

CEE 2025

THE 10th INTERNATIONAL CONFERENCE ON ELECTRICAL
ENGINEERING AND INFORMATICS

PROGRAM & ABSTRACT BOOK

13-15 NOVEMBER 2025

Pullman Hotel Kuching
Sarawak, MALAYSIA

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THE 10th INTERNATIONAL CONFERENCE ON ELECTRICAL
ENGINEERING AND INFORMATICS (ICEEI2025)

::: 13 - 15 NOVEMBER 2025 :::

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FOREWORD

:: Message from Vice-Chancellor UKM ::



PROF. DR. SUFIAN JUSOH

Vice-Chancellor
Universiti Kebangsaan Malaysia (UKM)

Assalamualaikum warahmatullahi wabarakatuh and Greetings.

It gives me great pleasure to welcome all participants to the 10th International Conference on Electrical Engineering and Informatics (ICEEI 2025), jointly organized by Universiti Kebangsaan Malaysia (UKM) and Institut Teknologi Bandung (ITB), Indonesia.

ICEEI has established itself as a leading international platform that brings together academics, researchers, and industry professionals to exchange innovative ideas, share research findings, and foster collaboration in the fields of Electrical Engineering and Informatics. The 2025 edition, held from 13–15 November 2025 at Pullman Hotel, Kuching, Sarawak, continues this proud tradition.

ICEEI has established itself as a premier platform for researchers, academicians, and professionals from around the world to share knowledge, exchange ideas, and explore new frontiers in the fields of electrical engineering and informatics. The long-standing collaboration between UKM and ITB continues to strengthen regional and international partnerships, driving innovation and technological advancement across disciplines.

As one of Malaysia's leading research universities, UKM remains committed to fostering academic excellence and supporting initiatives that contribute to global progress. Conferences such as ICEEI play a vital role in promoting collaboration, encouraging impactful research, and inspiring creative solutions to address today's challenges.

I would like to express my sincere appreciation to the Organizing Committee and Technical Program Committee of ICEEI 2025 for their dedication and tireless efforts in making this conference a success. My gratitude also extends to all keynote speakers, authors, reviewers, and participants for their valuable contributions and engagement. I wish everyone a productive, inspiring, and rewarding experience at ICEEI 2025. May this conference continue to strengthen the bond between UKM, ITB, and our international partners in advancing knowledge and innovation for a better future.

Thank you.

FOREWORD

:: Message from Dean, FTSM, UKM ::



PROF. DR. NURHIZAM SAFIE MOHD SATAR

Dean, Faculty of Information Science and
Technology (FTSM)
Universiti Kebangsaan Malaysia (UKM)

Assalamualaikum warahmatullahi wabarakatuh and a very warm welcome.

It is with great enthusiasm that I, on behalf of the Faculty of Information Science and Technology (FTSM) at Universiti Kebangsaan Malaysia, welcome you to the 10th International Conference on Electrical Engineering and Informatics (ICEEI 2025). We are delighted to continue our long-standing partnership with Institut Teknologi Bandung (ITB) to bring this significant event to the beautiful city of Kuching, Sarawak.

This conference holds special significance for our faculty. The convergence of informatics and electrical engineering is where today's most exciting innovations are born, from intelligent systems and data science to next-generation computing.

For our researchers and students at FTSM, ICEEI is more than just a conference; it is a vital arena to engage with the global scientific community, challenge conventional thinking, and showcase the impactful work being done within our walls.

It is a particular point of pride for us to see our very own Prof. Dr. Rosilah Hassan steering this conference as its General Chair, a reflection of the leadership and dedication within our faculty. I strongly encourage our academic staff, researchers, and students to immerse themselves in the sessions, build new professional relationships, and draw inspiration from the wealth of knowledge being shared.

My sincerest gratitude goes to the organizing committees at both UKM and ITB, whose collaborative spirit has been instrumental. To all our distinguished speakers, presenters, and delegates, thank you for joining us. Your presence is what makes this gathering a success.

May you have a most productive and memorable conference.

Thank you

FOREWORD

:: Message from Rector Institut Teknologi Bandung ::



**PROF. DR. IR. TATACIPTA
DIRGANTARA, M.T.**

Rector of Institut Teknologi Bandung

It is with great honour and deep appreciation that I extend my warmest welcome to all distinguished guests, keynote speakers, and participants of the 10th International Conference on Electrical Engineering and Informatics (ICEEI 2025), jointly organized by Institut Teknologi Bandung (ITB) and Universiti Kebangsaan Malaysia (UKM).

The theme of this year's conference, "Harmonizing Sustainable Next-Generation Computing, Intelligent Systems & Electrical Engineering," reflects our collective aspiration to integrate advances in electrical engineering and informatics with the principles of sustainability and societal well-being. In an era defined by rapid digital transformation, the synergy between these disciplines plays a pivotal role in shaping the foundation of future technologies that are not only intelligent and interconnected but also energy-efficient and environmentally responsible.

This theme underscores the importance of harmonizing innovation with responsible development—ensuring that breakthroughs in computing, intelligent systems, and electrical engineering are guided by ethical considerations and contribute positively to humanity and the environment.

Through ICEEI 2025, we aim to foster meaningful dialogue, stimulate collaboration, and inspire new directions in research and application that align with this vision. The partnership between ITB and UKM exemplifies how academic cooperation can transcend geographical boundaries, strengthening regional ties while contributing to the global scientific community.

As we celebrate the 10th edition of this distinguished conference, I encourage all participants to actively engage in discussions, share insights, and cultivate networks that will lead to enduring collaborations and innovative outcomes. May this gathering serve as a platform for harmonizing diverse perspectives, driving forward sustainable solutions, and advancing the frontiers of knowledge in computing, intelligent systems, and electrical engineering.

On behalf of Institut Teknologi Bandung, I extend my sincere gratitude to all organizing committees, reviewers, contributors, and sponsors for their dedication and hard work in making ICEEI 2025 a success. I wish everyone a productive, inspiring, and memorable conference experience. Thank you.

FOREWORD

:: Message from General Chair ::



PROF. DR. ROSILAH HASSAN

General Chair, ICEEI 2025
Faculty of Information Science and Technology
Universiti Kebangsaan Malaysia (UKM)

**Assalamualaikum warahmatullahi
wabarakatuh and Greetings.**

It is my great pleasure to welcome you to the 10th International Conference on Electrical Engineering and Informatics (ICEEI 2025), co-hosted by Universiti Kebangsaan Malaysia (UKM) and Institut Teknologi Bandung (ITB), Indonesia. The conference will be held from 13–15 November 2025 at the Pullman Hotel, Kuching, Sarawak, Malaysia.

Since its beginning in 2006, ICEEI has served as an international forum where researchers, engineers, practitioners, and academicians share innovative ideas, present cutting-edge research, and build collaborations that bridge theory and practice. The partnership between UKM and ITB has grown stronger with each edition, nurturing a community committed to advancing excellence in Electrical Engineering, Informatics, and related domains.

The theme of ICEEI 2025, "Harmonizing Sustainable Next-Generation Computing, Intelligent Systems & Electrical Engineering," reflects our shared commitment to shaping a sustainable digital future. As technology continues to evolve, it becomes crucial to harmonize innovation with sustainability—creating intelligent systems and engineering solutions that contribute positively to society and the environment.

ICEEI 2025 provides an excellent platform to exchange perspectives, explore interdisciplinary approaches, and strengthen cooperation across academia and industry. I am confident that the ideas shared during this conference will inspire meaningful collaborations and lead to impactful contributions in research and innovation.

I would like to express my heartfelt appreciation to the Organizing Committee, Technical Program Committee, and all our collaborators for their commitment and dedication. My gratitude also goes to all keynote speakers, authors, reviewers, and participants for their valuable engagement and contributions. May ICEEI 2025 be a rewarding and inspiring experience for all, driving forward our collective pursuit of knowledge and sustainable innovation.

Thank you.

THE 10th INTERNATIONAL CONFERENCE ON ELECTRICAL
ENGINEERING AND INFORMATICS (ICEEI2025)

General Program Schedule

Day 1: Thursday, November 13, 2025

Time	Event
07:30 am	Arrival of Guests & Registration Room: Main Hall – Petra 1
08:00 am	Arrival of the Guest of Honor
08:30 am	ICEEI2025 Opening & Launching Ceremony
09:30 am	Keynote Speaker 1 Prof. Dr. Patrick Then Chief Executive Officer Sarawak Artificial Intelligence Centre (SAIC), Kuching, Malaysia Title: AI Revolution: Driving Innovation, Sustainability, and Growth
10:10 am	Keynote Speaker 2 Prof. Dr. Ir. Nana Rachmana Syambas Professor School of Electrical Engineering and Informatics, Institut Teknologi Bandung (ITB), Indonesia Title: Future Network & Trend
10:50 am	Break
11:10 am	Keynote Speaker 3 Ms. Faryal Dotani Senior Engineer P&E Engineering Co., United States Title: The New Era of Engineering – Renewable, Sustainable & Green
11:50 am	Keynote Speaker 4 Assoc. Prof. Ts. Dr. Abdul Hadi Abd Rahman Deputy Dean (Research & Innovation) Faculty of Information Science and Technology, Universiti Kebangsaan Malaysia (UKM), Malaysia Title: WaRiSAN MELAYU: Building a Collaborative AI Bahasa Melayu Ecosystem
	Closing Remarks by MC
12:30 pm	Lunch and Prayer Break

THE 10th INTERNATIONAL CONFERENCE ON ELECTRICAL
ENGINEERING AND INFORMATICS (ICEEI2025)

General Program Schedule

Time	Event		
02:00 pm - 05:00 pm	Parallel Session 1 – (31 papers)		
	Track	Venue	No. of Papers
	SOFTWARE ENGINEERING	Petra 2	8
	CYBER SECURITY	Giza	8
	ARTIFICIAL INTELLIGENCE TECHNOLOGY	Petra 1	8
	ELECTRICAL ENGINEERING	Taj Mahal	7
3:00pm- 3:30pm	Break		
2:00 pm – 5:00 pm	Video Presentation Session (50 papers)		
5:00 pm	Conference Adjourns		
(Free and Easy)	Near By Attractions: • Cat Statue • Borneo Cultures Museum • Darul Hana Bridge • India Mosque Kuching • India Street Pedestrian Mall • Tua Pek Kong Muzium • Sejarah Cina Temple		

THE 10th INTERNATIONAL CONFERENCE ON ELECTRICAL
ENGINEERING AND INFORMATICS (ICEEI2025)

General Program Schedule

Day 2: Friday, November 14, 2025

Time	Event		
09:00 am – 11:30 am	Parallel Session 2 – (29 papers)		
	Track	Venue	No. of Papers
	SOFTWARE ENGINEERING	Petra 2	5
	CYBER SECURITY	Giza	8
	ARTIFICIAL INTELLIGENCE TECHNOLOGY I	Petra 1	8
	ARTIFICIAL INTELLIGENCE TECHNOLOGY II	Taj Mahal	8
10:00 am – 10:30 am	Break		
11:30 am	Lunch and Friday Prayer Break		
02:00 am – 04:30 pm	Parallel Session 3 – (20 papers)		
	Track	Venue	No. of Papers
	CYBER SECURITY	Giza	8
	ARTIFICIAL INTELLIGENCE TECHNOLOGY I	Petra 1	7
	ELECTRICAL ENGINEERING	Taj Mahal	5
03:00 pm – 03.30 pm	Break		
09:00 am – 05:00 pm	Video Presentation Session(81 papers)		
04:30 pm	Conference Adjourns		
05:30 pm	Conference Dinner Royal Kuching Cruise (Boarding Time: 05:00 pm)		

THE 10th INTERNATIONAL CONFERENCE ON ELECTRICAL
ENGINEERING AND INFORMATICS (ICEEI2025)

General Program Schedule

Day 3: Saturday, November 15, 2025

Time	Event
09:00 am - 12:00 pm	Workshop Session Topic: Transforming Learning & Work with AI Speaker: Ts. Dr. Mohd Nor Akmal Khalid, UKM, Malaysia Room: Taj Mahal
	Online Session Moderator: Dr. Anahita Ghazvini Room: Online Live (Zoom)
10:15 am - 10:45 am	Break
12:00 pm	Lunch and Prayer Break
02:00 pm	Conference End

THE 10th INTERNATIONAL CONFERENCE ON ELECTRICAL ENGINEERING AND INFORMATICS (ICEEI2025)

Opening & Launching Ceremony Schedule

Thursday, November 13, 2025

Venue: – Petra 1, Level, 1, Pullman Kuching Hotel, Kuching, Sarawak

Time	Event
08:30 am	• <i>Entrance of the Guest of Honor</i> • <i>Opening Remarks by the Master of Ceremony</i> • <i>National and Sarawak Anthem</i> • <i>Prayer Recitation DOA</i> • <i>Master of Ceremony explains about SCB and then SCB Corporate Video</i>
08:40 am	• <i>Welcoming Address by: YBrs. Prof. Dr. Rosilah Hassan</i> <i>Chairperson, The 10th International Conference on Electrical Engineering and Informatics (ICEEI 2025)</i>
08:50 am	• <i>Welcoming Address by: YBhg. Prof. Dr. Nurhizam Safie Mohd Satar</i> <i>Dean, Faculty of Information Science and Technology (FTSM)</i> <i>Universiti Kebangsaan Malaysia (UKM)</i>
09:00 am	• <i>Opening Speech by: YBhg. Prof. Dr. Jamia Azdina Jamal</i> <i>Acting Deputy Vice-Chancellor (Research and Innovation Affairs)</i> <i>Universiti Kebangsaan Malaysia</i> • <i>Gimic and Montage</i> <i>Official Opening Ceremony of The 10th International Conference on Electrical Engineering and Informatics (ICEEI 2025)</i>
09:10 am	• <i>Presentation of Souvenirs</i>
09:15 am	• <i>Cultural Performance (15-20 min)</i>
09:30 am	• <i>Group Photo and Dismissal of the Guest of Honor</i>

THE 10th INTERNATIONAL CONFERENCE ON ELECTRICAL ENGINEERING AND INFORMATICS

Officiated by:

**YBhg. Prof. Dr. Jamia
Azdina Jamal**

**Acting Deputy Vice-Chancellor
(Research and Innovation Affairs)**
Universiti Kebangsaan Malaysia

::: KEYNOTE SPEAKER 1 :::



PROF. DR. PATRICK THEN
Chief Executive Officer Sarawak
Artificial Intelligence Centre (SAIC),
Kuching, Malaysia

Biography

Prof. Dr. Patrick Then assumed the Chief Executive Officer of state-owned Sarawak Artificial Intelligence Centre (SAIC) since March 2025. SAIC aims to accelerate Sarawak economic growth by leveraging AI technologies. SAIC conducts high-impact research and development for Sarawak's needs, and advises policymakers on AI governance, policy, audit, and talent development.

Before that, he led School of ICT as Head of School, Centre for Digital Futures as Director, Swinburne University of Technology Sarawak. As SAIC CEO, he continues mentoring researchers and academics in academia. He has been recognized as eminent researcher in health informatics in the region collaborating with prominent cardiologists and clinicians in Clinical Research Centre Sarawak General Hospital in Malaysia and the National Institutes of Health, Ministry of Health Malaysia. He has published papers in high impact journals and proceedings. He is a strong advocate of transdisciplinary research where he translated artificial intelligence techniques into healthcare, manufacturing and other applications. He is a sought-after keynote speaker in IT and cardiology conferences in Europe, India, Indonesia and South Korea. He is the holder of multiple patents and software copyrights that have been translated into commercial product. He is a highly recognised digital health Key Opinion Leader by Ministry of Health Malaysia.

He is an elected fellow of the European Society of Cardiology, fellow of the Society for Design and Process Science USA, Senior member of Australian Computer Society, Senior member of IEEE, and Board member of Sarawak Development Institute.

Title: AI Revolution: Driving Innovation, Sustainability, and Growth

Artificial Intelligence (AI) is no longer a futuristic concept; it has become a practical tool that is transforming how businesses operate, compete, and grow. From automating routine processes to uncovering new market insights, AI offers unprecedented opportunities for efficiency, innovation, and value creation. The session will also address the challenges businesses face in adopting AI, including data readiness, skills development, and ethical considerations. Participants will gain a clear understanding of the strategic role AI can play in driving competitiveness and growth, as well as actionable insights on how to start or scale their AI journey.

::: KEYNOTE SPEAKER 2 :::



**PROF. DR. IR. NANA
RACHMANA SYAMBAS**
Professor
School of Electrical Engineering Informatics,
Institut Teknologi Bandung (ITB), Indonesia

Biography

Nana Rachmana Syambas. He was graduated from his bachelor degree at Electrical Engineering Department, ITB in 1983. He got his Master by Research degree from Royal Melbourne Institute of Technology, Australia in 1990 and doctoral degree from School of Electrical Engineering and Informatics, ITB in 2011. He has been a lecturer at School of Electrical Engineering and Informatics, ITB since 1984. His research interest includes: Telecommunication Networks, Telematic Services, Content Centric Network (CCN), Software Define Network (SDN), Protocol engineering and Tele-traffic engineering. He has authored or coauthored over 150 published articles.

Title: Future Network & Trend

Named Data Networking (NDN) is a forward-looking architecture for the Internet. Rather than relying on device addresses, NDN routes and caches data by name, enabling users to retrieve content from the closest or most efficient source. This paradigm reduces latency, improves throughput, and cuts packet loss by leveraging in-network caching and name-based forwarding. Data security comes inherently via cryptographic signatures on content, ensuring integrity regardless of path. Using simulations based on the Palapa Ring network, we observe that NDN consistently outperforms traditional IP-based models in delay, reliability, and resource utilization. Given its alignment with the requirements of 5G and 6G—especially ultra-low latency and scalability—NDN offers a promising path for future electrical engineering and information systems research.

::: KEYNOTE SPEAKER 3 :::



MS. FARYAL DOTANI
Senior Engineer
P&E Engineering Co.

Biography

Faryal's journey began in a small town in northern Pakistan and led her to a bustling metropolitan city for her schooling. She earned a Bachelor's degree in Electrical Engineering from the prestigious University of Engineering and Technology (UET) Peshawar. While raising three children as a single mother, she completed a Master's in Electrical and Computer Engineering and began her career in academia, becoming the first female member of the teaching staff at UET. She ultimately served as an Associate Professor there, balancing the demands of teaching, research, and motherhood.

About twenty years ago, she moved to the United States to begin a new professional chapter, transitioning from academia to industry. Her career started in the field of Mechanical, Electrical, and Plumbing (MEP) systems for buildings, which sparked her passion for sustainable design and green building practices. She quickly became dedicated to the principles of clean energy, energy conservation, and achieving net-zero carbon footprints. In line with this mission, she earned certification as a LEED (Leadership in Energy and Environmental Design) Accredited Professional with the U.S. Green Building Council and contributed to dozens of LEED-certified projects.

After more than a decade in the MEP field, she moved into renewable energy as a Senior Design Engineer in wind power. Today, she designs wind farms and works closely with transmission operators to integrate clean, renewable energy into the power grid, continuing a lifelong commitment to sustainability and innovation.

::: KEYNOTE SPEAKER 4 :::



**ASSOC. PROF. TS. DR. ABDUL HADI
ABD RAHMAN**
Deputy Dean (Research & Innovation)
Faculty of Information
Science & Technology (FTSM),
Universiti Kebangsaan Malaysia (UKM), Malaysia

Biography

Assoc. Prof. Dr. Abdul Hadi Abd Rahman is a recognised expert in Artificial Intelligence (AI) and Robotics in Malaysia, with contributions spanning international, national, industry, and academic domains. Internationally, he was invited to present the Report on the Development of the Artificial Intelligence Industry in Malaysia at the First Forum on China-ASEAN AI Cooperation 2023, reaffirming his role as a regional thought leader. He is an Adjunct Professor at Ontario Tech University, Canada (2021–2027) and collaborates with Tokai University, Japan on autonomous robotics. In 2023, he was part of the Malaysia AI Delegation to the United Kingdom, under the British High Commission, to assess national progress under the Malaysia AI Roadmap 2021–2025.

Nationally, Dr. Abdul Hadi leads the WaRiSAN MELAYU Project, a RM8 million initiative under Budget 2025 to build Malaysia's sovereign Bahasa Melayu Large Language Model (LLM) and supporting infrastructure. The project comprises over 25 sub-projects, covering corpus development, domain-specific datasets, and applied use cases, positioning UKM as the national hub for continuous LLM-BM development. He is an active member of national platforms including the ASM Task Force on Robotics, where he contributed to the National Robotics Roadmap 2021–2030, the National Blockchain and AI Committee (NBAIC), and the Robotic Talent Development Academy (RoTDA).

He is also part of the Young Scientist Network-Academy of Sciences Malaysia (YSN-ASM). In industry, Dr. Abdul Hadi serves as AI consultant to FGV R&D, advancing smart agriculture, and holds a strategic MoA with Move Robotics to commercialize service robots. Since 2012, he has contributed to the UTM-Proton Active Safety (UPAS) Lab and the Vehicle System Engineering Lab (MJIT, UTM), where he developed AI-based perception modules for autonomous vehicles using LiDAR, radar, and vision fusion. Academically, he leads the ARVIS Lab at UKM and is the inventor of AiRIS, an AI-powered autonomous service robot, and OQSense, a multi-depth vision system. As Deputy Dean (Research and Innovation) at FTSM, UKM, he drives AI research, talent development, and innovation translation across Malaysia and ASEAN.

Title: WaRiSAN MELAYU: Building a Collaborative AI Bahasa Melayu Ecosystem

WaRiSAN MELAYU (Wahana Rintis Semantik Ayat Nasional) is Malaysia's flagship initiative to build a comprehensive AI Bahasa Melayu ecosystem grounded in data sharing, linguistic resources, and collaborative innovation. As language becomes a strategic digital asset, WaRiSAN MELAYU brings together academia, government, industry, and cultural institutions to develop high-quality corpora, shared infrastructure, and governance frameworks that strengthen language sovereignty. This keynote will highlight how collaborative data ecosystems accelerate the development of Malay language models and enable cross-sector innovation in education, governance, cultural preservation, and digital services. It will address challenges in standardization, interoperability, and policy alignment while outlining Malaysia's roadmap towards a sustainable, trusted, and inclusive AI Bahasa Melayu ecosystem. Through WaRiSAN MELAYU, Bahasa Melayu is positioned as a digitally empowered language that drives national competitiveness and regional leadership in the AI era.

PARALLEL SESSION

1

:: DAY 1: PARALLEL SESSION 1.1 (8 PAPERS) ::

Thursday, November 13, 2025

Venue: Petra 2

Track Name: SOFTWARE ENGINEERING

Chairperson: Associate Prof. Dr. Nur Fazidah Elias

Time	Paper ID	Title	Authors	Presenter
02:00 pm	8	A Comparative Review of SaaS Adoption In M-Government Apps	Adawiyah Md Ashar, Nur Fazidah Elias, Ruzzakiah Jenal and Meng Chun Lam	Adawiyah Md Ashar
02:15 pm	37	Assessing Cloud Computing Adoption in the Malaysian Healthcare Industry based on IT Capability	Normilah Mohd Noh, Hasimi Sallehudin, Nurhizam Safie Mohd Satar, Nur Azaliah Abu Bakar, Ahmad Firdause Md Fadzil and Farashazillah Yahya	Hasimi Sallehudin
02:30 pm	46	Understanding User Perspectives and Preferences on Bus and Shuttle: A Human-Centered Design Approach to Attract New Users: Tiket.com Study	Ashari Muhammad Hisbulloh, Rini Setiawati and Riyan Leandros	Ashari Muhammad Hisbulloh
02:45 pm	60	A Comparative Evaluation of Moodle-Based Learning Management System in Malaysian Public Universities Using a Refined SQL Framework	Nurhidayah Bahar, Zulkefli Mansor, Dian Indrayani Jambari, Sabrina Tiun, Farzana Parveen Tajudeen and Nur Syahirah Nabilah Shahril	Nurhidayah Bahar
03:00 pm	Break			
03:30 pm	61	Enhancing University Student Mental Health Through AI-Driven Personalized Bibliotherapy	Kinn Abass Bakon, Tines Subramaniam, Lilysuriazna Raya, Zulaika Sauid and Nur Fazidah Elias	Kinn Abass Bakon

Time	Paper ID	Title	Authors	Presenter
03:45 pm	62	The Application of Lifelong Learning Algorithm in Software Effort Estimation	Xin Xiong and Zulkefli Mansor	Zulkefli Mansor
04:00 pm	77	Compound Encryption Algorithm using AES and RSA for a Secured Password Manager	Dahlila Putri Dahnil, Nur Azrina Amira Salehuddin and Wan Fariza Fauzi	Dahlila Putri Dahnil
04:15 pm	323	Vaccine Monitoring System Using TPFADA Algorithm	Huang Qi, Rosilah Hassan, Yazrina Yahya, Shahnorbanun Sahran and Anahita Ghazvini	Anahita Ghazvini
05:00 pm	Conference Adjourns			

∴ DAY 1: PARALLEL SESSION 1.2 (8 PAPERS) ∴

Thursday, November 13, 2025

Venue: Giza

Track Name: CYBER SECURITY

Chairperson: Prof. Dr. Zarina Shukur

Time	Paper ID	Title	Authors	Presenter
02:00 pm	44	Energy Management for BMS with Auto Reclosure RCCB/MCB	Rosilah Hassan, Arbaiah Inn, Nur Sumayyah Ahmad, Mohamad Hafiz Zakaria, Faizan Qamar and Zhiyi Cui	Zhiyi Cui
02:15 pm	66	Improved Security and Efficiency of Aircraft Baggage Handling Management System Using Spring-Struts2-Hibernate (SSH) Framework	Jin Yuhao, Nur Hanis Sabrina Suhaimi, Nazhatul Hafizah Mohd Kamarudin, Fadilla Atyka Nor Rashid, Mohamad Kamrul Hasan and Azana Hafizah Mohamad Aman	Nazhatul Hafizah Mohd Kamarudin
02:30 pm	67	Authentic Die-cast Empowering Collectors with Digital Watermarking Technology	Taufiq Mohamad, Muhammad Faiz Hakimi Muhd Shepuan, Nur Atiqah Sia Abdullah and Muhammad Ridhwan Mohamad Razali	Taufiq Mohamad
02:45 pm	73	The Advancement of Wi-Fi 7 Technology: Standard and Case Study	Gaoyang Guo, Faizan Qamar, Khairull Akram Ariffin, Tan Siok Yee and Fatin Filzahti Binti Ismail	Gaoyang Guo

Time	Paper ID	Title	Authors	Presenter
03:00 pm	Break			
03:30 pm	78	A Software Defined Framework for Real Time Monitoring and Alerting in IoT Based Home AC Charging for EV	Ruichen Wang, Rosilah Hassan, Mohd Nor Akmal Khalid and Shuai Li Shuai	Ruichen Wang
03:45 pm	95	GenAI Game Analysis of Computational Offloading and Resource Management in Vehicular Networks	Nusrat Jahan, Mohammad Kamrul Hasan and Mohd Zakree Ahmad Nazri	Nusrat Jahan
04:00 pm	236	ReliefChain: A Blockchain-Enabled Framework for Transparent and Accountable Flood Relief Donations in Malaysia	Hafiz Adnan Hussain, Uzma Jafar, Zulkefli Mansor, Zarina Shukur, Mohd Juzaidin Ab Aziz and Lusiana Binti Syaiful	Hafiz Adnan Hussain
04:15 pm	265	An Enhanced Federated Learning Framework for Intrusion Detection in SDN using Local Interpretable Model-Agnostic Explanations	Syed Hussain Ali Kazmi, Rosilah Hassan, Faizan Qamar, Kashif Nisar, Bahari Idrus and Noridayu Adnan	Syed Hussain Ali Kazmi
05:00 pm	Conference Adjourns			

:: DAY 1: PARALLEL SESSION 1.3 (8 PAPERS) ::

Thursday, November 13, 2025

Venue: Petra 1

Track Name: ARTIFICIAL INTELLIGENCE TECHNOLOGY

Chairperson: Ts. Dr. Vong Wan Tze

Time	Paper ID	Title	Authors	Presenter
02:00 pm	52	Exploring the Impact of In-Context Learning and Few-Shot Demonstrations on Nuclear Material Entity Normalization in Named Entity Recognition	Nazlia Omar and Nur Fatini Abdul Ghani	Nur Fatini Abdul Ghani
02:15 pm	54	Malaysia's COVID-19 Vaccination Impact: A Visualization and Regression Analysis of Cases and Mortality	Qian Peng, Xingang Bao, Sien Lu, Geyu Liu, Yuanzhe Cai, Feijuan Huang, Fadilla' Atyka Nor Rashid and Suhaila Zainudin	Suhaila Binti Zainudin
02:30 pm	68	Encircling Dynamics in Swarm-Based Intelligent: Trends, Challenges and Future Direction	Wirawati Dewi Ahmad, Azuraliza Abu Bakar and Mohd Nor Akmal Khalid	Wirawati Dewi Ahmad
02:45 pm	83	Patient Waiting List Management: A Systematic Analysis of Current Approaches and Evidence Gaps	Saadeddin Hroub, Masri Ayob and Norizal Abdullah	Saadeddin Hroub
03:00	Break			

Time	Paper ID	Title	Authors	Presenter
03:30 pm	97	Classification of Metal Screw Defect Detection using FOMO on Edge Impulse	Muhammad Imran Daing, Zuraidi Saad, Ahmad Puad Ismail, Kamarulazhar Daud, Fadzil Ahmad and Zainal Hisham Che Soh	Zainal Hisham Che Soh
03:45 pm	99	A Systematic Evaluation of Deep Learning Models for Vehicle Classification and Counting Using Numerical Data	Amir Raza, Johari Abdullah, Rehman Ullah Khan, Irwandi Hipni Mohd Hipiny and Hamimah Ujir	Amir Raza mahdi
04:00 pm	296	Multi-Granularity Spatio-Temporal Affective Perception Network with MentalBERT for Social Media Depression Detection	Shiwen Zhou, Masnizah Mohd and Lailatul Qadri Zakaria	Shiwen Zhou
04:15 pm	426	Deep Learning for Web Phishing Detection: A Comparative Evaluation of CNN, LSTM, and GRU	Po Chan Chiu, Yu Heng Liew, King Kuok Kuok and Hamizan Sharbini	Po Chan Chiu
05:00 pm	Conference Adjourns			

∴ DAY 1: PARALLEL SESSION 1.4 (7 PAPERS) ∴

Thursday, November 13, 2025
Venue: Taj Mahal
Track Name: ELECTRICAL ENGINEERING
Chairperson: Prof. Dr. Ir. Yoanes Bandung

Time	Paper ID	Title	Authors	Presenter
02:00 pm	7	Improving UAV Altitude Estimation using Barometric Sensor: A Method via Data Analysis	Kieu Trang Le, Tien Truong Nguyen and Dong Thanh Nguyen	Kieu Trang Le
02:15 pm	38	Enhanced Turbulence Characteristics in Dual Pulsating Jets Using Hot-Wire Anemometry	Rozli Zulkifli, Shahrir Abdullah, Kamaruzzaman Sopian	Rozli Zulkifli
02:30 pm	53	PUDAL Engine and V-Model: The Foundation of Smart Management Framework for Higher Education Accreditation	Daniel Jahja Surjawan, Armein Z. R. Langi, Jaka Sembiring and Albarda Albarda	Daniel Jahja Surjawan
02:45 pm	85	Performance Comparison of Single-Node and Multi-Node Kubernetes Orchestration for SRv6 Network Testbed Deployment with Clabernetes	Fazza Ihza	Fazza Ihza
03:00 pm	Break			

Time	Paper ID	Title	Authors	Presenter
03:30 pm	98	Immersive Experiences in Virtual Science Labs: A Systematic Review and the VIRTAS Framework	Anis Ezzaty Mohd Saidi, Syahrul Nizam Junaini and Wan Azani Mustafa	Syahrul Nizam Junaini
03:45 pm	226	Techno-Economic Analysis for A Typical Commercial Building Grid-Connected PV Integration with Load Shifting Strategy	Rafif Daffa Aribawa Putra and Burhanuddin Halimi	Rafif Daffa Aribawa Putra
04:00 pm	230	Performance Evaluation of Web-based Internet of Video Things (IoVT) Protocols	Yoanes Bandung, Hafidz Shidqi and Dion Tanjung	Yoanes Bandung
05:00 pm	Conference Adjourns			

:: DAY 2: PARALLEL SESSION 2.1 (6 PAPERS) ::

Friday, November 14, 2025

Venue: Petra 2

Track Name: SOFTWARE ENGINEERING

Chairperson: Associate Prof. Dr Zulkefli Mansor

PARALLEL SESSION

2

Time	Paper ID	Title	Authors	Presenter
09:00 am	2	Modelling the Acceptance and Use of Digital Twin Technology in Smart Buildings: An Extended TAM Approach	Hasimi Sallehudin, Affiuddin Husairi, Mat Jusoh Hussain, Farashazillah Yahya, Rogis Baker, Ahmad Firdause Md Fadzil, Nur Azaliah Abu Bakar and Mohd Khairolden Ghani	Hasimi Sallehudin
09:15 am	93	eSaku: An Interactive Mobile App for University Students to Manage Expenses	Sue Nee Lau and Jonathan Sidi	Sue Nee Lau
09:30 am	94	eDog: An Interactive Dog Care Application Using An UI/UX Approach	Ang Nee Lee and Jonathan Sidi	Ang Nee Lee
09:45 am	220	Applying SOFL to Enhance Requirements Gathering in Educational Technology: Case Study of Developing Course Plan Assistant	A Rahman Mat, Edwin Mit and Ayu Nazirah Razamie	A Rahman Mat
10:00 am	Break			
10:30 am	415	Pantun Bermukun Sarawak: Automated Pantun Reply Generation using Fuzzy N-gram Similarity	Mohammad bin Hossin, Fatimah Binti Subet and Hamizan Binti Sharbini	Mohammad bin Hossin
10:45 am	297	Kaswati Salleh, Zurina Muda and Umawathy Technamurthy	Algorithmic Thinking in TVET Programming Education: An Analysis of Student Proficiency Levels and Pedagogical Implications	Zurina Muda
11:30 am	Lunch and Prayer Break			

∴ DAY 2: PARALLEL SESSION 2.2 (8 PAPERS) ∴

Friday, November 14, 2025

Venue: Giza

Track Name: CYBER SECURITY

Chairperson: Prof. Dr. Siti Norul Huda Sheikh Abdullah

Time	Paper ID	Title	Authors	Presenter
09:00 am	6	Generative Adversarial Networks for Synthetic Attack Generation: Strengthening Network Defense Training	Hiba A. Tarish, Rosilah Hassan, Khairul Akram Zainol Ariffin, Mustafa Musa Jaber and Syed Hussain Ali Kazmi	Syed Hussain Ali Kazmi
09:15 am	9	Prediction of Privacy Concerns based on Personality Traits and General Risk Propensity	Abdulsalam Alshaqhaa, Rosilah Hassan, Faizan Qamar, Anwar Ibrahim and Gaoyang Guo	Gaoyang Guo
09:30 am	58	A Hybrid Binary Artificial Bee Colony Algorithm for the Minimum Dominating Set Problem in Wireless Sensor network	Lina Talib, Faizan Qamar, Ravie Chandren Muniyandi, Syed Hussain Ali Kazmi and Tan Siok Yee	Lina Talib
09:45 am	59	Performance Comparison of Deep Q-Network Variants in Network Slicing Resource Optimization	Zhiyi Cui, Faizan Qamar, Syed Hussain Ali Kazmi, Khairul Akram Zainol Ariffin and Fazlina Mohd Ali	Zhiyi Cui
10:00 am	Break			
10:30 am	79	Real time Mobile Device Detection Tool Based on the Fusion of BLE Signal Analysis and Deep Learning Technology	Shuai Li, Rosilah Hassan, Ruichen Wang and Rimaniza Zainal Abidin	Shuai Li

Time	Paper ID	Title	Authors	Presenter
10:45 am	81	Lightweight Protocol Using Elliptic Curve based Key Agreement Techniques for Secured Cyber-Physical Systems of Smart Grids	Md Mehedi Hasan, Mohammad Kamrul Hasan, Elankovan A. Sundararajan, Naganna Chetty and Rashid A Saeed	Md Mehedi Hasan
11:00 am	86	Deep Learning Based Microfilariae Detection and Quantification	Rose Mary Maniraj, Zhou Dengrui, Emelia Osman, Siti Norul Huda Sheikh Abdullah, Aishah Hani Azil and Mohd Amierul Fikri Mahmud	Rose Mary Maniraj
11:15 am	234	RoI-based Selective Encryption for Multimedia IoT using Lightweight AEAD Cipher	Yoanes Bandung, Aditya Pradana, Kusprasapta Mutijarsa and Dion Tanjung	Yoanes Bandung
11:30 am	Lunch and Prayer Break			

∴ DAY 2: PARALLEL SESSION 2.3 (8 PAPERS) ∴

Friday, November 14, 2025

Venue: Petra 1

Track Name: ARTIFICIAL INTELLIGENCE TECHNOLOGY I

Chairperson: Associate Prof. Dr. Suhaila Zainudin

Time	Paper ID	Title	Authors	Presenter
09:00 am	72	EEG-Based Attention Detection in Dynamic Settings: A Deep and Meta-Learning Approach	Teddy Marcus Zakaria, Armein Z.R. Langi, Dimitri Mahayana, Isa Anshori and Muhamad Sophian Nazaruddin	Teddy Marcus Zakaria
09:15 am	92	Automated Essay Grading System with Automated Feedback	Alexander Anak Adrian and Ping Ping Tan	Ping Ping Tan
09:30 am	102	IndoEduBERT: Tailored Multi-Lingual and Multi-Grained Sentence Embeddings for the Indonesian Education Domain	Arrival Dwi Sentosa, Ary Setijadi Prihatmanto, Nina Lestari, Dewi Tresnawati and Azizah Zakiah	Arrival Dwi Sentosa
09:45 am	210	A Survey on Multi-Armed Bandit Approaches in Hyper-Heuristics: Recent Advances and Future Direction	Masri Ayob, Norizal Abdullah, Meng Chun Lam and Nasser R. Sabar	Masri Ayob
10:00 am	Break			

Time	Paper ID	Title	Authors	Presenter
10:30 am	213	MACS: A Cognitive Diversity Multi-Agent Consensus Framework for Bias Mitigation in Automated Evaluation Systems	Arrival Dwi Sentosa and Julyan Widiyanto	Arrival Dwi Sentosa
10:45 am	215	EQANER: Annotated Corpus for English Quranic Studies	Shasha Arzila Tarmizi and Saidah Saad	Shasha Arzila Tarmizi
11:00 am	216	Impact of Adaptive Learning Rate Strategies on Deep Learning Models for Chest X-Ray Diagnosis	Meteab Moqbel, Zuraidi Saad, Mohd Ikmal Fitri Maruzuki, Noor Diyana Osman, Dayang Suhaida Awang Damit and Zainal Hisham Che Soh	Zuraidi Saad
11:15am	227	Privacy-Aware Machine Unlearning for Stable Association Rules in Retail Recommendations	Xuanming Hu, Wan Tze Vong, Miko May Lee Chang and Pei-Wei Tsai	Xuanming Hu
11:30 am	Lunch and Prayer Break			

∴ DAY 2: PARALLEL SESSION 2.4 (8 PAPERS) ∴

Friday, November 14, 2025

Venue: Taj Mahal

Track Name: ARTIFICIAL INTELLIGENCE TECHNOLOGY II

Chairperson: Dr Joel Than Chia Ming

Time	Paper ID	Title	Authors	Presenter
09:00 am	36	Machine learning driven enterprise business intelligence refactoring and dynamic adaptation	Yong-Jie Wu, Jiayin Yu, Zi-Zhen Li, Shen Wu and Jiang Jiang	Jiayin Yu
09:15 am	57	Intelligent Clinical Dialogue Assistant: Enhancing Doctor-Patient Anamnesis through LLM-Powered Real-Time Symptom Analysis	Yoenie Indrasary, Ary Setijadi, Siti Kustini, Isna Wardiah and Khairunnisa Khairunnisa	Yoenie Indrasary
09:30 am	84	MEGANet-W: A Wavelet-Driven Edge-Guided Attention Framework for Weak Boundary Polyp Detection	Zhe Yee Tan and Ashwaq Qasem	Zhe Yee Tan
09:45 am	91	Doodle Recognition for Early Language Learning in Preschool Children	Phei Chin Lim and Dy Llen Hoo	Phei Chin Lim
10:00 am	Break			
10:30 am	96	Extracting Colour Features from Colposcopy Images for Classification Of Cervical Cancer	Stephanie Chua and Siti Nursyafiqah Binti Abdullah	Stephanie Chua

Time	Paper ID	Title	Authors	Presenter
10:45 am	243	Optimization of Energy Forecasting Anomalies Using LSTM based Time Series Analysis and Secure Federated Learning	S. Rayhan Kabir, Mohammad Kamrul Hasan, Simi Bajaj, Salwani Abdullah, Tanja Pavleska and Rabiul Aliyu Abdulkadir	S. Rayhan Kabir
11:00 am	381	GEDW-PPI: Gaussian Kernel Enhanced DeepWalk for Protein-Protein Interaction Prediction	Suhaila Zainudin, Kauthar Mohd Daud and Cao Meiyuan	Kauthar Binti Mohd Daud
11:15 am	386	AI-Enhanced Learning: Personalizing Mobile Application Development Education: A Preliminary Study	Mohammad Salim and Nazhatul Hafizah Kamarudin	Mohammad Salim
11:30 am	Lunch and Prayer Break			

PARALLEL SESSION

3

::: DAY 2: PARALLEL SESSION 3.1 (8 PAPERS) :::

Thursday, November 14, 2025

Venue: Giza

Track Name: CYBER SECURITY

Chairperson: Prof. Dr. Siti Norul Huda Sheikh Abdullah

Time	Paper ID	Title	Authors	Presenter
02:00 pm	40	Optimizing Security Automation in DevSecOps: Evaluating the Effectiveness of SCA, SAST, DAST, and Container Scanning in an Integrated Vulnerability Management System	Faza Muhandisa Asro and Hamonangan Situmorang	Faza Muhandisa Asro
02:15 pm	74	Enhancing Network Security: Hybrid XGMB Model for Intrusion Detection with Intelligent Feature Engineering	Shayla Islam, Phani Praveen S, Naga Deepti Ponnaganti, Sreenath Kocharla, Nurhizam Safie Mohd Satar and Mohammad Kamrul Hasan	Mohammad Kamrul Hasan
02:30 pm	89	Understanding the Evolution and Escalation of Cyber Threats from the Inception of the Internet to the Era of Quantum Computing	Haitham Assiri	Haitham Assiri
02:45 pm	268	An IoT-Based Air Quality Monitoring System using Interactive Map	Li Bingkai, Md Nasiruzzaman and Mahdi Miraz	Mahdi Miraz
03:00 pm	Break			

∴ DAY 2: PARALLEL SESSION 3.2 (7 PAPERS) ∴

Friday, November 14, 2025

Venue: Petra 2

Track Name: ARTIFICIAL INTELLIGENCE TECHNOLOGY I

Chairperson: Prof Ts Dr Dayang Nurfatimah binti Awang Iskandar

Time	Paper ID	Title	Authors	Presenter
03:30pm	295	Knowledge, Attitude & Behavior Analysis toward Human E-commerce Protection Model	Noridayu Adnan, Siti Norul Huda Sheikh Abdullah and Wan Fariza Wan Fauzi	Noridayu Adnan
03:45 pm	296	Multi-Granularity Spatio-Temporal Affective Perception Network with MentalBERT for Social Media Depression Detection	Shiwen Zhou, Masnizah Mohd and Lailatul Qadri Zakaria	Shiwen Zhou
04:00 pm	303	A Hybrid Deep Learning Approach Integrating CNN BiLSTM, and Attention Mechanism for Robust Phishing URL Detection	Khulood Abdullah, Siti Norul Abdullah, Afran Abdullah, Amelia Natasya Abdul Wahab and Esra Halbob	Khulood Abdullah
04:15 pm	387	Enhanced Predictive Pixel Deviation Frame Guided Hybrid Edge-Based Image Steganography for High Capacity and Imperceptibility	A F M Zainul Abadin, Rossilawati Sulaiman and Mohammad Kamrul Hasan	A F M Zainul Abadin
04:30 pm	Conference Adjourns			

Time	Paper ID	Title	Authors	Presenter
02:00 pm	55	Fine-Tuning Komodo Model with LoRA for Sentiment Analysis of YouTube Comments	Viny Christanti Mawardi, Edward Thomas Alexander and Daniel Jahja Surjawan	Viny Christanti Mawardi
02:15 pm	71	GCS-UNet: Improved Swin-Unet for Medical Image Segmentation	Yifan Ouyang and Ashwaq Qasem	Ashwaq Qasem
02:30 pm	76	Hybrid QNN for Weed or Crop Detection using DNN and 2-QubitCircuits	Firdaus Firdaus, Infall Syafalni, Nur Ahmadi, Nana Sutisna, Rahmat Mulyawan and Trio Adiono	Firdaus Firdaus
02:45 pm	223	Detection of Object Manipulation in Video Authentication Using Efficient Net-Based Frame Analysis	Shaima Mohammed Gaashan, Nazhatul Hafizah Kamarudin and Siti Norul Huda Sheikh Abdullah	Nazhatul Hafizah Kamarudin
03:00 pm	Break			

:: DAY 2: PARALLEL SESSION 3.3 (5 PAPERS) ::

Friday, November 14, 2025

Venue: Taj Mahal

Track Name: ELECTRICAL ENGINEERING

Chairperson: Prof. Dr. Zarina Shukur

Time	Paper ID	Title	Authors	Presenter
03:30 pm	231	T2DM-PHKG: A Framework for Ontology-Driven and Explainable Recommendations in Type 2 Diabetes Care	Tracy Jeng Yee Jong, Wan-Tze Vong, Miko May Lee Chang and Huai Liu	Tracy Jeng Yee Jong
03:45 pm	380	Advanced Rehabilitation IoT (RIoT) System Utilizing IMAGy MEMS Sensors and Deep Learning for Hand Gesture Recognition	Ahmad Anwar Zainuddin, Md Sariful Islam, Dr Irwandi, Edwar Iswardy, Mohd Izzudin Mohd Tamrin, Dini Handayani and Saidatul Izyanie Kamarudin	Ahmad Anwar Zainuddin
04:00 pm	232	Lightning Density Prediction Using Quantum Support Vector Regression	Muhammad Fadhil Amri, Lenny Putri Yulianti, Bryan Denov, Brian Bramantyo S.D.A. Harsono and Sriyono	Muhammad Fadhil Amri
04:30 pm	Conference Adjourns			

Time	Paper ID	Title	Authors	Presenter
02:00 pm	32	Monitoring Natural Hazard Trends in Power Distribution Networks Using Professional Meteorological Services and Rainfall Distribution Analysis for Early Warning Systems	Guole Li, Caifen Wang, Xuwei Zhang, Pengfei Cao and Hongjian Li	Guole Li
02:15 pm	33	Research Progress and Future Prospects of Bionic Aerodynamic Noise Control Technologies	Ke Xu	Ke Xu
02:30 pm	42	Automated Information Extraction and Text Summarization of IBL News using IndoBERT and BART	Daniel Jahja Surjawan, William Budianto and Viny Christanti Mawardi	Daniel Jahja Surjawan
02:45 pm	398	Distributed Smart Street Lighting: A Case Study with Predictive Control with Heterogeneous Road Traffic	Pei Zhen Lee, Sei Ping Lau and Chong Eng Tan	Sei Ping Lau
03:00 pm	Break			
03:30 pm	428	Ensemble Fusion for Inertial-Sensor-Based Field Hockey Activity Recognition	Norazman Shahr, Norhana Arsad, Ahmad Kamal Ariffin Mohd Ihsan, Mohd Faisal Ibrahim, Aqilah Baseri Huddin and Muhammad Amir As'Ari	Norhana Binti Arsad
03:45pm	Conference Adjourns			

:: DAY 3: ONLINE SESSION (11 PAPERS) ::

Saturday, November 15, 2025

Venue: Zoom

Track Name: ONLINE LIVE SESSION

<https://tinyurl.com/ICEEI2025>

Meeting ID: 960 2240 0448

Passcode: 949850

Chairperson: Dr Anahita Ghazvini

Time	Paper ID	Title	Authors	Presenter
09:00 am	41	Optimized Integration of Renewable Energy Systems Using Chaotic Optimization in Distribution Systems	Muhammad Suhail Shaikh, Dong Xiaoqing, Chunwu Wang, Chang Wang, Senlin Xie and Haoyue Lin	Muhammad Suhail Shaikh
09:10 am	64	Secure Data Hiding and Transmission Utilizing Multi-Layered Cryptographic and Steganographic Techniques With High Capacity	Murad Njoum, Rossilawati Sulaiman, Zarina Shukur and Faizan Qamar	Murad Njoum
09:20 am	69	Humaira Helen, Md. Uzzal Mia, Mohammad Kamrul Hasan, Tan Siok Yee, Rinku Islam, Md. Sarwar Hosain and Md. Omar Faruk	Real-Time Facial Expression Detection Using YOLOv12 Architecture	Humaira Helen
09:30 am	70	Enhancing Robustness and Accuracy of Bone-Conducted Speech Emotion Recognition via Transformer Models	Md. Rifat Hossen, Khairul Azmi Abu Bakar, Mohammad Kamrul Hasan, Md. Uzzal Mia, Md. Najmul Hossain and Md. Sarwar Hosain	Md. Uzzal Mia
09:40 am	103	Modeling of Novel Ensemble Learning Method for Emergency Intelligent Transportation System Tracking and Mobility Management	Prabha R, Aruna M G and Nurhizam Safie Mohd Satar	Prabha R

ONLINE LIVE SESSION

Time	Paper ID	Title	Authors	Presenter
09:50 am	214	Modeling and Analysis of Compensator for Power Quality Improvement in Low-Voltage Industrial Load	Maman Rukmana, Philip Nathanael Erlangga Sitorus, Wakhyu Dwiono and Tri Desmana Rachmildha	Maman Rukmana
10:00 am	235	Egbunu Ojochogwu, Fadhilah Rosdi, Mohammed Faizul Nasrudin and Abdul Hadi Abd Rahman	Enhancing Naturalness in Text-to-Speech Synthesis: Optimizing TD-PSOLA with Hybrid Pitch Detection and Cross-Fade Technique	Egbunu Ojochogwu
10.10 am	251	Adversarial Interception of Deepfake Videos Using Quantum Neural Networks for Robust Social Media Content Monitoring	Falah Amer Abdulazeez, Mohammad Kamrul Hasan, Siti Norul Huda Sheikh Abdullah	Falah Amer Abdulazeez
10:20 am	266	Knowledge Distillation with Genetic Architecture Search for Tiny IoT Devices	Sara Ghorab, Meziani Lila and Rubin Stuart Harvey	Sara Ghorab
10:30 am	299	An Integrated Framework for Enhancing Banking Software Performance, Security, and User Experience: A Case Study of Bank of China	Lulu Jia and Azana Hafizah Mohd Aman	Lulu Jia
10:40 am	389	YOLO-LSTM Enabled Sleeping Disorder Monitoring System	Yicheng Liu and Mohammad Kamrul Hasan	Yicheng Liu
12:00 pm	Lunch and Prayer Break			

WORKSHOP SESSION

09:00 am-12:00pm	Workshop Transforming Learning & Work with AI by Ts. Dr. Mohd Nor Akmal Khalid, UKM, Malaysia Venue: Taj Mahal, Level 1, Pullman Kuching Sessions Overview:	
	Session	Title
	1	Problem-Solving in Learning / Work Environment
	2	Developing Your Unique Problem Rubric
	3	Infusing AI into Learning / Working Environment
	4	Moving Forward in Learning / Working with AI
	Focus	
	Approaches to identify and address real-world issues using AI tools.	
	Techniques to build frameworks for evaluating learning or work challenges.	
	Practical integration of AI tools and automation in daily tasks.	
	Long-term strategies and skill adaptation for AI-driven environments.	
10.15 am - 10:45 am	Break	
12:00 pm	Conference Adjourns	
1:00-2:00 pm	Lunch	

VIDEO PRESENTATION SESSION (131 PAPERS)

:: DAY 1: VIDEO PRESENTATION SESSION 1 (50 PAPERS) ::

**Thursday, November 13, 2025
(02:00 PM – 05:00 PM)**

Track Name: Recorded Video Presentation Session

S.No	Paper ID	Title	Authors
1	126	The Role Artificial Intelligence Applications in Detecting Workplace Bullying and Deviant Behavior: A Study of Private Hospitals in Anbar City	Fatima Amer Abbas, Abdulsalam Ali Hussein, Saeed Aldulaimi, Marwan Abdeldayem
2	128	Fostering Reflective Thinking through AI-Driven E-Learning Platforms: Evidence from Mathematics Education in The Higher Education	Haider Abdulkareem Alzuhiry, Marwa Salah Yahya Alrawi, Saeed Aldulaimi, Majid Lateef Abdulrazaq, Sabreen Ali Hussein, Marwan Abdeldayem
3	130	Enhancing Digital Strategic Performance in Higher Education through AI-Enabled Strategic Capabilities	Saeed Aldulaimi, Khamees Naser Mohammed, Basma Muhammed Khalaf, Marwan Abdeldayem
4	207	AI-Driven Intrusion Detection Systems: Leveraging Machine Learning for Real-Time Threat Mitigation	Taher M. Ghazal
5	208	Securing the Internet of Things: Frameworks for Vulnerability Assessment and Autonomous Device Protection	Taher M. Ghazal
6	209	Quantum-Resistant Cryptographic Algorithms: Safeguarding Data Integrity in the Post-Quantum Era	Taher M. Ghazal
7	211	The Psychological Impact of AI Adoption in Higher Education: Technology Anxiety and Paranoid Thinking among University Faculties	Saeed Aldulaimi, Muhammad Majid Taha Al-Ani, Ibrahim Hamad Shabeeb, Majid Lateef Abdulrazaq, Marwan Abdeldayem, Ahmed Basil Ahmed Suwaidan
8	212	Artificial Intelligence Application to Examine the Internationalization of the Dollar-Yuan in the Context of US-China Economic Competition	Saeed Aldulaimi, Mohanad Hameed Mhaidi, Ahmed A'Rak Naif, Zeyad Khalaf Ismail, Soraqa Ahmed Jumadh

S.No	Paper ID	Title	Authors
9	244	A Swarm Intelligence-Driven Framework for Detecting Insider Trading in Stock Markets	Ahmed T. Sadiq, Dena Kadhim Muhsen, Amjed Abbas Ahmed, Azhaar Abd-Alhussan Shalal, Zainab Mohammed Hussein, Layla Safwat Jamil
10	245	Differential Privacy-Preserving Risk Analysis in Financial Institutions Using Reinforcement Learning	Fatima S. Hussian, Falah Amer Abdulazeez, Bareq M. Khudhair, Bushra Saadoon Mohammed Alnoori, Riyadh Hassoon Jabbar, Amjed Sahib Noori Alshami
11	246	Game-Theoretic Modeling of Cybersecurity Insurance Pricing in Global Financial Markets	Amjed Abbas Ahmed, Fatima S. Hussian, Dena Kadhim Muhsen, Ahmed T. Sadiq, Sura Mazin Ali, Yasir Mahmood Younus
12	248	Zero-Knowledge Proof-Based Authentication for Secure Digital Wallet Transactions in Decentralized Finance	Bareq M. Khudhair, Karrar M. Khudhair, Jasim Gshayyish Zwaïd, Falah Amer Abdulazeez, Ziad Najim Abed, Riyadh Hassoon Jabbar
13	249	Feature Selection for Large-Scale E-Commerce Fraud Detection Using Recursive Feature Elimination and Big Data Analytics	Riyad Hassoon Jabbar, Bareq M. Khudhair, Jasim Gshayyish Zwaïd, Ziad Najim Abed, Karrar M. Khudhair, Falah Amer Abdulazeez
14	250	Metaheuristic-based Secure Forecasting of Cryptocurrency Volatility in Adversarial Environments	Ahmed T. Sadiq, Dena Kadhim Muhsen, Amjed Abbas Ahmed, Saif Aamer Fadhil, Sura Mazin Ali, Ali Hamzah Najim
15	252	Post-Quantum Key Exchange in IoT-Blockchain Hybrid Infrastructures Using NTRUEncrypt Algorithm	Jasim Gshayyish Zwaïd, Fatima S. Hussian, Bareq M. Khudhair, Bushra Saadoon Mohammed Alnoori, Layla Safwat Jamil, Falah Amer Abdulazeez
16	253	Chaos-Enhanced Encryption for Secure Financial Data Transmission in Smart Banking Infrastructures	Ziad Najim Abed, Sura Mazin Ali, Layla Safwat Jamil, Asma Ibrahim Hussein, Zainab Mohammed Hussein, Amjed Abbas Ahmed
17	254	Secure Transmission Path Optimization in UAV Mesh Networks Using Reinforcement Learning Techniques	Mustafa M. Abd Zaid, Jasim Gshayyish Zwaïd, Ahmed Mazin Jalal, Azhaar Abd-Alhussan Shalal, Bushra Saadoon Mohammed Alnoori, Falah Amer Abdulazeez

S.No	Paper ID	Title	Authors
18	255	Anomaly Detection in Digital Payment Systems Using Attention-Based Recurrent Neural Networks	Mustafa Hussein Hasan, Mustafa M. Abd Zaid, Ziad Najim Abed, Zainab Mohammed Hussein, Ali Abbas Hadi, Ali Hamzah Najim
19	256	Secure Personal Finance Management Using Fuzzy Logic and Biometric Multi-Factor Authentication	Mustafa Hussein Hasan Hasan, Mujtaba Zuhair Al-Amshaw, Zainab Mohammed Hussein, Ziad Najim Abed, Ali Abbas Hadi, Fatima S. Hussian
20	257	AI-Enhanced Anti-Money Laundering System Using Self-Supervised Graph Learning Models	Ahmed Mazin Jalal, Karrar M. Khudhair, Mustafa Hussein Hasan, Zainab Mohammed Hussein, Ali Abbas Hadi, Ali Hamzah Najim
21	258	A Hybrid Deep Learning and Elliptic Curve Cryptography Scheme for Real-Time Financial Transaction Security	Azhaar A. Shalal, Amjed Sahib Noori Alshami, Layla Safwat Jamil, Saif Aamer Fadhil, Ahmed Mazin Jalal, Karrar Abbas Yousif
22	259	AI-Powered Credit Card Fraud Detection Using Optimized Convolutional Neural Networks and Synthetic Data Augmentation	Ahmed Mazin Jalal, Amjed Sahib Noori Alshami, Azhaar A. Shala, Bushra Saadoon Mohammed Alnoori, Layla Safwat Jamil, Mohammed Ridha Abbas Yousif Yousif
23	260	Blockchain-Integrated Genetic Algorithm for Secure Asset Allocation in Robo-Advisory Systems	Amjed Sahib Noori Alshami, Ahmed Mazin Jalal, Azhaar A. Shalal, Layla Safwat Jamil, Saif Aamer Fadhil, Mohammed Ridha Abbas Yousif
24	261	Privacy-Preserving Federated Clustering for Financial Data Analytics in Cloud Environments	Amjed Sahib Noori Alshami, Sura Mazin Ali, Ahmed T. Sadiq, Dena Kadhim Muhsen, Saif Aamer Fadhil, Odai Amer Hamid
25	262	Explainable Machine Learning for Trust-Based Risk Prediction in Decentralized Financial Networks	Riyad Hassoon Jabbar, Mustafa Hussein Hasan, Ahmed T. Sadiq, Dena Kadhim Muhsen, Sura Mazin Ali, Odai Amer Hamid
26	263	Spiking Neural Networks for Real-Time Threat Detection	Zainab Mohammed Hussein, Sura Mazin Ali, Ahmed T. Sadiq, Dena Kadhim Muhsen, Yasir Mahmood Younus, Saif Aamer Fadhil

S.No	Paper ID	Title	Authors
27	264	Behavioral Biometrics-Based Intrusion Detection in Online Banking Using LSTM Networks	Riyad Hassoon Jabbar, Karrar M. Khudhair, Mustafa Hussein Hasan, Dena Kadhim Muhsen, Abbas Fadhil Kreh, Ali Hamzah Najim
28	270	The Role Artificial Intelligence Applications in Detecting Workplace Bullying and Deviant Behavior: A Study of Private Hospitals in Anbar City	Fatima Amer Abbas, Abdulsalam Ali Hussein, Saeed Aldulaimi, Marwan Abdeldayem
29	271	Fostering Reflective Thinking through AI-Driven E-Learning Platforms: Evidence from Mathematics Education in The Higher Education	Haider Abdulkareem Alzuhiry, Marwa Salah Yahya Alrawi, Saeed Aldulaimi, Majid Lateef Abdulrazaq, Sabreen Ali Hussein, Marwan Abdeldayem
30	272	Enhancing Digital Strategic Performance in Higher Education through AI-Enabled Strategic Capabilities	Saeed Aldulaimi, Khamees Naser Mohammed, Basma Muhammed Khalaf, Marwan Abdeldayem
31	273	AI-Driven Intrusion Detection Systems: Leveraging Machine Learning for Real-Time Threat Mitigation	Taher M. Ghazal
32	274	Securing the Internet of Things: Frameworks for Vulnerability Assessment and Autonomous Device Protection	Taher M. Ghazal
33	275	Quantum-Resistant Cryptographic Algorithms: Safeguarding Data Integrity in the Post-Quantum Era	Taher M. Ghazal
34	276	The Psychological Impact of AI Adoption in Higher Education: Technology Anxiety and Paranoid Thinking among University Faculties	Saeed Aldulaimi, Muhammad Majid Taha Al-Ani, Ibrahim Hamad Shabeeb, Majid Lateef Abdulrazaq, Marwan Abdeldayem, Ahmed Basil Ahmed Suwaidan
35	277	Artificial Intelligence Application to Examine the Internationalization of the Dollar-Yuan in the Context of US-China Economic Competition	Saeed Aldulaimi, Mohanad Hameed Mhaidi, Ahmed A'Rak Naif, Zeyad Khalaf Ismail, Soraqa Ahmed Jumadh

S.No	Paper ID	Title	Authors
36	278	A Swarm Intelligence-Driven Framework for Detecting Insider Trading in Stock Markets	Ahmed T. Sadiq, Dena Kadhim Muhsen, Amjed Abbas Ahmed, Azhaar Abd-Alhussan Shalal, Zainab Mohammed Hussein, Layla Safwat Jamil
37	279	Differential Privacy-Preserving Risk Analysis in Financial Institutions Using Reinforcement Learning	Fatima S. Hussian, Falah Amer Abdulazeez, Bareq M. Khudhair, Bushra Saadoon Mohammed Alnoori, Riyadh Hassoon Jabbar, Amjed Sahib Noori Alshami
38	280	Game-Theoretic Modeling of Cybersecurity Insurance Pricing in Global Financial Markets	Amjed Abbas Ahmed, Fatima S. Hussian, Dena Kadhim Muhsen, Ahmed T. Sadiq, Sura Mazin Ali, Yasir Mahmood Younus
39	281	Zero-Knowledge Proof-Based Authentication for Secure Digital Wallet Transactions in Decentralized Finance	Bareq M. Khudhair, Karrar M. Khudhair, Jasim Gshayyish Zwaaid, Falah Amer Abdulazeez, Ziad Najim Abed, Riyadh Hassoon Jabbar
40	282	Feature Selection for Large-Scale E-Commerce Fraud Detection Using Recursive Feature Elimination and Big Data Analytics	Riyadh Hassoon Jabbar, Bareq M. Khudhair, Jasim Gshayyish Zwaaid, Ziad Najim Abed, Karrar M. Khudhair, Falah Amer Abdulazeez
41	283	Metaheuristic-based Secure Forecasting of Cryptocurrency Volatility in Adversarial Environments	Ahmed T. Sadiq, Dena Kadhim Muhsen, Amjed Abbas Ahmed, Saif Aamer Fadhil, Sura Mazin Ali, Ali Hamzah Najim
42	284	Post-Quantum Key Exchange in IoT-Blockchain Hybrid Infrastructures Using NTRUEncrypt Algorithm	Jasim Gshayyish Zwaaid, Fatima S. Hussian, Bareq M. Khudhair, Bushra Saadoon Mohammed Alnoori, Layla Safwat Jamil, Falah Amer Abdulazeez
43	285	Chaos-Enhanced Encryption for Secure Financial Data Transmission in Smart Banking Infrastructures	Ziad Najim Abed, Sura Mazin Ali, Layla Safwat Jamil, Asma Ibrahim Hussein, Zainab Mohammed Hussein, Amjed Abbas Ahmed
44	286	Secure Transmission Path Optimization in UAV Mesh Networks Using Reinforcement Learning Techniques	Mustafa M. Abd Zaid, Jasim Gshayyish Zwaaid, Ahmed Mazin Jalal, Azhaar Abd-Alhussan Shalal, Bushra Saadoon Mohammed Alnoori, Falah Amer Abdulazeez

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45	287	Anomaly Detection in Digital Payment Systems Using Attention-Based Recurrent Neural Networks	Mustafa Hussein Hasan, Mustafa M. Abd Zaid, Ziad Najim Abed, Zainab Mohammed Hussein, Ali Abbas Hadi, Ali Hamzah Najim
46	288	Secure Personal Finance Management Using Fuzzy Logic and Biometric Multi-Factor Authentication	Mustafa Hussein Hasan Hasan, Mujtaba Zuhair Al-Amshaw, Zainab Mohammed Hussein, Ziad Najim Abed, Ali Abbas Hadi, Fatima S. Hussian
47	289	AI-Enhanced Anti-Money Laundering System Using Self-Supervised Graph Learning Models	Ahmed Mazin Jalal, Karrar M. Khudhair, Mustafa Hussein Hasan, Zainab Mohammed Hussein, Ali Abbas Hadi, Ali Hamzah Najim
48	290	A Hybrid Deep Learning and Elliptic Curve Cryptography Scheme for Real-Time Financial Transaction Security	Azhaar A. Shalal, Amjed Sahib Noori Alshami, Layla Safwat Jamil, Saif Aamer Fadhil, Ahmed Mazin Jalal, Karrar Abbas Yousif
49	291	AI-Powered Credit Card Fraud Detection Using Optimized Convolutional Neural Networks and Synthetic Data Augmentation	Ahmed Mazin Jalal, Amjed Sahib Noori Alshami, Azhaar A. Shalal, Bushra Saadoon Mohammed Alnoori, Layla Safwat Jamil, Mohammed Ridha Abbas Yousif Yousif
50	292	Blockchain-Integrated Genetic Algorithm for Secure Asset Allocation in Robo-Advisory Systems	Amjed Sahib Noori Alshami, Ahmed Mazin Jalal, Azhaar A. Shalal, Layla Safwat Jamil, Saif Aamer Fadhil, Mohammed Ridha Abbas Yousif

:: DAY 2: VIDEO PRESENTATION SESSION 2 (50 PAPERS) ::

**Friday, November 14, 2025
(09:00 AM - 12:00 PM)**

Track Name: Recorded Video Presentation Session

S.No	Paper ID	Title	Authors
51	293	Enhancing Fairness and Transparency in Electronic Voting with Blockchain-Based Identity Management	A. Senthil Kumar, Honganur Raju Manjunath, Ch. Mohan Sai Kumar, Kaberi Das, G. Sundari and Amit Sharma
52	294	Implementing Blockchain-Based Secure Payment Systems in Electronic Government Services	Anukampa Behera, M. Kavitha, V. Nirmalrani, K. Suneetha, T. Manikandan and Kusum Lata
53	298	Transformer-Augmented Encoding for Identifying Pediatric Pneumonia Patterns Using Radiographic Chest Imagery	Karthi Vivekanandan, Mohana M, Sagaya Mary S, Jeevitha Sakkarai, Rachel Nallathamby and Manjunathan Alagarsamy
54	300	Federated Representation Adaptation for Harmonizing Cross-Border Healthcare Records Under Privacy Constraints	Selva Banu Priya T, Venkataraman N L, Palraj Karuppasamy, Menaka S, Senthil Mahesh P C, Manjunathan Alagarsamy
55	301	Topological Deep Learning for Recognizing Manufacturing Defects in High-Precision Semiconductor Fabrication Lines	Vishnuraja Palanisamy, Kokulavani K, Jeevitha Sakkarai, Radhika K, Maria Kalavathy Gnanamani, Manjunathan Alagarsamy
56	302	Quantum-Resistant Hashing for Protecting Genomic Privacy within Decentralized Biomedical Data Ecosystems	Sumithra Subramanian, Malarvizhi C, Nadhiya S, Siva K P, Parimala Gandhi Ayyavu and Manjunathan Alagarsamy
57	304	AI-Enhanced Cultural Data Analytics in EFL Education: Ethical and Societal Implications for Smart City and Rural Schools in Uzbekistan	Nargiza Shaumarova Shorustam Qizi, Sharustam Shamusarov Giyasovich, Hariharan N Krishnasamy

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58	305	AI-Driven NLP and Blockchain-Enabled Linguistic Analytics: Integrative Approaches for Fair, Transparent Literary Translation of George Orwell's Works	Sodikova Dinora Ilhom Qizi, Sodikova Sabohat Ilhom Qizi, Nasriddinov Dilshod Azamkulovich, Zakhidova Guzai Elbekovna, Khalikova Dildora Normurodovna, Abdullayeve Markhabo Raxmonkulovna
59	306	AI-Driven Personalized Learning Ecosystem for Smart Universities Using Cognitive and Context Aware Techniques with Personalized Learning Adaptation Algorithm	M. Mohammed Jalaluddin, Haja Alaudeen A
60	307	Computational Intelligence Approaches for AI-Powered Education and Language Accessibility in Smart Learning Systems	Dilshoda Kakhramonovna Maksudova, Tursunova Nargiza Xamrakulovna, Gaipova Shakhnoza Makhmudovna, Oripova Nargiza Vosiqjon Qizi, Dilfuza Abduganiyevna Akramxodjayeva, Okhunov Mukhammadyusuf
61	308	Relational Graph Completion for Discovering Drug Interactions across Pharmacological Knowledge Databases	Purushothaman Ramaiah, Balaji V S, Kayalvizhi S, Dinesh Kumar P, Alima Beevi Azizur Rahuman, Manjunathan Alagarsamy
62	309	Hybrid Grey Wolf Optimizer-CNN Model for High-Resolution Remote Sensing Image Classification	Ahmed Tareq Sadiq, Ahmed A. Elngar, Ahmed Hammad, Shuxrat Boymuradov, Arasuraja Ganesan, Sowmiya S
63	310	Genetic Algorithm-Based Hyperparameter Tuning for Transformer Models in Biomedical Text Mining	Khaled Shaalan, Azza Mohamed, Mohamed Elsersty, Rustam Turakulv, Prabakaran Paranthaman, Tedi Sheron U
64	311	Particle Swarm Optimization for Feature Selection in IoT Sensor Anomaly Detection	Taher M. Ghazal, Amjed Abbas Ahmed, Amer Ibrahim, Feruza Azizova, Aruna V, Jana M
65	312	Colony Optimization for Multi-Objective Urban Traffic Light Scheduling	Israa Shihabahmed, Rasha Almajed, Marif Karimov, Karpagham C, S Sam Jebakumar

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66	313	Neuro-Symbolic Sequencing for Automating Financial Contract Assessment During International Trade Negotiations	Sunita Dhote, Rupesh Pais, Reshma Pais, Rajas Dhote
67	314	YOLOv8-Based Real-Time Pedestrian Detection for Autonomous Public Transport Systems	Ahmed Tareq Sadiq, Rasha Almajed, Feruza Azizova, Karunakaran S, Sujeetha A
68	315	Quantum-Enhanced Approximation for Accelerating Protein Folding Dynamics in Molecular Biology Research	Sunita Dhote, Purushottam Shobhane, Priti Golar, Satyajit Uparkar, Rajas Dhote
69	316	Hyperbolic Graph Attention for Linking Cross-Language News Articles Across Global Outlets	Sunita Dhote, Pravin Karmore, Swapnil Karmore, Rajas Dhote
70	317	BERT with Knowledge Distillation for Low-Latency Multilingual Chatbots in Smart Cities	Khaled Shaalan, Azza Mohamed, Aya M. Al-Zoghby, Ziyoda Muminova, Raimova Malokhatkhon, Lavanya M
71	318	Blockchain-Enabled Access Control Using Practical Byzantine Fault Tolerance for Healthcare IoT	Abdallah Altrad, Ammar Yaser Almansour, Bashar Yaser Almansour, Djakhangir Tursunov, Buzrukova Kamilla, R. Rogith
72	319	Random Forest-Based Intrusion Detection for Zero-Day Attack Mitigation in Industrial Control Systems	Abdallah Altrad, Hani Q. R. Al-Zoubi, Mahmoud Mahfuri, Dilbar Najmutdinova, Aakansha Soy, Sanjay K
73	320	ARIMA-LSTM Hybrid for Predictive Energy Demand Forecasting in Smart Grids	Israa Shihab Ahmed, Sameh Ghwanmeh, Bashar Yaser Almansour, Khilola Mirakhmedova, Nidhi Mishra, Hema Priya S

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74	321	XGBoost with Time Series Embeddings for Stock Price Movement Prediction	Ismaeel Abdel Qader, Faruq Al-Omari, Saed Adnan Mustafa, Maktuba Mirakhimova, Nidhi Mishra, Parvathy P V
75	322	Deep Reinforcement Learning-Based Autonomous Navigation for Planetary Rovers in Unknown Terrains	Darin Shafek, Aghiad Khedr Suleiman, Ravshan Usmanov, Manish Nandy, Manoj Kumar M
76	324	Deep Q-Learning for Dynamic Resource Allocation in Cloud Computing Environments	Saed Adnan Mustafa, Atef Alkhawaldah, Muna Al Mkhaini, Turdikul Bobamuratov, Priya Sethuraman, Criffin P Dickson
77	325	U-Net with Residual Attention for Automated Road Damage Detection	Israa Shihab Ahmed, Mahmoud Mahfuri, Faruq Al-Omari, Abror Khamraev, Nodir Khodjaev, Hariharan Ks
78	326	Vision Transformer (ViT) for Satellite-Based Smart City Land Use Classification	Ahmed A. Elngar, Nowf O. Maaitah, Ahmed Hammad, Akmal Irnazarov, Altmisheva Yorkinoy, Anthony Raja Surya M
79	327	Seq2Seq with Attention for Real-Time Emergency Communication Translation in Disaster Zones	Khaled Shaalan, Azza Mohamed, Suha Khalil Assayed, Sarvar Aliev, Karabayeva Aziza, Shrinidhi G
80	328	Federated Learning with Secure Aggregation for Distributed Malware Detection in IoT Networks	Taher M. Ghazal, Amer Ibrahim, Amjed Abbas Ahmed, Feruza Salomova, Khoshimova Madinabonu, Kavitha J
81	329	Support Vector Machine with SMOTE for Imbalanced Phishing Website Detection	Abdallah Altrad, Darin Shafek, Rasha Almajed, Ilkhom Otajonov, Shakhriyor Kholbayev, Alen Roy A R
82	330	Graph Neural Networks for Insider Threat Detection in Corporate Networks	Taher M. Ghazal, Amjed Abbas Ahmed, Amer Ibrahim, Farhad Akilov, Dilmurod Nasimov, Samyuktha M
83	331	Reinforcement Learning-Driven Adaptive Traffic Signal Control in Metropolitan Areas	Nidal A. Al-Dmour, Nowf O. Maaitah, Aghiad Khedr Suleiman, Laziz Tuychiev, Ashu Nayak, Keerthika S

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84	332	K-Means Clustering with GIS Integration for Optimal Placement of Electric Vehicle Charging Stations	Nidal A. Al-Dmour, Nowf O. Maaitah, Sameh Ghwanmeh, Dildora Nabieva, Priya Vij, Ebenezer D
85	333	Edge Computing-Enabled Deep CNN for Real-Time Video Analytics in Drone-Based Surveillance	Ahmed Tareq Sadiq, Faruq Al-Omari, Mahmoud Mahfuri, Khalmurad Akhmedov, Manish Nandy, Chandramoulieswaran V
86	334	LSTM Autoencoder for Predictive Maintenance in Industrial Cyber-Physical Systems	Aghiad Khedr Suleiman, Ahmed Hammad, Ahmed A. Elngar, Nargiza Nurillaeva, Debarghya Biswas, Aldrin Snowson P
87	335	Explainable Gradient Boosting Models for Fair Loan Approval Decisions	Ismaeel Abdel Qader, Saed Adnan Mustafa, Sameh Ghwanmeh, Abdigaffor Gadaev, Aakansha Soy, Hari Ganesh S
88	336	SHAP-Integrated Decision Trees for Transparent AI in Public Safety Applications	Ismaeel Abdel Qader, Darin Shafek, Umida Tashkenbaeva, Ashu Nayak, S. V. Yogeshwaran
89	337	LightGBM for Customer Churn Prediction in Subscription-Based Services	Abdullah Elkhoudary, Ammar Yaser Almansour, Bashar Yaser Almansour, Ilhamdjan Karimdjano, Priya Vij, Elakiya V
90	338	Graphene-Inspired Neural Mapping for Anticipating Seismic Shifts Across Continental Fault Zones	Roberto Acevedo, Araceli Rodriguez
91	339	Diffusion-Driven Framework for Reconstructing Archaeological Artifacts from Fragmented Historical Remnants	Roberto Acevedo, Matias Pavez
92	340	Contrastive Fusion Network for Interpreting Multimodal Emotional Cues within Interactive Theatre Performances	Roberto Acevedo, Diego Onetto

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93	341	Generative Vision Paradigm for Reanimating Extinct Species Illustrations Through Paleontological Museum Archives	Roberto Acevedo, Tamara Roblero
94	342	Attention-Oriented Pathfinding for Coordinating Autonomous Maritime Fleets Across Polar Shipping Routes	Roberto Acevedo, Laura Spinelli
95	343	Capsule-Based Modeling for Forecasting Renewable Hydroelectric Output in Mountainous River Basin Regions	Venkatesh R, Marimuthu S, Nandhakumar A, Jayanthi M G, Senthil Kumar Vishnu, Sathiyamurthy S
96	344	Transformer-Diffusion Hybrid for Enhancing Digital Twin Precision in Aerospace Structural Maintenance	Venkatesh R, Nandhakumar A, Marimuthu S, Yashashwini S, Senthil Kumar Vishnu, Sathiyamurthy S
97	345	Biologically Inspired Oscillatory Computing for Classifying Soil Nutrient Variations Across Agricultural Landscapes	Venkatesh R, Jeevakarunya C, Ramya S. R., Jayashree N, Amuthasurabi M, Senthil Kumar Vishnu
98	346	Integrated Disaster Warning System for Multi-Hazard Management	Karthikeyan N, Anupraba P. C., Basker Ke, Haripriya I, Jawagar S
99	347	Analysis of Navalur (Thazhambur) Agricultural Land with Forecasts for Future Soil Conditions and Crop Recommendations	Prince Prasanna Kumar Rk, Yogesh P, Jaraline Kirubavathy K
100	348	Optimizing Honeypot Mobility: A Hybrid ML Approach for Advanced DDoS Protection	C. Navaneetha, Kathirvel A

:: DAY 2: VIDEO PRESENTATION SESSION 3 (31 PAPERS) ::

**Friday, November 14, 2025
(02:00 PM – 05:00 PM)**

Track Name: Recorded Video Presentation Session

S.No	Paper ID	Title	Authors
101	349	Self-Supervised Embedding for Classifying Ancient Manuscripts Across Multilingual Historical Library Collections	Gopal K, Chandraprakash R, Marimuthu S, Indumathi G, Nageswaran M, Srinivasan R
102	350	Machine Learning-Based Inflation Forecasting System for Macroeconomic Analysis	Grandhi Sai Guptha, Kumuda Sreenivasa, Pranav Paikar, G. V. Radhakrishnan, Pushparaj Kulkarni, Partha Kumar Dey
103	351	Elect and Locate the Hollow Blocks	P. Vidhyalakshmi, K. P. Sasikumar, K. Prabhu, S. Thiyanesh, P. Sowmiya, G. Ravishankar
104	352	A Balanced Evolutionary Algorithm for Reliability and Sustainability Trade-Offs in Hybrid Renewable Systems	Minu Mary Joy, H. Vennila
105	353	Blockchain-Integrated Overhead-Aware Optimization of Post-Quantum Digital Signature Protocols	K. Thenmozhi, R. Sabin Begum
106	354	Driver Alert System: Sending Alert Messages upon Speed Control, Alcohol Detection and Object Detection Using IoT and Arduino	Sakhinetipalli Ravali, Raavi Hemalatha
107	355	Parameter-Optimized WOA-CNN-Bi-LSTM Model for Improved CT Image Segmentation and Classification	M. Sathya Sundaram, S. Karthick, P. Thiagarajan
108	356	Spiking Cortical Architecture for Monitoring Wildlife Migration Trajectories via Aerial Imaging Sensors	Gopal K, Nandhakumar A, Daniel Das A, Cyril Prasanna Raj, Amuthasurabi M, Thirugnanasambandham T

S.No	Paper ID	Title	Authors
109	357	Reinforcement-Guided Navigation for Optimizing Drone Delivery Routes through Dense Urban Environments	Gopal K, Jeevakarunya C, Daniel Das A, Shivapanchakshari T G, Nageswaran M and Murali M
110	358	Multi-Agent Coordination using Evolutionary Heuristics for Managing Shared Electric Vehicle Charging Infrastructure	Chinnayan R V, Meera C, Marimuthu S, Varalatchoumy M, Gobu R and Sathiyamurthy S
111	359	Knowledge-Grounded Dialogue Models for Supporting Patient Counseling During Chronic Disease Management	Chinnayan R V, Nandhakumar A, Meera C, Geetha R, Gobu R and Sathiyamurthy S
112	360	Fire Detection and Extinguishing System using CNN	Ramprasath S, Rahul Sanjai R, Arunpandian M, Sivaprasath and Gopinath C
113	361	B. Senthil Kumar, K Kishore, S Bharathwaj and S Jayasruthi	Comparison Between LSTM and Bi-LSTM for Wind Speed Forecasting
114	362	OPTIMISING SURGICAL INSTRUMENT RECOGNITION USING ADVANCED OBJECT DETECTION ALGORITHM	A Bhavana Rajaputana, Harika Mahalakshmi S and G. Maria Kalavathy
115	363	AI-based detection and classification of periapical lesions in CBCT and periapical radiographs using deep learning	Tejal Gowda, Ravi Ranjan Sinha, Niladri Maiti, Swagat Panda, Priyanka Das and Siddhartha Das
116	364	Battery Ageing Prediction in Electric Vehicles using Hybrid AI Model	Retineni Rohan, Shishir Kathi and Venkata Siva Rao Alapati
117	365	Optimizing Hybrid Renewable Energy Systems Under Uncertainty Using Robust Evolutionary Multi-Objective Algorithms	Munna Basil Mathai and V.A. Tibbie Pon Symon

S.No	Paper ID	Title	Authors
118	366	Implementation of RSA Algorithm using FPGA and Analysis of Post Quantum Cryptography	Keith Raymond Fernandes, Dayakshini Sathish, Shreyas S, Varun Kamath, Sinchana S and Sanjana
119	367	DEEP LEARNING BASED MULTI-MODEL ASSISTIVE LEARNING SYSTEM FOR HEARING AND VISUALLY IMPAIRED STUDENTS	Senthil Kumari P, Gokila K and Akalya A
120	368	Cognitive Computing-Based Financial Risk Assessment Framework For Banking	Sonali S. Shrotri, Pratyay Das, Archana Kumari, Indrajeet Singh, Bhavna Agrawal and Vimal D. Deokar
121	369	Neural Radiance Field Reconstruction for Preserving Cultural Heritage Sites through Immersive Virtual Experiences	Gowtham Raj R, Raj Kumar P, Daniel Das A, Girish H, Vijayavardhana C and Rathinavelu V
122	370	Swarm-Driven Metaheuristics for Scheduling Satellite Constellations in Low-Earth Orbital Communication Networks	Gowtham Raj R, Jeevakarunya C, Meera C, Bharani B R, Santhosh V and Rathinavelu V
123	371	Anitha M and Yegnanarayanan Venkataraman	Dominating Sets and Influence Measures in Co-authorship Graphs
124	372	Stock Market Trend Prediction Using Long Short-Term Memory (LSTM) Networks for Business Investment Strategies	N. Venkatesan, S.S.J Onyx Nathanael Nirmal Ra, D. Paul Dhinakaran, M Suresh, P. Ashok Kumar and M Rajalakshmi

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125	373	Multi-Objective Optimal Planning of DG and FACTS in Radial Distribution Systems via Arithmetic Optimization Algorithm	Shridevi Akkewar and Rajendra Dhatrak.
126	374	Optimizing IoV Cloud Trust with Adaptive Blockchain and Reinforcement Learning	Francis Shamili S and Gopi R
127	377	Deep Reinforcement Policy for Coordinating Cooperative Autonomous Vehicles at Highway Intersection Merges	Tanvi Mittal, Raunaq Malik, Siva Sai Krishna Suryadevara, Reshma Thakkallapelly and Bala Krishna Rao Guntupalli
128	378	Adversarial Robustness Mechanism for Safeguarding Biometric Verification across Mobile Financial Applications	Mohon Raihan, Muhammad Adnan, Md Jubayar Hossain, Kazi Bushra Siddiq, Farhana Karim, Sraboni Clara Mohonta and Uday Sankar Saha
129	379	Continual Learning Pipelines for Detecting Insider Threats across Corporate Cybersecurity Infrastructures	Norun Nabi, Md Kazi Tuhin, Monjira Bashir, Khadeza Yesmin Lucky, Mohon Raihan, Hasan Imam and Md Talha Bin Ansar
130	382	Cyber Security Challenges in Student Digital Learning Platforms	Ambika S and Abirami K
131	385	Trust-Aware Federated Learning for Secure Loan Approval in Peer-to-Peer Lending Platforms	Layla Safwat Jamil, Amjed Sahib Noori Alshami, Azhaar A. Shalal, Amjed Abbas Ahmed Amjed Abbas Ahmed, Dena Kadhim Muhsen and Karrar Abbas Yousif

PAPER ABSTRACTS

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1	2	Modelling the Acceptance and Use of Digital Twin Technology in Smart Buildings: An Extended TAM Approach	Hasimi Sallehudin, Afiffuddin Husairi Mat Jusoh Hussain, Farashazillah Yahya, Rogis Baker, Ahmad Firdause Md Fadzil, Nur Azaliah Abu Bakar and Mohd Khairolden Ghani
2	6	Generative Adversarial Networks for Synthetic Attack Generation: Strengthening Network Defense Training	Hiba A. Tarish, Rosilah Hassan, Khairul Akram Zainol Ariffin, Mustafa Musa Jaber and Syed Hussain Ali Kazmi
3	7	Improving UAV Altitude Estimation using Barometric Sensor: A Method via Data Analysis	Kieu Trang Le, Tien Truong Nguyen and Dong Thanh Nguyen
4	8	A Comparative Review of SaaS Adoption In M-Government Apps	Adawiyah Md Ashar, Nur Fazidah Elias, Ruzzakiah Jenal and Meng Chun Lam
5	9	Prediction of Privacy Concerns based on Personality Traits and General Risk Propensity	Abdulsalam Alshaqhaa, Rosilah Hassan, Faizan Qamar, Anwar Ibrahim and Gaoyang Guo
6	32	Monitoring Natural Hazard Trends in Power Distribution Networks Using Professional Meteorological Services and Rainfall Distribution Analysis for Early Warning Systems	Guole Li, Caifen Wang, Xuewei Zhang, Pengfei Cao and Hongjian Li
7	33	Ke Xu	Research Progress and Future Prospects of Bionic Aerodynamic Noise Control Technologies
8	36	Yong-Jie Wu, Jiayin Yu, Zi-Zhen Li, Shen Wu and Jiang Jiang	Machine learning driven enterprise business intelligence refactoring and dynamic adaptation
9	37	Assessing Cloud Computing Adoption in the Malaysian Healthcare Industry based on IT Capability	Normilah Mohd Noh, Hasimi Sallehudin, Nurhizam Safie Mohd Satar, Nur Azaliah Abu Bakar, Ahmad Firdause Md Fadzil and Farashazillah Yahya

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10	38	Enhanced Turbulence Characteristics in Dual Pulsating Jets Using Hot-Wire Anemometry	Rozli Zulkifli, Shahrir Abdullah and Kamaruzzaman Sopian
11	40	Faza Muhandisa Asro and Hamonangan Situmorang	Optimizing Security Automation in DevSecOps: Evaluating The Effectiveness of SCA, SAST, DAST, and Container Scanning In An Integrated Vulnerability Management System
12	41	Optimized Integration of Renewable Energy Systems Using Chaotic Optimization in Distribution Systems	Muhammad Suhail Shaikh, Dong Xiaoqing, Chunwu Wang, Chang Wang, Senlin Xie and Haoyue Lin
13	42	Automated Information Extraction and Text Summarization of IBL News using IndoBERT and BART	Daniel Jahja Surjawan, William Budianto and Viny Christanti Mawardi
14	44	Energy Management for BMS with Auto Reclosure RCCB/MCB	Rosilah Hassan, Arbaiah Inn, Nur Sumayyah Ahmad, Mohamad Hafiz Zakaria, Faizan Qamar and Zhiyi Cui
15	46	Ashari Muhammad Hisbulloh, Rini Setiawati and Riyan Leandros	Understanding User Perspectives and Preferences on Bus and Shuttle: A Human-Centered Design Approach to Attract New Users: Tiket.com Study
16	52	Nazlia Omar and Nur Fatini Abdul Ghani	Exploring the Impact of In-Context Learning and Few-Shot Demonstrations on Nuclear Material Entity Normalization in Named Entity Recognition
17	53	PUDAL Engine and V-Model: The Foundation of Smart Management Framework for Higher Education Accreditation	Daniel Jahja Surjawan, Armein Z. R. Langi, Jaka Sembiring and Albarda Albarda
18	54	Malaysia's COVID-19 Vaccination Impact: A Visualization and Regression Analysis of Cases and Mortality	Qian Peng, Xingang Bao, Sien Lu, Geyu Liu, Yuanzhe Cai, Feijuan Huang, Fadilla'Atyka Nor Rashid and Suhaila Zainudin

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19	55	Fine-Tuning Komodo Model With LoRA for Sentiment Analysis of YouTube Comments	Viny Christanti Mawardi, Edward Thomas Alexander and Daniel Jahja Surjawan
20	57	Intelligent Clinical Dialogue Assistant: Enhancing Doctor-Patient Anamnesis through LLM-Powered Real-Time Symptom Analysis	Yoenie Indrasary, Ary Setijadi, Rahadian Yusuf, Metty Verasari, Wafa Nurfatimah Shalihah, Siti Kustini, Isna Wardiah and Khairunnisa Khairunnisa
21	58	A Hybrid Binary Artificial Bee Colony Algorithm for the Minimum Dominating Set Problem in Wireless Sensor network	Lina Talib, Faizan Qamar, Ravie Chandren Muniyandi, Syed Hussain Ali Kazmi and Tan Siok Yee
22	59	Performance Comparison of Deep Q-Network Variants in Network Slicing Resource Optimization	Zhiyi Cui, Faizan Qamar, Syed Hussain Ali Kazmi, Khairul Akram Zainol Ariffin, Fazlina Mohd Ali and Rimaniza Zainal Abidin
23	60	A Comparative Evaluation of Moodle-Based Learning Management System in Malaysian Public Univesities Using a Refined SCTL Framework	Nurhidayah Bahar, Zulkefli Mansor, Dian Indrayani Jambari, Sabrina Tiun, Farzana Parveen Tajudeen and Nur Syahirah Nabilah Shahril
24	61	ENHANCING UNIVERSITY STUDENT MENTAL HEALTH THROUGH AI-DRIVEN PERSONALIZED BIBLIOTHERAPY	Kinn Abass Bakon, Tines Subramaniam, Lilysuriazna Raya, Zulaika Saud and Nur Fazidah Elias
25	62	The Application of Lifelong Learning Algorithm in Software Effort Estimation	Xin Xiong and Zulkefli Mansor
26	64	Secure Data Hiding and Transmission Utilizing Multi-Layered Cryptographic and Steganographic Techniques With High Capacity	Murad Njoum, Rossilawati Sulaiman, Zarina Shukur and Faizan Qamar

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27	66	IMPROVED SECURITY AND EFFICIENCY OF AIRCRAFT BAGGAGE HANDLING MANAGEMENT SYSTEM USING SPRING-STRUTS2-HIBERNATE (SSH) FRAMEWORK	Jin Yuhao, Nur Hanis Sabrina Suhaimi, Nazhatul Hafizah Mohd Kamarudin, Fadilla Atyka Nor Rashid, Mohamad Kamrul Hasan and Azana Hafizah Mohamad Aman
28	67	Authentic Die-cast Empowering Collectors with Digital Watermarking Technology	Taufiq Mohamad, Muhammad Faiz Hakimi Muhd Shepuan, Nur Atiqah Sia Abdullah and Muhamad Ridhwan Mohamad Razali
29	68	Encircling Dynamics in Swarm-Based Intelligent: Trends, Challenges and Future Direction	Wirawati Dewi Ahmad, Azuraliza Abu Bakar and Mohd Nor Akmal Khalid
30	69	Real-Time Facial Expression Detection Using YOLOv12 Architecture	Humaira Helen, Md. Uzzal Mia, Mohammad Kamrul Hasan, Tan Siok Yee, Rinku Islam, Md. Sarwar Hosain and Md. Omar Faruk
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:: PAPER ID: 2 ::

**MODELLING THE ACCEPTANCE AND USE OF DIGITAL TWIN TECHNOLOGY IN
SMART BUILDINGS: AN EXTENDED TAM APPROACH**

Hasimi Sallehudin

Faculty of Information Science and Technology Universiti Kebangsaan Malaysia

Affuddin Husairi Mat Jusoh@Hussain

School of Liberal Studies (CITRA-UKM) Universiti Kebangsaan Malaysia

Farashazillah Yahya

Faculty of Computing and Informatics Universiti Malaysia Sabah

Rogis Baker

Faculty of Defence Studies and Management Universiti Pertahanan Nasional Malaysia,

Ahmad Firdause Md Fadzil

Faculty of Economy and Management Science,Universiti Sultan Zainal Abidin,

Nur Azaliah Abu BakarRazak

Faculty of Technology and Informatics,Universiti Teknologi Malaysia

Mohd Khairoldeen Ghani

Construction Research Institute of Malaysia (CREAM)

hasimi@ukm.edu.my, affuddin@ukm.edu.my, fara.yahya@ums.edu.my, rogis@upnm.edu.my,
firdause@unisza.edu.my, azaliah@utm.my, khairoldeen@cream.my

Abstract—Digital Twin Technology (DTT) has emerged as a transformative innovation in the smart building domain, enabling real-time simulation, monitoring, and optimisation of building systems. Despite its potential, the adoption of DTT remains limited due to organisational, technical, and behavioural barriers. This study investigates the factors influencing the acceptance and use of DTT in smart buildings by extending the Technology Acceptance Model (TAM) with contextual variables including social influence, perceived risk, facilitating conditions, cost, management support, technical readiness, and innovation inclination. A structured survey was administered to 185 professionals, including engineers, facility managers, and IT experts, involved in smart building projects in Klang Valley, Malaysia. Data were analysed using Structural Equation Modelling (SEM) to validate the hypothesized relationships among the constructs. The results confirm that perceived usefulness and ease of use significantly influence behavioral intention, while external factors such as management support and facilitating conditions enhance these perceptions. Perceived risk and cost were found to negatively affect adoption behaviour. This study contributes to both theory and practice by extending TAM to the context of DTT and providing actionable insights for stakeholders seeking to improve adoption strategies in the built environment. The findings underscore the need for user-centred design, organisational readiness, and robust support mechanisms to fully leverage DTT in sustainable and intelligent building operations.

Keywords—Digital Twin Technology, Smart Buildings, Technology Acceptance Model (TAM), Structural Equation Modeling (SEM), User Adoption, Malaysia

:: PAPER ID: 6 ::

GENERATIVE ADVERSARIAL NETWORKS FOR SYNTHETIC ATTACK GENERATION: STRENGTHENING NETWORK DEFENSE TRAINING

Hiba A. Tarish, Rosilah Hassan, Khairul Akram Zainol Ariffin, Syed Hussain Ali Kazmi
Centre for Cyber Security Faculty of Information Science and Technology Universiti Kebangsaan MalaysiaBangi,
Malaysia
Mustafa Musa Jaber
University of Information Technology and Communication, Informatics Institute for postgraduate studies, Baghdad,
10021, Iraq

pl19044@siswa.ukm.edu.my, rosilah@ukm.edu.my, k.akram@ukm.edu.my,
pl12235@siswa.ukm.edu.my, mustafa.musa@iips.icci.edu.iq

Abstract—Cyber threats have changed dramatically in recent years, which has made the need for creative network defensive techniques necessary. Networks are always susceptible because traditional intrusion detection systems frequently depend on data from a collection of attack flows, which are unable to identify particular or adaptable attack techniques. In order to combat various, combat diverse cyber-attack patterns, this study suggests a novel framework that makes use of Generative Adversarial Networks (GANs). Algorithm layer training procedures increase the strength of defense systems. The system creates a variety of attack scenarios that imitate the actions of actual threats by teaching a generator to replicate intricate attack pathways and differentiate between malicious and benign traffic. The suggested defense techniques using GANs have demonstrated significant superiority in handling high-impact and random attack traffic on networks. Various attacks are integrated with reference datasets (like CIC-IDS2017) for training purposes to improve intrusion detection system models. Simulation results using the GAN deep learning technique showed an improvement of 15-22% in detecting new threats compared to traditional methods. They also helped reduce false positives by 12%. High efficiency results have been achieved in detecting and mitigating cyber threats, with a success rate of 98.05% with an average error of 0.0035.

Keywords—GANs, synthetic attack generation, network defense training, IDS, adversarial machine learning, zero-day threats

:: PAPER ID: 7 ::

IMPROVING UAV ALTITUDE ESTIMATION USING BAROMETRIC SENSOR: A METHOD VIA DATA ANALYSIS

Kieu Trang Le, Tien Truong Nguyen, Dong Thanh Nguyen
Unmanned Aerial Center, Viettel High Technology Industries Corporation, Viettel Group, Hanoi, Vietnam.

tranglk2@viettel.com.vn, truongnt2@viettel.com.vn, dongnt11@viettel.com.vn

Abstract—This paper presents a method to improve the accuracy of altitude estimation based on pressure sensor during cruise and descent flight modes, specifically for small fixed-wing and quad-copter UAV (unmanned aerial vehicles) that use pitot tube to measure pressure. First, based on barometer temperature data, we propose a model to estimate the reference temperature when the circuit is active. Second, in the descent phase, we propose an equation to correct altitude based on the climb rate and pitch angle. Finally, our proposals are verified by real flight data, demonstrating that our method achieves higher accuracy compared to commonly used methods without correction. This is the initial step of the data fusion task for UAV navigation.

Keywords—UAV, barometer, altitude estimation, static pressure, temperature compensation, real-time navigation

:: PAPER ID: 8 ::

A COMPARATIVE REVIEW OF SaaS ADOPTION IN M-Government Apps

Adawiyah Md Ashar, Nur Fazidah Elias, Ruzzakiah Jenal

Center for Software Technology and Management Faculty of Information Science & Technology,
Universiti Kebangsaan Malaysia Bangi Selangor, Malaysia

Meng Chun Lam

Center for Artificial Intelligence Technology Faculty of Information Science & Technology,
Universiti Kebangsaan Malaysia. Bangi Selangor, Malaysia

p131533@siswa.ukm.edu.my, fazidah@ukm.edu.my, ruzzakiahjenal@ukm.edu.my, lammc@ukm.edu.my

Abstract—The escalating requirement for effective, secure and citizen-centric digital services has expedited the global adoption of mobile government (m-government) applications. This review article examines the pivotal function of Software-as-a-Service (SaaS) as a fundamental facilitator in the execution and viability of m-government applications, which has not been much explored. Through the synthesis of existing literature and the analysis of country-specific case studies from Estonia, Singapore and Malaysia, this research provides a comparative assessment of how varying governance, infrastructure approaches and levels of digital readiness influence the implementation of SaaS-based mobile applications within the public sector. The review elucidates crucial success determinants, including technological capability, operational efficiency, organizational readiness and citizen-centric. This study simultaneously addresses the benefits and barriers of incorporating a SaaS-based solution in m-government. The results contribute to the ongoing discourse regarding digital public service delivery, specifically in the m-government domain, furnishing a structured basis for policymakers, developers and scholars striving to enhance m-government through cloud-based initiatives. The paper concludes with a conceptual model for adapting SaaS in the m-government context.

Keywords—mobile government, m-government, digital services, cloud, SaaS, software-as-a-service, sustainability

:: PAPER ID: 9 ::

PREDICTION OF PRIVACY CONCERNS BASED ON PERSONALITY TRAITS AND GENERAL RISK PROPENSITY

Abdulsalam Alshaqhaa

Department of Computer and Information Technology Buraydah College of Technology Technical and Vocational
Training Corporation, Qassim, Saudi Arabia

Rosilah Hassan, Faizan Qamar, Gaoyang Guo

Centre for Cyber Security Faculty of Information Science and Technology Universiti Kebangsaan Malaysia Bangi,
Malaysia

Anwar Ibrahim

Department of Electrical Engineering Qassim University Qassim, Saudi Arabia

p123026@siswa.ukm.edu.my, rosilah@ukm.edu.my, faizanqamar@ukm.edu.my,
P161069@siswa.ukm.edu.my, dr.anwar@qec.edu.sa

Abstract—This study presents a machine learning-based framework to predict users' privacy concern levels (low, medium, high) based on Big Five personality traits and general risk propensity. Using a validated dataset of Twitter users, we evaluated multiple classifiers: SVM, XGBoost, KNN, and Random Forest (RF). The RF achieved the best performance F1-score of 0.727 and weighted accuracy of 0.730. Our SHAP-based feature importance revealed that risk propensity and conscientiousness are the most influential predictors of privacy sensitivity, with openness contributing to medium-level concerns. Additionally, association rule mining using the Apriori algorithm uncovered interpretable trait combinations, such as low conscientiousness with high risk, strongly predicting high privacy concern (lift = 5.77). These findings could be adopted to design personalized privacy mechanisms for the IoT environment. It could be used to change or adapt the default security and privacy settings in IoT based on public data. The proposed framework advances prior work by integrating interpretable machine learning and association rules with psychological profiling, achieving superior predictive performance and enabling explainable privacy personalization. Future work may extend the prediction model using textual content (i.e., tweets) for finer-grained personalization.

Keywords—privacy prediction, personality traits, risk propensity, machine learning, association rules, privacy personalization

:: PAPER ID: 32 ::

MONITORING NATURAL HAZARD TRENDS IN POWER DISTRIBUTION NETWORKS USING PROFESSIONAL METEOROLOGICAL SERVICES AND RAINFALL DISTRIBUTION ANALYSIS FOR EARLY WARNING SYSTEMS

Guole Li, Caifen Wang, Xuwei Zhang, Pengfei Cao

Power Generation Business Center BEIJING SGITG ACCENTUREINFORMATION TECHNOLOGY CENTERCO.,LTD Beijing, China

Hongjian Li

Power Generation Business Center STATE GRID SGIT DIGITAL TECHNOLOGY(BEIJING) CO.,LTD Beijing, China

sdf135132025@163.com, 741841944@qq.com, 15063338591@126.com, caopengfei@qq.com, Glee2022sgitg@163.com

Abstract—In this study, the training efficiency and operation performance of the model were improved by training the selected professional meteorological service and rainfall distribution model, and the appropriate optimization algorithm was used in the training process to reasonably adjust the index parameters such as influence index, model flexibility, and model fitting value. At the same time, the distribution network natural disaster early warning model is used to expand the quantity and diversity of training data, collect natural disaster data, and further analyze the distribution characteristics, category proportion, and meteorological characteristics of natural disasters, so as to provide data support for the construction of distribution network datasets and model training, and ensure the generalization ability and stability of the model.

Keywords—professional meteorological services, rainfall distribution, distribution networks, Natural disaster, Early warning model

:: PAPER ID: 33 ::

RESEARCH PROGRESS AND FUTURE PROSPECTS OF BIONIC AERODYNAMIC NOISE CONTROL TECHNOLOGIES

Ke Xu

School of power and energy Northwestern Polytechnical University Xi'an China

xiyoyo0601@163.com

Abstract—The quick developments in materials science lead to new methods of aerodynamic noise control which primarily rely on porous materials. Research into aerodynamic noise emissions continues to be problematic even with recent advancements thus requiring new solutions based on natural structures. Researchers have established a study which examines the ability of porous materials built from owl wing surface characteristics to decrease aerodynamic noise. The study combines experimental and numerical methods for measuring how porous materials affect acoustic reduction. Research investigators examine vortex shedding noise produced by axial compressor blades to create fundamental knowledge about aeroacoustics applications. The research shows that porous materials reduce noise from air foil trailing edges while blade vortex interaction while these materials equalize surface impedance to minimize vortex shedding from critical aerodynamic features and control pressure changes. Porous materials efficiently reduce low-frequency broadband noise but specific usage conditions lead to the creation of high-frequency noise. Better application results for porous materials need additional research that tackles high-frequency noise sources alongside performance improvement for noise reduction in particular aerodynamic settings.

Keywords—Porous Materials, Aerodynamic Noise Reduction, Blade-Vortex Interaction Noise, Bio-Inspired Design, Turbulence-Wing Interaction

::: PAPER ID: 36 :::

MACHINE LEARNING DRIVEN ENTERPRISE BUSINESS INTELLIGENCE REFACTORIZING AND DYNAMIC ADAPTATION

Yong-Jie Wu, Shen Wu, Jiang Jiang
Guangdong Power Grid Co., Ltd., CSG, Guangzhou 510030, China
Jiayin Yu, Zi-Zhen Li

Management Science Research Institute of Guangdong Power Grid Co., Ltd., Guangzhou 510050, China

13922720326@139.com, Jiayin, m3gz9m@163.com, angjiang@gd.csg.cn, ucpc81@163.com, kloofwind@hotmail.com

Abstract—In the context of extending cross enterprise collaboration to the product and service field, traditional frameworks are unable to meet the needs of multi-agent collaboration, business hierarchical management, and dynamic process operation, this study carries out machine learning driven enterprise business intelligence reconstruction and dynamic adaptation model construction. A 3D BPM framework based on machine learning has been developed, which integrates manufacturing and service entities, layers business objects, and integrates AI throughout the entire process to achieve cross organizational collaboration and intelligent management. The research results show that BDAIM is significantly better than comparative models such as IBPOIM and DSCADM in terms of classification error rate, RMSE, and recall rate; In enterprise applications, the inventory turnover rate of large manufacturing enterprises has increased from 2.87 times/year to 4.13 times/year (+43.90%), the order fulfillment rate has increased by 16.93%, the customer churn rate of large retail enterprises has decreased by 39.97%, the marketing input-output ratio has been optimized by 45.39%, the production efficiency of electronic product manufacturing enterprises has increased by 25.76%, and the monthly equipment downtime has decreased by 56.31%. This study provides intelligent solutions for enterprise business intelligence reconstruction and provides methods and practical references for multi domain digital transformation.

Keywords—Artificial intelligence, Machine learning, Business intelligence reconstruction, Dynamic adaptation, BDAIM

::: PAPER ID: 37 :::

ASSESSING CLOUD COMPUTING ADOPTION IN THE MALAYSIAN HEALTHCARE INDUSTRY BASED ON IT CAPABILITY

Normilah Mohd Noh
School of Digital Health KPJ Healthcare University Nilai 71800, Malaysia
Hasimi Sallehudin, Nurhizam Safie Mohd Satar

Faculty of Information Science and Technology Universiti Kebangsaan Malaysia Bangi 43600, Malaysia

Nur Azaliah Abu Bakar
Razak Faculty of Technology and Informatics Universiti Teknologi Malaysia Kuala Lumpur 54100, Malaysia

Ahmad Firdause Md Fadzil
Faculty of Economy and Management Science Universiti Sultan Zainal Abidin Kuala Terengganu 21300, Malaysia

Farashazillah Yahya
Faculty of Computing and Informatics Universiti Malaysia Sabah Kota Kinabalu 88400, Malaysia

ucn.normilah@kpju.edu.my, hasimi@ukm.edu.my, nurhizam@ukm.edu.my, azaliah@utm.my, firdause@unisza.edu.my, fara.yahya@ums.edu.my

Abstract—Cloud computing has rapidly evolved into a central pillar of modern Information Technology (IT) ecosystems. Across diverse sectors, including healthcare, organizations are progressively migrating systems and applications to cloud environments to enhance operational efficiency. Guided by the Resource-Based View (RBV) theory, this study investigates how IT capabilities shape cloud computing adoption within Malaysia's healthcare sector. Data were gathered from 265 respondents representing 127 healthcare institutions and analyzed using Partial Least Squares-Structural Equation Modeling (PLS-SEM). Findings indicate that among the dimensions of IT capability, managerial capability has the most substantial influence on adoption, followed by technical and relational capabilities. The study advances understanding of the strategic drivers of cloud adoption and provides practical insights for healthcare organizations seeking to strengthen IT capability for effective cloud integration and improved digital transformation outcomes.

Keywords—cloud computing, adoption, healthcare, Resource-based view/theory, (RBV), Partial least squares-structural equation modeling

:: PAPER ID: 38 ::

ENHANCED TURBULENCE CHARACTERISTICS IN DUAL PULSATING JETS USING HOT-WIRE ANEMOMETRY

Rozli Zulkifli, Shahrir Abdullah

Department of Mechanical and Manufacturing Engineering, Faculty of Engineering and Built Environment,
Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor, Malay

Kamaruzzaman Sopian

Department of Mechanical Engineering, Universiti Teknologi Petronas, Seri Iskandar, Perak, Malaysia

rozlizulkifli@ukm.edu.my, shahrir@ukm.edu.my, ksopian@utp.edu.my

Abstract—Jet impingement is a widely utilized technique in thermal management systems due to its high heat transfer efficiency. This study investigates the enhancement of heat transfer performance using twin pulsating air jets, with a particular focus on the interference zone where the jets interact and induce elevated turbulence levels. The research aims to characterize both the flow and thermal behavior under varying operational parameters, including Reynolds number, pulse frequency, nozzle spacing, nozzle-to-plate distance, and phase difference angle between the jets. Experiments were conducted at Reynolds numbers of 5000 and 9000. Jet velocity was measured using a constant temperature anemometry system, while heat flux and surface temperature were obtained using a micro-foil heat flux sensor. Results show significant jet deflection and strong vortex formation at a 90° phase angle, leading to a peak turbulence intensity of 147% within the interference zone. The Nusselt number was found to be highly sensitive to phase angle, with a maximum value of 104.36 observed under optimal conditions. Under these conditions, twin pulsating jets achieved up to a 52% increase in Nusselt number and an overall heat transfer enhancement of 83%. These findings demonstrate the potential of pulsating twin jets to substantially improve flow dynamics and thermal performance in jet impingement applications.

Keywords—Jet Impingement, Heat transfer, Thermal Management System, Pulse Jet, Nusselt number

:: PAPER ID: 40 ::

OPTIMIZING SECURITY AUTOMATION IN DevSecOps: EVALUATING THE EFFECTIVENESS OF SCA, SAST, DAST, AND CONTAINER SCANNING IN AN INTEGRATED VULNERABILITY MANAGEMENT SYSTEM

Faza Muhandisa Asro, Hamonangan Situmorang

Program Studi Teknik Telekomunikasi Institut Teknologi Bandung Bandung, Indonesia

fazaasro@gmail.com, monang@stei.itb.ac.id

Abstract—In the rapidly evolving digital era, software applications underpin various facets of life, making application security an absolute necessity rather than an option. DevSecOps emerges as an innovative solution, integrating security practices into every stage of the software development lifecycle (SDLC) to enable early vulnerability detection and mitigation. This research explores and implements a comprehensive DevSecOps pipeline for modern web applications built with Go, Node.js, and Python. The focus is on security automation using robust open-source tools: OSV-Scanner for Software Composition Analysis (SCA) to analyze dependencies, Bearer and Gosec for Static Application Security Testing (SAST) to analyze source code, Trivy for Container Scanning to identify vulnerabilities in container images, and OWASP ZAP for Dynamic Application Security Testing (DAST) to test running applications. The findings from these security tests are aggregated and analyzed using DefectDojo, an open-source vulnerability management platform, providing comprehensive visibility into the application's security posture. The implementation leverages cloud infrastructure on DigitalOcean for scalability and flexibility, with Cloudflare managing domains and providing additional security layers. This study aims to provide valuable insights into integrating security automation into DevSecOps pipelines to enhance web application security, serving as a guide for developers and security teams adopting DevSecOps practices.

Keywords—DevSecOps, Security Automation, Vulnerability Management, SCA, SAST, DAST, Container Scanning, DefectDojo, Kubernetes, Open-Source Security Tools

:: PAPER ID: 41 ::

OPTIMIZED INTEGRATION OF RENEWABLE ENERGY SYSTEMS USING CHAOTIC OPTIMIZATION IN DISTRIBUTION SYSTEMS

Muhammad Suhail Shaikh, Dong Xiaoping, Chunwu Wang, Chang Wang, Senlin Xie, Haoyue Lin
School of Physics and Electronic Engineering Hanzhou Normal University Chaozhou, Guangdong 521000, China

suhail.shaikh@live.com, dxqzq@hstc.edu.cn, wangchunwu@hstc.edu.cn,
wchang@hstc.edu.cn, senlinxie@hstc.edu.cn, linhao@hstc.edu.cn

Abstract—Renewable energy system (RES) plays an important role in greenhouse gas emissions reduction. However, one major problem is that RSS is located far away from the load center, which leads to increased energy losses during transmission. To address this issue, an active distribution network that combines wind energy and solar energy-based distributed generation is proposed to enhance the voltage profile and minimize energy losses. This network design includes the reactive power compensation modeling for solid-state transformers (SST) of a three-stage SST. To effectively manage variability in RES, a model is developed using the K-medoids algorithm (KMA). This model is further evaluated on different test systems are considered to determine the effect of SST with distributed generation (DG) technologies, such as wind turbines (WT), solar panels (PV), and batteries. A Gorilla Troop Optimization Algorithm (GOA) based on the chaotic search method (cGTO) is analyzed for the optimal solution of SST installations within a radial distribution network, focusing on enhancing the voltage profile and minimizing energy losses. The cGTO considers SST parameters, along with the placement and number of WTs and other units added to the system. It also includes power flow analysis that incorporates losses from both the distribution transformer (DT) and the SST to solve the active distribution network problem.

Keywords—Renewable Energy, Solar and Wind, Optimization, Voltage Profile

:: PAPER ID: 42 ::

AUTOMATED INFORMATION EXTRACTION AND TEXT SUMMARIZATION OF IBL NEWS USING IndoBERT and BART

Daniel Jahja Surjawan
Faculty of Smart Technology and Engineering Maranatha Christian University Bandung, Indonesia
William Budianto, Viny Christanti Mawardi
Faculty of Information Technology Tarumanagara University Jakarta, Indonesia

daniel.js@it.maranatha.edu, wb21012003@gmail.com, viny@untar.ac.id

Abstract—This study discusses the application of Named Entity Recognition (NER) using the IndoBERT-base-pl model for the Indonesian basketball domain, specifically the Indonesian Basketball League (IBL). The aim of this research is to develop an NER system capable of identifying critical information such as players, teams, locations, scores, and match times from news article data related to the IBL. The data used in this study consists of match statistics, including player names, teams, play durations, points scored, rebounds, assists, and other relevant metrics. The methodology involves data extraction using BIO tagging, training the IndoBERT-base-pl model, and evaluation through precision, recall, and F1-score metrics. The results indicate that the IndoBERT-based NER system is highly effective in accurately identifying and structuring statistical information, contributing significantly to the processing of sports data in Indonesia.

Keywords—IBL news, information extraction, named entity recognition, natural language processing

:: PAPER ID: 44 ::

ENERGY MANAGEMENT FOR BMS WITH AUTO RECLOSURE RCCB/MCB

Rosilah Hassan, Faizan Qamar, Zhiyi Cui

Centre for Cyber Security Faculty of Information Science and Technology Universiti Kebangsaan Malaysia Bangi, Malaysia

Arbaiah Inn, Nur Sumayyah Ahmad, Mohamad Hafiz Zakaria

Centre for Diploma Studies School of Professional and Continuing Education (SPACE)Universiti Teknologi Malaysia Kuala Lumpur, Malaysia

rosilah@ukm.edu.my, arbaiah.kl@utm.my, sumayyah@utmpace.edu.my, mhafizzack911@gmail.com

Abstract—Electrical faults, such as overcurrent and short circuits, often lead to unexpected service interruptions and pose potential hazards. This study develops a smart auto reclosure mechanism for Residual Current Circuit Breakers (RCCB) and Miniature Circuit Breakers (MCB) that aims to improve the safety, efficiency, and reliability of electrical distribution systems. The proposed system leverages the capabilities of the Arduino microcontroller platform to monitor real-time electrical parameters through current and voltage sensors. In the event of a fault, the system automatically trips the breaker and simultaneously initiates a fault data logging process via Google Spreadsheet integration. For communication and remote access to system data, the system is equipped with a Wi-Fi module, enabling seamless synchronization with online services and allowing real-time updates and control through the internet. Additionally, an Android-based mobile application has been developed to enhance user interaction by providing real-time monitoring, system status updates, and historical data analytics. The implementation of this smart auto reclosure mechanism offers a practical and scalable solution for reducing downtime and improving operational continuity, particularly in mission critical and remote-area applications.

Keywords—auto reclosure, RCCB, MCB, Google Spreadsheet, Wi-Fi

:: PAPER ID: 46 ::

UNDERSTANDING USER PERSPECTIVES AND PREFERENCES ON BUS AND SHUTTLE: A HUMAN-CENTERED DESIGN APPROACH TO ATTRACT NEW USERS: TIKET.COM STUDY

Ashari Muhammad Hisbulloh, Rini Setiawati, Riyan Leandros

Information Systems Department BINUS Online Bina Nusantara University Jakarta, Indonesia, 11480

ashari.hisbulloh@binus.ac.id, rini.setiawati@binus.ac.id, riyan.leandros@binus.ac.id

Abstract—Tiket.com is a prominent online travel platform that offers a seamless booking experience by providing a broad range of services, including bus and shuttle ticket reservations. The platform's user interface enables travelers to compare available options, apply filters according to personal preferences, and view real-time availability, thereby streamlining the booking process and enhancing usability. These features are designed to support efficient decision-making and provide a convenient travel planning experience. However, despite its generally user-friendly design, the bus and shuttle booking service still presents challenges. Users often encounter difficulties in identifying reputable bus operators (POs) and in assessing the expected level of comfort prior to purchase. Such limitations can affect user confidence and may lead to hesitation in completing bookings. Addressing these issues presents an opportunity for Tiket.com to further improve the quality, reliability, and overall satisfaction of its bus and shuttle booking service. This research analyzes user behavior and challenges in using Tiket.com's bus and shuttle services. Using ethnography, contextual interviews, and System Usability Scale (SUS) testing with 100 users, the study identifies areas for UX improvement. Despite a good SUS score of 74.67, the research suggests enhancements to interface appearance and functionality to further increase user satisfaction.

Keywords—online travel agents, buses, user experience, ethnography, SUS

:: PAPER ID: 52 ::

EXPLORING THE IMPACT OF IN-CONTEXT LEARNING AND FEW-SHOT DEMONSTRATIONS
ON NUCLEAR MATERIAL ENTITY NORMALIZATION IN NAMED ENTITY RECOGNITION

Nur Fatini Abdul Ghani, Nazlia Omar

CAIT, Faculty of Information Science and Technology Universiti Kebangsaan Malaysia Bangi, Malaysia

fatini48@gmail.com, nazlia@ukm.edu.my

Abstract—This paper explores the impact of In-Context Learning (ICL) and Few-Shot Learning (FSL) with instruction-tuned large language models (LLaMA-3, Mistral, and Gemma) to improve nuclear material normalization in Named Entity Recognition (NER). The study examines how well-crafted prompts, incorporating structured instructions and a limited number of demonstration examples, can guide the model in recognizing and normalizing nuclear materials across diverse textual representations. Results show that ICL, with as few as three demonstrations, significantly improves normalization accuracy, achieving over 90% accuracy in extracting and handling material entities. However, challenges remain for entities with highly variable representations, indicating that the current prompts and demonstrations do not fully cover all necessary transformation patterns. These findings underscore the importance of refining both prompt design and demonstration examples to ensure effective normalization across diverse entity variations. Nonetheless, this approach provides a practical foundation for semi-automated annotation tools in specialized and low resource domain.

Keywords—In-Context Learning, Few-shot Learning, Nuclear Material, Entity Normalization

:: PAPER ID: 53 ::

PUDAL ENGINE AND V-MODEL: THE FOUNDATION OF SMART MANAGEMENT FRAMEWORK
FOR HIGHER EDUCATION ACCREDITATION

Daniel Jahja Surjawan

School of Electrical Engineering and Informatics Bandung Institute of Technology Faculty of Smart Technology and Engineering Maranatha Christian University Bandung, Indonesia

Armein Z. R. Langi, Jaka Sembiring, Albarda Albarda

School of Electrical Engineering and Informatics Bandung Institute of Technology Bandung, Indonesia

daniel.js@it.marathanatha.edu, armein.z.r.langi@stei.itb.ac.id, jaka@itb.ac.id, albarda@itb.ac.id

Abstract—Higher Education Institutions (HEIs) globally face increasing pressure to balance traditional academic values with the demands of digital transformation and stringent accreditation standards. This paper proposes a novel Smart Management Framework (SMF), underpinned by the smart engineering paradigm, designed to enhance quality assurance and optimize the PPEPP (Penetapan/Planning, Pelaksanaan/Implementation, Evaluasi/Evaluation, Pengendalian/Control, and Peningkatan/Improvement) cycle for accreditation compliance. At its core, the framework introduces a unique PUDAL (Perception, Understanding, Decision, Action, Learning) engine, functioning as the cognitive intelligence that enables the system to be context-aware, adaptive, and capable of autonomous learning from accreditation data. Developed using a holistic methodology, including a 4-layer ASTF (Application, System, Technology, Fundamental) architecture and a V-Model engineering process, the SMF provides a systematic, data-driven approach to strategic decision-making. Initial results demonstrate the feasibility of automated data collection and restructuring from diverse sources, laying a crucial foundation for the framework's capabilities. This research contributes to a systematic, technology-based solution that specifically addresses the challenges of data fragmentation and administrative burdens while offering a proactive pathway for continuous quality improvement in higher education. The framework's key novelty lies in its integration of the PUDAL engine with the PPEPP cycle, presenting a significant paradigm shift from traditional, reactive quality assurance models.

Keywords—Accreditation, higher education, PPEPP cycle, quality assurance, smart engineering, smart management framework

::: PAPER ID: 54 :::

MALAYSIA'S COVID-19 VACCINATION IMPACT: A VISUALIZATION AND REGRESSION ANALYSIS OF CASES AND MORTALITY

Qian Peng

School of AI and Advanced Computing Xi'an Jiaotong-Liverpool University Suzhou, China

Geyu Liu

School of Data Science The Chinese University of Hong Kong, Shenzhen Shenzhen, China

Sien Lu, Yuanzhe Cai

College of Big Data and Internet, College of Engineering Physics Shenzhen Technology University Shenzhen, China

Feijuan Huang

Shenzhen Institute of Geriatrics Shenzhen Second People's Hospital Shenzhen, China

Xingang Bao, Fadilla'Atyka Nor Rashid, Suhaila Zainudin

Faculty of Information Science and Technology (FTSM) Universiti Kebangsaan Malaysia Bangi, Malaysia

qianpeng.sz@outlook.com, 123090351@cuhk.edu.cn, 2906508030@qq.com, caiyuanzhe@sztu.edu.cn,
huangfeijuan@163.com, pl44252@siswa.ukm.edu.my, fadilla.atyka@gmail.com, suhaila.zainudin@ukm.edu.my

Abstract—This study provides a comprehensive analysis of the COVID-19 pandemic in Malaysia, emphasizing the impact of vaccination campaigns on the epidemic's progression. The analysis uses official and validated data from trusted government sources, including the Crisis Preparedness and Response Centre (CPRC), the MySejahtera system, and the Ministry of Health Malaysia (MoH), covering the period from January 2021 to May 2025. Initially, multimodal visualization techniques—such as time-series plots, scatter plots with regression lines, and stacked area charts—are employed to illustrate trends in new cases, deaths, and vaccination rates. Subsequently, Ordinary Least Squares (OLS) regression is applied to quantify the association between vaccination progress and daily new cases and deaths. OLS regression was chosen for its simplicity, interpretability, and suitability for identifying linear relationships, despite the time-series nature of the data. The results highlight a nuanced relationship: vaccination efforts significantly reduced COVID19 mortality but were not directly linked to a decrease in new cases. This complexity arises from factors like the emergence of highly transmissible variants (Delta and Omicron) and the timing of vaccine rollout campaigns. These findings offer valuable insights for public health decision-makers to optimize vaccination strategies, focus interventions on high-risk groups, and enhance healthcare system readiness for future outbreaks.

Keywords—COVID-19, vaccination rates, data visualization techniques, Ordinary Least Squares regression, pandemic dynamics, Malaysia, healthcare utilization, public health interventions

::: PAPER ID: 55 :::

FINE-TUNING KOMODO MODEL WITH LoRA FOR SENTIMENT ANALYSIS OF YOUTUBE COMMENTS

Viny Christanti Mawardi, Edward Thomas Alexander

Faculty of Information Technology Tarumanagara University Jakarta, Indonesia

Daniel Jahja Surjawan

Faculty of Smart Technology and Engineering Maranatha Christian University Bandung, Indonesia

viny@fti.untar.ac.id, edward.535210102@stu.untar.ac.id, daniel.js@maranatha.ac.id

Abstract—The rapid development of digital technology has made online platforms such as YouTube increasingly significant in the education sector, serving not only as a medium for disseminating knowledge but also as an interactive space for exchanging opinions through the comment section. With more than 2.1 billion active users worldwide, YouTube comments provide a vast source of information about users' emotional responses and opinions, making them highly valuable for sentiment analysis. This research introduces a web application built with Streamlit, specifically developed to conduct sentiment analysis on YouTube comments. The system incorporates several key processes, including data scraping from YouTube using the API, data preprocessing, and sentiment classification. A Large Language Model, Komodo-7B, was employed and finetuned using a dataset comprising 2,000 manually categorized comments into positive, neutral, and negative sentiments. The fine-tuning process utilized the Low-Rank Adaptation (LoRA) method, which effectively improves memory efficiency while maintaining high accuracy in classification tasks. The dataset was divided into training and validation sets with an 80:20 ratio to ensure robust model evaluation. The model demonstrated a consistent improvement in accuracy during training, achieving up to 91% accuracy by the third checkpoint, highlighting its potential for practical sentiment analysis applications on social media content.

Keywords—komodo-7b, lora, sentiment analysis, streamlit, youtube comments

:: PAPER ID: 57 ::

INTELLIGENT CLINICAL DIALOGUE ASSISTANT: ENHANCING DOCTOR-PATIENT ANAMNESIS THROUGH LLM-POWERED REAL-TIME SYMPTOM ANALYSIS

Yoenie Indrasary

Doctoral Program of Electrical Engineering and Informatics School of Electrical Engineering and Informatics Institut Teknologi Bandung Bandung, Indonesia Politeknik Negeri Banjarmasin Banjarmasin, Indonesia

Metty Verasari

Universitas Mercu Buana Yogyakarta Yogyakarta, Indonesia Division of Research of Clinical Psychology Association Region Yogyakarta Yogyakarta, Indonesia

Ary Setijadi, Rahadian Yusuf

School of Electrical Engineering and Informatics Institut Teknologi Bandung Bandung, Indonesia

Wafa Nurfatimah Shalihah

Medical Study Program Medicine Faculty Universitas Lambung Mangkurat Banjarmasin, Indonesia

Siti Kustini, Isna Wardiah, Khairunnisa

Electrical Engineering Department Politeknik Negeri Banjarmasin Banjarmasin, Indonesia

33221303@std.stei.itb.ac.id, metty@mercubuana-yogya.ac.id, asetijadi@lsmk.itb.ac.id, yrahadian@itb.ac.id, shalihahwafall@gmail.com, kustini@poliban.ac.id, isnawardiah@poliban.ac.id, khairunnisa.poliban@gmail.com

Abstract—Conventional physician history taking for patients faces several key challenges: the failure to capture key symptoms, limited time, and communication gaps. Although several AI-assisted tools have been developed, none have addressed these key challenges. This study proposes the use of LLM to help generate response questions and tag key information required for the history taking, such as symptoms, medication history, genetic disease history, and allergy history. The system was validated in two healthcare settings: an emergency room and a general clinic, by comparing it to information generated through conventional history taking. The use of an intelligent assistant for history taking demonstrated strengths in the in-depth investigation of chief complaints and systematic allergy screening, but still presented limitations in the exploration of medication history and pain scale exploration. The preliminary results of this comparative study demonstrate the potential for intelligent assistants to mitigate challenges encountered in the conventional history taking process.

Keywords—Clinical Dialogue Assistant, DeepSeek-R1LLM, Real-Time Anamnesis, Symptom Tagging, Medical Microservice Architecture

:: PAPER ID: 58 ::

A HYBRID BINARY ARTIFICIAL BEE COLONY ALGORITHM FOR THE MINIMUM DOMINATING SET PROBLEM IN WIRELESS SENSOR NETWORK

Lina Talib, Faizan Qamar, Ravie Chandren Muniyandi, Syed Hussain Ali Kazmi

Center for Cyber Security Faculty of Information Science and Technology, Universiti Kebangsaan Malaysia(UKM) Bangi, Selangor, Malaysia

Tan Siok Yee

Center for Artificial Intelligence Technology, Faculty of Information Science and Technology, Universiti Kebangsaan Malaysia (UKM), Bangi, Selangor, Malaysia

p138306@siswa.ukm.edu.my, faizanqamar@ukm.edu.my, ravie.chandren@uniten.edu.my, P112235@siswa.ukm.edu.my, esther@ukm.edu.my

Abstract—A dominating set in a network is a group of nodes where every other node is either included in the set or directly connected to one of its members. The Minimum Dominating Set (MDS) problem seeks the smallest such group, which is an NP-hard problem with practical relevance in Wireless Sensor Networks (WSNs). Solving MDS in WSNs helps reduce energy consumption, balance node activity, and extend network lifetime. In this work, we propose a Hybrid Binary Artificial Bee Colony (HBABC) algorithm that adapts the Artificial Bee Colony (ABC) method for binary spaces and enhances local search with Late Acceptance Hill Climbing (LAHC). We tested the algorithm on Unit Disk Graph (UDG) benchmarks with different network sizes, ranges, and densities. Each setup was executed thirty times. In these tests, HBABC produced smaller dominating sets than standard ABC and other baselines, with improvements reaching 78.5% in some cases. These results show the method can save energy and improve stability, which makes it useful for IoT-based WSN applications.

Keywords—Minimum Dominating Set, Wireless Sensor Networks, Artificial Bee Colony, Binary Optimization, Hybrid Metaheuristics, Local Search

::: PAPER ID: 59 :::

PERFORMANCE COMPARISON OF DEEP Q-NETWORK VARIANTS IN NETWORK SLICING RESOURCE OPTIMIZATION

Zhiyi Cui, Faizan Qamar, Syed Hussain Ali Kazmi, Khairul Akram Zainol Ariffin

Center for Cyber Security, Faculty of Information Science and Technology Universiti Kebangsaan Malaysia, Selangor, Malaysia

Fazlina Mohd Ali, Rimaniza Zainal Abidin

Center for Software Technology and Management, Faculty of Information Science and Technology Universiti Kebangsaan Malaysia (UKM), Bangi, Selangor, Malaysia

p132149@siswa.ukm.edu.my, faizanqamar@ukm.edu.my, P112235@siswa.ukm.edu.my, k.akram@ukm.edu.my, fazlina.mohdali@ukm.edu.my, nizazainal@ukm.edu.my

Abstract—As a key enabling technology for 5G and future networks, network slicing can meet diverse service requirements through flexible resource allocation mechanisms. However, the dynamics and heterogeneity of slicing requests pose a serious challenge to the efficiency of resource management. In recent years, Deep Reinforcement Learning (DRL) has been widely regarded as a promising solution to the dynamic optimization problem of network resources, due to its ability to learn adaptive policies and perceive the environment. In this paper, three representative DRL algorithms, Deep Q-Network (DQN), Double DQN (DDQN) and Preferential Experience Replay DQN (PER-DQN), are selected for a systematic performance comparison study. By constructing a simulation environment based on Markov Decision Process (MDP), the resource competition, demand fluctuation and interference factors among slices were considered. Under a unified experimental framework, the same neural network structure and training parameters are set, and the performance of the three algorithms under different slice sizes is evaluated. The comparison indicators include cumulative reward, resource utilization, service delay and demand satisfaction. The training results show that PER-DQN achieves the best performance under all evaluation metrics, and DQN is slightly better than DDQN, but with little difference. The research results can provide a reference for the selection and optimization of intelligent resource management algorithms in future network slicing.

Keywords—5G, network slicing, resource allocation, deep reinforcement learning, optimization

::: PAPER ID: 60 :::

A Comparative Evaluation of Moodle-Based Learning Management System in Malaysian Public Universities Using a Refined SCTL Framework

Nurhidayah Bahar, Zulkefli Mansor, Dian Indrayani Jambari, Sabrina Tiun, Nur Syahirah Nabilah Shahril

Faculty of Information Science & Technology Universiti Kebangsaan Malaysia Bangi, Malaysia

Farzana Parveen Tajudeen

Faculty of Business and Economics Universiti Malaya Kuala Lumpur, Malaysia

nbahar@ukm.edu.my, kefflee@ukm.edu.my, dian@ukm.edu.my, sabrinatiun@ukm.edu.my, nsnabilah1803@gmail.com, farzanatajudeen@um.edu.my

Abstract—A dominating set in a network is a group of nodes where every other node is adjacent to at least one node in the dominating set. This study examines and compares the functions and features available in Moodle-based Learning Management System (LMS) platforms at two Malaysian public universities using selected criteria from the Software Quality and Teaching-Learning (SCTL) framework. These criteria include accessibility, communication tools, learning tools, and productivity tools. This study set out two research objectives: first, to observe and document the availability and configuration of selected LMS features, and second, to compare the functionality and user experience of the platforms from a student perspective. This study employs qualitative comparative case study approach. The study involved assisted system walkthroughs conducted with final-year students from each university. The findings reveal that while core features related to accessibility, communication, learning, and productivity are generally available across both LMS platforms, some asynchronous tools are missing or underutilized. Even when certain configurable tools are present, they are not fully exploited within the observed courses. The study contributes both theoretically and practically. Theoretically, it extends the application of the SCTL framework to a comparative context, highlighting how institutional differences influence the effective use of LMS features. Practically, the findings offer insights for university administrators and LMS support teams seeking to optimize platform configurations and provide targeted training to enhance digital learning experiences. These insights can guide further research aimed at closing the gap between available MS functionality and actual usage in diverse educational settings.

Keywords—Moodle, learning management systems, higher education technology, comparative case study

:: PAPER ID: 61 ::

ENHANCING UNIVERSITY STUDENT MENTAL HEALTH THROUGH AI-DRIVEN PERSONALIZED BIBLIOTHERAPY

Kinn Abass Bakon, Tines Subramaniam, Lilysuriazna Raya, Zulaika Sauid

Faculty of Information Science and Engineering Management and Science University Section 13, 40100 Shah Alam, Selangor

Nur Fazidah Elias

Faculty of Information Science and Technology Universiti Kebangsaan Malaysia, Bangi Selangor

kinn_abass@msu.edu.my, tines0910@gmail.com, lilysuriazna@msu.edu.my,
zulaika_sauid@msu.edu.my, fazidah@ukm.edu.my

Abstract—The growing mental health challenge among higher education students, exacerbated by global conditions and compounded with the inaccessibility and stigmatization of traditional care, necessitates new and scalable solutions. While existing electronic mental health services are available, there is an absence of therapeutic richness and personalization required to address users' emotional needs. This work offers, a novel bibliotherapy system based on AI specifically designed to answer that indispensable need by offering customised book suggestions in real time. With a sophisticated architecture founded upon Natural Language Processing (NLP) and a hybrid recommender system, the system embeds pre-trained deep learning networks such as BERT and Gemini to read and decipher subtle conditions of emotion from engagements with users. This enables the platform to dynamically match users with evidence-based therapeutic reading material. This is a significant evolution from the static book lists and script-based dialogues of conventional digital tools. Developed through an iterative, user-centric Spiral Model with validation from students and mental health experts, the platform's efficacy was empirically tested in a pilot study with 81 respondents. Results demonstrate a high average user satisfaction of 4.45 out of 5, with the relevance of the personalized recommendations rated at 4.29 out of 5. These findings validate the proposed prototype as a credible, scalable, and effective mental health solution that reimagines bibliotherapy for a digitally connected generation, laying a robust foundation for future interventions.

Keywords—Bibliotherapy, Digital Therapeutics, Artificial Intelligence in Mental Health, Natural Language Processing (NLP), Large Language Models (LLMs), BERT, Hybrid Recommendation Systems, Student Mental Health

:: PAPER ID: 62 ::

THE APPLICATION OF LIFELONG LEARNING ALGORITHM IN SOFTWARE EFFORT ESTIMATION

Xin Xiong

Faculty of Information Science & Technology Universiti Kebangsaan Malaysia Bangi, Malaysia

Zulkefli Mansor

Center for Software Technology and Management Universiti Kebangsaan Malaysia Bangi, Malaysia

PI41311@siswa.ukm.edu.my, kefflee@ukm.edu.my

Abstract—In view of the poor adaptability of existing software cost estimation methods in various software development methodologies, this study proposes a multi-task divide-and-conquer estimation framework based on continuous learning to enhance the generalization ability and memory retention ability of the model in heterogeneous tasks. The framework constructs a unified feature representation and incorporates a continuous learning mechanism, and systematically compares three representative strategies: progressive neural network, experience replay with limited sample memory, and elastic weight integration achieved through regularization. Experiments are conducted on the International Software Benchmark Standard Group dataset, where multiple task sequences are constructed based on different development methodologies and evaluated using standardized preprocessing procedures and performance indicators such as root mean square error, mean relative error, determination coefficient, and prediction accuracy within 20% relative error. The results show that the progressive neural network method has the best performance, almost completely retains the prior task knowledge, and maintains a stable accuracy in various tasks; the experience replay method performs second with a moderate degree of retention; and the elastic weight integration has the worst performance due to the obvious forgetting effect. This study provides an effective example for applying continuous learning to software cost estimation in multi-task scenarios, and provides valuable inspiration for theoretical progress and practical deployment.

Keywords—continue learning, software effort estimation, machine learning, software engineering, prediction models, catastrophic forgetting, rehearsal-based method, regularization-based methods, parameter isolation

:: PAPER ID: 64 ::

SECURE DATA HIDING AND TRANSMISSION UTILIZING MULTI-LAYERED CRYPTOGRAPHIC AND STEGANOGRAPHIC TECHNIQUES WITH HIGH CAPACITY

Murad Njoun, Rossilawati Sulaiman, Zarina Shukur, Faizan Qamar

Center of Cyber Security, Faculty of Information Science and Technology, Universiti Kebangsaan Malaysia, 43600, Bangi, Selangor, Malaysia

PI12574@siswa.ukm.edu.my, rossilawati@ukm.edu.my, zarinashukur@ukm.edu.my, faizanqamar@ukm.edu.my

Abstract—The increasing sensitivity of information exchanged over digital networks necessitates improved security protocols that ensure confidentiality and concealment. Traditional methods often develop weaknesses in these areas. This paper presents a multi-layer communication scheme that integrates lossless data compression, double-stage encryption, and steganography to enhance security and concealment. The system uses Huffman coding for lossless data compression to reduce message size. The compressed data is then encrypted with a stream cipher generated by the Blum-Blum-Shub (BBS) pseudorandom number generator for confidentiality. The encrypted stream of bits is concealed in a cover image using a separate data structure, enhancing payload capacity. Simultaneously, the Huffman decompression header is encrypted using the Advanced Encryption Standard (AES) and concealed in a cover image using a novel steganographic method based on an AVL-tree data structure, enhancing imperceptibility and resisting steganalysis through efficient embedding. This solution leverages the strengths of Huffman coding for performance, BBS and AES for secrecy, separate hashing for enhancing capacity, and AVL-tree steganography for concealment, offering an end-to-end solution for secure and covert data communication. The encryption and steganographically hidden key provide an additional barrier to interception. Initial results demonstrate the transfer of substantial information with PSNR greater than 46, indicating high capacity, imperceptibility, and security over digital networks.

Keywords—Steganography, Cryptography, Huffman Coding, BBS, AES, AVL Tree, Separate Hashing, Imperceptibility, Capacity

:: PAPER ID: 66 ::

IMPROVED SECURITY AND EFFICIENCY OF AIRCRAFT BAGGAGE HANDLING MANAGEMENT SYSTEM USING SPRING-STRUTS2-HIBERNATE (SSH) FRAMEWORK

Jin Yuhao, Nur Hanis Sabrina Suhaimi, Nazhatul Hafizah Mohd Kamarudin, Fadilla Atyka Nor Rashid, Mohamad Kamrul Hasan, Azana Hafizah Mohamad Aman

Faculty of Information Science & Technology Universiti Kebangsaan Malaysia Bangi, Malaysia

p141291@siswa.ukm.edu.my, sabrinassuhaimi@ukm.edu.my, nazhatulhafizah@ukm.edu.my, fadilla@ukm.edu.my, mkhassan@ukm.edu.my, azana@ukm.edu.my

Abstract—The current Aircraft Baggage Handling Management System faces significant delays and inefficiencies, disrupting airport operations and passenger satisfaction. Existing automated solutions struggle to manage real-time data processing, and the complex demands of modern airports. To address these issues, this paper proposes a user-friendly, secure, and efficient baggage handling system. The system will adopt the SSH (Spring+Struts2+Hibernate) framework to ensure robust data security and seamless module integration. SQL Server will be used for stable database management, while MyEclipse will streamline system development. Hbuilder X will support the design of an intuitive user interface, and Navicat will enable efficient visual database management. Rigorous system testing will be conducted to validate its functionality, usability, and performance under real-world conditions. The system aims to improve baggage handling efficiency, reduce passenger wait times, lower operational costs, and enhance passenger and staff satisfaction. By addressing existing system limitations, it will set new benchmarks for airport service quality and operational excellence.

Keywords—Aircraft Baggage Handling Management System, airport management system, airport service personnel, baggage management

:: PAPER ID: 67 ::

AUTHENTIC DIE-CAST EMPOWERING COLLECTORS WITH DIGITAL WATERMARKING TECHNOLOGY

Taufiq Mohamad, Muhammad Faiz Hakimi Muhd Shepuan, Nur Atiqah Sia Abdullah,
Muhamad Ridhwan Mohamad Razali

School of Computing Sciences, Faculty of Computer and Mathematical Sciences Universiti Teknologi MARA40450
Shah Alam, Selangor, Malaysia

ahmadtaufiq@uitm.edu.my, faizhakimill.fh@gmail.com, atiqah684@uitm.edu.my, mridwan84@uitm.edu.my

Abstract—The increasing popularity of diecast collecting in Malaysia has led to a rise in fraudulent activities, including counterfeit sales and image theft on general e-commerce platforms. Existing platforms such as Facebook Marketplace and Carousell lack specialized security measures, leaving collectors vulnerable to scams. This study addresses these challenges by developing a secure, dedicated platform for diecast enthusiasts, integrating digital watermarking technology to enhance authenticity and protect diecast images from unauthorized use. This study explores the implementation of a hybrid digital watermarking approach using Discrete Cosine Transform (DCT) and Discrete Wavelet Transform (DWT) to embed and verify ownership of diecast images. The results demonstrate that the proposed solution successfully safeguards diecast images while maintaining high visual quality and security.

Keywords—digital watermarking, DCT, DWT, diecast

:: PAPER ID: 68 ::

ENCIRCLING DYNAMICS IN SWARM-BASED INTELLIGENT: TRENDS, CHALLENGES AND FUTURE DIRECTION

Wirawati Dewi Ahmad, Azuraliza Abu Bakar, Mohd Nor Akmal Khalid
CAIT, FTSM, Universiti Kebangsaan Malaysia, Bangi, Selangor Malaysia

p131968@siswa.ukm.edu.my, azuraliza@ukm.edu.my, akmal@ukm.edu.my

Abstract—Encircling strategy is a fundamental mechanism in swarm-based intelligent optimization algorithms, inspired by natural collective behaviors such as foraging and predation. It enables agents to move toward promising regions in the solution space by maintaining a critical balance between exploration and exploitation, thus improving the algorithm's ability to escape local optima and accelerate convergence. Particularly during the initialization phase, encircling plays a vital role in distributing agents effectively, ensuring both diversity and directional search toward global optimality. This study investigates the emerging trends, ongoing challenges, and prospective future directions related to the design and enhancement of encircling strategies in swarm-based metaheuristic algorithms. This study contributes a focused synthesis of key developments and offers a forward-looking perspective on how encircling strategies can be advanced to meet the increasing complexity of modern optimization challenges.

Keywords—encircling strategy, swarm intelligent, metaheuristic, optimization

:: PAPER ID: 69 ::

REAL-TIME FACIAL EXPRESSION DETECTION USING YOLOV12 ARCHITECTURE

Humaira Helen, Md. Uzzal Mia, Md. Sarwar Hosain, Md. Omar Faruk
Dept. of ICE, PUSTPabna, Bangladesh

Mohammad Kamrul Hasan, Ahmad Tarmizi Abdul Ghani,
Center for Cyber Security The National University of Malaysia Selangor, Malaysia
Rinku Islam
Dept. of CSE Varendra University Rajshahi, Bangladesh

humairahelen.160608@s.pust.ac.bd, uzzal.220605@s.pust.ac.bd, sarwar.ice@pust.ac.bd, fom_06@pust.ac.bd,
mkhasan@ukm.edu.my, atag@ukm.edu.my, rinku.vu.cse41@gmail.com

Abstract—Facial expression recognition (FER) plays a vital role in real-time emotion-aware systems, with applications in intelligence, healthcare, and human-computer interaction. However, ensuring both high accuracy and real-time performance remains challenging due to factors like lighting variations, occlusion, and dynamic expressions. To address this, we propose an enhanced version of the latest YOLOv12 model for real-time FER. The proposed model achieves 82.0% accuracy, outperforming CNN-based models while ensuring fast inference and low computational cost. It accurately detects expressions even in complex scenes. With its lightweight design and high efficiency, YOLOv12n is ideal for deployment on low-power devices. Experimental results confirm its superior trade-off between accuracy and speed, highlighting its potential for adaptive, real-world, emotion-aware systems.

Keywords—YOLOv12, facial expression, FER, Emotion Detection, attention mechanism

:: PAPER ID: 70 ::

ENHANCING ROBUSTNESS AND ACCURACY OF BONE-CONDUCTED SPEECH EMOTION RECOGNITION VIA TRANSFORMER MODELS

Md. Rifat Hossen, Md. Uzzal Mia, Md. Sarwar Hosain
Information and Communication Engineering Pabna University of Science and Technology Pabna, Bangladesh
Khairul Azmi Abu Bakar, Mohammad Kamrul Hasan
Center for Cyber Security The National University of Malaysia Selangor, Malaysia
Md. Najmul Hossain
dept. of ECE PUST Pabna, Bangladesh

rifat.220614@s.pust.ac.bd, uzzal.220605@s.pust.ac.bd, sarwar.ice@pust.ac.bd,
khairul.azmi@ukm.edu.my, mkhasan@ukm.edu.my, najmul.ru@gmail.com

Abstract—Speech Emotion Recognition (SER) enhances human-computer interaction by enabling systems to identify and respond to emotions in vocal expressions. This research presents a high-performance SER model based on the Wav2Vec2.0 transformer framework, fine-tuned with a custom dataset named audio EmoBon, created with bone-conducted (BC) speech from Malaysian speakers. The dataset features eight emotional categories and has undergone rigorous validation for high recording quality and accurate emotional representation. Our model utilizes raw audio input via a self-supervised transformer to automatically extract rich acoustic representations, eliminating feature engineering and enhancing generalizability across diverse acoustic conditions. Additionally, the audio Emobon dataset boosts emotional authenticity by simulating speech transmission through bone conduction. Our system achieves 99.06% accuracy, surpassing existing models on similar tasks. It performs excellently across all evaluation metrics, including macro and weighted precision, recall, and F1-score. ROC curve and confusion matrix analyses validate its ability to classify emotional states accurately while reducing misclassification. This study advances the SER field by integrating transformer-based learning with culturally relevant and physiologically informed speech data. The findings indicate that these models are feasible for Southeast Asian populations and practical applications like affective computing, mental health diagnostics, and intelligent virtual agents.

Keywords—Speech Emotion Recognition, Bone-Conducted Speech, Transformer Model, Deep Learning

:: PAPER ID: 71 ::

GCS-UNET: IMPROVED SWIN-UNET FOR MEDICAL IMAGE SEGMENTATION

Yifan Ouyang, Ashwaq Qasem

School of Artificial Intelligence and Robotics Xiamen University Malaysia Sepang, Malaysia

AIT2209084@xmu.edu.my, ashwaq.qasem@xmu.edu.my

Abstract—Recently, the U network structure based on tranformer has been widely used in various medical image segmentation tasks. Due to its excellent global modeling ability, it has excellent performance. However, there are still two shortcomings in this type of framework. One is that the simple patch embedding in the early stage leads to the weakening of information in the initial tokenization stage; the second is that the traditional skip connection is difficult to make up for the information lost in the deep decoding of the tranformer-based framework. This paper proposes GCS-UNet, a network based on Swin-Unet, which combines Global-Local Selective Attention (GLSA) to pre-integrate local and global information before patch embedding and introduces a Cross-Layer Alignment and Fusion Block (CLAFFB) instead of traditional skip connections to supplement the missing information. The combination of the two can effectively enhance the model's attention to local details and boundaries. In the experimental phase, the evaluation was carried out on the three brain tumor segmentation task datasets of BraTS 2019, 2020, and 2021. The results verified that the early global local enhancement and cross-scale attention connection have a synergistic effect, showing its good generalization ability and performance.

Keywords—Medical image segmentation, Swin Transformer, Global-Local Selective Attention, Cross-Layer Fusion

:: PAPER ID: 72 ::

EEG-BASED ATTENTION DETECTION IN DYNAMIC SETTINGS: A DEEP AND META-LEARNING APPROACH

Teddy Marcus Zakaria, Armein Z.R. Langi, Dimitri Mahayana

School of Electrical Engineering and Informatics Institut Teknologi Bandung Bandung, Indonesia

Isa Anshori

Biomedical Engineering Institut Teknologi Bandung Bandung, Indonesia

Muhamad Sophian Nazaruddin

Faculty of Multidisciplinary and Sustainability Studies i-CATS, University College Kuching, Sarawak, Malaysia

33224005@mahasiswa.itb.ac.id, azr.langi@gmail.com, dimitri@itb.ac.id,
isaa@staff.stei.itb.ac.id, sophian@icats.edu.my

Abstract—Attention detection is an important part of many fields, such as education, business, and health care. Electroencephalography (EEG) provides a non-invasive approach to assess brain activity associated with attention levels; nevertheless, a major problem is creating models that can accommodate the intrinsic individual heterogeneity in brain activity patterns. Variations among persons, ambient conditions, and emotional factors can significantly affect the precision of attention detection systems. This work proposes the creation of an adaptive artificial intelligence (AI) model designed to tackle these issues, with the objective of substantially improving the precision of attention detection through EEG data. The methodology encompasses EEG data gathering, rigorous signal preprocessing to reduce noise and artifacts, and the application of sophisticated deep learning algorithms, including Convolutional Neural Networks (CNN) and Long Short-Term Memory (LSTM). The research utilizes the ModelAgnostic Meta-Learning (MAML) algorithm, allowing the model to swiftly adjust to new data from various individuals with minimal fine-tuning, thereby enhancing the model's generalization abilities across diverse subject characteristics and facilitating a more personalized and responsive methodology. Metrics including accuracy, precision, recall, and F1-score are employed to evaluate the model's performance. The anticipated results suggest that an AI-driven adaptive methodology can significantly enhance attention detection precision relative to traditional techniques, rendering it exceptionally beneficial for practical applications like improving concentration in educational settings and assessing work-related weariness. This preliminary stage lays the foundation for subsequent developments in neurofeedback technology and EEG-driven human-machine interaction.

Keywords—adaptive model, attention detection, deep learning, EEG, initial research phase, meta-learning

::: PAPER ID: 73:::

THE ADVANCEMENT OF WI-FI 7 TECHNOLOGY: STANDARD AND CASE STUDY

Gaoyang Guo, Faizan Qamar, Khairull Akram Ariffin

Center for Cyber Security, Faculty of Information Science and Technology Universiti Kebangsaan Malaysia (UKM),
Bangi, Selangor, Malaysia

Tan Siok Yee

Center for Artificial Intelligence Technology, Faculty of Information Science and Technology, Universiti Kebangsaan
Malaysia (UKM), Bangi, Selangor, Malaysia

Fatin Filzahti Binti Ismail, Rimaniza Zainal Abidin

Center for Software Technology and Management, Faculty of Information Science and Technology
Universiti Kebangsaan Malaysia (UKM), Bangi, Selangor, Malaysia

PI61069@siswa.ukm.edu.my, faizanqamar@ukm.edu.my, k.akram@ukm.edu.my,
esther@ukm.edu.my, fatinfilzahti@ukm.edu.my, nizazainal@ukm.edu.my

Abstract—With the rapid development of education informatization, campus networks have become an indispensable infrastructure for colleges and universities. At the same time, with the rapid development of Internet technology and the popularity of smart devices, wireless networks have become an indispensable part of people's daily lives and work. Especially in environments such as university campuses, the demand for wireless networks is increasing daily for students and faculty. They need high-speed, stable, and reliable wireless networks to support learning, research, and daily communication. Traditional Wi-Fi technologies such as Wi-Fi 4(802.11n) and Wi-Fi 5 (802.11ac), while provided adequate network capacity and coverage over the past few years, but with the increase of high-bandwidth applications such as high-definition video streaming (4K, 8K video streaming), online conferencing, online collaborative office, virtual reality, and augmented reality, these networks are beginning to show their limitations. As the standard for the next generation of wireless local area networks, Wi-Fi 7 (802.11be) is expected to provide higher data rates, better performance, and lower latency than Wi-Fi 6. These improvements are crucial for college campuses because they can support more concurrent users, provide higher throughput, and better support high-bandwidth applications to meet the needs of teachers and students for large bandwidth, low latency, and high-quality campus networks. This paper discusses the development and standards of Wi-Fi 7 technology and conducts a case study based on the Wi-Fi 7 wireless campus network.

Keywords—Wireless Network, Wi-Fi 7, 802.11BE

::: PAPER ID: 74 :::

ENHANCING NETWORK SECURITY: HYBRID XGMB MODEL FOR INTRUSION DETECTION WITH INTELLIGENT FEATURE ENGINEERING

Shayla Islam

Institute of Computer Sciene and Digtial Innovation, UCSI University Malaysia, 56000 Kuala Lumpur, Malaysia

Phani Praveen S

Department of CSE Prasad V Potluri Siddhartha Institute of Technology Kanuru, Vijayawada, India.

Naga Deepti Ponnaganti

Department of CSE Sir C R Reddy College of Engineering Eluru, India

Sreenath Kocharla

Assistant Professor Department of CSE-AI Madanapalle Institute of Technology & Science, Madanapalle, India

Nurhizam Safie, Mohammad Kamrul Hasan

Faculty of Information Science and Technology, University Kebangsaan Malaysia, Bangi, Selangor, Malaysia

shayla@ucsiuniversity.edu.my, sppraveen@pvpsiddhartha.ac.in, deepthi.viggeswarapu@gmail.com,
kocharlasreenath@gmail.com, nurhizam@ukm.edu.my, mkhasan@ukm.edu.my

Abstract—Network intrusion detection is a very important component of cybersecurity that demands sophisticated methods to correctly distinguish between malicious and normal network traffic. The current study proposes a new hybrid model, XGMB, which combines the use of XGBoost and GBM in order to optimize intrusion detection efficiency and reduce false positives. Comprehensive data preprocessing including data cleaning, SMOTE-based balancing, and outlier removal via the IQR approach is employed in the methodology. Feature selection is conducted through the use of the Boruta algorithm in order to find the most salient features, enhancing model effectiveness. The XGMB model is trained and tested on the UNSW-NB15 dataset, exhibiting high performance with a 98.92% accuracy rate, beating conventional machine learning models like K-NN, Logistic Regression, SVM, and Neural Networks. Comparative analysis pinpoints the superiority of ensemble learning methods in network security, consolidating the robustness of boosting-based hybrid models. The findings highlight the need for effective feature engineering and model optimization in the discovery of dynamic cyber threats. The work contributes to intrusion detection system research through the design of a high-accuracy, scalable solution applicable in real-world settings. Future endeavors will involve optimizing real-time deployment, applying the model to multiclass classification, and incorporating deep learning models to further enhance detection in dynamic network environments.

Keywords—XGMB model, data preprocessing, feature selection, XGBoost, GBM, class imbalance, SMOTE, Logistic Regression, SVM, and Neural Networks

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HYBRID QNN FOR WEED OR CROP DETECTION USING DNN AND 2-QUBIT CIRCUITS

Firdaus Firdaus, Infall Syafalni, Nur Ahmadi, Nana Sutisna, Rahmat Mulyawan, Trio Adiono
School of Electrical Engineering and Informatics, Bandung Institute of Technology, Indonesia
Infall Syafalni, Nur Ahmadi, Nana Sutisna, Rahmat Mulyawan, Trio Adiono
University Center of Excellence on Microelectronics, Bandung Institute of Technology, Indonesia

13221013@mahasiswa.itb.ac.id, infall@ieee.org, nahmadi@itb.ac.id, nana.sutisna@staff.stei.itb.ac.id,
rahmat@staff.stei.itb.ac.id, tadiono@gmail.com

Abstract—This paper presents a comparative study of a classical Deep Neural Network (DNN) and a Hybrid Quantum Classical Neural Network for weed or crop detection. Two models are compared, the DNN is built from DenseNet121 model, whereas the HQNN model is built from DenseNet121 and 2qubit QNN architecture. Detection heads are also attached to both models. Both models were trained under 20 epochs by using the Adam optimizer with learning rate of 0.001. It resulted in overall performance that DNN model is better than the HQNN model. For the DNN, it resulted in F1-score of 0.9206, accuracy of 0.9216, mAP@0.5 of 0.5512 and mean IoU of 0.4425. On the other hand, the HQNN model resulted in F1-score of 0.8246, accuracy of 0.8347, mAP@0.5 of 0.5512, and mean IoU of 0.5512. The HQNN model only surpasses DNN in the mean IoU category. This study shows that HQNN has potential for certain tasks and cases.

Keywords—Hybrid Quantum-Classical Neural Network, Quantum Neural Network, DenseNet, Weed-Crop Detection, Object Detection

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COMPOUND ENCRYPTION ALGORITHM USING AES AND RSA FOR A SECURED PASSWORD MANAGER

Dahlila Putri Dahnil
Faculty of Information Science and Technology Universiti Kebangsaan Malaysia Bangi, Malaysia
Nur Azrina Amira Salehuddin, Wan Fariza Fauzi
Center for Software Technology and Management, FTSM Universiti Kebangsaan Malaysia Bangi, Malaysia

dahlilaputri@ukm.edu.my, a187944@siswa.ukm.edu.my, fariza.fauzi@ukm.edu.my

Abstract—As technology advances, robust digital security becomes increasingly critical. Online services like e-banking require strong passwords for user authentication. Yet, many users resort to weak passwords or insecure storage methods, exposing themselves to cyber threats such as brute-force attacks. To address these vulnerabilities, we present Cryptify, a password manager application designed to enhance password security through a compound encryption algorithm. This application simplifies password management by generating strong, unique passwords from a random phrase provided by the users. The application employs a combination of AES and RSA encryption algorithms to convert plaintext passwords into secure ciphertext, making them difficult to crack without the proper decryption key. Cryptify distinguishes itself with two advanced encryption techniques integrated into its system, ensuring that stored passwords remain secure and inaccessible to unauthorized users. By securely encrypting passwords and providing a straightforward user interface for password generation, Cryptify offers a significant improvement in protecting user data from cyber threats. This solution mitigates the risk of password-related security breaches and simplifies the process of maintaining robust password practices, ultimately enhancing overall password security for its users.

Keywords—password management, compound encryption, cryptography, AES and RSA Encryption

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A SOFTWARE DEFINED FRAMEWORK FOR REAL TIME MONITORING AND ALERTING IN IoT BASED HOME AC CHARGING FOR EV

Ruichen Wang

Centre for Cyber Security Faculty of Information Science and Technology Universiti Kebangsaan Malaysia Bangi, Selangor, Malaysia

Rosilah Hassan, Li Shuai, Mohd.Nor Akmal Khalid

Center for Artificial Intelligence Technology Faculty of Information Science and Technology Universiti Kebangsaan Malaysia Bangi, Selangor, Malaysia

pl47051@siswa.ukm.edu.my, rosilah@ukm.edu.my, pl46942@siswa.ukm.edu.my, akmal@ukm.edu.my

Abstract—The growing deployment of Electric Vehicles(EVs) has heightened the demand for safe, transparent, and user controllable home Alternating Current (AC) charging supervision. This work introduces a lightweight, software based Internet of Things (IoT) web framework that simulates home AC charging behavior in real time and monitors system parameters without relying on physical sensors. It synthetically derives voltage, current, temperature, and duration values to trigger immediate, rule based alerts whenever defined thresholds are exceeded. A browser accessible dashboard offers unified access to real time status, logged anomalies, and historical sessions for traceability and post event review. Whereas existing EV platforms such as PlugShare or Gentari GO primarily focus on location discovery or billing summaries, the proposed framework provides real time, parameter level supervision tailored to single phase 230 V residential environments, with future extendibility to three phase AC or Direct Current (DC)charging configurations. The system strengthens household safety protocols, improves usability for not specialist users, and lays the foundation for integration with emerging smart grid technologies.

Keywords—EV, AC charging, real time monitoring, rule-based alerting, web application, IoT

::: PAPER ID: 79 :::

REAL TIME MOBILE DEVICE DETECTION TOOL BASED ON THE FUSION OF BLE SIGNAL ANALYSIS AND DEEP LEARNING TECHNOLOGY

Shuai Li, Rosilah Hassan, Ruichen Wang

Centre for Cyber Security Faculty of Information Science and Technology Universiti Kebangsaan Malaysia Bangi, Selangor, Malaysia

Rimaniza Zainal Abidin

Center For Software Technology And Management (SOFTAM)Faculty of Information Science and Technology Universiti Kebangsaan Malaysia Bangi, Selangor, Malaysia

pl46942@siswa.ukm.edu.my, rosilah@ukm.edu.my, 147051@siswa.ukm.edu.my, nizazainal@ukm.edu.my

Abstract—The misuse of cell phones in exam rooms is still a thorny issue, particularly with the advancement of concealed mobile devices. This paper introduces a real time system for detecting mobile devices on the basis of Bluetooth Low Energy(BLE) signal analysis and lean Deep Learning models. The system works completely offline on iOS platforms, which scan BLE advertisements to obtain signal features like Received Signal Strength Indicator (RSSI), Universally Unique Identifier (UUID)change, and broadcast intervals. We established two detection modes: Convolutional Neural Networks (CNN) for One-to-one close proximity detection and Recurrent Neural Networks (RNN)for One-to-more classroom level signal sequence recognition. Experimental testing in a reality classroom environment showed that the CNN model was 97.2% accurate, while the RNN showed consistent performance at 94%. False positives were reduced with the incorporation of a visual risk filtering interface ("Little EyesMode"), through which invigilators can focus on actual threats. Unlike traditional threshold and Machine Learning (ML) based on schemes, our system is privacy preserving, efficient, and more accurate and provides an understandable solution for academic integrity monitoring.

Keywords—Bluetooth Low Energy, Deep Learning, Mobile Device Detection, CNN, RNN, Signal Filtering

:: PAPER ID: 81 ::

LIGHTWEIGHT PROTOCOL USING ELLIPTIC CURVE BASED KEY AGREEMENT TECHNIQUES FOR SECURED CYBER-PHYSICAL SYSTEMS OF SMART GRIDS

Md Mehedi Hasan, Mohammad Kamrul Hasan, Elankovan A. Sundararajan

Faculty of Information Science and Technology Universiti Kebangsaan MalaysiaBangi, Malaysia

Naganna Chetty

Department of Information Science & Engineering NMAM Institute of Technology Nitte University Mangaluru, India

Rashid A Saeed

Department of Computer Engineering, College of Computers and Information Technology, Taif University, P.O. Box 11099, 21944, Taif, Saudi Arabia

Mehedi.upm@gmail.com, mkhasan@ukm.edu.my, elan@ukm.edu.my,
naganna.chetty@nitte.edu.in, eng_rashid@hotmail.com

Abstract—The smart grid integrates cyber physical system by information and communication technology facilitate data transmission between smart meters and data aggregator points. These advancements also introduce risks of cyberattacks and unauthorized access, which can compromise the privacy and security of both customer information and system operational data. Thus, cryptographic key agreement protocols have emerged to ensure data confidentiality, integrity, forward secrecy, and authentication. However, existing protocols often suffer from excessive computational overhead which making them unsuitable for resource-constrained devices such as smart meters. Additionally, inadequate authentication mechanisms in these protocols have led to increased vulnerability to cyberattacks. Therefore, this proposed lightweight-secured key agreement protocol leveraging elliptic curve cryptography for efficient encryption and decryption for smart meter and aggregator point. Ultimately, comparative analysis shows that the combination of ECC, hash functions, timestamps, and pseudo-random number proposed protocols enhanced security features with significantly reducing computation time and bit overheads. The formal and informal analyses based on the Dolev-Yao threat model and AVISPA tool confirm that the proposed protocol preserves mutual authentication with the intended security features. The proposed protocol is suitable for resource-constrained devices as this protocol ensures secure communication without compromising performance.

Keywords—Key Agreement, ECC, Lightweight Cryptography, Cyber-Attacks, Cyber-Physical System, Smart Grids

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PATIENT WAITING LIST MANAGEMENT: A SYSTEMATIC ANALYSIS OF CURRENT APPROACHES AND EVIDENCE GAPS

Saadeddin Hroub, Masri Ayob, Norizal Abdullah

Data Mining and Optimization Lab Faculty of Information Science and Technology Universiti Kebangsaan Malaysia
Selangor, Malaysia

saad.hroub@gmail.com, masri@ukm.edu.my, norizal.abdullah23@gmail.com

Abstract—Elective procedure waiting lists are increasing, causing long delays and unequal access to care, especially for non-urgent patients. Decision-making processes in other domains, such as infertility care, show that patient priorities often extend beyond clinical urgency to include psychological and contextual factors. Traditional methods like first-come, first-served (FCFS) often ignore key factors such as clinical urgency, risk of deterioration, and social complexity. Although many prioritization tools have been proposed—ranging from point-based systems to advanced techniques like machine learning and fuzzy logic—most are not used in real-world settings. This is especially true in low-resource countries, where the tools may not be practical or relevant. This reveals a clear gap between research and practice, and a lack of solutions that are both effective and scalable across different healthcare environments. This review addresses key gaps by examining common patterns, the quality of supporting evidence, and barriers to real-world adoption. We aim to better understand why theoretical advances in prioritization have not translated into practice, and what might be needed to develop more effective, implementable systems. A systematic review of 21 studies (2010–2025) was conducted to analyze current prioritization approaches and their implementation rates. The review revealed that while 71% of studies propose point-based scoring systems, only 5% report actual implementation, with 76% of research concentrated in developed countries. Despite 57% of studies promoting automated systems, few provide real-world evidence of their effectiveness, suggesting an over-reliance on technical innovation without sufficient testing in clinical environments. The key contribution is a comprehensive analysis of the theory-practice gap in patient prioritization systems, identifying specific barriers to implementation and providing evidence-based recommendations to support the development of more effective, evidence-based prioritization systems.

Keywords—waiting list, prioritization, healthcare, artificial intelligence, systematic analysis, implementation science

::: PAPER ID: 84:::

MEGANET-W: A WAVELET-DRIVEN EDGE-GUIDED ATTENTION FRAMEWORK FOR WEAK BOUNDARY POLYP DETECTION

Zhe Yee Tan, Ashwaq Qasem

School of Artificial Intelligence and Robotics (SAIR) Xiamen University Malaysia, Sepang, Malaysia

AIT2209953@xmu.edu.my, ashwaq.qasem@xmu.edu.my

Abstract—Colorectal polyp segmentation is critical for early detection of colorectal cancer, yet weak and low contrast boundaries significantly limit automated accuracy. Existing deep models either blur fine edge details or rely on handcrafted filters that perform poorly under variable imaging conditions. We propose MEGANet-W, a Wavelet Driven Edge Guided Attention Network that injects directional, parameter free Haar wavelet edge maps into each decoder stage to recalibrate semantic features. The key novelties of MEGANet-W include a two-level Haar wavelet head for multi orientation edge extraction; and Wavelet Edge Guided Attention (W-EGA) modules that fuse wavelet cues with boundary and input branches. On five public polyp datasets, MEGANet-W consistently outperforms existing methods, improving mIoU by up to 2.3% and mDice by 1.2%, while introducing no additional learnable parameters. This approach improves reliability in difficult cases and offers a robust solution for medical image segmentation tasks requiring precise boundary detection.

Keywords—Colorectal Polyp Segmentation, Haar Wavelet Transform, W-EGA, Parameter-Free Attention, U-Net

::: PAPER ID: 85 :::

PERFORMANCE COMPARISON OF SINGLE-NODE AND MULTI-NODE KUBERNETES ORCHESTRATION FOR SRV6 NETWORK TESTBED DEPLOYMENT WITH CLABERNETES

Saadeddin Hroub, Masri Ayob, Norizal Abdullah

Data Mining and Optimization Lab Faculty of Information Science and Technology Universiti Kebangsaan Malaysia
Selangor, Malaysia

saad.hroub@gmail.com, masri@ukm.edu.my, norizal.abdullah23@gmail.com

Abstract—The need for dynamic and scalable network testbeds is crucial for validating modern network technologies like Segment Routing over IPv6 (SRv6). Kubernetes, as a leading container orchestration platform, combined with tools like Clabernetes, offers a promising solution for deploying such testbeds. However, the performance implications of the underlying Kubernetes cluster architecture—specifically, single-node versus multi-node configurations—are not well-documented for this use case. This paper presents a quantitative comparative analysis of these two architectures. We deploy two network topologies of varying complexity (a 4-router ring and a 20-router mesh) on both single-node and multi-node Kubernetes clusters. Key performance metrics, including deployment time, resource utilization (CPU softirq), and data plane throughput, are measured. Experimental results show that the single-node configuration is consistently faster for deployment. Conversely, the multi-node configuration demonstrates far superior resource scalability, effectively distributing load while the single node reaches saturation (88% CPU and 70% softirq load). Most significantly, and contrary to initial hypotheses, the single-node configuration delivers vastly superior data plane throughput (approx. 3 Gbps) compared to the multi-node setup, which suffers severe performance degradation (down to 0.285 Gbps) due to network overlay overhead. This research empirically proves a critical trade-off between resource scalability (favoring multi-node) and data plane performance (favoring single-node), providing an essential guide for designing Kubernetes-based network testbeds.

Keywords—Kubernetes, Clabernetes, Container Orchestration, Network Performance, Single-Node, Multi-Node, SRv6

:: PAPER ID: 86::

DEEP LEARNING BASED MICROFILARIAE DETECTION AND QUANTIFICATION

Rose Mary Maniraj, Emelia Osman, Aishah Hani Azil

Department of Parasitology & Medical Entomology, Faculty of Medicine, Universiti Kebangsaan Malaysia, Jalan Yaacob Latif, Bandar Tun Razak, 56000 Cheras, Kuala Lumpur, Malaysia

Zhou Dengrui, Siti Norul Huda Sheikh Abdullah,

Center for Cyber Security, Faculty of Information Science and Technology,
Universiti Kebangsaan Malaysia, 43600 Bangi

Mohd Amierul Fikri Mahmud

Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

p153144@siswa.ukm.edu.my, emelia.osman@ukm.edu.my, aishah.azil@ukm.edu.my,
P144257@siswa.ukm.edu.my, snhsabdullah@ukm.edu.my, amierul.fikri@moh.gov.my

Abstract—Lymphatic filariasis is a neglected tropical disease caused by blood-borne nematode parasites known as microfilariae that poses a significant public health concern in many tropical regions, including Southeast Asia, Africa, and South America. The traditional diagnostic approach for this disease involves manually examining thick blood smears under a microscope. However, these methods suffer from low diagnostic efficiency, cumbersome procedures, strong dependence on skilled technicians, and difficulties in implementation in remote or resource-poor areas, particularly when handling high sample volumes. To address these limitations, this paper proposes an automated detection approach for microfilariae in thick blood smears based on the YOLOv10 model. This method combines lightweight convolution structures, large kernel convolution, and improved feature fusion modules (such as BiFPN), thereby enhancing the model's accuracy and robustness in small object detection scenarios. We constructed a dataset conforming to the VOC format and trained and validated the YOLOv10 model. The test results show that on the test set, the model achieved an Accuracy of 84.8%, a Precision of 86.6%, a Recall of 97.6% and an F1-score of 0.918, with an average detection accuracy of mAP@0.5:0.95 of 66.7%. Furthermore, the model can still achieve high-confidence predictions for microfilariae targets in complex background images, demonstrating good robustness and generalization ability. It has been proven that this method can achieve rapid and stable detection of microfilariae and has good practical deployment value. This study provides a feasible solution for the intelligent diagnosis of parasitic diseases, which is particularly suitable for the large-scale screening needs of primary medical institutions or public health systems.

Keywords—Lymphatic filariasis, Microfilariae, Medical image analysis, Deep learning, Public health screening

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UNDERSTANDING THE EVOLUTION AND ESCALATION OF CYBER THREATS FROM THE INCEPTION OF THE INTERNET TO THE ERA OF QUANTUM COMPUTING

Haitham Assiri

Department of Computer Science College of Engineering and Computer Sciences Jazan University, Jazan, Saudi Arabia

habusallam@jazanu.edu.sa

Abstract—This research introduces a comprehensive cybersecurity framework comprising Temporal Pattern Recognition (TPR), Behavioral Analytics and Anomaly Detection (BAAD), Quantum-Safe Cryptographic Modeling (QSCM), Deep Learning for Threat Prediction (DLTP), and Quantum-Resilient Blockchain (QRB) algorithms. TPR captures historical data, BAAD detects anomalies, QSCM ensures quantum-safe communication, DLTP predicts threats, and QRB establishes a secure blockchain. Comparative evaluations demonstrate the proposed method's superior performance, emphasizing its holistic approach in addressing evolving cyber threats across different computing paradigms. The ablation study highlights the individual contributions of each algorithm, and the results underscore the framework's effectiveness and resilience. This research presents a robust and adaptive cybersecurity solution, crucial for safeguarding against diverse and evolving cyber threats in the digital landscape.

Keywords—Temporal Pattern Recognition (TPR), Behavioral Analytics and Anomaly Detection (BAAD), Quantum-Safe Cryptographic Modeling (QSCM), Deep Learning for Threat Prediction (DLTP), Quantum-Resilient Blockchain (QRB), Cybersecurity Framework, Threat Evolution, Adaptive Approach, Quantum Computing

:: PAPER ID: 91 ::

DOODLE RECOGNITION FOR EARLY ENGLISH LANGUAGE LEARNING IN PRESCHOOL CHILDREN

Dy Llen Hoo, Phei Chin Lim
Faculty of Computer Science and Information Technology
Universiti Malaysia Sarawak 94300 Kota Samarahan, Sarawak, Malaysia

dyllehoo@gmail.com, pclim@unimas.my

Abstract—This work presents the design and evaluation of a Doodle Recognition System aimed at improving English vocabulary retention in preschool children aged 3 to 6. The implemented interactive web application incorporates AI-based doodle recognition using the DoodleNet model to provide real-time feedback and support fine motor skill development. Implemented with Next.js, Tailwind CSS, and Supabase, the system includes a responsive drawing interface, pre- and post- assessment features, and progress tracking (<https://fypdoodlenet-with-supabase.vercel.app/>). User testing with 28 children revealed measurable vocabulary improvements, particularly among 4- to 5-year-olds, with an overall post-test score increment of 11.3%. The findings indicated that integrating visual-motor activities with vocabulary learning enhances engagement and retention, suggesting the potential of doodle recognition systems to supplement early childhood language instruction.

Keywords—Computer-aided learning, Vocabulary memory, Artificial intelligence

:: PAPER ID: 92 ::

AUTOMATED ESSAY GRADING SYSTEM WITH AUTOMATED FEEDBACK

Alexander Anak Adrian, Ping Ping Tan
Faculty of Computer Science and Information Technology Universiti Malaysia Sarawak 94300 Kota Samarahan
Sarawak, Malaysia

alexander2620@gmail.com, pptan@unimas.my

Abstract—Essay grading is a crucial yet time-consuming task, particularly in preparation for the Malaysian University English Test (MUET). This study proposes an Automated Essay Grading System (AEGS) that leverages Natural Language Processing (NLP) and Artificial Intelligence (AI) technologies to assess essays based on MUET rubrics to assist language teachers in grading essays and more importantly, to provide essays feedbacks efficiently as assist students' learning. The system was developed using generative pre-trained transformer (GPT)-4o OpenAI application programming interface (API), focusing on key features such as automated grading, detailed feedback generation, and user-friendly user interface design. AEGS extracts content from typed or scanned essays using Optical Character Recognition (OCR) and evaluates submissions via AI-powered analysis. The difference between the grade generated using MUET rubrics and the those marked by the language teachers is ± 5 mark (an acceptable range). Through an interview with a MUET language teacher and conducting User Acceptance Testing (UAT) via Google Forms, the functional testing and user feedback indicate improved grading efficiency, consistency, and rubric-aligned feedback delivery. Most AEGS do not provide feedback but our propose system not only grade but also provide essay writing feedback that the teachers can adjust accordingly. The feedback from the language teacher stated the usefulness of AI-generated essays feedback, indicates the potential to reduce lecturer workload, improve overall feedback quality, and scale for wider academic use.

Keywords—Artificial intelligence, automated grading, feature-driven development, Malaysian University English Test (MUET), natural language processing, OpenAI

:: PAPER ID: 93 ::

eSAKU: AN INTERACTIVE MOBILE APP FOR UNIVERSITY STUDENTS TO MANAGE EXPENSES

Sue Nee Lau, Jonathan Sidi

Faculty of Computer Science and Information Technology Universiti Malaysia Sarawak Sarawak, Malaysia

laujoanne22@gmail.com, jonathan@unimas.my

Abstract—eSaku is an interactive mobile application designed to help university students manage their finances more effectively. The development process follows the Rapid Application Development (RAD) methodology, which focuses on iterative design and user feedback to create a functional and user-friendly product. Data for the app's design and features were gathered through surveys from university students, ensuring that it meets their specific financial management needs. The aim of eSaku is to provide students with a comprehensive tool that enables them to track their expenses, plan budgets, set financial goals, and monitor their spending habits. The app offers key features such as income and expense tracking, semester-based budgeting, goal setting for savings, and payment reminders for academic-related expenses. Users can categorize financial records, attach receipts, and analyze their spending through visual charts. eSaku also emphasizes an intuitive user experience, allowing students to easily navigate various financial tasks. The app's design was carefully crafted to ensure it helps students make informed financial decisions, providing them with the insights needed to take control of their finances. By focusing on the essential financial management needs of university students, eSaku aims to empower users to better manage their finances, make smarter financial decisions, and achieve their financial goals, all through a simple and efficient mobile platform.

Keywords—budgeting, expense tracking, financial management, mobile application, spending habits

:: PAPER ID: 94 ::

eDOG: AN INTERACTIVE DOG CARE APPLICATION USING AN UI/UX APPROACH

Ang Nee Lee, Jonathan Sidi

Faculty of Computer Science and Information Technology Universiti Malaysia Sarawak Kota Samarahan, Sarawak, Malaysia

hongrulee6@gmail.com, jonathan@unimas.my

Abstract—This project is a mobile application designed to assist dog owners in efficiently managing their pets' care routines. It addresses the challenges faced by busy dog owners who often struggle to keep track of essential tasks such as feeding schedules, veterinary appointments, grooming, and other dog care activities. Furthermore, while mobile applications can be an ideal solution for quick services, the poor UI/UX design and features of some existing apps often leads to user dissatisfaction. By leveraging a user-centered design methodology and adopting Agile development practices, this project ensures iterative improvements to user needs throughout the development process. The application features reminders, notifications for upcoming tasks, and a pet log to monitor vital details. The use of Agile methodology facilitates the incremental delivery of these features, enabling continuous feedback and refinement to align with user expectations. This project aims to enhance the quality of life for both dog owners and their pets through an accessible, user-friendly, and engaging digital platform. By integrating UI/UX principles and iterative Agile practices, the project simplifies pet care management, addresses usability challenges, and fosters stronger bonds between owners and their dogs while maintaining a flexible and innovative approach to development.

Keywords—Dog care application, UI/UX

:: PAPER ID: 95::

GenAI GAME ANALYSIS OF COMPUTATIONAL OFFLOADING AND RESOURCE MANAGEMENT IN VEHICULAR NETWORKS

Nusrat Jahan, Mohammad Kamrul Hasan and Mohd Zakree Ahmad Nazri
Faculty of Information Science and Technology Universiti Kebangsaan Malaysia (UKM) Selangor, Malaysia

pl28645@siswa.ukm.edu.my, mkhasan@ukm.edu.my, zakree@ukm.edu.my

Abstract—This research introduces a framework that integrates Generative Artificial Intelligence (GAI) and game theoretic models for enhancing computational offloading and resource allocation in vehicular edge computing (VEC) scenarios. The proposed three-layer architecture—Input, Augmented Intelligence, and Decision layers—enables intelligent and timely decision-making for dynamic task distribution with minimal latency and optimal energy efficiency. The framework leverages a Transformer-based GAI model with Retrieval-Augmented Generation (RAG) to adaptively learn from distributed vehicular environments, supported by federated learning to ensure privacy-preserving training across edge and cloud servers. Simulation outcomes demonstrate that the GAI-based solution achieves 25–35% lower task latency, 20–30% reduced energy consumption, and 30–40% faster convergence to the Nash equilibrium compared with traditional game-theoretic methods. These findings highlight the potential of combining GAI and game-theoretic mechanisms to provide scalable, energy-efficient, and latency-aware offloading strategies for future vehicular networks.

Keywords—Generative Artificial intelligence (GenAI), Game theory, Computation Offloading, Artificial intelligence technology, Nash Equilibrium, Energy consumption, Vehicular Networks

:: PAPER ID: 96 ::

EXTRACTING COLOUR FEATURES FROM COLPOSCOPY IMAGES FOR CLASSIFICATION OF CERVICAL CANCER

Siti Nursyafiqah Binti Abdullah, Stephanie Chua
Faculty of Computer Science and Information Technology Universiti Malaysia Sarawak Kota Samarahan, Malaysia

78541@siswa.unimas.my, chlstephanie@unimas.my

Abstract—This research focuses on improving cervical cancer classification using colour feature extraction from colposcopy images with machine learning algorithms. The images were preprocessed to improve the quality, and the colour features such as mean, standard deviation, and dominant values in the RGB colour space were extracted. Machine learning algorithms, including Support Vector Machine (SVM), Random Forest (RF), eXtreme Gradient Boosting (XGBoost), Decision Tree (DT), and Logistic Regression (LR) were used to learn models for the classification of colposcopy images, assisting in improved diagnostic accuracy and supporting the development of automated screening systems and better healthcare solutions. The Random Forest model recorded the best classification results, showing a promising accuracy of 96%.

Keywords—Cervical Cancer, Classification, Colour Features, Colposcopy Images, Machine Learning

::: PAPER ID: 97:::

CLASSIFICATION OF METAL SCREW DEFECT DETECTION USING FOMO ON EDGE IMPULSE

Muhammad Imran Daing, Zuraidi Saad, Ahmad Puad Ismail, Kamarulazhar Daud, Fadzil Ahmad and
Zainal Hisham Che Soh

Electrical Engineering Studies Universiti Teknologi MARA, Cawangan Pulau Pinang Permatang Pau, Pulau Pinang,
Malaysia

2022758071@student.uitm.edu.my, zuraidi570@uitm.edu.my, ahmadpuad127@uitm.edu.my,
kamarul395@uitm.edu.my, fadzilahmad@uitm.edu.my, zainal872@uitm.edu.my

Abstract—Surface defects in metal screws are typically identified through manual inspection, which can be labor-intensive and prone to human error. The introduction of deep learning, particularly in visual detection, offers a significant improvement in the effectiveness and precision of defect identification. This research work uses the FOMO (Faster Objects, More Objects) algorithm to detect surface flaws on metal screws. FOMO is optimized for real-time applications, making it suitable for edge devices with limited resources. The model processes images to identify defects by analyzing features such as shape, texture, and structural integrity. The results demonstrate that FOMO not only achieves high accuracy of 94.5% in defect detection but also operates efficiently, making it ideal for real-time applications. This study highlights the potential of deep learning-based methods, like FOMO, to revolutionize quality control processes in the manufacturing industry by providing fast, reliable, and automated defect detection.

Keywords—Metal Screw Defect Detection, Faster Object More Object, FOMO, Edge Impulse Platform

::: PAPER ID: 98 :::

IMMERSIVE EXPERIENCES IN VIRTUAL SCIENCE LABS: A SYSTEMATIC REVIEW AND THE VIRTAS FRAMEWORK

Anis Ezzaty Mohd Saidi, Syahrul Nizam Junaini

Faculty of Computer Science and Information Technology Universiti Malaysia Sarawak 94300 Kota Samarahan,
Sarawak Malaysia

Wan Azani Mustafa

Faculty of Electrical Engineering & Technology Universiti Malaysia Perlis Pau Putra Campus 02600 Arau, Perlis,
Malaysia

77835@siswa.unimas.my, syahruln@unimas.my, wanazani@unimap.edu.my

Abstract—Virtual laboratories and Metaverse platforms are reshaping science education by offering immersive, interactive, and scalable alternatives to traditional labs. This systematic review synthesizes 37 peer-reviewed studies (2021–2024) from Scopus and Web of Science, guided by PRISMA protocols. Findings show that Augmented and Virtual Reality-based virtual labs enhance understanding of abstract scientific concepts, promote critical thinking, and support collaborative problem-solving through real-time simulations and feedback. These technologies improve access to practical science experiences, especially in under-resourced contexts. Key challenges persist, including digital inequality, cognitive overload, and limited teacher preparedness. To address these, the review proposes a new framework: Virtual Immersion for Real-Time Thinking, Access, and Skills (VIRTAS). It is built on six pedagogical pillars based on the SLR results: immersive simulation, instant feedback, gamified learning, team collaboration, equitable access, and skill scaffolding. Anchored in Theory, Context, Construct and Methods (TCCM) analysis, VIRTAS offers a model for designing and assessing Metaverse-based science labs. The review outlines a roadmap for future research, policy, and practice in immersive Science, Technology, Engineering, and Mathematics (STEM) education.

Keywords—Virtual Science Labs, Metaverse in Education, STEM Education, Augmented and Virtual Reality (AR/VR), Immersive Learning Environments

:: PAPER ID: 99::

A SYSTEMATIC EVALUATION OF DEEP LEARNING MODELS FOR VEHICLE CLASSIFICATION AND COUNTING USING NUMERICAL DATA

Amir Raza, Johari Abdullah, Irwandi Hipni Mohd Hipiny, Hamimah Ujir

Faculty of Computer Science and Information Technology Universiti Malaysia Sarawak Sarawak, Malaysia

Rehman Ullah Khan

Faculty of Cognitive Sciences and Human Development Universiti Malaysia Sarawak Sarawak, Malaysia

24020032@siswa.unimas.my, ajohari@unimas.my, mhihipni@unimas.my,
uhamimah@unimas.my, krullah@unimas.my

Abstract—This study provides a comprehensive baseline evaluation of five deep learning models 1D Convolutional Neural Network (1DCNN), Long Short-Term Memory (LSTM), 2D Convolutional Neural Network (2DCNN), Recurrent Neural Network (RNN), and Autoencoder on two distinct dataset types: a synthetic dataset and a hybrid dataset. Structured numeric data exists in two separate datasets: The synthetic dataset spans from 10K to 100K points and the hybrid integration of synthetic data with real-world data also falls within this parameter range. Results from experiments show 1DCNN excels at numeric data processing due to its ability to deliver superior results with increased efficiency rates beyond competing models. The experimental results of this study validate the compatibility and efficient data handling abilities of 1DCNN across various large numeric datasets, resulting in reduced computational complexity. This study provides essential knowledge about deep learning model capabilities in numeric data processing so future AI systems and data-driven decisions can develop further.

Keywords—Deep learning, vehicle detection, traffic, classification, vehicle counting

:: PAPER ID: 102 ::

IndoEduBERT: TAILORED MULTI-LINGUAL AND MULTI-GRAINED SENTENCE EMBEDDINGS FOR THE INDONESIAN EDUCATION DOMAIN

Arrival Dwi Sentosa, Ary Setijadi Prihatmanto, Nina Lestari, Dewi Tresnawati, Azizah Zakiah

School of Electrical Engineering and Informatics, Bandung Institute of Technology, Indonesia

arrivaldwi@itb.ac.id, ary.setijadi@itb.ac.id, nina.lestari@itb.ac.id, dewi.tresnawati@itb.ac.id, azizah.zakiah@itb.ac.id

Abstract—IndoEduBERT is a specialized Indonesian-language sentence embedding model meticulously designed for the educational domain. Building upon the versatile BAAI/bge-m3 transformer architecture, our approach integrates multifunctional, multilingual, and multigranularity capabilities to capture the nuanced terminology and curriculum-specific language prevalent in Indonesian educational materials. By fine-tuning the model within a Sentence-BERT (SBERT) framework on an extensive Indonesian educational corpus, and incorporating a contrastive Cosine-based Sentence-Embedding loss (CoSENTLoss) with rigorous hyperparameter optimization via Optuna, IndoEduBERT achieves significant improvements over strong baselines such as mBERT and IndoBERT.

To further substantiate the novelty of our approach, we compare our method against advanced contrastive learning techniques and demonstrate that our domain-specific loss function more effectively aligns with human-annotated semantic similarities. We also critically discuss potential biases and ethical considerations in both training and deployment, ensuring transparency and fairness in application.

Our comprehensive evaluation on the stsb-indo-edudataset demonstrates state-of-the-art Pearson correlation scores, while extensive perturbation studies and factual correctness assessments on real-world Q&A datasets confirm the robustness and domain fidelity of our model. Beyond its superior semantic similarity performance, IndoEduBERT effectively aligns complex educational content, thereby enabling advanced applications in curriculum mapping, automated question-answer matching, semantic search, and nuanced student feedback analysis. We provide an in-depth error analysis and ablation study that illustrate the critical impact of domain-specific fine-tuning on model interpretability and resilience.

IndoEduBERT thus represents a significant step forward in Indonesian educational NLP, and its design principles may inform future work in domain adaptation, advanced contrastive learning, and cross-lingual educational technologies.

Keywords—SBERT, Transformers, Indonesian NLP, Educational Data, Semantic Similarity, Fine-Tuning, Domain-Specific Modeling, Curriculum Alignment, Contrastive Learning, Hyperparameter Optimization, Ethical AI

:: PAPER ID: 103 ::

MODELING OF NOVEL ENSEMBLE LEARNING METHOD FOR EMERGENCY INTELLIGENT TRANSPORTATION SYSTEM TRACKING AND MOBILITY MANAGEMENT

Prabha R

Department of Computer Science Engineering, T John Institute of Technology, Bengaluru, India

Aruna M G

Department of Artificial Intelligence & Machine Learning Engineering, Dayanand Sagar College Engineering, Bengaluru, India

Nurhizam Safie Bin Mohd Satar

Institute of Computer Science & Digital Innovations, UCSI University, Kuala Lumpur, Malaysia

Mohammad Kamrul Hasan

Faculty of Information Science and Technology, Universiti Kebangsaan Malaysia, 43600 Bangi, Malaysia

Shayla Islam

North Garth Institute of Technology, Dhaka, Bangladesh

Mohan K G

Department of CSE, GITAM University, Bengaluru, India

prabha@tjohnsgroup.com, mgaruna@gmail.com, nurhizam@ukm.edu.my,
mkhasan@ukm.edu.my, shayla@ucsiuniversity.edu.my

Abstract—With the advent of the Intelligent Transportation System (ITS), there have been increasing attempts to strengthen and improve the communication system among vehicles. A review of existing studies towards improving the ITS communication system shows some sophisticated methods mainly based on artificial intelligence that played the dominant role. The proposed study addresses the challenge associated with the urban traffic system where the emergency vehicles (ambulance, Fire Engine, Heavy Rescue Vehicle, Police Car) are required to be tracked and offered an alternative route separating from other vehicles without disrupting the normalcy of traffic management. The proposed model introduces a framework for tracking the emergency vehicle, and a novel ensemble decision-learning method to construct a traffic rule that controls the traffic signal and intelligent routing. The simulation outcome shows that the proposed system can generate consistency in tracking and traffic management.

Keywords—Intelligent Transportation System, Traffic Management, Ensemble Decision learning Scheme, Controlling Signal

:: PAPER ID: 126 ::

THE ROLE ARTIFICIAL INTELLIGENCE APPLICATIONS IN DETECTING WORKPLACE BULLYING AND DEVIANT BEHAVIOR: A STUDY OF PRIVATE HOSPITALS IN ANBAR CITY

Fatima Amer Abbas, Abdulsalam Ali Hussein

College of Administration and Economics, University of Anbar, Iraq

Saeed Aldulaimi, Marwan Abdeldayem

College of Administrative Sciences, Applied Science University (ASU), Bahrain

fat23n1004@uoanbar.edu.iq, drsalamaalnoori@uoanbar.edu.iq, saeed.aldulaimi@asu.edu.bh,
marwan.abdeldayem@asu.edu.bh

Abstract—the current research aims to discover the role of AI in career bullying in its dimensions (work-related Cyber-bullying, personal bullying, and physical intimidation) in deviant work behavior in its dimensions (deviant work behavior towards the organization, deviant work behavior towards people, and deviant work behavior towards the direct supervisor) in a sample of several private hospitals in Anbar Governorate. The descriptive analytical approach was used to achieve the research objectives and to test the research hypotheses and answer its questions using the data collection method represented by the questionnaire that was prepared considering previous studies and consisted of 52 paragraphs. The research was applied in private hospitals, and the research community amounted to 360 employees working within it, represented by health and administrative cadres. (186) questionnaires were distributed to the research sample, and the number of returned questionnaires valid for analysis amounted to (174) questionnaires, i.e., (94%) of the original sample. To process the data, the statistical analysis program (SPSS V.25) and Excel were used, and it was reached. The researcher found several results, the most significant of which is a substantial correlation and influence between the dimensions of workplace bullying and deviant work behavior in private sector hospitals in Anbar Governorate. We conclude from the results that there is a direct relationship, meaning that the more workplace bullying increases, the more deviant work behavior increases.

Keywords—Workplace bullying, deviant work behavior, private hospitals in Anbar Governorate. SDG 4

::: PAPER ID: 128:::

FOSTERING REFLECTIVE THINKING THROUGH AI-DRIVEN E-LEARNING PLATFORMS: EVIDENCE FROM MATHEMATICS EDUCATION IN THE HIGHER EDUCATION

Haider Abdulkareem Alzuhiry

General Directorate of Anbar Education, Iraq

Marwa Salah Yahya Alrawi, Majid Lateef Abdulrazaq, Sabreen Ali Hussein,

College of Education for Humanities Sciences, University of Anbar, Iraq

Saeed Aldulaimi, Marwan Abdeldayem

College of Administrative Sciences, Applied Science University (ASU), Kingdom of Bahrain.

Dr.haiderkareem98@gmail.com, Mrw99743@uoanbar.edu.iq, saeed.aldulaimi@asu.edu.bh, majid.abdulrazaq@uoanb, ar.edu.iq, sabreen.ali@uoanbar.edu.iq, marwan.abdeldayem@asu.edu.bh

Abstract—This study intended to assess the impact of e-learning on the development of reflective thinking for students at the Mathematics Department in Anbar University. The chosen sample for the study was 60 students of the third year in the mathematics department at the College of Education for Pure Sciences at Anbar University during the academic year 2024 2025. The researchers split the sample into two groups. The experimental group consisted of 31 students where taught the curriculum and instructional methods using e-learning while the control group also consisted of 31 students and taught the same subject but using the classical method. The researchers matched the two groups statistically on two variables which were chronological age calculated in months and the score of the reflective thinking test. The reflective thinking test was created by the researchers and consisted of 25 items which were targeted and clustered around the 5 skills of reflecting and observing, diagnosing fallacies, concluding, providing explanation and developing solutions. The psychometric properties of the test were also verified. The test was executed and sent remotely to students after the experiment was completed. The results showed that students in the experimental group outperformed students in the control group in the reflective thinking test, and that there is a large effect size in the impact of e-learning on reflective thinking. The authors offered a number of recommendations and suggestions.

Keywords—Reflective Thinking, AI, E-Learning Platforms, Mathematics Education, Higher Education, SDG 4

::: PAPER ID: 130 :::

ENHANCING DIGITAL STRATEGIC PERFORMANCE IN HIGHER EDUCATION THROUGH AI- ENABLED STRATEGIC CAPABILITIES

Khamees Naser Mohammed, Basma Muhammed Khalaf

College of Administration and Economics, University of Anbar, Iraq

Saeed Aldulaimi, Marwan Abdeldayem

College of Administrative Sciences, Applied Science University (ASU), Bahrain

dr.Khamees_mohammed@uoanbar.edu.iq, bas22n1004@uoanbar.edu.iq, saeed.aldulaimi@asu.edu.bh, marwan.abdeldayem@asu.edu.bh

Abstract—This study aims to discover how strategic capabilities supported by AI tools contribute to achieving digital strategic performance, which is assessed from financial, stakeholder, internal operations, AI enablers, education and research, learning and development, and institutional image perspectives in higher education and particularly in private universities. The descriptive analytical strategy was utilized for the presentation, analysis, and interpretation of research data, as it facilitates the collection of extensive information pertinent to the research problem. The study was executed in private universities and colleges within Anbar Governorate, targeting a population of 90 senior and mid-level Managerial leaders, including the university president, vice presidents, deans and their deputies, department heads, and division directors. A comprehensive enumeration method was employed, resulting in the distribution of 90 questionnaires, of which 87 valid responses were received for statistical analysis, yielding a response rate of 97%. The researcher utilized the questionnaire as the primary instrument for data collection. To analyze the data, various statistical methods were employed, including the mean, standard deviation, coefficient of variation, variance, Pearson correlation coefficient, simple regression, and multiple regression, utilizing the SPSS V. 28 and AMOS V. 28 software programs. The researcher found results that mostly matched the research predictions, showing strong connections between the strategic capabilities and its parts within the strategic performance, as well as a clear positive impact of the AI strategic capabilities on the digital strategic performance in private universities and colleges in Anbar Governorate.

Keywords—Strategic capabilities, strategic performance, Digitalization, Higher education, SDG4

:: PAPER ID: 207 ::

AI-DRIVEN INTRUSION DETECTION SYSTEMS: LEVERAGING MACHINE LEARNING FOR REAL-TIME THREAT MITIGATION

Taher M. Ghazal

Department of Networks and Cybersecurity, Hourani Center for Applied Scientific Research Al-Ahliyya Amman University
Amman, Jordan
Center for Cyber Security, Faculty of Information Science and Technology Universiti Kebangsaan Malaysia (UKM) 43600 Bangi, Selangor, Malaysia

taher.ghazal@ieee.org

Abstract—AI-Driven Intrusion Detection Systems (IDS) harness the power of machine learning to identify and mitigate cyber threats in real time, enhancing the resilience of enterprise networks. These systems aim to provide automated, accurate, and adaptive threat detection capabilities against evolving attack vectors. However, existing IDS approaches often suffer from high false-positive rates, limited adaptability to novel threats, and latency in detection, leading to compromised network performance and security gaps. To address these issues, the proposed Enterprise Network Security Monitoring using Supervised Machine Learning (ENSM-SML) framework integrates advanced supervised learning techniques for proactive anomaly detection. ENSM-SML employs a structured data pipeline for network traffic monitoring, feature extraction, and pattern recognition, enabling timely and precise threat alerts. The method leverages Random Forest classification to categorize network activities into regular and malicious classes, benefiting from its ensemble learning strengths, robustness to overfitting, and high classification accuracy. Experimental results demonstrate that the proposed system significantly reduces false positives, improves detection accuracy, and ensures real-time threat mitigation with minimal computational overhead. The findings confirm the effectiveness of ENSM-SML in enhancing enterprise network security, offering a scalable and reliable intrusion detection solution.

Keywords—Intrusion Detection System, Machine Learning, Enterprise Network Security, Supervised Learning, Random Forest, Real-Time Threat Mitigation

:: PAPER ID: 208 ::

SECURING THE INTERNET OF THINGS: FRAMEWORKS FOR VULNERABILITY ASSESSMENT AND AUTONOMOUS DEVICE PROTECTION

Taher M. Ghazal

Department of Networks and Cybersecurity, Hourani Center for Applied Scientific Research Al-Ahliyya Amman University
Amman, Jordan
Center for Cyber Security, Faculty of Information Science and Technology Universiti Kebangsaan Malaysia (UKM) 43600 Bangi, Selangor, Malaysia

taher.ghazal@ieee.org

Abstract—The rapid proliferation of Internet of Things (IoT) devices in homes, industries, and cities has significantly improved automation, efficiency, and convenience. However, the interconnected nature of IoT systems exposes them to a wide range of security threats and vulnerabilities. Existing IoT security methods often lack real-time threat assessment, suffer from centralized trust management, and fail to address device authentication in dynamic environments. To address these limitations, this paper proposes a Blockchain-based Trust Verification (BC-TV) framework for smart home device security. The proposed method enables the decentralized trust establishment, tamper-proof vulnerability assessment, and autonomous protection mechanisms. In the proposed method, each IoT device is assigned a unique blockchain identity, and all interactions are validated through consensus mechanisms, ensuring transparency and integrity. The BC-TV framework supports continuous vulnerability scanning and adaptive access control based on real-time trust scores. Experimental evaluation demonstrates that the proposed approach enhances device authentication speed, reduces false trust assignments, and improves resilience against spoofing and man-in-the-middle attacks. Findings indicate that BC-TV can significantly strengthen IoT security while maintaining operational efficiency, making it suitable for large-scale smart home ecosystems. BC-TV achieved 600 ms authentication at 2000 devices, reduced false trust rate to 3.2%, mitigated 85% of 500 attacks, and maintained 1100 ms trust validation latency, proving efficiency and scalability in large IoT networks.

Keywords—Internet of Things Security, Blockchain, Trust Verification, Vulnerability Assessment, Smart Home Devices, Autonomous Protection

::: PAPER ID: 209 :::

QUANTUM-RESISTANT CRYPTOGRAPHIC ALGORITHMS: SAFEGUARDING DATA INTEGRITY IN THE POST-QUANTUM ERA

Taher M. Ghazal

Department of Networks and Cybersecurity, Hourani Center for Applied Scientific Research Al-Ahliyya Amman University
Amman, Jordan
Center for Cyber Security, Faculty of Information Science and Technology Universiti Kebangsaan Malaysia (UKM) 43600 Bangi, Selangor, Malaysia

taher.ghazal@ieee.org

Abstract—The emergence of quantum computing poses significant challenges to conventional cryptographic algorithms, threatening the security of sensitive data. Quantum-resistant cryptographic algorithms are essential to ensure robust data integrity in the post-quantum era. However, existing encryption methods, such as RSA and ECC, are vulnerable to quantum attacks like Shor's algorithm, which can break their mathematical foundations. These vulnerabilities compromise secure data storage and transmission, especially in cloud-based environments. To address these challenges, this paper proposes the Secure Cloud Data Storage using Lattice-Based Cryptography (SCDS-LC) framework. SCDS-LC leverages the hardness of lattice problems, which remain computationally infeasible even for quantum computers, ensuring long-term data confidentiality and integrity. The framework is designed for seamless integration into cloud storage systems, providing end-to-end encryption, secure key management, and efficient data retrieval. Using the proposed method, sensitive information is protected against both classical and quantum threats, enabling reliable data sharing and storage in critical applications such as finance, healthcare, and government sectors. Experimental results demonstrate that SCDS-LC achieves high encryption efficiency, minimal computational overhead, and strong resistance to quantum attacks, making it a viable solution for future-proof data security.

Keywords—Quantum cryptography, Lattice-based cryptography, Post-quantum security, Data integrity, Cloud storage security, Cryptographic resilience

::: PAPER ID: 210 :::

A SURVEY ON MULTI-ARMED BANDIT APPROACHES IN HYPER-HEURISTICS: RECENT ADVANCES AND FUTURE DIRECTION

Masri Ayob, Norizal Abdullah

Data Mining and Optimization Lab Center for Artificial Intelligence Technology (CAIT) Faculty of Information Science and Technology Universiti Kebangsaan Malaysia Selangor, Malaysia

Meng Chun Lam

Mixed Reality and Pervasive Computing Lab Center for Artificial Intelligence Technology (CAIT) Faculty of Information Science and Technology Universiti Kebangsaan Malaysia Selangor, Malaysia

Nasser R. Sabar

Department of Computer Science and Information Technology La Trobe University Melbourne, Australia

masri@ukm.edu.my, norizal.abdullah23@gmail.com, lammc@ukm.edu.my, n.sabar@latrobe.edu.au

Abstract—Multi-armed bandit (MAB) algorithms have emerged as a promising framework for addressing the exploration-exploitation dilemma in hyper-heuristic design. This paper presents a critical assessment and systematic investigation of MAB applications in hyper-heuristics, examining 18 peer-reviewed studies published between 2020 and 2025. We rigorously evaluate algorithmic approaches, performance characteristics, and application domains whilst identifying critical gaps in theoretical foundations and practical implementations. Our investigation reveals that Thompson Sampling and Upper Confidence Bound (UCB) variants demonstrate consistent performance improvements ranging from 0.05% to 26.5% across diverse optimisation problems. However, significant challenges persist in scalability analysis, multi-objective regret bounds, and standardised evaluation frameworks. This research concludes with a forward-looking assessment of promising research directions, emphasising the need for theoretical advancement, cross-domain validation, and industrial deployment strategies. This work serves as a foundation for researchers seeking to advance MAB-based hyper-heuristic methodologies and practitioners implementing adaptive optimisation systems.

Keywords—Multi-armed bandit, hyper-heuristics, combinatorial optimisation, Thompson Sampling, Upper Confidence Bound, adaptive algorithms

::: PAPER ID: 211 :::

THE PSYCHOLOGICAL IMPACT OF AI ADOPTION IN HIGHER EDUCATION: TECHNOLOGY ANXIETY AND PARANOID THINKING AMONG UNIVERSITY FACULTIES

Ahmed Basil Ahmed Suwaidan, Muhammad Majid Taha Al-Ani, Ibrahim Hamad Shabeeb
College of Education for Humanities, University Of Anbar, Iraq
Majid Lateef Abdulrazaq
University of Anbar, Iraq
Saeed Aldulaimi, Marwan Abdeldayem
College of Administrative Sciences, Applied Science University (ASU), Kingdom of Bahrain

ahmedbasil91@uoanbar.edu.iq, majid82@uoanbar.edu.iq, ibrahimhamad@uoanbar.edu.iq, majid.abdulrazaq@uoanbar.edu.iq, saeed.aldulaimi@asu.edu.bh, marwan.abdeldayem@asu.edu.bh

Abstract—This study aims to measure the level of technological anxiety among faculty members, as well as to determine their degree of paranoid thinking. Furthermore, it examined the nature of the relationship between. To achieve these objectives, the first instrument was the Technology Anxiety Scale (TAS), developed by Meuter and colleagues in 2003. This multidimensional scale measures cognitive, affective, physical, and social anxiety, in addition to distance learning anxiety. It was modified to suit the local university context in Iraq. The second instrument was the Paranoid Thinking Scale, based on the tripartite model developed by Bobko et al. in 2014. This 30-item scale measures apprehension about others' intentions, negative interpretation of behavior, and overanalysis of everyday situations. The validity of this scale for use in the Arab context was verified through appropriate validity and reliability procedures. The study relied on a descriptive analytical approach and was applied to a sample of faculty members randomly selected from several Iraqi universities. The results showed that the level of paranoid thinking was moderate to high, particularly in aspects related to chronic doubt about others' intentions and exaggerated mental analysis of simple situations. Statistical analyses revealed a statistically significant direct relationship between technology anxiety and paranoid thinking, indicating that high feelings of anxiety regarding the use of technology may lead to the reinforcement of patterns of negative, paranoid thinking among university professors. The findings underscored the relevance of understanding the impact of the psychological variables regarding digital transformation in higher education. These initiatives were aimed at adding psychological support and technology training aimed at alleviating anxiety and fostering constructive technological adaptation to underpin flexible, interactive, functional education environments.

Keywords—AI, technological anxiety, paranoid thinking, Education, Higher Education

::: PAPER ID: 212 :::

ARTIFICIAL INTELLIGENCE APPLICATION TO EXAMINE THE INTERNATIONALIZATION OF THE DOLLAR–YUAN IN THE CONTEXT OF US–CHINA ECONOMIC COMPETITION

Mohanad Hameed Mhaidi, Zeyad Khalaf Ismail, Soraqa Ahmed Jumaah
College of Political Sciences University of Anbar, Iraq
Ahmed A'Rak Naif
University Presidency University of Anbar, Iraq
Saeed Aldulaimi

College of Administrative Sciences, Applied Science University (ASU), Kingdom of Bahrain

Muhannadhamd84@uoanbar.edu.iq, zeyad.k.ismail@uoanbar.edu.iq, Soraqa.h.jumaah@uoanbar.edu.iq, ahmed.an@uoanbar.edu.iq, saeed.aldulaimi@asu.edu.bh

Abstract—The internationalization of the Yuan is part of a long-term strategy adopted by China with the aim to create a stable international monetary environment for its economic development. This step would help reduce the risks the Chinese currency might encounter in trade and financial transactions. It would, also, help reduce the chance of crises happening in the balance of payments in China due to speculation attacks on the Yuan. The Chinese rise on the economic level represents a worrying issue for the United States of America, as it is well aware that this rise will be at the expense of the United States of America and its regions of influence. Therefore, it is working hard to restrict and curb this growth by all possible means. The competition between the Dollar and the Yuan is one of the phases of the US–China economic competition. Hence, while the Dollar is still dominating international transactions due to the capabilities it enjoys that have enhanced this position, China has begun to take effective measures to impose its currency as an international reserve currency.

Keywords—Artificial Intelligence, Internationalization, Dollar–Yuan, US–China, Digital Economic

::: PAPER ID: 213 :::

MACS: A COGNITIVE DIVERSITY MULTI-AGENT CONSENSUS FRAMEWORK FOR BIAS MITIGATION IN AUTOMATED EVALUATION SYSTEMS

Arrival Dwi Sentosa, Julyan Widiyanto

School of Electrical Engineering and Informatics Bandung Institute of Technology Bandung, Indonesia

arrivaldwi@itb.ac.id, 23525017@mahasiswa.itb.ac.id

Abstract—The reliance on single Large Language Models (LLMs) for automated academic assessment risks creating an algorithmic monoculture, where inherent model biases are amplified at scale. This paper introduces a framework, the MultiAgent ConsensusSystem (MACS), designed to mitigate this risk by simulating cognitive diversity. MACS orchestrates a heterogeneous ensemble of LLMs in a structured, adversarial peer-review workflow. The system comprises: (1) a VLM-driven multimodal extraction module for high-fidelity data retrieval from PDFs; (2) an initial review by a primary agent; (3) a critical challenge stage by secondary agents with diverse architectures; and (4) a final arbitration stage where a concluding agent synthesizes conflicting evaluations to form a robust consensus. By formalizing this process of structured disagreement and resolution, our framework moves beyond simple ensemble averaging. We introduce the Disagreement-Resolution Ratio (DRR) as a metric to quantify the system's ability to identify and correct initial scoring biases. Our experiments show that MACS achieves a high degree of alignment with human expert consensus, demonstrating superior consistency when benchmarked against the inherent variability of human judges.

Keywords—Automated Assessment, Multi-Agent Systems, Cognitive Diversity, Algorithmic Bias, Consensus Scoring, Large Language Models, Explainable AI, Educational Technology

::: PAPER ID: 214 :::

MODELING AND ANALYSIS OF COMPENSATOR FOR POWER QUALITY IMPROVEMENT IN LOW-VOLTAGE INDUSTRIAL LOAD

Maman Rukmana, Philip Nathanael Erlangga Sitorus, Wakhyu Dwiono, Tri Desmana Rachmildha

School of Electrical Engineering and Informatics Institut Teknologi Bandung Bandung, Indonesia

maman.rukmana491@gmail.com, 23223333@std.stei.itb.ac.id, 33220012@std.stei.itb.ac.id, trides@itb.ac.id

Abstract—In low-voltage industrial power systems, the use of inverters, rectifiers, and motors with variable speed drives often causes current harmonics and load imbalance that violate applicable standards. Current harmonics and imbalance loads lead to increased power losses, low efficiency, reduced equipment lifetime, and can cause overheating in electrical machines. These problems can be addressed by implementing a compensator in the form of a shunt active power filter. This study presents the design and simulation of a shunt active power filter using a voltage source converter, modeled in MATLAB/Simulink for a low-voltage industrial application. By applying the instantaneous power theory, the filter compensates for all reactive power components, as well as oscillating parts of the active power and the zero-sequence active power. Simulation results demonstrate that the filter effectively shapes the source current into a sinusoidal waveform, lowers total harmonic distortion (THD), balances the current, and improves the power factor.

Keywords—harmonics, imbalance load, instantaneous power theory, power quality, shunt active power filter

::: PAPER ID: 215 :::

EQANER: ANNOTATED CORPUS FOR ENGLISH QURANIC STUDIES

Shasha Arzila Tarmizi, Saidah Saad

Center for Artificial Intelligence Technology The National University of Malaysia Bangi, Malaysia

shasha.arzila@gmail.com, saidah@ukm.edu.my

Abstract—The absence of dedicated Named Entity Recognition (NER) corpora for English translations of the Holy Qur'an hinders advanced computational analysis of this pivotal religious text. We introduce EQANER, a novel, manually adjudicated NER corpus designed to address this critical resource gap. Constructed from two linguistically distinct English Quran translations (contemporary and classical), EQANER features a domain-specific annotation scheme that defines eight entity types, including distinct categories like names of God and prophets. The annotation process combined rule-based pre-annotation with rigorous human review to ensure high quality and consistency. We demonstrate the utility of EQANER by training baseline NER models, which are Conditional Random Field (CRF) models and Bidirectional Encoder Representations from Transformers (BERT) models, to validate its effectiveness for extracting entities with varying naming conventions. EQANER serves as a vital foundation for advancing NLP applications and information extraction in the Islamic domain.

Keywords—named entity recognition, annotated corpus, Quranic texts

::: PAPER ID: 216 :::

IMPACT OF ADAPTIVE LEARNING RATE STRATEGIES ON DEEP LEARNING MODELS FOR CHEST X-RAY DIAGNOSIS

Meteab Moqbel, Zuraidi Saad, Mohd Ikmal Fitri Marzuki, Dayang Suhaida Awang Damit, Zainal Hisham Che Soh
Electrical Engineering Studies, Universiti Teknologi MARA, Cawangan Pulau Pinang 13500 Pulau Pinang, Malaysia City
Noor Diyana Osman

Advanced Medical and Dental Institute, Universiti Sains Malaysia, Kepala Batas, 13200, Penang, Malaysia

Meteabmoqbel@gmail.com, zsaad73@yahoo.com, ikmal@uitm.edu.my,
dayang671@uitm.edu.my, zainal872@uitm.edu.my, noordiyana@usm.my

Abstract—Chest X-ray (CXR) imaging is crucial for the diagnosis of thoracic diseases and should be optimized for training strategies in deep learning-based classification to be accurate. This work evaluates the effect of adaptive learning rate (LR) scheduling—time-based decay and step-based decay—on five recent state-of-the-art CNN architectures (DenseNet121, InceptionV3, ResNet50, MobileNetV2, VGG16) using a well-balanced multi-class dataset of Normal, COVID-19, Bacterial Pneumonia, and Viral Pneumonia cases, with both original and lung-masked CXR representations. Results showed that DenseNet121 on decayed masked CXRs performed the best in terms of stability (Accuracy 97.8%, F1-score 97.7%), and InceptionV3 on intact original CXRs performed the best overall (Accuracy 98.6%, F1-score 98.5%). These findings highlight that compatibility of adaptive LR methods with well-processed datasets supports stable, generalizable, and high-performance CXR classification.

Keywords—Chest X-ray (CXR), COVID-19, CNN, Learning Rate Scheduling

::: PAPER ID: 220 :::

APPLYING SOFL TO ENHANCE REQUIREMENTS GATHERING IN EDUCATIONAL TECHNOLOGY: CASE STUDY OF DEVELOPING COURSE PLAN ASSISTANT

A Rahman Mat, Edwin Mit, Ayu Nazirah Razamie

Fac. Of Computer Science & IT Universiti Malaysia Sarawak 94300 Kota Samarahan, MALAYSIA

marahman@unimas.my, edwin@unimas.my, 77868@siswa.unimas.my

Abstract—The purpose of this research paper is to present the approach of applying the Structured Object-oriented Formal Language (SOFL) method for requirements gathering in the development of a Course Plan Assistant (CPA). This system aimed at efficiently tracking and enhancing students' academic progress. The study adopts the case study methodology, focusing on the design and implementation of the CPA. The SOFL method is employed to systematically gather and document the requirements for the development of the system. This includes a detailed analysis and modeling of the educational context, stakeholder requirements, and system functionalities. The findings of the research indicate that the SOFL method significantly improves the clarity and completeness of the requirements gathering process. It facilitates better communication and understanding among stakeholders, leading to the identification of key features that enhance student progress tracking. The study demonstrates that the use of SOFL reduces ambiguities and misunderstandings during the requirements elicitation phase. This research contributes to the literature by providing insights into the application of the SOFL method within an educational context. It highlights the importance of a structured and rigorous approach in requirements gathering for systems aimed at improving academic performance. The findings of this case study can serve as a reference for future projects in educational technology and requirement engineering.

Keywords—education technology, requirement engineering, SOFL, software analysis & design

::: PAPER ID: 223:::

DETECTION OF OBJECT MANIPULATION IN VIDEO AUTHENTICATION USING EfficientNet-BASED FRAME ANALYSIS

Shaima Mohammed Gaashan, Nazhatul Hafizah Kamarudin and Siti Norul Huda Sheikh Abdullah
Centre for Cybersecurity Universiti Kebangsaan MalaysiaBangi, Selangor, Malaysia

shaimagaashan@gmail.com, nazhatulhafizah@ukm.edu.my, snhsabdullah@ukm.edu.my

Abstract—The increasing prevalence of video manipulation techniques presents substantial challenges to the authentication of digital media. This research introduces an efficient deep learning-based methodology for detecting object-level forgeries in videos, specifically focusing on the addition and removal of objects. Employing a frame-level classification approach, the proposed system utilizes EfficientNetB0 as a fixed feature extractor to identify manipulated frames, thereby avoiding reliance on intricate temporal models. A balanced dataset was compiled from the VideoSham benchmark, from which over 20,000 frames were extracted for both training and evaluation. The model achieved a test accuracy of 91%, surpassing conventional CNN-based methods in both classification performance and computational efficiency. Experimental findings indicate that spatially localized manipulations can be accurately identified using lightweight convolutional networks, rendering the method suitable for real-time and resource-constrained forensic applications. This study underscores the potential of task-specific architectures in video forgery detection and paves the way for extending the model to address other forms of manipulation.

Keywords—Video Forgery Detection, Frame-Level Classification, Object Removal, Object Addition, EfficientNetB0, VideoSham Dataset, Computational Efficiency

::: PAPER ID: 226 :::

TECHNO-ECONOMIC ANALYSIS FOR A TYPICAL COMMERCIAL BUILDING GRID-CONNECTED PV INTEGRATION WITH LOAD SHIFTING STRATEGY

Rafif Daffa Aribawa Putra, Burhanuddin Halimi

School of Electrical Engineering and Informatics Institut Teknologi Bandung Bandung, Indonesia

23223321@mahasiswa.itb.ac.id, burhan@itb.ac.id

Abstract—Maximizing on-site self-consumption is critical for the economic viability of rooftop photovoltaic (PV) systems under grid policies that do not compensate for exported energy. This paper presents a techno-economic optimization of a grid-tied PV and battery system for a typical 22-room commercial hotel in Indonesia. Using a granular, occupancy-driven load profile and a load-shifting strategy, 13 system configurations with varying PV and battery capacities were evaluated. Results show the load-shifting strategy consistently improved self-consumption across all scenarios. While a 17.4 kWp PV-only system offered the fastest payback of 5.7 years (IRR 20.25%), a larger 24.36 kWp system yielded the maximum Net Present Value (NPV) of IDR 255.6 million. The study concludes that an optimized PV system is a financially viable investment for small-scale hotels, with the optimal configuration depending on the investor's financial objectives.

Keywords—Techno-economic analysis, solar photovoltaic(PV), self-consumption, load shifting, hotel energy

::: PAPER ID: 227 :::

PRIVACY-AWARE MACHINE UNLEARNING FOR STABLE ASSOCIATION RULES IN RETAIL RECOMMENDATIONS

Xuanming Hu, Wan Tze Vong, Miko May Lee Chang

Faculty of Engineering, Computing and Science, Swinburne University of Technology, Kuching, Sarawak, Malaysia

Pei-Wei Tsai

Department of Computing Technologies, Swinburne University of Technology, Hawthorn, Victoria, Australia

xhu@swinburne.edu.my, wvong@swinburne.edu.my, mchang@swinburne.edu.my, ptsai@swin.edu.au

Abstract—This study presents a novel model architecture for retail recommendation systems that integrates machine unlearning to balance data-driven insights with strict privacy requirements. By using the FP-Growth algorithm and bootstrap sampling, the research demonstrates that removing specific customer data record in only a minimal reduction in the consistency of top-performing association rules, as measured by high Dice (≥ 0.81) and cosine (≥ 0.99) similarity scores. And the application of weight adjustments to rules provides a practical mechanism for refining recommendations to align with specific business objectives, such as promoting high-margin products. The result shows that machine unlearning can effectively reduce privacy risks while maintaining model stability and utility, offering a practical framework for building privacy-aware recommendation systems.

Keywords—machine unlearning, association rules, data privacy

::: PAPER ID: 230 :::

PERFORMANCE EVALUATION OF WEB-BASED INTERNET OF
VIDEO THINGS (IoVT) PROTOCOLS

Yoanes Bandung, Hafidz Shidqi and Dion Tanjung

School of Electrical Engineering and Informatics Institut Teknologi Bandung Bandung, Indonesia

yoanes.bandung@itb.ac.id, 18221074@std.stei.itb.ac.id, dion.tanjung@itb.ac.id

Abstract—Maximizing on-site self-consumption is critical for the economic viability of rooftop photovoltaic (PV) systems under grid policies that do not compensate for exported energy. This paper presents a techno-economic optimization of a grid-tied PV and battery system for a typical 22-room commercial hotel in Indonesia. Using a granular, occupancy-driven load profile and a load-shifting strategy, 13 system configurations with varying PV and battery capacities were evaluated. Results show the load-shifting strategy consistently improved self-consumption across all scenarios. While a 17.4 kWp PV-only system offered the fastest payback of 5.7 years (IRR 20.25%), a larger 24.36 kWp system yielded the maximum Net Present Value (NPV) of IDR 255.6 million. The study concludes that an optimized PV system is a financially viable investment for small-scale hotels, with the optimal configuration depending on the investor's financial objectives.

Keywords—Techno-economic analysis, solar photovoltaic(PV), self-consumption, load shifting, hotel energy

::: PAPER ID: 231 :::

T2DM-PHKG: A FRAMEWORK FOR ONTOLOGY-DRIVEN AND EXPLAINABLE
RECOMMENDATIONS IN TYPE 2 DIABETES CARE

Tracy Jeng Yee Jong, Wan-Tze Vong, Miko May Lee Chang

Faculty of Engineering, Computing and Science Swinburne University of Technology Sarawak Campus Sarawak,
Malaysia

Huai Liu

Department of Computing Technologies Swinburne University of Technology Victoria, Australia

tracyjg94@gmail.com, wvong@swinburne.edu.my, mchang@swinburne.edu.my, hliu@swin.edu.au

Abstract—Diabetes is a chronic condition that requires continuous medical attention and effective self-management. However, current approaches lack a unified, ontology-driven framework to semantically integrate heterogeneous clinical and lifestyle data into an explainable decision support system. This study proposes the Type 2 Diabetes Mellitus-Personal Healthcare Knowledge Graph (T2DM-PHKG), an ontology-driven framework for integrating multi-source patient data and generating explainable recommendations. The framework comprises four components: (1) a PostgreSQL staging layer for consolidating heterogeneous patient data sources, (2) an ontology-driven mappings aligned with FHIR standards and extended with diabetes-specific entities such as HbA1c and BloodGlucose (3) a graph reasoning mechanisms linking patient subgraphs with clinical guideline nodes to illustrate inference paths, and (4) a recommendation-feedback loop supporting continuous adaptation and personalization. A prototype was developed to illustrate the construction process and technical feasibility of the proposed framework, with PostgreSQL for data staging and Neo4j for graph representation. Although quantitative evaluation is beyond the current scope, this study provides a detailed methodological foundation for constructing interoperable, explainable, and adaptive Personal Healthcare Knowledge Graphs (PHKGs) that bridge symbolic (ontology-based) and neural (LLM-assisted) reasoning for future healthcare decision support applications.

Keywords—Personal Health Data, Knowledge Graphs, Ontology, Electronic Health Records, Semantic, Diabetes Mellitus

::: PAPER ID: 232 :::

LIGHTNING DENSITY PREDICTION USING QUANTUM SUPPORT VECTOR REGRESSION

Muhammad Fadhil Amri, Lenny Putri Yulianti, Bryan Denov, Brian Bramantyo S.D.A. Harsono
School of Electrical Engineering and Informatics
Institut Teknologi Bandung Bandung, Indonesia
Sriyono
PLN Research Institute
PT PLN (Persero) Jakarta, Indonesia

13521066@mahasiswa.itb.ac.id, lennyputriy@itb.ac.id, bryan_denov@itb.ac.id, sriyono81@pln.co.id

Abstract—The lightning phenomenon has caused several negative impacts that require an effective protection system. To determine the level of protection, reliable lightning density prediction is a necessity. However, existing classical algorithms face difficulties when dealing with small or complex datasets that drive research into quantum machine learning. Several quantum algorithms are being researched, and Quantum Support Vector Regression (QSVR) shows promising performance in dealing with regression tasks. This research explores the potential of QSVR to be applied to the prediction of lightning density. In this research, two data sets, PLN Puslitbang and NASA MERLIN, were used. The prediction is based on spatial and meteorological parameters. Quantum feature maps are the main focus of this study. The experimental results show varied performance. In the PLN Puslitbang dataset, a classical Support Vector Regression (SVR) model (RMSE 0.0102, MAE 0.0058, R^2 0.7750) slightly outperformed the best QSVR model (RMSE 0.0104, MAE 0.0059, R^2 0.7651). In contrast, on the NASA MERLIN dataset, the QSVR model (RMSE 0.0275, MAE 0.0110, R^2 0.3856) surpassed the SVR model (RMSE 0.0282, MAE 0.0095, R^2 0.3566). QSVR consistently demonstrates an advantage on smaller datasets. Additionally, experiments on both datasets reveal that latitude is the most influential parameter for the models. This study indicates that QSVR has potential as an alternative for lightning density prediction.

Keywords—prediction, lightning density, meteorology, spatial, QSVR, quantum kernel, quantum feature map

::: PAPER ID: 234 :::

ROI-BASED SELECTIVE ENCRYPTION FOR MULTIMEDIA IoT USING LIGHTWEIGHT AEAD CIPHER

Yoanes Bandung, Aditya Pradana, Kusprasapta Mutijarsa, Dion Tanjung
School of Electrical Engineering and Informatics
Institut Teknologi Bandung Bandung, Indonesia

yoanes.bandung@itb.ac.id, 33223014@std.stei.itb.ac.id, kusprasapta.mutijarsa@itb.ac.id, dion.tanjung@itb.ac.id

Abstract—The rapid development of the Internet of Things (IoT) involving multimedia data, such as smart surveillance systems and telemedicine, poses serious challenges in terms of security and efficiency. Full encryption of all images can indeed guarantee confidentiality, but it results in a large computational and communication load, making it less suitable for IoT devices with limited resources. This paper proposes a Region of Interest (RoI)-based selective encryption scheme using the lightweight Ascon AEAD cipher to achieve a balance between privacy protection and efficiency. The proposed method uses Haar Cascade to automatically detect sensitive areas (such as human faces), which are then encrypted, while other parts of the image are transmitted without encryption. Experimental results show significant payload savings, where the average encrypted portion is only about 0.35 MB at a high resolution compared to the full input size of 2.76 MB. Privacy evaluation demonstrates the effectiveness of RoI protection, with low SSIM and PSNR values, rendering sensitive areas unrecognizable. At the same time, the reconstructed image retains its visual quality with high number of SSIM and PSNR, ensuring that the Quality of Experience (QoE) is maintained. In terms of performance, the system is able to work efficiently with a recovery time of around 100–130 ms at low resolution, 120–150 ms at medium resolution, and 150–220 ms at high resolution. The results of this study confirm that RoI-based selective encryption not only reduces overhead but also maintains privacy and QoE in IoT multimedia applications. Future research directions include improving RoI detection accuracy using deep learning, applying it to real-time video streaming, and integrating it with lightweight end-to-end protocols such as OSCORE to strengthen IoT communication security.

Keywords—Multimedia IoT, Lightweight AEAD, Region of Interest (RoI), Selective Encryption, Ascon, Privacy Protection

::: PAPER ID: 235 :::

ENHANCING NATURALNESS IN TEXT-TO-SPEECH SYNTHESIS: OPTIMIZING TD-PSOLA WITH HYBRID PITCH DETECTION AND CROSS-FADE TECHNIQUE

Charity Ojochagwu Egbunu, Fadhilah Rosdi, Mohammed Faizul Nasrudin, Abdul Hadi Abd Rahman
Faculty of Information Science and Technology (FTSM), Universiti Kebangsaan Malaysia

P119562@siswa.ukm.edu.my, fadhilah.rosdi@ukm.edu.my, mfn@ukm.edu.my, abdulhadi@ukm.edu.my

Abstract—Concatenative text-to-speech (TTS) systems for tonal languages frequently encounter issues related to unnatural pitch and duration, as well as audible discontinuities at unit junctions. This study introduces an improved TD-PSOLA pipeline that integrates hybrid pitch detection, utilizing autocorrelation with cepstral refinement, to ensure robust epoch placement, alongside a brief cosine cross-fade at concatenation boundaries to facilitate smoother waveform transitions. The proposed method was evaluated using a Yoruba syllable inventory (comprising 796 units and 20 items for objective tests) and a Mean Opinion Score (MOS) test involving 10 listeners. Results indicate enhancements in signal fidelity and perceived naturalness. Compared to a baseline concatenator, the average Signal-to-Noise Ratio (SNR) improved from -10.7dB to -1.7 dB; the pitch-contour error was minimal (Root Mean Square Error [RMSE] ≈ 0.13); intelligibility remained high (Short-Time Objective Intelligibility [STOI] mean ≈ 0.90 , minimum 0.79); and naturalness increased from a MOS of 3.06 to 4.38 out of 5. These improvements are attributed to more precise pitch marking and phase-consistent overlap-add with crossfading, which mitigate boundary artifacts without eliminating linguistically significant fundamental frequency (F_0) patterns. The approach is lightweight, operates near real-time, and complements neural TTS, making it particularly suitable as a post-processing stage to rectify local F_0 and continuity errors, especially in tonal contexts.

Keywords—Concatenated Speech, TD-PSOLA, Pitch Detection, Cross-Fade, Tonal Speech Synthesis

::: PAPER ID: 236 :::

ReliefChain: A BLOCKCHAIN-ENABLED FRAMEWORK FOR TRANSPARENT AND ACCOUNTABLE FLOOD RELIEF DONATIONS IN MALAYSIA

Hafiz Adnan Hussain, Uzma Jafar, Lusiana Binti Syaiful

Faculty of Computing and Informatics Multimedia University Cyberjaya Centre for Big Data and Blockchain Technologies, CoE Advanced Cloud, Multimedia University Cyberjaya, Selangor, Malaysia

Zulkefli Mansor, Mohd Juzaidin Ab Aziz

Center For Software Technology And Management (SOFTAM) Faculty of Information Science & Technology, Universiti Kebangsaan Malaysia Bangi, Selangor, Malaysia

Zarina Shukur

Center for Cyber Security (CYBER) Faculty of Information Science & Technology, Universiti Kebangsaan Malaysia Bangi, Selangor, Malaysia

hafizadnan87@gmail.com, uzmajafar@gmail.com, lusiana@mmu.edu.my,
kefflee@ukm.edu.my, juzaidin@ukm.edu.my, zarinashukur@ukm.edu.my

Abstract—Malaysia's flood relief efforts face transparency and accountability gaps that weaken donor confidence during disasters. We introduce ReliefChain, a blockchain platform integrated with an IPFS framework, designed for Malaysian flood relief disbursements. The system enforces role-based controls (administrator, verified NGO, donor), escrows funds per campaign, and links withdrawals to verifiable IPFS receipts. An emergency-mode governance policy establishes stricter rules for large transfers, including multisignature approval and time-limited overrides during declared disasters. We develop a working prototype and test it on a local Ethereum setup (Ganache) with a React front-end and IPFS backed by Pinata. End-to-end testing verifies proper role separation, immutable on-chain audit trails from donation to expenditure, and reasonable gas costs for typical actions; the most costly operation is "Report Expenditure," mainly due to storage writes. We discuss operational alignment with Malaysia's Societies Act 1966 and donor tax-deduction procedures under Section 44(6) of the Income Tax Act, along with privacy measures under the Personal Data Protection Act 2012 (PDPA). Overall, these findings demonstrate a feasible path to trustworthy, regulation-aware donation tracking for flood relief efforts in Malaysia.

Keywords—Blockchain, Ethereum, Smart Contracts, Donation Tracking, Disaster Relief, Transparency, Malaysia

:: PAPER ID: 243 ::

OPTIMIZATION OF ENERGY FORECASTING ANOMALIES USING LSTM BASED TIME SERIES ANALYSIS AND SECURE FEDERATED LEARNING

S. Rayhan Kabir, Mohammad Kamrul Hasan, Salwani Abdullah

Faculty of Information Science and Technology Universiti Kebangsaan Malaysia Bangi, Malaysia

Tanja Pavleska

Laboratory for Open Systems and Networks Jožef Stefan Institute Ljubljana, Slovenia

Rabiu Aliyu Abdulkadir

Department of Electrical Engineering Aliko Dangote University of Science and Technology Wudil, Kano, Nigeria

pl26933@siswa.ukm.edu.my, mkhasan@ukm.edu.my, salwani@ukm.edu.my,
atanja@e5.ijs.si, rabiu.abdulkadir@kustwudil.edu.ng

Abstract—The global energy sector is prioritizing the development of AMI (Advanced-Metering Infrastructure) to enhance the smart grid sustainability, where energy load forecasting anomalies remain a critical challenge. Existing machine learning-based load forecasting models exhibit anomalies, such as underestimation and overestimation of energy demand, which contribute to errors in AI (Artificial Intelligence) hallucination (inaccurate generative forecasting). Moreover, cyber threat anomalies can emerge in federated learning and smart meter node-based load forecasting processes, including risks, such as information leakage and data breaches caused by cyber-attack. To overcome these challenges, this paper proposes a generative load forecasting approach by combining time-series comparative analysis with LSTM (Long-Short-Term-Memory) neural networks. The load forecasting program computes generative load forecasts at each smart meter node, which are encrypted using AES (Advanced-Encryption-Standard) cryptography. The encrypted data is aggregated into AMI server and a total load forecast for a substation-grid node is generated through federated learning aggregation method. In the proposed Secure-LSTM-FedAggSum process, the smart-meter energy data used that was provided by the UK's "Low Carbon-London" project. The comparative analysis shows that the proposed model outperforms other approaches in mitigating load-forecasting anomalies and delivers more reliable, risk-free forecasting.

Keywords—Smart Grid, Load Forecasting, Cryptography, Federated Learning, Green Computing, Artificial Intelligence, Advanced Metering Infrastructure

:: PAPER ID: 244::

A SWARM INTELLIGENCE-DRIVEN FRAMEWORK FOR DETECTING INSIDER TRADING IN STOCK MARKETS

Ahmed T. Sadiq

University of Technology-Iraq Computer Science College A. I. Department

Dena Kadhim Muhsen

Computer Science College, University of Technology - Iraq, 10066 Baghdad

Amjed Abbas Ahmed

Center for Cyber Security, Faculty of Information Science and Technology Universiti Kebangsaan Malaysia, Department of Computer Techniques Engineering, Imam AlKadhim College (IKC), Baghdad, Iraq

Azhaar Abd-Alhussan Shalal

College of Engineering, Al-Shatrah University, Thi-Qar 64001, Iraq

Zainab Mohammed Hussein

Law Department/Imam AlKadhim College (IKC), Baghdad, Iraq

Layla Safwat Jamil

college of agriculture engineering science, university of Baghdad, Iraq

Ahmed.T.Sadiq@uotechnology.edu.iq, dena.k.muhsen@uotechnology.edu.iq, amjedabbas@alkadhim-col.edu.iq,
azhaar.alkhafaji@shu.edu.iq, zaynab.mohammed@iku.edu.iq, layla.s@coagri.uobaghdad.edu.iq

Abstract—Insider trading in stock markets undermines market integrity and investor confidence by exploiting non-public information for unfair gains. Detecting such illicit activities is critical but challenging due to the complex and covert nature of insider behaviors. Existing detection methods often rely on static rules or traditional machine learning techniques that struggle with high-dimensional data and fail to capture dynamic, subtle trading patterns. These limitations result in reduced detection accuracy and an increased number of false positives. To address these challenges, this paper proposes a Swarm Intelligence-driven framework based on Ant Colony Optimization-Enhanced Pattern Mining (ACO-PM). This framework models insider trading detection as an optimization problem, where artificial ants explore transactional data to discover frequent and anomalous trading patterns. The ACO algorithm efficiently navigates large datasets, dynamically adapting to evolving trading behaviors and uncovering hidden patterns that traditional methods overlook. The proposed ACO-PM method is applied to real-world stock market datasets to identify suspicious trading sequences indicative of insider trading activities. Results demonstrate significant improvements in detection accuracy by 99.7%, reduction of false alarms by 39%, pattern discovery rate by 98.6%, and dynamic market conditions by 97.3% compared to baseline models. The framework's adaptive nature enables real-time monitoring, providing market regulators with an effective tool to combat insider trading and maintain fair market conditions.

Keywords—Insider trading, swarm intelligence, Ant Colony Optimization, pattern mining, stock market, anomaly detection

:: PAPER ID: 245 ::

DIFFERENTIAL PRIVACY-PRESERVING RISK ANALYSIS IN FINANCIAL INSTITUTIONS USING REINFORCEMENT LEARNING

Fatima S.Hussian

College of Computer Science and Information Technology, University of Al-Qadisiyah, Diwaniyah, Iraq

Falah Amer Abdulazeez

Center for Cyber Security, Faculty of Information Science and Technology, Universiti Kebangsaan Malaysia(UKM), Malaysia Department of Mathematics, Education for Pure Sciences College, Alanbar, Iraq

Bareq M. Khudhair

Department of Computer Techniques Engineering Imam Al-Kadhim University College(ICK), Iraq

Bushra Saadoon Mohammed Alnoori

Almansour University College English Department

Dr. Riyadh Hassoon Jabbar

Business Administration Department Imam AlKadhim College (ICK), Baghdad, Iraq

Amjed Sahib Noori Alshami

Ministry of Higher Education&Scientific Research Department of Scholarships& Cultural Relations

fatima.s.hussian@qu.edu.iq, falah.amer.azeez@uoanbar.edu.iq, bareq.maher@iku.edu.iq,
Bushra.Saadoon@muc.edu.iq, riadhassoon@iku.edu.iq, Amjed.Sahib@mohers.edu.iq

Abstract—Risk analysis in financial institutions is critical for identifying potential threats such as fraud, credit default, and market volatility while ensuring customer data confidentiality. The integration of advanced machine learning techniques has enhanced the accuracy of risk assessment but often overlooks privacy concerns related to sensitive financial information. Existing methods typically rely on centralized data processing, which increases the risk of data leakage and privacy breaches, limiting their applicability in highly regulated financial environments. This paper proposes a novel framework that utilizes Differential Privacy-based Deep Reinforcement Learning (DP-DRL) combined with Differential Privacy to address these challenges. The DRL agent learns optimal risk management policies through continuous interaction with a financial environment. At the same time, Differential Privacy mechanisms inject calibrated noise into training data and model updates to prevent the exposure of sensitive data. This approach ensures robust privacy preservation without significantly compromising model performance. The proposed method is applied to fraud detection and credit risk assessment in financial institutions, enabling real-time, privacy-preserving risk analysis. Experimental results demonstrate that the framework achieves a high detection accuracy of 97.8% while maintaining strong privacy guarantees of 98.4% and latency of 96.9%, effectively balancing risk mitigation of 97.3% and data confidentiality.

Keywords—Differential Privacy, Deep Reinforcement Learning, risk analysis, financial institutions, fraud detection, privacy preservation

:: PAPER ID: 246::

GAME-THEORETIC MODELING OF CYBERSECURITY INSURANCE PRICING IN GLOBAL FINANCIAL MARKETS

Amjed Abbas Ahmed

Center for Cyber Security, Faculty of Information Science and Technology Universiti Kebangsaan Malaysia

Department of Computer Techniques Engineering, Imam AlKadhim College (ICK), Baghdad, Iraq

Fatima S. Hussian, Dena Kadhim Muhsen

College of Computer Science and Information Technology University of Al-Qadisiyah, Diwaniyah, Iraq

Ahmed T. Sadiq

University of Technology-Iraq Computer Science College A. I. Department

Sura Mazin Ali

Mustansiriyah university Political science college

Yasir Mahmood Younus

School of Electrical and Electronic Engineering Campus, Universiti Sains Malaysia (USM), 14300 Nibong Tebal, Pulau Pinang, Malaysia

Department of Computer Techniques Engineering, Imam Al-Kadhim College (ICK), Baghdad, Iraq

amjedabbas@alkadhim-col.edu.iq, fatima.s.hussian@qu.edu.iq, dena.k.muhsen@uotechnology.edu.iq, Ahmed.t.sadiq@uotechnology.edu.iq, Suraaz2007@uomustansiriyah.edu.iq, yasir.mahmood@iku.edu.iq

Abstract—Cybersecurity insurance is now part of the risk management strategies used by global financial markets to defend themselves from the growing number of cyberattacks. There needs to be a good way to set prices so that insurance companies can make more money and customers have compelling reasons to buy protection. But the way things are done now often doesn't consider the strategic ways that firms and insurers operate together, which can lead to problems like moral hazard and adverse selection. Because of changes in rules and risks, it is harder to follow standard price norms in international markets, which makes these limits considerably harder to reach. This study introduces the STACI framework, a theoretical model for pricing cybersecurity insurance in international markets, grounded in Stackelberg's principles, to address the prevailing challenges. The model uses game theory and has businesses making choices about their cybersecurity insurance and investments and insurers making choices about their premium rates and coverage possibilities. The STACI model can help you make sense of all the many types of data, investment trends, and rules that are different in each country. The idea is to decrease the effects of bad selection and make sure that everyone has the same reasons to do things. The suggested method says that insurance companies can charge varying prices to different businesses based on how risky they are and how they act. This will let businesses establish better prices, which will encourage individuals to spend money on cybersecurity when they need it. The world is a better place when the internet is safer and insurance is stronger. As the world's financial systems get more complicated and integrated, the STACI framework offers a valuable and adaptable way to create cybersecurity insurance coverage.

Keywords—Cybersecurity insurance, game theory, Stackelberg game, insurance pricing, adverse selection, moral hazard

::: PAPER ID: 248 :::

ZERO-KNOWLEDGE PROOF-BASED AUTHENTICATION FOR SECURE DIGITAL WALLET TRANSACTIONS IN DECENTRALIZED FINANCE

Bareq M. Khudhair, Karrar M. Khudhair, Jasim Gshayyish Zwaid

Department of Computer Techniques Engineering Imam Al-Kadhim University College (IKC), Iraq

Falah Amer Abdulazeez

Center for Cyber Security, Faculty of Information Science and Technology, Universiti Kebangsaan Malaysia (UKM), Malaysia

Department of Mathematics, Education for Pure Sciences College, Alanbar, Iraq

Ziad Najim Abed, Riyad Hassoon Jabbar

Business Administration Department Imam Al-Kadhim College (IKC), Baghdad, Iraq

bareq.maher@iku.edu.iq, karrarmaher@iku.edu.iq, jasim.alwosole@mtu.edu.iq, falah.amer.azeez@uoanbar.edu.iq, ziadnajim@iku.edu.iq, riadhassoon@iku.edu.iq

Abstract—Zero-Knowledge Proof (ZKP)-based authentication offers a privacy preserving and secure approach for digital wallet transactions in decentralized finance (DeFi). It enables users to verify identity and execute transactions without revealing sensitive information. However, existing authentication methods often rely on exposed public addresses, vulnerable private keys, or basic multi-factor authentication, which compromise privacy and scalability under high transaction loads. To address these challenges, this paper proposes a novel framework called zk-Rollup-Integrated The zk-BHC biometric hash algorithm. The solution uses zk-Rollups for efficient and scalable off-chain computation with biometric hash commitments to verify users while keeping their privacy safe. This integration makes sure that user identity verification and transaction validation happen without giving up any raw biometric inputs or transactional metadata. The proposed zk-BHC method uses a zero-knowledge proof inside a zk-Rollup to check biometric input (such a fingerprint) and let users log in. The method keeps authentication secure and reduces touch on the blockchain. Transaction confidentiality. Experimental evaluation demonstrates that zk-BHC significantly reduces gas costs, ensures sub-second authentication, and maintains zero knowledge compliance. It enhances privacy by 98.7%, improves scalability by 97.4%, and resists common attack vectors by 96.2%, as well as reduces authentication latency by 97.9%, thereby mitigating risks such as key theft or identity spoofing in DeFi wallet interactions.

Keywords—Zero-Knowledge proof, zk-Rollup, biometric authentication, decentralized finance, digital wallet, privacy-preserving verification

::: PAPER ID: 249 :::

FEATURE SELECTION FOR LARGE-SCALE E-COMMERCE FRAUD DETECTION USING RECURSIVE FEATURE ELIMINATION AND BIG DATA ANALYTICS

Riyad Hassoon Jabbar, Ziad Najim Abed

Business Administration Department Imam AlKadhim College (IKC), Baghdad, Iraq

Bareq M. Khudhair, Karrar M. Khudhair

Department of Computer Techniques Engineering Imam Al-Kadhim University College (IKC), Iraq

Jasim Gshayyish Zwaid

Department of Accounting, Kut Technical Institute Middle Technical University, Iraq

Falah Amer Abdulazeez

Center for Cyber Security, Faculty of Information Science and Technology, Universiti Kebangsaan Malaysia (UKM), Malaysia

Department of Mathematics, Education for Pure Sciences College, Alanbar, Iraq

riadhassoon@iku.edu.iq, bareq.maher@iku.edu.iq, jasim.alwosole@mtu.edu.iq, ziadnajim@iku.edu.iq, karrarmaher@iku.edu.iq, falah.amer.azeez@uoanbar.edu.iq

Abstract—As these types of transactions happen more often and in increasingly complicated ways on large e-commerce sites, it is becoming more important to find them. To get the best possible prediction accuracy, it needs to choose your features very carefully. This will make it easier and faster for fraud detection systems to work. The information about fraud is always changing, so it is not stable. But most of the solutions that are available right now use static feature sets and machine learning models that aren't very good. This research proposes a methodology that combines Recursive Feature Elimination (RFE) with a Random Forest classifier within the framework of Apache Spark, a big data platform. The goal of this strategy is to get rid of the problems that were discussed. The method uses distributed computing to make everyone's job faster and more flexible. It also puts things in a logical sequence and gets rid of anything that isn't important. After that stage is done, the chosen attributes are utilized to teach a model how to find fraud in real time. This makes it easier to handle a lot of streaming data. We can greatly reduce the number of features using the method described without compromising or improving the accuracy of the detection in any manner. This means that the time it takes to process is shorter and the number of false positives is lower. These results suggest that RFE-based feature selection is an effective method for assisting e-commerce enterprises in detecting fraudulent activities inside large data environments.

Keywords—E-commerce fraud detection, Feature selection, Recursive Feature Elimination, Random Forest, Big data analytics, Apache Spark

::: PAPER ID: 250 :::

METAHEURISTIC-BASED SECURE FORECASTING OF CRYPTOCURRENCY VOLATILITY IN ADVERSARIAL ENVIRONMENTS

Ahmed T. Sadiq

University of Technology-Iraq Computer Science College A. I. Department

Dena Kadhim Muhsen

Computer Science College, University of Technology – Iraq

Amjed Abbas Ahmed

Center for Cyber Security, Faculty of Information Science and Technology Universiti Kebangsaan Malaysia, Department of Computer Techniques Engineering, Imam AlKadhim College (IKC), Baghdad, Iraq

Saif Aamer Fadhil

Cyber Security Department, Imam Al-Kadhim College, Baghdad, Iraq.

Sura Mazin Ali

Mustansiriyah university Political science college

Ali Hamzah Najim

Department of Computer Technical Engineering, Imam Al-Kadhim University College (IKC), Al-Diwaniyah, Iraq

Ahmed.t.sadiq@uotechnology.edu.iq, dena.k.muhsen@uotechnology.edu.iq, amjedabbas@alkadhim-col.edu.iq, saifaamer@alkadhim-col.edu.iq, Suraaz2007@uomustansiriyah.edu.iq, alihamza@iku.edu.iq

Abstract—Cryptocurrency markets are highly volatile and often operate in adversarial environments, where both legitimate and manipulative behaviors influence price movements. Accurate forecasting in such dynamic settings is essential for secure financial decision-making. However, existing methods often fail to address the dual challenges of optimal parameter tuning and resilience against adversarial noise, leading to reduced predictive accuracy. To overcome these limitations, this paper proposes a Hybrid Metaheuristic-Enhanced Long Short-Term Memory (HME-LSTM) framework integrated with Adversarial Noise Filtering. The metaheuristic component, such as Particle Swarm Optimization, is used to fine-tune the LSTM model parameters, while the filtering module removes manipulated or anomalous data patterns. This hybrid approach ensures more robust and reliable forecasts under distorted market conditions. The method is applied to Bitcoin price volatility prediction, providing enhanced security and stability in forecasting. Experimental results show significant improvement in accuracy and resilience compared to traditional approaches, even under adversarial manipulation.

Keywords—Cryptocurrency Volatility, Metaheuristic Optimization, Adversarial Noise Filtering, LSTM Forecasting, Secure Prediction, etc

::: PAPER ID: 251 :::

ADVERSARIAL INTERCEPTION OF DEEFPAGE VIDEOS USING QUANTUM NEURAL NETWORKS FOR ROBUST SOCIAL MEDIA CONTENT MONITORING

Falah Amer Abdulazeez, Mohammad Kamrul Hasan, Siti Norul Huda Sheikh Abdullah

Faculty of Information Science and Technology, National University of Malaysia, Bangi 43600, Malaysia

Falah Amer Abdulazeez

Education for Pure Sciences College, University of Anbar, Al Rumadi, 31001, Iraq

p160006@siswa.ukm.edu.my, mkhasan@ukm.edu.my, snhsabdullah@ukm.edu.my

Abstract—The widespread circulation of deepfake videos on social media threatens public information veracity. This paper proposes a quantum neural network (QNN)-based strategy to combat deepfakes, leveraging quantum computational superiority. We introduce a Quantumvolutional Neural Network (QuNN) with adversarial training (FGSM/PGD attacks). Unlike classical neural networks—which are vulnerable to adversarial attacks—our QNN system exploits quantum parallelism to detect imperceptible artifacts. Evaluations on FF++, Celeb-DF, and DFDC datasets show improved adversarial robustness. The study also addresses scalability for real-world deployment, offering insights into secure social media monitoring.

Keywords—Deepfakes, Fake video detection, Quantum Computing, Quantum Neural Networks, Adversarial attacks, Social Media Monitoring

:: PAPER ID: 252 ::

POST-QUANTUM KEY EXCHANGE IN IOT-BLOCKCHAIN HYBRID INFRASTRUCTURES USING NTRUEncrypt ALGORITHM

Jasim Gshayyish Zwaid

Department of Accounting, Kut Technical Institute Middle Technical University, Iraq

Fatima S.Hussian

College of Computer Science and Information Technology University of Al-Qadisiyah, Diwaniyah, Iraq

Bareq M. Khudhair

Department of Computer Techniques Engineering Imam Al-Kadhimi University College (IKC), Iraq

Bushra Saadoon Mohammed Alnoori

Almansour University College English Department Layla Safwat Jamil college of agriculture engineering science, university of Baghdad, Iraq

Falah Amer Abdulazeez

Center for Cyber Security, Faculty of Information Science and Technology, Universiti Kebangsaan Malaysia (UKM), Malaysia

Department of Mathematics, Education for Pure Sciences College, Alanbar, Iraq

jasim.alwosole@mtu.edu.iq, fatima.s.hussian@qu.edu.iq, bareq.maher@iku.edu.iq, bushra.saadoon@muc.edu.iq, layla.s@coagri.uobaghdad.edu.iq, falah.amer.azeez@uoanbar.edu.iq

Abstract—The Internet of Things (IoT) and blockchain technology have created a new way to share data safely and without a central point of failure in mission-critical infrastructures. RSA and ECC are examples of traditional cryptographic methods that are particularly weak in the age of quantum computing, which challenges their fundamental core security. Existing key exchange methods will be useless in the future since they don't work well with Internet of Things devices or are easy for quantum computers to attack. To make matters worse, a lot of weak cryptosystems can't handle quantum assaults and yet work with blockchain protocols. This paper presents a Hybrid Post-Quantum Key Exchange Method (HPQKM) founded on the NTRUEncrypt algorithm to overcome these constraints. This is a lattice-based cryptography technique that is well-known for being quantum-resistant and efficient. HPQKM can validate public keys and make safe connections without a central authority by using NTRUEncrypt, a lightweight encryption solution, and blockchain smart contracts. The suggested method lets you add more devices without using up processing power. It also makes it possible to safely and securely send keys across IoT nodes using blockchain technology. Because it has been put into action, this method can also stand up to attacks from quantum computers. HPQKM is far ahead of the competition when it comes to blockchain solutions for the next generation of IoT ecosystems. After quantum computing, it is safer, has less delay, and uses less energy than RSA and ECC-based methods.

Keywords—Post-Quantum Cryptography, NTRUEncrypt, IoT Security, Blockchain, Key Exchange, Lattice-based Cryptography

:: PAPER ID: 253 ::

CHAOS-ENHANCED ENCRYPTION FOR SECURE FINANCIAL DATA TRANSMISSION IN SMART BANKING INFRASTRUCTURES

Ziad Najim Abed

Business administration dept. Imam Al-Kadhimi College (IKC)– Iraq

Sura Mazin Ali

Mustansiriyah university Political science college

Layla Safwat Jamil

college of agriculture engineering science, university of Baghdad, Iraq

Asma Ibrahim Hussein

Ministry of Higher education and, Scientific Research, Baghdad, Iraq,

Zainab Mohammed Hussein

Law Department/Imam AlKadhimi College (IKC), Baghdad, Iraq

Amjed Abbas Ahmed

Center for Cyber Security, Faculty of Information Science and Technology Universiti Kebangsaan Malaysia

Department of Computer Techniques Engineering, Imam AlKadhimi College (IKC), Baghdad, Iraq

ziadnajim@iku.edu.iq, Suraaz2007@uomustansiriyah.edu.iq, layla.s@coagri.uobaghdad.edu.iq, cs.20.10@grad.technology.edu.iq, zaynab.mohammed@iku.edu.iq, amjedabbas@alkadhimi-col.edu.iq

Abstract—In smart banking infrastructures, securing financial data transmission is critical due to the increasing reliance on mobile and IoT-based banking applications. Chaos-enhanced encryption offers a novel approach by leveraging the unpredictable behavior of chaotic systems for stronger cryptographic protection. Encryption methods often suffer from high computational overhead, vulnerability to statistical attacks, and inefficiencies in handling real-time mobile transactions. To address these issues, this work proposes a hybrid encryption framework that combines a chaos-based stream cipher with elliptic curve cryptography (CSC-ECC). The chaotic stream cipher generates highly sensitive pseudorandom keystreams for initial encryption, while ECC provides lightweight, secure key exchange and an additional encryption layer. The proposed method is applied to secure real-time financial transactions transmitted from user devices to bank servers, ensuring both speed and confidentiality. Simulation results indicate that the framework significantly enhances resistance to known-plaintext and differential attacks while maintaining low latency, making it suitable for innovative banking systems. Findings reveal that the hybrid chaos-ECC framework enhances transmission security by over 40% compared to conventional schemes, with minimal computational cost, making it ideal for scalable, real-time banking environments.

Keywords—Chaos encryption, Elliptic Curve Cryptography, stream cipher, innovative banking, secure transmission, financial data security

:: PAPER ID: 254 ::

SECURE TRANSMISSION PATH OPTIMIZATION IN UAV MESH NETWORKS USING REINFORCEMENT LEARNING TECHNIQUES

Mustafa M. Abd Zaid

College of Technical Engineering, Islamic University, Najaf, Iraq

Jasim Gshayyish Zwaid

Department of Accounting, KutTechnical Institute Middle Technical University, Iraq

Ahmed Mazin Jalal,

Department of Computer Communications Engineering, Imam alKadhum collage(IKC), Iraq

Azhaar Abd-Alhussan Shalal

College of Engineering, Al-Shatrah University, Thi-Qar , Iraq

Bushra Saadoon Mohammed Alnoori

Almansour University College English Department

Falah Amer Abdulazeez

Center for Cyber Security, Faculty of Information Science and Technology, Universiti Kebangsaan Malaysia(UKM), Malaysia

Department of Mathematics, Education for Pure Sciences College, Alanbar, Iraq

mustafamajeed@iunajaf.edu.iq, jasim.alwosole@mtu.edu.iq, ahmed.mazin@iku.edu.iq, azhaar.alkhafaji@shu.edu.iq, bushra.saadoon@muc.edu.iq, falah.amer.azeez@uonbar.edu.iq

Abstract—Secure communication in UAV mesh networks is crucial for mission-critical tasks, including surveillance, disaster management, and military operations. Due to their dynamic topology and decentralized nature, optimizing transmission paths while ensuring data security remains a core challenge. Existing routing protocols often fail to adapt to rapid changes in topology. They are vulnerable to malicious attacks, such as black-hole and sybil attacks, which compromise data integrity and network efficiency. Moreover, static routing lacks the intelligence to evaluate trustworthiness and stability in real time. To address these challenges, this paper proposes a Deep Q-Network (DQN)-based reinforcement learning framework for optimizing secure transmission paths. Each UAV is modeled as an intelligent agent that learns to select safe and reliable routing paths by observing local network states such as trust scores, link quality, and energy levels. The proposed method enables UAVs to dynamically adapt routing strategies based on learned experiences, minimizing the risk of routing through compromised or unstable nodes. It balances security, efficiency, and energy constraints through continuous learning. Simulation results demonstrate an improved packet delivery ratio, reduced end-to-end delay, and enhanced robustness against security threats, validating the effectiveness of the proposed intelligent routing scheme.

Keywords—mesh networks, reinforcement learning, secure routing, path optimization, network security

:: PAPER ID: 255 ::

ANOMALY DETECTION IN DIGITAL PAYMENT SYSTEMS USING ATTENTION-BASED RECURRENT NEURAL NETWORKS

Mustafa Hussein Hasan

College of Administration and Economics, University of Baghdad, Baghdad, Iraq Business Administration

Department, Imam Al-Kadhim College, Baghdad, Iraq,

Mustafa M. Abd Zaid

College of Technical Engineering, Islamic University, Najaf, Iraq

Ziad Najim Abed

Business administration dept. Imam Al-Kadhim College

Zainab Mohammed Hussein

Computer Science/ Information System University of Technology Law Department/Imam AlKadhum College (IKC), Baghdad, Iraq

Ali Abbas Hadi

Computer Science/ Information System University of Technology Law Department/Imam AlKadhum

College(IKC),Baghdad, Iraq

Ali Hamzah Najim

Department of Computer Technical Engineering, Imam Al-Kadhim University College (IKC), Al-Diwaniyah, Iraq

mustafahussein@iku.edu.iq, mustafamajeed@iunajaf.edu.iq, ziadnajim@iku.edu.iq, zaynab.mohammed@iku.edu.iq, Aliabbas@alkadhum-col.edu.iq, aliamza@iku.edu.iq

Abstract—Digital payment systems have become an integral part of modern financial infrastructure, enabling fast, seamless, and convenient transactions. However, the increasing reliance on these systems has led to a rise in fraudulent activities and anomalous transaction patterns that pose significant security and financial risks. Existing anomaly detection methods often rely on rule-based systems or traditional machine learning models that struggle to capture the complex temporal dependencies and evolving patterns in transaction data. These approaches frequently yield high false positive rates and lack adaptability to new fraud techniques. To address these challenges, we propose TABA-Net (Temporal Attention-enhanced BiLSTM Autoencoder Network), a deep learning-based framework designed to detect anomalies in digital payment transactions. TABA-Net utilizes a Bidirectional Long Short-Term Memory (BiLSTM) autoencoder to learn latent representations of normal transaction sequences, incorporating a temporal attention mechanism that dynamically assigns weights to each time step to enhance the model's sensitivity to subtle and context-specific anomalies. The proposed method is applied to real-time mobile wallet transactions, where it analyzes sequential behavioral patterns of users to flag unusual activity, such as sudden transaction spikes, atypical transfer timings, or interactions with unrecognized recipients. Experimental results demonstrate that TABA-Net outperforms traditional LSTM-based and statistical anomaly detection methods by achieving higher precision and recall while significantly reducing false positives. The model adapts effectively to dynamic transaction environments, offering a robust, scalable, and intelligent solution for enhancing security in digital payment ecosystems.

Keywords—Anomaly Detection, Digital Payment Systems, BiLSTM, Autoencoder, Temporal Attention, Fraud Detection, Sequence Modeling, Deep Learning

:: PAPER ID: 256 ::

SECURE PERSONAL FINANCE MANAGEMENT USING FUZZY LOGIC AND BIOMETRIC MULTI-FACTOR AUTHENTICATION

Mustafa Hussein Hasan

College of Administration and Economics, University of Baghdad, Baghdad, Iraq
Business Administration Department, Imam Al-Kadhim College, Baghdad, Iraq

Karrar M. Khudhair

Department of Computer Techniques Engineering Imam Al-Kadhim University College (IKC), Iraq

Zainab Mohammed Hussein

Computer Science/ Information System University of Technology Law Department/Imam AlKadhum College (IKC), Baghdad, Iraq

Ziad Najim Abed

Business administration dept. Imam Al-Kadhim College

Ali Abbas Hadi

Department of communication Engineering Imam Al-Kadhum university college(IKC)

Ali Hamzah Najim

Department of Computer Technical Engineering, Imam Al-Kadhim University College (IKC), Al-Diwaniyah, Iraq

mustafahussein@iku.edu.iq, karrarmaher@iku.edu.iq, zaynab.mohammed@iku.edu.iq,
ziadnajim@iku.edu.iq, Aliabbas@alkadhum-col.edu.iq, alihamza@iku.edu.iq

Abstract—Secure personal finance management is critical in the digital age due to increasing online transactions and data breaches. This research proposes a novel system integrating fuzzy logic and biometric multi-factor authentication to enhance financial data protection and user trust. Existing personal finance systems often rely on static passwords and PINs, which are vulnerable to phishing, brute force attacks, and identity theft. These traditional methods fail to provide robust, adaptive, and context-aware security measures. To overcome these limitations, here introduce the Fuzzy-Biometric Enhanced Personal Finance Framework (FBEPF). FBEPF combines fuzzy logic for risk-based access control with biometric multi-factor authentication (fingerprint, facial recognition, voice) to dynamically assess and verify user identity. The proposed method enables secure, real-time access to financial services by analyzing behavioral and biometric patterns and adjusting access privileges based on risk scores calculated through fuzzy logic. This ensures flexibility and heightened protection against unauthorized access. Experimental results demonstrate that FBEPF significantly improves security, reduces false acceptance and rejection rates, and enhances user convenience compared to conventional methods. The framework thus provides a smart, adaptive solution for secure personal finance management.

Keywords—Fuzzy Logic, Biometric Authentication, Personal Finance, Multi-Factor Authentication, Risk-Based Access, Cybersecurity

:: PAPER ID: 257::

AI-ENHANCED ANTI-MONEY LAUNDERING SYSTEM USING SELF-SUPERVISED GRAPH LEARNING MODELS

Ahmed Mazin Jalal

Department of Computer Communications Engineering, Imam alkadhum collage (IKC), Baghdad, Iraq

Karrar M. Khudhair

Department of Computer Techniques Engineering Imam Al-Kadhim University College (IKC), Iraq

Mustafa Hussein Hasan

College of Administration and Economics, University of Baghdad, Baghdad, Iraq

Business Administration Department, Imam Al-Kadhim College, Baghdad, Iraq

Zainab Mohammed Hussein

Computer Science/ Information System University of Technology Law Department/Imam AlKadhum College (IKC), Baghdad, Iraq

Ali Abbas Hadi

Department of communication Engineering Imam Al-Kadhum university college(IKC)

Ali Hamzah Najim

Department of Computer Technical Engineering, Imam Al-Kadhim University College (IKC), AlDiwaniyah, Iraq

ahmed.mazin@iku.edu.iq, karrarmaher@iku.edu.iq, mustafahussein@iku.edu.iq, zaynab.mohammed@iku.edu.iq,
Aliabbas@alkadhum-col.edu.iq, alihamza@iku.edu.iq

Abstract—Anti-money laundering (AML) systems are very important for banks and other financial organizations to detect suspicious activity and stop money from moving illegally. Using artificial intelligence (AI) and graph-based learning may make it much easier to find sophisticated money laundering patterns amongst linked companies. Most modern AML solutions involve supervised learning and rule-based algorithms. When there isn't enough labeled data, when laundering methods change, or when there are a lot of false positives, they don't work well. Because of these problems, they are not as good for big, changing financial networks. This study suggests SAGE-AML, which stands for "Self-supervised Attention-based Graph Embedding for Anti-Money Laundering." This new AI-based solution uses self-supervised graph learning to find connections and patterns across accounts that aren't obvious without a lot of labeled data. SAGE-AML uses attention processes to focus on key links and creates strong representations of entities and transactions in financial graphs that are not all the same. By looking at the relationships and connections across accounts, the suggested method is good at finding strange behavior and abnormalities. It changes over time, which helps it learn from fresh data streams all the time. When tested on real-world financial transaction datasets, SAGE-AML was far better than conventional and supervised graph-based models in finding items, being reliable, and reducing false positives.

Keywords—Attention, Anti-money Laundering, Graph Learning, Self-supervised Learning, and Financial Fraud Detection, Mechanism, Anomaly Detection

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A HYBRID DEEP LEARNING AND ELLIPTIC CURVE CRYPTOGRAPHY SCHEME FOR REAL-TIME FINANCIAL TRANSACTION SECURITY

Azhaar A. Shalal

Department of Computer Engineering, Al-Shatrah University, Thi-Qar, Iraq

Amjed Sahib Noori Alshami

Cyber Security Department, Imam Al-Kadhim College, Baghdad, Iraq.

Layla Safwat Jamil

college of agriculture engineering science, university of Baghdad, Iraq

Saif Aamer Fadhil

Cyber Security Department, ImamAl-Kadhim College, Baghdad, Iraq.

Ahmed Mazin Jalal

Department of Computer Communications Engineering, Imam alkadhun collage (IKC), Iraq

Karrar Abbas Yousif

DOCTORADO EN INGENIERÍA AUTOMÁTICA, ELECTRÓNICA Y DE TELECOMUNICACIÓN Escuela Técnica Superior de Ingeniería - Universidad de Sevilla

azhaar.alkhafaji@shu.edu.iq, saifaamer@alkadhun-col.edu.iq, layla.s@coagri.uobaghdad.edu.iq,
saifaamer@alkadhun-col.edu.iq, ahmed.mazin@iku.edu.iq, karyou@alum.us.es

Abstract—Real-time financial transactions demand high levels of security and intelligence to prevent unauthorized access and fraudulent activities. To address this, integrating deep learning with cryptographic techniques provides a promising approach to enhancing transaction safety without compromising speed. Existing methods often suffer from two major issues: limited real-time fraud detection accuracy and significant computational overhead due to traditional encryption algorithms. These shortcomings result in either delayed responses or vulnerable transaction channels, particularly in mobile or lightweight financial systems. This paper proposes HDELTS (Hybrid Deep Learning and Elliptic Curve Cryptography Scheme for Live Transaction Security). This novel framework combines LSTM-based Autoencoder models for anomaly detection with Elliptic Curve Cryptography (ECC) for secure data transmission. The LSTM Autoencoder is trained to learn normal transaction behaviors and detect anomalies with high precision based on reconstruction errors. Meanwhile, ECC ensures the lightweight, strong encryption of transaction data, making it suitable for real-time applications with limited processing capacity. Experimental results demonstrate that HDELTS significantly improves the accuracy of real-time fraud detection while reducing encryption latency compared to traditional systems. The framework achieves a balanced trade-off between security, speed, and resource efficiency, making it highly suitable for modern digital financial infrastructures.

Keywords—Real-time transaction security, Autoencoder-based anomaly detection, Elliptic Curve Cryptography, hybrid deep learning-cryptography framework, and secure mobile payment systems

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AI-POWERED CREDIT CARD FRAUD DETECTION USING OPTIMIZED CONVOLUTIONAL NEURAL NETWORKS AND SYNTHETIC DATA AUGMENTATION

Ahmed Mazin Jalal

Department of Computer Communications Engineering, Imam alkadhun collage (IKC), Iraq

Amjed Sahib Noori Alshami

Ministry of Higher Education & Scientific Research Department of Scholarships & Cultural Relations

Azhaar A. L Shala

Department of Computer Engineering, Al-Shatrah University, Thi-Qar, Iraq

Bushra Saadoon Mohammed Alnoori

Almansour University College English Department

Layla Safwat Jamil

College of agriculture engineering science, university of Baghdad, Iraq

Mohammed Ridha Abbas Yousif

English Language Studies, Faculty of Social Sciences and Humanities, Universiti Kebangsaan Malaysia (UKM), Bangi 43600, Malaysia Department of Computer English, Imam AlKadhun College/Diyala Departments (IKC), Baghdad, Iraq

ahmed.mazin@iku.edu.iq, Amjed.Sahib@mohers.edu.iq, azhaar.alkhafaji@shu.edu.iq, bushra.saadoon@muc.edu.iq,
layla.s@coagri.uobaghdad.edu.iq, mohammed.ridha@iku.edu.iq

Abstract—Credit card fraud detection, a essential a part of economic safety, desires accurate, actual-time detection of suspicious transactions. Artificial intelligence (AI) driven fashions have demonstrated ability in enhancing detection competencies, particularly in-depth expertise of strategies, which is essential given the developing complexity of fraud operations. However, current fraud detection techniques are often bothered by excessive data imbalance, wherein true transactions outnumber fraudulent ones, resulting in poor sample generalization and excessive price of false negatives. In addition, traditional fashions lack the capacity to explore subtle patterns because of suboptimal structural company. To conquer the ones constraints, this paper proposes SCORFraudNet (Synthetic Data Augmentation with CNN Optimization for Real-time Fraud Detection Using Neural Networks). This sturdy framework combines synthetic facts epoching with an optimized 1D Convolutional Neural Network (CNN) and the usage of SMOTE. SMOTE efficiently balances the dataset via building artificial models of minority splendor, even as the hyper-parameter-tuned CNN framework improves the overall standard performance of characteristic extraction and sophistication in discontinuous transaction data. The proposed technique is applied in an actual-time transaction monitoring engine designed for ecommerce systems and banking offerings. Experimental results show that SCOR-FraudNet notably improves detection accuracy, precision, and keep in mind in comparison to conventional device gaining knowledge of and unoptimized deep getting to know models.

Keywords—Credit Card Fraud Detection, Synthetic Data Augmentation, SMOTE, Real-time Monitoring, Deep Learning, Imbalanced Data Classification

::: PAPER ID: 260 :::

BLOCKCHAIN-INTEGRATED GENETIC ALGORITHM FOR SECURE ASSET ALLOCATION IN ROBO-ADVISORY SYSTEMS

Amjed Sahib Noori Alshami

Ministry of Higher Education & Scientific Research Department of Scholarships & Cultural Relations

Ahmed Mazin Jalal

Department of Computer Communications Engineering, Imam al-Kadhim College (IKC), Iraq

Azhaar A. Shalal

Department of Computer Engineering, Al-Shatrah University, Thi-Qar, Iraq

Layla Safwat Jamil

College of Agriculture Engineering Science, University of Baghdad, Iraq

Saif Aamer Fadhil

Cyber Security Department, Imam Al-Kadhim College, Baghdad, Iraq

Mohammed Ridha Abbas Yousif

English Language Studies, Faculty of Social Sciences and Humanities, Universiti Kebangsaan Malaysia (UKM), Bangi 43600, Malaysia

Department of Computer English, Imam Al-Kadhim College/Diyala Departments (IKC), Baghdad, Iraq

Amjed.Sahib@mohers.edu.iq, ahmed.mazin@iku.edu.iq, azhaar.alkhafaji@shu.edu.iq, layla.s@coagri.uobaghdad.edu.iq, saifaamer@alkadhum-col.edu.iq, mohammed.ridha@iku.edu.iq

Abstract—Blockchain-Integrated Genetic Algorithm (BIGA) offers a novel approach to enhancing security and optimization in robo-advisory asset allocation systems. By combining the decentralized trust of blockchain with the adaptive optimization power of genetic algorithms, BIGA ensures both transparency and intelligent decision-making in financial advising. Existing robo-advisory methods often suffer from limited security, a lack of transparency in allocation processes, and suboptimal asset selection due to the use of static or linear optimization models. These weaknesses reduce trust and performance efficiency in dynamic market conditions. To address these issues, here propose a hybrid framework named BIGA-RA (Blockchain-Integrated Genetic Algorithm for Robo-Advisory Systems), which integrates smart contract-enabled blockchain layers with a self-evolving genetic algorithm engine. This ensures secure transaction recording, tamper-proof audit trails, and dynamic, optimized asset allocation. The BIGA-RAS framework utilizes blockchain for secure client data handling and transparent transaction validation. At the same time, the genetic algorithm adapts portfolio strategies based on real-time market data and investor preferences. Smart contracts automate investment rules, enhancing compliance and trust. Experimental results demonstrate that BIGA-RAS outperforms conventional methods in terms of security, transparency, adaptability, and return optimization. It provides a robust, intelligent, and secure solution for next-generation robo-advisory platforms.

Keywords—Blockchain, Genetic Algorithm, Robo-Advisory, Asset Allocation, Smart Contracts, Financial Optimization

::: PAPER ID: 261 :::

PRIVACY-PRESERVING FEDERATED CLUSTERING FOR FINANCIAL DATA ANALYTICS IN CLOUD ENVIRONMENTS

Amjed Sahib Noori Alshami

Ministry of Higher Education & Scientific Research Department of Scholarships & Cultural Relations

Sura Mazin Ali

Mustansiriyah University Political Science College

Ahmed T. Sadiq

University of Technology-Iraq Computer Science College A. I. Department

Dena Kadhim Muhsen

Computer Science College, University of Technology, Iraq

Saif Aamer Fadhil

Cyber Security Department, Imam Al-Kadhim College, Baghdad, Iraq

Odai Amer Hamid

Administrative Technical College / Mosul - Northern Technical University, Iraq

*Center for Software Technology and Management, Faculty of Information Science and Technology, University Kebangsaan Malaysia, Bangi, Malaysia

Amjed.Sahib@mohers.edu.iq, Suraaz2007@uomustansiriyah.edu.iq, Ahmed.T.Sadiq@uotechnology.edu.iq, dena.k.muhsen@uotechnology.edu.iq, saifaamer@alkadhum-col.edu.iq, oudayamer@ntu.edu.iq

Abstract—The increasing reliance on cloud platforms for financial data analytics necessitates secure and scalable frameworks that ensure user privacy across institutions. Federated clustering offers a promising solution by enabling collaborative learning without centralized data aggregation. However, traditional federated clustering methods are vulnerable to privacy leakage and suffer from high communication overhead and limitations in static learning. These issues hinder real-time decision-making and compromise sensitive financial information. To address these challenges, this paper propose a novel Differentially Private Federated K-Means Clustering (DP-FedKMeans) framework integrated with Spike-Timing Dependent Plasticity (STDP)-based online learning. This hybrid model combines privacy guarantees through differential privacy with adaptive learning from spiking neural dynamics to support real-time, efficient clustering across distributed financial institutions. The proposed method is applied for secure customer segmentation in multi-bank environments, enabling financial platforms to identify investment behaviors and credit risk groups without exposing raw customer data. Experimental evaluation demonstrates that DP-FedKMeans with STDP enhances clustering accuracy by 11.3%, reduces communication cost by 27%, and maintains strict privacy constraints, outperforming conventional federated methods in both scalability and compliance.

Keywords—Federated Clustering, Differential Privacy, STDP Learning, Financial Data Analytics, Cloud Security, Customer Segmentation

::: PAPER ID: 262 :::

EXPLAINABLE MACHINE LEARNING FOR TRUST-BASED RISK PREDICTION IN DECENTRALIZED FINANCIAL NETWORKS

Riyad Hassoon Jabbar

Economic Development Major Business Administration Department Imam AlKadhum College (IKC), Baghdad, Iraq

Mustafa Hussein Hasan

College of Administration and Economics, University of Baghdad, Baghdad, Iraq Business Administration Department, Imam Al-Kadhim College, Baghdad, Iraq

Ahmed T. Sadiq

University of Technology-Iraq Computer Science College A. I. Department

Dena Kadhim Muhsen

Computer Science College, University of Technology – Iraq

Sura Mazin Ali

Mustansiriyah university Political science college

Odai Amer Hamid

Administrative Technical College /Mosul –Northern Technical University. Iraq

*Center for Software Technology and Management, Faculty of Information Science and Technology, University Kebangsaan Malaysia, Bangi, Malaysia

riyadhassoon@iku.edu.iq, mustafahussein@iku.edu.iq, Ahmed.T.Sadiq@uotechnology.edu.iq, dena.k.muhsen@uotechnology.edu.iq, Suraaz2007@uomustansiriyah.edu.iq, oudayamer@ntu.edu.iq

Abstract—Decentralized financial networks rely on trust and transparency to facilitate secure transactions across anonymous participants. In such environments, explainable machine learning plays a crucial role in enabling reliable risk prediction and informed decision-making. However, existing models often lack interpretability and fail to capture complex transactional relationships, making them inadequate for transparent and trustworthy predictions. To address these limitations, this paper proposes a novel framework that combines Graph Neural Networks with SHapley Additive exPlanations (GNN-SHAP)-based explainability. GNN effectively learns patterns from interconnected wallet transactions, while SHAP provides clear, feature-level interpretations for each risk prediction. This approach is applied to assess trust and predict risk scores for users in decentralized financial lending platforms, helping to identify potentially fraudulent or high-risk actors. Experimental results demonstrate that the proposed method not only achieves high predictive accuracy but also delivers interpretable insights, empowering users and regulators to better understand, trust, and act upon model outputs in decentralized environment.

Keywords—Explainable Machine Learning, Decentralized Finance, Graph Neural Network, SHAP Explainability, Risk Prediction, etc

::: PAPER ID: 263 :::

SPIKING NEURAL NETWORKS FOR REAL-TIME THREAT DETECTION

Zainab Mohammed Hussein

Law Department/Imam AlKadhum College, Baghdad, Iraq

Sura Mazin Ali

Mustansiriyah university Political science college

Ahmed T. Sadiq

University of Technology-Iraq Computer Science College A. I. Department

Dena Kadhim Muhsen

Computer Science College, University of Technology – Iraq

Yasir Mahmood Younus

School of Electrical and Electronic Engineering Campus, Universiti Sains Malaysia (USM), 14300 Nibong Tebal, Pulau Pinang, Malaysia

Department of Computer Techniques Engineering, Imam Al-Kadhum College (IKC), Baghdad, Iraq

Saif Aamer Fadhil

Cyber Security Department, Imam Al-Kadhim College, Baghdad, Iraq

zaynab.mohammed@iku.edu.iq, Suraaz2007@uomustansiriyah.edu.iq, Ahmed.T.Sadiq@uotechnology.edu.iq, dena.k.muhsen@uotechnology.edu.iq, yasir_mahmood@student.usm.my, saifaamer@alkadhum-col.edu.iq

Abstract—Spiking Neural Networks (SNNs) offer a biologically inspired approach to intelligent computing, making them well-suited for processing high-speed, event-driven data. In the context of high-frequency trading (HFT) systems, real-time threat detection demands both rapid inference and adaptive learning capabilities. Traditional deep learning and rule-based systems struggle with the latency, scalability, and adaptability required in HFT environments, leading to delayed or inaccurate threat recognition. These methods are not designed to handle the continuous, asynchronous flow of microsecond-level financial data. To address these limitations, this paper proposes an Event-Driven Spiking Neural Network (ED-SNN) architecture with Spike-Timing Dependent Plasticity (STDP)-based online learning. This framework captures temporal patterns from streaming market data, enabling continuous learning and low-latency threat inference without retraining. The ED-SNN framework is deployed for anomaly detection in transaction streams, where it processes spikes generated from live trading features such as order book changes, quote bursts, and abnormal volume shifts. It identifies outliers suggestive of market manipulation cyberattack activity in real time. Experimental results demonstrate that the proposed method significantly enhances detection accuracy, reduces response time, and is energy-efficient, making it well-suited for real-world financial infrastructures.

Keywords—Spiking Neural Networks, High-Frequency Trading, Real-Time Detection, Anomaly Detection, STDP, Financial Cybersecurity

:: PAPER ID: 264 ::

BEHAVIORAL BIOMETRICS-BASED INTRUSION DETECTION IN ONLINE BANKING USING LSTM NETWORKS

Karrar M. Khudhair

Department of Computer Techniques Engineering Imam Al-Kadhim University College (IKC), Iraq

Riyad Hassoon Jabbar

Economic Development Major Business Administration Department Imam AlKadhim College (IKC), Baghdad, Iraq

Mustafa Hussein Hasan

University of Baghdad, Baghdad, Iraq Business Administration Department, Imam Al-Kadhim College

Dena Kadhim Muhsen

Computer Science College, University of Technology – Iraq

Abbas Fadhil Kreaah

Imam Al-Kadhim College(IKC),Baghdad, Iraq

Ali Hamzah Najim

Department of Computer Technical Engineering, Imam Al-Kadhim University College (IKC), Al-Diwaniyah, Iraq

karrarmaher@iku.edu.iq, riadhassoon@iku.edu.iq, mustafahussein@iku.edu.iq,
dena.kmuhsen@uotechnology.edu.iq, abbas_fadhil_k@ahsgs.uum.edu.my, alihamza@iku.edu.iq

Abstract—Behavioral biometrics-based intrusion detection leverages unique user interaction patterns, such as keystroke dynamics and mouse movements, to secure online banking systems. Using Long Short-Term Memory (LSTM) networks, this study focuses on capturing and learning these behavioral sequences to distinguish between legitimate users and intruders. Existing intrusion detection methods often suffer from limitations in capturing temporal dependencies, leading to high false positives and poor adaptability to dynamic user behavior. To overcome these issues, the proposed framework introduces Long Short-Term Memory-Based Sequential Pattern Learning (LSTM-SPL), which effectively models the temporal relationships within behavioral biometric sequences. The proposed method enables continuous user authentication by analyzing real-time behavioral data during banking sessions. It ensures a proactive security mechanism that does not solely rely on static credentials or hardware tokens. Findings from the evaluation reveal that the LSTM-SPL framework achieves high detection accuracy, significantly reduces false acceptance rates, and adapts well to evolving user behaviors, making it a robust and scalable solution for securing online banking platforms.

Keywords—Behavioral Biometrics, Intrusion Detection, Online Banking, LSTM Networks, Continuous Authentication, Cybersecurity, etc

:: PAPER ID: 265 ::

AN ENHANCED FEDERATED LEARNING FRAMEWORK FOR INTRUSION DETECTION IN SDN USING LOCAL INTERPRETABLE MODEL-AGNOSTIC EXPLANATIONS

Syed Hussain Ali Kazmi, Rosilah Hassan, Faizan Qamar, Noridayu Adnan

Center for Cyber Security, Faculty of Information Science and Technology Universiti Kebangsaan Malaysia, Selangor, Malaysia

Kashif Nisar

School of Arts and Sciences, Sydney, The University of Notre Dame, Australia

Bahari Idrus

Center for Artificial Intelligence Technology, Faculty of Information Science and Technology Universiti Kebangsaan Malaysia, Selangor, Malaysia

P112235@siswa.ukm.edu.my, rosilah@ukm.edu.my, faizanqamar@ukm.edu.my, p131986@siswa.ukm.edu.my, kashif.nisar@nd.edu.au, bahari@ukm.edu.my

Abstract—The evolution of Software-Defined Networking(SDN) within Sixth Generation (6G) networks demands intelligent, adaptive, and scalable security solutions. In this study, we propose a novel federated learning (FL) framework for intrusion detection in Software Defined Networks (SDNs), leveraging Local Interpretable Model-Agnostic Explanations (LIME) for dynamic model evaluation and selection. Traditional FL approaches are based on aggregation of local models from all clients regardless of their data quality or relevance, often leading to suboptimal global performance in heterogeneous environments like SDNs. To tackle this, proposed approach employs LIME to create interpretable explanations for client model predictions using LIME-generated synthetic validation data, allowing fine-grained performance evaluation. Only local models exhibiting high predictive accuracy and consistency are chosen for aggregation at the central server. This selective process ensures that only generalized, robust models are used to update the global intrusion detection system, boosting detection accuracy and resilience against non-IID data effects. Experiments on the benchmark In SDN dataset confirm our method improves detection metrics while preserving privacy advantages.

Keywords—Deep Learning, Explainable, Security, Artificial Intelligence, Features

::: PAPER ID: 266 :::

KNOWLEDGE DISTILLATION WITH GENETIC ARCHITECTURE SEARCH FOR TINY IoT DEVICES

Sara Ghorab, Meziani Lila
Ecole nationale Supérieure d'Informatique – ESI Algiers, Algeria
Rubin Stuart Harvey
Naval Information Warfare Center Pacific San Diego, CA 92152, United States
es_ghorab@esi.dz, L_meziani@esi.dz, stuart.rubin@navy.mil

Abstract—The deployment of convolutional neural networks (CNNs) on resource-constrained platforms, such as embedded systems and IoT devices, is hindered by their high computational and memory demands. This paper introduces a unified compression framework that synergistically combines Genetic Algorithms (GAs) with Knowledge Distillation (KD) to jointly optimize network sparsity and predictive accuracy. The search space, defined by all possible pruning configurations of neurons, grows exponentially (2^m) and renders exhaustive search intractable. To address this NP-hard problem, we encode network architectures as binary chromosomes and employ a GA to perform global exploration, guided by a multi-objective fitness function that simultaneously rewards classification accuracy and compression ratio. Unlike conventional two-stage strategies, KD is embedded directly into the evolutionary process, enabling pruned candidate models to inherit representational capacity from a high-performing teacher network during optimization. Extensive experiments on MNIST, CIFAR-10 with architectures including SimpleCNN, ResNet-18, and GoogLeNet demonstrate parameter reductions of up to 98% and substantial inference speedups, while preserving or improving baseline accuracy. Comparative analysis against state-of-the-art pruning and distillation methods confirms the superiority of the proposed approach in achieving high compression without sacrificing performance, paving the way for efficient deep learning in constrained environments.

Keywords—Convolutional neural networks, model compression, genetic algorithms, knowledge distillation, neural architecture search, pruning, resource-constrained devices, deep learning optimization

::: PAPER ID: 268 :::

AN IOT-BASED AIR QUALITY MONITORING SYSTEM USING INTERACTIVE MAP

Li Bingkai, Md Nasiruzzaman, Mahdi Miraz
School of Computing and Data Science Xiamen University Malaysia Selangor, Malaysia
CME2009091@xmu.edu.my, PCS2411001@xmu.edu.my, m.miraz@gmail.com

Abstract—This paper presents the design, development and implementation of an innovative air quality monitoring system utilising Internet of Things (IoT) technology. The system addresses the limitations of traditional monitoring methods by providing a cost-effective, scalable and real-time solution for monitoring air quality at Xiamen University Malaysia (XMUM) campus. The system integrates low-cost sensors for measuring temperature, humidity and gas concentrations with a Raspberry Pi for data processing and a web application featuring an interactive map for data visualisation. The findings from unit and integration testing highlight the system's accuracy and reliability, demonstrating its potential for wider application in environmental monitoring and promoting public awareness of air pollution. The system also highlights the potential of IoT to support sustainable development and environmental management.

Keywords—Air Quality, IoT, Interactive Map, Sustainable Development

::: PAPER ID: 269 :::

LEXICON SCORES IN MALAY SENTIMENT ANALYSIS

Sabrina Tiun, Nazlia Omar

Fakulti Teknologi dan Sains Maklumat Universiti Kebangsaan Malaysia Bangi, Malaysia

Iznora Aini Zolkifly

College of Computing and Informatics Universiti Tenaga Nasional Selangor, Malaysia

sabrinatiun@ukm.edu.my, nazlia@ukm.edu.my, icznora.aini@uniten.edu.my

Abstract—Sentiment analysis (SA) is used to examine user-generated content such as tweets and reviews. For review texts containing only a few words, a lexicon-based approach can be an effective option. The success of lexicon-based SA, however, depends on the availability of a high-quality sentiment lexicon with appropriate sentiment scores. With reliable sentiment scores, a simple lexicon-based SA model can achieve good performance. This paper therefore investigates several approaches, such as information-theoretic (e.g., bag-of-words), probabilistic (e.g., TFIDF), and pointwise mutual information (PMI) for constructing word-level sentiment scores and applying them in a simple lexicon-based SA framework to assess their quality. The study focuses on reviews written in Malay about Malaysian local products sold by small businesses on e-commerce websites. Product reviews from these platforms are used as both training and testing datasets. In training, we extracted sentiment lexicons from the collected reviews, computed the sentiment scores, and evaluated their effectiveness using a simple sentiment classification method, and compared against VADER-multi. Based on the experimental findings, PMI and bag-of-words were the most suitable techniques for effectively determining word-level sentiment scores for a Malay lexicon-based SA model.

Keywords—Sentiment analysis, lexicon-based sentiment analysis, PMI, TF-IDF, lexicon score, Malay sentiment analysis

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IoT APPLICATIONS IN AGRICULTURE FOR IMPROVING FOOD QUALITY AND SAFETY

Shubhansh Bansal

Centre of Research Impact and Outcome, Chitkara University, Rajpura- 140417, Punjab, India

Udita Goyal

Quantum University Research Center, Quantum University

K.S. Bhuvaneshwari

Department of Artificial Intelligence and Data Science, Karpagam College of Engineering, Coimbatore- 641032

Gourav Sood

Chitkara Centre for Research and Development, Chitkara University, Himachal Pradesh-174103 India

D. Anandhasilambarasan

Department of Computer Science Engineering, Karpagam Academy of Higher Education, Coimbatore-641021

Roopa Traisa

Department of Management, School of Mangement- UG, JAIN (Deemed to be University), Bangalore, Karnataka, India

subhansh.bansal.orp@chitkara.edu.in, udita@quantumeducation.in, bhuvaneshwari.k.s@kce.ac.in, gourav.sood.orp@chitkara.edu.in, anadhasilambarasan.duraisamy@kahedu.edu.in, roopa@cms.ac.in

Abstract—The adoption of Internet of Things (IoT) technologies in agriculture has emerged as a promising approach to enhance food quality and safety across the supply chain. Real-time monitoring and intelligent decision-making systems enable more effective crop, livestock, and storage management. However, existing methods often face limitations such as fragmented data collection, limited predictive capability, and a lack of integration between farm-level monitoring and food safety assessment. To address these challenges, this study introduces the Agri-IoT Framework (AIF), which integrates IoT sensor data with Random Forest Classification for accurate food quality monitoring and prediction of contamination risk. The proposed method enables precise detection of anomalies in soil, water, storage, and transport conditions, ensuring timely interventions. Findings indicate that AIF significantly improves food quality control, enhances traceability, and reduces safety risks by providing data-driven, automated insights. This framework demonstrates the potential to transform agriculture into a more sustainable and consumer-trusted system.

Keywords—IoT, Agriculture, Food Quality, Food Safety, Random Forest, Smart Farming

::: PAPER ID: 271 :::

ENHANCING WIRELESS CONNECTIVITY NETWORKS THROUGH INTRUDER JAMMING DETECTION AND LOCALIZATION WITH ADVANCED TECHNIQUES

Saumya Goyal

Quantum University Research Center, Quantum University

Mohit Gupta

Chitkara Centre for Research and Development, Chitkara University, Himachal Pradesh-174103 India

K.S. Bhuvaneshwari

Department of Artificial Intelligence and Data Science, Karpagam College of Engineering, Coimbatore- 641032

Pavas Saini

Centre of Research Impact and Outcome, Chitkara University, Rajpura- 140417, Punjab, India

K. Yuvaraj

Department of Computer Science, Karpagam Academy of Higher Education, Coimbatore- 641021

Babitha B.S.

Assistant Professor, Department of Management, School of Mangement – UG, JAIN (Deemed to be University), Bangalore, Karnataka, India

saumyaqsb@quantumeducation.in, mohit.gupta.orp@chitkara.edu.in, bhuvaneshwari.k.s@kce.ac.in,
pavas.saini.orp@chitkara.edu.in, yuvaraj.k@kahedu.edu.in, babitha@cms.ac.in

Abstract—Wireless connectivity networks are increasingly vulnerable to intruder jamming attacks that disrupt communication and degrade service quality. Detecting and localizing these attacks is crucial for ensuring reliable and secure transmissions. Existing methods often suffer from high false alarm rates, limited adaptability to dynamic environments, and insufficient accuracy in localization. To address these challenges, this study proposes an Anti-Jamming Framework (AJF) that integrates Deep Reinforcement Learning (DRL) for adaptive detection and Direction of Arrival (DOA) estimation, enabling precise localization of jammers. The framework enables real-time learning of jamming patterns while enhancing spatial awareness for accurate positioning of intruders. The proposed method is applied to dynamic wireless environments, ensuring resilience against diverse jamming strategies. Experimental findings show improved detection accuracy, faster localization, and reduced communication outages compared to traditional approaches. This highlights AJF as a robust solution for securing wireless networks against sophisticated jamming threats.

Keywords—Wireless Networks, Jamming Detection, Intruder Localization, Deep Reinforcement Learning, DOA Estimation, Anti-Jamming Framework

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MACHINE LEARNING'S IMPACT ON ADVANCING GASTROINTESTINAL DIAGNOSIS AND THERAPEUTIC APPROACHES

Anvesha Garg

Research Center, Quantum University

Sumeet Kaur

Centre of Research Impact and Outcome, Chitkara University, Rajpura- 140417, Punjab, India

G. Arun Francis

Department of Electronics and Communication Engineering, Karpagam College of Engineering, Coimbatore- 641032

Noopur Pandey

Chitkara Centre for Research and Development, Chitkara University, Himachal Pradesh-174103 India

M. Kulandhaivel

Department of Microbiology, Karpagam Academy of Higher Education, Coimbatore-641021

Shruthi K Bekal

Department of Management, School of Mangement – UG, JAIN (Deemed to be University), Bangalore, Karnataka, India

anvesha.garg@quantumeducation.in, sumeet.kaur.orp@chitkara.edu.in, ja.arunji@kce.ac.in, noopor.pandey.orp@chitkara.edu.in, kulandhaivel.m@kahedu.edu.in, shruthi_b2015@cms.ac.in

Abstract—Machine learning (ML) has emerged as a transformative tool in gastrointestinal (GI) healthcare, enhancing diagnostic accuracy and enabling personalized therapeutic approaches. By leveraging large-scale clinical, imaging, and histopathological data, ML can identify subtle patterns often missed by traditional methods. Current GI diagnostic techniques rely heavily on manual endoscopic evaluation and generalized treatment guidelines, which are time-consuming, subjective, and prone to errors, often leading to delayed detection and suboptimal patient outcomes. To address these challenges, this paper proposes the GI-ML Framework (GIMF). This hybrid approach combines Convolutional Neural Networks (CNNs) for image-based diagnosis with Support Vector Machines (SVMs) for optimizing treatment pathways. This framework enables the automated detection of polyps and lesions, accurate disease classification, and patient-specific therapy recommendations. Experimental results demonstrate improved diagnostic accuracy, faster decision-making, and enhanced clinical relevance compared to conventional methods, highlighting the potential of ML-driven solutions in advancing GI healthcare.

Keywords—Gastrointestinal diagnosis, Machine learning, CNN-SVM hybrid, Personalized therapy, Clinical decision support, Disease classification

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THE ROLE OF ADVANCED ALGORITHMS IN CREATING SYNERGY FOR THE FUTURE OF WORK

Vivek Saraswat

Centre of Research Impact and Outcome, Chitkara University, Rajpura- 140417, Punjab, India.

Neelesh Singh

Chitkara Centre for Research and Development, Chitkara University, Himachal Pradesh-174103 India

G. Arun Francis

Department of Electronics and Communication Engineering, Karpagam College of Engineering, Coimbatore- 641032

Diksha Aggarwal

Quantum University Research Center, Quantum University

N. Thangarasu

Department of Computer Science, Karpagam Academy of Higher Education, Coimbatore-641021

Baishakhi Debnath

Assistant Professor, Department of Management, School of Mangement - UG, JAIN (Deemed to be University), Bangalore, Karnataka, India

vivek.saraswat.orp@chitkara.edu.in, neeleesh.singh.orp@chitkara.edu.in, ja.arunj@kce.ac.in, diksha.aggarwal@quantumeducation.in, drthangarasu.n@kahedu.edu.in, baisakhi_2015@cms.ac.in

Abstract—The rapid evolution of technology is transforming the modern workplace, where advanced algorithms play a critical role in enhancing efficiency, collaboration, and innovation. Leveraging computational intelligence, organizations can create synergistic interactions between human employees and automated systems to optimize performance and decision-making. Current workplace models often struggle with fragmented workflows, inefficient resource allocation, and limited predictive capabilities, which hinder productivity and reduce the effectiveness of collaboration. To address these challenges case study 1 the Algorithmic Synergy Framework (ASF) is proposed. The case study 2 integrates machine learning-based task allocation, AI-driven predictive analytics, and intelligent collaboration tools. This case studies aligns tasks with employee strengths, automates repetitive processes, and provides data-driven insights for strategic decision-making. The case study method enables adaptive and collaborative work environments, enhancing real-time coordination across teams and reducing operational bottlenecks. Experimental evaluation demonstrates improved team efficiency, higher productivity, and accelerated innovation cycles, validating the framework's potential for future work ecosystems.

Keywords—Advanced Algorithms, Future of Work, AI Collaboration, Workflow Optimization, Predictive Analytics, Human-AI Synergy

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LEVERAGING BIG DATA ANALYTICS AND QUALITY DATA FOR EFFECTIVE MISINFORMATION

Divya Sharma

Centre of Research Impact and Outcome, Chitkara University, Rajpura- 140417, Punjab, India

Shuthanshu Marwaha

Chitkara Centre for Research and Development, Chitkara University, Himachal Pradesh-174103 India

G. Premananthan

Department of Electronics and Communication Engineering, Karpagam College of Engineering

Udita Goyal

Quantum University Research Center, Quantum University

N. V. Balaji

Department of Computer Science, Karpagam Academy of Higher Education, Coimbatore- 641021

Mithun Kumar S

Department of Management, School of Mangement -UG, JAIN (Deemed to be University), Bangalore, Karnataka, India

divya.sharma.orp@chitkara.edu.in, shuthanshu.marwaha.rop@chitkara.edu.in, premananthan.g@kce.ac.in, udita@quantumeducation.in, fashdean@kahedu.edu.in, Idmithun_k@cms.ac.in

Abstract—The rapid growth of digital sites has increased the spread of misinformation and demands advanced analysis of effective detection. Large data analysis and quality data coordination offer a powerful approach to address this challenge. Existing methods often rely on superficial linguistic samples or defined databases, leading to the inability to analyze poor identity accuracy and complex spread forms. To solve these problems, we propose a large data false information structure (BDMF), which combines NLP transformers for map neurological networks (GNNs) sample misinformation networks and text content analysis. The proposed method enables real-time false information monitoring, captures hidden forms in large-scale database and supports multilingual, cross-platform. Innovations reveal significant progress, reducing false positives and quick identification of false evidence, thereby promoting policymakers and digital sites.

Keywords—Big Data Analytics, Quality Data, Misinformation Detection, Graph Neural Networks, NLP Transformers, Real-time Analysis

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OPTIMIZING INSULATION LONGEVITY WITH ADVANCED CHARACTERIZATION OF COMPOSITE INSULATION LAYERS

Arpit Arora

Centre of Research Impact and Outcome, Chitkara University, Rajpura- 140417, Punjab, India

Shikhar Gupta

Chitkara Centre for Research and Development, Chitkara University, Himachal Pradesh-174103 India

P. Karthigaikumar

Department of Electronics And Communication Engineering, Karpagam College of Engineering, Coimbatore- 641032

Anisha Chaudhary

Quantum University Research Center, Quantum University

G. Ravivarman

Department of Electrical And Electronics Engineering, Karpagam Academy of Higher Education,

Jamuna. K. V,

Department of Forensic Science, School of Sciences, JAIN (Deemed to be University), Bangalore, Karnataka, India

arpit.arora.orp@chitkara.edu.in, shikhar.gupta.orp@chitkara.edu.in, hod.ece@kce.ac.in, anisha.chaudhary@quantumeducation, ravivarmanme@gmail.com, kv.jamuna@jainuniversity.ac.in

Abstract—Ensuring the longevity of insulation is essential for the reliability, safety, and efficiency of high-voltage equipment. Composite insulation systems, widely used across electrical and electronic industries, exhibit complex, multi-factorial aging mechanisms that traditional empirical assessment methods fail to capture accurately. To overcome these limitations, the Insulation Longevity Framework (ILF) has been developed, combining accelerated aging experiments with Weibull statistical analysis for reliable lifespan prediction. The framework systematically monitors electrical, thermal, and mechanical parameters under stress, enabling probabilistic modeling of insulation degradation and failure mechanisms. Testing ILF on key performance metrics revealed substantial deterioration: dielectric strength declined from 25 kV/mm to 10kV/mm, thermal conductivity dropped from 0.32 to 0.16W/m·K, mechanical strength reduced from 120 to 55 MPa, and reliability fell from 100% to 10%. These results demonstrate that ILF improves prediction accuracy, mitigates the overestimation of service life, and provides actionable insights for enhancing insulation design, reducing maintenance, and improving operational safety in high-voltage systems.

Keywords—Composite Insulation, Longevity Prediction, Accelerated Aging, Weibull Analysis, Reliability Modeling, High-Voltage Systems

::: PAPER ID: 276 :::

ASSESSING THE COMPETENCY AND PERFORMANCE OF MATERIAL TYPES IN ELECTRICAL TREEING EXPERIMENTS

B. Reddy

Chitkara Centre for Research and Development, Chitkara University, Himachal Pradesh-174103 India

Deepak Bhanot

Centre of Research Impact and Outcome, Chitkara University, Rajpura- 140417, Punjab, India

P. Jeevananthan

Department of Electrical and Electronics Engineering, Karpagam College of Engineering, Coimbatore- 641032

Anvesha Garg

Quantum University Research Center, Quantum University

V.J. Vijayalakshmi

Department of Electrical And Electronics Engineering, Karpagam Academy of Higher Education, Coimbatore- 641021

Yashoda L

Department of Management, School of Mangement - UG, JAIN (Deemed to be University), Bangalore, Karnataka, India

b.reddy.orp@chitkara.edu.in, deepak.bhanot.orp@chitkara.edu.in, jeevananthan@kce.ac.in, anvesha.garg@quantumeducation.in, vijayalakshmi.vjaganathan@kahedu.edu.in, yashoda@cms.ac.in

Abstract—Evaluating the competency of insulating materials in electrical treeing experiments is essential for ensuring the reliability and longevity of high-voltage systems. Evaluation approaches are constrained by limitations and loss of specificity in material differentiation, as well as poor correlation between experimental assessments and model predictions, which limit our ability to select materials with precision. 100% of your text is likely AI-generated. This article presents the Dielectric-ANN Material Competency Framework (DA-MCF). The DA-MCF includes dielectric analysis, which conveys the electrical properties of materials, along with an Artificial Neural Network(ANN) classifier to read dielectric data, classify materials, and predict their behavior under electrical stress. In summary, the DA-MCF is a systematic method for evaluating the material's competency in preventing electrical treeing. The DA-MCF enables more accurate and comprehensive classification of material data. The DA-MCF was validated during several breakdown events and at a 500 kV/mm breakdown voltage, there was a 0.97 probability of breakdown occurring. It correctly predicted breakdown voltage of 165 kV, with a dielectric thickness of 4 mm. It also had a low dielectric loss of 0.012 at 1,000 Hz, and increased the breakdown time to 540 s at 20°C. This leads to helping electrical insulation systems be improved, as well as choosing better materials.

Keywords—Electrical Treeing, Dielectric Analysis, Artificial Neural Network, Material Competency, Insulation Performance, High-Voltage Materials

::: PAPER ID: 277 :::

THE GROWING INFLUENCE OF MACHINE LEARNING IN MEDICAL SCIENCES AND ITS EFFECT ON HEALTHCARE PROFESSIONALS

Amritpal Sidhu

Chitkara Centre for Research and Development, Chitkara University, Himachal Pradesh, India

Anatha Charan Ojha

Department of Computer Science and Information Technology, Jain (Deemed to be University), Bangalore, Karnataka, India

Rajeev Sharma

Centre of Research Impact and Outcome, Chitkara University, Rajpura, Punjab, India

M Kulanthaivel

Department of Microbiology, Karpagam Academy of Higher Education, Coimbatore, India

G Premananthan

Department of Electronics and Communication Engineering, Karpagam College of Engineering, Coimbatore, India

R Thanga Kumar

Department of Management, School of Management - UG, JAIN (Deemed to be University), Karnataka, India

amritpal.sidhu.arp@chitkara.edu.in, oc.ananta@jainuniversity.ac.in, .sharma.arp@chitkara.edu.in, el.m@kahedu.edu.in, premananthan.g@kce.ac.in, thanga@cms.ac.in

Abstract—Machine learning (ML) is transforming healthcare by enhancing diagnostics, personalized interventions, and clinical decision support. This shift requires healthcare professionals to adapt while balancing patient interests and ethical responsibilities. Traditional adaptation studies, often survey-based, provide limited predictive power. To address this, the Med-ML Impact Framework (MMIF) was developed, combining structured survey analytics with Random Forest prediction to assess professional adaptability. MMIF captures perceptions, barriers, and skill readiness, while predicting adaptation trends across diverse healthcare roles. Statistical methods extract key signals, and machine learning refines the accuracy of predictions. Findings highlight critical drivers of adaptability, including confidence in technology use, access to training, resources, and ethical awareness. To further strengthen prediction, the Multi-Head Attention Random Forest Ensemble (MHARF) integrates demographic and behavioral features such as age (24–50 years), social interaction index (5–9), communication skills, and adaptive behavior index (74–90) achieving superior accuracy. MHARF enables targeted training and policy strategies, supporting the effective adoption of ML in healthcare.

Keywords—Machine Learning, Medical Sciences, Healthcare Professionals, Adaptation, Random Forest, Survey Analytics

::: PAPER ID: 278 :::

ANALYZING PARTIAL DISCHARGE FEATURES IN LDPE NANOSTRUCTURE MATERIALS FOR INSIGHTS INTO ELECTRICAL TREEING

Aseem Aneja

Centre of Research Impact and Outcome, Chitkara University, Rajpura, Punjab, India

Avni Garg

Chitkara Centre for Research and Development, Chitkara University, Himachal Pradesh, India

Anujhna B

Department of Computer Science and Information Technology, Jain (Deemed to be University), Bangalore, Karnataka, India

A. Amudha

Department of Electronics and Communication Engineering, Karpagam College of Engineering, Coimbatore, India

C. Mukuntharaj

Department of Electronics and Communication Engineering, Karpagam College of Engineering, Coimbatore, India

Richa Tiwari

Department of Management, School of Management - UG, JAIN (Deemed to be University), Bangalore, Karnataka, India

aseem.aneja.arp@chitkara.edu.in, avni.garg.arp@chitkara.edu.in, jpc222388@jainuniversity.ac.in, amudha.a@kahedu.edu.in, mukuntharaj.c@kce.ac.in, dr.richa_t@cms.ac.in

Abstract—Understanding partial discharge (PD) in low-density polyethylene (LDPE) nanostructures is essential, as PD strongly influences insulation degradation phenomena such as electrical treeing, which compromise high-voltage reliability. Conventional PD detection techniques suffer from inadequate feature extraction and weak noise discrimination, limiting early diagnosis and monitoring of insulation health. To address these challenges, this work proposes the Discharge Analysis Framework using Wavelet Transform and Support Vector Machine (DAF-WS). The framework integrates wavelet-based time-frequency decomposition for improved PD waveform analysis with Support Vector Machine (SVM)-based classification to enhance robustness against noise and strengthen feature discrimination. Applied to experimental PD data from LDPE nanostructures, DAF-WS successfully identifies and classifies discharge events linked to electrical tree initiation and growth. Results demonstrate superior diagnostic performance, achieving precise evaluation of parameters such as peak discharge magnitude (8.3 nC), time to peak discharge (2.9 μ s), pulse repetition rate (23 pps), and rise time (0.40 μ s). Compared to traditional methods, DAF-WS provides higher classification accuracy, noise resilience, and predictive reliability in insulation monitoring.

Keywords—Partial Discharge, LDPE Nanostructure, Electrical Treeing, Wavelet Transform, Support Vector Machine, Insulation Diagnostics

::: PAPER ID: 279 :::

IMPROVING ELECTRICAL MACHINE PERFORMANCE WITH THE POWER OF LINEAR REGRESSION PREDICTORS

B Jayaprakash

Department of Computer Science and Information Technology, Jain (Deemed to be University), Bangalore, Karnataka, India

Abhinav Rathour

Centre of Research Impact and Outcome, Chitkara University, Rajpura, Punjab, India

G. Arun Francis

Department of Electronics and Communication Engineering, Karpagam College of Engineering, Coimbatore, India

Gourav Sood

Chitkara Centre for Research and Development, Chitkara University, Himachal Pradesh, India

G. Ravivarman

Department of Electrical and Electronics Engineering, Karpagam Academy of Higher Education, Coimbatore, India

N. Beemkumar

Department of Mechanical Engineering, School of Engineering and Technology, JAIN (Deemed to be University), Bangalore, Karnataka, India

b.jayaprakash@jainuniversity.ac.in, abhinav.rathour.orp@chitkara.edu.in, ja.arunji@kce.ac.in, gourav.ood.orp@chitkara.edu.in, ravivarmanme@gmail.com, n.beemkumar@jainuniversity.ac.in

Abstract—Improving the performance of electrical machines is critical for improving efficiency and reliability in industrial environments. Electrical machines require specific control and optimization for better power generation and operational consistency and stability. Current methods typically employ complicated nonlinear models that require large sets of experiments, which are computationally expensive and not integrated in real-time. Both current methodologies lack the appreciation of the linear relationships between salient input variables and important performance measures of the machine. This paper outlined the Multiple Linear Regression Performance Predictor (MLRPP) as a systematic approach that performs multiple linear regression-based models to predict and subsequently optimize electrical machine performance. MLRPP considers key operating variables, including magnetic field strength, current, and coil configuration, to establish linear relationships with the output parameter specification while limiting power and rotational speed. MLRPP effectively reduce the modeling burden while ensuring that the produced recommendations remain quantitatively and qualitatively correct and sound. Using MLRPP enables real-time performance prediction and tunable parameter selection, facilitating quick decisions and ultimately improved machine control. The experiments conducted using the MLRPP method demonstrated the ability to achieve high prediction confidence through reduced computational processing demand compared to previous nonlinear-based models, the inclusion of variable significance ranking for machine performance specification-based decision-making, and substantially established a baseline for understanding improved machine performance. Results suggest improvements were made to machine efficiency and operational stability. Thus, the proposed MLRPP is useful and multifunctional in its eventual use for electrical machine design and optimization, or any suitable model, problem, or eventual evaluation.

Keywords—Electrical Machine, Linear Regression, Performance Optimization, Predictive Modeling, Multiple Linear Regression, Machine Control

::: PAPER ID: 280 :::

POWER SYSTEMS FOR RF SYSTEMS ON DOMESTIC ROUTES AND AN OVERVIEW OF CURRENT STATUS AND POLICY CHANGES

Ca Priti Sharma

Department of Commerce, Graphic Era Deemed to be University, Dehradun, Uttarakhand, India

Mohit Gupta

Chitkara Centre for Research and Development, Chitkara University, Himachal Pradesh, India

C. Karthikeyan

Department of Computer Science Engineering, Karpagam Institute of Technology, Coimbatore

Sumeet Singh Sarpal

Centre of Research Impact and Outcome, Chitkara University, Rajpura, Punjab, India

S. Hemelatha

Department of Computer Science Engineering, Karpagam Academy of Higher Education, Coimbatore

Gopalakrishna K

Department of Electronics and Communication Engineering, School of Engineering and Technology, JAIN (Deemed to be University), Bangalore, Karnataka, India

prisharma@geu.ac.in, mohit.gupta.orp@chitkara.edu.in, karthikeyan.cse@karpagamtech.ac.in, sumeet.sarpal.orp@chitkara.edu.in, hema.vtht@gmail.com, k.gopalakrishna@jainuniversity.ac.in

Abstract—The growth of dependable and energy-efficient power systems for Radio Frequency (RF) communications on domestic transportation systems demonstrates the significance of effective communication, safety, and operational efficiency. The existing solutions primarily focus on conventional grid support and ancillary batteries, which suffer from inefficiencies including power losses, limited scalability, and variable power supply under varying loads. To address these limitations, I propose the SMART-P (Sustainable Modular Adaptive RF Power) framework, a method for integrating modular renewable energy sources into an RF subsystem that employs adaptive power management. Under the proposed system, we introduce SMART-P, a hybrid method for creating a power supply model that dynamically balances renewable inputs, storage, and real-time RF loading demands in domestic transportation systems, ensuring sustained transmission, reducing dependencies on non-renewable sources of energy, and improving resilience against disruptions. This method relies on predictive load forecasting and adaptive switching to optimize efficiency and minimize downtime. The application of SMART-P shows effective outcomes to include an achievable reduction in energy consumption, improvements in RF signal reliability and the ability to align with recent government strategies intended to add sustainability to communications networks feed into domestic transport. SMART-P outperformed traditional methods, achieving a received RF power of 0.82 dBm, solar irradiance capture of 0.91 kW/m², a power demand reduction of 18–20%, and an energy efficiency of up to 0.85. Compared to TLEH, ML-SRFP, and RFEH, SMART-P consistently demonstrated higher sustainability and system reliability across all evaluated parameters.

Keywords—Energy Efficiency, Hybrid Power Systems, Adaptive Framework, Sustainable Communication, Load Forecasting, Resilient Infrastructure

:: PAPER ID: 281 ::

THE IMPACT OF PREDICTIVE ROBOTICS ON THE LABOR ECONOMY THROUGH THE LENS OF ARTIFICIAL INTELLIGENCE

Sachin Ghai

Department of Management Studies, Graphic Era Deemed to be University, Dehradun, Uttarakhand, India

Sunila Choudhary

Centre of Research Impact and Outcome, Chitkara University, Rajpura, Punjab, India

C. Mukuntharaj

Department of Electronics and Communication Engineering, Karpagam College of Engineering, Coimbatore, India

Mithhil Arora

Chitkara Centre for Research and Development, Chitkara University, Himachal Pradesh, India

A. Amudha

Department of Electrical and Electronics Engineering, Karpagam Academy of Higher Education, Coimbatore, India

Ramachandran T

Department of Mechanical Engineering, School of Engineering and Technology, JAIN (Deemed to be University), Bangalore, Karnataka, India

profsg.mba@geu.ac.in, sunila.choudhary.arp@chitkara.edu, mukuntharaj.c@kce.ac.in, mithhil.arora.arp@chitkara.edu.in, amudha.a@kahedu.edu.in, tramachandran@jainuniversity.ac.in

Abstract—The AI-Driven Predictive Robotics Framework (AIPRF) integrates labor forecasting through machine learning with intelligent robotics to address dynamic workforce challenges. Unlike conventional systems that struggle with dislocation, rigidity, and weak execution mapping, AIPRF enables adaptive task reallocation, predictive reporting, and resilience to economic shifts. By simulating applications across varied labor environments, the framework demonstrates measurable efficiency gains while reducing workforce disruption. Key labor indicators highlight its impact: reduction in unemployment (0.85), decline in job vacancies (0.80), improved labor force participation (0.88), and optimized workforce demographics (0.82). These results show how AIPRF bridges automation and labor markets, ensuring security alongside productivity. Beyond operational benefits, it enhances employee engagement, fosters sustainable cooperation between humans and machines, and supports policymakers in strategic planning. AIPRF thus advances economic resilience by interlinking factors traditionally viewed as independent, positioning automation not as a disruptor but as a driver of balanced and inclusive labor market growth.

Keywords—Predictive Robotics, Artificial Intelligence, Labor Economy, Workforce Optimization, Human-Robot Collaboration, Economic Resilience

:: PAPER ID: 282 ::

ENHANCING ELECTRICAL PERFORMANCE IN COLD TEMPERATURES USING MODIFIED GRADING RINGS FOR EHV POST-INSULATION

Ruchira Rawat

Department of Computer Science & Engineering, Graphic Era Deemed to be University, Dehradun, Uttarakhand, India

Divya Sharma

Chitkara Centre for Research and Development, Chitkara University, Himachal Pradesh, India

G. Arun Francis

Department of Electronics and Communication Engineering, Karpagam College of Engineering, Coimbatore, India

Anubhav Bhalla

Centre of Research Impact and Outcome, Chitkara University, Rajpura, Punjab, India

V.J. Vijayalakshmi

Department of Electrical and Electronics Engineering, Karpagam Academy of Higher Education, Coimbatore, India

Nagaraj Patil

Department of Mechanical Engineering, School of Engineering and Technology, JAIN (Deemed to be University), Bangalore, Karnataka, India

ruchira.rawat.cse@geu.ac.in, divya.sharma.arp@chitkara.edu.in, ja.arunji@kce.ac.in, anubhav.bhalla.arp@chitkara.edu.in, vijayalakshmi.vjaganathan@kahedu.edu.in, nagaraj.patil@jainuniversity.ac.in

Abstract—Ensuring reliable electrical performance of extra-high voltage (EHV) post insulators in cold climate zones is essential for maintaining uninterrupted power transmission. In such regions, extreme weather and sub-zero temperatures can cause irregular electric field distribution, insulation stress, and premature equipment failure. Traditionally, grading rings are used to regulate electric field stress and extend insulator life, but conventional designs often fail to perform efficiently in cold environments. To address these challenges, this paper introduces the Cold Temperature EHV Grading Ring Optimization (CT-EHVGRO) method. The approach focuses on optimizing grading ring geometry, placement, and electric field distribution specifically for extreme cold conditions. By using simulation-based optimization, CT-EHVGRO minimizes irregular potential gradients, reduces corona discharges, and improves overall insulation reliability. Unlike traditional methods, it enhances performance without requiring significant physical redesign of existing systems, making it both safe and cost-effective. Experimental and simulation results demonstrate substantial improvements. CT-EHVGRO achieved maximum breakdown strengths of 950 kV at 1000 kV voltage, 940 kV at 40°C, 680 kV with silicone materials, and 945 kV at a 5.0 eV band gap. These results outperform traditional optimization techniques across all test scenarios, highlighting CT-EHVGRO as a sustainable solution for enhancing winter reliability and grid performance in EHV systems.

Keywords—EHV Insulation, Optimization Technique, Grading Ring Modification, Cold Climate Reliability, Electric Field Control, Corona Suppression

::: PAPER ID: 283 :::

EXPLORING THE ELECTROMAGNETIC CHARACTERISTICS OF POLYIMIDE/TiO₂ HYBRID FILMS AND THEIR INTERFACE-DEPENDENT BEHAVIOR

Roohi Naaz

Department of Commerce, Graphic Era Deemed to be University, Dehradun, Uttarakhand, India

Ravi Kumar

Centre of Research Impact and Outcome, Chitkara University, Rajpura, Punjab, India

M.S. Gowtham

Department of Electronics and Communication Engineering, Karpagam Institute of Technology, Coimbatore, India

Lalit Khanna

Chitkara Centre for Research and Development, Chitkara University, Himachal Pradesh, India

R. Kumar

Department of Chemistry, Karpagam Academy of Higher Education, Coimbatore, India

Ranganathaswamy M K

Department of Mechanical Engineering, School of Engineering and Technology, JAIN (Deemed to be University), Bangalore, Karnataka, India

roohinaaz.comm@geu.ac.in, ravi.kumar.orp@chitkara.edu.in, gowtham.ece@karpagamtech.ac.in, lalit.khanna.orp@chitkara.edu.in, kumar.r@kahedu.edu.in, mk.ranganatha@jainuniversity.ac.in

Abstract—The development of high-performance polymer nanocomposites for advanced electronic and shielding applications is constrained by a limited understanding of the interfacial region, which strongly governs dielectric behavior. In this work, polyimide/titanium dioxide (TiO₂) hybrid films were synthesized by incorporating surface-functionalized (3-aminopropyl) triethoxysilane (APTES) modified TiO₂ nanoparticles into a polyamic acid precursor, followed by thermal imidization. Structural and chemical characterization of the interfacial region was performed using high-resolution transmission electron microscopy (HR-TEM) and X-ray photoelectron spectroscopy (XPS). The electromagnetic response was quantified through broadband dielectric spectroscopy (10 Hz–1 MHz) and vector network analysis across the X-band (8.2–12.4 GHz). To contextualize experimental findings, results were benchmarked against the Dielectric Properties of Materials dataset (Kaggle, 2022), which compiles dielectric constants of over 1,000 inorganic compounds. Functionalized nanocomposites exhibited a 35% enhancement in dielectric constant and a significant reduction in loss tangent (0.008 vs. 0.023 at 1 kHz) relative to unmodified films, aligning with dataset-predicted high- κ oxide behavior. Furthermore, a transition in EMI shielding mechanism from reflection (~15 dB) to absorption (~22 dB) was observed, attributed to improved nanoparticle dispersion and interfacial covalent bonding. These results highlight interfacial engineering as the primary determinant of electromagnetic performance, providing a pathway for lightweight, high-efficiency materials for next-generation flexible electronics and EMI mitigation.

Keywords—Polyimide/TiO₂ hybrid films, Interfacial engineering, Dielectric properties, Electromagnetic interference (EMI) shielding, Nanocomposite materials

::: PAPER ID: 284 :::

LEVERAGING IoT AND MACHINE LEARNING FOR EFFICIENT PREDICTIVE MAINTENANCE IN INDUSTRIAL SYSTEMS

Pina Bhatt

Mechanical Engineering, Silver Oak University, Ahmedabad, Gujarat, India

Bharathi B Department of Computer Science and Engineering, Sathyabama Institute of Science and Technology, Chennai, Tamil Nadu, India

V Muthu Ganesh

Department of Electronics and Communication Engineering, Presidency University, Bangalore, Karnataka, India

R Suchithra

Department of Computer Applications (DCA), Presidency College, Bengaluru, India

Satya Ranjan Das

Department of Computer Science and Engineering, Siksha 'O' Anusandhan (Deemed to be University), Bhubaneswar, Odisha, India

Adarsha Harinaiha

Department of Mechanical Engineering, Faculty of Engineering and Technology, JAIN (Deemed-to-be University), Ramnagar, Karnataka, India

osdresearch@silveroakuni.ac.in, bharathi.cse@sathyabama.ac.in, muthu.ganesh@presidencyuniversity.in, suchithrar@presidency.edu.in, satyadas@soa.ac.in, h.adarsha@jainuniversity.ac.in

Abstract—Unanticipated breakdowns of industrial machinery can be very costly and disrupt production. These breakdowns can occur without warning. The majority of people perform preventive maintenance according to a predetermined timetable that cannot be altered, depending on how well the equipment is functioning. A novel method that combines machine learning with Internet of Things (IoT) sensor networks is known as the Hybrid Internet of Things-Machine Learning Predictive Framework (HIMLPF). Through the use of Spatio-Temporal Feature Fusion (STFF), the system can simultaneously manage sensor discrepancies and time-series dependencies. Compared to prior methods, this one is more accurate in predicting errors. Using a model known as Bidirectional Long Short-Term Memory (Bi-LSTM) with Attention (BLA), it examines and interprets the continuous input generated by the Internet of Things-enabled architecture. This data includes sound, temperature, and vibration. Once that is complete, these datasets are leveraged to produce predictions. When compared to baseline models, experimental models exhibit a significant reduction in the number of false positives and a 15–18% increase in the accuracy of failure prediction, as evaluated on commonly used datasets in the field. It is possible to schedule maintenance based on data using HIMLPF, which not only makes systems more dependable but also saves a significant amount of money.

Keywords—Predictive Maintenance, IoT, Machine Learning, Industrial Systems, Smart Manufacturing

:: PAPER ID: 285 ::

STRATEGIC IMPLEMENTATION OF ARTIFICIAL INTELLIGENCE IN TALENT MANAGEMENT: ETHICAL CONSIDERATIONS AND DATA-DRIVEN APPROACHES FOR EMPLOYEE ENGAGEMENT

Shruti Shrivastava, Shweta Saxena

Research Scholar, Amity Business School, Amity University Madhya Pradesh

Ramachandran Thulasiram

Department of Mechanical Engineering, Faculty of Engineering and Technology, JAIN (Deemed-to-be University),
Ramnagar District, Karnataka, India

Arun Khatri

Mittal School of Business, Lovely Professional University

Mary Posonia A

Department of Computer Science and Engineering, Sathyabama Institute of Science and Technology, Chennai,
Tamil Nadu, India

Wanda Gema Prasadio Akbar Hidayat

Management, Universitas Multimedia Nusantara, Indonesia

shrutishrivastava707@gmail.com, er.saxenashweta15@gmail.com, tramachandran@jainuniversity.ac.in,
arun.31886@lpu.co.in, maryposonia.cse@sathyabama.ac.in, wanda.hidayat@umn.ac.id

Abstract—Human resource management solutions powered by AI have transformed organizational practices. Change must be prioritized. Several results are possible from this situation. These results were reached through smart hiring, predictive analytics, and tailored employee engagement. Ethically Guided Artificial Intelligence for Talent Engagement (EGAITE) helps people use data-driven insights ethically. Development of this technique addressed these difficulties. This solution handled both difficulties. EGAITE uses justice-focused algorithms, simple AI models, and encryption-based analytics. Results show that EGAITE improves engagement prediction accuracy by 9.4% over baseline models. The outcome is clear. The algorithmic bias that caused gender representation outcomes decreases 12.7%. This assertion was experimentally validated using 5,200 employee records from an HR dataset. With an F1-score of 0.87, this machine learning method predicted employee turnover better than others. Integrating ethical norms into AI-driven HRM systems improves clarity and accountability. This builds worker trust in the company, extending its lifespan. Results of the topic's study. The constant conversation about how AI could aid human capital development drives this research. This paper shows data-driven optimization and ethical alignment in modern people management systems.

Keywords—Artificial Intelligence (AI), Talent Management, Employee Engagement, Ethical AI, Data-Driven Decision Making, Human Resource Analytics

:: PAPER ID: 286 ::

ENHANCING PERSONALIZED MARKETING WITH ARTIFICIAL INTELLIGENCE FOR SUPERIOR CONSUMER TARGETING AND GROWTH

Amit Kumar Bhanja

Department of Management, School of Management Sciences, Varanasi

Shailee L Choudhary, Rinku Sharma Dixit

Department of Artificial Intelligence/Machine Learning, New Delhi Institute of Management, New Delhi, India

Swaroop Mohanty

Department of ACCFK, AMITY University, Kolkata, India

Shweta Saxena

Amity Business School, Amity University Madhya Pradesh, Gwalior, Madhya Pradesh, India

Saptorshi Das

Marketing Area, KIIT School of Management, KIIT Deemed to be University, Bhubaneswar

akbhanja10@gmail.com, shailee.choudhary@ndimdelhi.org, rinku.dixit@ndimdelhi.org, swaruniv@gmail.com,
er.saxenashweta15@gmail.com, saptorshi.das@ksom.ac.in

Abstract—Unfortunately, customer behavior patterns remain fixed, making conventional tailored marketing ineffective for targeting and engagement. This research introduces PERSUADE (Personalized Engagement and Recommendation System Using AI for Dynamic Enhancement) an AI-driven platform for consumer targeting and sustainability. Ensemble preparation manages several data streams, graph-based neural networks capture relational consumer patterns, and transformer designs extract contextual insights from unstructured text. A reinforcement learning optimization layer adjusts targeting algorithms based on real-time interaction input to keep marketing strategies successful and responsive. This approach was refined utilizing over 10million e-commerce and social media customer interactions. Experimental results show that PERSUADE outperforms machine learning and rule-based approaches in terms of targeting accuracy, campaign ROI, and churn rate by 21.4%, 25.6%, and 17.8%, respectively. Ablation testing supports the role of attention processes and graph embeddings in customizing accuracy. Ultimately, PERSUADE's AI-driven solution may evolve and adapt, creating a customized marketing approach that is growth-oriented, predictive, and dynamic for future digital enterprises.

Keywords—Personalized Marketing, Artificial Intelligence (AI), Consumer Targeting, Recommendation Systems, Reinforcement Learning, Graph Neural Networks, Predictive Analytics

:: PAPER ID: 287 ::

LEVERAGING BLOCKCHAIN FOR ENHANCED SECURITY AND TRANSPARENCY IN RECORD KEEPING

B. Ashwini

Department of Electronics and Communication Engineering, Presidency University, Bangalore, Karnataka, India

Ramkumar Krishnamoorthy

Department of Computer Science and Information Technology, Jain (Deemed to be University), Bangalore, Karnataka, India

Ramya G Franklin

Department of Computer Science and Engineering, Sathyabama Institute of Science and Technology, Chennai, Tamilnadu, India

Arun Khatri

Mittal School of Business, Lovely Professional University, India

Sheetal

Department of Computer Applications (DCA), Presidency College, Bengaluru, India

Suman Sau

Department of Computer Science and Information Technology, Siksha 'O' Anusandhan (Deemed to be University), Bhubaneswar, Odisha, India

ashwini.b@presidencyuniversity.in, ramkumar.k@jainuniversity.ac.in, ramyagfranklin.cse@sathyabama.ac.in,
khatriarun@yahoo.com, sheetal-coll@presidency.edu.in, sumansau@soa.ac.in

Abstract—As workplaces adopt digital technology, concerns about record-keeping systems' accuracy, transparency, and truthfulness grow. Traditional central databases are vulnerable to hacking, unauthorized access, and a single point of failure; therefore, users don't trust them with essential data. People trust data handlers less because of this. This study introduces Blockchain-Enabled Secure and Transparent Record Keeping (BEST-RK), a novel system. This framework solves issues with blockchain technology. BEST-RK may help secure, verify, and hold data accountable by leveraging blockchain technology's decentralized, immutable, and consensus-driven design. Blockchain design makes this possible. Compared to centralized systems, BEST-RK reduces operational costs by 21.5%, data retrieval by 37.8%, and unwanted access by 92.4% through the automation of brilliant contract execution. Experimental evaluations led to these conclusions. The system can handle significant expansion, as evidenced by its 1,250 TPS stress test result. Additionally, the system implements access control methods with a success rate of 98.7%. This study shows that BEST-RK can keep records openly, safely, quickly, and easily. The framework also addresses design considerations that strike a balance between security and performance to address interoperability challenges. This research demonstrates that BEST-RK is more than just a game-changing technology; it fosters confidence in healthcare, governance, supply chains, and education.

Keywords—Blockchain-enabled record keeping, Data security and transparency, Decentralized information management, Smart contracts for auditing, Tamper-proof data provenance, and Scalable blockchain frameworks

:: PAPER ID: 288 ::

EXPLORING THE IMPACT OF ARTIFICIAL INTELLIGENCE ON STRATEGIC DECISION-MAKING

Amit Kumar Bhanja

Department of Management, School of Management Sciences, Varanasi, India

Durga Sivashankar

Technical Lead, Department of IT, Siemens Healthineers, India

Tanu Marwah

Department of Business Studies, Hindustan college of Science and Technology, Mathura, India

Vikash Kumar Singh

Principal Software Engineer, Department of IT, Societe Generale, India

Sonal Pundhir

Department of Business Studies, Sharda University, Agra, India

A. Jagdish Mohan Rao

Commerce, KL (Deemed to be University) Vadeswaram Guntur, India

akbhanja10@gmail.com, durga.sivashankar@yahoo.com, tanumarwah@gmail.com, vikashsd@gmail.com,
sonalac@gmail.com, ajmohanrao@kluniversity.in

Abstract—Given the abundance of data and the numerous perspectives from which it can be interpreted, it is becoming increasingly challenging to make sound strategic decisions in today's fast-paced business environment. This paper examines the potential for artificial intelligence to enhance decision-making by increasing precision, speed, and adaptability. This innovative approach to decision-making is known as Data-Driven Artificial Intelligence for Strategic Decision-Making (DAS-DM), which utilizes machine learning models, natural language processing, and predictive analytics simultaneously. This approach has the potential to help managers identify trends more quickly, enhance their ability to make accurate estimates about what will occur, and mitigate the impact of specific risks. To guarantee the successful application of the idea, case studies from the fields of healthcare, manufacturing, and finance were used. Based on the most significant results, artificial intelligence has the potential to reduce cognitive bias by a factor of two, and halve the number of decision cycles. Human supervision and ethical leadership continue to face numerous obstacles, despite this fact. When paired with an organization's goals, the results suggest that artificial intelligence has the potential to enhance the quality of evidence-based, adaptive decision-making significantly.

Keywords—Artificial Intelligence, Strategic Decision-Making, Predictive Analytics, DAIS-DM Framework, Business Strategy

:: PAPER ID: 289 ::

OPTIMIZING OPERATIONS MANAGEMENT THROUGH MACHINE LEARNING APPLICATIONS

J. Anitha D Souza

Department of Computer Applications (DCA), Presidency College, Bengaluru, India

J. Rani

Master of Business Administration, Sathyabama Institute of Science and Technology, Chennai, Tamilnadu, India

Satish Choudhury

Department of Electrical and Electronics Engineering, Siksha 'O' Anusandhan (Deemed to be University),
Bhubaneswar, Odisha, India

Bhupendra Singh

Maharishi School of Engineering & Technology, Maharishi University of Information Technology, Uttar Pradesh, India

V.S. Vijaya Krishna V

Department of Electronics and Communication Engineering, Presidency University, Bangalore, Karnataka, India

V. Pushparajesh

Department of Electrical and Electronics Engineering, Faculty of Engineering and Technology, JAIN (Deemed-to-be University), Ramnagar District, Karnataka, India

anitha@presidency.edu.in, rani.soms@sathyabama.ac.in, satishchoudhury@soa.ac.in, bs1050046@gmail.com,
vijayakrishna@presidencyuniversity.in, v.pushparajesh@jainuniversity.ac.in

Abstract—Operations management has traditionally relied on statistical forecasting and linear optimization models, but such methods struggle to address the scale, uncertainty, and interdependencies of modern supply chains. With the rise of large-scale data availability, machine learning (ML) presents an opportunity to transform decision-making by enabling adaptive and data-driven optimization. The primary objective of this research is to optimize inventory, demand forecasting, and logistics operations through advanced ML techniques. A secondary goal is to establish a unified framework that can integrate predictive and prescriptive models to enhance operational resilience and scalability. The methodology utilizes the Supply Chain Data Set (Kaggle, shivaiyer129), which includes demand, orders, products, inventory levels, supplier details, and logistics flows. Forecasting is performed using gradient boosting and LSTM-based models. Clustering methods are applied for supplier and product segmentation, and reinforcement learning, combined with spiking neural networks, is explored for real-time adaptive scheduling and resource optimization. Experimental evaluation demonstrates that ML-driven approaches significantly outperform baseline models in forecasting accuracy, inventory efficiency, and logistics cost reduction. The results also demonstrate improved flexibility in response to shifting supply and demand. According to the study's findings, ML-based optimization frameworks can significantly enhance operational effectiveness by providing intelligent, data-driven decision support for supply chain management processes.

Keywords—Operations Management, Supply Chain Optimization, Machine Learning, Demand Forecasting, Reinforcement Learning

:: PAPER ID: 290 ::

OPTIMIZING PREDICTIVE MAINTENANCE IN THE ENERGY SECTOR WITH MACHINE LEARNING FOR COST SAVINGS AND EQUIPMENT RELIABILITY

Gayatri Nayak

Department of Computer Science and Engineering, Siksha 'O' Anusandhan (Deemed to be University),
Bhubaneswar, Odisha, India

N. Raghu

Department of Electrical and Electronics Engineering, Faculty of Engineering and Technology, JAIN (Deemed-to-be University), Ramnagar District, Karnataka, India

Dhanasingh B Rathod

Department of Computer Applications (DCA), Presidency College, Bengaluru, India

H.S. Annapurna

Department of Electronics and Communication Engineering, Presidency University, Bangalore, Karnataka, India

T. Sasikala

Department of Computer Science and Engineering, Sathyabama Institute of Science and Technology, Chennai, Tamilnadu, India

Savita

Maharishi School of Engineering & Technology, Maharishi University of Information Technology, Uttar Pradesh, India

gayatrinayak@soa.ac.in, n.raghu@jainuniversity.ac.in, dhanasingh.rathod@presidency.edu.in, annapurna.hs@presidencyuniversity.in, sasikala.cse@sathyabama.ac.in, savita@mit.in

Abstract—Energy sector machine learning-based predictive analysis for cost savings and equipment dependability may reliably forecast and control system behavior by leveraging enormous amounts of data from various sources. Organizations may predict equipment failures and schedule maintenance using supervised, unsupervised, and reinforcement learning to reduce unplanned downtime and maximize asset lifespans. Classic reactive and preventive maintenance methods can lead to inefficient resource allocation, unexpected downtime, and excessive investment. The machine learning-based predictive maintenance architecture in this research optimizes maintenance schedules, enhances cost efficiency, and improves equipment reliability. The primary components of predictive maintenance systems include data collection, feature engineering, model training, and deployment. Resolves data quality, sensor reading unpredictability, and real-time monitoring difficulties in Machine Learning data collecting and preparation. ML methods, including logistic regression, support vector machines, clustering, and anomaly detection, are covered. ML predictive maintenance utilizes these algorithms to reduce expenses and enhance equipment reliability. According to the results, maintenance costs can be reduced by 18% to 25%, and unplanned downtime can be reduced by 30%. Accurate failure prediction and explainable approaches provide energy sector operators with actionable information, improving safety, reliability, and cost-effectiveness.

Keywords—Predictive maintenance, Machine learning, Energy sector, Equipment reliability, Cost optimization, Failure prediction, Anomaly detection, Real-time monitoring, Explainable artificial intelligence (XAI), Downtime reduction

::: PAPER ID: 291 :::

BLOCKCHAIN APPLICATIONS FOR ENHANCING SECURITY AND TRANSPARENCY IN INTELLECTUAL PROPERTY MANAGEMENT

Divyanshi Rajvanshi

Maharishi School of Engineering & Technology, Maharishi University of Information Technology, Uttar Pradesh, India

Kalyandurg Rafeeq Ahmed

Department of Electronics and Communication Engineering, Presidency University, Bangalore, Karnataka, India

A. Pravin

Department of Computer Science and Engineering, Sathyabama Institute of Science and Technology, Chennai, Tamil Nadu, India

Abhilash Pati

Department of Computer Science and Engineering, Siksha 'O' Anusandhan (Deemed to be University), Bhubaneswar, Odisha, India

Adarsha Harinaiha

Department of Mechanical Engineering, Faculty of Engineering and Technology, JAIN (Deemed-to-be University), Ramnagar District, Karnataka, India

J. Jesupriya

Department of Computer Applications (DCA), Presidency College, Bengaluru, India

divyanshirajvanshi@gmail.com, rafeeq.ahmed@presidencyuniversity.in, pravin.cse@sathyabama.ac.in, abhilashpati@soa.ac.in, h.adarsha@jainuniversity.ac.in, jesupriya.j@presidency.edu.in

Abstract—Pirates, ownership conflicts, and distrust of centralized institutions plague intellectual property management. Traditional methods often fail to protect writers from infringement and improper remuneration due to issues with security, transparency, and rights enforcement. The article introduces BRAIN-IP (Blockchain for Rights, Authentication, and Integrity in Intellectual Property), a blockchain-powered IP ecosystem security and efficiency architecture, to address these issues. After studying blockchain architectures and consensus processes, a model with smart contracts for intellectual property registration, licensing, and royalties is constructed. The proposed framework ensures rapid, secure, and scalable agreement across dispersed nodes using the Hot Stuff consensus algorithm, a cutting-edge Byzantine Fault-Tolerant protocol. BRAIN-IP uses immutable distributed ledgers and smart contracts to automate royalty payments, dispute mitigation, and ownership verification. Significant results show that BRAIN-IP improves IP lifecycle accountability, authenticity verification, and traceability. BRAIN-IP's decentralized, transparent, and secure infrastructure represents a tremendous advance in intellectual property management; however, legal alignment and compatibility are hindering its wider adoption.

Keywords—Personalized Marketing, Artificial Intelligence (AI), Consumer Targeting, Recommendation Systems, Reinforcement Learning, Graph Neural Networks, Predictive Analytics

::: PAPER ID: 292 :::

ADVANCING AUGMENTED REALITY IN LEISURE AND GAMING WITH 5G TECHNOLOGY

Trapti Agarwal

Maharishi School of Engineering & Technology, Maharishi University of Information Technology, Uttar Pradesh, India

G. Sridhar

Department of Computer Applications (DCA), Presidency College, Bengaluru, India

Beemkumar Nagappan

Department of Mechanical Engineering, Faculty of Engineering and Technology, JAIN (Deemed-to-be University), Ramnagar District, Karnataka, India

Bichitrnanda Patra

Department of Computer Applications, Siksha 'O' Anusandhan (Deemed to be University), Bhubaneswar, Odisha, India

V. Vijaya Baskar

Department of Electronics and Communication Engineering, Sathyabama Institute of Science and Technology, Chennai, Tamil Nadu, India

Ajit Kumar

Department of Electronics and Communication Engineering, c, Bangalore, Karnataka, India

trapti@mit.in, sridhar.g@presidency.edu.in, n.beemkumar@jainuniversity.ac.in, bichitrnandapatra@soa.ac.in, vijayabaskar.ece@sathyabama.ac.in, ajitkumar@presidencyuniversity.in

Abstract—Users' gaming experiences are evolving as a result of the integration of augmented reality (AR) with fifth-generation (5G) wireless networks. This is because highly responsive, immersive, and scalable experiences are now within reach. In this article, we will discuss 5G-based augmented reality gaming. This essay is here to discuss ARG-5G. It is a method that utilizes network slicing, increased bandwidth, and low-latency communication to enhance the performance of augmented reality entertainment apps. In comparison to the typical end-to-end latency of traditional 4G networks, experimental simulations indicate that ARG-5G can achieve a median latency of 11 milliseconds, representing a 71.6% reduction. Typical 4G networks have an average latency that is different from this. There were no hiccups when connecting with numerous individuals or showing at a higher quality, thanks to the 64.3% increase in bandwidth utilization. System stress test results further demonstrate that ARG-5G is robust enough for massively multiplayer online gaming, showing that session stability increases by 52.8% under heavy user loads. An additional benefit of the comparative performance evaluation is the 39.5% improvement in energy efficiency, which lends support to the idea of developing environmentally friendly infrastructures that utilize edge computing. This enhancement is emphasized in the rating. By merging 5G with augmented reality engines, ARG-5G paves the path for the next iteration of gaming and leisure settings. Never before have engagement, scalability, and realism been offered by these ecosystems. This study's findings provide credence to the idea that ARG-5G has the potential to encourage innovation in digital entertainment by bridging the gap between virtual immersion and real-world responsiveness.

Keywords—Augmented Reality (AR), 5G Networks, Immersive Gaming, Low-Latency Communication, Edge Computing, Interactive Entertainment

:: PAPER ID: 293 ::

ENHANCING FAIRNESS AND TRANSPARENCY IN ELECTRONIC VOTING WITH BLOCKCHAIN-BASED IDENTITY MANAGEMENT

A. Senthil Kumar

Computer Science and Engineering, Dayananda Sagar University, India

Honganur Raju Manjunath

Department of Physics, Faculty of Engineering and Technology, JAIN (Deemed-to-be University), Ramnagar District, Karnataka, India

Ch. Mohan Sai Kumar

Department of Electronics and Communication Engineering, Assistant Professor, Vel Tech Rangarajan Dr. Sagunthala R&D Institute of Science and Technology, Chennai, India

Kaberi Das

Department of Computer Applications, Siksha 'O' Anusandhan (Deemed to be University), Bhubaneswar, Odisha, India

G. Sundari

Department of Electronics and Communication Engineering, Sathyabama Institute of Science and Technology, Chennai, Tamilnadu, India

Amit Sharma

School of Computer Application, Lovely Professional University, Phagwara, Punjab, India

angusen@gmail.com, hr.manjunath@jainuniversity.ac.in, chmohansaikumar@veltech.edu.in, kaberidas@soa.ac.in, sundari.ece@sathyabama.ac.in, profamitsharma@gmail.com

Abstract—A significant number of individuals are worried about the level of security that electronic voting systems provide, the ease with which someone can impersonate a voter, and the difficulty in monitoring these systems. One of the many issues that arise with these systems is the need to ensure that voting is both open and fair, while also concealing the identities of those who cast their ballots. According to the findings of this research, Blockchain-Based Identity Management (BBIM) is a more effective strategy for electronic voting. The inability to be updated, the absence of centralization, and the security offered by blockchain technology are utilized in this process. The combination of BBIM and a distributed ledger would enable the proposed system to record transactions transparently, without disclosing any personally identifiable information. It is also feasible that employing encrypted ID tokens would enable the reliable verification of voter credentials. Through the use of smart contracts, the election rules are automatically verified and checked to ensure compliance. The simulation's findings reveal that the BBIM-based electronic voting model outperforms traditional voting systems, as it provides greater transparency, protection against identity theft, and prevents individuals from voting more than once. To safeguard the privacy of users and provide a foundation for the development of future electronic voting systems, this paper proposes the use of identity management based on blockchain technology.

Keywords—Electronic Voting, Blockchain, Identity Management, Transparency, Fairness

:: PAPER ID: 294 ::

IMPLEMENTING BLOCKCHAIN-BASED SECURE PAYMENT SYSTEMS IN ELECTRONIC GOVERNMENT SERVICES

Anukampa Behera

Department of Computer Science and Engineering, Siksha 'O' Anusandhan (Deemed to be University), Bhubaneswar, Odisha, India

M. Kavitha

Department of Computer Applications (DCA), Presidency College, Bengaluru, India

V. Nirmalrani

Department of Information Technology, Sathyabama Institute of Science and Technology, Chennai, Tamilnadu, India

K. Suneetha

Department of Computer Science and Information Technology, Jain (Deemed to be University), Bangalore, Karnataka, India

T. Manikandan

Department of Electronics and Communication Engineering, Presidency University, Bangalore, Karnataka, India

Kusum Lata

Maharishi School of Engineering & Technology, Maharishi University of Information Technology, Uttar Pradesh, India

anukampabehera@soa.ac.in, kavitha.m@presidency.edu.in, nirmalrani.it@sathyabama.ac.in, k.suneetha@jainuniversity.ac.in, manikandan.t@presidencyuniversity.in, kusumlata@mut.in

Abstract—Electronic government (e-Gov) platforms are increasingly adopting digital payment systems to streamline citizen-to-government and inter-agency transactions. However, traditional infrastructures remain vulnerable to identity theft, fraud, and privacy leakage, which hinder trust and scalability in digital governance. The objective of this research is to develop a blockchain-enabled secure payment methodology that ensures privacy-preserving authentication and robust identity verification while maintaining transparency and auditability. Furthermore, the study aims to evaluate its effectiveness against real-world blockchain payment data. This study proposes the Hybrid Zero-Knowledge Proof with Decentralized Identity (ZKP-DID) Secure Payment Validation Methodology (HZDV-M), which integrates ZKP for eligibility verification without disclosing sensitive information and DID for decentralized, tamper-proof identity management. Smart contracts enforce rule-based payment execution across government services. The Elliptic Data Set from Kaggle, comprising over 200,000 labeled Bitcoin transactions, is employed to simulate and validate the methodology. Experimental results show that HZDV-M achieves a notable reduction in authentication overhead (≈approximately 45%), improves fraud resilience by accurately distinguishing between licit and illicit transaction patterns, and ensures compliance with auditability standards while maintaining near real-time transaction confirmation. In conclusion, incorporating ZKP with DID over blockchain transactions provides a technically robust and governance-compliant foundation for secure, transparent, and privacy-preserving payment systems in e-Government services.

Keywords—Blockchain-based e-Government Systems, Zero-Knowledge Proof (ZKP), Decentralized Identity (DID), Secure Payment Validation, Fraud Detection in Digital Transactions, Privacy Gaming, Low-Latency Communication, Edge Computing, Interactive Entertainment

::: PAPER ID: 295 :::

KNOWLEDGE, ATTITUDE & BEHAVIOR ANALYSIS TOWARD HUMAN E-COMMERCE PROTECTION MODEL

Noridayu Adnan, Siti Norul Huda Sheikh Abdullah, Wan Fariza Wan Fauzi
Faculty of Information Science and Technology, Universiti Kebangsaan Malaysia, Bangi, Malaysia.

p131986@siswa.ukm.edu.my, snhsabdullah@ukm.edu.my, fariza.fauzi@ukm.edu.my

Abstract—This study investigates the interplay between knowledge, attitude, and behavior (KAB) in the context of cybercrime awareness for online trading, utilizing a validated survey instrument to systematically measure each construct. The study employs a quantitative methodology, administering a structured questionnaire to a diverse group of respondents and analyzing the data through descriptive statistics, Pearson correlations, and t-test comparisons of composite scores. Results demonstrate significant disparities among the constructs, with higher levels of behavior observed relative to knowledge and attitude, and moderate to strong inter-item correlations supporting scale validity. The analysis further reveals that comprehensive knowledge provides a foundation for positive attitudes, which in turn strongly predict the adoption of secure online practices. The findings affirm the value of the KAB framework for diagnosing specific gaps, shaping targeted interventions, and informing policy and educational strategies in e-commerce environments. In conclusion, leveraging distinct measures of knowledge, attitude, and behavior is essential for designing effective initiatives to foster a resilient, cyber-aware online trading community and mitigate the risks associated with digital commerce.

Keywords—Knowledge, Attitude, Behavior, E-commerce Protection

::: PAPER ID: 296 :::

MULTI-GRANULARITY SPATIO-TEMPORAL AFFECTIVE PERCEPTION NETWORK WITH MentalBERT FOR SOCIAL MEDIA DEPRESSION DETECTION

Shiwen Zhou, Masnizah Mohd, Lailatul Qadri Zakaria
The Faculty of Information Science and Technology, Universiti Kebangsaan Malaysia, Malaysia Selangor, Malaysia

p132309@siswa.ukm.edu.my, masnizah.mohd@ukm.edu.my, lailatul.qadri@ukm.edu.my

Abstract—Social media analysis as a critical field in computational mental health has surfaced due to the detection of tendencies of depression. In this paper, an innovative Multi-Granularity Spatio-Temporal Affective Perception Network(MSTAPN) is proposed that utilizes the temporal dynamics and multi-scale feature extraction to achieve higher depression-detecting accuracy. Our approach integrates a specialized temporal attention mechanism with time-decay modeling, multi-granularity convolutions, and bidirectional LSTM networks to capture both short-term emotional fluctuations and long-term behavioral patterns. The method extracts 44 comprehensive features, including 24 static emotional indicators and 20 novel temporal characteristics such as posting patterns, emotional evolution trends, and time-interval distributions. On depression detection datasets, our MentalBERT-MSTAPN model has shown significant improvements with a 0.6452 F1-score and 0.6500 accuracy, which are significant improvements over the baselines. The temporal enhancement offers an improvement of 0.4720 F1-score compared to the Mental BERT baseline, especially in depression-specific detection with 0.6866 F1-score. The results confirm that temporal modeling of emotional expression patterns is an important element toward effective depression detection using social media analysis.

Keywords—depression detection, temporal modeling, multi-granularity networks, Mental BERT

::: PAPER ID: 297 :::

ALGORITHMIC THINKING IN TVET PROGRAMMING EDUCATION: AN ANALYSIS OF STUDENT PROFICIENCY LEVELS AND PEDAGOGICAL IMPLICATIONS

Kaswati Salleh, Zurina Muda, Syahanim Mohd Salleh
Faculty of Information Science and Technology Universiti Kebangsaan Malaysia Selangor, Malaysia
Umawathy Technamurthy
Faculty of Engineering & Built Environment Universiti Kebangsaan Malaysia Selangor, Malaysia

p136896@siswa.ukm.edu.my, zurinam@ukm.edu.my, syahanim@ukm.edu.my, t.umawathy@ukm.edu.my

Abstract—Algorithmic thinking (AT) is a fundamental yet challenging cognitive skill in programming that enables students to design structured and efficient problem solving processes. Within Technical and Vocational Education and Training (TVET), AT not only strengthens programming comprehension but also enhances employability in the digital era. Despite its recognized importance, few empirical studies in Malaysia have systematically measured AT proficiency among TVET learners using validated instruments, leaving a gap in understanding their actual mastery level. This study aims to (1) assess the level of AT proficiency among TVET students, (2) identify key challenges hindering its mastery and (3) propose learning strategies to enhance AT within programming education. A quantitative survey using the adapted Programming Oriented Computational Thinking Scale (P-CTS) is administered to 300 community college students, enrolled in the SFC10403 Programming Fundamentals course across Malaysia. Descriptive results revealed a moderate level of AT proficiency ($M = 2.39$, $SD = 0.70$), with stronger performance in constructing pseudocode ($M = 2.74$) but weaker ability in tracing logic errors ($M = 2.15$) and analyzing algorithmic efficiency ($M = 2.04$). These weaknesses stem from limited exposure to authentic, interactive and experiential programming contexts. Aligned with prior studies, the findings highlight serious games as a promising interactive learning tool grounded in Experiential Learning and Cognitive Load principles. This research provides baseline empirical evidence for Malaysian TVET programming education and establishes a foundation for developing serious game based frameworks to strengthen algorithmic thinking competencies.

Keywords—Algorithmic thinking, TVET education, programming learning, serious games, skills development

:: PAPER ID: 298 ::

TRANSFORMER-AUGMENTED ENCODING FOR IDENTIFYING PEDIATRIC PNEUMONIA PATTERNS USING RADIOGRAPHIC CHEST IMAGERY

Karthi Vivekanandan

Department of Electrical and Electronics Engineering, Kangeyam Institute of Technology, Kangeyam - 638108, Tamilnadu, India

Mohana M

Department of Information Technology, Easwari Engineering College (Autonomous), Ramapuram, Chennai - 600089, Tamil Nadu, India

Sagaya Mary S

Department of Electronics and Communication Engineering, J.J. College of Engineering and Technology, Trichy - 620009, Tamil Nadu, India

Jeevitha Sakkarai

Department of Computer Science and Information Technology, Kalasalingam Academy of Research and Education, Tamil Nadu, India

Rachel Nallathamby

Department of Computer Science & Engineering, School of Computing, Veltch Rangarajan Dr. Sagunthala R&D Institute of Science and Technology, Chennai - 600062, Tamil Nadu, India

Manjunathan Alagarsamy

Department of Electronics and Communication Engineering, K.Ramakrishnan College of Technology, Trichy, Tamil Nadu, India

karthivme@gmail.com, mohana.m@eec.srmmp.edu.in, sagayamarys@jjcet.ac.in, jeevitha.ramkumar@gmail.com, drachelnallathamby@veltech.edu.in, manjunathankrct@gmail.com

Abstract—In children globally, pneumonia is a primary cause of illness and death. Preventing complications and death needs early diagnosis. Standard chest radiograph interpretation needs powerful deep learning models for accurate and automatic identification because there are so many different types of them. The transformer-augmented encoding (TAE) method used in this work tries to improve how pediatric chest X-ray characteristics are shown. The research also seeks to precisely classify pneumonia by employing global contextual reasoning and localized radiographic texture indicators. The methodology introduces TAE-CXR, a hybrid architecture that utilizes convolutional layers for low-level spatial encoding and multi-scale transformer blocks to capture long-range relationships. Transformer-augmented attention modules and cross-feature fusion are utilized to analyze radiographic patches, pinpointing pneumonia-specific areas and eliminating background noise. TAE-CXR beats both the baseline CNN and pure ViT models in terms of sensitivity, specificity, and accuracy on a pediatric chest radiograph dataset. The framework displays pneumonia regions using attention maps to simplify clinical use. In conclusion, transformer-augmented encoding greatly enhances pneumonia identification in child radiography. Results indicate that this technology could be a reliable tool for pediatric imaging decision support.

Keywords—Pediatric Pneumonia, Chest Radiograph Analysis, Transformer-Augmented Encoding (TAE-CXR), Deep Learning, Medical Image Classification, Attention Mechanisms, Computer-Aided Diagnosis

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AN INTEGRATED FRAMEWORK FOR ENHANCING BANKING SOFTWARE PERFORMANCE, SECURITY, AND USER EXPERIENCE: A CASE STUDY OF BANK OF CHINA

Lulu Jia, Azana Hafizah Mohd Aman, Nur Hanis Sabrina Suhaimi

Faculty of Information Science and Technology Universiti Kebangsaan Malaysia Kuala Lumpur, Malaysia

jialulu996@163.com, azana@ukm.edu.my, sabrina@ukm.edu.my

Abstract—With the acceleration of digital transformation, the performance of banking software has become an important factor affecting the quality of financial services and customer satisfaction. The aim of this study is to analyse the performance, security and user experience of the current software system of Bank of China to identify and solve key problems encountered in the financial services sector. The research questions focus on how to improve the efficiency, security, and user satisfaction of banking software. The goal of the study is to propose a comprehensive set of improvement solutions to optimize the functionality and performance of banking software. The study adopts a comprehensive approach, including performance testing, vulnerability analysis, and user research. Data processing latency and throughput were analyzed through simulation testing in a highly concurrent environment; the effectiveness of security protections was assessed using penetration testing tools; and the usability of interface designs was analyzed quantitatively and qualitatively in conjunction with user feedback studies. The research results showed that the existing banking software had deficiencies in terms of data processing speed, security measures, and user interface design: high database response latency caused serious performance degradation under high concurrency; the security system had limited ability to defend against new types of network attacks; and the interface design lacked intuitiveness, which affected user satisfaction. The study proposed a series of innovative solutions, including using the Dynatrace model to improve software performance, using PDCA tools to improve software security, and combining user satisfaction surveys to optimize interface design improvements. Further evaluation showed that these optimization strategies can improve system performance by more than 30%. In addition, the success of this study has also had a positive impact on the formulation of relevant policies, helping to promote the improvement of software standards and regulatory mechanisms in the financial industry. For the banking industry, this study can help improve service efficiency and enhance the customer experience, thus gaining a competitive advantage in the fierce market competition.

Keywords—Software Performance, High Concurrency, User Experience, Cybersecurity, Experience perspective

::: PAPER ID: 300 :::

FEDERATED REPRESENTATION ADAPTATION FOR HARMONIZING CROSS-BORDER HEALTHCARE RECORDS UNDER PRIVACY CONSTRAINTS

T. Selva Banu Priya

Department of Artificial Intelligence and Data Science, Panimalar Engineering College, Chennai- 600123, Tamil Nadu, India

N. L. Venkataraman

Department of Electronics and Communication Engineering, J.J. College of Engineering and Technology, Trichy - 620009, TamilNadu, India

Palraj Karuppasamy

Department of Information Technology, Ramco Institute of Technology, Rajapalayam - 626117, Tamil Nadu, India.

Menaka S

Department of Computer Science and Engineering, Vivekanandha College of Engineering for Women, Tiruchengode - 637 205, Tamil Nadu, India

P. C. Senthil Mahesh

Department of Computer Science and Engineering, Excel Engineering College, Komarapalayam - 637 303, Namakkal, Tamil Nadu, India

Manjunathan Alagarsamy

Department of Electronics and Communication Engineering, K.Ramakrishnan College of Technology, Trichy, Tamil Nadu, India

priya8517@gmail.com, venkat.altera@gmail.com, palraj@gmail.com, menakas@vcew.ac.in, senthilmaheshaits@gmail.com, manjunathankrct@gmail.com

Abstract—High demand for healthcare analytics that protect patient privacy requires a solution that meets GDPR and HIPAA regulations. FL significantly reduces the hazards of centralized data aggregation by enabling cooperative model training across multiple institutions while preserving local data. Attacks that exploit local updates and leverage gradient inversion to extract sensitive information from shared gradients target conventional FL frameworks. To overcome these issues, the paper proposes the FedSplit-Adpt framework for cross-border healthcare data harmonization under privacy constraints, leveraging split learning with vertical data partitioning. The framework addresses the challenge of integrating heterogeneous healthcare data from multiple institutions across different countries, where data features are vertically partitioned, with each institution possessing a distinct subset of patient information. Split learning is employed to divide the neural network into client-side and server-side components, ensuring that patient data remains local to the device. At the same time, intermediate activations are transmitted for further computation, thereby ensuring compliance with privacy regulations. Vertical data partitioning enables the model to learn from complete patient profiles and integrate traits from several institutions, assured that sensitive data is protected. Institutions can only communicate encrypted intermediate outputs using homomorphic encryption, which enhances security and enables the server to compute encrypted data, thereby keeping raw patient data confidential throughout the training process. The encrypted intermediate representations are incorporated during collaborative training to create a global model that can synchronize data across various healthcare systems with different terminologies, feature distributions, and medical standards. The results show that the FedSplit-Adapt framework harmonises healthcare data from other nations with 96.4% success and 20% data interoperability, compared to standard federated learning methods.

Keywords—Federated Learning, Split learning, Vertical data partitioning, Homomorphic encryption, privacy constraints

::: PAPER ID: 301 :::

TOPOLOGICAL DEEP LEARNING FOR RECOGNIZING MANUFACTURING DEFECTS IN HIGH-PRECISION SEMICONDUCTOR FABRICATION LINES

Vishnuraja Palanisamy

Department of Computer Science and Engineering, Kangeyam Institute of Technology, Kangeyam - 638108, Tamil Nadu, India

Kokulavani K

Department of Electronics and Communication Engineering, J.J. College of Engineering and Technology, Trichy - 620009, Tamil Nadu, India

Jeevitha Sakkarai

Department of Computer Science and Information Technology, Kalasalingam Academy of Research and Education, Tamil Nadu, India

K. Radhika

Department of Electronics and Communication Engineering, Muthayammal Engineering College (Autonomous), Namakkal - 637408, Tamil Nadu, India

Maria Kalavathy Gnanamani

Department of Information Technology, Easwari Engineering College, Chennai - 600089, Tamil Nadu, India

Manjunathan Alagarsamy

Department of Electronics and Communication Engineering, K.Ramakrishnan College of Technology, Trichy, Tamil Nadu, India

vishnurajap@gmail.com, kokulavani1982@gmail.com, jeevitha.ramkumar@gmail.com, radhikasiva1982@gmail.com, maria_kalavathy@yahoo.co.in, manjunathankrct@gmail.com

Abstract—Product quality and yield depend on the identification of manufacturing faults in high-precision semiconductor fabrication. With the growing complexity and downsizing of semiconductor components, pixel-wise defect identification methods struggle to handle the complex spatial connections and topological structures of semiconductor images. Advanced, computationally viable algorithms that can effectively detect even tiny flaws are essential for real-time industrial applications. Non-Euclidean flaw patterns on semiconductor surfaces make it challenging for Convolutional Neural Network (CNNs) and standard deep learning (DL) algorithms to operate effectively. These flaws have complicated geometries and subtle changes that traditional techniques cannot capture. These approaches have sluggish processing durations, limited applicability to new fault kinds, and an inability to use data topological properties effectively. A reliable, scalable, and real-time solution is needed to overcome these constraints. To address these challenges, this research presents the Topological Defect Recognition Network (TDR-Net), which integrates DL and Topological Data Analysis (TDA). TDR-Net captures the multi-scale topological aspects of defect patterns using Persistent Homology-Based Feature Extraction (PHFE), retaining geometric information that previous approaches often overlook. The "shape" and "structure" of faults can be recognized by extracting and learning topological properties from raw photos without added features. The TDR-Net DL network embeds these topological properties to improve fault classification accuracy and resilience. A Graph Convolutional Layer (GCL) represents the links between retrieved topological characteristics and combines them with the spatial context of the image for higher-order fault structural reasoning. Real-time defect identification with little computing overhead is critical in production. Based on experiments from a prominent semiconductor production line, TDR-Net outperforms CNN-based approaches. The proposed technique achieves 15% higher defect detection accuracy, 20% faster processing time, and improved generalization to new defect types.

Keywords—Topological Data Analysis (TDA), Persistent Homology, Semiconductor Defect Detection, Topological Defect Recognition Network (TDR-Net), Graph Convolutional Layer (GCL), Real-Time Defect Recognition

:: PAPER ID: 302 ::

QUANTUM-RESISTANT HASHING FOR PROTECTING GENOMIC PRIVACY WITHIN DECENTRALIZED BIOMEDICAL DATA ECOSYSTEMS

Sumithra Subramanian

Department of Electronics and Communication Engineering, J.J. College of Engineering and Technology, Trichy - 620009, Tamil Nadu, India

C. Malarvizhi

Department of Electronics and Communication Engineering, Rajalakshmi Institute of Technology, Chembarambakkam - 600024, Tamil Nadu, India

S. Nadhiya

Department of Computer Science and Engineering, Excel Engineering College, Komarapalayam - 637 303, Namakkal, Tamil Nadu, India

K. P. Siva

Department of Computer Science and Business Systems, Sri Eshwar College of Engineering, Coimbatore - 641020, Tamil Nadu, India

Parimala Gandhi Ayyavu

Department of Electronics and Communication Engineering, Paavai Engineering College, Pachal-637018, Namakkal, Tamil Nadu, India

Manjunathan Alagarsamy

Department of Electronics and Communication Engineering, K.Ramakrishnan College of Technology, Trichy, Tamil Nadu, India

dsumithra30@gmail.com, malarvizhi.c@ritchennai.edu.in, nadhiyasanthosh03@gmail.com, siva.insane@gmail.com, parimalagandhi410@gmail.com, manjunathankrct@gmail.com

Abstract—A new era in the security of communication channels in Biomedical Data Ecosystems has begun with the advent of quantum-based privacy-preserving technologies such as Quantum Key Distribution (QKD). Traditional cryptographic methods, including hashing functions and public-key cryptosystems, are vulnerable to quantum attacks, putting the security of sensitive genomic data at risk. The paper proposes Q-GenCryptoProtect, a novel quantum-resistant cryptographic framework designed to ensure genomic privacy within decentralized biomedical data ecosystems. The proposed framework integrates lattice-based post-quantum signatures, multi-key homomorphic encryption, and a newly developed quantum-resilient hash function optimized for high-dimensional genomic data integrity. For comprehensive quantum-secure protection against emerging quantum threats, Q-GenProtect utilizes blockchain technology to provide decentralized key management, dynamic and immutable access controls, and reliable audit trails. Supporting large-scale genomic repositories, the design enables secure multiparty genomic computation without data exposure and interfaces easily with current decentralized infrastructures. The substantial research and practical evaluations that indicate Q-GenProtect is quantum-resistant, scalable, and computationally efficient have set a new standard for genomic privacy and governance. This innovation secures the communication of biological data in the quantum computing era.

Keywords—Quantum resistant, hash function, Biomedical data, component, homomorphic encryption

:: PAPER ID: 303 ::

A HYBRID DEEP LEARNING APPROACH INTEGRATING CNN BiLSTM, AND ATTENTION MECHANISM FOR ROBUST PHISHING URL DETECTION

Khulood Abdullah, Afnan Mohammed Ali Abdullah

Center for Artificial Intelligence Technology, Faculty of Information Science and Technology Universiti Kebangsaan Malaysia (UKM) Bangi, Malaysia

Siti Norul Huda Sheikh Abdullah, Amelia Natasya Abdul Wahab

Centre for Cyber Security, Faculty of Information Science and Technology Universiti Kebangsaan Malaysia, 43600 Bangi, Malaysia

Esraa Esam Halbob

Department of Computer Science, Faculty of Information Science and Technology Universiti Kebangsaan Malaysia (UKM) Bangi, Malaysia

p147144@siswa.ukm.edu.my, PI47146@siswa.ukm.edu.my, snhsabdullah@ukm.edu.my, anaw@ukm.edu.my, A199870@siswa.ukm.edu.my

Abstract—The rapidly increasing number of phishing and malicious websites has generated serious cybersecurity concerns, necessitating accurate and scalable detection techniques. This paper presents a novel hybrid architecture that combines deep learning techniques for local feature extraction using Convolutional Neural Networks, sequence-modeling through Bidirectional Long Short-Term Memory (BiLSTM) networks, and interpretability through an attention mechanism. The proposed architecture achieved an accuracy of 98.53%, precision at 99.60%, recall at 96.95%, and F1-score at 98.52%, exceeding the performance of Logistic Regression, Random Forest, and CNN-baseline versions, using balanced data containing 102,339 URLs from PhishTank and Tranco. With the attention mechanism, the model provides better transparency about which parts of a URL (login, secure) must be considered to ensure the final judgment is sufficiently accurate and explainable. These results demonstrate the practical applicability and robustness of the proposed CNN-BiLSTM-Attention framework for malicious URL detection in cybersecurity defense systems.

Keywords—Malicious URL detection, phishing detection, deep learning, CNN, BiLSTM, attention mechanism, cybersecurity

:: PAPER ID: 304 ::

AI-ENHANCED CULTURAL DATA ANALYTICS IN EFL EDUCATION: ETHICAL AND SOCIETAL IMPLICATIONS FOR SMART CITY AND RURAL SCHOOLS IN UZBEKISTAN

Nargiza Shaumarova Shorustam Qizi

Kimyo International University in Tashkent, Uzbekistan Faculty of Education and Liberal Arts/ Centre for Education and Sustainable Development Strategies, INTI International University, Persiaran Perdana BBN, Putra Nilai, 71800 Nilai, N. Sembilan, Malaysia

Sharustam Shamusarov Ghyasovich

Tashkent State University of Oriental studies, Tashkent, Uzbekistan

Hariharan N Krishnasamy

Faculty of Education and Liberal Arts/ Centre for Education and Sustainable Development Strategies, INTI International University, Persiaran Perdana BBN, Putra Nilai, 71800 Nilai, N. Sembilan, Malaysia

shaumarova1991@gmail.com, shamusarov@yahoo.com, hariharan.samy@newinti.edu.my

Abstract—The integration of AI in EFL teaching has the potential to revolutionize the sector, particularly when combined with cultural data analytics. The growth of AI-enhanced educational systems in Uzbekistan presents both opportunities and challenges for rural schools and smart cities. The problem stems from several factors, including unequal access to AI resources, concerns about data privacy, and disparities in educational outcomes within society. This study employs a mixed-methods approach to investigate the impact of cultural data analytics and AI-powered language learning platforms on student engagement and success. To evaluate the influence that artificial intelligence technology has on cultural inclusivity and the ethical viewpoints of both teachers and students, they carried out experiments, conducted interviews with teachers, and conducted surveys with students attending urban and rural schools. According to the results, artificial intelligence-enhanced systems have the potential to improve students' understanding of a variety of cultures, make it easier for them to learn new languages, and reduce the number of educational hurdles they face. The findings bring to light ethical concerns about the methodology of data gathering, algorithmic prejudice, and digital inequality. To ensure that AI-driven cultural data analytics will continue to be effective in improving English as a Foreign Language (EFL) education in Uzbekistan, this work highlights the importance of a comprehensive framework that considers ethical considerations, includes equitable access, and incorporates local cultural adaptation.

Keywords—Blockchain, Healthcare IoT, Access Control, PBFT, Security

:: PAPER ID: 305 ::

AI-DRIVEN NLP AND BLOCKCHAIN-ENABLED LINGUISTIC ANALYTICS: INTEGRATIVE APPROACHES FOR FAIR, TRANSPARENT LITERARY TRANSLATION OF GEORGE ORWELL'S WORKS

Sodikova Dinora Ilhom Qizi

Tashkent State Transport University
Nordic International University, Uzbekistan

Sodikova Sabohat Ilhom Qizi, Nasriddinov Dilshod Azamkulovich, Zakhidova Guzal Elbekovna, Khalikova Dildora

Normurodovna

Nordic International University, Uzbekistan

Abdullayeva Markhabo Raxmonkulovna

Tashkent state university of Oriental studies, Uzbekistan

dinorasodikova1990@gmail.com, sabohatsodikova92@gmail.com, dilshodnasr@gmail.com,
guzal.zakhidova81@gmail.com, xalikovadildora6@gmail.com, a.marxabo.r@mail.ru

Abstract—The rapid improvement of artificial intelligence (AI) in natural language processing (NLP) has changed literary translation by implementing semantic protection and stylistic reliability throughout the languages. However, regular translation systems often lack transparency, diagnosticity, and justification, especially when dealing with politically sensitive texts, such as George Orwell's works. This study aims to design an integrated method for ensuring the fair, transparent, and responsible translation of AI-operated NLP by combining Blaxain-Issued linguistic analysis. This research aims to preserve the conceptual integrity, stylistic synchronization, and semantic balance while ensuring censorship in translation verification. The so-called hybrid-based translation verification structure (HECTVF) utilizes the proposed mechanism, which involves transformer-based neural engine translation, interprets AI instructions for the safety of semantic and stylistic integrity, and employs non-modern verification. To implement large-scale multilingual training and standardization, 1,620 language combinations are used as a basic framework for the Wikimatrics database, with more than 135 million parallel synthetic pairs. A reasonable measurement, the conceptual reliability score (IFS), has been introduced to quantify translation consistency. Experiments using the Wikimatrics database show that this structure improves the transparency of 12% of the semantic reliability, 9% of the stylistic reliability, and transparency in transformation accountability compared to basic systems that lack Blaxain coordination. Smart contracts ensure a strong character in protecting fellow verification and ideological techniques. In conclusion, this research provides a new intermediate structure that not only improves the accuracy of translation but also, in accordance with the importance of the environment for reality and transparency, enables justification, illustration, and accountability.

Keywords—Blockchain-enabled Linguistic Analytics, Explainable Artificial Intelligence (XAI), Ideological Fidelity Score (IFS), Neural Machine Translation (NMT), Semantic and Stylistic Fidelity

:: PAPER ID: 306 ::

AI-DRIVEN PERSONALIZED LEARNING ECOSYSTEM FOR SMART UNIVERSITIES USING COGNITIVE AND CONTEXT AWARE TECHNIQUES WITH PERSONALIZED LEARNING ADAPTATION ALGORITHM

M.Mohammed Jalaluddin, Haja Alaudeen A

Dept of Computer Applications, B S Abdur Rahman Crescent Institute of Science and Technology, Vandalur;
Chennai-600048, Tamil Nadu, S.India

jalaluddin@crescent.education, hajaalaudeen@crescent.education

Abstract—Popular smart university campuses are emphasizing intelligent learning technologies that can adapt to each student's requirements. Conventional e-learning frameworks are ineffective and dropout-prone because they can't adjust to learning speed, behavioral involvement, and contextual variables. This study proposes a Personalized Learning Adaptation Algorithm (PLAA) that utilizes a Context-Aware Resource Recommendation Algorithm (CARRA) to address these constraints. PLAA uses learning analytics to adjust course speed, complexity, and presentation depending on student behavior, interests, and participation. CARRA also recommends the best learning materials, taking into account contextual factors such as time, device usage, and attention levels, to make the information engaging and useful. Combining intelligent content selection with personalized routes, these algorithms provide a full adaptive learning environment. It enhances academic performance, learner engagement, and dropout risks compared to typical adaptive systems in simulated smart university environments. When integrated, PLAA and CARRA provide a student-centered, scalable approach to education that enables next-gen individualized learning.

Keywords—Personalized Learning Adaptation Algorithm (PLAA), Context-Aware Resource Recommendation Algorithm (CARRA), Smart Universities, Artificial Intelligence in Education, Adaptive Learning Systems

:: PAPER ID: 307 ::

COMPUTATIONAL INTELLIGENCE APPROACHES FOR AI-POWERED EDUCATION AND LANGUAGE ACCESSIBILITY IN SMART LEARNING SYSTEMS

Dilshoda Kakhramonovna Maksudova, Dilfuza Abduganiyevna Akramxodjayeva

Tashkent State University of Oriental Studies, Uzbekistan

Tursunova Nargiza Xamrakulovna, Gaipova Shakhnoza Makhmudovna, Oripova Nargiza Vosijon Qizi, Okhunov

Mukhammadysuf

Journalism and Mass Communications University of Uzbekistan

jumagulxonima@gmail.com, dilfuzakramxodjayeva@gmail.com, nargizat444@gmail.com,
shakhnoza.makhmud@gmail.com, oripova.shirin97@gmail.com, dilfuza@gmail.com

Abstract—The rapid expansion of online education has led to the development of several innovative instructional methods that are adaptable and accessible to all individuals. However, a significant number of the courses now offered do not cater to the requirements of all types of students or guarantee that languages are accessible in every region of the world. The Computational Intelligence-Driven Adaptive Learning Framework (CI-ALF) is an approach presented in this work. The idea will enable natural language processing (NLP), evolutionary optimization (EO), and neural networks (NN) to collaborate, creating intelligent learning environments tailored to each user and accommodating a diverse range of linguistic backgrounds. Through the use of real-time translation and pronunciation assistance, the CI-ALF can monitor student profiles, identify areas where they require extra information, and present them with materials tailored to their specific needs. The results indicate that the framework assists students in learning more rapidly (by 18%) and gaining a deeper understanding of more complex topics when they are required to work with multiple languages. According to the results, artificial intelligence has the potential to significantly improve academic performance, diversity, and engagement, while reducing the mental effort required. Ultimately, this work provides a framework for future learning systems driven by artificial intelligence that can be tailored to the specific needs of each individual and support multiple languages.

Keywords—Computational Intelligence, Smart Learning Systems, Language Accessibility, Adaptive Learning, Natural Language Processing, Personalization

::: PAPER ID: 308 :::

RELATIONAL GRAPH COMPLETION FOR DISCOVERING DRUG INTERACTIONS ACROSS PHARMACOLOGICAL KNOWLEDGE DATABASES

Purushothaman Ramaiah

Department of Electronics and Communication Engineering, J.J. College of Engineering and Technology, Trichy - 620009, Tamil Nadu, India

Balaji V S

School of Electrical and Electronics Engineering, SASTRA Deemed University, Thanjavur - 613401, Tamil Nadu, India

Kayalvizhi S

Department of Computer Science and Engineering, Excel Engineering College, Komarapalayam - 637 303, Namakkal, Tamil Nadu, India

Dinesh Kumar P

Department of Computer Science and Engineering, Vivekanandha College of Engineering for Women, Tiruchengode - 637 205, Tamil Nadu, India

Alima Beevi Azizur Rahman

Department of Computer Science and Engineering, Panimalar Engineering College, Chennai- 600123, Tamil Nadu, India

Manjunathan Alagarsamy

Department of Electronics and Communication Engineering, K. Ramakrishnan College of Technology, Trichy, Tamil Nadu, India

purushoth8419@gmail.com, biobala_mtech@eie.sastra.edu, kayalvizhi.sekar95@gmail.com, dineshkumarpadmaraj@gmail.com, mail2alimabeevi@gmail.com, manjunathankrct@gmail.com

Abstract—Adverse drug interactions (ADIs) can affect patients and limit therapeutic efficacy in pharmacology. A current issue is the prediction of drug interactions (DIs) utilizing large pharmacological knowledge databases. Traditional machine learning classifiers and rule-based algorithms struggle to capture the complex patterns of connections in pharmaceutical data, thereby limiting prediction accuracy and generalizability. Drug interactions, including drug-target interactions and pharmacological effects, are too complex for static or basic relational models to predict accurately. Drug-target interaction (DTI) and drug-drug interaction (DDI) data cannot integrate these entities' many relationships. Scalability and performance issues arise when applying existing models to big pharmacological datasets because they ignore the hierarchical structure and complex interdependencies of many pharmacological components. Pharmacological data is modelled as a multi-relational graph in this Relational Graph Completion (RGC) paradigm for drug interaction prediction. Edges connect nodes, drugs, targets, and interactions. An attention-based Graph Convolutional Network (GCN) architecture is presented to better weight drug-target interactions based on their pharmacological importance. Graph autoencoders capture latent drug additions and unique drug interactions for fast relational completion. Multi-graph learning integrates chemical, genetic, and pharmacological data to improve drug interaction predictions. An RGC-based approach was evaluated on a large pharmacological knowledge base containing over 1,500 medications and their interactions across categories. The Area Under the Precision-Recall Curve shows a 21% gain in projected accuracy and a 16% reduction in processing time for large graph datasets, outperforming typical GCN models. As the dataset increased in size, the model maintained its prediction accuracy.

Keywords—Relational Graph Completion (RGC), Drug Interaction Prediction, Graph Convolutional Networks (GCN), Drug-Drug Interaction (DDI) Graph Autoencoder, Attention Mechanism, Pharmacological Knowledge Graph

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HYBRID GREY WOLF OPTIMIZER-CNN MODEL FOR HIGH-RESOLUTION REMOTE SENSING IMAGE CLASSIFICATION

Ahmed Tareq Sadiq

Department of Computer Sciences, University of Technology, Baghdad 10066, Iraq

Ahmed Hammad

Faculty of Information Technology, Department of Cyber Security, Al-Isra University, Amman, Jordan

Arasuraja Ganesan

Department of Management Studies, St. Joseph's Institute of Technology, OMR, Chennai - 600119, Tamil Nadu, India

Ahmed A. Elngar

Faculty of Computers and Artificial Intelligence, Beni-Suef University, Beni-Suef City, 62511, Egypt

Shuxrat Boymuradov

maxillofacial surgery and dentistry, Tashkent State Medical University, Tashkent, Uzbekistan, 100109

Sowmiya S

Department of Management Studies, St. Joseph's Institute of Technology, OMR, Chennai- 600 119

drahmaed.tark1971@gmail.com, ahmed.khairt@iu.edu.jo, arasuraja.mba@gmail.com, elngar_7@yahoo.co.uk, sh.boymuradov@tma.uz, sowmiyasowmi192004@gmail.com

Abstract—Classifying high-resolution remote sensing images is an essential task for resource management, urban planning, and environmental monitoring; however, it is still difficult because of the subtle variations in land cover types and high intra-class variability. Extensive manual hyperparameter tuning is frequently necessary for traditional convolutional neural networks (CNNs), which can lead to less-than-ideal convergence and classification performance. This study offers a Hybrid Grey Wolf Optimizer-CNN (GWO-CNN) architecture, where key CNN hyperparameters, including the number of feature maps, learning rate, and convolutional filter sizes, are automatically adjusted by the Grey Wolf Optimizer (GWO). The RESISC45 dataset, which comprises 31,500 photos in 45 classes, serves as the benchmark. Pre-processing techniques include data augmentation, normalization, and stratified division into training, validation, and testing sets. According to experimental results, the suggested GWO-CNN framework outperforms baseline CNN models and other metaheuristic-optimized CNN techniques, achieving a classification accuracy of 97.3%. The optimization procedure lessens the need for manual parameter selection, improves generalization, and speeds up convergence. To sum up, the combination of GWO and CNN offers a reliable and effective method for classifying high-resolution remote sensing images, with substantial promise for intelligent Earth observation applications and extensive geospatial analysis.

Keywords—Remote Sensing Image Classification, Convolutional Neural Networks (CNN), Grey Wolf Optimizer (GWO), Hyperparameter Optimization, RESISC45 Dataset

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GENETIC ALGORITHM-BASED HYPERPARAMETER TUNING FOR TRANSFORMER MODELS IN BIOMEDICAL TEXT MINING

Khaled Shaalan

Faculty of Engineering & IT, The British University in Dubai, 345015, Dubai, UAE

Mohamed Elersy

Higher Colleges of Technology, Al Ain City, Abu Dhabi, UAE

Prabakaran Paranthaman, Tedi Sheron U

Department of Management Studies, St.Joseph's Institute of Technology, OMR, Chennai - 600119, Tamil Nadu

Azza Mohamed

Faculty of Information Technology, Liwa University, Al Ain, United Arab Emirates

Rustam Turakulov

Department of internal medicine in family medicine, Tashkent State Medical University, Tashkent, Uzbekistan

khaled.shaalan@buid.ac.ae, melsersy@hct.ac.ae, prabakaran191085@gmail.com, tedisheron@gmail.com, azza.basiouni@lu.ac.ae, rustam.turakulov@tma.uz

Abstract—In biomedical text mining, it is imperative to be able to get accurate clinical insights from large, varied datasets. Transformer-based models like BERT and BioBERT have gotten top-notch results. However, the effectiveness of these models largely depends on the proper hyperparameter settings, which are typically determined by hand or through grid search, both of which are computationally expensive. The authors of this study recommend employing a Genetic Algorithm (GA) to autonomously modify transformer architecture hyperparameters such as learning rate, batch size, dropout rate, and attention heads when handling biomedical datasets. The GA uses selection, crossover, and mutation to change hyperparameters that are stored as chromosomes. It uses the validation F1-score fitness as a guide. The experimental results on benchmark biomedical datasets show a 6.8% improvement in F1-score and a 23% reduction in training time compared to baseline tuning methods. The results show that GA can efficiently search large search spaces and find high-performance configurations. This makes it possible to deploy transformer models in clinical text mining applications more quickly.

Keywords—Genetic Algorithm, Transformer Models, Hyperparameter Tuning, Biomedical Text Mining, Optimization

::: PAPER ID: 311 :::

PARTICLE SWARM OPTIMIZATION FOR FEATURE SELECTION IN IoT SENSOR ANOMALY DETECTION

Taher M. Ghazal

Department of Networks and Cybersecurity, Hourani Center for Applied Scientific Research, AlAhllyya Amman University, Amman, Jordan
Center for Cyber Security, Faculty of Information Science and Technology, Universiti Kebangsaan Malaysia (UKM), 43600 Bangi, Selangor

Amer Ibrahim

Department of Computer Science and Software Engineering, United Arab Emirates

Aruna V, Jana M

Department of Management Studies, St.Joseph's Institute of Technology, OMR, Chennai - 600119, Tamil Nadu, India
Amjed Abbas Ahmed

Center for Cyber Security, Faculty of Information Science and Technology Universiti Kebangsaan Malaysia, Bangi, Malaysia

Department of Computer Techniques Engineering, Imam AlKadhun College (IKC), Baghdad, Iraq

Feruza Azizova

Department of Hygiene of Children and Adolescents, Nutrition Hygiene, Tashkent State Medical University, Tashkent, Uzbekistan, 100109

taher.ghazal@ieee.org, amer.ibrahim@uaeu.ac.ae, arunasivakumar28@gmail.com, janajana10856@gmail.com, amjedabbas@alkadhun-col.edu.iq, feruzaziz@mail.ru

Abstract—Large-scale, high-dimensional sensor data streams have been produced by the quick growth of Internet of Things (IoT) systems, and prompt and accurate anomaly detection is essential to preserving operational safety and system dependability. In resource-constrained IoT environments, high-dimensional data frequently contains redundant and unnecessary features, which can impair detection performance and raise computational overhead. For effective anomaly detection in Internet of Things sensor networks, this paper suggests a Particle Swarm Optimization-based Feature Selection (PSO-FS) framework. Finding the best subset of informative features from the dataset that optimizes detection performance while reducing computational complexity is the main goal. Each particle in the methodology encodes a subset of candidate features using the Binary Particle Swarm Optimization (BPSO) algorithm. Classification accuracy, F1-score, and a penalty term for the quantity of features chosen are all combined to form the fitness function. The chosen features are then used to train lightweight classifiers like Random Forest and Support Vector Machine for anomaly detection after a preliminary filter-based pre-screening step narrows the search space. When compared to full-feature models, the PSO-FS framework maintains or improves overall detection accuracy, improves F1-score by 4–6%, and reduces feature dimensionality by up to 65%, according to experimental evaluation on the Pump Sensor Data dataset from Kaggle. Additionally, the method cuts down on computation time, which makes it appropriate for deployment on edge devices. To sum up, the suggested PSO-FS methodology offers a reliable, accurate, and resource-efficient way to detect anomalies in real time in IoT sensor networks.

Keywords—Particle Swarm Optimization (PSO), Feature Selection, IoT Sensor Networks, Anomaly Detection, High-Dimensional Data Analysis

::: PAPER ID: 312 :::

COLONY OPTIMIZATION FOR MULTI-OBJECTIVE URBAN TRAFFIC LIGHT SCHEDULING

Israa Shihabahmed

Informatics Institute for Postgraduate studies, university of information technology and communication, Iraq
Marif Karimov

Department of Propedeutics of Internal Diseases No. 2 of Tashkent State Medical University, Tashkent, Uzbekistan

S Sam Jebakumar, karpagham.C

Department of Management Studies, St. Joseph's Institute of Technology, OMR, Chennai- 600 119

Rasha Almajed

Computer engineering school, Abu Dhabi University

israa_aljebory@iips.edu.iq, m.shakirovich@mail.ru, samjebakumarkxp32@gmail.com,
karpaghamchandrasekaran@gmail.com, rasha.almajed@adu.ac.ae

Abstract—Greater urbanization has increased traffic congestion, which in turn has improved fuel consumption, air pollution, and travel times. Intelligent transportation systems rely on efficient and effective traffic light timing. The purpose of these systems is to mitigate the impact of these issues. This study introduces ACO-TLS, a novel city-specific multi-objective optimization system. Our acronym stands for "Ant Colony Optimization for Traffic Light Scheduling." Only city intersections were the intended users of the framework. In contrast, the ACO-TLS model simultaneously maximizes the reduction of carbon emissions, the flow of traffic at intersections, and the average amount of time that cars wait. Conventional models aim for a single goal, but this one achieves more. It is feasible to coordinate traffic at intersections without a central authority by modifying virtual pheromone trails to encode changes to signal phases. In comparison to conventional fixed-time control, ACO-TLS reduces average vehicle wait times by 27.8%, increases junction throughput by 19.6%, and reduces estimated CO₂ emissions by 14.3%. The findings of a simulation run on a standard metropolitan network with four crossings provided these insights. Also, as compared to the top adaptive heuristic, ACO-TLS performs 12.1% higher when juggling several objectives. The findings demonstrate that ACO-TLS offers a flexible and extensible method for realtime traffic management.

Keywords—Ant Colony Optimization (ACO), Multi-objective optimization, Urban traffic light scheduling, Intelligent transportation systems, Traffic congestion management, Sustainable urban mobility

::: PAPER ID: 313 :::

NEURO-SYMBOLIC SEQUENCING FOR AUTOMATING FINANCIAL CONTRACT ASSESSMENT DURING INTERNATIONAL TRADE NEGOTIATIONS

Sunita N. Dhote, Rupesh Pais, Rajas Dhote

School of Management Ramdeobaba University Nagpur, India

Reshma Pais

Priyadarshini College of Engineering Nagpur, India

dhotesn@rknec.edu, paisrs@rknec.edu, rndhote@gmail.com, reshmarpais@gmail.com

Abstract—Financial contract evaluation is crucial for ensuring fair and secure international commerce in complex and high-stakes markets. Due to the complex legal, financial, and linguistic elements of these contracts, manual examination remains difficult. Advanced, automated systems that can handle international trade agreements with more accuracy, speed, and transparency are needed as their number and complexity grow. Automated financial contract analysis techniques that utilize rule-based systems or basic machine learning models often struggle with the nuances of legal and financial semantics. These systems seldom describe clause-condition interdependencies, resulting in inadequate reliability and explainability. Additionally, the inability to easily integrate multiple legal systems, read symbolic representations, and draw logical inferences from contract structures limits the real-world adoption of these systems, particularly in dynamic international trade discussions. The unique and advanced Causal-Symbolic Contract Reasoning (CSCR) methodology blends Causal Inference Models with Symbolic Logic Networks to improve financial contract analysis. This research employs causal reasoning to reveal the cause-and-effect linkages in contract clauses, providing a deeper understanding of contractual dynamics than standard models. This research utilizes Neuro-Symbolic Graph Neural Networks (NSGNN) to describe legal sentences as graph entities, comprising nodes and edges, to handle complex symbolic structures. FCA enables us to represent hierarchical relationships and identify abstract patterns that traditional models can overlook. The system models contractual duties and circumstances across time using Temporal Logic Reasoning to manage the sequential, time-dependent character of contract terms. Critical contractual terms are identified 35% more accurately using the CSCR framework than previous methods. Causal inference helps clarify how changes in clauses affect others, whereas symbolic reasoning maintains the logic of contract terms. CSCR speeds up international trade discussions by 50% by reducing the time required for contract review and negotiation. Our approach provides customers with a thorough, explainable rationale behind every assessment, boosting trust in the automated evaluation process.

Keywords—Causal inference, symbolic logic networks, Neuro-Symbolic Graph Neural Networks (NSGNN), formal concept analysis (FCA), temporal logic reasoning, causal-symmetric contract reasoning, contract automation, financial contract analysis, deep learning (DL), explainable AI, legal technology, contract evaluation, international trade negotiations, Transformer models, actionability, contract compliance, hybrid models, logical inference

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YOLOv8-BASED REAL-TIME PEDESTRIAN DETECTION FOR AUTONOMOUS PUBLIC TRANSPORT SYSTEMS

Ahmed Tareq Sadiq

Department of Computer Sciences, University of Technology, Baghdad

Rasha Almajed

Computer engineering school, Abu Dhabi

Feruza Azizova

Tashkent State Medical University, Tashkent, Uzbekistan, 100109

Karunakaran S. Sujeetha A

Department of Management Studies, St. Joseph's Institute of Technology, OMR, Chennai- 600 119

rasha.almajed@adu.ac.ae, azizova.kafedra@gmail.com,
karunakaranmba.s@gmail.com, sujeetha25ag@gmail.com

Abstract—Pedestrian protection is a important mission in the deployment of autonomous public shipping structures, where accurate real-time detection underneath diverse environmental conditions is crucial. Conventional deep studying techniques often attain excessive accuracy in controlled datasets but suffer performance degradation in complicated urban situations such as crowded bus stops, occlusions, and varying illumination. This observe goals to design a sturdy pedestrian detection framework, YOLOv8 + Graph Neural Network(GNN), that leverages real-time detection and contextual reasoning to decorate pedestrian safety. The goal is to improve detection accuracy, reliability, and chance prediction for autonomous buses and trains. The proposed methodology employs YOLOv8 because the number one detector to generate pedestrian bounding containers, which can be then represented as nodes in a graph. Spatial relationships between pedestrians and surrounding automobiles are modeled the usage of GNN layers, refining detection effects and permitting predictive threat evaluation. The City Persons dataset is used for training and assessment because of its sensible urban scenes, numerous pedestrian poses, and splendid annotations. Experimental results display that the hybrid YOLOv8-GNN model outperforms standalone YOLOv8, accomplishing better suggest Average Precision (mAP) and reducing fake positives in crowded and occluded eventualities. In conclusion, integrating GNN-based totally contextual reasoning with YOLOv8 at the CityPersons dataset permits safer and more dependable pedestrian notion, presenting significant potential for subsequent-era self sufficient public transport structures.

Keywords—YOLOv8, Real-Time Pedestrian Detection, Autonomous Public Transport Systems, Graph Neural Networks(GNNs), Intelligent Transportation Systems (ITS)

::: PAPER ID: 315 :::

QUANTUM-ENHANCED APPROXIMATION FOR ACCELERATING PROTEIN FOLDING DYNAMICS IN MOLECULAR BIOLOGY RESEARCH

Sunita N. Dhote, Rajas Dhote

School of Management Ramdeobaba University Nagpur, India

Purushottam D. Shobhane

Symbiosis Institute of Technology, Nagpur Campus Symbiosis International (Deemed University), Pune, India

Priti C. Golar

Department of Information Technology, St. Vincent Pallotti College of Engineering and Technology, Nagpur, India

Satyajit Uparkar

Department of Computer Science and Applications, Ramdeobaba University, Nagpur, India

dhotesn@rknc.edu, rndhote@gmail.com, purushottam.shobhane@sitnagpur.siu.edu.in,
pgolar@stvincentngp.edu.in, uparkarss@rknc.edu

Abstract—One of the most challenging tasks for molecular biologists is navigating the vast conformational space associated with protein folding. The ineffectiveness of classical simulation techniques in displaying structural transitions and folding processes frequently results from their lack of scalability. To address this challenge, it presents a framework known as Quantum-Enhanced Approximation (QEA), which integrates traditional molecular dynamics with techniques derived from quantum physics. Quantum processing enables the swift investigation of conformational states with biological precision by simulating the energy environment. To illustrate its effectiveness, experimental validation on benchmark protein datasets demonstrated that QEA can reduce computation time by up to 45% compared to established molecular dynamics approaches, while still accurately predicting native structures. These results indicate that quantum-enhanced methods could significantly enhance the efficiency of research on protein folding. Last but not least, quantum electrochemistry provides a feasible and flexible approach to advancing studies in computational molecular biology and pharmaceuticals.

Keywords—Quantum computing, protein folding, molecular dynamics, quantum-enhanced approximation, computational biology

::: PAPER ID: 316 :::

HYPERBOLIC GRAPH ATTENTION FOR LINKING CROSS-LANGUAGE NEWS ARTICLES ACROSS GLOBAL OUTLETS

Sunita N. Dhote, Rajas Dhote

School of Management Ramdeobaba University Nagpur, India

Pravin Karmore

Department of Computer Science and Applications, Ramdeobaba University Nagpur

Swapnil Karmore

Tulsiramji Gaikwad Patil College of Engineering & Technology

dhotesn@rknc.edu, rndhote@gmail.com, karmorepy@rknc.edu, swapnilkarmore@gmail.com

Abstract—Due to digital media growing so quickly in many languages, it's hard to identify news pieces that convey the same meaning on numerous platforms. Traditional neural and graph-based models struggle to capture the non-Euclidean and hierarchical patterns that are common in cross-language interactions. It developed a Hyperbolic Graph Attention for Cross-Language Linking (HGAT-L) that can connect news stories in different languages. Within the framework's multilingual news graph, nodes represent articles, and edges indicate their similarity in terms of meaning, timing, and sources. When it comes to identifying hidden hierarchical alignments across languages, hyperbolic space-based attention mechanisms outperform their Euclidean counterparts. Results from experimental evaluations on benchmark multilingual news datasets demonstrate significant enhancements in clustering and link prediction, as well as improved recall and precision in cross-lingual article alignment. The results support the assertion that hyperbolic embeddings are an effective tool for global media research, facilitating enhanced discovery of overlapping stories.

Keywords—Hyperbolic Graph Attention, Cross-Language Linking, Multilingual News, Global Media Analysis, Knowledge Graphs

::: PAPER ID: 317 :::

BERT WITH KNOWLEDGE DISTILLATION FOR LOW-LATENCY MULTILINGUAL CHATBOTS IN SMART CITIES

Khaled Shaalan

Faculty of Engineering & IT, The British University in Dubai, 345015, Dubai, UAE

Aya M. Al-Zoghby

Computer Science Department, Faculty of Computers and Artificial Intelligence, Damietta University, Damietta, Egypt

Faculty of Computer Science and Engineering, New Mansoura University, Dakhla, Egypt

Raimova Malokhatkhon

Andijan State Institute of Foreign Languages

Azza Mohamed

Faculty of Information Technology, Liwa University, Al Ain, United Arab Emirates

Ziyoda Muminova

Department of Obstetrics and Gynecology, Tashkent State Medical University, Tashkent, Uzbekistan, 100109

Lavanya M

Department of Management Studies, St. Joseph's Institute of Technology, OMR, Chennai- 600 119

khaled.shaalan@buid.ac.ae, aya_el_zoghby@du.edu.eg, aya_el_zoghby@nmu.edu.eg, malohatrayimova238@gmail.com, azza.basiouni@lu.ac.ae, ziyoda.muminova@tma.uz, lava2003mn@gmail.com

Abstract—Due to the fast growth of smart city infrastructures, intelligent, multilingual conversational systems that can provide real-time services to various populations are in high demand. The rise of smart city infrastructures has intensified this desire. Transformer-based solutions can be challenging to implement in chatbots like BERT due to their high processing and time requirements, particularly in metropolitan areas with poor infrastructure and limited IoT connectivity. BERT with Knowledge Distillation (BERT-KD) is the research goal. The program helps smart cities use low-latency multilingual chatbots. This strategy reduces huge BERT models to smaller student networks without compromising semantic richness or cross-lingual understanding using knowledge distillation. Adaptive distillation and multilingual embeddings improve inference speed, memory use, and conversational accuracy across languages. Experimental assessments on benchmark multilingual conversation datasets show that the BERT-KD can reduce model size by 42%, speed up inference by 35%, and keep correctness at 93.6% compared to the full-scale BERT baseline. Due to its reaction time dropping from 412 to 265 milliseconds, the chatbot might have real-time conversations for innovative city installations. Reducing Latency enabled this. These findings suggest that smart city ecosystem-based chatbot services can be efficient, scalable, and real-time. This would allow people to communicate with care providers regardless of culture or language.

Keywords—BERT, Knowledge Distillation, Low-Latency Chatbots, Multilingual Natural Language Processing, Smart Cities, Lightweight Language Models

::: PAPER ID: 318 :::

BLOCKCHAIN-ENABLED ACCESS CONTROL USING PRACTICAL BYZANTINE FAULT TOLERANCE FOR HEALTHCARE IoT

Abdallah Altrad

Faculty of Information Technology, Department of Cybersecurity & Cloud Computing, Applied Science Private University

Bashar Yaser Almansour

Faculty of Business and Management

Buzrukova Kamilla

Andijan State Institute of Foreign Languages

Ammar Yaser Almansour

Department of Administrative and Financial Sciences

Djakhongir Tursunov

medical and biological chemistry department, Tashkent State Medical University, Tashkent, Uzbekistan, 100109

R. Rogith

Department of Management Studies, St. Joseph's Institute of Technology, OMR, Chennai - 600119

lah.net9@gmail.com, Bal_mansour@hotmail.com, kamillabuzrukova@gmail.com, Ammaryaser1982@yahoo.com/
aalmansour@ocmt.edu.om, johongirtursunov@gmail.com, ravirogith10@gmail.com

Abstract—When it comes to privacy and security, the H-IoT presents many challenges, one of the most significant of which is the question of how to safeguard patient information and the need for stringent access control measures. By virtue of the fact that they are susceptible to hacking and include single points of failure, traditional centralized systems in the healthcare industry are held to very high dependability criteria. Blockchain-Enabled for Healthcare Internet of Things is the term it proposes for the concept, which combines PBFT-Refined Blockchain for Healthcare Access Control (PrB-HAC). It is more fault-tolerant than Proof-of-Work systems, has less latency than such systems, and trust is distributed throughout all healthcare institutions. This approach is also more fault-tolerant when nodes are hacked. According to the results of our experiments, it can simultaneously enhance efficiency, decrease the amount of energy required for communication, and boost scalability, all while maintaining the confidentiality and security of the data. To ensure the safety of digital ecosystems that prioritize patient well-being, the final step is to implement PrB-HAC. This is accomplished by providing a reliable, robust, and comprehensive method for controlling access to the Internet of Things in healthcare.

Keywords—Blockchain, Healthcare IoT, Access Control, PBFT, Security

::: PAPER ID: 319 :::

RANDOM FOREST-BASED INTRUSION DETECTION FOR ZERO-DAY ATTACK MITIGATION IN INDUSTRIAL CONTROL SYSTEMS

Abdallah Altrad

Faculty of Information Technology, Department of Cybersecurity & Cloud Computing, Applied Science Private University

Hani Q. R. Al-Zoubi

Department of Computer Engineering, College of Engineering, Mutah University, Jordan

Mahmoud Mahfuri

Computer and Information Technology Department International University for Science and Technology Damascus, Syria

Dilbar Najmutdinova

department of obstetrics and gynecology in family medicine, Tashkent State Medical University, Tashkent, Uzbekistan, 100109

Aakasha Soy

Department of CS & IT, Kalinga University, Raipur

Sanjay K

Department of Management Studies, St. Joseph's Institute of Technology, OMR, Chennai - 600 119
lah.net9@gmail.com, hanirash@mutah.edu.jo, mahmahfuri@iust.edu.sy, dilbarkn20@gmail.com, India.

ku.aakashasoy@kalingauniversity.ac.in, sanjay445060@gmail.com

Abstract—In Network Intrusion Detection Systems (NIDS), zero-day attack detection means using learned characteristics from past known assaults to find newly unreported attack patterns during testing without explicit training. New cyberattack research opportunities include zero-day attacks that exploit software or system flaws. To prevent these risks, current methods include machine learning/deep neural networks or anomaly detection. For instance, zero-day attack detection approaches ignore network data byte stream correlation and frequency. A unique and robust strategy for identifying and mitigating Zero-Day Attacks in Industrial Control Systems is presented in this research, utilizing heavy-hitter concepts and graph-based methodologies. It generates and evaluates signatures. This method analyzes training phase features to assess efficiency. Real-time attack data indicate that the proposed zero-day attack detection approach achieves 91.33% binary accuracy and 90.35% multi-class accuracy. The proposed method for detecting zero-day attacks achieved an average accuracy of 90.84% on continuous incursion results.

Keywords—Zero-Day Attack Detection, Network Intrusion Detection Systems, Industrial Control Systems Security, Heavy-Hitter Concept, Graph-Based Detection, Real-Time Attack Data

::: PAPER ID: 320 :::

ARIMA-LSTM HYBRID FOR PREDICTIVE ENERGY DEMAND FORECASTING IN SMART GRIDS

Israa Shihab Ahmed

Informatics Institute for Postgraduate studies, university of information technology and communication,

Sameh Ghwanmeh

College of Engineering and Technology American University in the Emirates Dubai, UAE

Bashar Yaser Almansour

Faculty of Business and Management

Khilola Mirakhmedova

Department of Propaedeutics of internal diseases, Tashkent State Medical University, Tashkent, Uzbekistan, 100109

Nidhi Mishra

Department of CS & IT, Kalinga University, Raipur

Hema Priya S

Department of Management Studies, St.Joseph's Institute of Technology, OMR, Chennai- 600 119

iraqisraa_aljebory@iips.edu.iq, sameh.ghwanmeh@aae, Bal_mansour@hotmail.com,
hilola_mirakhmedova@mail.ru, ku.nidhimishra@kalingauniversity.ac.in, priyashanker.74@gmail.com

Abstract—Optimizing and ensuring smart grid system resilience requires accurate energy demand predictions. Nonlinearity and severe unpredictability make classic statistical models like the Autoregressive Integrated Moving Average (ARIMA) ineffective for energy use. Deep learning methods like the Long Short-Term Memory (LSTM) network are great at simulating nonlinear and long-range temporal connections, but they may struggle with short-term oscillations. This paper presents a hybrid ARIMA-LSTM framework (HARIMA-LSTM) to improve smart grid demand forecasting by combining the two methodologies' strengths. After ARIMA extracts linear components from historical energy consumption data, an LSTM network predicts nonlinear residuals. Combining hybrid predictions yields demand estimates. MPE and RMSE experiments reveal that the ARIMA-LSTM hybrid outperforms the ARIMA and LSTM models on smart grid datasets. The findings suggest that the model's forecast uncertainty reduction might help grid stability and real-time demand response. This research shows hybrid statistical-deep learning approaches for intelligent energy management, which may benefit future smart grids.

Keywords—Smart Grid, Energy Demand Forecasting, ARIMA Model, Long Short-Term Memory (LSTM), Hybrid Time Series Modeling, Nonlinear Forecasting, Load Prediction, Renewable Energy Integration, Deep Learning, Predictive Analytics

::: PAPER ID: 321 :::

XGBoost WITH TIME SERIES EMBEDDINGS FOR STOCK PRICE MOVEMENT PREDICTION

Ismaeel Abdel Qader

Postgraduate Centre, Management and Science University, Shah Alam, Malaysia

Faruq Al-Omari

College of Engineering and Technology American University in the Emirates

Saed Adnan Mustafa

Faculty of Business, Department of Marketing, Applied Science Private University

Maktuba Mirrahimova

Department of Children's diseases, Tashkent State Medical University, Tashkent, Uzbekistan

Nidhi Mishra

Department of CS & IT, Kalinga University, Raipur, India

Parvathy, P. V

Department of Management Studies, St.Joseph's Institute of Technology, OMR, Chennai - 600 119

ismaeel_abdul@hotmail.com Postgraduate, faruq.alomari@aue.ae, said_es@yahoo.com, mmh.20@mail.ru,
ku.nidhimishra@kalingauniversity.ac.in, pvparvathy2003@gmail.com

Abstract—Financial markets are unpredictable, non-linear, and continually changing, making stock price forecasting difficult. Conventional machine learning approaches typically overlook temporal correlations in stock price sequences. This study uses XGBoost and time series embeddings to improve stock price movement forecasts. This method builds a prediction model using power system operating data and XGBoost. The XGBoost explanation mechanism analyzes prediction results in several dimensions using Shapley Additive Explanations. Thus, numerous factors affect the anticipated inertia value. Historical stock data is processed using algorithms and sliding windows to create time series embeddings that represent temporal interdependence and sequential patterns. These embeddings enable XGBoost to identify intricate, non-linear relationships between historical patterns and price movements. Researchers can maintain system continuity and reliability by precisely forecasting changes in system resistance and identifying their origins.

Keywords—Stock price forecasting, time series embeddings, XGBoost, Shapley Additive Explanations, temporal dependencies, financial market prediction

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DEEP REINFORCEMENT LEARNING–BASED AUTONOMOUS NAVIGATION FOR PLANETARY ROVERS IN UNKNOWN TERRAINS

Darin Shafek

Computer Engineering Techniques Department; Alma'moon University College, Baghdad

Aghiad Khedr Suleiman

Cybersecurity and Cloud Computing Al-Ma'moon University College Baghdad, Iraq

Ravshan Usmanov

Department of Human Anatomy and OSTA, Tashkent State Medical University, Tashkent, Uzbekistan, 100109

Manish Nandy

Department of CS & IT, Kalinga University, Raipu

Manoj Kumar M

Department of Management Studies, St. Joseph's Institute of Technology, OMR, Chennai - 600 119

darin.s.salim@almamonuc.edu.iq, aghiad.k.suleiman@almamonuc.edu.iq, usmanov.ravshan@mail.ru, ku.manishnandy@kalingauniversity.ac.in, manojkumarharini354@gmail.com

Abstract—Planetary exploration rovers struggle with unpredictable and ever-changing terrain without prior mapping and frequent human inspection. Traditional route-planning procedures diminish mission efficiency owing to irregular impediments, communication delays, and environmental unpredictability. DRL-RoverNet, a Rover Navigation Network that utilizes deep reinforcement learning to autonomously and adaptively traverse without modeling the surroundings, addresses these challenges. Convolutional neural networks (CNNs) for perception-driven state representation and policy gradient reinforcement learning enable collision-free navigation. Our simulated planetary habitat features dynamic soil conditions, varied topography, and randomly placed hazards for training and evaluation purposes. DRL-RoverNet outperforms heuristic and rule-based techniques in success rates, optimal trajectories, and energy efficiency. The framework's adaptability to unexpected terrain conditions makes it suitable for planetary exploration missions. The robust and extendable DRL-RoverNet technology improves planetary rover autonomy, making future planetary exploration missions more efficient and trustworthy.

Keywords—DRL-RoverNet, Deep Reinforcement Learning (DRL), Autonomous Navigation, Planetary Rovers, Unknown Terrains, Convolutional Neural Networks (CNN)

::: PAPER ID: 323 :::

VACCINE MONITORING SYSTEM USING TPFADA ALGORITHM

Huang Qi, Rosilah Hassan, Yazrina Yahya, Anahita Ghazvini

Faculty of Information Science and Technology Universiti Kebangsaan Malaysia, Selangor, Malaysia

Shahnorbanun. Sahran

Center for Cyber Security, Faculty of Information Science and Technology Universiti Kebangsaan Malaysia, Selangor, Malaysia

p151682@siswa.ukm.edu.my, rosilah@ukm.edu.my, yazrina@ukm.edu.my, anahitaghazvini@ukm.edu.my, shahnorbanun@ukm.edu.my

Abstract—Prompt identification of Adverse Events Following Immunization (AEFI) is essential. However, conventional monitoring methods lack real-time and personalised analysis capabilities. This study addresses this limitation by enhancing an intelligent Vaccine Monitoring System (VMS) aimed at improving the reliability and efficiency of post-vaccination surveillance through the use of the Internet of Things (IoT) and a customized machine learning algorithm. The methodology consisted of prototyping a system utilising an ESP32 microcontroller, physiological sensors measuring temperature, heart rate, and blood oxygen saturation (SpO₂), a PostgreSQL database, and a Flask-based web interface. The primary contribution lies in the development of the Temporal-Physiological Parameters Fusion Anomaly Detection (TPFADA) algorithm, a customized analytical approach designed for this context. This layered algorithm delivers context-aware risk evaluations by incorporating individual baseline adjustments, weighted fusion of multiple parameters, analysis of physiological correlations, and a temporal weighting component sensitive to timing. The system's effectiveness was validated through five targeted scenarios, demonstrating its ability to accurately classify normal physiology, detect single-parameter and complex correlational anomalies, and generate risk scores with both temporal sensitivity and personal baseline adaptation. In summary, this paper introduces a functional VMS prototype along with the TPFADA algorithm, providing a more detailed and dependable method for post-vaccination monitoring, thereby representing a notable advancement in intelligent health surveillance.

Keywords—Vaccine Monitoring System, Internet of Things, Machine Learning, Anomaly Detection, Physiological Monitoring

::: PAPER ID: 324 :::

DEEP Q-LEARNING FOR DYNAMIC RESOURCE ALLOCATION IN CLOUD COMPUTING ENVIRONMENTS

Saed Adnan Mustafa

Faculty of Business, Department of Marketing, Applied Science Private University

Atef Alkhawaldah

School of education College of arts and sciences Universiti utara Malaysia

Muna Al Mkhaini

Faculty of Business and Management

Turdikul Bobamuratov

department of propaedeutics of children diseases, Tashkent State Medical University, Tashkent, Uzbekistan, 100109

Priya Sethuraman, Criffin P Dickson

Department of Management Studies, St. Joseph's Institute of Technology, OMR, Chennai -119.Tamil Nadu, India

said_es@yahoo.com, atef.alkhawaldah@uum.edu.my, malmukhaini@muscatuniversity.edu.m,
sulnafisa865@gmail.com, priasethuraman@gmail.com, criffinandel@gmail.com

Abstract—In cloud computing, efficiently allocating resources is challenging due to the need to maintain service-level agreements (SLAs), utilize a variety of resources, and manage workloads that are constantly changing. When demand changes, traditional static or rule-based allocation methods either underutilize resources or lead to conflicts over scarce resources. In this study's proposed framework, which is based on Deep Q-Learning (DQL), an agent learns the best ways to allocate resources by interacting with the cloud environment. The model finds the best balance between performance reliability, cost, and energy efficiency. The praise feature seems at adjustments in workload, availability of assets, and excellent of service limits inside the country area. The DQL technique outperforms traditional heuristic techniques by reducing SLA violations, optimizing useful resource usage, and expediting response times in dynamic environments. The results display that reinforcement getting to know can assist next-gen cloud infrastructures by way of offering revolutionary, scalable, and adaptable aid manage solutions.

Keywords—Deep Q-Learning, Cloud Computing, Dynamic Resource Allocation, Reinforcement Learning, SLA Optimization

::: PAPER ID: 325 :::

U-NET WITH RESIDUAL ATTENTION FOR AUTOMATED ROAD DAMAGE DETECTION

Israa Shihab Ahmed

Informatics Institute for Postgraduate studies, university of information technology and communication, Iraq

Mahmoud Mahfuri

Computer and information Technology Department International University for Science and Technology Damascus, Syria

Faruq Al-Omari

College of Engineering and Technology American University in the Emirates

Abror Khamraev

Department of Internal medicine and endocrinology No.2, Tashkent State Medical University, Tashkent, Uzbekistan, 100109

Nodir Khodjaev

Tashkent International University of Education

Hariharan Ks

Department of Management Studies, St. Joseph's Institute of Technology, OMR, Chennai- 600 119

israa_aljebory@iips.edu.iq, mahmahfuri@iust.edu.sy, faruq.alomari@aeu.ae,
khamraev.abror@gmail.com, t432@tiue.uz, hariharansrinivasan15@gmail.com

Abstract—Automated road damage detection is an important part of intelligent transportation systems because it makes repairs faster and makes the roads safer. Traditional manual inspections are not very effective, make a lot of mistakes, and take a lot of time, especially in large urban networks. We use a U-Net with a Residual Attention mechanism to accurately divide up road damage. The U-Net backbone uses an encoder-decoder architecture to do feature extraction and localization. By focusing on areas with cracks and potholes, the residual attention modules make discriminative learning better. This helps cut down on false positives caused by background noise. Our model beats traditional U-Net and CNN-based methods by a wide margin on benchmark road damage datasets. It does this by improving IoU, F1-score, and detection accuracy. Attention integration improves both feature representation and convergence. Lastly, the suggested framework gives a strong, scalable, and automated answer for practical road monitoring applications.

Keywords—Road damage detection, U-Net, residual attention, semantic segmentation, intelligent transportation systems

::: PAPER ID: 326 :::

VISION TRANSFORMER (ViT) FOR SATELLITE-BASED SMART CITY LAND USE CLASSIFICATION

Ahmed A. Elngar

Faculty of Computers and Artificial Intelligence, Beni-Suef University, Beni-Suef City, 62511, Egypt

Nowf O. Maaitah

Department of Architecture Engineering, Al-Balqa Applied University, Al-Salt, Jordan

Ahmed Hammad

Faculty of Information Technology, Department of Cyber Security, Al-Isra University, Amman, Jordan

Akmal Irmazarov

Department of Faculty and Hospital Surgery, Tashkent State Medical University, Tashkent, Uzbekistan, 100109

Altmisheva Yarkinoy

Andijan State Institute of Foreign Languages

Anthony Raja Surya M

Department of Management Studies, St. Joseph's Institute of Technology, OMR, Chennai- 600 119

elngar_7@yahoo.co.uk, nowfmaaitah@hotmail.com, ahmed.khairt@iu.edu.jo, akmal.irmazarov1980@gmail.com, majidovna@mail.ru, anthonyrajasurya@gmail.com

Abstract—Satellite imagery has become a critical resource for urban monitoring, yet the complexity of high-dimensional data often limits the accuracy of automated land use classification. Traditional convolutional neural networks (CNNs) capture only local spatial features, making them insufficient for modeling the global dependencies present in heterogeneous smart city environments. This research aims to develop a Vision Transformer (ViT)-based framework tailored for smart city land use classification from satellite imagery. The study focuses on integrating both spectral and spatial characteristics to enhance feature representation and support more reliable urban planning applications. A Spectral-Spatial Vision Transformer (SS-ViT) is introduced in the suggested methodology, which divides images from the EuroSAT Sentinel-2 dataset into patches, encodes spectral indices and pixel intensities, and uses self-attention mechanisms to capture spectral correlations and long-range spatial relationships. A supervised learning approach is adopted, with transfer learning from ImageNet-pretrained weights to accelerate convergence. Experimental evaluation on the EuroSAT dataset demonstrates that the SS-ViT outperforms state-of-the-art CNN-based and hybrid models, achieving higher accuracy in distinguishing urban, residential, industrial, vegetation, and water classes across multispectral bands. In situations with little labeled data, the model also shows better generalization. To sum up, the suggested SS-ViT framework offers a scalable and robust methodology for smart city land use classification, advancing the role of satellite-based deep learning in sustainable urban development.

Keywords—Vision Transformer (ViT), Satellite Image Classification, Multi-Head Self-Attention, Smart City Land Use Mapping, Deep Learning for Remote Sensing

::: PAPER ID: 327 :::

Seq2Seq WITH ATTENTION FOR REAL-TIME EMERGENCY COMMUNICATION TRANSLATION IN DISASTER ZONES

Khaled Shaalan

Faculty of Engineering & IT, The British University in Dubai, 345015, Dubai, UAE

Azza Mohamed

Faculty of Information Technology, Liwa University, Al Ain, United Arab Emirates

Suha Khalil Assayed

The British University in Dubai, Dubai, UAE

Sarvar Aliev

department of Pharmacology, Tashkent State Medical University, Tashkent, Uzbekistan, 100109

Karabayeva Aziza

Andijan State Institute of Foreign Languages

Shrinidhi G

Department of Management Studies, St. Joseph's Institute of Technology, OMR, Chennai- 600 119

khaled.shaalan@buid.ac.ae, azza.basiouni@lu.ac.ae, sassayed@gmail.com, sarvaraliev1984@gmail.com, azizakarabayeva361@gmail.com, shrigopi30@gmail.com

Abstract—When people are unable to communicate effectively during disaster response efforts, it is usually because of language barriers. Important decisions become more difficult to make, and rescue operations are slowed down as a result. A real-time translation system developed specifically to aid individuals in communicating during emergencies in areas where more than one language is spoken, SAREC-T, is discussed in this article. Pay great attention to the Sequence-to-Sequence (Seq2Seq) model, since it is the foundation of SAREC-T. To discover long-term dependencies, the constructed system makes use of bidirectional recurrent layers. Also, it employs an attention strategy to align crucial tokens dynamically, ensuring accurate translation of short, urgent instructions. The model needs to be reduced so that mobile and edge devices can process it. The goal is to make it practical for actual usage. As a result, less bandwidth-intensive infrastructure is required. The results of experimental evaluations on a multilingual dataset tailored to disasters demonstrate that SAREC-T outperforms the baseline setup, which is believed to be a neural translation system. SAREC-Tout performed regular Seq2Seq models by 14.7%, with BLEU scores of 41.8 and METEOR scores of 38. Additionally, the system can maintain real-time performance, with a typical delay of 212 ms per phrase. Because of this, it can ensure faultless communication even in critical situations where every second counts. It is effective in improving cooperation between locals and first responders, according to field simulations. Additionally, these models demonstrate how it has the potential to increase catastrophe resilience and shorten the time it takes to administer life-saving measures.

Keywords—Seq2Seq with Attention, Real-Time Machine Translation, Emergency Communication Systems, Disaster Response Technology, Low-Latency Neural Networks, Edge and Mobile Deployment

∴ PAPER ID: 328 ∴

FEDERATED LEARNING WITH SECURE AGGREGATION FOR DISTRIBUTED MALWARE DETECTION IN IoT NETWORKS

Taher M. Ghazal

Department of Networks and Cybersecurity, Hourani Center for Applied Scientific Research, Al-Ahliyya Amman University, Amman, Jordan
Center for Cyber Security, Faculty of Information Science and Technology, Universiti Kebangsaan Malaysia (UKM), 43600 Bangi, Selangor, Malaysia

Amer Ibrahim

Department of Computer Science and Software Engineering, United Arab Emirates University

Amjed Abbas Ahmed

Center for Cyber Security, Faculty of Information Science and Technology Universiti Kebangsaan Malaysia, Bangi, Malaysia
Department of Computer Techniques Engineering, Imam AlKadhum College (IKC), Baghdad, Iraq

Feruza Salomova

Faculty of Medical Prevention and Public Health, Head of the Department of Environmental Hygiene, Tashkent State Medical University, Tashkent, Uzbekistan, 100109

Khoshimova Madinabonu

Andijan State Institute of Foreign Languages

Kavitha J

Department of Management Studies, St. Joseph's Institute of Technology, OMR, Chennai - 600 119

taher.ghazal@ieee.org, amer.ibrahim@uaeu.ac.ae, amjedabbas@alkadhum-col.edu.iq, fsalomova@mail.ru, khoshimovamadinabonu04@gmail.com, kavitha231102@gmail.com

Abstract—Cybersecurity threats have grown significantly due to the proliferation of Internet of Things (IoT) devices, particularly malicious software targeting environments with limited resources and dispersed users. Traditional centralized malware detection frameworks have several drawbacks, including inadequate protection of data privacy, significant communication overhead, and a high risk of single points of failure. This study introduces a Federated Learning (FL) framework that integrates Secure Aggregation to address these challenges and facilitate the distributed detection of malware in IoT networks. The proposed system enables IoT devices to collaborate in training local models on-device, while also sending encrypted model updates to the server. A secure aggregation protocol keeps individual updates private to keep sensitive device-level data from leaking. The proposed method achieves high detection accuracy and data privacy, as evidenced by experimental results on benchmark IoT malware datasets. This framework enhances system resistance to poisoning and model inversion attacks, reducing communication costs by up to 28% compared to centralized methods. The results show that combining federated learning with secure aggregation can lead to an effective, scalable, and privacy-preserving way to find malware in IoT networks.

Keywords—Federated learning, secure aggregation, IoT security, malware detection, distributed systems, privacy-preserving learning, cyber resilience

∴ PAPER ID: 329 ∴

SUPPORT VECTOR MACHINE WITH SMOTE FOR IMBALANCED PHISHING WEBSITE DETECTION

Abdallah Altrad

Faculty of Information Technology, Department of Cybersecurity & Cloud Computing, Applied Science Private University

Darin Shafek

Computer Engineering Techniques Department, Alma'moon University College, Baghdad, Iraq

Rasha Almajed

Computer engineering school, Abu Dhabi University

Ilkhom Otajonov

Department of Children, Teenagers and Nutrition hygiene, Tashkent State Medical University, Tashkent, Uzbekistan, 100109

Shakhriyor Kholbayev

Academy of Public Administration, Uzbekistan

Alen Roy A R

Department of Management Studies, St. Joseph's Institute of Technology, OMR, Chennai- 600 119

lah.net9@gmail.com, darin.s.salim@almamonuc.edu.iq, rasha.almajed@adu.ac.ae, ilhom1802@mail.ru, sh.xolbayev@gmail.com, alenroy982@gmail.com

Abstract—Due to the exponential growth of online businesses, phishing attacks in which fraudulent websites masquerading as legitimate ones attempt to steal sensitive user data have increased in frequency. One of the significant issues with phishing detection is the inherent class inequality that occurs. This occurs when the number of trustworthy websites greatly outnumbers the number of phishing attempts, leading to inaccurate classification findings. Synthetic Minority Oversampling Technique with Support Vector Machine, sometimes known as SMOTE-SVM, is the solution we proposed for this issue. In cases when there is an imbalance, this hybrid structure can assist in locating phishing websites. This method creates phony phishing samples and utilizes SMOTE to even out the dataset. Afterwards, SVM classification is employed to leverage SVM's capacity to handle non-linear, high-dimensional decision boundaries. The next step is to sort the data into categories. After extensive testing on a dataset comprised of phishing websites, SMOTE-SVM has proven to be more effective than conventional SVM and other baseline classifiers. The research confirmed this to be correct. The total accuracy went up from 90.1% to 95.8%, the F1-score went up from 83.2% to 92.5%, and the recall went up from 81.4% to 93.7% using the suggested method. This improves its ability to detect phishing websites. These results highlight the need to strengthen cybersecurity defenses against increasing phishing attempts by integrating data-level balance with efficient classifiers.

Keywords—Phishing Website Detection, Support Vector Machine (SVM), Synthetic Minority Oversampling Technique (SMOTE), Imbalanced Data Classification, Cybersecurity, Machine Learning

::: PAPER ID: 330 :::

GRAPH NEURAL NETWORKS FOR INSIDER THREAT DETECTION IN CORPORATE NETWORKS

Taher M. Ghazal

Department of Networks and Cybersecurity, Hourani Center for Applied Scientific Research, Al-Ahliyya Amman University, Amman, Jordan
Center for Cyber Security, Faculty of Information Science and Technology, Universiti Kebangsaan Malaysia (UKM), 43600 Bangi, Selangor, Malaysia

Amer Ibrahim

Department of Computer Science and Software Engineering, United Arab Emirates University

Dilmurod Nasimov

Silk Road International University of Tourism and Cultural Heritage

Amjed Abbas Ahmed

Center for Cyber Security, Faculty of Information Science and Technology, Universiti Kebangsaan Malaysia, Bangi, Malaysia

Department of Computer Techniques Engineering, Imam AlKadhum College (IKC) Baghdad, Iraq

Farhad Akilov

Department of Urology, Tashkent State Medical University, Tashkent, Uzbekistan

Samyuktha M

Department of Management Studies, St. Joseph's Institute of Technology, OMR

taher.ghazal@ieee.org, Amer.ibrahim@uaeu.ac.ae, d.nasimov@univ-silkroad.uz, amjedabbas@alkadhum-col.edu.iq, akilovmd@gmail.com, samyukm06@gmail.com

Abstract—Insider threats remain an essential cybersecurity undertaking for groups, as malicious threats often originate from dependent clients who can evade conventional safety mechanisms. Traditional anomaly detection strategies frequently conflict in capturing the complex dependencies among customers, devices, and sources in dynamic business environments. This research aims to develop a Graph Neural Network (GNN)-based framework that accurately detects insider threats in organizational networks. The goal is to leverage graph representations of business enterprise hobby logs to seize every relational dependency and temporal behavioral shifts. The proposed approach constructs a dynamic, heterogeneous graph wherein customers, devices, documents, and programs are represented as nodes, and edges capture interactions that consist of logins, document accesses, and electronic mail communications, all with timestamps. A Dynamic Heterogeneous Graph Neural Network (DH-GNN) is employed, integrating temporal message passing and contrastive anomaly detection to identify diffuse deviations from normal behavior. For evaluation, experiments are conducted on the CMU-CERT Insider Threat Dataset (R4.2), which includes realistic simulated company logs, along with logon/logoff events, report access data, tool utilization, web browsing, and email activity. Results show that the proposed version outperforms traditional machine learning and static GNN baselines, achieving better detection accuracy and higher overall performance in identifying stealthy insider sports. In this study, this investigation establishes the effectiveness of DH-GNNs for insider risk detection and introduces a scalable, graph-based method for organizational security monitoring.

Keywords—Graph Neural Networks (GNNs), Insider Threat Detection, Dynamic Heterogeneous Graphs, Anomaly Detection, Corporate Cybersecurity

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REINFORCEMENT LEARNING-DRIVEN ADAPTIVE TRAFFIC SIGNAL CONTROL IN METROPOLITAN AREAS

Nidal A. Al-Dmour

Department of Computer Engineering, College of Engineering, Mutah University, Jordan

Nowf O. Maaitah

Department of Architecture Engineering, Al-Balqa Applied University, Al-Salt, Jordan

Aghiad Khedr Suleiman

Cybersecurity and Cloud Computing Al-Ma'moon University College Baghdad, Iraq

Laziz Tuychiev

Department of Infectious and Pediatric Infectious Diseases of the Tashkent State Medical University

Ashu Nayak

Department of CS & IT, Kalinga University, Raipur

Keerthika S

Department of Management Studies, St. Joseph's Institute of Technology, OMR

sathiyarajg121@gmail.com, nowfmaaitah@hotmail.com, aghiad.k.suleiman@almamonuc.edu.iq, l_tuychiev@mail.ru, ku.ashunayak@kalingauniversity.ac.in, keerthikasenthil7@gmail.com

Abstract—Metropolitan population growth has worsened city congestion. This caused delays, fuel use, and carbon emissions. All these reasons have contributed to increased greenhouse gas emissions. City traffic is unpredictable and ever-changing, making rules-based traffic signals ineffective. Why? Because systems aren't perfect and can't always handle unexpected events. "Self-learning" is "SMART-SIG." The system addressed in this article is the Intelligent Governor for Metropolitan Area Traffic Signals Based on Adaptive Reinforcement. It provides adaptive traffic signal control via reinforcement learning. The difficulties mentioned above inspired this paradigm. SMART-SIG treats all junctions as autonomous actors. Through constant interaction with the traffic environment, this agent will develop optimal signaling tactics. State representations include wait times, queue lengths, and real-time traffic densities, so agents can dynamically alter green phases. Deep Q-learning ensures compatibility with big metropolitan networks and resistance to unpredictable traffic. You can trust its design to deliver these two benefits. SMART-SIG reduces vehicle waiting time by 27.4%, traffic throughput by 22.9%, and CO2 emissions by 19.6% compared to fixed-time controls. Studies using a dataset simulation that matched metropolitan settings showed this. These findings show that SMART-SIG can improve traffic flow and build resilient urban transportation networks.

Keywords—Reinforcement Learning, Adaptive Traffic Signal Control, Metropolitan Traffic Management, Deep Q-Learning, Intelligent Transportation Systems (ITS), Sustainable Urban Mobility

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K-MEANS CLUSTERING WITH GIS INTEGRATION FOR OPTIMAL PLACEMENT OF ELECTRIC VEHICLE CHARGING STATIONS

Nidal A. Al-Dmour

Department of Computer Engineering, College of Engineering, Mutah University, Jordan

Nowf O. Maaitah

Department of Architecture Engineering, Al-Balqa Applied University, Al-Salt, Jordan

Sameh Ghwanmeh

College of Engineering and Technology American University in the Emirates Dubai, UAE

Dildora Nabieva

Department of faculty and hospital therapy No. 1, occupational pathology, DSc, professor, Tashkent State Medical University, Tashkent, Uzbekistan, 100109

Priya Vij

Department of CS & IT, Kalinga University, Raipur

Ebenezer D

Department of Management Studies, St. Joseph's Institute of Technology, OMR, Chennai - 600 119

nidal75@yahoo.com, nowfmaaitah@hotmail.com, sameh.ghwanmeh@aue.ae,
dil_nab@mail.ru, ku.priyavij@kalingauniversity.ac.in, ebbyyyl6@gmail.com

Abstract—The rapid adoption of electric vehicles (EVs) intensified the demand for efficient loading infrastructure, requiring ideal positioning strategies to balance accessibility, cost-effectiveness, and grid stability. Conventional approaches usually neglect the heterogeneity of space demand, leading to underused or congested stations. This research aims to develop a data-oriented structure that integrates the K-Means analysis by grouping with the analysis of the Geographic Information System (GIS) for the strategic location of EV loading stations. The goal is to maximize service coverage by minimizing the redundancy and energy distribution challenges of the installation. The methodology applies K-Means groupings to space coordinates obtained in the Global Database of EV Charging Stations (Kaggle), which provides comprehensive geospatial data of loading facilities in various regions. Cluster results are refined through GIS-based space filtering that incorporates road networks, power network accessibility, and demographic distribution patterns to ensure practical implementation. Simulation results demonstrate that the proposed method increases coverage efficiency, reducing the average user travel distance from the station, simultaneously optimizing resource allocation in urban areas. Validation against baseline spatial heuristics confirms higher scalability and adaptability. In conclusion, the GIS-integrated grouping methodology, validated in the Global Database of EV loading stations, provides a robust decision-making tool for planner and urban policy formulators, allowing the implementation of data and supporting the broader transition to sustainable mobility.

Keywords—Electric Vehicle Charging Infrastructure, K-Means Clustering, Geographic Information System (GIS), Optimal Facility Location, Sustainable Urban Mobility

::: PAPER ID: 333 :::

EDGE COMPUTING-ENABLED DEEP CNN FOR REAL-TIME VIDEO ANALYTICS IN DRONE-BASED SURVEILLANCE

Ahmed Tareq Sadiq

Department of Computer Sciences, University of Technology, Baghdad 10066, Iraq

Faruq Al-Omari

College of Engineering and Technology American University in the Emirates

Mahmoud Mahfuri

Computer and information Technology Department International University for Science and Technology Damascus, Syria

Khalimurad Akhmedov

department of internal medicine in family medicine, Tashkent State Medical University, Tashkent, Uzbekistan, 100109

Manish Nandy

Department of CS & IT, Kalinga University, Raipur

Chandramouli Swaran V

Department of Management Studies, St. Joseph's Institute of Technology, OMR, Chennai - 600 119

drahmaed.tark1971@gmail.com, faruq.alomari@aue.ae, mahmahfuri@iust.edu.sy, khalimurad1968@mail.ru,
ku.manishnandy@kalingauniversity.ac.in, mouliSwaran06112003@gmail.com

Abstract—The video feeds that are sent by drone-based surveillance are large and rapid, and as a result, they need to be evaluated as soon as possible. When it comes to mission-critical applications, cloud-based analytics that are based on conventional approaches are completely ineffective due to problems with latency, bandwidth, and security. It can overcome these limits by using the EC-DCNN architecture, which allows us to view video on devices that are located in proximity to the location where the data is stored. By using lightweight convolutional neural network (CNN) layers, the EC-DCNN can extract information from various video sources. Additionally, it can identify suspicious actions in real time while simultaneously reducing the amount of burden placed on the cloud. Experimental evaluations demonstrate a 42% increase in bandwidth economy, a 35% drop in latency, and significant gains in detection accuracy when compared to systems that utilize the cloud. Through the achievement of an ideal balance between speed and accuracy, the approach that has been developed guarantees rapid decision-making in surveillance scenarios. In conclusion, but certainly not least, EC-DCNN demonstrates that the integration of edge-AI could potentially be successful for smart monitoring systems. It provides a safe, reliable, and scalable method for monitoring drones in real time.

Keywords—Edge Computing, Deep CNN, Drone Surveillance, Real-Time Video Analytics, Low Latency

:: PAPER ID: 334 ::

LSTM AUTOENCODER FOR PREDICTIVE MAINTENANCE IN INDUSTRIAL CYBER-PHYSICAL SYSTEMS

Aghiad Khedr Suleiman

Cybersecurity and Cloud Computing AI-Ma'moon University College Baghdad, Iraq

Ahmed Hammad

Faculty of Information Technology, Department of Cyber Security, Al-Isra University, Amman, Jordan

Ahmed A. Elngar

Faculty of Computers and Artificial Intelligence, Beni-Suef University, Beni-Suef City, 62511, Egypt

Nargiza Nurillaeva

Department of Internal Diseases in Family Medicine No1 and Fundamentals of Preventive Medicine, Tashkent State Medical University, Tashkent, Uzbekistan, 100109

Debarghya Biswas

Department of CS & IT, Kalinga University, Raipur

Aldrin Snowson P

Department of Management Studies, St.Joseph's Institute of Technology, OMR, Chennai- 600 119

aghiad.k.suleiman@almamonuc.edu.iq, ahmed.khairt@iu.edu.jo, elngar_7@yahoo.co.uk, nargizanur@yandex.ru, ku.debarghyabiswas@kalingauniversity.ac.in, aldrinsnowsonp@gmail.com

Abstract—Intentional system disasters are getting a bigger risk to Industrial Cyber-Physical Systems (ICPS). They purpose expensive downtime, lower performance, and safety concerns. Two commonplace troubles with conventional upkeep methods, such as scheduled or reactive upkeep, are overestimating the amount of service required and failing to prevent breakdowns correctly. This paper introduces a predictive renovation version that employs Long Short-Term Memory (LSTM) Autoencoders to analyze the complicated temporal relationships inside ICPS sensor statistics. As part of the technique, multivariate time-series signals are organized for use. The LSTM autoencoder learns how matters typically paintings. Reconstruction blunders thresholds are used to locate deviations. This method enables the identification of unusual actions which could imply issues early on. When examined on enterprise-well known datasets, the recommended version identifies extra faults than the pleasant statistical and machine mastering methods. The main consequences show that the LSTM autoencoder can tell the distinction between everyday and defective states, which allows it make correct failure predictions with few false positives. The outcomes display that the gadget can cope with noisy, high-dimensional information streams which are commonplace in commercial settings. In short, this examine shows that LSTM autoencoders are a dependable way to do predictive preservation on ICPS.

Keywords—LSTM autoencoder, predictive maintenance, cyber-physical systems, anomaly detection, time-series analysis

:: PAPER ID: 335 ::

EXPLAINABLE GRADIENT BOOSTING MODELS FOR FAIR LOAN APPROVAL DECISIONS

Ismaeel Abdel Qader

Postgraduate Centre, Management and Science University, Shah Alam, Malaysia

Saed Adnan Mustafa

Faculty of Business, Department of Marketing, Applied Science Private University

Sameh Ghwanmeh

College of Engineering and Technology American University in the Emirates Dubai, UAE

Abdigaffor Gadaev

department of internal medicine in family medicine, Tashkent State Medical University, Tashkent, Uzbekistan, 100109

Aakansha Soy

Department of CS & IT, Kalinga University, Raipur

Department of Management Studies, St.Joseph's Institute of Technology, OMR, Chennai- 600 119

ismaeel_abdul@hotmail.com, said_es@yahoo.com, sameh.ghwanmeh@aue.ae, abdigafforgadaev@gmail.com, ku.aakanshasoy@kalingauniversity.ac.in, hariganesh2u@gmail.com

Abstract—The trustworthiness of machine learning models is hindered by issues of transparency and equity in loan approval procedures. No matter how crucial these models are for estimating a loan's risk, this remains true. This article introduces a new framework called FAIR-GBM, which stands for Fairness-Aware Interpretable Gradient Boosting Model. The objectives of this paradigm are to reduce prejudice, facilitate understanding, and improve prediction accuracy. To achieve better results than traditional Gradient Boosting Machines, FAIR-GBM incorporates fairness-aware regularization into the boosting process and utilizes SHAP explanations to understand results at both global and instance levels. The FAIR-GBM system outperforms the other two parts. According to studies conducted on the German Credit and LendingClub datasets, FAIR-GBM achieves better results than traditional GBMs. There are signs that it was successful, such as an area under the curve (AUC) of 0.89, compared to 0.86, and a decrease in the disparate impact ratio from 0.74 to 0.91, indicating increased equality among demographic groups. The outcomes of both of these tests have been favorable. The interpretability consistency of the framework is 20% higher than that of the baseline SHAP interpretations. Additionally, the framework provides explanations that are both more accurate and easier to comprehend. These findings have led some to speculate that FAIR-GBM could be the key to creating rule-abiding AI for the banking sector. If you choose this path, you won't have to wonder if the automated loan approvals are reasonable and accurate.

Keywords—Explainable Artificial Intelligence (XAI), Gradient Boosting Models, Fairness-Aware Machine Learning, Loan Approval Decisions, SHAP Interpretability, Responsible Financial AI

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SHAP-INTEGRATED DECISION TREES FOR TRANSPARENT AI IN PUBLIC SAFETY APPLICATIONS

Ismaeel Abdel Qader

Postgraduate Centre, Management and Science University, Shah Alam, Malaysia

Darin Shafek

Computer Engineering Techniques Department; AlMa'moon University College, Baghdad, Iraq

Umida Tashkenbaeva

department of Dermatovenerology and cosmetology, Tashkent State Medical University, Tashkent, Uzbekistan, 100109

Ashu Nayak

Department of CS & IT, Kalinga University, Raipur

S V Yogeshwaran

Department of Management Studies, St. Joseph's Institute of Technology, OMR, Chennai - 600 119

ismaeel_abdul@hotmail.com, darin.s.salim@almamonuc.edu.iq, umidatashkenbaeva@mail.ru, India.
ku.ashunayak@kalingauniversity.ac.in, yogeshsubramaniyam47126@gmail.com

Abstract—A few public safety applications of Artificial intelligence (AI) that are becoming increasingly common include crime prediction, optimizing emergency response, and risk assessment. However, typical machine learning models are often difficult to understand, which makes it challenging for stakeholders to trust, be open, and take responsibility. This work proposes a SHAP-Integrated Decision Tree (SIDT) paradigm, merging the predictive capabilities of decision trees with the interpretative strengths of Shapley Additive Explanations. This method uses SHAP values to figure out how much of an impact each feature has on the final model output after training a decision tree with public safety data. By directly including SHAP explanations into the tree structure, the proposed method allows for the real-time viewing of decision paths. Important features, such as event kind, location, and patterns over time, are brought to light in this. The results show that compared to baseline decision trees, SIDT significantly decreases the time it takes to discover model bias and helps stakeholders better understand AI-driven forecasts. Additionally, politicians and police obtain clear and useful results, which help people trust safety measures that utilize AI. The study came to the conclusion that SIDT is an appropriate foundation for the ethical application of artificial intelligence insensitive public places because it strikes a beautiful balance between being accurate and being easy to understand.

Keywords—SHAP, Decision Trees, Explainable AI, Public Safety, Interpretability, Transparent AI

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LightGBM FOR CUSTOMER CHURN PREDICTION IN SUBSCRIPTION-BASED SERVICES

Abdullah Elkhoudary, Bashar Yaser Almansour

Faculty of Business and Management

Ammar Yaser Almansour

Department of Administrative and Financial Sciences

Ilhamdjan Karimjanov

department of children diseases in family medicine, Tashkent State Medical University, Tashkent, Uzbekistan, 100109

Priya Vij

Department of CS & IT, Kalinga University, Raipur

Elakiya V

Department of Management Studies, St. Joseph's Institute of Technology, OMR, Chennai - 600 119

a.elkhoudary@gmail.com, Bai_mansour@hotmail.com, Ammaryaser1982@yahoo.com/aalmansour@ocmt.edu.om,
dr.ilhomjon@mail.ru, India.ku.priyavij@kalingauniversity.ac.in, elakiya312004@gmail.com

Abstract—Customer turnover has become a crucial issue for subscription-based businesses, as retaining existing customers is substantially less expensive than recruiting new ones. Nonlinear interactions and imbalanced criteria in customer behavior data are frequently difficult for traditional turnover approaches to capture. Using the Light Gradient Boosting Machine (LightGBM), this study aims to develop a reliable machine learning model for accurate customer turnover forecasting. Furthermore, to enhance data-driven retention initiatives, the study aims to identify the most significant resources that contribute to turnover. The methodology uses the Telco Customer Rode Data set (Kaggle), which contains detailed signature attributes, customer demographic data, collection information, service use, and turnover labels. The pre-processing of data addresses missing values, categorical coding, and class imbalance using SMOTE. Next, stratified k-fold cross-validation is used to train a LightGBM model and compare it to logistic regression, random forest, and XGBoost. The results indicate that LightGBM significantly outperforms traditional models, achieving higher ROC-AUC and F1 scores. Shape-based interpretability reveals that the frequency of engagement, payment methods, and contract type are the most decisive predictors of turnover. In conclusion, this study demonstrates that LightGBM, when applied to the telecommunications customer turnover dataset, provides a scalable and explainable solution for rotating forecasting. The results give signature services useful information for implementing proactive customer retention tactics.

Keywords—Customer Churn Prediction, LightGBM (Light Gradient Boosting Machine), Subscription-Based Services, Machine Learning, Predictive Analytics

::: PAPER ID: 338 :::

GRAPHENE-INSPIRED NEURAL MAPPING FOR ANTICIPATING SEISMIC SHIFTS ACROSS CONTINENTAL FAULT ZONES

Roberto Acevedo, Araceli Rodríguez

Facultad de Ingeniería, Universidad San Sebastián, Bellavista 7, 8420524 Santiago, Chile

roberto.acevedo.llanos@gmail.com, aracelib.rodriguezs@gmail.com

Abstract—Predicting seismic movements over continental fault zones remains a challenging task. This is largely due to the lack of high-resolution data and the difficulty in understanding tectonic processes. The purpose of this paper is to introduce Graphene-Inspired Neural Mapping (GINM), a graph-based neural architecture that draws inspiration from graphene's hexagonal lattice structure. The interrelated dynamics of seismic occurrences are the focus of this work. Each node in the visualization of the earthquake events has a spatial-temporal edge that is weighted by the distance and the intervals between the occurrences. We were able to accomplish this by utilizing the "All the Earthquakes Dataset: from 1990–2023," a collection of over 1.2 million earthquake recordings from around the globe. The hexagonal connections and multiscale receptive fields were features of the graphene-based architecture. This allowed for the simultaneous recording of both local clusters and long-range stress propagation. Graphene served as the inspiration for the design. According to the experimental data, GINM achieves a 93.4% accuracy rate and an F1-score of 0.91 in predicting moderate to large seismic events with a duration of 5.0 minutes or longer. When compared to the standard CNN (87.6% accuracy) and BiLSTM (89.2% accuracy), this is a significant improvement. These findings suggest that materially modified network topologies may substantially enhance earthquake prediction. This could be an opportunity to study seismic risk on a continental scale and improve early warning systems.

Keywords—Graphene-Inspired Neural Mapping (GINM), Seismic Forecasting, Continental Fault Zones, Graph-Based Neural Networks, Spatiotemporal Earthquake Modeling, Early Warning Systems

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DIFFUSION-DRIVEN FRAMEWORK FOR RECONSTRUCTING ARCHAEOLOGICAL ARTIFACTS FROM FRAGMENTED HISTORICAL REMNANTS

Roberto Acevedo, Matías Pavez

Facultad de Ingeniería, Universidad San Sebastián, Bellavista 7, 8420524 Santiago, Chile

roberto.acevedo.llanos@gmail.com, matiaspavez60@gmail.com

Abstract—The manual repair of broken or missing components is a time-consuming process prone to errors and seldom yields satisfactory results. In this study, a Diffusion-Driven Reconstruction Framework (DDRF) is presented for contextualized and coherent item reconstruction. This framework is developed by using the most advanced diffusion models currently available. To restore fine textures, fill in gaps, and maintain the cultural authenticity of the work, the DDRF is a cyclical process that utilizes structural alignment techniques and generative priors based on diffusion. Recent advancements in artificial intelligence and strategies for restoring archaeological sites have enabled the digital replication of any artifact, regardless of its damage or fragility. In popular archaeological datasets, DDRF outperformed rival restoration algorithms in terms of completing the reconstruction, preserving texture, and replicating the original appearance of the structure. According to the findings, DDRF has the potential to significantly reduce the time required to protect digital history while requiring only a minimal degree of human interaction. To conclude, the proposed paradigm has the potential to provide a scalable solution to the challenges associated with conserving and restoring cultural items in accordance with their historical context of creation.

Keywords—Diffusion Models, Archaeological Reconstruction, Cultural Heritage Preservation, Fragmented Artifacts, Generative Framework

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CONTRASTIVE FUSION NETWORK FOR INTERPRETING MULTIMODAL EMOTIONAL CUES WITHIN INTERACTIVE THEATRE PERFORMANCES

Roberto Acevedo, Diego Onetto

Facultad de Ingeniería, Universidad San Sebastián, Bellavista 7, 8420524Santiago, Chile

roberto.acevedo.llanos@gmail.com, d.onetto994@gmail.com

Abstract—Interactive theater relies on onstage interactions, body language, and vocalization. These parts are dynamic. Weakly linked or typical unimodal fusion algorithms may struggle to identify emotional signals in multimodal data. These methods overlook complex emotional links and overlapping expressions. We present CFN-IMPROV (Contrastive Fusion Network for Interactive Multimodal Performance Recognition and Optimization via Variational Learning) and Jellyfish Optimization to address these issues. The proposed CFN-IMPROV employs modality-specific encoders for audio, video, and text streams to optimize cross-modal alignment while retaining modality uniqueness. Jellyfish Optimization (JO) enables continuous convergence and discrimination by adaptively altering learning rates and fusion weights. The proposed CFN-IMPROV outperforms optimization-driven models and baseline fusion in accuracy, robustness, and interpretability on recorded interactive theatrical performances enriched with multimodal emotional signals. Its modality attribution method also shows how speech inflection, body language, and facial emotions interact. Theater-going multimodal affective computing benefits greatly from CFN-IMPROV's enhanced audience-performer interactions and more accurate research on emotional dynamics in interactive shows.

Keywords—Contrastive fusion network, multimodal emotion recognition, jellyfish optimization, interactive theatre, affective computing

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GENERATIVE VISION PARADIGM FOR REANIMATING EXTINCT SPECIES ILLUSTRATIONS THROUGH PALEONTOLOGICAL MUSEUM ARCHIVES

Roberto Acevedo, Matías Pávez

Facultad de Ingeniería, Universidad San Sebastián, Bellavista 7, 8420524Santiago, Chile

roberto.acevedo.llanos@gmail.com, matiaspavez60@gmail.com

Abstract—The acronym for "Generative Extinct-Species Neural framework for Paleontological Archives and Lifelike Evolutionary Outputs" is GEN-PALEO. Researchers propose leveraging fossil image sets and paleontological museum archives to resurrect prehistoric animal drawings. The four-step approach uses phylogenetic proximity to fill structure gaps. First, Geo Fossil-1 fossil photos are morphologically analyzed. Comparative anatomical inference fills in lacking structures. Illustrative style transfer from museum paleoart restores colors, textures, and posture. Finally, diffusion-based generative synthesis creates lifelike reconstructions. Each of 1,200 fossil photos has 300 museum illustrations. Paleontologists gave GEN-PALEO a plausibility grade of 92.1%, an Inception Score (IS) of 8.46, and an SSIM of 87.4% after blind expert reviews. Another benefit was a 63% reduction in reconstruction time over hand drawing. This study shows that GEN-PALEO can merge static fossil material with dynamic reconstructions, proving its scientific validity and visual believability. Research showed this capability. The paradigm may expand paleontological visualization, improve digital museum archives, and speed up evolution education. These outcomes could be substantial.

Keywords—Generative vision models, Paleontological reconstruction, Extinct species illustration, Fossil image datasets, Diffusion-based synthesis, Museum digital archives

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ATTENTION-ORIENTED PATHFINDING FOR COORDINATING AUTONOMOUS MARITIME FLEETS ACROSS POLAR SHIPPING ROUTES

Roberto Acevedo, Diego Onetto

Facultad de Ingeniería, Universidad San Sebastián, Bellavista 7, 8420524 Santiago, Chile

roberto.acevedo.llanos@gmail.com, d.onetto994@gmail.com

Abstract—The demand for reliable maritime transportation in the polar regions is increasing due to the melting of ice sheets, severe weather, and other hazards that make navigation more challenging. Given the unpredictability of sea courses in the Arctic and Antarctic, it will not be easy to plan routes and coordinate ships in these regions. There, ordinary pathfinding techniques often fail to yield the desired results. The Attention-Oriented Pathfinding (AOPF) technology will assist ships capable of navigating independently across the Arctic and Antarctic. The AOPF will enable ships to adjust the order of important environmental aspects such as ice thickness, drifting threats, and fuel management. This will be accomplished via the use of graph-based navigation models and attention-based methodologies. Through the use of spatiotemporal data, the strategy enables people to collaborate on decision-making, ensuring that everything continues to operate effectively and securely. When compared to standard operations, experimental models demonstrate that AOPF results in a 15% increase in fuel efficiency, a 15% gain in route flexibility, and an 18% reduction in trip time. Attention-based navigation has the potential to greatly improve marine resilience in polar habitats, according to the results of this study. To handle fleets of self-driving vehicles for an extended period, AOPF now has a system that can scale with the company's operations.

Keywords—Polar shipping, Autonomous fleets, Pathfinding, Attention mechanism, Maritime navigation

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CAPSULE-BASED MODELING FOR FORECASTING RENEWABLE HYDROELECTRIC OUTPUT IN MOUNTAINOUS RIVER BASIN REGIONS

R. Venkatesh

Department of Mechanical Engineering, Saveetha School of Engineering, Saveetha Institute of Medical and Technical Sciences, SIMATS

S. Marimuthu

Department of Mechanical Engineering, Karpagam Academy of Higher Education Coimbatore, Tamilnadu

A. Nandhakumar

Department of Biomedical Engineering Dhaanish Ahmed Institute of Technology Coimbatore 641105

M.G. Jayanthi

Computer Science & Engineering, Cambridge Institute of Technology KR Puram, Bengaluru-560036

Senthil Kumar Vishnu

Centre for Sustainable Materials Research, Department of Mechanical Engineering, Academy of Maritime Education and Training (AMET) Deemed to be University, Kanathur, Chennai 603112, Tamil Nadu, India

S. Sathiyamurthy

Department of Mechanical Engineering, Easwari Engineering College, Ramapuram, Chennai 600089, Tamil Nadu, India

venkidsec@gmail.com, mech.hod@kahedu.edu.in, nandhakumar3107@gmail.com, jayanthi.cse@cambridge.edu.in, vs4034@srmist.edu.in, ssathya1978@gmail.com

Abstract—Incorporating assessments of climate variables into operational planning processes is critical for the effective implementation of a sustainable power system. The growth of renewable power generation, which is inherently stochastic, underscores the importance of accurate power generation projections. An accurate forecast of hydropower generation is crucial for power systems that increasingly rely on renewable energy sources, such as solar and wind. The paper proposes the HydroCaps-STMN (Hydroelectric Capsule-Spatio-Temporal Multimodal Network) architecture for Forecasting Renewable Hydroelectric Output in Mountainous River Basin Regions. The model integrates heterogeneous environmental data sources using a unified capsule framework that dynamically encodes complex spatial and temporal dependencies through advanced routing mechanisms. HydroCaps-STMN can model multiscale watershed interactions and the nonlinear evolution of hydro-meteorological variables, allowing for the recording of both short-term and long-term seasonal changes. The capsule structure's multimodal fusion and hierarchical feature representation outperforms LSTM and CNN algorithms in sparse and non-stationary data, which is common in hilly terrain, in terms of both accuracy and interpretability. Extensive experiments with benchmark hydroelectric datasets demonstrate the superior forecasting performance and robustness of the proposed model compared to existing conventional deep learning models. The findings highlight the effectiveness of the capsule network in predicting renewable energy in physically complex and environmentally dynamic regions.

Keywords—Hydroelectric power, Capsule network, Spatio-Temporal Multimodal Network, LSTM, CNN

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TRANSFORMER-DIFFUSION HYBRID FOR ENHANCING DIGITAL TWIN PRECISION IN AEROSPACE STRUCTURAL MAINTENANCE

R. Venkatesh

Department of Mechanical Engineering, Saveetha School of Engineering, Saveetha Institute of Medical and Technical Sciences, SIMATS

A. Nandhakumar

Department of Biomedical Engineering Dhaanish Ahmed Institute of Technology Coimbatore 641105

S. Marimuthu

Department of Mechanical Engineering, Karpagam Academy of Higher Education Coimbatore, Tamilnadu

Yashashwini S

Computer Science& Engineering, Cambridge Institute of Technology, KR Puram, Bengaluru-560036

Senthil Kumar Vishnu

Centre for Sustainable Materials Research, Department of Mechanical Engineering, Academy of Maritime Education and Training (AMET) Deemed to be University, Kanathur, Chennai 603112, Tamil Nadu, India

S. Sathiyamurthy

Department of Mechanical Engineering, Easwari Engineering College, Ramapuram, Chennai 600089, Tamil Nadu, India

venkidsec@gmail.com, mech.hod@kahedu.edu.in, nandhakumar3107@gmail.com, yashashwini.cse@cambridge.edu.in, vs4034@srmist.edu.in, ssathyal978@gmail.com

Abstract—Predictive maintenance utilizing digital twins is growing in aerospace, although structural health portrayal is still difficult. Due to stochastic wear progression, noisy sensor streams, and inadequate inspection data, traditional models typically make erroneous projections and poor maintenance recommendations. This paper proposes a Transformer-Diffusion Hybrid (TDH) model that adaptively optimizes its parameters using the Dragonfly Algorithm (DA) to overcome these issues. Multi-modal sensor data representing long-range temporal-spatial correlations is sent to the Transformer encoder, and the conditional diffusion module denoises probabilistic structure degradation routes. The Dragonfly Algorithm optimizes by continually modifying both modules' hyperparameters, inspired by the static-dynamic swarming behavior of dragonflies. When compared to state-of-the-art digital twin architectures, TDH-DA reduced crack propagation forecasting uncertainty by 21.7% and improved prediction accuracy by 16.3% on aircraft structural fatigue datasets. The hybrid system performs well with partial datasets and poor signal-to-noise ratios. These results demonstrate that bio-inspired optimization can enhance the accuracy of the Transformer-Diffusion pipeline digital twin and facilitate proactive aeronautical maintenance. The TDH-DA design enables reliable, scalable, and intelligent predictive structural health management in safety-critical aircraft systems.

Keywords—Digital Twin, Transformer, Diffusion Model, Dragonfly Algorithm, Aerospace Structural Maintenance, Predictive Maintenance, Bio-inspired Optimization, Structural Health Monitoring, Uncertainty Reduction, Reliability Engineering

:: PAPER ID: 345 ::

BIOLOGICALLY INSPIRED OSCILLATORY COMPUTING FOR CLASSIFYING SOIL NUTRIENT VARIATIONS ACROSS AGRICULTURAL LANDSCAPES

R. Venkatesh

Department of Mechanical Engineering, Saveetha School of Engineering, Saveetha Institute of Medical and Technical Sciences, SIMATS

Jeevakarunya C

Department of Electronics and Communication Engineering, Rathinam Technical Campus, Coimbatore-641021A.

S.R.Ramya

School of Management Studies Karpagam College of Engineering, Coimbatore

Jayashree N

Information Science & Engineering, Cambridge Institute of Technology, KR Puram, Bengaluru-560036

M.Amuthasurabi

Department of ECE, Dhanalakshmi Srinivasan University, school of Engineering and technology Trichy, Tamilnadu

Senthil Kumar Vishnu

Centre for Sustainable Materials Research, Department of Mechanical Engineering, Academy of Maritime Education and Training (AMET) Deemed to be University, Kanathur, Chennai 603112, Tamil Nadu, India

venkidsec@gmail.com, karunya89.pse@gmail.com, ramya.sr@kce.ac.in,
jayashree.ise@cambridge.edu.in, amuthal6@gmail.com, vs4034@srmist.edu.in

Abstract—Soil nutrient diversity is crucial for crop yield and sustainability; however, defining nutrient distributions across agricultural landscapes is a challenging task. Soil qualities and environmental influences are complex and dynamic, yet laboratory testing and simple machine learning (ML) models fail to capture them. Existing models lack real-time adaptability, limiting agricultural accuracy. This paper introduces the Oscillatory-Convolutional Network for Agricultural Nutrient Variability (OCN-ANV), a unique computational framework that uses Oscillatory Neural Networks (ONNs), Dynamic Convolutional Networks (DCNs), and Hyperbolic Geometry. ONNs mirror biological oscillations and facilitate OCN-ANV time-series soil data classification by simulating soil nutrient cycles. DCNs provide real-time sensor data updates by responding to variations in soil properties. Hyperbolic Geometry represents complicated, non-linear spatial relationships between soil elements to improve scalability and accuracy across large agricultural regions. This study evaluated the system utilizing large agricultural datasets from different regions. ONNs increased classification accuracy by 20%, particularly for temporal variations in soil nutrients. Traditional methods yield 18% more spatial mapping errors than those using hyperbolic geometry. A real-time processing lag of < 5 minutes enabled precise agricultural insights from DCNs. OCN-ANV outperformed conventional models with 80-85% accuracy in field experiments, achieving 94% cross-validation accuracy. Finally, the OCN-ANV framework classifies soil nutrient fluctuations in real-time with improved accuracy. This biologically inspired precision agricultural strategy might improve resource management and crop productivity.

Keywords—Soil Nutrient Variability, Precision Agriculture, Oscillatory Neural Networks (ONNs), Dynamic Convolutional Networks (DCNs), Hyperbolic Geometry, Real-Time Classification, Spatiotemporal Data

:: PAPER ID: 346 ::

INTEGRATED DISASTER WARNING SYSTEM FOR MULTI-HAZARD MANAGEMENT

Karthikeyan N, Anupraba P C, Basker KE, Haripriya I, Jawagar S
Department of ECE Velalar College of Engineering and Technology Erode, India

florakarthi1988@gmail.com, anuprabapc@gmail.com, basker26112003@gmail.com, iyyappanharipriya04@gmail.com, jawagar400@gmail.com

Abstract—The project creates a multi-sensor framework, this can detect and analyze both physical and predictive parameters in combination of wind, landslide, rainfall, and flooding. Rain sensors, level sensors, vibration sensors, and a DC motor are used to enhance the precision and reliability of measurement. Environmental hazards pose a threat to human life and infrastructure, so early detection is of the utmost importance. At present, single sensor systems are inaccurate, and our system, on the other hand, uses several sensors to generate a detailed monitoring system. Presently, systems are based on standalone sensors, whereas our system incorporates multiple sensors and processes data with the help of powerful algorithms. Our initial finding shows that our method significantly enhances the detection accuracy and can even provide an exact forecast and a timely alarm. This multi-sensor system can be a good alternative to enhance the identification of the hazards and thus enhance safety and preparedness towards the hazards.

Keywords—multi-sensor system, environmental hazard monitoring, wind flow detection, landslide prediction, rainfall measurement, flood level monitoring, rain sensors, level sensors, vibration sensors, wind anemometers, data accuracy, hazard prediction, real-time monitoring, safety, preparedness

:: PAPER ID: 347 ::

ANALYSIS OF NAVALUR (THAZHAMBUR) AGRICULTURAL LAND WITH FORECASTS FOR FUTURE SOIL CONDITIONS AND CROP RECOMMENDATIONS

Prince Prasanna Kumar Rk, Yogesh P, Jaraline Kirubavathy K
Department of Electronics & Communication Engineering, KCG College of Technology Chennai, India

21ec60@kcgcollege.com, 21ec94@kcgcollege.com, kjaraline@gmail.com

Abstract—As a consequence of pollution, obesity, and increases in global temperature, it is becoming more challenging to execute agricultural practices that are environmentally friendly. An evaluation of the soil quality in the agricultural region of Navalur (Thazhambur) is the purpose of this research. This evaluation will be accomplished via the use of a number of different machine learning algorithms. Conducting regular checks on the pH, moisture, and nutrient content of the soil is something you should conduct if you want to be absolutely certain that this is the instance. The Random Forest dataset has the highest accuracy rate, which is 67%, when compared to the other 2000 datasets under consideration. It is possible that the prediction method will be able to identify the features of the soil in ten years after the crop proposal has been implemented, provided that location-specific information is used. Agriculture has the potential to become far less harmful to the environment if artificial intelligence (AI) and the Internet of Things (IoT) are effectively used. The capacity to make decisions based on correct information and to spend money in a responsible way is an extra advantage that may be gained. In order to make judgments about agricultural practices and property management that are more well-informed, it is possible to undertake an analysis of the historical data obtained by the project on the soil and climate. In the article, the topic of selecting plant species that are resistant to drought is discussed, in addition to the addition of soil amendments such as fertilizer or a decrease in pH. Farmers are better prepared to cope with the volatility of the weather, regardless of whether it is hot or wet, thanks to the aid of weather forecasts made available to them.

Keywords—Soil health, Machine learning, Random Forest, Precision farming, Climate variability, Crop recommendation, IoT in agriculture, Sustainable farming

:: PAPER ID: 348 ::

OPTIMIZING HONEYPOT MOBILITY: A HYBRID MI APPROACH FOR ADVANCED DDoS PROTECTION

C Navaneetha

Department of Computer Science and Business Systems Panimalar Engineering College Chennai, India

Kathirvel A

Department of Computer Science and Engineering Saveetha Engineering College Chennai, India

navaneetha27@gmail.com, ayyakathir@gmail.com

Abstract—DDoS attacks (Distributed Denial of Service) are a constant threat to network infrastructure, as they can incapacitate services and overwhelm systems. In this paper, we introduce an Adaptive Roaming Strategy for honeypots, using a Hybrid Machine Learning (ML) approach. We use the CICDDoS2019 dataset [24] to show that our method uses Reinforcement Learning (Q-learning, DQN) to dynamically optimize roaming, Anomaly Detection (Autoencoders, Isolation Forests) to detect attacks early on, Time Series Forecasting using LSTM to provide proactive defense, Game-Theoretic Models to explore honeypot deployment strategies as a cost-defending strategy, Hybrid Optimization Methods (Genetic Algorithm and Particle Swarm Optimization) to augment the detection strategy with a performance improvement. Experimental evaluation shows that our approach offers better accuracy, resource use and adaptive response capabilities than static defenses.

Keywords—Software Defined Network (SDN), Network Security, Honeypot Efficiency

:: PAPER ID: 349 ::

SELF-SUPERVISED EMBEDDING FOR CLASSIFYING ANCIENT MANUSCRIPTS ACROSS MULTILINGUAL HISTORICAL LIBRARY COLLECTIONS

Gopal K

Department of Mechanical Engineering, New Horizon college of engineering, Bangalore, Karnataka, India

Chandraprakash R

Department of Robotics and Automation, Dhaanish Ahmed Institute of technology Coimbatore-641105

Marimuthu S

Department of Mechanical Engineering Karpagam Academy of Higher Education Coimbatore, Tamilnadu, India

Indumathi G

Communication Engineering Cambridge Institute of Technology KR Puram, Bengaluru-560036

Nageswaran M.

Department of Mechanical Engineering, Dhanalakshmi Srinivasan University Samayapuram, Trichy (DT), Tamilnadu, India

Srinivasan R

Department of Mechanical Engineering, Saveetha School of Engineering, Saveetha Institute of Medical and Technical Sciences, SIMATS, Chennai, Tamil Nadu, India

vkgoopalme23@gmail.com, rcprakash2020@gmail.com, mech.hod@kahedu.edu.in,
principal@cambridge.edu.in, nages.1983@gmail.com, srinivasansimats@gmail.com

Abstract—Regarding the ancient manuscripts that will be discovered in historical library collections and that include writing in more than one language, there is limited information available. It isn't easy to discuss the languages and writing style since they are distinct from one another. When it comes to rare historical texts, supervised learning approaches are not beneficial since they require labeled data, which is difficult to obtain and costly. The Self-Supervised Embedding Framework (SSEF) is presented in this paper as a potential solution to the identified problems. Through the use of contrastive learning, SSEF can discover robust, language-independent representations in images and text that lack labels. Visual, contextual, and semantic data are all types of information that the SSEF system can process. In addition to using encoders that are capable of working with multiple languages, it also employs graph-based relational modeling. When it comes to categorizing manuscripts from Asian, European, and Middle Eastern libraries according to age, provenance, and script family, SSEF is superior to the best supervised classifiers currently available. The approach in question must be able to function with languages and publications that are not very prevalent. According to the findings of this research, self-supervised learning has the potential to aid underfunded archives in organizing materials by size, which could potentially accelerate the preservation of cultural treasures. The focus of future studies will be on developing more effective approaches for domain adaptation and identifying more effective methods for style detection in newly digitized texts.

Keywords—Self-supervised learning, Ancient manuscripts, Multilingual classification, Historical libraries, Contrastive embedding

::: PAPER ID: 350 :::

MACHINE LEARNING-BASED INFLATION FORECASTING SYSTEM FOR MACROECONOMIC ANALYSIS

Grandhi Sai Guptha

Data Scientist, N2N Services LLC, 3063 Peachtree Industrial Blvd, USA
Kumuda Sreenivasa, Pranav Paikar
Independent researcher

Gv Radhakrishnan

Department of Economics and Finance, School of Management, Kalinga Institute of Industrial Technology (KIIT)
Deemed to be University, Bhubaneswar, Odisha, India

Pushparaj Kulkarni

Department of Management, AMBEDKARINSTITUTE OF MANAGEMENTSTUDIES AND RESEARCH, NAGPUR

Partha Kumar Dey

Business Risk, Citibank, 388 Greenwich St, New York, NY

guptha.grandhi@n2nservices.com, kumudasreenivasa@gmail.com, pranavpaikar@gmail.com,
gv.radhakrishnan@ksom.ac.in, pushparajkk@gmail.com, partha.dey@tbird.asu.edu

Abstract—Effective macroeconomic policy depend on accurate inflation forecasts. In today's complex and nonlinear financial landscape, conventional inflation models typically fail. A machine learning-based inflation prediction model is proposed in this paper to deliver exact macroeconomic inflation projections. Advanced machine learning algorithms, including ensemble and deep learning methods, are used to predict economic indicators like retail price indices, commodity prices, interest rates, and exchange rate fluctuations. A realistic feature engineering technique captures complicated patterns, time-based interactions, and lagging and leading indications. The model is carefully evaluated using real-world economic statistics and compared to standard economic forecasting criteria. Forecasting accuracy improved significantly, highlighting the potential of such a system to help central banks, governments, and financial institutions make evidence-based decisions. The framework was designed to highlight the issues with classical forecasting methods while proposing a flexible and scalable structure that would adapt to economic realities. This adds to the literature on machine-learning techniques to economics and provides a more realistic and persuasive inflation forecasting tool. Machine learning techniques can overcome the limits of traditional forecasting approaches, improving macroeconomic policy decision-making, according to the study.

Keywords—Inflation Forecasting, Machine Learning, Macroeconomic Analysis, Economic Indicators, Deep Learning, Forecast Accuracy, Financial Decision-Making

::: PAPER ID: 351 :::

ELECT AND LOCATE THE HOLLOW BLOCKS

P. Vidhyalakshmi, K Prabhu

Assistant Professor (SLG), Department of Electronics and Instrumentation Engineering, Kongu Engineering College,
Perundurai – 638060

K.P. Sasikumar, S. Thiyanesh, P. Sowmiya and G. Ravishankar

UG Scholar, Department of Electronics and Instrumentation Engineering, Kongu Engineering College, Perundurai –
638060

vidhyalakshmi.eie@kongu.edu, prabhu.eie@kongu.edu, sasikumarkp.20eie@kongu.edu,
thiyaneshs.20eie@kongu.edu, sowmiyap.20eie@kongu.edu, ravishankarg.20eie@kongu.edu

Abstract—The raw materials required for the formation of hollow blocks include sand, gravel, stones, Portland pozzolana cement, and water. The project 'Elect and Locate the Hollow Blocks' seeks to automate the processes of moving and placing hollow blocks into various uses in construction or manufacturing industries. What is the goal of the project? To design, develop, and implement a robotic system that is able to pick, place, and orient hollow bricks with high precision. This system aims at improving productivity, reducing the amount of manual work performed, cutting down mistakes, and improving safety in processes where hollow blocks are pried at and moved around often. In all probability, the project will involve the use of similar components that enable other projects to be completed more quickly, such as sensors, actuators, and advanced control systems. Aspects of Construction Journal: The main focus of this type of work is to remove the manual handling of hollow blocks, and as a result, the benefits achieved include a decrease in time taken for construction or manufacturing, decreased labour costs, lower probability of human error, improved safety in workplaces, and resource consumption that is economic and ecological. The results of the project seem to be focused towards industries where manipulation of a controlled object is fundamental, therefore providing possible enhancement in efficiency, cost savings, and automation technology in the future. The time it takes to search for the blocks is cut at the correct time.

Keywords—Double Action Pneumatic Arm, Solenoid Valve, IoT, Node MCU

:: PAPER ID: 352 ::

A BALANCED EVOLUTIONARY ALGORITHM FOR RELIABILITY AND SUSTAINABILITY TRADE-OFFS IN HYBRID RENEWABLE SYSTEMS

Minu Mary Joy, H. Vennila

Department of EEE, Noorul Islam Centre for Higher Education, Kumarakoil, India

minujoy3@gmail.com, vennilarajesh@yahoo.co.in

Abstract—The integration of multiple sources, such as solar, wind, and biomass, gives hybrid renewable energy systems (HRES) the capacity to provide an optimal solution for sustainable energy. However, there is a multifaceted design challenge in optimally configuring these systems due to the conflicting nature of the trade-off between reliability and sustainability. This investigation formulates a balanced evolutionary algorithm capable of managing the conflict between system reliability and sustainability and optimizing performance across varying operational conditions. With the use of multi-objective optimization, it balances the need to supply energy reliably with the need to protect the environment by reducing carbon emissions and increasing the use of renewable energy sources. Simulation results validate that the algorithm can configure a sustainable energy supply that meets the reliability targets. The use of these algorithms aids the design of energy systems that are reliable and have reduced environmental impact, contributing towards a low-carbon energy system.

Keywords—Hybrid Renewable Energy Systems, Balanced Evolutionary Algorithms, Sustainability, Multi-Objective Optimization, Energy Systems Optimizations, Environmental Impacts

:: PAPER ID: 353 ::

BLOCKCHAIN-INTEGRATED OVERHEAD-AWARE OPTIMIZATION OF POST-QUANTUM DIGITAL SIGNATURE PROTOCOLS

K. Thenmozhi, R. Sabin Begum

Department of Computer Applications, B.S.Abdur Rahman Crescent Institute of Science and Technology, Chennai, India

thenmozhikalaiselvan100@gmail.com, sabin@crescent.education

Abstract—The evolution of quantum computing technologies poses the most significant threat to traditional cryptosystems, which use number-theoretic RSA and ECC. These systems seem to be on the verge of extinction; therefore, there is a desperate search for reliable digital signatures intended for post-quantum systems. This paper presents a novel blockchain model utilizing overhead-aware post-quantum cryptography optimization. The blockchain layer provides decentralized and tamper-proof validation, key management, and audit trails. At the same time, optimization techniques aimed at reducing the complexity of computations, key size, and communications enhance system performance. The model proposed here offers both scalability and energy efficiency, making it ideal for constrained environments such as IoT and edge networks. Experimental results demonstrate that latency and resource consumption are improved without compromising cryptographic security. This approach lays the groundwork for creating secure digital communication systems designed for the future.

Keywords—Post-Quantum Cryptography, Blockchain, Digital Signatures, Optimization, Overhead Reduction, Secure Communication

:: PAPER ID: 354 ::

DRIVER ALERT SYSTEM: SENDING ALERT MESSAGES UPON SPEED CONTROL, ALCOHOL DETECTION AND OBJECT DETECTION USING IoT AND ARDUINO

Sakhinetipalli Raval, Raavi Hemalatha
Vishnu Institute Of Technology Bhimavaram, India

23paid5815@vishnu.edu.in, hemalatha.r@vishnu.edu.in

Abstract—Road safety remains a worldwide concern because over-speeding and impaired driving together with collisions stand as the main sources of traffic-related death. Safety standards show delayed responses at critical times so accidents become more likely to occur. The proposed intelligent Driver Alert System unlocks new vehicle security possibilities through speed control alarms and alcohol and object detectors which minimize occurrences of accidents automatically. The Arduino microcontroller system monitors continuously the driver's sobriety and speed alongside detecting nearby objects to enhance driving safety. Through the use of a buzzer system the device warns users about speed violations alcohol use or possible obstacle interaction. If an over-speeding or accident occurs the device sends an SMS warning to defined emergency contacts through its GSM module for urgent assistance. The system generates alerts through sound only for alcohol detection together with object detection events although engine shut down happens automatically for safety purposes. The system enables real-time vehicle tracking through GPS for unsafe driving situations. Experimental tests established high accuracy levels and rapid responsiveness which shows the system works efficiently in preventing accidents. As an affordable system with straightforward deployment capabilities, it finds perfect application for enhancing safety measures in developing areas.

Keywords—Arduino, GPS Tracking, GSM Module, MQ3Sensor, Ultrasonic sensor

:: PAPER ID: 355 ::

PARAMETER-OPTIMIZED WOA-CNN-Bi-LSTM MODEL FOR IMPROVED CT IMAGE SEGMENTATION AND CLASSIFICATION

M. Sathya Sundaram
Department of Computer Science and Engineering, SRM Institute of Science and Technology, Kattankulathur, Chennai
S. Karthick
Department of Computational Intelligence, SRM Institute of Science and Technology, Kattankulathur, Chennai
P. Thiyagarajan
Department of Computer Science and Engineering, Paavai Engineering College, Pachal, Namakkal

sm0432@srmist.edu.in, karthiks2@srmist.edu.in, tvn210@gmail.com

Abstract—Adequate CT scan classification is essential for accurate diagnosis and quick clinical guidance. Traditional deep learning designs are good at feature extraction but poor at capturing complicated spatial and temporal effects, which is exacerbated by inadequate hyperparameter optimization. Thus, we present a CT image analysis-specific Parameter-Optimized Whale Optimization Algorithm-Convolutional Neural Network-Bidirectional Long Short-Term Memory framework (WOA-CNN-BiLSTM). CNN backbone develops relevant spatial features, and Bi LSTM excels at contextual continuity in successive slices. The Whale Optimization Algorithm tunes key hyperparameters automatically, speeding convergence and predicting generalization. Hybrid framework outperforms CNN, sequential LSTM, and CNN LSTM in segmentation accuracy, classification F1-score, and computing speed. The WOA feature also optimizes run time, reducing training and resource use while ensuring clinical sensitivity and specificity. The WOA-CNN-BiLSTM architecture is an integrated, resource-saving system of state-of-the-art medical image perception that can be integrated into real-time diagnostic systems and decision-support dashboards.

Keywords—CT image segmentation, CT image classification, Convolutional Neural Network (CNN), Bidirectional Long Short-Term Memory (Bi-LSTM), Whale Optimization Algorithm(WOA), deep learning, medical image analysis, diagnostic imaging

:: PAPER ID: 356 ::

SPIKING CORTICAL ARCHITECTURE FOR MONITORING WILDLIFE MIGRATION TRAJECTORIES VIA AERIAL IMAGING SENSORS

Gopal K

Department of Mechanical Engineering, New Horizon college of engineering, Bangalore, Karnataka, India

A.Nandhakumar

Department of Biomedical Engineering Dhaanish Ahmed Institute of Technology Coimbatore-641105

A.Daniel Das

Department of Mechanical Engineering Karpagam Academy of Higher Education Coimbatore, Tamilnadu, India

Cyril Prasanna Raj

Electronics and Communication Engineering Cambridge Institute of Technology, KR Puram, Bengaluru-560036

Amuthasurabi M

Department of ECE, Dhanalakshmi Srinivasan University, school of Engineering and technology Trichy, Tamilnadu

Thirugnanasambandham T

Department of Mechanical Engineering, Saveetha School of Engineering, Saveetha Institute of Medical and Technical Sciences, SIMATS Chennai 602105, Tamil Nadu, India

vkgoalme23@gmail.com, nandhakumar3107@gmail.com, danielamaladas@gmail.com,
cyril@cambridge.edu.in, amuthal6@gmail.com, thirusimats@gmail.com

Abstract—Wildlife migration monitoring has become critical for ecological conservation, biodiversity assessment, and climate adaptation studies. Traditional tracking systems, which rely on GPS collars and conventional computer vision pipelines, are often constrained by high power demands, limited spatiotemporal resolution, and difficulties in scaling to large-scale aerial surveys. This study aims to develop a Spiking Cortical Trajectory Encoding (SCTE) methodology that leverages spiking cortical neural architectures to process aerial imaging data in an event-driven and energy-efficient manner. The objective is to provide a biologically inspired, real-time framework capable of accurately identifying, tracking, and predicting migration trajectories of wildlife populations. The proposed approach employs a spiking cortical reservoir network with leaky integrate-and-fire neurons and spike-timing-dependent plasticity to encode migration dynamics as temporal spike trains. Aerial imaging sensors, including dynamic vision sensors mounted on UAV platforms, capture event-based input, which is processed through hierarchical cortical layers to extract spatiotemporal features. Unsupervised trajectory encoding is employed to cluster the encoded spike trajectories into migration corridors, while prediction modules are utilized to estimate movement patterns under various ecological conditions. In comparison to deep CNN and Transformer baselines, experimental evaluation shows that the SCTE methodology achieves higher tracking precision, lower latency, and lower energy consumption. This is measured for comprehensive environmental surveillance, as the field simulations will be verified in the context of multi-ethnic group movement, different lighting conditions, and obstructions. According to the results, spike cortical structures provide a new and long-term approach to monitoring wildlife migration. This method has the potential to revolutionize environmental sensing, as it allows for real-time, low-power, and adaptive analysis of immigration in natural environments.

Keywords—Spatiotemporal Trajectory Encoding, Wildlife Detection, Spike Train Representation, Migration Pathway Clustering, Aerial Image Analysis

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REINFORCEMENT-GUIDED NAVIGATION FOR OPTIMIZING DRONE DELIVERY ROUTES THROUGH DENSE URBAN ENVIRONMENTS

Gopal K

Department of Mechanical Engineering, New Horizon college of engineering, Bangalore, Karnataka, India

Jeevakarunya C

Department of Electronics and Communication Engineering, Rathinam Technical Campus, Coimbatore-641021

A.Daniel Das

Department Of Mechanical Engineering Karpagam Academy Of Higher Education Coimbatore, Tamilnadu, India

Shivapanchakshari T G

Electronics and Communication Engineering Cambridge Institute of Technology, KR Puram, Bengaluru-560036

M.Nageswaran

Department of Mechanical Engineering Dhanalakshmi Srinivasan University Samayapuram, Trichy (DT) Pin code - 621 112, Tamilnadu, India

M. Murali

Department of Mechanical Engineering, Saveetha School of Engineering, Saveetha Institute of Medical and Technical Sciences, SIMATS, Chennai 602105, Tamil Nadu, India

vkgoalme23@gmail.com, karunya89.pse@gmail.com, danielamaladas@gmail.com,
hod.ece@cambridge.edu.in, nages.1983@gmail.com, muralisimats@gmail.com

Abstract—The increasing demand for drone-based delivery poses significant challenges in densely populated urban areas, where determining the optimal route is hampered by both static and dynamic obstacles. Since standard path planning techniques are ineffective in real-world urban layouts, we utilize reinforcement-driven learning algorithms with real-world datasets. The reinforcement-guided navigation system in this study aims to determine the optimal drone delivery route with the lowest energy consumption and crash probability. The study's primary objective is to teach reinforcement learning agents to fly more realistically by leveraging the Semantic Drone Dataset's comprehension of urban scenes. By converting the labeled images from the Semantic Drone Dataset into structured graphs of roads, buildings, and obstacles, the methodology proposes a Graph-Constrained Reinforcement Navigation (GCRN) approach. In these graph-based settings, navigation policies are then trained using Proximal Policy Optimization. Its objective is to strike a balance between delivery speed and safety. The findings demonstrate that policies trained on the Semantic Drone Dataset maps find more efficient routes than A* and DQN baselines, reducing the number of collisions and the distance traveled. The approach also demonstrates its applicability to new urban areas and its ability to perform well in complex architectural designs. Lastly, the Semantic Drone Dataset and reinforcement learning can be combined to produce a flexible, scalable, and practical framework for improving urban drone delivery. A safer and better future for aerial logistics is made possible by this dataset-driven approach, which connects theoretical research with practical application.

Keywords—Reinforcement Learning, Drone Delivery, Semantic Drone Dataset, Urban Navigation, Route Optimization

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MULTI-AGENT COORDINATION USING EVOLUTIONARY HEURISTICS FOR MANAGING SHARED ELECTRIC VEHICLE CHARGING INFRASTRUCTURE

Chinnayan R V

Department of Mechanical Engineering, Saveetha School of Engineering, Saveetha Institute of Medical and Technical Sciences, SIMATS, Chennai 602105, Tamil Nadu, India

C.Meera

School of Management Studies Karpagam College of Engineering

S Marimuthu

Department of Mechanical Engineering Karpagam Academy of Higher Education Coimbatore, Tamilnadu, India

Varalatchoumy M

Department of Artificial Intelligence and Machine Learning, Cambridge Institute of Technology, KR Puram, Bengaluru-560036

R.Gobu

Department of Electrical and Electronics Engineering Velalar College of Engineering and Technology, Tamilnadu, India

S Sathiyamurthy

Department of Mechanical Engineering, Easwari Engineering College, Ramapuram, Chennai 600089, TamilNadu, India

venkissedesign@gmail.com, meera.phd@gmail.com, drsmarimuthu@gmail.com,
hod.aiml@cambridge.edu.in, kuttigobu@gmail.com, ssathya1978@gmail.com

Abstract—There is a higher demand for the limited charging infrastructure due to the rapid increase in the number of electric vehicle (EV) purchases. Time management, resource distribution, and user happiness have all suffered as a result. EVO-CHARGE is an architecture for multi-agent coordination that effectively manages shared electric vehicle charging stations by applying evolutionary heuristics. To accomplish this, the current study aims to provide EVO-CHARGE. Charging stations and electric vehicles (EVs) are two independent entities, each with the ability to negotiate its own charging slot. The battery's charge, arrival, and departure times, as well as grid load, are some of the dynamic constraints that this agent must contend with. The use of a genetic algorithm in conjunction with particle swarm optimization is one approach. Practical testing on simulated urban charging networks with up to 500 electric vehicles demonstrated that EVO-CHARGE could effectively regulate energy distribution and reduce peak load stress by 26.5%. Based on these results, EVO-CHARGE may reduce typical wait times by 34.7%, boost station usage by 41.2%, and achieve a more balanced energy distribution. The findings clearly show that evolutionary multi-agent coordination is a scalable and adaptive way to manage shared electric car charging.

Keywords—Multi-Agent Systems, Evolutionary Heuristics, Electric Vehicle Charging, Resource Allocation, Smart Grid Optimization, Collaborative Scheduling

:: PAPER ID: 359 ::

KNOWLEDGE-GROUNDED DIALOGUE MODELS FOR SUPPORTING PATIENT COUNSELING DURING CHRONIC DISEASE MANAGEMENT

Chinnayan R V

Department of Mechanical Engineering, Saveetha School of Engineering, Saveetha Institute of Medical and Technical Sciences, SIMATS, Chennai 602105, Tamil Nadu, India

A.Nandhakumar

Department of Biomedical Engineering Dhaanish Ahmed Institute of Technology Coimbatore-641105

C.Meera

School of Management Studies Karpagam College of Engineering

Geetha R

Department of Artificial Intelligence and Machine Learning, Cambridge Institute of Technology, KR Puram, Bengaluru-560036

R.Gobu

Department of Electrical and Electronics Engineering Velalar College of Engineering and Technology, Tamilnadu, India

S Sathiyamurthy

Department of Mechanical Engineering, Easwari Engineering College, Ramapuram, Chennai 600089, TamilNadu, India

venkissedesign@gmail.com, nandhakumar3107@gmail.com, meera.phd@gmail.com,
geetha.aiml@cambridge.edu.in, kuttigobu@gmail.com, ssathya1978@gmail.com

Abstract—Counseling patients is an essential part of chronic disease management (CDM), as individuals with chronic diseases often require ongoing support to adhere to their treatment plans and make informed decisions about their daily lives. Sadly, traditional healthcare facilities usually struggle to provide personalized, real-time therapy due to the sheer volume of patients and limited resources. It has developed an information-grounded dialogue model (KGDM) that leverages conversational AI and structured clinical information sources to bridge this gap. The process involves utilizing medical discussion corpora to refine transformer-based models and leveraging domain-specific knowledge graphs and guideline libraries to enhance the quality of replies. The method utilizes KGDM to ensure that counseling is relevant to the situation, grounded in facts, and incorporates empathy. Compared to baseline conversation models, KGDM helps patients understand better, trust automated systems more, and get less erroneous information. The evaluation results also show that patients are far more involved and give more accurate feedback about their treatment. Last but not least, KGDM's CDM support is scalable, reliable, and focused on the patient, which could make a big difference in clinical practice.

Keywords—Chronic disease management, conversational AI, knowledge graphs, healthcare support, patient counseling, and the Knowledge-Grounded Dialogue Model (KGDM)

::: PAPER ID: 360 :::

FIRE DETECTION AND EXTINGUISHING SYSTEM USING CNN

Ramprasath S

Electronics And Communication Engineering Karpagam College of Engineering Coimbatore, Tamil Nadu

Rahul Sanjai R, Arunpandian M, Sivaprasath, Gopinath C

UG - Electronics And Communication Engineering Karpagam College of Engineering Coimbatore, Tamil Nadu

ramprasath.s@kce.ac.in, rahulsanjai00@gmail.com, arunpandian2208@gmail.com,
sivamanjula477@gmail.com, gobinath512003@gmail.com

Abstract—Fire events threaten life and property safety and require fire prevention and firefighting. Traditional methods such as smoke detectors and thermometers often suffer from low accuracy and false alarms. To solve these problems, a computer vision fire detection and fire suppression system using neural network networks (CNN) is presented in this study. The system integrates advanced hardware and software including the esp32cam microcontroller, actuators and Tensor Flow Lite to accurately model and provide fire plans. By using machine learning algorithms and computer vision, the system can clearly analyze the displayed video or image and find the source of the fire, so that fire suppression can be carried out to reduce the destruction.

Keywords—Fire detection, CNN, ESP 32

::: PAPER ID: 361 :::

COMPARISON BETWEEN LSTM AND Bi-LSTM FOR WIND SPEED FORECASTING

B. Senthil Kumar, K Kishore, S Bharathwaj, S Jayasruthi

Department of Electronics and Instrumentation Engineering, St. Josephs College of Engineering Chennai, India

vlrsenthil@gmail.com, kishorekaruna8@gmail.com, jbharathwajseie2020@gmail.com, sjayasruthi@gmail.com

Abstract—Weather forecasting is an important part of fields such as renewable energy, aviation, weather and climate science. This article examines the performance of LSTM and Bi-LSTM neural networks in fast weather forecasting. LSTM is suitable for time series forecasting problems; We build an LSTM model to predict future wind speeds. Additionally, Bi-LSTM networks are a good alternative to LSTM networks. We believe our research could have a significant impact on the renewable energy sector and hope to share our findings with the research community. A comparison of Bi-LSTM and LSTM parameter tuning is shown, compared to the results and performance indicators obtained by tuning various hyperparameters.

Keywords—LSTM, Bi-LSTM, Wind Speed, Wilmot's Index

:: PAPER ID: 362 ::

OPTIMISING SURGICAL INSTRUMENT RECOGNITION USING ADVANCED OBJECT DETECTION ALGORITHM

A Bhavana Rajaputana, Harika Mahalakshmi S
St. Joseph's College of Engineering, Chennai-119

G. Maria Kalavathy

Department of Information Technology, Easwari Engineering College, Chennai

bhavana2002@gmail.com, lakshmimaha683@gmail.com, maria_kalavathy@yahoo.co.in.

Abstract—Manual processes need to be upgraded in many crucial medical departments, particularly those engaged in minimally invasive surgery. When counting surgical instruments with the traditional method, staff members have to verify that each tool is in line with the surgical plan by comparing it to a comprehensive list. 8, the manual counting of instruments is ineffective and imprecise for various reasons, such as patient cases, people, and environmental elements. Surgeons also must learn how to obtain and use their tools and instruments in an operating room. This process is valuable, although it can be frustrating: There is a great profusion of tools that look alike, making it difficult for people to avoid making some errors or some inconsistencies somewhere. Also, errors during supervision can occur, and automated systems have implemented rudimentary machine learning methods that may not be applicable in general. Thus, in this study, the research focuses on improving the recognition of surgical instruments with respect to accuracy and efficiency. The technology minimizes the risk of infection by improving instrument management for safe and effective operations. The purpose of this proposed instrument detection system is to be effective in achieving better accuracy of surgical instrument detection, which contributes to better surgical safety as well as the patient's life by using the advanced YOLOv8 algorithm.

Keywords—Object Detection, Medical Instrument, Safety, and Precision

:: PAPER ID: 363 ::

AI-BASED DETECTION AND CLASSIFICATION OF PERIAPICAL LESIONS IN CBCT AND PERIAPICAL RADIOGRAPHS USING DEEP LEARNING

Tejal Gowda

Dayanand Sagar College of Dental Sciences, Dept of Conservative dentistry and Endodontics, Bengaluru, India

Ravi Ranjan Sinha

The Oxford Dental College, Dept of Prosthodontics, Crown and Bridge, Bengaluru, India

Niladri Maiti

School of Dentistry, Central Asian University, Tashkent, Uzbekistan

Swagat Panda, Priyanka Das

Hi Tech Dental College and Hospital, Dept of Conservative dentistry and endodontics, Bhubaneswar, India

Siddhartha Das

Kalinga Institute of Dental Sciences, KIIT Deemed to Be University, Bhubaneswar, India

tejalgowda2303@gmail.com, r.ravi.sinha@gmail.com, m.niladri@centralasian.uz, reachswagat@gmail.com, priyanka.das053@gmail.com, siddharthadas115@gmail.com

Abstract—Accurate and timely identification of periapical lesions caused by endodontic infections is considered essential for the formulation of appropriate treatment strategies and the maintenance of long-term dental health. The detection of such lesions is traditionally carried out through the interpretation of Cone Beam Computed Tomography (CBCT) and periapical radiographs by clinicians. Although this approach is effective, it is subjectively oriented, time-consuming, and limited by human variability. With these limitations in mind, an automated detection system is developed in the present work by employing Convolutional Neural Networks (CNNs) to make the diagnosis of periapical lesions more reliable and faster. The system is developed and evaluated using annotated datasets consisting of CBCT scans and periapical radiographs. Training of the CNN model on a carefully constructed dataset containing diverse lesion presentations is carried out to improve generalisability. Systematic training and validation are performed to enable the model to distinguish between the presence and absence of periapical lesions and to classify them with high accuracy. Performances are tested for accuracy, sensitivity, specificity, and F1-score using the usual diagnostic criteria to assess the robustness and consistency in the system. The CNN-based model yields higher precision and dependable predictions and reduces diagnosis time when compared to the interpretation of a diagnostic manual made subjectively by an expert. This improvement shows AI as an adjunctive diagnostic modality in dental practice, giving clinicians quick and consistent objective assistance in evaluating periapical lesions. Less formally said, this study therefore contemplates AI-inspired methods for day-to-day endodontic use to better serve patient care and treatment planning.

Keywords—Deep Learning, Periapical Lesions, Cone Beam Computed Tomography (CBCT), Periapical Radiographs, Artificial Intelligence, Convolutional Neural Networks (CNNs)

:: PAPER ID: 364 ::

BATTERY AGEING PREDICTION IN ELECTRIC VEHICLES USING HYBRID AI MODEL

Retineni Rohan, Shishir Kathi, Venkata Siva Rao Alapati
CBIT, Hyderabad, India

rohanretineni@gmail.com, shishirint9new@gmail.com, avsivaraocse@cbit.ac.in

Abstract—Electric Vehicles (EVs) are pivotal in reducing green-house gas emissions and advancing sustainable transportation. The battery system, as the most critical and expensive component in EVs, significantly influences vehicle performance, range, and safety. Accurate prediction of battery ageing is essential, as it forms the basis for estimating both the Remaining Useful Life (RUL) and the vehicle's driving range, which are key outcomes for effective battery management and operational safety. This study proposes a hybrid Artificial Intelligence (AI) model based on Long Short-Term Memory (LSTM) networks as a data-driven approach to enhance the accuracy and reliability of battery RUL and Vehicle Range prediction. Differently from the traditional model-based approaches which often face the intricate and nonlinear challenges of battery degradation, we investigated approaches to hybrid modeling that utilize time relations in battery health data which improves prediction performance using the Nissan Leaf 2018 dataset. Our research shows that LSTM-based models work very well for predicting battery health. Our approach is to tune the model architecture to produce accurate, yet interpretable, estimates that improves the effectiveness of Battery Management Systems (BMS) in electric vehicles. We computed the performance of our model using the conventional Root Mean Squared Error (RMSE), Mean Absolute Error (MAE), and R^2 Score metrics to estimate the prediction level and robustness of the model. The applied hybrid model was used to forecast the State of Health (SOH) and State of Charge (SOC) which are critical interdependent variables for predicting RUL and estimating the travelling range of the vehicle. The model produced RMSE of 0.0693, 0.1397 and MAE of 0.0456, 0.0566 for SOH and SOC consequently. Such results show considerable accuracy in our predictions. By incorporating deep learning with several battery health metrics, we were able to better estimate battery ageing and thus, provide more dependable range predictions, addressing range anxiety and enhancing EV adoption.

Keywords—EVs, Battery Ageing, RUL, Vehicle Range Prediction, Battery Health Estimation, LSTM, Deep Learning, AI, BMS, Nissan Leaf Dataset, Time-Series Modeling, Range Anxiety Reduction

:: PAPER ID: 365 ::

OPTIMIZING HYBRID RENEWABLE ENERGY SYSTEMS UNDER UNCERTAINTY USING ROBUST EVOLUTIONARY MULTI-OBJECTIVE ALGORITHMS

Munna Basil Mathai, V.A. Tibbie Pon Symon
Department of EEE, Nooral Islam Centre for Higher Education, Kumarakoil, India

munnabasil@gmail.com, tibbiesymon@gmail.com

Abstract—The development of integrated hybrid renewable energy systems (HRES) offers a viable approach to meeting increasing energy needs while considering ecological impacts. Nevertheless, the optimally designing and operating such systems is quite challenging due to the absence of predictability regarding the availability of renewable resources, load demand, and system components. This research proposes a robust optimization model for HRES design that concurrently evaluates multiple conflicting objectives, such as cost, dependability, and environmental consequences, within the scope of uncertainty. Utilizing advanced evolutionary multi-objective algorithms with robustness features, the proposed methods improve the exploration of multi-dimensional design spaces to find mediating solutions that retain performance under varying conditions. Simulation results validate the strong and effective configurations of HRES against conventional approaches, revealing enhanced reliability and cost efficiency in adaptable situations that are variable and uncertain.

Keywords—Hybrid Renewable Energy Systems, Robust Optimization, Evolutionary Multi-objective Algorithms, Cost-Effectiveness, Environmental Impact, Renewable Resource Variability

::: PAPER ID: 366 :::

IMPLEMENTATION OF RSA ALGORITHM USING FPGA AND ANALYSIS OF POST QUANTUM CRYPTOGRAPHY

Keith Raymond Fernandes, Dayakshini Sathish

Department of Electronics & Communication Engineering, St Joseph Engineering College, Mangaluru, Karnataka

Shreyas S, Varun Kamath, Sinchana S, Sanjana

Department of Electronics & Communication Engineering, St Joseph Engineering College, Mangaluru, Karnataka

India575028 keithf@sjec.ac.in, dayakshini@sjec.ac.in, India57502821e48.shreyas@sjec.ac.in,
21c62.varun@sjec.ac.in, 21e52.sinchana@sjec.ac.in, 21f49.sanjana@sjec.ac.in

Abstract—The importance of secure communication has never been higher than it is in today's digital age. Among the many reliable and widely used approaches to public-key encryption, RSA remains a top choice. In this paper, we investigate the use of the Artix-7 FPGA board to implement RSA encryption in hardware. FPGA implementation improves speed, performance, and efficiency. The approach makes use of Montgomery multiplication to expedite modular exponentiation, the central operation in RSA. The complete architecture is built using Verilog HDL and synthesized with the Xilinx Vivado. The results demonstrate that FPGA-based RSA encryption provides superior speed and reliability. For embedded systems and IoT applications, this provides a very effective option for secure communication. The proposed implementation highlights how hardware acceleration can help to meet the increasing need for cryptographic security.

Keywords—RSA Algorithm, Hardware Implementation, Modular Exponentiation, Post Quantum Cryptography

::: PAPER ID: 367 :::

DEEP LEARNING BASED MULTI-MODEL ASSISTIVE LEARNING SYSTEM FOR HEARING AND VISUALLY IMPAIRED STUDENTS

Senthil Kumari P, Gokila K, Akalya A

Dept. of artificial intelligence and data science PSNA College of engineering and technology Dindigul, India

psk045@psnacet.edu.in, gokilak21ad@psnacet.edu.in, akalyaa21ad@psnacet.edu.in

Abstract—Students with hearing or visual impairments often struggle to access mainstream education due to the absence of inclusive teaching aids. To reduce this gap, this study presents a Python-based assistive learning platform that integrates speech-to-text, text-to-speech, and sign language translation technologies. The system reads both verbal and written materials, translating them into animated sign language and providing audio feedback to users with visual impairments. Text analysis relies on Natural Language Processing (NLP) and gesture detection with the help of OpenCV and Media Pipe. To make the communication more engaging, we use PyGame to create animated signs utilizing a set of avatars. With the help of this multimodal solution, accessibility is expected to improve, and the learning environment will become more inclusive. They are scheduled to be enhanced with the support of multiple regional sign languages, further enhancing avatar realism and face expression recognition by AI to capture non-verbal messages effectively.

Keywords—Assistive Learning, Sign Language Interpretation, Accessibility, Speech-to-Text, Text-to-Speech, NLP, Inclusive Education

:: PAPER ID: 368 ::

COGNITIVE COMPUTING-BASED FINANCIAL RISK ASSESSMENT FRAMEWORK FOR BANKING

Sonali S. Shrotri

Department of BBA, Indira Institute of Management, Tathwade, Pune

Pratyay Das

Department of Management Studies, Indian Institute of Technology Madras, Chennai, India

Archana Kumari

Department of Management Studies, JIMS Engineering Management Technical Campus, 48/4Knowledge Park III, Greater Noida, India

Indrajeet Singh

Department of Commerce (B.Com Honours), Jims Engineering Management Technical Campus, Greater India

Bhavna Agrawal

Department of Management & Commerce, GNIOT Institute of Professional Studies, Greater Noida, Knowledge Park 2, UP, INDIA

Vimal D. Deokar

Department of Management, Marathwada Institute of Management and Research, Mhada Colony

sonalishrotri@gmail.comOrcid, ms24d023@smail.iitm.ac.in, raj.archana14@gmail.com, indrajeetsingh.gn@jagannath.org, dr.bhavna.aggrawal@gmail.com, deokarvimal@gmail.com

Abstract—In the current state of banking, cyberattacks are frequently carried out, leading to market instability and presenting challenges in the evaluation and management of risks. Such static risk assessment methods, particularly those that rely on time-invariant statistics, are deemed inefficient when applied to real-time data streams and emerging risk factors. Hence, cognitive computing has been considered a plausible way to enhance decision-making in bank risk management. In this book, a new framework is proposed, referred to as the Cognitive Computing-Based Financial Risk Assessment Framework, with a particular emphasis on the banking industry. Through the use of artificial intelligence, natural language processing, and real-time data analytics, the detection of financial risks is intended to be carried out, and actions are planned to mitigate and minimize such risks. Sophisticated risk management methodologies are employed, and structured information, such as financial ratios and transaction histories, is combined and processed together with unstructured information, including news feeds and regulatory reports. Experiments are conducted using real banking data, and the results demonstrate that the accuracy of risk prediction is improved, false alarms are reduced, and assistance is provided for mitigating risks. The cognitive System carries out continuous learning from new information at each moment, and through this learning, flexibility and stability are allowed within financial environments. This paper contributes to the literature of financial risk management by creating a smart, real-time, and data-driven system that is designed to respond to the changing requirements of the banking industry.

Keywords—Cognitive Computing, Financial Risk Assessment, Banking Sector, Machine Learning, Real-Time Analytics, Unstructured Data, Risk Mitigation

:: PAPER ID: 369 ::

NEURAL RADIANCE FIELD RECONSTRUCTION FOR PRESERVING CULTURAL HERITAGE SITES THROUGH IMMERSIVE VIRTUAL EXPERIENCES

Gowtham Raj R

Department of Mechanical Engineering, New Horizon college of engineering, Bangalore, Karnataka, India

P Raj Kumar

Department of Robotics and Automation Dhaanish Ahmed Institute of Technology India

Daniel Das A

Department Of Mechanical Engineering Karpagam Academy Of Higher Education Coimbatore, Tamilnadu, India

Girish H

Electronics and Communication Engineering, Cambridge Institute of Technology, KR Puram, Bengaluru-560036

Vijayavardhana C

Mechanical engineering Dayananda Sagar academy of technology and management Bangalore -82

Rathinavelu V

Department of Mechanical Engineering, Saveetha School of Engineering, Saveetha Institute of Medical and Technical Sciences, SIMATS, Chennai 602105, Tamil Nadu, India

gowthamiitdh19@gmail.com, rajkumarait32@gmail.com, danielamaladas@gmail.com, girish.ece@cambridge.edu.in, vijayavardhanac@yahoo.com, venkisimats@gmail.com

Abstract—Development, environmental degradation, and restricted access pose significant threats to cultural heritage sites. Traditional photogrammetry and laser scanning produce static models with little photorealism and immersion. To address these constraints, this research presents HeritNeRF-BOA, a Neural Radiance Fields-based framework enhanced with the Butterfly Optimization Algorithm (BOA) for improved reconstruction accuracy and efficiency. The suggested BOA dynamically adjusts hyperparameters to balance processing cost and rendering quality, and a NeRF pipeline learns continuous volumetric scene representations to analyze multi-view picture datasets. Our depth priors and illumination-aware regularization reduce discrepancies across various lighting conditions and complex building textures. The proposed HeritNeRF-BOA outperforms baseline NeRF models in terms of visual realism, geometric correctness, and artifact reduction in blocked structures across various historical sites. The reconstructed models can be utilized in virtual reality to explore historical locations realistically. NeRF combined with bio-inspired optimization may aid digital preservation and provide scalable, interactive cultural heritage experiences. Ultimately, the HeritNeRF-BOA demonstrates a novel approach to archiving history and engaging global audiences through dynamic virtual spaces.

Keywords—Neural Radiance Fields (NeRF), Cultural Heritage Preservation, Immersive Virtual Reality (VR), Butterfly Optimization Algorithm (BOA), Photorealistic Reconstruction, 3DScene Representation, Digital Heritage Conservation

::: PAPER ID: 370 :::

SWARM-DRIVEN METAHEURISTICS FOR SCHEDULING SATELLITE CONSTELLATIONS IN LOW-EARTH ORBITAL COMMUNICATION NETWORKS

Gowtham Raj R

Department of Mechanical Engineering, New Horizon college of engineering, Bangalore, Karnataka, India

Jeevakarunya C

Department of Electronics and Communication Engineering, Rathinam Technical Campus, Coimbatore-641021

Meera C

School of Management Studies Karpagam College of Engineering Tamilnadu, India

Bharani B R

Information Science & Engineering, Cambridge Institute of Technology, KR Puram, Bengaluru-560036

Santhosh V

Department of Mechanical Engineering, Karpagam Academy of Higher Education, Coimbatore 641021, Tamil Nadu, India

Rathinavelu V

Department of Mechanical Engineering, Saveetha School of Engineering, Saveetha Institute of Medical and Technical Sciences, SIMATS, Chennai 602105, Tamil Nadu, India.

gowthamiitdh19@gmail.com, karunya89.pse@gmail.com, meera.phd@gmail.com, bharani.ise@cambridge.edu.in, santhosh.velmurugan@kahedu.edu.in, venkisimats@gmail.com

Abstract—The management of communication activities has become increasingly challenging due to the exponential growth in the number of Low-Earth Orbital (LEO) satellite constellations. This is due to variations in traffic requirements, orbital patterns, and limitations on available bandwidth. In distributed networks of this type, conventional deterministic methods are not particularly effective in load balancing, reducing latency, and maximizing connectivity utilization. To address this issue, it utilizes Swarm-Driven Metaheuristic Scheduling (SDMS) to simplify communication between satellites and ground stations. The Self-Organizing Distributed Management System (SDMS) utilizes Adaptive Ant Colony Search (AACS) and Particle Swarm Optimization (PSO) to perform a hybrid exploration-exploitation approach. This indicates that scheduling can rearrange the sequence of jobs in real time in response to fluctuations in orbital parameters and sudden spikes in demand. When it comes to large low Earth orbit (LEO) constellations, simulation trials show that SDM Suses 15% less energy, is 18% faster, and has 21% less delay from start to finish than ordinary heuristics and standalone metaheuristics. According to the research findings, swarm-based scheduling algorithms should be incorporated into future satellite networks that are scalable and have long-term operational capabilities. The concept proposes a dependable method for automatically and in real-time distributing resources for the construction of LEO infrastructures.

Keywords—Swarm Intelligence, Metaheuristics, Low-Earth Orbit (LEO), Satellite Scheduling, Communication Networks

::: PAPER ID: 371 :::

DOMINATING SETS AND INFLUENCE MEASURES IN CO-AUTHORSHIP GRAPHS

Anitha M, Yegnanarayanan Venkataraman

Department of Mathematics Kalasalingam Academy of Research and Education, Krishnankoil, Tamil Nadu, India

m.anitha@klu.ac.in, prof.yegna@gmail.com

Abstract—The paper discusses the structural characteristics of a graph of collaboration constructed based on the network of Rolf Nevanlinna Prize laureate research interaction between 1982 and 2010. Graph construction. The graph has been built with the aid of the Erdos numbers, following a chain of recipients of a prize with Paul Erdos, a coauthor, and with the assistance of data available in the AMS Mathematical Reviews (MR) database. The graph, created using Pajek software to model a network, illustrates the complexity of academic relationships within this elite mathematical group. The purpose of this research is to calculate accurate numbers and forms of structural parameters, such as domination numbers and chromatic numbers. Worthy of mention is that the work is remarkable because of (a) the systematic and exhaustive development of the graph, (b) the use of constructive and innovative approaches to proving to derive the values of the parameters, and (c) the clever usage of the inferences on the background of knowledge exchange and influence in mathematical networks of cooperation.

Keywords—Erdos number, collaboration graph, tuner set, acyclic chromatic number, Dominating set (DS), distance DS, Social Network (SN), Domination Parameter

::: PAPER ID: 372 :::

STOCK MARKET TREND PREDICTION USING LONG SHORT-TERM MEMORY (LSTM) NETWORKS FOR BUSINESS INVESTMENT STRATEGIES

N. Venkatesan

Faculty of Science and Humanities, SRM Institute of Science and Technology, Tiruchirapalli, India

S.S.J Onyx Nathanael Nirmal Raj

School of Arts, Humanities & Management, Jeppiaar University, Chennai

D. Paul Dhinakaran

Department of Commerce, Jayagovind Harigopal Agarwal Agarsen College (Affiliated to University of Madras),
Madhavaram, Chennai, Tamil Nadu, India

M Suresh

Department of Management Studies, SRM Institute of Science and Technology (Deemed to be University),
Tiruchirapalli, India

P. Ashok Kumar

Sri Vasavi College, Erode, India

M Rajalakshmi

Thiru Kolanjiappar Government Arts College, Virudhachalam, India

venkaten5@srmist.edu.in, dronyx77@gmail.com, pauldthinakaranboss@gmail.com, saytodrsuresh@gmail.com,
ashokg224@gmail.com, paulrajalakshmi@gmail.com

Abstract—only for the stock market, investment strategies are created, and it is very critical to predict. Because the accurate forecasting of the market is very important in this trend. The complex and time-dependent nature of financial data was a struggle for most of the nonlinear statistical models. The article discussed one particular kind of recurrent neural network (RNN), the LSTM networks, which predict stock market trends. It also aims to offer data-based investment suggestions for business use. By analysing the stock trends, the LSTM model in this paper tries to make predictions by analysing stock trends. It uses a broad set of past stock prices, technical indicators, social media analytics, and news data. By using the key stock market indices, the model was trained, and it was evaluated based on accuracy, precision, recall, and mean-squared error (MSE). The LSTM model performed well at capturing long-term patterns and gave more accurate long-term predictions compared to other models like ARIMA and SVM. These results highlight how novel learning systems can contribute to optimising the operational strategies of financial analysts and investors. The paper similarly entertains and gives new insight into LSTM-based models in automated trading systems and investment portfolios, shedding light on proprietary investing opportunities.

Keywords—Stock Market Prediction, LSTM Networks, Investment Strategies, Time Series Forecasting

::: PAPER ID: 373 :::

MULTI-OBJECTIVE OPTIMAL PLANNING OF DG AND FACTS IN RADIAL DISTRIBUTION SYSTEMS VIA ARITHMETIC OPTIMIZATION ALGORITHM

Shridevi Akkewar, Rajendra Dhatrak

Department of Electrical and Electronics Engineering, RCERT, Chandrapur, India

shrideviakkewar@gmail.com, rkdhattrak@gmail.com

Abstract—Modern radial distribution systems must adapt to new planning requirements brought about by the increasing usage of renewable-based distributed generation (DG) and the deployment of FACTS devices. Conventional planning methods, however, often overlook the nonlinear trade-offs that exist among reducing investment costs, enhancing the voltage profile, and minimizing power loss. This study's overarching objective is to provide a solid optimization methodology for radial network DG and FACTS device placement and sizing with respect to several objectives. The specific aims are to reduce active power losses, improve system voltage stability, and lower overall operating costs. Optimal solutions are explored within technological and economic restrictions using the Arithmetic Optimization Algorithm (AOA), a current metaheuristic. A forward/backward sweep load flow study is combined with the AOA search method to assess candidate solutions across several objectives. The methodology is validated using the IEEE 69-busradial distribution feeder dataset (Figshare), which is a standard benchmark for distribution system planning research. Simulation findings on this feeder indicate that the AOA-based framework significantly reduces power losses and improves voltage stability indices compared to traditional metaheuristics, such as GA, PSO, and GWO. Furthermore, Pareto front analysis demonstrates superior trade-off handling between technical and economic objectives. The study concludes that the AOA-driven multi-objective planning technique provides an efficient and scalable solution for integrating DG and FACTS in radial distribution systems, delivering practical benefits for utilities and distribution planners.

Keywords—Renewable energy sources, Power distribution networks, Reinforcement learning, Energy management systems, Smart grids

::: PAPER ID: 374 :::

OPTIMIZING IoV CLOUD TRUST WITH ADAPTIVE BLOCKCHAIN AND REINFORCEMENT LEARNING

Francis Shamili S, Gopi R

Faculty of Computer Science & Engineering, Dhanalakshmi Srinivasan Engineering College Perambalur, Tamilnadu, India

francisshamili.s@dsengg.ac.in, gopi.r@dsengg.ac.in

Abstract—With the use of public internet connections, vehicles fitted with sensors can exchange data with each other through the Internet of Vehicles (IoV), a subnetwork of the broader Internet of Things (IoT). The complex challenges of securing IoV environments from diverse attackers necessitate exploring alternative security and trust evaluation systems. Traditional approaches have been employed, but innovative solutions are imperative. Amid these challenges, a novel approach, Trustopt-IoV, is presented to enhance trust in IoV cloud environments by leveraging adaptive blockchain consensus and the Deep Reinforcement Learning (DRL) technique. TrustOpt-IoV enables decentralized, transparent, and immutable data transfer between automobiles and cloud services, leveraging blockchain technology. Adaptive approaches adjust consensus procedures based on network conditions and security issues. DRL learns and responds to vehicle behavior, communication patterns, and threats to optimize trust management in real time. Data is either dumped or validated by RSUs through vehicle interfaces using trust metrics and real-time incentives. It is achieved using blockchain-based smart contracts and the tuning of a reinforcement learning agent. TrustOpt-IoV reduces latency by 70%, triples reliable data throughput, and lowers transaction aborts by 91% compared to the Two-Phase Locking protocol, according to experimental results. In terms of scalability, each transaction uses 94% less storage than standard blockchain systems.

Keywords—Internet of Vehicles, Adaptive Blockchain, Deep Reinforcement learning, Cloud trust

::: PAPER ID: 377 :::

DEEP REINFORCEMENT POLICY FOR COORDINATING COOPERATIVE AUTONOMOUS VEHICLES AT HIGHWAY INTERSECTION MERGES

Tanvi Mittal

Common Transactions US Bank Corp Cincinnati, USA

Raunaq Malik

Insurtech Strategy & Analytics Expedia Group Seattle, USA

Siva Sai Krishna Suryadevara

Digital Experience Maganti IT Resources (Client: T.Rowe Price) Fredrick, USA

Reshma Thakkallapelly

Information Technology Elevance Health Dallas, USA

Bala Krishna Rao Guntupalli

Information Technology Department Elevance Health Inc Cincinnati, USA

77tanvi@gmail.com, raunaqmalik108@gmail.com, sivasaikrishna.suryadevara@gmail.com,
reshmarao.t@gmail.com, bala.guntupalli@gmail.com

Abstract—The rapid growth of AVs makes it much harder for drivers to work together safely and efficiently at highway crossings, where merging is already known for causing traffic backups. Traditional rule-based methods that don't consider how AVs interact with each other in real time often generate delays and safety problems. This paper introduces a Deep Reinforcement Policy (DRP) framework that employs deep reinforcement learning to enable real-time cooperative decision-making among autonomous vehicles (AVs). Vehicles in the DRP model employ simulations of past mistakes to create policies that make traffic safer, fairer, and more efficient. Next, it turn the merging process into an optimization problem that involves more than one agent. Simulation tests conducted under real-world highway conditions demonstrate that DRP enhances throughput by 18%, reduces the risk of collisions, and reduces the average merging delay by 24% compared to baseline heuristic approaches. This study demonstrates that deep reinforcement learning can enhance coordination during complex merges, potentially resulting in autonomous traffic systems that are more intelligent, cooperative, and secure.

Keywords—Autonomous Vehicles, Deep Reinforcement Learning, Policy Coordination, Highway Merging, Multi-Agent Systems

::: PAPER ID: 378 :::

ADVERSARIAL ROBUSTNESS MECHANISM FOR SAFEGUARDING BIOMETRIC VERIFICATION ACROSS MOBILE FINANCIAL APPLICATIONS

Mohon Raihan

Department of Information Technology Middle Georgia State University Macon, GA 31206, USA

Muhammad Adnan

Department of Business Analytics Trine University Detroit, MI 4810, USA

Md Jubayr Hossain, Uday Sankar Saha

Department of Management & IT St. Francis College Brooklyn, NY 11201 USA

Kazi Bushra Siddiq

Department of Business Administration International American University Los Angeles, CA 90010, USA

Farhana Karim

Department of Business Administration Southeast Missouri State University Cape Girardeau, Missouri 63701, USA

Sraboni Clara Mohonta

Department of Business Analytics Baruch College New York, NY 10010, USA

mohon.raihan@mga.edu, muhammadadnan441@outlook.com, mhossain8@sfc.edu,
udoy.saha.sfc2026@gmail.com bushrasiddiq.iau@gmail.com, fkarim2s@semo.edu, sraboniclara.m@gmail.com

Abstract—Recent years have seen the rise of adversarial attacks targeting deep learning authentication systems by taking advantage of flaws in these models. While there is some excellent work assessing the probability of adversarial attacks in general, most existing research focuses on specific modules or types of attacks. The paper proposes the Adversarial Robust Biometric Verification (ARBV) Framework, with the primary goal of protecting biometric authentication in mobile banking apps from constantly emerging adversarial threats. ARBV uniquely employs a multitiered defence strategy that integrates the Dynamic Adversarial Feature Selector (DAFS), which adaptively identifies and suppresses adversarial perturbations at the feature representation level using an explainable AI(XAI)- guided instance-wise selection process. This mitigation removes adversarial tuned noise components to minimize overfitting and preserve discriminative biometric characteristics. Complementing DAFS, a Dual Channel Noise Discriminator (DCND) module leverages a hybrid convolutional-recurrent neural network architecture enhanced with temporal attentive gating mechanisms to isolate adversarial noise patterns in real-time, preventing their propagation through the feature extraction layer. The proposed model further incorporates Federated Adversarial Adaptation Learning (FAAL), which federates model updates from distributed mobile devices, allowing for continuous adaptation to novel adversarial signatures. The results demonstrate that ARBV achieves a verification accuracy of up to 98.7 percent, even when subjected to the most sophisticated adversarial attacks, in simulated mobile financial verification scenarios using multimodal biometric datasets.

Keywords—Adversarial Robustness, Biometric Verification, Federated Learning, Explainable Artificial Intelligence (XAI)

::: PAPER ID: 379 :::

CONTINUAL LEARNING PIPELINES FOR DETECTING INSIDER THREATS ACROSS CORPORATE CYBERSECURITY INFRASTRUCTURES

Norun Nabi

Department of Technology and CS University of The Potomac Washington, DC 20005, USA

Md Kazi Tuhin, Md Talha Bin Ansar

Department of Cybersecurity Yeshiva University New York, NY10016, USA

Monjira Bashir, Hasan Imam

School of Business International American University Los Angeles, CA 90010, USA

Khadeza Yesmin Lucky

College of Business Westcliff University Irvine, CA 92614, USA

Mohon Raihan

Department of Information Technology Middle Georgia State University Macon, GA 31206, USA

norunnabinishan@gmail.com, muhammadkazituhin@gmail.com, mtalhabi@mail.yu.edu,
monjiratrisha@gmail.com, hasanimam.iau@gmail.com, k.lucky.446@westcliff.edu, mohon.raihan@mga.edu

Abstract—The ability of authorized users to overcome conventional barriers makes insider assaults a continuous concern for corporate cybersecurity. Static detection systems overlook risks and slow discovery due to changing user behaviors and complicated connection patterns. This study introduces SentiDeep-RL, Deep learning and RL-based sentinel for a real-time adaptive security Framework and an adaptive insider threat detection system. Deep learning models represent behavioral features, while graph neural networks (GNNs) model user-asset interactions. Real-time anomaly detection frameworks identify threats immediately, and reinforcement learning-based adaptive thresholding makes dynamic decisions under uncertain threat conditions in the SentiDeep-RL framework. By monitoring user behaviors, access logs, and network telemetry, the system detects changing insider threat trends without retraining. The SentiDeep-RL method uses incremental model changes and temporal attention. SentiDeep-RL outperforms static models in early threat detection by 12-18% on multi-source corporate datasets that simulate both deliberate and inadvertent insider actions, thereby decreasing false positives while maintaining computational efficiency. Improved performance in dynamic operating situations is achieved through the use of adaptive learning methods and concept drift detection. Deep learning, GNN-based relational modeling, reinforcement learning, and real-time anomaly detection enable this platform to be proactive, scalable, and robust in identifying insider threats. Finally, SentiDeep-RL solves corporate cybersecurity, reaction time, and operational and reputational risks with technology.

Keywords—Insider Threat Detection, Continual Learning, Deep Learning, Graph Neural Networks, Real-Time Anomaly Detection, Reinforcement Learning, Adaptive Security, SentiDeep-RL

::: PAPER ID: 380 :::

ADVANCED REHABILITATION IOT (RIoT) SYSTEM UTILIZING IMAGy MEMS SENSORS AND DEEP LEARNING FOR HAND GESTURE RECOGNITION

Ahmad Anwar Zainuddin, Md Sariful Islam, Mohd Izzudin Mohd Tamrin, Dini Handayani
Kulliyah of Information and Communication technology IUM Gombak, Selangor, Malaysia

Dr Irwandi, Edwar Iswardy
STEM Research Center (STEM.id) Syiah Kuala University Banda Aceh, Indonesia

Saidatul Izyanie Kamarudin
College of Computing, Informatica and Media, Universiti Teknologi MARA (UITM) Shah Alam, Selangor, Malaysia

anwarzain@ium.edu.my, sarif2435@gmail.com, izzuddin@ium.edu.my, dinihandayani@ium.edu.my,
irwandi@usk.ac.id, edwariswardy@usk.ac.id, saidatulizyanie@tmsk.uitm.edu.my

Abstract—The rise in the prevalence of stroke and the neurological conditions has also led to the increasing number of physically disabled persons, which necessitates the necessity to find effective rehabilitation solutions. The traditional rehabilitation procedures provide little monitoring and feedback, which usually results in decreased patient motivation and slower recovery. In this paper, the construction of an Advanced Rehabilitation Internet of Things (RIoT) system combined with MEMS-based hand gesture recognition as a way of enhancing the rehabilitation process. This system uses a one-dimensional Convolutional Neural Network (1D CNN) to identify and recognize hand signals and to classify them in real-time, which gives continuous feedback and remote monitoring with the help of the IoT connection. Acquiring and analyzing data based on MEMS sensors is done by the IMAGy device, which allows one to track the motion of every patient in personalized therapy. The latter enhances the results of rehabilitation, patient engagement, and the number of visits to the hospital due to the availability of data-driven remote therapy.

Keywords—Internet of Things (IoT), Rehabilitation Internet-of-Things (RIoT), MEMS Sensors, Hand Gesture Recognition (HGR), Convolutional Neural Networks (CNNs), IMAGy

::: PAPER ID: 381 :::

GEDW-PPI: GAUSSIAN KERNEL ENHANCED DeepWalk FOR PROTEIN-PROTEIN INTERACTION PREDICTION

Mei-Yuan Cao, Suhaila Zainudin, Kauthar Mohd Daud

Center for Artificial Intelligence Technology (CAIT) Faculty of Information Science and Technology, Universiti
Kebangsaan MalaysiaUKM Bangi, Malaysia

p116930@siswa.ukm.edu.my, suhaila.zainudin@ukm.edu.my, kauthar.md@ukm.edu.my

Abstract—Protein-protein interactions (PPIs) underlie essential cellular processes, yet accurately predicting these interactions remains challenging due to the complex network topology and multifaceted nature of protein relationships. We present GEDW-PPI, integrating Gaussian kernel transformation with network embedding to capture the subtle interaction patterns in PPI networks. Our approach transforms discrete binary relationships into continuous similarity measures, providing a more nuanced representation of protein interaction strengths. Weighted random walks in the embedding process support GEDW-PPI. The random walks preserve direct and indirect relationships in the network structures. We performed experiments on benchmark datasets. The results show that the weighted network structure outperforms the sequence-based and hybrid approaches. These outcomes provide insights into feature engineering advancements in biological networks analysis and ultimately offer a deeper understanding of protein interaction patterns.

Keywords—Protein-Protein Interactions, Gaussian Kernel, DeepWalk, Network embedding

:: PAPER ID: 382 ::

CYBER SECURITY CHALLENGES IN STUDENT DIGITAL LEARNING PLATFORMS

S.Ambika, K. Abirami

School of Computing Sciences, VISTAS, Chennai, India

slambika@yahoo.co.in, abiramidharmarajan@gmail.com

Abstract—Teaching and learning have been revolutionized by digital learning platforms, which offer unparalleled flexibility and access to a wealth of resources. However, cybersecurity threats are increasing as these platforms become more crucial in academic settings. Student data, assessment integrity, and online interactions are the primary targets of hackers. Real-time, complex attacks need a more intelligent and adaptable security strategy than current solutions. Traditional rule-based intrusion detection systems and rudimentary encryption fail to defend digital learning platforms against emerging and dynamic threats effectively. These systems can't identify AI-driven attack strategies or subtle system behavior changes, as learning environments are complex. A robust and adaptable cybersecurity system that can learn from current operations, identify complex attacks in real-time, and respond to emerging weaknesses is urgently needed. The Cyber Secure-Learn Framework (CSL-F) utilizes a Transformer-based Deep Learning Model for Real-Time Behavioral Anomaly Detection to overcome these issues. This approach utilizes the self-attention mechanism of transformers to analyze sequential student interaction data for identifying cyber threat trends. Instead of relying on handcrafted features, the Transformer-based model learns from raw data to identify unique and complex threats, including unauthorized access and online test cheating. Anomaly detection and Quantum-Resistant AES-256Encryption safeguard sensitive student data from traditional and quantum computing-based decryption efforts in the CSL-F. In real-time anomaly detection, CSL-F's transformer-based deep learning model achieves 98.9% accuracy, surpassing established approaches in both speed and precision. AES-256Quantum-Resistant Encryption safeguarded student data 99%under simulated quantum-based decryption attempts. Even though the Transformer model is complex, the system balanced security and performance with just a 4% latency increase, minimizing the effect on real-time instructional operations.

Keywords—Cybersecurity, Digital Learning Platforms, Behavioral Anomaly Detection, Deep Learning Transformer Model, Quantum-Resistant Encryption, Real-Time Threat Detection

:: PAPER ID: 385 ::

TRUST-AWARE FEDERATED LEARNING FOR SECURE LOAN APPROVAL IN PEER-TO-PEER LENDING PLATFORMS

Layla Safwat Jamil

college of agriculture engineering science, university of Baghdad, Iraq

Amjed Sahib Noori Alshami

Ministry of Higher Education & Scientific Research Department of Scholarships & Cultural Relations

Azhaar A. Shalal

Department of Computer Engineering, Al-Shatrah University, Thi-Qar, Iraq

Amjed Abbas Ahmed

Center for Cyber Security, Faculty of Information Science and Technology Universiti Kebangsaan Malaysia,

Department of Computer Techniques Engineering, Imam Alkadhim College (IKC), Baghdad, Iraq

Dena Kadhim Muhsen

Computer Science College, University of Technology - Iraq, 10066 Baghdad

Karrar Abbas Yousif

Escuela Técnica Superior de Ingeniería - Universidad de Sevilla

layla.s@coagri.uobaghdad.edu.iq, Amjed.Sahib@mohers.edu.iq, azhaar.alkhafaji@shu.edu.iq,
amjedabbas@alkadhim-col.edu.iq, dena.k.muhsen@uotechnology.edu.iq, karyou@alum.us.es

Abstract—P2P lending platforms have changed the way financial services work by allowing borrowers and lenders to deal directly with each other, eliminating the need for traditional banking systems. Using machine learning to automatically approve loans has made these decentralized arrangements even more efficient and easy to use. But there are big flaws with the way federated and centralized learning works right now. For example, data privacy issues, being open to hostile inputs, and making wrong decisions because of biased or untrustworthy data sources. These flaws put the safety and fairness of the loan approval process at risk. T-FedLoan is our answer to these difficulties. Aware Federated Learning Framework for Secure Loan Approval in Peer-to-Peer Lending Platforms. This framework has a dynamic trust evaluation method that looks at the past actions, data quality, and consistency of peers to see how reliable they are. In an improved federated averaging method (TA-FedAvg), each participant's model update is given a weight based on how much they trust it. This method uses trust scores. Safe aggregation techniques are used to make sure that data stays private and is protected from attacks. The proposed T-FedLoan technique allows decentralized model training while filtering out contributors with low trust or malicious intent. This improves the accuracy and fairness of loan approval decisions without revealing sensitive financial information. Experimental results on simulated P2P loan datasets indicate that T-FedLoan significantly enhances model accuracy, fairness, and durability in comparison to conventional federated learning methods. The results show that T-FedLoan is a safe and reliable platform for decentralized financial services in the future.

Keywords—Protecting privacy, being strong against attacks, making sure loans are safe, federated learning, and peer-to-peer lending

::: PAPER ID: 386 :::

EDUCATION ASSESSMENT FOR AI-SUPPORTED PERSONALIZATION IN MOBILE APPLICATION DEVELOPMENT

Mohammad Salim

Faculty of Applied Science, Tishk International University, Erbil, Iraq

Nazhatul Hafizah Kamarudin

Faculty of Information Science and Technology Universiti Kebangsaan Malaysia Bangi, Selangor 43600, Malaysia

mhmadip@gmail.com, nazhatulhafizah@ukm.edu.my

Abstract—The increasing complexity of mobile application development poses significant learning challenges for students. This paper investigates the potential of Generative Artificial Intelligence (GAI) to create personalized learning experiences within this domain. A mixed-methods study is conducted, surveying 36 third-year Information Technology students enrolled in a mobile application development course to identify their primary learning difficulties, preferred educational resources, and current engagement with AI tools. The results identified syntax mastery, correct widget usage, and debugging as the most prevalent challenges. While quantitative analysis, including chi-square tests (χ^2) and correlation analysis (r), did not yield statistically significant associations, qualitative feedback revealed a strong student interest in and positive perception of AI-driven learning aids. This study provides crucial preliminary insights, mapping common student hurdles to specific opportunities for GAI intervention, and serves as a foundational study for the future design and evaluation of AI-powered tools in software education.

Keywords—Personalized Learning, Mobile Application Development, Software Education, Generative Artificial Intelligence

::: PAPER ID: 387 :::

ENHANCED PREDICTIVE PIXEL DEVIATION FRAME GUIDED HYBRID EDGE-BASED IMAGE STEGANOGRAPHY FOR HIGH CAPACITY AND IMPERCEPTIBILITY

A F M Zainul Abadin, Rossilawati Sulaiman, Mohammad Kamrul Hasan

Center for Cyber Security, Faculty of Information Science and Technology Universiti Kebangsaan Malaysia Bangi, Selangor, 43600, Malaysia

abadin.7@gmail.com, rossilawati@ukm.edu.my, mkhasan@ukm.edu.my

Abstract—Image steganography has been widely explored as a secure communication technique. However, previous techniques have intrinsic constraints between payload capability, imperceptibility, and resistance to steganalysis. Most edge-based methods achieve good imperceptibility by embedding in high-frequency regions, but often suffer from limited payload and vulnerability to noise or filtering attacks. Conversely, non-edge embedding techniques provide higher capacity but compromise visual quality and statistical detectability. To address these limitations, this paper introduces an Enhanced Predictive Pixel Deviation Frame Guided Hybrid Edge-Based Image Steganography (ePPDFHES) framework. The method begins with preprocessing the color cover image through ePPDF to identify suitable embedding zones. A hybrid approach, combining Canny, Laplacian of Gaussian (LoG), and Prewitt detectors, is then applied to increase reliable edge pixels. A novel embedding algorithm utilizes the red channel, guided by both edge and non-edged pixel references, to achieve high payload capacity while preserving imperceptibility. Experimental results show that the suggested system increases the edge area 5.75 times compared to a single (Canny) detector and leads to a higher payload capacity. At the same time, a PSNR value of 64.93 dB with a payload rate of 0.125 bpp, SSIM, NCC, and UIQI values are very close to 1.0, confirming the system's outperformance. The robustness of the system against steganalysis is further validated by analyzing the histogram plotting, entropy, and Chi-square statistics of the cover and stego images. The results establish ePPDF-HES as an outperformed, balanced, and resilient solution for secure data hiding.

Keywords—Image steganography, enhanced predictive pixel deviation frame (ePPDF), hybrid edge detection, data hiding capacity, robustness analysis

::: PAPER ID: 389 :::

YOLO-LSTM ENABLED SLEEPING DISORDER MONITORING SYSTEM

Yicheng Liu and Mohammad Kamrul Hasan

Faculty of Information Science and Technology, Universiti Kebangsaan Malaysia, 43600 Bangi, Malaysia

A191653@siswa.ukm.edu.my, mkhasan@ukm.edu.my

Abstract—Sleep monitoring is crucial for evaluating sleep disorders and assessing overall brain, lung, and heart health. This thesis presents a comprehensive approach to sleep state recognition through improved deep learning models and a user-friendly system interface. In the first part, the authors enhance the YOLOv8 object detection model by incorporating a Visual Transformer (ViT) module to improve sleep type classification accuracy. The improved YOLOv8-ViT model demonstrates superior performance over the original YOLOv8 across various evaluation metrics, particularly in mAP50 and mAP50-95 scores for different sleep stages. The model is trained and validated on sleep-related datasets with physiological signals, and the experimental results highlight significant improvements in detection accuracy and robustness. Meanwhile, the authors introduce a sleep stage recognition system based on heart rate data using an LSTM model in the second part. The LSTM model effectively captures long-term dependencies in time-series heartrate data and achieves high accuracy in classifying different sleep stages. The experimental results validate the model's effectiveness in distinguishing between various sleep stages with minimal misclassifications. Finally, the authors develop a sleep stage recognition system using PyQT, which integrates the improved YOLOv8 model and LSTM model into a simple yet powerful user interface. The system allows users to upload images or videos for sleep stage detection and provides detailed results including location and confidence. Functional testing of the system demonstrates its excellent performance in sleep stage detection tasks, proving its feasibility and reliability in practical applications. Overall, this research offers a promising solution for sleep stage recognition, combining advanced deep learning techniques with an intuitive user interface to meet the needs of sleep research and health monitoring.

Keywords—Sleeping, disorder, monitoring, system

::: PAPER ID: 398 :::

DISTRIBUTED SMART STREET LIGHTING: A CASE STUDY WITH PREDICTIVE CONTROL WITH HETEROGENEOUS ROAD TRAFFIC

Pei Zhen Lee

Faculty of Computer Science and Information Technology University Malaysia Sarawak (UNIMAS)94300, Kota Samarahan, Sarawak, Malaysia

Sei Ping Lau, Chong Eng Tan

Institute of Social Informatics and Technological Innovations 2, 3University Malaysia Sarawak (UNIMAS)94300, Kota Samarahan, Sarawak, Malaysia

18020071@siswa.unimas.my, splau@unimas.my, cetan@unimas.my

Abstract—The network performance and reliability in a distributed networked street lighting scheme – TALiSMaN, is crucial for its seamless operation. However, TALiSMaN shows notable packet drops during road traffic rush hour. The occurrence of packet drops is notably higher in specific network topologies. Different network topologies have other distribution structures of the streetlights. When the arrangement of streetlights is closer together, an increment of packet drops might occur. The occurrence of packet drops in a real-time application may cause operational failure. A potential solution is implementing a forecasting model into TALiSMaN to learn and adapt to real-time road traffic scenarios to allow the system to control packet broadcasting for different road junctions. This paper describes a predictive control networked street lighting scheme that can dynamically observe and anticipate incoming road traffic patterns to control illumination levels under two network topologies. Although the proposed scheme has increased energy usage, it reduces the packet drops for both linear and cross-junction topologies with an average of 0.01 – 5.63% and 0.04 – 6.28%, respectively, while improving streetlight usefulness. Due to the design, the proposed scheme requires 1.7 – 12.7 times more energy compared to TALiSMaN.

Keywords—Smart Networked Street light, Streetlight, Prediction Control, Multi-hop Wireless Sensor Network

::: PAPER ID: 415 :::

PANTUN BERMUKUN SARAWAK: AUTOMATED PANTUN REPLY GENERATION USING FUZZY N-gram SIMILARITY

Mohammad bin Hossin, Hamizan Binti Sharbini

Faculty of Computer Science and Information Technology Universiti Malaysia Sarawak (UNIMAS) 94300 Kota Samarahan, Sarawak

Fatimah Binti Subet

Faculty of Language, Education and Communication Universiti Malaysia Sarawak (UNIMAS) 94300 Kota Samarahan, Sarawak

hmohamma@unimas.my, sfatimah@unimas.my, shamizan@unimas.my

Abstract—Pantun bermukun, an interactive oral poetry tradition of the Sarawak Malay community, is under threat due to declining practice and the lack of dialogic paired pantun data. Existing collections predominantly consist of single-verse pantun, impeding both digital preservation and computational analysis. This paper proposes an automated reply selection method that utilises N-gram similarity, augmented with fuzzy matching and Levenshtein distance, to identify the most appropriate reply-pantun from a dataset of 316 single-verse Pantun Melayu Sarawak (PMS). Evaluation by five subject matter experts (SMEs) on 50 query pantun indicates that the fuzzy matching-enhanced approach outperforms the standard Jaccard coefficient method in generating suitable replies (80.4% vs. 74.8%). The results demonstrate the viability of automated pantun pairing for digital preservation, while also highlighting the limitations of current text similarity measures in handling semantic and culturally nuanced pantun. These findings support the development of computational tools for the documentation and revitalisation of pantun bermukun traditions.

Keywords—n-gram technique, Levenshtein distance, Jaccard coefficient, pantun melayu sarawak, bermukun

::: PAPER ID: 426 :::

DEEP LEARNING FOR WEB PHISHING DETECTION: A COMPARATIVE EVALUATION OF CNN, LSTM, AND GRU

Po Chan Chiu, Yu Heng Liew, Hamizan Sharbini

Faculty of Computer Science and Information Technology Universiti Malaysia Sarawak Kota Samarahan, Sarawak

King Kuok Kuok

Faculty of Engineering, Computing and Science Swinburne University of Technology Sarawak Campus Kuching, Sarawak

pcchiu@unimas.my, 77313@siswa.unimas.my, kkuok@swinburne.edu.my, shamizan@unimas.my

Abstract—Phishing continues to pose a critical challenge in cybersecurity, as attackers deceive users into revealing confidential information through fraudulent web interfaces. Traditional detection methods such as blacklisting and heuristic-based analysis are often limited in adaptability and accuracy against evolving phishing strategies. This study investigates the application of deep learning (DL) models for effective phishing website detection. Three architectures, namely Convolutional Neural Network (CNN), Long Short-Term Memory (LSTM), and Gated Recurrent Unit (GRU) were implemented and evaluated using datasets obtained from PhishTank and the University of California, Berkeley. The data underwent preprocessing, including cleaning, encoding, and reshaping into 3D tensor inputs for model training. Two training strategies, 70/30 data split and K-fold cross-validation, were applied to ensure robustness. Experimental results indicate that the LSTM_Split model achieved the highest accuracy of 90.1%, outperforming the other models, while maintaining consistent F1-Score, Precision, and Recall values. The findings demonstrate the potential of LSTM-based approaches in enhancing phishing detection accuracy and contribute to the development of more adaptive and reliable cybersecurity solutions.

Keywords—Deep learning, CNN, GRU, LSTM, phishing detection

:: PAPER ID: 428 ::

ENSEMBLE FUSION FOR INERTIAL-SENSOR-BASED FIELD HOCKEY ACTIVITY RECOGNITION

Norazman Shahar, Norhana Arsad, Mohd Faisal Ibrahim, Aqilah Baseri Huddin and

Department of Electrical, Electronic and Systems Engineering, Faculty of Engineering and Built Environment, Universiti
Kebangsaan Malaysia (UKM) Selangor, Malaysia

Ahmad Kamal Ariffin Mohd Ihsan

Department of Mechanical and Manufacturing Engineering, Faculty of Engineering and Built Environment, Universiti
Kebangsaan Malaysia (UKM) Selangor, Malaysia

Muhammad Amir As'ari

Department of Biomedical Engineering & Health Sciences, Faculty of Electrical Engineering, Universiti Teknologi
Malaysia (UTM) Johor, Malaysia

norazmanshahar@ukm.edu.my, noa@ukm.edu.my, faisal.ibrahim@ukm.edu.my,
aqilah@ukm.edu.my, kamal3@ukm.edu.my, amir-asari@utm.my

Abstract—Accurate recognition of complex sports movements remains a challenge in human activity recognition (HAR), particularly in field hockey, where overlapping motion patterns complicate classification. This study evaluates the effectiveness of feature selection and ensemble strategies using multi-sensor inertial data to improve recognition robustness and efficiency. Five feature configurations were developed through hybrid pipelines integrating Minimum Redundancy Maximum Relevance (MRMR) and Regularized Neighborhood Component Analysis (RNCA) and evaluated using polynomial support vector machines (SVM) under a leave-one-subject-out (LOSO) cross-validation framework. The findings revealed that all configurations achieved comparable performance, with accuracies between 85.0% and 85.9% and mean F1-scores ranging from 0.736 to 0.757. The most compact configuration (RNCA2) reduced dimensionality by over 80% while maintaining equivalent accuracy. Statistical analyses confirmed that differences among models were not significant. Additionally, an ensemble based on majority voting between the Original and RNCA configurations further improved stability, yielding an accuracy of 0.860 ± 0.146 . These results demonstrate that efficient feature reduction can preserve recognition accuracy, supporting the development of lightweight, subject-independent HAR systems for sports analytics.

Keywords—Accelerometer, Activity recognition, Gyroscope, leave-subject-one-out, support vector machine

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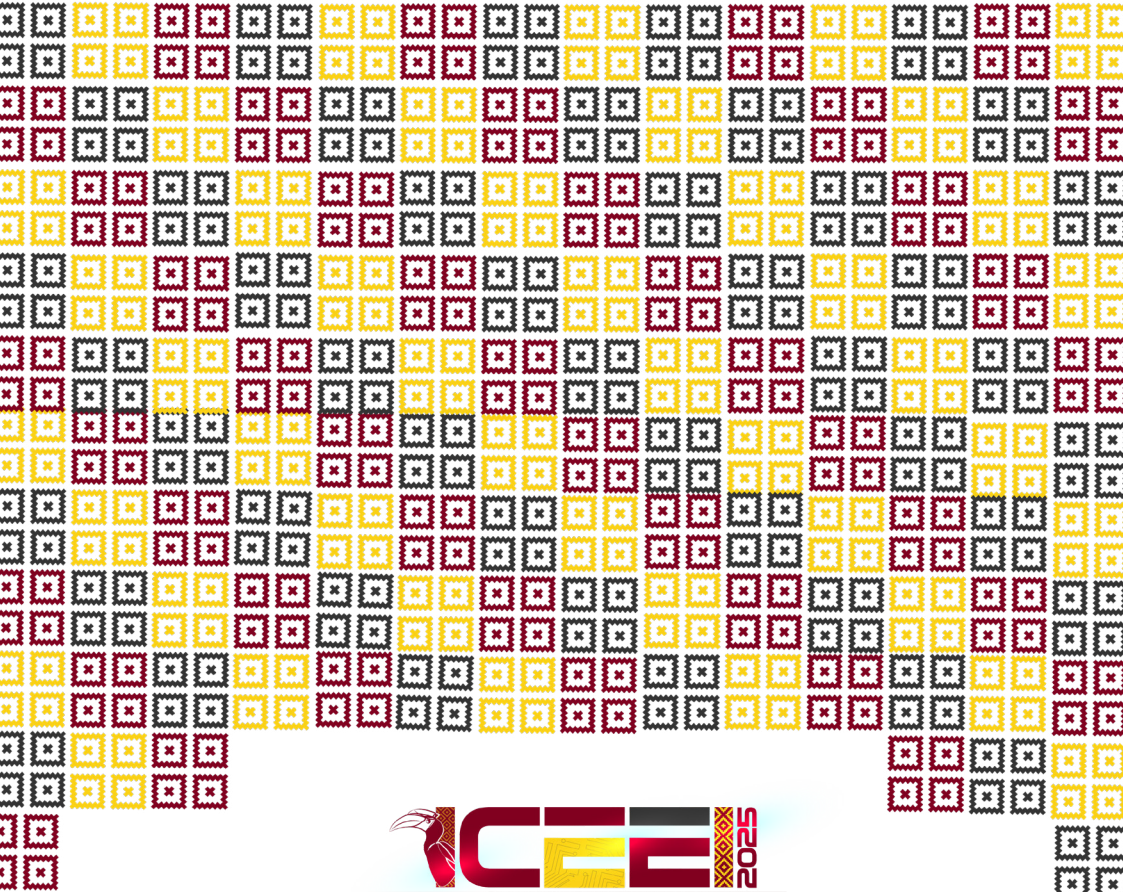


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