearchCV for hyperparameter optimization. The framework is evaluated using the WDBC dataset across several classifiers, including Random Forest, Logistic Regression, SVM, XGBoost, and MLP. The Random Forest model optimized with ADASYN achieved an accuracy of 98.59%, an AUC of 99.96%, a precision of 98.17%, and a recall of 99.07%. These results confirm the robustness of the proposed approach in improving breast cancer classification performance.

Keywords— *Adaptive Synthetic Sampling, Breast Cancer Detection, Hyperparameter Optimization, Machine Learning, Wrapper Methods.*

A Comprehensive Literature Survey for the IoT Security challenges and mitigation techniques

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Abstract—The Internet of Things (IoT) is revolutionizing current systems by enabling the seamless integration of devices from many areas. This paper seeks to offer a comprehensive review of IoT advances, concentrating on how IoT interacts with new technologies such as edge computing and 5G. Unlike previous surveys, which focused on single technological features, this research takes a comprehensive approach that covers various features, including architecture, security, data privacy, interoperability, and trust management. The goal is to bridge the research gap and provide solutions for making IoT systems more secure, scalable, and context-aware. This study helps expanding the understanding of the IoT ecosystem and identifies key areas for collaboration and innovation.

Keywords— *Internet of Things, security, 5G, data privacy, interoperability, and new technologies.*

Commencing Mobility as a Service (MaaS) Platform for the Rural Passengers of Trans Banyumas, Indonesia

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Abstract—Banyumas Regency is one of the five most populous regencies in Central Java, Indonesia. This number has continuously increased, with an average annual growth rate of 1.95%. The high population growth has led to increased transportation needs for mobility, and one of the solutions is implementing Bus Rapid Transit (BRT) Trans Banyumas with Mobility as a Service (MaaS) integration. However, the development and implementation of transportation services such as MaaS still primarily focus on urban areas, while rural areas tend to be neglected. Therefore, this research aims to propose a MaaS program for Trans Banyumas, focusing on rural passengers. The method used was quantitative. The study assessed 200 passengers, and the approach used was ANOVA. The results show that service quality significantly affects the origin and routine of Trans Banyumas passengers. Accessibility significantly affects routine, travel time, and last mile transport. However, there are many challenges to supporting MaaS from rural areas, such as the availability of real-time information, internet connectivity in rural areas, integration of local transportation modes, accessibility, and bus stop conditions. Therefore, the government and other stakeholders are essential in supporting the adoption of MaaS digital infrastructures.

Keywords*— Accessibility, MaaS, Mobility, Rural Passengers, Trans Banyumas*

Mitigating Risks in Smart Construction: Integrating Emerging Technologies for a Sustainable Future

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Abstract— Smart Civil Infrastructure (SCI) enhances conventional civil systems through digital technologies, offering improved performance and efficiency. However, this digital integration, while beneficial, also introduces significant risks from increased connectivity and systemic interconnectedness. This paper addresses the urgent need for comprehensive risk management and resilience in SCI by exploring inherent challenges and outlining mitigation and resilience-building approaches. Through a literature review, risks are classified into primary categories of physical hazards (e.g., aging infrastructure, natural disasters) and cyber threats (e.g., system vulnerabilities, cyberattacks). To mitigate these risks, the study explores strategies including structural reinforcement, cybersecurity measures, intelligent sensing, nature-based solutions, and policy interventions. Beyond mitigation, the paper emphasizes resilience-building through system redundancy, adaptability, institutional/social capacity, and life-cycle sustainability. Key considerations such as data integration, security, funding mechanisms, and public acceptance are also examined. Furthermore, the paper delves into the transformative potential and applications of emerging technologies (AI, digital twins, blockchain) for SCI resilience, examining their implementation challenges and future research. This study advocates for a systematic, interdisciplinary approach to developing safer, more sustainable, and resilient smart infrastructure for future generations.

Keywords—*Smart Infrastructure, Risk Mitigation, Cyber Security, Emerging Technologies, Sustainability.*

Exploring The Potential Of Virtual Reality For R Programming Education

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Abstract—This study develops and evaluates a novel Virtual Reality (VR) system for teaching fundamental R programming skills to university students, addressing common learning challenges. Grounded in Experiential Learning Theory and constructivism, our system aims to leverage immersive environments for enhanced knowledge construction. Employing a quasi-experimental design, we compared the efficiency of VR-based and traditional R learning methods among fifty 21-27 year-old participants. Participants were divided into two groups: one utilizing conventional methods and the other the VR system, developed with Unity 3D using a Rapid Application Development (RAD) approach and implemented on Oculus Quest 2 for an immersive experience. Evaluation involved hypothesis tests, the System Usability Scale (SUS), and Presence Questionnaires (PQ). Findings demonstrate that VR-based learning significantly enhanced performance over traditional methods, with a t-statistic of 2.741 (exceeding the t-critical value of 2.011) and a large Cohen's d effect size of 0.78. Additionally, 40% of participants rated the VR system above 68/100, indicating high satisfaction. Overall, the VR method proved to be an effective, convenient, and engaging tool for R coding education.

Keywords— *Virtual reality, education, immersive, programming learning, R coding*.

Enhancing Cybersecurity in Cyber-Physical Systems: an Explainable AI Approach for Intrusion Detection

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Abstract—Cyber-Pyshical Systems (CPS) are increasingly vulnerable to worst-case cyberattacks, where adversaries exploit both cyber and physical components to maximize disruption while avoiding detection. Traditional Intrusion Detection Systems (IDS) struggled against these adaptive threats due to their resilience on static rules and black-box models. This paper proposes an Explainable Artificial Intelligence-Based Intrusion Detection System (XAI-IDS) tailored for CPS security. By leveraging SHapley Additive Explanations (SHAP) and Local Interpretable Model-Agnostic Explanations (LIME), our approach enhances threat visibility, enabling security practitioners to understand, trust, and refine attack mitigation strategies. The system dynamically detects cyber-physical anomalies, prioritizing high-risk attack paths, that reduce system resilience by 19% in worst-case scenarios. Experimental results show that Random Forest achieves 98.2% accuracy, Decision Tree 95.7%, and Logistic Regression 91.4%, with SHAP analysis identifying network traffic rate, sensor anomalies, and unauthorized access attempts as the most critical threat indicators. By reducing detection latency and improving interpretability, the proposed XAI-IDS ensures proactive real-time security industrial control systems against sophisticated adversarial threats.

Keywords— *Cyber-Physical Systems, Worst-Case Attack, Explainable AI, Intrusion Detection, SHAP, LIME, Cybersecurity.*

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Tri-Band Circular Microstrip Patch Antenna with Slits and Multilayered Substrate for 5G mmWave Communications

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Abstract— This paper presents a compact tri-band microstrip patch antenna for 5G mmWave and WiGig applications, featuring a circular patch with dual symmetrical slits on a three-layer substrate. The stacked configuration combines Rogers RT/Duroid 5880 ($\varepsilon r = 2.2$, $\tan\delta = 0.0009$, 0.2 mm of thickness) as top and bottom layers and Taconic RF-43 ($\varepsilon r = 4.3$, $\tan\delta = 0.0033$, a thickness of 0.2 mm) as the middle layer, yielding a 0.6 mm total substrate thickness. The 10×10×0.6 mm³ design with a full ground plane achieves tri-band operation at 28.3 GHz (27.12–29.42 GHz, 2.3 GHz BW), 41.5 GHz (40.1–48.21 GHz, 8.11 GHz BW), and 61.6 GHz (55.24–66.27 GHz, 11.03 GHz BW), covering n261 (27.5–28.35 GHz), n262 (47.2–48.2 GHz), and WiGig (57–64 GHz) bands. Simulations in CST Studio Suite reveal peak gains of 7.05 dBi, 7.28 dBi, and 6.39 dBi at the three frequencies, with radiation efficiencies exceeding 80%, peaking at 91%. Performance validation includes reflection coefficients <-16.28 dB, VSWR 1.04–1.36, and stable impedance matching across all bands. The antenna's low-profile geometry, broad bandwidth, and high-efficiency address key mmWave challenges, making it suitable for 5G backhaul, IoT, and short-range communications. Its compatibility with emerging standards and cost-effective fabrication potential underscores its viability for next-generation wireless systems.

Keywords— *tri-band antenna, circular microstrip patch antenna, multilayer dielectric substrate, slits.*

SHAP-Based Explainable Machine Learning Framework for Interpreting SHCC Mix Design Parameters

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Abstract— Artificial intelligence advancements have generated significant potential for concrete mix design optimization; however, translating machine learning predictions into practical engineering knowledge remains challenging. This investigation presents an explainable machine learning framework that addresses this limitation through application to strain-hardening cementitious composites (SHCC). Utilizing Shapley Additive exPlanations (SHAP) methodology, an analysis of 266 experimental samples incorporating various mineral admixtures and fiber types was conducted. The CatBoost algorithm demonstrated superior predictive capability (R^2=0.957) while facilitating transparent interpretation of parametric relationships. SHAP analysis identified cement content as the primary determinant of compressive strength development, with water-to-binder ratio and fly ash content constituting secondary influential factors. Experimental results indicated optimal compressive strength was achieved with water-to-binder ratios not exceeding 0.3, fly ash content approximately 600 kg/m³, and fiber volume fractions between 0.2-0.3%. Additionally, the investigation revealed that shorter fibers with larger diameters provided enhanced contribution to compressive strength development. These findings extend the fundamental understanding of SHCC behavior while establishing quantitative guidelines for sustainable mix design optimization. The methodological framework developed herein effectively transforms complex algorithmic outputs into practical engineering knowledge, providing valuable analytical capabilities for both academic researchers and industry practitioners in cementitious materials development.

Keywords— *COVID-19, Artificial Intelligence, Medical Image Classification, Diversity Medical Dataset, Generalization Smart Solution.*

Optimizing Residual Signal Analysis for Fault Detection in Industrial Robots with SSA and Deep Learning

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Abstract— Industrial robots are essential components in modern manufacturing processes where precision and reliability directly impact production quality and efficiency. However, position errors remain a critical challenge affecting operational performance. This paper presents a novel hybrid deep learning framework for fault diagnosis in industrial robots, specifically proposing the SSA-CNN-LSTM model that integrates Singular Spectrum Analysis (SSA) with deep learning architectures. The framework employs SSA as a preprocessing technique to decompose noisy encoder signals into trend, oscillatory, and residual components, isolating fault-indicative residual signals for analysis. The proposed model combines one-dimensional Convolutional Neural Networks (1D CNNs) for spatial feature extraction with Long Short-Term Memory (LSTM) networks for temporal dependency modeling. Experimental validation on Joint 2 of an industrial robot operating at 6°/s with a 4kg payload demonstrates superior performance of the SSA-CNN-LSTM model compared to SSA-CNN-GRU, achieving significantly lower Mean Absolute Error (0.0012 vs. 0.019), higher correlation coefficient (0.8287 vs. 0.6399), and reduced Mean Absolute Percentage Error (235.42% vs. 670.94%). The results confirm the framework's effectiveness in capturing complex temporal patterns in residual position data, offering a computationally efficient and practically viable solution for real-time fault detection in industrial robotics applications.

Keywords— *Fault diagnosis, Convolutional neural network, Singular spectrum analysis, long short-term memory, Industrial robot.*

Pushing the Limits of Real-Time Face Detection: A Comparative Analysis of YOLOv11 Models

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Abstract—Real-time face recognition systems and computer vision applications are based critically on face detection. In this work, we use the well-known speed and accuracy YOLOv11 model and customize its variants (YOLOv11n, YOLOv11s, YOLOv11m, YOLOv11l, and YOLOv11x) to maximize performance for face detection tasks. Following training on the WIDER FACE dataset [1], all models were assessed on a subset of its images using measures including accuracy, recall, F1 score, mean average precision (mAP), and frames per second (FPS). The results show a clear trade-off: although smaller models (e.g., YOLOv11n and YOLOv11s) produced faster inference speeds with acceptable detection quality, larger variations (YOLOv11l and YOLOv11x) attained greater accuracy. This makes the smaller variants sensible for real-time uses like human-robot interaction or surveillance systems, where speed is critical. While YOLO models have been widely used in general object detection, their specific comparative performance in real-time face detection tasks particularly among the YOLOv11 variants has not been systematically evaluated. This study addresses that gap. Notably, YOLOv11m achieves 0.7499 mAP@0.5 and 0.4295 mAP@0.5:0.95 at 100 FPS, providing the best trade-off between accuracy and speed. Meanwhile, YOLOv11s delivers 0.7207 mAP with 194 FPS, making it ideal for real-time deployments on resource-constrained platforms.

Keywords*— YOLOv11, Face Detection, WIDER FACE, Real-Time, Face Recognition.*

Enhancement of Scholarship Decisions Precision Using Support Vector Machine Algorithm

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Abstract—With the increasing number of scholarship applicants, there is a growing need for intelligent systems that support fair and efficient decision-making. This study aims to enhance the scholarship selection process by applying machine learning techniques, specifically the Support Vector Machine (SVM) algorithm. The proposed model analyzes student data according to standardized academic and demographic criteria, classifying applicants as either eligible or ineligible for scholarship awards. The model was trained and evaluated using a real-world dataset, yielding a classification accuracy of 97.28%. Compared to traditional manual methods, the proposed approach enhances fairness, reduces subjectivity, and increases transparency in the distribution of scholarship.

Keywords— *Classification, Machine Learning Support Vector Machine (SVM).*

Enhancing Real-Time Detection of Distributed Denial of Service (DDoS) Attacks on IoT Infrastructure

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Abstract—Distributed Denial of Service (DDoS) attacks pose a significant threat to Internet of Things (IoT) infrastructures, leading to service disruptions and substantial financial losses. This research proposes an advanced real-time DDoS detection framework by integrating feature selection techniques with metaheuristic optimization algorithms like Grey Wolf Optimizer (GWO), Particle Swarm Optimization (PSO), and Salp Swarm Algorithm (SSA), alongside machine learning ML classifiers, including Support Vector Machine (SVM) and K-Nearest Neighbors (KNN). The feature selection process identifies the most informative network traffic attributes, optimizing model training and improving detection performance. Experimental results demonstrate that the proposed approach enhances detection accuracy, reduces false positives, and achieves low detection time, ensuring rapid threat mitigation. This makes it a robust and scalable solution for securing IoT environments against evolving DDoS threats.

Keywords— *DDoS Attack, IoT, Real-time Detection, AI.*

Designing and Simulating an MPPT Solar Charger Using Machine Learning

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Abstract— As the shift toward sustainable energy intensifies, enhancing photovoltaic (PV) efficiency is crucial. Maximum Power Point Tracking (MPPT) controllers play a vital role, yet conventional methods like Perturb & Observe (P&O) and Particle Swarm Optimization (PSO) face challenges under fluctuating irradiance and temperature due to steady-state oscillations and parameter dependence. Machine learning (ML) approaches, such as Artificial Neural Networks (ANN), and Adaptive Neuro-Fuzzy Inference Systems (ANFIS), offer adaptive, real-time tracking without requiring predefined panel data. However, prior ML-based MPPT implementations typically rely on offline training or fixed panel parameters, limiting scalability and robustness in large scale or rapidly changing environments. This study introduces an ML based MPPT controller that learns dynamically from voltage-power variations, eliminating dependence on manufacturer specifications. Duty cycle boundaries are adaptively set based on the voltage ratio to enhance response time and stability. Four algorithms (P&O, PSO, ANN, ANFIS) were simulated in MATLAB/Simulink under three dynamic test cases. Results show that ANN and ANFIS achieved over 99.5% efficiency with minimal settling time, with ANFIS maintaining high output stability under oversized module conditions. The findings highlight ML's potential especially ANFIS, as a scalable, parameter-independent MPPT solution. Future work includes real-time hardware implementation and integration with reinforcement learning for long term adaptability.

Keywords— *ANFIS, ANN, MPPT, photovoltaic systems, machine learning, P&O, PSO, renewable energy*

Real-time monitoring and optimization of energy consumption in smart buildings: case of Hospital

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Abstract— Smart buildings use IoT (Internet of Things) technologies to enhance energy efficiency, occupant comfort, and environmental sustainability. Within this domain, smart hospitals stand out due to their unique energy demands, driven by energy-consuming medical equipment that must operate continuously. Efficient energy management in smart hospitals is essential to ensure operational reliability, patient safety, and cost-effectiveness, but it faces several challenges, including managing peak consumption, adapting to variable needs, and optimizing energy usage without compromising essential services. In this paper, we present a comprehensive solution for energy optimization in smart hospitals. Concretely, we propose a 4-layer architecture for IoT-based system, and a Web application for energy monitoring and management, offering real-time visualization, configurable thresholds, and actionable insights for hospital managers. Also, we propose an algorithm that dynamically adjusts the operation of energy-intensive devices, considering some constraints, like environmental conditions, space occupancy, and type of medical equipment. We performed a set of sensors' data simulations and demonstrated a significant optimization of energy consumption in a smart hospital, comparing our algorithm with a GA-based approach. The comparison showed the effectiveness of our approach in minimizing energy consumption, while maximizing occupant comfort and ensuring the optimal operation of medical equipment.

Keywords— *Connected object; Internet of Things; Resource; Dynamic allocation; Optimization; Energy; Green IoT; Smart Building; Smart Hospital.*

User-Centered Design and Evaluation of a Mobile Mental Health App for Stress Management and Relaxation

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Abstract— To meet the increasing demand for easy-to-use mental health applications, this study introduces the design and evaluation of an entirely new mobile application to support men tal well-being and relaxation. The application was designed using User-Centered Design (UCD) principles and included numerous application features to facilitate mental health for a general audience, along with feedback from undergraduate participants. The important features were sorted out by conducting literature research and an initial assessment of current, existing solutions. The focus was therefore placed on user usability, supported by iterative user assessments, along with other key functionalities, enhancing developments in mental health app technology, and demonstrating the potential of our methodology in its design. The results revealed a strong user interest in AI-driven support within the app, moderate ratings for usability and monitoring features, and mixed reviews on other features, guiding future optimization and engagement strategies.

Keywords— *Mental Health, Stress Management, mHealth, User-Centered Design (UCD), Prototype, Usability.*

Hybrid Time Series Forecasting for Semiconductor Demand: A Comparative Analysis of Prophet-Based Ensemble Models for Smooth and Erratic Demand Patterns

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Abstract—In this study, we compare various hybrid time series forecasting models to improve prediction accuracy for semiconductor product demand. Our investigation examines two contrasting demand patterns observed in the industry: smooth demand (regular occurrences with modest variability) and erratic demand (significant variability despite occurring at generally consistent intervals). The analysis draws from actual semiconductor product data collected between 2009 and 2022. We benchmarked conventional time series approaches—specifically ARIMA and Facebook Prophet—against our proposed hybrid frameworks that integrate Prophet with advanced machine learning techniques (Random Forest and XGBoost). The empirical results indicate that our Prophet-Random Forest hybrid architecture substantially outperforms traditional methods, delivering a 30.5% accuracy improvement for smooth demand forecasting and a 7.2% enhancement when predicting erratic demand patterns. The proposed approach offers a practical alternative to computationally intensive foundation models, achieving substantial forecasting improvements while maintaining the interpretability and operational efficiency required for semiconductor manufacturing environments.

Keywords— *forecasting models, semiconductor demand, hybrid methods, Prophet, Random Forest, XGBoost, demand classification, supply chain management.*

Developing a Specialized Question Answering Model for the Yemeni Middle School Curriculum Using NLP Techniques

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Abstract— Question Answering (QA) is a critical subfield in Natural Language Processing (NLP). However, research efforts have predominantly focused on the English language, leaving other linguistically rich languages, such as Arabic, significantly underexplored. Recent research has increasingly focused on developing QA systems for Islamic- Arabic texts. However, these texts present unique computational challenges due to Arabic's complex morphology and syntax, as well as the lack of large-scale, annotated benchmark corpora. Moreover, recent studies have emphasized advancing open-domain QA frameworks that can dynamically retrieve and generate accurate, context-aware responses from both structured and unstructured knowledge sources. In this study, we employed artificial intelligence to answer questions from the Yemeni middle school curriculum (grades 7-9) to facilitate access to precise educational information. We created a textbook- derived dataset consisting of questions and answers to help students obtain accurate information without navigating overwhelming online content. We used the transformer- based Arabic language generation model AraGPT2, and we reconfigured the answer generation task, as our approach provides answers to questions by generating the answer from the trained data without relying on external contexts. This is what is known as the system for answering closed-domain questions. Then we evaluated the resulting model using the evaluation methods, which are BERTScore, Levenshtein distance, and BLEU. The proposed model achieved the best evaluation score of 0.74 on the BERTScore scale, which indicates good performance. In addition, the performance results were analyzed to determine the strengths and weaknesses of the model. The researchers suggest improving the model's performance by expanding the dataset, modifying the model structure, and applying human evaluation of the model

Keywords— *Arabic Question Answering , Transformers, Arabic Pre-trained Language , AraGPT2.*

The AI Revolution in Industry: A Review of Its Usage in Reverse Logistics Returns Prediction

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Abstract— As a result of the increasing growth of various industrial sectors in the modern era, and the remarkable progress in Artificial Intelligence (AI) technologies, predicting product returns, their causes, and the various processes that follow the return stage has become a matter of great importance and a modern trend for industrial and commercial companies. The primary goal of this approach is to achieve customer satisfaction by improving operational efficiency, reducing costs, and reducing the risk of excess inventory. This study analyzes scientific papers published between 2020 and 2025 that included forecasting returns and associated processes, including recycling, remanufacturing, and refurbishment as a post-return stage. We also highlight a variety of artificial intelligence methods, such as deep learning, machine learning, and large language models. AI is being used in a wide range of industries and businesses, such as consumer goods, fashion, automotive, and auto parts, to improve their operations. This research also addresses the generalizability of the results, research gaps, future directions, and the data they relied on. Additionally, exploring emerging technologies and providing a comprehensive analysis of AI methods for predicting returned products in reverse logistics.

Keywords— *Returns Prediction, Reverse Logistics, Circular Economy, e-commerce, Artificial Intelligence.*

Enhancing University Admissions through Scalable and Fair Machine Learning Models: A Case Study from Yemeni Universities

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Abstract— Machine learning (ML) techniques have been used to improve university admissions in Yemen, which faces major challenges. There is a bias against disadvantaged applicants. This bias comes from relying too much on traditional academic metrics. At the same time, weak technology leads to inefficiencies in handling many applications. These problems hurt the fairness and ability of current admission systems. To address this, we ap ply ML techniques. Various models, including logistic regression, support vector machines, k-nearest neighbors, random forest, and gradient boosting were evaluated. Their performance was evaluated based on accuracy and fairness. Among these, gradient boosting achieved the highest accuracy of 92% along with a notable 20% bias reduction measured by the Disparate Impact Ratio (DIR) and the Equal Opportunity Difference (EOD). Although all ensemble models demonstrated superior scalability and fairness compared to traditional methods. These models effectively processed datasets of over 15,000 student records while maintaining performance. Unlike complex deep learning models, the proposed models are easier to interpret. They show the clear importance of the feature. Entrance exam scores and high school GPA are the main predictors. Furthermore, the framework incorporates fairness-aware optimization, effectively reducing biases in admission decisions and enhancing suitability for socioe conomically diverse applicant pools. The findings illustrate that ML-driven approaches can revolutionize university admissions by delivering scalable, equitable, and resource-efficient solutions, which are particularly beneficial for institutions in constrained environments.

Keywords— *Fairness-Aware ML, University Admissions, Scalability, Yemeni Universities, Gradient Boosting, Random Forest.*

Deep Learning Analysis of Satisfaction and Dissatisfaction Levels in Arabic, Hebrew, and English Responses to the Gaza Ceasefire on YouTube

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Abstract— This study presents the first comprehensive comparative analysis of public sentiment regarding the Gaza ceasefire decision across Arabic, Hebrew, and English linguistic communities. We analyzed 1.1 million YouTube comments collected from 15 international news channels between January 17 and February 24, 2025 - a critical period following the ceasefire announcement. Our methodology employed specialized language models (AraBERT for Arabic, HeBERT for Hebrew, and DeBERTa for English) to ensure maximum accuracy in capturing linguistic nuances and cultural specificities. These models were fine-tuned using manually annotated geopolitical datasets, achieving exceptional classification accuracy between 91-95%. The findings reveal striking sentiment disparities: Arabic comments showed 66.3% satisfaction (versus 16.5% in Hebrew and 39.5% in English), while Hebrew responses exhibited the highest neutrality (45.6%). These patterns reflect deep divisions in media narratives and political perspectives. Our analysis further uncovered a weak correlation between comment engagement metrics ("likes") and sentiment labels, along with significant daily sentiment fluctuations corresponding to major news developments. This research makes three key contributions: (1) demonstrating the effectiveness of culturally-adapted AI models in analyzing polarized political discourse; (2) providing a robust framework for real-time monitoring of cross-cultural public opinion; and (3) offering practical tools for conflict resolution professionals and policymakers. The methodology can be directly implemented in early warning systems to detect escalatory rhetoric during geopolitical crises, while the findings provide unique insights into the complex dynamics of public sentiment formation in conflict situations. This work establishes a new standard for multilingual sentiment analysis in highly charged political contexts.

Keywords— *Gaza ceasefire, sentiment analysis, AraBERT, HeBERT, DeBERTa, Transformers, YouTube, public opinion, temporal trends, engagement analysis.*

AlphaFold-Based PPI Prediction Methods Classification

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Abstract— Abstract—Protein-protein interactions (PPIs) are fundamental to biology. While experimental PPI detection is crucial, it is often expensive, error-prone, and struggles with transient interactions. Computational, especially structure based, methods offer valuable alternatives, their reliance on experimentally determined structures has historically restricted their applicability. AlphaFold has transformed PPI prediction by providing accurate protein structure predictions, even without experimental data, thereby overcoming a major bottleneck in PPI research. This review examines the transformative impact of AlphaFold-based methods - including AlphaFold2, AlphaFold-Multimer, and AlphaFold3 - on PPI prediction, categorizing their contributions into six methodological domains. These methods utilize AlphaFold's capabilities to directly predict interacting protein complex structures, employing enhanced metrics for accuracy and sensitivity in PPI detection based on predicted interface features. The combination of AlphaFold-generated structures with computational techniques such as machine learning and network analysis is also considered to further improve prediction reliability and coverage. Furthermore, the critical role of the AlphaFold Database (AFDB) is highlighted in facilitating large-scale PPI studies by providing access to millions of predicted structures, enabling researchers to explore interaction networks and binding interfaces at an unprecedented scale. The review also surveys databases that provide critical information on protein interactions, sequences, structures, as PPI research hinges on the effective utilization and integration of these databases.

Keywords— *PPI, AlphaFold , computational biology.*

Environmental Condition Impacts On PV Systems In Yemen Based On Fuzzy Logic Technique: A Case Study

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Abstract—Environmental conditions have a major impact on the performance and reliability of solar energy systems. This study focuses on the impact of temperature and solar radiation variations on the performance of solar photovoltaic (PV) systems in some Yemeni cities. This study presents a MATLAB-based simulation to evaluate the performance of PV systems under these environmental conditions. A comparative analysis of Fuzzy Logic Controller (FLC) and Perturb & Observe (P&O) controller was conducted, highlighting that FLC achieved 2-5% higher efficiency and faster adaptation to environmental changes. These findings emphasize the potential for improving solar energy deployment in Yemen through advanced MPPT techniques. The study evaluates the impact of these changes on the system's energy output, efficiency, and overall performance

Keywords— *Environmental condition, solar irradiation, Temperature, photovoltaic system, Maximum Power Point Tracking, Fuzzy Logic Controller (FLC), MATLAB.*

AI-Driven Aerial Corrosion Detection: Capabilities, Limitations, and Future Directions

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Abstract— Corrosion poses a persistent threat to infrastructure integrity across critical industries. Traditional inspection methods often suffer from safety concerns, accessibility limitations, and human subjectivity. While drone-enabled corrosion detection systems offer promising solutions by leveraging advanced sensing technologies and AI, existing review studies often lack a compre hensive analysis of both the technological advancements and the practical challenges hindering widespread adoption. This paper addresses this gap by providing a comprehensive review of AI driven aerial corrosion detection, critically evaluating current capabilities, identifying key limitations, and proposing future research directions. We aim to articulate the research problem by highlighting the deficiencies in current review approaches and emphasizing the specific gaps our study aims to fill, particularly concerning the convergence of AI, digital twin frameworks, and multi-sensor fusion strategies for enhanced reliability and scalability of autonomous corrosion assessment systems.

Keywords— —*Drone Corrosion Detection, AI in Corrosion Monitoring, Infrastructure Inspection, Deep Learning for Cor rosion, Non-Destructive Testing.*

A Comprehensive Review of Transcranial Direct Current Stimulation (tDCS): Mechanisms, Cognitive Effects, Applications, and Future Directions

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Abstract— Transcranial direct current stimulation (tDCS) has emerged as a prominent, non-invasive brain stimulation tech nique with applications spanning cognitive enhancement and neurorehabilitation. This review synthesizes current evidence re garding tDCS mechanisms, from cellular-level effects to network level reorganization, and evaluates its efficacy across cognitive and clinical domains. We examine fundamental principles, in cluding polarity-dependent modulation of cortical excitability, protocol optimization, and safety considerations. Applications in working memory, executive function, language rehabilitation, and neuropsychiatric disorders are critically analyzed, highlighting both promising results and limitations. Emerging directions, including high-definition tDCS, personalized dosing, and multi modal interventions, are discussed. The review concludes with recommendations for standardizing protocols and addressing current challenges in reproducibility and individual variability.

Keywords— *Transcranial direct current stimulation (tDCS), Brain stimulation, EEG system, Review*

Smart Information Systems for Enhanced Employee Performance

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Abstract— Intelligent information systems improve performance by data analysis and effective decision-making, thereby advancing information technology and optimizing company operations with intelligence and accuracy. This research aims to evaluate the influence of intelligent information systems on employee performance at the Al-Amel Center for Oncology Treatment, National Cancer Control Foundation, in Taiz city. The research employed a descriptive-analytical methodology and utilized a questionnaire for data gathering. The study population comprised all personnel of the Al-Amel Center, encompassing individuals in the roles of administrative director, department head, and technician. An electronic survey was created and randomly disseminated to participants in the research population. Ninety-six valid surveys were gathered for study. The research employed the statistical software SPSS for data analysis. A variety of statistical techniques were employed, including Pearson's correlation coefficient, multiple and simple linear regression coefficients, Cronbach's alpha coefficient, and normality tests (skewness and kurtosis). The research revealed a statistically significant effect of intelligent information systems across all dimensions on employee performance. The research additionally identified the influence of specific intelligent information system characteristics (software components, human resources, hardware components, data, and networks) on employee performance.

Keywords— *Smart Information System, Performance, Human Resources.*

Design of a Wideband Circular Microstrip Patch Antenna for Ka-Band 5G Wireless Communications

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Abstract— The growing demand for high-speed and high-capacity wireless communication has intensified the need for compact, wideband, and efficient antenna solutions suitable for 5G applications, particularly in the Ka-band. To address this, a modified circular microstrip patch antenna is proposed, specifically designed to support 5G communication across multiple Ka-band frequencies. The antenna features a simple yet effective structure comprising a circular patch with a central circular slot, fabricated on a Taconic RF-35TC substrate with a relative permittivity of 3.5 and a low loss tangent of 0.0011. A partial ground plane is utilized on the bottom side to enhance radiation characteristics. The overall dimensions of the optimized antenna are 18 × 17 × 1.5 mm³. The design process involved modeling, simulation, and performance evaluation using CST software. Simulation results reveal that the antenna effectively covers the full Ka-band range from 21.7 GHz to 47.5 GHz, achieving a wide fractional bandwidth of 74.6%. It also demonstrates a peak gain of 8.8 dBi and a maximum radiation efficiency of approximately 94%, making it highly suitable for deployment in key 5G frequency bands such as 24, 26, 28, 38, and 39 GHz.

Keywords—*Microstrip antenna, Circular patch, Circular slot, Ka-band, Partial ground, Wideband.*

DStor: Blockchain-Driven IPFS Solution for Decentralized Storage

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Abstract— Decentralized blockchain technology could change businesses and processes. Centralized data cannot be entirely regulated. Large corporations can use our data to train their machines according to their standards. Decentralized blockchains employ a network of computers (nodes) to validate and record transactions without a central authority. Data security, trans- parency, and immutability are achieved using cryptography. Decentralized blockchain provides efficiency, confidence, and cheaper costs by eliminating intermediaries and centralized control. It is widely utilized in many industries and has enormous promise for supply chain management, with transparent product tracking and fraud reduction. It can also revolutionize financial systems by enabling safe, rapid cross-border transactions and eliminating middlemen. Transaction validation requires a lot of computer power, making blockchain networks slow. As users, transactions, and apps grow, blockchain networks struggle to process and confirm them. This makes blockchain networks unsuitable for fast-transaction applications. Integrating blockchain with IPFS is a novel way to address these issues. IPFS can store and share big files. IPFS works well for file-sharing but not for real-time content delivery. Thus, we presented a framework where IPFS stores big datasets and blockchain provides immutability and secure access via cryptographic hashes. Furthermore, the implementation of a two-level mining technique improves the overall security and efficiency of the system. First and second-level miners collaborate to protect and optimize data management. Data security is handled via a decentralized Ethereum smart contract in our proposed architecture.

Keywords— *Decentralized Storage, Blockchain, Ethereum, Smart Contracts, IPFS*.

Anomaly Detection System for Secure Cloud Computing Environment Using Machine Learning

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Abstract— The fast expansion of cloud computing requires strong security measures to safeguard sensitive information and maintain dependable service provision. Traditional anomaly detection systems often struggle due to their reliance on static methods and predefined attack signatures. This study describes a new Anomaly Detection System designed for Secure Cloud Computing Environments that makes use of machine learning methods. The system utilizes a Stacking Ensemble Model that merges the capabilities of various individual models to achieve superior accuracy and performance. Five different machine learning algorithms - Decision Tree (DT) , KNN , Support Vector Machine (SVM) , Random Forest (RF) , and Gradient Boosting Classifier - are used for base learner training on the revised NSL-KDD+ dataset. These models' predictions serve as input for a final meta-learner, Logistic Regression, which learns to combine their outputs into a final classification. The purposed Stacking Ensemble Model shows outstanding accuracy of 99.99%, exceeding past research. This significant improvement in accuracy highlights the effectiveness of our approach in detecting anomalies and mitigating potential threats in cloud computing environments. The results of this study provide practical benefits for improving the security and reliability of cloud services, leading to a more secure and trustworthy digital environment.

Keywords— *Cloud Computing, NSL-KDD+, Anomaly Detection System (ADS), Machine Learning-KNN, DT, RF, SVM, GB, Stacking Ensemble Learning Model.*

Improving Medication Adherence in Elderly Patients Through IoMT-Enabled Smart Pill Dispensers: A Narrative Review

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Abstract— Non-adherence to medications represents a major complication among the elderly, with dire consequences on health outcomes and healthcare costs. The advent of internet of medical things (IoMT)-enabled dispensers opened up opportunities feasible for confronting these issues of great concern. With real-time monitoring, automated personal reminders, and caregiver interfacing, these devices address some of the common barriers to adherence with attention to patient and caregiver experience. The objective of this review was to evaluate the contribution of IoMT-enabled dispensers toward the improvement of medication compliance in elderly patients. Evidence extracted from research on Scopus, PubMed, and the Cochrane Library suggests high adherence rates, low missed doses, and greater levels of satisfaction from both the patient and caregiver. Furthermore, effectiveness is explained by personal real-time reminders, tailored interventions, and interfacing with healthcare systems. However, their uptake is opposed by constraints such as limited-quality internet access, issues with privacy of data, and financial constraints. The review builds on highlighting opportunities for the future for incorporation into AI technologies, policy measures, and educational programs to improve the availability and performance of the devices.

Keywords— *elderly, IoMT, IoT, medication adherence, smart arithmetical health, smart pill dispensers.*

Microstrip Antenna Design for W-Band with Enhanced Return Loss Performance Using Slots and Parasitic Elements

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Abstract— Fifth-generation (5G) networks are essential for meeting the increasing demands of emerging wireless applications that require high-quality service, ultra-fast data rates, and efficient management of rapidly growing data traffic. This paper presents a compact slotted patch antenna integrated with parasitic elements, designed for superior return loss performance in the W-band to support 5G wireless systems. The antenna is fabricated on a Rogers RT5880 substrate, characterized by a dielectric constant of 2.2 and a loss tangent of 0.0009, and features a miniaturized footprint of $3.2 \times 4.57 \times 0.1518$ mm³. By incorporating strategically placed slots and parasitic coupling elements, the design achieves enhanced return loss performance. Comprehensive full-wave electromagnetic simulations using CST Studio Suite validate the antenna's performance across both frequency and time domains. At an operational frequency of 87 GHz, the antenna exhibits a bandwidth of 4.1 GHz (84.9 – 89 GHz), a peak gain of 8.13 dBi, a radiation efficiency of 83%, a return loss of 73.7 dB, and a voltage standing wave ratio (VSWR) of 1.0004, indicating exceptional impedance matching and minimal signal reflection. These findings demonstrate the antenna's suitability for high-density 5G environments and its potential to reduce interference while improving radiation performance in next-generation communication systems.

Keywords— *W-Band, parasitic elements, microstrip antenna, 87 GHz, return loss performance.*

MultiheadSelfAttention vs. Traditional Encoders: A Benchmark Study on Precision and Recall in Tajweed Recognition

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Abstract—Accurate classification of Tajweed rules is critical for preserving the integrity of Quranic recitation. While prior studies relied on traditional machine learning (ML) models with handcrafted features, they faced limitations in handling class imbalance and capturing nuanced acoustic patterns. This paper introduces a novel encoder-based framework for Tajweed rule classification, combining adaptive feature extraction (Mel-Frequency Cepstral Coefficients, openSMILE) with advanced neural architectures (DNN, LSTM, Self-Attention, Multihead Self-Attention). We curate a diverse dataset of Quranic recitations that span four Tajweed rules (Ikhfa, Izhar, Idgham, Iqlab) from eight reciters, ensuring robustness through varied vocal styles and regional accents. Our Multi-Head Self-Attention encoder achieves 98.6% accuracy, with perfect precision (1.00) for the minority Iqlab class, while the DNN encoder attains 98.9% accuracy—significantly outperforming prior benchmarks (82.2% accuracy with Random Forest). The LSTM encoder, however, fails to classify Iqlab (0% F1-score), highlighting the superiority of attention-based mechanisms. Results demonstrate that encoder architectures effectively address class imbalance and capture intricate temporal dependencies, establishing a new state-of-theart for automated Tajweed validation. This work contributes (1) a preprocessing pipeline for audio standardization, (2) empirical validation of encoder models, and (3) a canonical, expertannotated Tajweed dataset to advance research in Quranic recitation analysis.

Keywords—*Tajweed, Self-Attention, Multi-Head Self-Attention, LSTM, DNN ,speech.*

Navigating GenAI in Malaysian Universities: Use, Problems, and Challenges

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Abstract— The growing presence of Generative Artificial Intelligence (GenAI) in higher education offers promising advantages but also raises critical concerns that deserve close attention. This study explores how GenAI is being used by university communities in Malaysia, with a focus on user behaviour — including usage patterns, motivations, perceived benefits, and perceived risks. Given the limited empirical work in this area, particularly within the Malaysian context, our investigation seeks to provide insights that can inform more thoughtful and responsible integration of AI tools in academia. Using a mixed-methods approach, we collected data from 290 students and academic staff across Malaysian universities. The findings suggest that easy access and reliable, prompt results are major factors encouraging GenAI use. Participants appreciated its ability to save time and enhance problem solving, especially in completing routine academic tasks. However, concerns were also raised — notably around the decline of critical thinking skills, potential for information overload, ethical uncertainties, and increasing dependence on AI. Many respondents pointed out the need for better content verification practices, clearer ethical guidelines, and more institutional support to manage the cognitive demands of frequent GenAI use. Overall, this study highlights the urgent need for universities to develop policies, frameworks, and digital well-being strategies that promote ethical, balanced, and sustainable GenAI use. The findings also lay the groundwork for future research and conceptual models aimed at supporting effective AI adoption in higher education.

Keywords— *GenAI, Universities, Malaysia, Usage and Challenges.*

Quality of Experience Performance Evaluation of IoT in 6G Systems

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Abstract—The article thoroughly examines the influence of reconfigurable intelligent surfaces (RIS) technology on massive multi-input-multi-output (mMIMO) downlink (DL) non-orthogonal multiple access (NOMA) power domain (PD) control systems in Internet of Things (IoT) environments within a 6G network. The study presents a simulation model aimed at a comprehensive analysis and evaluation of capacity, throughput latency, and quality of experience (QoE) for proposal systems, with or without additional RIS, using the IoT in hybrid distribution and algorithms over a wide area. The proposed approaches are assessed by a simulation software program under unstable channel conditions, accounting for varying distances and power locations while utilizing 1024-QAM modulation, frequency-selective Rayleigh fading, and successive interference cancellation (SIC). The result shows a new evaluation of RIS-enhanced NOMA networks under hybrid IoT deployments. RIS integration not only enhances capacity and throughput but also effectively mitigates latency and improves QoE issues caused by increased device mobility or density and coverage areas.

Keywords— *NOMA, MIMO (mMIMO), RIS, IoT, quality of experience (QoE), successive interference cancellation (SIC).*

Critical_TSA: Twitter Sentiment Analysis in Critical Event Using Python

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Abstract— Twitter is a platform where users may post texts known as "tweets." They may be examined to determine their implications and meanings. Among these techniques, sentiment analysis is perhaps the most well-known. We addressed the issue of sentiment analysis of tweets on important occasions like disease or natural disasters. We called our proposal Critical_TSA, which means Twitter Sentiment Analysis (TSA) in critical event. We used SVM, to work on two datasets of distinct events at the psychological impact level: the first was tweets under the critical circumstances of the earthquake, and the second was the Covid-19 pandemic. Our results show that neutral tweets during the pandemic had the highest percentage in the analysis of the total tweets. We believe that the reason for this percentage being higher than others is that the impact was spread throughout the world. As for the earthquake, it is in one geographical area, so the number of positive earthquake tweets reached almost half of the total tweets. Finally, we implement the performance evaluation the SVM algorithm. Our proposed Critical_TSA reached a classification accuracy of up to 94% for tweets in the COVID-19 dataset and a classification accuracy of 92% for the earthquake dataset.

Keywords— *Machine Learning, Natural Language Processing (NLP), Python, Sentiment Analysis, Support Vector Machine (SVM), Twitter.*

Enhancing Arabic Dialect Classification with Deep Learning Techniques

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Abstract— Arabic dialect classification presents unique challenges due to the linguistic diversity across regions. This study explores deep learning methods to improve classification performance, focusing on underrepresented dialects, especially Saudi variants. We evaluate recurrent neural networks, including BiGRU and BiLSTM, using the SADA dataset—a rich corpus of dialectal Arabic. The approach integrates preprocessing techniques such as normalization, stop-word removal, and tokenization to refine text inputs. Models are assessed using accuracy, precision, recall, and F1-score. Among the architectures, BiLSTM achieved the highest performance with 97% training and 90% test accuracy. To address class imbalance and overfitting, we applied data balancing and regularization strategies, which significantly enhanced generalization. Our findings demonstrate the effectiveness of certain architectures for dialect identification and offer insights for future NLP applications. This work contributes to advancing Arabic dialect processing and provides a baseline for future research in low-resource language classification.

Keywords— *Artificial Intelligence, Deep Learning, Natural Language Processing, Arabic Dialects, Classification, Text Preprocessing.*

Enhancing Intrusion Detection Using Dragonfly Algorithm-Based Feature Selection and Extra Trees for Classification

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Abstract— Intrusion Detection Systems (IDS) play a critical role in identifying cyber threats and securing network environments. This research proposes an optimized IDS by leveraging the Dragonfly Algorithm (DA) for feature selection and employing Extra Trees (ET) and K-Nearest Neighbors (KNN) for classification. The UNSW-NB15 dataset is used for evaluation, ensuring a robust and realistic assessment. The implementation, conducted in Python, demonstrates that ET, when combined with DA-based feature selection, achieves an accuracy of 100%, highlighting its effectiveness in distinguishing between normal and malicious traffic. The results confirm that intelligent feature selection significantly enhances IDS performance, reducing computational complexity while improving detection accuracy. This study contributes to the advancement of IDS methodologies, offering a highly efficient approach for real-world cybersecurity applications.

Keywords— *Machine learning, Feature Selection, Dragonfly algorithm, and Extra Trees.*

Advancements in Robotic Arm Technologies: Precision, Intelligence, and Cross-Sector Applications

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Abstract— Modern robotic arm systems face three fundamental challenges that limit their widespread adoption: (1) achieving sub-millimeter precision in dynamic environments, (2) maintain ing flexibility across diverse applications, and (3) developing intelligent control systems for autonomous operation. This paper addresses these challenges through a comprehensive analysis of recent breakthroughs, including precision kinematic control systems achieving ±0.05mm accuracy via optimized Denavit Hartenberg modeling, AI-powered intelligent control with high object recognition rates, and cross-industry implementations demonstrating transformative efficiency gains. This study ana lyzes 25 case studies showing transformative impacts in manufac turing (22% cycle time reduction), healthcare (28% faster patient recovery), and high agriculture harvesting efficiency. The study identifies critical challenges in dynamic stability and human robot collaboration while outlining emerging solutions in bio inspired design and cognitive robotics. The findings demonstrate how converging technologies are enabling a new generation of versatile robotic manipulators, with particular emphasis on IoT enabled digital twins reducing operational latency to 0.16s. This work provides both a state-of-the-art assessment and a roadmapfor next-generation robotic arm development.

Keywords— *Robotic Manipulators; Kinematic Optimization; Precision Control Systems; Human-Robot Collaboration; Industrial Automation*.

Refactoring Approaches for Improving Software Flexibility

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Abstract—Software flexibility is a vital quality attribute that enables systems to adapt to evolving requirements, integrate emerging technologies, and support long-term maintenance. Refactoring, the practice of restructuring existing code without altering its external behavior, is a key strategy to enhance flexibility. However, the specific impact of individual refactoring approaches on software flexibility remains underexplored. This study investigates the effects of ten widely recognized refactoring approaches on software flexibility using the jEdit open-source dataset. A four-phase methodology was employed: selecting relevant refactoring approaches, choosing an appropriate dataset, identifying suitable software metrics, and applying the refactoring. Metrics such as MOA, DAM, DCC, and NOP were used to compute an aggregated flexibility score. The refactoring approaches were applied 352 times across 10 experiments across jEdit. Results revealed that Extract Class, Extract Subclass, Extract Superclass, and Encapsulate Field positively influence flexibility, while others, such as Inline Class and Push Down Method, may reduce it. These findings provide empirical evidence on how refactoring decisions can strategically improve software flexibility. The outcomes offer practical guidance for developers and software architects aiming to build more resilient and maintainable systems through informed and metrics-driven refactoring.

Keywords— *refactoring, refactoring approaches, software flexibility, software quality, software metrics, software maintenance*.

Phishing Attack Detection Using Whale Optimization Algorithm-Based Feature Selection

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Abstract— This study presents an optimized phishing attack detection model integrating the Whale Optimization Algorithm (WOA) for feature selection with XGBoost and Support Vector Machine (SVM) classifiers. The proposed approach enhances classification efficiency by selecting the most relevant features from the ISCX-URL2016 phishing dataset. Experimental evaluation demonstrates that XGBoost with WOA achieves an accuracy of 97.92%, while SVM with WOA attains 96.03%, highlighting the effectiveness of metaheuristic-based feature selection in improving detection performance. The results indicate that WOA successfully reduces feature dimensionality while preserving classification accuracy, making it a viable approach for phishing detection. This research contributes to cybersecurity by providing an adaptive and high-performance phishing detection framework, offering scalability and robustness for real-world deployment.

Keywords— *Machine learning, Feature selection, Whale Optimization Algorithm, Phishing, and ISCX-URL2016 dataset.*

Virtualized Firewalls: Design, Implementation, and Security Challenges in Modern Network Infrastructures

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Abstract— Virtualization technologies have significantly transformed the landscape of network infrastructure. Virtualized firewalls (VFs) have emerged as a critical component in modern network security, leveraging the flexibility and scalability of virtualization technologies. This paper provides a comprehensive review of the design principles, architectural models, and implementation best practices for VFs. We explore their evolution from traditional hardware-based systems to software-defined and cloud-native solutions, highlighting the benefits and challenges of virtualization in enhancing network security. By synthesizing current research and practical insights, this review aims to guide future developments in virtualized firewall technologies, particularly in cloud computing and Network Function Virtualization (NFV).

Keywords— *Virtualized Firewalls (VFs), Network Function Virtualization (NFV), Emerging Firewall Technologies.*

Automatic Detection of Neurodevelopmental Disorders Using CryAcoustic Features

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Abstract— Prompt detection of neurodevelopmental disorders (NDDs) is vital for launching timely interventions that can markedly improve developmental outcomes. In our study, we investigate whether infant cry sounds could serve as non-invasive biomarkers for NDD detection. We focus on CryAcoustic Features, which combine prosodic elements with selected voice-quality parameters. Our approach began with the extraction of a broad set of acoustic characteristics from infant cry recordings using the eGeMAPS feature set. We then applied a rigorous feature selection process to identify the most informative descriptors. For the classification task, we assessed several machine learning techniques, including Support Vector Machine (SVM) and Random Forest (RF). In addition, we developed a hybrid model that fuses the outputs of SVM and RF via logistic regression acting as a meta-classifier. This integrated approach yielded the best performance, achieving an accuracy of 75.52%, a recall of 80.05%, and an AUC of 83.00%. Our findings highlight the effectiveness of CryAcoustic Features in distinguishing between typically developing infants and those with NDDs, suggesting that cry-based acoustic analysis is a promising, non-invasive strategy for initial NDD screening.

Keywords— *Neurodevelopmental Disorders, CryAcoustic Features, Pr sodic Analysis, Voice-Quality Features, Machine Learning, Prompt Detection..*

Enhancing Diabetic Retinopathy Detection: A Deep Learning Approach with Advanced Image Preprocessing

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Abstract— Diabetic Retinopathy (DR) is one of the main causes of blindness globally, which calls for early intervention in order to avoid permanent vision loss. In this study, a new approach is proposed for DR severity level classification with automatic detection using deep learning and retinal fundus images. An image preprocessing pipeline is introduced to enhance the quality of the images and critical features of the retina. The dataset used for the study was the APTOS 2019 dataset which consists of 3662 high-resolution retinal images divided into 5 levels of severity. For optimal results, the model was prepped with grayscale, contrast adjustments, and contour filling. VGG16, InceptionV3, and MobileNetV2 were the three CNN architectures that were implemented and tested against each other using accuracy, precision, recall, F1 score, and ROC-AUC. Out of all participants, MobileNetV2 was able to exceed the most expectations achieving 99.35% accuracy. Unlike the traditional methods, he was able to capture essential features of the retina, decrease false identified positives, and improve the classification of the stages of DR. The results accentuate the promise of AI-powered diagnostic solutions for fully automated systems for DR screening and sets stage for research involving retinal data as alternative markers for potential cardiovascular disease risks.

Keywords— *Diabetic Retinopathy, Deep Learning, Image Preprocessing, Retinal Fundus Images, Convolutional Neural Networks, Automated Diagnosis, Medical Imaging, Feature Enhancement, Cardiovascular Risk Prediction.*

Precision Tracking for Steer-by-Wire Systems Based on Fast Integral Terminal Sliding Mode Control

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Abstract— Steer-by-Wire (SbW) systems eliminate conventional mechanical steering linkages by replacing them with electroni cally controlled mechanisms, offering enhanced design flexibility, reduced system complexity, and improved integration with au tonomous vehicle platforms. However, the absence of mechanical feedback introduces significant challenges, particularly increased sensitivity to modeling uncertainties, actuator nonlinearities, and external disturbances. To address these issues, this paper pro poses a Fast Integral Terminal Sliding Mode Control (FITSMC) strategy aimed at achieving robust and accurate trajectory tracking in SbW systems. The controller employs a nonlinear terminal sliding surface augmented with an integral term to eliminate steady-state error and accelerate convergence, all within a simplified control structure. Unlike more complex adaptive or learning-based approaches, the proposed method avoids online parameter tuning while still ensuring strong performance and ro bustness under dynamic and uncertain conditions. A Lyapunov based stability analysis is conducted to rigorously prove the finite time stability of the closed-loop system. The effectiveness of the FITSMC controller is validated through simulation experiments conducted under a variety of challenging road conditions and trajectory scenarios. Simulation results show that the FITSMC controller reduces the RMS tracking error by 18% for sinusoidal inputs and by 43% for trapezoidal profiles, compared to the Adaptive Integral Terminal Sliding Mode Control (AITSMC) method. Comparative results confirm that the proposed control strategy provides faster response, lower tracking error, and improved robustness.

Keywords— *Steer-by-Wire (SbW), terminal sliding mode control, adaptive control, tracking control, autonomous systems, Lyapunov analysis.*

Flying High or Grounded: Sentiment Analysis on Airline Reviews using Naïve Bayes Algorithm

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Abstract— Airlines receive large volumes of customer feedback daily, but manual analysis is time consuming and often inaccurate due to the unstructured nature of reviews and class imbalance. This study applies the Multinomial Naïve Bayes algorithm to analyse 23k airline reviews (2020–2023) from Kaggle, aiming to improve service quality through sentiment analysis. The process was conducted in the following phases which are literature review and dataset selection, data preprocessing, feature extraction using TF-IDF, and model implementation and evaluation. A user-friendly GUI was also developed to simplify review analysis. To address the class imbalance, ADASYN oversampling was applied, improving the model's reliability in detecting positive and negative sentiments. The experiment compared model performance under two settings, with and without class balancing using ADASYN. The model was evaluated using a 70:30 train-test split in two settings, with and without ADASYN. The best accuracy of 82% was achieved after applying to ADASYN. The findings confirm that Naïve Bayes is efficient and suitable for analysing airline reviews, enabling a clearer understanding of customer feedback and faster issue resolution. This contributes to enhanced service quality. The approach can be further strengthened by applying more advanced algorithms to larger datasets, thereby paving the way for greater customer satisfaction and more efficient airline operations.

Keywords—*Sentiment Analysis, Naïve Bayes, Airline Reviews, ADASYN, TF-IDF.*

Motion Tracking with Kalman Filter Prediction and Measurement Update for Robust Position Estimation

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Abstract— This paper presents a robust framework for real-time motion tracking using a classical linear Kalman Filter (KF) to predict moving object positions in subsequent video frames. Object tracking constitutes a fundamental task in autonomous systems, robotics, surveillance, and industrial automation applications. Conventional image processing techniques, however, often yield noisy measurements due to motion blur, low illumination conditions, and dynamic background interference. The proposed approach integrates KF into standard image processing to reduce uncertainty in these measurements and improve the accuracy of position prediction. The methodology includes the theoretical fundamentals of Kalman filtering, including state space formulation, measurement, modeling, and recursive predictive update mechanisms. Experimental assessments under various difficult conditions demonstrate a statistically significant reduction in processing error ($P < 0.05$) and an improved robustness compared to the basic line method. Improved arithmetic efficiency and framework accuracy demonstrate broad applicability in visual-based tracking systems in several domains.

Keywords— *Kalman Filter, Object Tracking, Image Processing, State-Space Model, Prediction, Real-Time Systems.*

A Survey on Camera-Based Measurement Systems: Techniques, Applications, and Challenges

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Abstract— Camera-based measurement systems have become indispensable across engineering and scientific domains, offering non-contact, high-precision quantification of physical phenom ena. This review analyzes their principles, applications, and challenges, revealing that modern systems achieve remarkable accuracy (micron-scale in surface metrology, sub-centimeter in environmental monitoring) but face fundamental trade-offs. While traditional image processing enables efficient edge deploy ment (60 fps), deep learning methods deliver superior accuracy (98.86%) at a higher computational cost. Persistent challenges include environmental sensitivity (15-25% accuracy degradation outdoors), calibration complexity (15-30 min/setup), and process ing bottlenecks. Emerging solutions like multi-spectral imaging (18-22% robustness improvement) and hybrid architectures (40% power reduction) point toward next-generation adaptive systems. The findings provide both a state-of-the-art reference and a roadmap for overcoming current limitations in optical metrology.

Keywords— *Camera-based Metrology, Optical Measurement Systems, Industrial Machine Vision, Non-contact Measurement, Edge-AI Vision Systems*

Smart Dermatological Diagnosis: Vision Transformer-Driven Skin Multi-Disease Detection System

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Abstract— Early diagnosis of dermatological conditions has garnered growing attention due to the potential risk of com- plications and associated metabolic changes. However, accurate classification remains a challenge due to variations in skin tone, pigmentation, and the presence of hair, often resulting in misclas- sification. To mitigate these issues, this study presents a Vision Transformer (ViT)-based framework for multi-class skin disease classification. The proposed Smart Skin Diagnosis system utilizes the ViT-B/16 architecture, incorporating patch embedding and self-attention mechanisms to effectively capture both local and global features. Input images are segmented into 16×16 patches and processed through a 12-layer transformer encoder to extract discriminative features. Comprehensive preprocessing and data augmentation enable the model to achieve an accuracy of 98.9% across eight distinct skin conditions. The system is particularly suited for deployment in underserved regions and incorporates a "disease not found" mechanism to handle unknown inputs. Future work includes external validation, model comparisons, and real-time optimization for constrained environments.

Keywords— *vision transformer, patch embedding, self- attention mechanism, smart skin diagnosis, ViT-B/16 architecture.*

A Comprehensive Review of Machine Learning-Based Approaches for Malware Detection

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Abstract— Malware detection is a pivotal challenge in cybersecurity, demanding advanced methods to counter increasingly sophisticated threats. Machine learning has evolved as an enabler in this regard, and powerful detection systems are made available. The paper provides a systematic review of 57 articles that cover the use of machine learning algorithms to detect malware on the computer and, importantly, this is with a picture in mind of mixing the use of signature-based, behavior-based, and hybrid approaches to achieve greater and higher detection rates and the resilience especially against real-world threats. Signature-based methods leverage predefined patterns, behavior-based techniques analyze runtime activities, and hybrid models combine rigid and dynamic assessment for enhanced detection accuracy. The review compares many algorithms, such as classical machine learning (e.g., Support Vector Machine, Naive Bayes, Decision Tree, Random Forest, Logistic Regression, K-Nearest Neighbors) approaches, deep architectures (e.g., Artificial Neural Networks, Convolutional Neural Networks, Recurrent Neural Networks) and advanced models (e.g. Graph Neural Networks, Transformer Models, Vision Transformers). Additionally, hybrid frameworks such as Deep Belief Networks, Transfer Learning Models, Tree Augmented Naive Bayes (TAN), and the Non-Dominated Sorting Genetic Algorithm (NSGA-II) are examined. These methodologies have been applied to diverse datasets, showcasing their applicability in real-world scenarios.

Keywords—*Machine Learning, Malware Detection, Signature-based Detection, Behavior-based Detection, Hybrid Approaches*.

DistilBERT Meets Diagnosis: Multi-Class Diseas Classification from Noisy Medical Transcriptions

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Abstract— Medical transcriptions, a rich yet underutilized source of clinical information, offer significant potential for supporting computer-aided diagnosis. However, this data is often unstructured, error-prone, and exhibits severe class imbalance—posing challenges for automated disease classification. In our research work, we present a novel framework called ”DistilBERT” for multi-class disease classification from medical transcription text, leveraging machine learning and deep learning models. The DistilBERT includes noise reduction through preprocessing, followed by class balancing using synthetic oversampling techniques such as SMOTE, ADASYN, and SMOTE-Tomek. To better understand data distribution and class separability, we employed dimensionality reduction methods such as PCA, t-SNE, and UMAP. We benchmark a range of models—Logistic Regression and Support Vector Machines on the classical side, and CNN, BiLSTM, Transformer-based models, and DistilBERT on the DL front. Among these, DistilBERT achieves the highest performance, with accuracy of 87.6% and an F1 score of 0.871. To enhance interpretability, we apply post hoc explainability tools like LIME and SHAP, revealing that model predictions are influenced by clinically relevant terms. Our results highlighted the value of integrating data balancing, deep learning, and explainability in building reliable and interpretable systems for medical text classification.

Keywords— *Early diagnosis, artificial intelligence, deep learning, medical transcription, text classification, BERT, transformer models.*

Smart Surveillance: Real-Time Shoplifting Detection Using Deep Learning and YOLOv8

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Abstract— Shoplifting is a major concern for retailers, leading to substantial financial losses worldwide. Traditional surveillance methods rely on manual monitoring, which is inefficient and prone to human error. This study presents an AI-powered shoplifting detection system using deep learning. The system integrates YOLOv8, accessed via the Roboflow API, for object detection, ByteTracker for object tracking, and EfficientNetV2B0 for behavioral classification. The DCSASS dataset from Kaggle was utilized for training, with a manually annotated subset of shoplifting and normal behavior videos ensuring balanced data. Preprocessing included converting videos into 224×224 frames, categorical encoding, and data augmentation techniques such as random flipping, rotation, zoom, and height & width scaling to enhance model generalization. The model achieved 93% accuracy, with a precision of 0.93, recall of 0.93, and F1 score of 0.93, demonstrating robust classification performance. Real-time deployment was achieved using Streamlit, enabling an interactive and efficient detection system. These results highlight the effectiveness of deep learning in automating shoplifting detection, offering a scalable, real-time solution for AI-driven retail security and loss prevention in modern retail environments.

Keywords*—Shoplifting Detection, Deep Learning, YOLOv8, EfficientNetV2B0, ByteTracker.*

A Systematic Review of ChatGPT's Role in Advancing Research Methodologies Across Education, Healthcare, and Economics

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Abstract— This systematic literature review (SLR) investigates the applications, challenges, and future directions of ChatGPT in research domains such as education, healthcare, and eco- nomics. Employing a structured methodology, we analyze studies published between 2022 and 2024 from databases including PubMed, IEEE Xplore, and Google Scholar. Our findings reveal ChatGPT's potential to enhance learning personalization, clinical decision-making, and economic data analysis. However, chal- lenges such as reliability limitations, ethical concerns, and biases in AI-generated content persist. The review underscores the need for hybrid frameworks, improved transparency, and standardized evaluation metrics to ensure responsible AI integration. By synthesizing empirical evidence, this study provides actionable insights for researchers and practitioners aiming to leverage ChatGPT's capabilities while addressing its limitations.

Keywords— *Systematic literature review, ChatGPT, AI in education, AI in healthcare, large language models (LLMs), AI ethics.*

HarvestEdge: Energy Harvesting in UAV-Assisted Edge Networks

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Abstract—This paper presents HarvestEdge, a novel framework that integrates energy harvesting with UAV-assisted edge networks to enable sustainable disaster response operations. The proposed system leverages the Multi-Agent Twin Delayed Deep Deterministic Policy Gradient (MATD3) algorithm to jointly optimize energy management, task allocation, and UAV coordination. Compared to the Multi-Agent Delayed Deep Deterministic Policy Gradient (MADDPG) and single-agent TD3 algorithms, MATD3 achieves 11.35% higher energy harvesting and a better performance in almost all metrics. The flexible and scalable architecture of HarvestEdge makes it a good candidate for facilitating resilient communications in dynamically changing disaster scenarios.

Keywords— *UAV-Assisted Edge, Networks, Energy Harvesting, DisasterRecovery, Sustainability, Energy Consumption.*

Spam Feature Selection Using Harris Hawks Optimization Algorithm

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Abstract— The identification of spam is crucial for networks and cybersecurity. The Internet has historically served as a line for cybercriminal activities such as spam. This study employs supervised Machine Learning (ML) to identify and detect spam. The ISCX-URL-2016 dataset from the Canadian Institute for Cyber Security is utilized for assessment purposes. This dataset has 79 features and 14,478 samples, categorized as spam and benign. The Python tools are used to evaluate and train the ML methods. The Harris Hawks Optimization (HHO) approach is utilized for dataset dimensionality reduction, with critical features selected according to their importance. The top 10 features were identified using the HHO method, and the classifiers were trained to employ 5-fold cross-validation. The ML methods assessed are Logistic Regression (LR) and K-Nearest Neighbors (KNN). These two ML methods have been tailored using the Random Serach (RS) method to address the spam detection issue. The performance parameters of accuracy, precision, and recall are evaluated. The KNN classifier achieved the best accuracy of 99.59%.

Keywords— *Machine learning, Feature selection, Whale Optimization Algorithm, Phishing, and ISCX-URL2016 dataset.*

A Comparative Study for Yemeni Poets Detection Using TEXT-CNN and RNN-LSTM Text Classification

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Abstract— The growing prevalence of internet usage has led to a substantial capacity in textual data. Text classification is an essential field in natural language processing (NLP). It differs in various domains and languages. This study aims to classify Arabic poetry to identify the poets, with a particular focus on Yemeni poets, who wrote in Modern Standard Arabic (MSA). We propose an approach that merges standard text pre-processing techniques with a hybrid algorithm, by combining the Levenshtein and Jaccard methods, to improve poet identification. To the best of our knowledge, this research is the first to utilize deep learning techniques for identifying Yemeni poets. It preprocesses Arabic text to enhance name matching, to enable the compilation of poets' verses despite variations in name presentation. Besides, two deep learning models were constructed and their performance was assessed. The deep learning architectures employed include TEXT-CNN and RNN-LSTM; these were evaluated using a range of learning rate values alongside other fixed hyperparameters. The models were trained on poetry texts utilizing two main text representation methods: word embedding through Word2Vec and document embedding via Doc2Vec, which significantly improved the training and testing efficiency, for poet recognition. The findings indicated that the TEXT-CNN model exceeded the RNN-LSTM model in training and testing accuracy. However, the RNN-LSTM results exhibited greater robustness and generalizability.

Keywords— *Deep Learning, RNN, CNN, Text Classification, Poet Detection, Poet Classification, Name Matching, Arabic Language Poetry*.

A Pervasive IoT-Cloud Architecture for Real-Time Temperature and Humidity Monitoring

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Abstract—In the evolving landscape of computer science, the convergence of Internet of Things (IoT), Cloud Computing, and Pervasive Computing is revolutionizing the development of intelligent, real-time systems. While these technologies are often interrelated, this study provides a focused analysis of their individual contributions, integration mechanisms, and areas of application, particularly in indoor environmental safety. As a proof of concept, we present the design and imple- mentation of a real-time environmental monitoring system. This system uses WiFi-enabled IoT devices—including temperature and humidity sensors connected to microcontrollers—to collect environmental data and transmit it to a cloud server for storage, processing, and visualization. Upon detecting values that exceed user-defined thresholds, the system automatically issues alerts through mobile application notifications and SMS messages, enabling prompt intervention such as activating ventilation or dehumidification systems. Alerts persist until the environment returns to safe conditions, thus preventing hazards like over- heating, fire, or damage to sensitive materials. Compared to traditional monitoring solutions, the proposed system demonstrates improved responsiveness, scalability, and automation, showcasing the practical benefits and scientific relevance of IoT–cloud integration in risk prevention and environ- mental control.

Keywords— *Internet of Things (IoT), Cloud Computing, Pervasive Computing, Sensors.*

When SemCom Meets Drones for Supporting 6G: Drone Dataspace Use Case

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Abstract—The growth of intelligent services drives the evo- lution of sixth-generation (6G) wireless networks from a tra- ditional high-speed transmission architecture to an architecture that enables the intelligent connection of everything. Semantic communication (SemCom) incorporates user and application re- quirements, and the significance of information in data processing and transmission is anticipated to become a critical paradigm in 6G. Overhead computing, delay, and storage computing are challenging in semantic extraction. To address these challenges, we propose a drone-driven approach to training, maintenance, and execution of semantic extraction. In this paper, we present a novel framework for enhancing drone intelligence with SemCom by improving the generalization abilities of drones while minimizing computation overhead and reducing the communication overhead in information exchange. In addition to bridging the gap between SemCom theory and real-world UAV applications, this paper lays the groundwork for future 6G networks to have adaptive, human- like intelligence. The adaptability of the proposed architecture is further demonstrated in fields like disaster relief and precision agriculture, highlighting its potential to completely transform IoE ecosystems.

Keywords— *SemCom, Drone computing, 6G, Semantic extraction, Knowledge graph, semantic management.*

ALGARADI: A Hybrid SPN–Feistel Block Cipher with Dynamic Round Keys

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Abstract— With the exponential growth of digital data transmission and the increasing sophistication of cyber threats, the demand for secure and efficient encryption algorithms has become more critical than ever. This paper presents a novel lightweight block cipher, the ALGARADI cipher, which combines principles from the Substitution-Permutation Network (SPN) and the Feistel structure to provide a secure and resource-efficient cryptographic solution. The proposed design employs compact 4×4 S-boxes constructed over GF(2^4) to ensure strong nonlinearity, along with an MDS-based diffusion matrix and a customized 16-bit derangement P-box to maximize both confusion and diffusion. A key innovation of the cipher is its dynamic SHA-256-driven key schedule, which generates four unique subkeys per round and applies them through interleaved key mixing significantly enhancing sensitivity to key variations. Security evaluations demonstrate strong resistance against linear and differential cryptanalysis, with worst-case differential probabilities below 2^{-36} and linear correlation biases under 2^{-120}. Moreover, the cipher exhibits an ideal avalanche effect and high ciphertext entropy, indicating a high degree of randomness and cryptographic strength. Designed with performance efficiency in mind, the cipher is well-suited for both high-throughput systems and resource-constrained devices. This work presents a promising candidate for future encryption standards where both security and efficiency are of paramount importance.

Keywords— *Encryption, cryptography, symmetric key, Advanced cipher, finite field GF(24), Affine Transformation, MDS Matri.*

Advances in Error Compensation for Robotic Manipulators: A Systematic Review from Geometric Calibration to AI-Driven Hybrid Control

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Abstract— This paper presents a comprehensive review of error compensation techniques for robotic manipulators, addressing the critical need for enhanced precision in modern industrial applications. It establishes a systematic taxonomy of error sources that categorizes geometric and non-geometric inaccura cies based on their physical origins and temporal characteristics. The review critically analyzes three dominant compensation paradigms: physics-based modeling approaches that leverage rig orous kinematic formulations, data-driven machine learning tech niques capable of capturing complex nonlinear error patterns, and hybrid methodologies that combine their complementary strengths. Through extensive comparative evaluation, it is demon strated that hybrid physics-ML approaches achieve superior performance in dynamic industrial environments, with certain implementations reducing positioning errors by up to 97%. The analysis reveals fundamental trade-offs between theoretical precision, computational efficiency, and practical implementation across different methodologies. Emerging research directions, including digital twin-enabled adaptive compensation and edge cloud collaborative architectures, are identified as promising solutions to current limitations. This review provides both a theoretical framework for understanding robotic error phenom ena and practical guidelines for implementing compensation systems in industrial settings, serving as a valuable reference for researchers and practitioners advancing the state-of-the-art in robotic precision.

Keywords— *Robotic manipulators error compensation, Robots relocation methods, Real-time error compensation, Self correcting manipulators*

A Review of Recent Advances in UAV Networks: Communication, Offloading, Protocols, and Security

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Abstract— Unmanned Aerial Vehicles (UAVs) are transforming a variety of industries with their advanced agricultural, disaster management, and surveillance capabilities. UAV network performance has increased due to recent advancements in 5G, edge computing, and artificial intelligence. This enables autonomous decision-making and real-time data processing. However, there are still issues with security, offloading strategies, scalability, and communication protocols. This research focuses on communication, protocol improvements, offloading methods, and security measures to improve system efficiency in current developments in UAV networks. Furthermore, it identifies research gaps and offers suggestions for future developments of UAV networks, particularly in light of emerging technology.

Keywords— *Unmanned Aerial Vehicles (UAVs), UAV Networks, Communi-cation Protocols, Offloading Strategies, Edge Computing, Artificial Intelligence (AI), 5G, Security, Autonomous Decision-Making.*

New Approach for Network Threat Detection and Prevention Using Real-time Data Analysis and Deep Learning

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Abstract— This research paper proposes a new approach for network threat detection and prevention using real-time data analysis and deep learning. The proposed approach utilizes isolation forests to effectively identify outliers. Isolation forests have gained popularity due to their efficacy in countering cyber threats, characterized by their speed and efficiency. The aim of the approach is to detect violations and their rapid responsiveness with minimal latency. A critical finding of the paper is that the proposed approach with deep learning techniques exhibit superiority in the learning of complex representations when compared to traditional techniques especially in terms of accuracy.

Keywords— *Network security, anomaly detection, intrusion detection, deep learning isolation forest, iForest.*

Efficient High-Accuracy Casting Defect Detection with Attention Module

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Abstract— Defect detection in casting processes plays a critical role in manufacturing, directly impacting product quality and operational efficiency. During casting, molten metal is injected into molds to form components; however, imperfections can com promise structural integrity and production outcomes. This study proposes an advanced defect detection framework by integrat ing the Convolutional Block Attention Module (CBAM)—which combines the Channel Attention Module (CAM) and Spatial At tention Module (SAM) in a unified block—into the MobileNetV3 Large architecture. To benchmark performance, four state-of the-art models—EfficientNet-B7, ResNet152, RegNet-Y 32GF, and MobileNetV3-large—were trained and evaluated on a pub licly available Kaggle dataset comprising 7,348 annotated images categorized into defective and non-defective castings. Experi mental results demonstrate that the proposed model outper forms competing architectures, achieving exceptional accuracy (99.33%), recall (99%), and precision (99.8%). The proposed model's superior performance underscores its potential as a ro bust solution for industrial quality control, offering high precision in defect identification to enhance manufacturing reliability.

Keywords— *Casting analysis, Convolutional Neural Networks (CNN), Deep learning, Hybrid model, Visual inception, Multi-Scale Attention.*

SDN and NFV: A State-of-the-Art Comparative Study of Architectures, Techniques, and Application

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Abstract— Software Defined Networking (SDN) and Network Function Virtualization (NFV) are reshaping the landscape of modern telecommunication through their flexible and programmable approaches to network management. The integration of these technologies has gained significant attention due to the potential to enhance scalability, efficiency, and service delivery across various network environments. SDN enables centralized control and dynamic configuration, while NFV replaces traditional hardware-based network functions with virtualized software components. However, challenges remain in areas such as security, interoperability, and deployment complexity. This review paper explores the state-of-the-art SDN and NFV architectures, benefits, and limitations of both SDN and NFV from a comparative perspective. It highlights the integration of SDN and NFV and their roles in 5G and large-scale networks. The paper also identifies existing gaps and proposes directions for future research to optimize the integration of these technologies and fully realize their potential in next-generation networking.

Keywords— *Software-Defined Networking (SDN), Network Function Virtualization (NFV), 5G Networks, Network Virtualization, SDN Controllers, Virtual Network Functions (VNFs), Network Slicing, Traffic Engineering, Load Balancing, Network Security*.

Transfer Learning and Cross-Linguistic Generalization in Multilingual Hate Speech Detection: Approaches and Challenges

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Abstract— Detecting hate speech in multilingual environments remains a critical challenge, particularly in low-resource and unseen languages during training. This study presents a systematic review of approximately 44 research papers, analyzing transfer learning strategies, cross-lingual generalization, and the challenges associated with linguistic biases and data scarcity. The study identifies key research gaps, including limitations in knowledge transfer between languages, biases in large language models (LLM), and inconsistencies in the classification of hate speech between linguistic contexts. The primary contribution of this work lies in its comprehensive analysis of existing methodologies, identification of critical shortcomings, the effectiveness of multilingual hate speech detection models. This study advocates for the development of more equitable and efficient models by improving cross-lingual knowledge transfer, mitigating biases, and strengthening detection capabilities in low-resource languages, ultimately contributing to safer and more inclusive digital environments.

Keywords— *NLP, Hate Detection, Multilingual Model, Cross-Language, Offensive Speech, zero-shot-learning, Transfer learning.*

Supply Chain Management in Yemeni Food Industry: Current Issues and Blockchain Technology as a Solution

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Abstract— Transparency, efficiency, and trust are critical yet severely lacking components in Yemen's food supply chains, which are hindered by weak infrastructure, fragmented data, limited traceability, and widespread product fraud. Despite growing global interest in blockchain technology for supply chain management, its potential in fragile, conflict-affected contexts such as Yemen remains underexplored. This study addresses this gap by conceptually analyzing how blockchain can mitigate systemic inefficiencies in Yemen's agricultural and food sector. Specifically, it examines blockchain's capabilities to enable real-time data sharing, strengthen traceability, automate regulatory compliance, and reduce fraud through tamper-proof records and smart contracts. The study also identifies significant contextual barriers to blockchain adoption, including technological underdevelopment, low digital literacy, legal ambiguity, and political instability. The findings provide a foundational framework for researchers, policymakers, and development stakeholders to evaluate and pilot blockchain-based interventions aimed at building transparent, resilient, and secure food supply chains in Yemen and similar fragile setting.

Keywords— *Supply Chain, Blockchain Technology, Food Manufacturers, Yemen*

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Detecting and Identifying Low-Rate Data Exfiltration Over DNS Protocol

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Abstract— Data exfiltration attacks increasingly exploit the Domain Name System (DNS) as a covert communication channel due to its ubiquitous presence and permissive firewall rules. While substantial attention has been given to detecting high-rate DNS tunneling attacks, low-rate DNS exfiltration, characterized by small, covert data packets intended to evade detection systems, remains inadequately addressed. This research proposes a deep learning-based detection framework specifically designed for identifying low-rate DNS exfiltration attacks. The proposed approach intentionally disregards traditional metrics related to traffic volume, timing, and data rate, instead leveraging novel feature extraction methods, such as subdomain depth analysis. Evaluation results demonstrate exceptional effectiveness, achieving accuracy, precision, recall, and F1-score of 99.83%, 99.73%, 99.94%, and 99.83% respectively, and a near-perfect ROC-AUC score, underscoring the proposed model's strong capability in accurately classifying malicious DNS traffic.

Keywords— *Exfiltration, DNS, Low-Rate, Malware, High-Rate, Traffic.*

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