

AMICT2023

1ST INTERNATIONAL CONFERENCE ON ADVANCES IN MACHINE INTELLIGENCE & CYBERSECURITY TECHNOLOGIES

11 & 12 December 2023
Kota Kinabalu, Sabah, Malaysia



UMS
UNIVERSITI MALAYSIA SABAH

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WELCOMING MESSAGE



Assalamu'alaikum warahmatullahi wabarakatuh,

A warm welcome to the International Conference on Advances in Machine Intelligence, and Cybersecurity Technologies (AMICT2023).

With great responsibility, it is my pleasure to host our very own first conference organized by the Faculty of Computing and Informatics (FCI) at Universiti Malaysia Sabah and co-organized by the Japan Advanced Institute of Science and Technology (JAIST), Ishikawa, Japan. Hence, I welcome all presenters, participants, eminent speakers, and guests from every nation to this conference that contribute to the UN Sustainable Development Goals (SDGs).

The conference will provide an excellent platform for knowledge exchange between academics, scientists, researchers, and industrialists from all around the world for knowledge sharing, exchange of ideas, and to present research findings in all aspects of Computing for Sustainable Development that are in line with UN Sustainable Development Goals (SDGs) and its related fields for future technology.

In closing, I would like to express my deepest appreciation to all keynote speakers, industrial invited speaker, organization committee, authors, presenters and reviewers, for your support and contribution. Special thank you to CWORKS and UNCLE BOB for sponsoring our conference. I am sincerely thankful.

Best regards,

Assoc. Prof. Ts. Dr. Samsul Ariffin Abdul Karim
AMICT2023 Chairman

ABOUT AMICT

Faculty of Computing and Informatics, Universiti Malaysia Sabah is organizing the 2023 International Conference on Advances in Machine Intelligence, and Cybersecurity Technologies (AMICT2023), co-organized by the Japan Advanced Institute of Science and Technology (JAIST), Ishikawa, Japan, which will be held virtually at Kota Kinabalu, Sabah, Malaysia from 11 to 12 December 2023.

AMICT2023 aims to bring together researchers, professionals, and practitioners from the field of computer science and computational intelligence to explore the integration of complex systems theory and sustainable computing. The conference will provide a platform for sharing novel ideas, presenting state-of-the-art research, and discussing innovative solutions to address the challenges in Machine Intelligence, and Cybersecurity Technologies and Advances in Computing for sustainability development in embracing IR4.0 and IR5.0 and contributing towards United Nation's Sustainability Development Goals (SDGs) i.e., SDG No. 9: Industry, Innovation and Infrastructure, SDG No. 11: Sustainable Cities and Communities and SDG No 4: Quality Education. Authors are invited to submit original, unpublished papers on all aspects of Advances in Machine Intelligence, and Cybersecurity Technologies. Topics include but not limited to Advanced Machine Intelligence and Cybersecurity Technologies.

ORGANIZATION COMMITTEE

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Dr. Chin Pei Yee
Mrs. Diana Kimmuan

LOGISTICS

Mrs. Molly Donna Awang Sham
Mrs. Roslinahwati Abdul Razak

PROGRAMME BOOK

Dr. Florence Sia Fui Sze
Dr. Ervin Gubin Moug
Dr. Tamrin Amboala

HEALTH AND SAFETY

Mr. Saidin Bin Ahmad
Mr. Leopold Modies Falix

REVIEWERS

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Chan Weng Howe	Universiti Teknologi Malaysia
Zaidatol Haslinda Abdullah Sani	Universiti Malaysia Sabah

KEYNOTE SPEAKERS



KEYNOTE SPEAKER 1

PROFESSOR DR HIROYUKI IIDA

Trustee and the Vice President of educational and student affairs with the Japan Advanced Institute of Science and Technology (JAIST)

Hiroyuki Iida received the Ph.D. degree in heuristic theories of game tree search from the Tokyo University of Agriculture and Technology, Tokyo, in 1994. He was affiliated with Shizuoka University, Hamamatsu, and a Guest Researcher with Maastricht University. He is currently a Japanese Computer Scientist and a Computer Game Researcher with a focus on game refinement theory, opponent-model search, and computer shogi. He is also the Trustee and the Vice President of educational and student affairs with the Japan Advanced Institute of Science and Technology (JAIST), and Head of the Iida Laboratory. He is a professional 7-dan shogi player, a coauthor of the shogi program TACOS, and a four-time gold medal winner at the Computer Olympiad. His research interests include artificial intelligence, game informatics, game theory, mathematical models, search algorithms, game refinement theory, game tree search, and entertainment science



KEYNOTE SPEAKER 2

PROFESSOR DR ANAND J KULKARNI

Research Professor & Associate Director Institute of Artificial Intelligence MIT World Peace University

Anand J Kulkarni holds a PhD in Artificial Intelligence (AI) based Distributed Optimization from Nanyang Technological University, Singapore, MS in AI from University of Regina, Canada, Bachelor of Mechanical Engineering from Shivaji University, India and Diploma from the Board of Technical Education, Mumbai. He worked as Postdoctoral Research Fellow at Odette School of Business, University of Windsor, Canada. Anand worked with Symbiosis International University, Pune, India for over six years. He is currently working as Research Professor and Associate Director of the Institute of Artificial Intelligence at the MITWPU, Pune, India. His research interests include AI based Nature Inspired optimization algorithms, and self-organizing systems. Anand pioneered optimization methodologies such as Cohort Intelligence, Ideology Algorithm, Expectation Algorithm, and Socio Evolution & Learning Optimization Algorithm. Anand is the founder of OAT Research Lab and has published over 70 research papers in peer-reviewed reputed journals, chapters and conferences along with 6 authored and 12 edited books. Anand is the lead series editor for Springer and Taylor & Francis as well as editor of several Elsevier journals. He also writes on AI in several newspapers and magazines. Anand has delivered expert research talks in countries such as the USA, Canada, Singapore, Malaysia, India, Australia, Dubai and France.



KEYNOTE SPEAKER 3

DATO' TS. DR HAJI AMIRUDIN ABDUL WAHAB CEO Cybersecurity Malaysia

DATO' TS. DR HAJI AMIRUDIN ABDUL WAHAB FASc ("Dato' Ts. Dr. Amir") is the Chief Executive Officer of CyberSecurity Malaysia - a cybersecurity specialist and technical agency that monitors e-sovereignty of the country. He has more than 30 years of ICT working experience in the telecom and IT sector in both public as well as private sectors. Dato' Ts. Dr. Amir holds a Doctor of Philosophy (PhD) from School of Information Technology & Electrical Engineering (ITEE), University of Queensland, Australia; Master's in Business Administration (MBA) University of Duquabue, Iowa, USA; Master's in information technology, National University of Malaysia (UKM) and a Bachelor of Science Engineering in Electrical Engineering from University of Michigan, Ann Arbor, USA. Under his leadership in CyberSecurity Malaysia, Dato' Ts. Dr. Amir contributed to the Malaysia's achievement in attaining top 10 world ranking at the International Telecom Union (ITU) Global Cyber Security Index Studies. CyberSecurity Malaysia was awarded 'Best Cyber Security Innovation Award' 2015 by FireEye Global; conferred a 'Winner of World Summit of the Information Society (WSIS) Prizes' 2020 and won 'Champion Prizes' for two consecutive years in 2016 and 2017. Dato' Ts. Dr. Amir is an Adjunct Professor at various institutions of higher learning in Malaysia, namely the International Islamic University of Malaysia (UIAM), Universiti Kebangsaan Malaysia (UKM), Universiti Utara Malaysia (UUM), University Teknologi Malaysia (UTM, KL), Universiti Teknologi Petronas (UTP), Universiti Teknologi MARA (UiTM), Kolej Poly-Tech MARA, UNITAR International University and Swinburne University of Technology Sarawak. He also serves as Board of Studies Member at Universiti Teknologi Petronas (UTP), University Malaya (UM), Universiti Putra Malaysia (UPM) and hold Professorial Chair of Cybersecurity, Faculty of Computing and Digital Technology, HELP University since January 2022.

INDUSTRIAL SPEAKER



INDUSTRIAL INVITED SPEAKER

DR. ABDUL RANI ACHMED

Founder and CEO of CWORKS Group of Companies

Dr. Abdul Rani Achmed is a founder and CEO of CWORKS Group of Companies. Dr. Abdul Rani Achmed holds a Doctor of Philosophy (PhD) in Engineering from University Technology Malaysia; Master of Science in Engineering Business Management, Warwick University; and a Bachelor of Science in Electrical Engineering, Purdue University, West Lafayette. Under his leadership in CWORKS Group as CEO, Dr. Abdul Rani Achmed contributed to the listed on the MESDAQ market of Bursa Malaysia, listed on Deloitte-Touche Technology Fast500 – Asia Pacific, Win MSC-Apicta Best General Application Award, be recognized as ASEAN SME in the US, be recognized with MITI's industry excellence awards. Besides, Dr. Abdul Rani Achmed has led the successful development of the National Construction Industry Material Price Index and was a winner, with collaborators, of Bronze Medal at InTEX22 for the invention of Automated Medical Device Risk Prioritizer. Dr. Abdul Rani Achmed is a navigation engineer for the search and recovery of silver bullions from WWII sunken ship in Oma, has implemented Computerised Management Information System (CMIS) for hospital support services at 72 government hospitals simultaneously and first Johnson Control's National Call Centre outside the US. Dr. Abdul Rani Achmed won Johnson Controls Worldwide Merit Awards. He also serves as member of Master Builder Association Malaysia (MBAM), Malaysian Asset and Project Management Association (MAPMA), ISO Technical Committee 267 for ISO 41000 - Facility Management and MOSTI Science Fund. Dr. Abdul Rani Achmed is a technopreneur mentorship for Malaysian Digital Economy Corporation and Malaysian Technology Development Corporation.

CONFERENCE PROGRAM

11 December 2023 (Monday)	
8.00 – 8.40	Registration
8.50 – 9.00	Sponsor Video
9.00 – 9.15	Doa Recitation/AMICT Opening Ceremony by Chairman
9.15 – 9.25	Opening Speech by Vice Chansellor (Video)
9.25 – 9.30	Best Paper Award Best Reviewer Award Best Presenter Award
9.30 – 9.40	UMS and FCI Video Showcase / HSE Video
9.40 – 10.00	Photo Session
10.00 – 11.00	Keynote Speaker 1 Professor Dr. Hiroyuki Iida <i>Gravity in mind theory – Paradigm shift from motion of objects to motion of things.</i>
11.00 – 11.30	Short Break
11.30 – 13.00	Session A
13.00 – 14.00	Lunch Break
14.00 – 15.00	Keynote Speaker 2 Professor Dr. Anand J Kulkarni <i>Socio-inspired Optimization Algorithms</i>
15.00 – 15.10	Short Break
15.10 – 17.00	Session B
12 December 2023 (Tuesday)	
8.00 – 8.40	Registration
8.40 – 9.00	HSE Video / Sponsor Video
9.00 – 10.00	Keynote Speaker 3 Dato' Ts. Dr. Haji Amirudin Abdul Wahab <i>Artificial Intelligence: A Bane or Boon to Cybersecurity</i>
10.00 – 11.00	Industrial Invited Speaker Dr. Abdul Rani Achmed <i>An Asset Risk Register Case Study</i>
11.00 – 11.10	Short Break
11.10 – 13.00	Session C
13.00 – 14.00	Lunch Break
14.00 – 16.00	Session D
16.00 – 16.30	Closing Ceremony - Closing speech by TNCPI (Video)

Note: Maximum 15 minutes per presentation – 10 minutes for presentation & 5 minutes for Q&A.

SPEAKER PROGRAM

Keynote 1 11 Dec 2023 (Monday) 10.00 AM – 11.00 AM
Chairperson: Dr. Ervin Gubin Moug
Professor Dr. Hiroyuki Iida Gravity in mind theory – Paradigm shift from motion of objects to motion of things.
Keynote 2 11 Dec 2023 (Monday) 14.00 PM – 15.00 PM
Chairperson: A.P. Ts. Dr. Samsul Ariffin Abdul Karim
Professor Dr. Anand J Kulkarni <i>Socio-inspired Optimization Algorithms.</i>
Keynote 3 12 Dec 2023 (Tuesday) 9.00 AM – 10.00 AM
Chairperson: Dr. Lai Po Hung
Dato' Ts. Dr. Haji Amirudin Abdul Wahab <i>Artificial Intelligence: A Bane or Boon to Cybersecurity</i>
Industrial Invited Speaker 12 Dec 2023 (Tuesday) 10.00 AM – 11.00 AM
Chairperson: Ts. Nordin Saad
Dr. Abdul Rani Achmed <i>An Asset Risk Register Case Study</i>

TECHNICAL PROGRAM

Session A: 11 Dec 2023 (Monday) 11.30 AM – 13.00 PM		
Session Chair: Dr. Salmah Fattah		
Paper ID	Paper Title	Author
2	A Method of Cover Audio Selection for Embedding Based on Various Criteria	Muhammad Harith Noor Azam, Farida Ridzuan , M Norazizi Sham Mohd Sayuti, Ah Azni, Sakinah Ali Pitchay and Najwa Hayaati Mohd Alwi <i>Universiti Sains Islam Malaysia</i>
4	Early Explorations using KNN to Classify Emotions in Virtual Reality based on Heart Rate (HR) and Electrodermography (EDG)	Aaron Frederick Bulagang , James Mountstephens and Jason Teo <i>Universiti Malaysia Sabah</i>
8	COVID-19 Detection using Deep Learning Classifiers with Histogram Equalization and Contour-Based X-Ray Images	Mohd Hanafi Ahmad Hijazi, Nur Dinie Balqis Abdul Yazid and Puteri Nor Ellyza Nohuddin <i>Universiti Malaysia Sabah</i>
15	Secure-Tech Triad Enhancing Electronic Voting System Security through Integrated Blockchain, AI, and IoT Technologies	Uzma Jafar, Mohd Juzaidin Ab Aziz, Zarina Shukur and Hafiz Adnan Hussain <i>Universiti Kebangsaan Malaysia</i>
20	Preliminary Mobile Beacon Application Framework for Higher Education Co-Curricular Engagement	Nurul Aida Mohamed Noor, Mohammad Fadhli Asli , Jackel Vui Lung Chew and Nurfadhlina Mohd Sharef <i>Universiti Malaysia Sabah</i>
27	Preliminary Emotion-Based Model for Realistic 3D Animation	Noorsyuhada Azlan , Mohammad Fadhli Asli and Muzaffar Hamzah <i>Universiti Malaysia Sabah</i>

Session B: 11 Dec 2023 (Monday) 15.10 PM – 17.00 PM		
Session Chair: Dr. Tamrin Amboala		
Paper ID	Paper Title	Author
6	Bearing Health Evaluation Model using Segmentive Technique and Cosine KNN in Different Loading Situations	Jee Siang Yap , Meng Hee Lim and M. Salman Leong <i>Universiti Teknologi Malaysia</i>
9	Detecting And Recognizing Seven Segment Digits Using A Deep Learning Approach	Loi Ming Low, Faridah Hani Mohd Salleh , Yi Feng Law and Nor Zaity Zakaria <i>Universiti Tenaga Nasional</i>

16	A Comparative Evaluation on Data Transformation Approach for Artificial Speech Detection	Choon Beng Tan and Mohd Hanafi Ahmad Hijazi <i>Universiti Malaysia Sabah</i>
26	Agri-Water: An IoT-based System for Sustainable Agriculture	Muhammad Azamuddin Adli Hanafi, Salmah Fattah , Asni Tahir, Siti Hasnah Tanalol and Hassan Jamil Syed <i>Universiti Malaysia Sabah</i>
14	Research on the Evaluation of Teaching Quality in MOOC Based on the AHP Fuzzy Integrated Evaluation Method	Wu Yangbo, Ng Giap weng and Lin Ying <i>Universiti Malaysia Sabah</i>
22	Extraction of Association Rules from Cancer Patient's Records using F-P Growth Algorithm	Razan Algilane , Mohammed Khalil, Ashraf Ibrahim and Salih Hassan Babiker <i>Universiti Malaysia Sabah</i>
7	Certificate Authority Capacity and Digital Signature Market Demand in Promoting Interoperability in Malaysia.	Azni Haslizan Abhalim , Farida Mohd Ridzuan, Najwa Hayaati Mohd Alwi, Sakinah Ali Pitchay, Mazihtusima Ishak and Rozlinda Radzali <i>Universiti Sains Islam Malaysia</i>

Session C: 12 Dec 2023 (Tuesday) 11.10 AM – 13.00 PM		
Session Chair: Dr. Ashraf Osman Ibrahim Elsayed		
Paper ID	Paper Title	Author
5	A CNN Plastic Detection Model for Embedded Platform on ROV	Anis Rashidah Aminurrashid and M Norazizi Sham Mohd Sayuti <i>Universiti Sains Islam Malaysia</i>
18	Cocoa Diseases Classification using Deep Learning Algorithm	Soh Ker Sing, Ervin Moung, Ali Farzamnia and John Julius Danker Khoo <i>Universiti Malaysia Sabah</i>
25	Detection of Botnet in the IoT Network	Syeda Lamiya Mumtaz, Hassan Jamil Syed , Ayman Al-Ani, Ahmed K. Al-Ani, Salmah Fatah and Azeem Khan <i>Universiti Malaysia Sabah</i>
28	Virtual Reality and Emotional Responses: A Comprehensive Literature Review on Theories, Frameworks, and Research Gaps	Hariyady, Ag Asri Ag Ibrahim, Jason Teo, Wildan Suharso, Muhammad Balya Firjaun Barlaman, Muhammad Aulanas Bitaqwa, Ng Giap Weng, Azhana Ahmad, Fouziah Md Yassin and Carolyn Salimun

		<i>Universiti Malaysia Sabah</i>
12	Enhanced Bearing Fault Analysis under Inconstant Loads Conditions by Cosine Weighted K-Nearest Neighbours Model	Jee Siang Yap , Meng Hee Lim and M. Salman Leong <i>Universiti Teknologi Malaysia</i>
29	A Survey on Vehicular Traffic Flow Anomaly Detection Using Machine Learning	Jackel Vui Lung Chew and Mohammad Fadhli Asli <i>Universiti Malaysia Sabah</i>

Session D: 12 Dec 2023 (Tuesday) 14.00 PM – 16.00 PM

Session Chair: Puan Shaliza Hayati A. Wahab

Paper ID	Paper Title	Author
17	Advancing Curve and Surface Images Modeling with Two-Parameters Polynomial-Based Quaternary Subdivision Schemes	Rakib Mustafa, Muhammad Tahseen Iqbal, Ghulam Mustafa and Samsul Ariffin Abdul Karim <i>Universiti Malaysia Sabah</i>
21	Cubic Bézier-Like Triangular Patches for Rainfall Scattered Data Interpolation and Visualization	Samsul Ariffin Abdul Karim , Mohammad Fadhli Asli, Chin Kim On, Ghulam Mustafa, Faheem Khan, Mohammad Khatim Hasan, Jumat Sulaiman and Ahmed Kherd <i>Universiti Malaysia Sabah</i>
23	A 3-Point Point Quinary Approximating Subdivision Schemes And Its Application In Geometric Modeling And Computer Graphics	Samsul Ariffin Abdul Karim , Abdul Ghaffar and Ghulam Mustafa <i>Universiti Malaysia Sabah</i>
10	Dissecting Denial Of Service (Dos) Syn Flood Attack Dynamics And Impacts In Vehicular Communication Systems	Muhammad Arif Hakimi Zamrai , Kamaludin Mohamad Yusof and Muhammad Afizi Azizan <i>Universiti Teknologi Malaysia</i>
11	Cost-Optimized Dynamic Access Control Policy Using Blockchain and Machine Learning for Enhanced Security in IoT Smart Homes	Hafiz Adnan Hussain , Zulkefli Mansor, Zarina Shukur and Uzma Jafar <i>Universiti Kebangsaan Malaysia</i>
30	Design and Development of IoT-Smart Mirror Information Display System for Organizational Efficiency	Daimler Benz Alebaba , Suaini Sura, Nooralisa Mohd Tuah and Seungwon Lee <i>Universiti Malaysia Sabah</i>
31	Denoising diffusion implicit model for bearing fault diagnosis	Toong Yang Wong , Meng Hee Lim and Wai Keng Ngui <i>Universiti Teknologi Malaysia</i>

32	Cryptographic Technique for Communication System	Kartik Choudhary, Surabhi Jain, Ashwani Kumar and Kumar Hiritik <i>Chandigarh University</i>
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ABSTRACTS

2

A Method of Cover Audio Selection for Embedding Based on Various Criteria

*Muhammad Harith Noor Azam, *Farida Ridzuan, M Norazizi Sham Mohd Sayuti, Ah Azni, Sakinah Ali Pitchay and Najwa Hayaati Mohd Alwi*
farida@usim.edu.my

The main goal of an audio steganography method is to improve the capacity, imperceptibility, and robustness. Several methods of audio steganography have been proposed to enhance its capabilities. To further optimize the efficiency of the audio steganography method, this paper proposes to select the appropriate audio cover for concealing the message. The selection of an appropriate cover can significantly improve the quality of the output and facilitate the development of innovative audio steganography techniques. This paper proposed a new audio cover selection method, which can further enhance the characteristics of the resulting output. This method ranked each cover according to the qualities that need to be boosted using various measurements. These measurements are the Maximum Available Space (MAS), Peak Signal to Noise Ratio (PSNR) and Bit Error Rate (BER) for capacity, imperceptibility, and robustness respectively. Based on the experiment conducted using five cover audios stored in the self-created database, each audio is ranked differently based on the measurement used to determine its characteristic level. In conclusion, the proposed cover selection method can be used to select the most proper cover, hence improving the characteristics of audio steganography.

4

Early Explorations using KNN to Classify Emotions in Virtual Reality based on Heart Rate (HR) and Electrodermography (EDG)

*Aaron Frederick Bulagang, James Mountstephens and *Jason Teo*
jtwteo@ums.edu.my

To detect multimodal emotions using Virtual Reality (VR), this research demonstrates the findings and results of using a KNN Classifier by merging Heart Rate and Electrodermography signals. The participants in the study were shown 360-degree videos using a VR headset to elicit their emotional reactions. A wearable that measures skin activity and pulse rate in real time was used to record their emotional response. The experiment had a total of 30 participants, and the KNN classifier was used to classify intra-subject data. With the HR combined with EDG signals paired with KNN as the classifier, the study's 30 participants' data went through intra-subject classification where 11 out of 30 participants achieved a peak accuracy of 100%. These findings show that by combining HR and EDG signals, KNN may be used as the classifier to produce highly accurate results. This study's possible applications include VR rehabilitation, gaming, and entertainment.

8

COVID-19 Detection using Deep Learning Classifiers with Histogram Equalization and Contour-Based X-Ray Images

**Mohd Hanafi Ahmad Hijazi, Nur Dinie Balqis Abdul Yazid and
Puteri Nor Ellyza Nohuddin
Hanafi@ums.edu.my*

The global health crisis caused by COVID-19 has significantly impacted both lifestyle and healthcare. Accurate and prompt medical diagnosis is crucial in combating the spread of the disease. However, the time required for laboratory interpretation and the high cost of a Computed Tomography (CT) scan can lead to inaccurate predictions of this disease. Several existing works have addressed this issue by using the Chest X-ray (CXR) images, however, achieving high accuracy is still a challenge in this domain. In this paper, features extracted from various modified CXR images that could produce more informative features, coupled with deep learning architectures, were evaluated to address the accuracy issue. First, the original CXR images were preprocessed and generated two subsequent different sets: the enhanced CXR images using histogram equalisation and the CXR contour images using contour-based methods. VGG16, InceptionV3, and Xception were used as feature extractors and classifiers; trained on public datasets to classify the CXR images into three categories: health, pneumonia, and COVID-19. The results demonstrate that the proposed work is able to accurately differentiate CXR images based on their respective classes. The best individual model was trained using InceptionV3 with histogram equalisation, achieving an accuracy of 98.25%.

15

Secure-Tech Triad Enhancing Electronic Voting System Security through Integrated Blockchain, AI, and IoT Technologies

**Uzma Jafar, Mohd Juzaidin Ab Aziz, Zarina Shukur and Hafiz Adnan Hussain
P97939@siswa.ukm.edu.my*

As electronic voting systems become increasingly prevalent, the urgent need for robust security measures to combat evolving cyber threats has never been more critical. This paper introduces a ground-breaking architectural framework Secure-Tech Triad that synergistically combines Blockchain technology with Machine Learning (ML) algorithms and Internet of Things (IoT) capabilities to enhance the security and efficiency of electronic voting systems. This architectural framework utilizes a modified Proof-of-Stake (PoS) Blockchain algorithm, a Random Forest ML model for real-time anomaly detection, and an MQTT protocol for IoT-based data collection to create a more secure, efficient, and responsive voting environment. Rigorous testing and evaluation show that the integrated framework significantly outperforms existing Blockchain-only solutions in key performance indicators, such as security breach detection rate, system latency, and cost efficiency. This integrated approach is the best-performing model, achieving a 97% security breach detection rate, a 30% reduction in system latency (down to 2.3 seconds), and a 25% decrease in operational costs. These results underscore the combined effectiveness of Blockchain, AI, and IoT in enhancing security, speed, and cost-effectiveness. Specifically, the Random Forest algorithm has been instrumental in achieving an exceptional security breach detection rate, while IoT data collection has played a pivotal role in enabling real-time anomaly detection and proactive threat mitigation.

20

**Preliminary Mobile Beacon Application Framework for
Higher Education Co-Curricular Engagement**

*Nurul Aida Mohamed Noor, *Mohammad Fadhli Asli, Jackel Vui Lung Chew and
Nurfadhlina Mohd Sharef
fadhli.asli@ums.edu.my*

Mobile beacon application leverages the beacon technology as location-based or proximity sensors to notify or interact with user via mobile apps. There are many instances of these applications especially as an engagement platform across many domains like marketing, retails, exhibitions, or public services. Mobile beacon application holds potential as an engagement tool for empowering co-curricular engagement in higher education. Integrated with personalized mobile notification, users can be notified and interact with cocurricular events within their proximity in the campus. However, literature indicates limited insights on the design applicability and empirical studies of mobile beacon application for higher education context. This new application context poses its own unique challenges, but imperative in helping researchers to discover the extents of mobile beacon potentials. This concept paper introduces a preliminary mobile beacon application framework for supporting co-curricular engagement in higher education. The framework aims to enable design applicability of a mobile beacon application integrated with personalized notification for education engagement purposes. Characterization of mobile beacon application components along with the deliberation of mobile notification features are highlighted in the framework. The presented conceptual framework offers the foundation for application designers in building a mobile beacon application for higher education engagement.

27

Preliminary Emotion-Based Model for Realistic 3D Animation

*Noorsyuhada Azlan, *Mohammad Fadhli Asli and Muzaffar Hamzah
fadhli.asli@ums.edu.my*

3D animators commonly employ facial expressions to convey emotions, yet this method has limitations in fostering audience immersion. Existing guidelines prioritize storytelling, offering limited insight into character construction for immersive experiences. Our investigation seeks to enhance the lifelike movement of animated characters, focusing on audience engagement at specific points. This paper presents empirical findings highlighting the importance of facial and body movements in authentically portraying animated characters' emotions. Drawing on Shapiro's 15 controllers for character animation, we conducted an empirical study, examining distinct elements associated with each emotion. Data collection via Likert-scale assessments determined the average agreement for each controller concerning specific emotions. Our results indicate that varied emotions demand unique controllers for optimal realism. Although facial and gaze controllers are integral to all emotions, their intensity differs across emotional states. In response, we propose a preliminary model rooted in basic emotions, offering guidance to animators crafting realistic 3D characters. This model addresses the nuanced requirements of diverse emotions, providing a valuable resource for those seeking to enhance the authenticity of animated character expressions.

6**Bearing Health Evaluation Model using Segmentive Technique and Cosine KNN in Different Loading Situations**

**Jee Siang Yap, Meng Hee Lim and M. Salman Leong
yapjeesiang@gmail.com*

Bearing faults are a common cause of machinery failure, and bearing vibration analysis is critical in preventing any unacceptable consequences of such failures. Advancements in smart data and computing make Artificial Intelligence (AI) preferable for bearing vibration analysis. Typically, signal processing and feature engineering are essential for achieving satisfactory classification accuracy. Additionally, a drop in classification accuracy is commonly observed during different loading situations due to the vastly varying vibration characteristics under different loads. This paper evaluates an AI model in variable loading situations using raw vibration signals, devoid of signal processing and feature engineering. The proposed AI model, Segmentive Cosine K-Nearest Neighbours (SCosKNN), demonstrated a higher overall classification accuracy of 90.6-94.3% in same loading situations, and 72.1-84.2% in different loading situations. An improvement of around 9% in same loadings and 10-14% in different loadings were observed compared to a model without Segmentive Technique.

9**Detecting And Recognizing Seven Segment Digits Using A Deep Learning Approach**

**Loi Ming Low, Faridah Hani Mohd Salleh, Yi Feng Law and Nor Zaity Zakaria
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Recognizing seven-segment digits is a specific task within the broader field of text detection and recognition. Seven-segment digits are commonly used for displaying numerical information in various applications. However, accurately detecting and recognizing these digits can be challenging due to factors like LED bleeding, glare, and the presence of printed text alongside the digits. The experiment described in this paper aims to identify the most effective models for detecting and recognizing texts and assess their accuracy and performance under different environmental conditions. The experiment reveals that DBNet from PaddleOCR is the best model for text detection, while PARSeq has the best accuracy for recognizing seven-segment digits on the 7Seg dataset. PARSeq also performs well on a custom dataset with lower LED ratios but struggles with glare conditions. Excluding special characters improves accuracy in all conditions.

16**A Comparative Evaluation on Data Transformation Approach for Artificial Speech Detection**

*Choon Beng Tan and *Mohd Hanafi Ahmad Hijazi
Hanafi@ums.edu.my*

The rise of voice biometrics has transformed user authentication and offered enhanced security and convenience while phasing out less secure methods. Despite these advancements, Automatic Speaker Verification (ASV) systems remain vulnerable to spoofing, particularly with artificial speech generated swiftly using advanced speech synthesis and voice conversion algorithms. A recent data transformation technique achieved an impressive Equal Error Rate (EER) of 1.42% on the ASVspoof 2019 Logical Access Dataset. While this approach predominantly relies on Support Vector Machine (SVM) as the backend classifier for artificial speech detection, it is vital to explore a broader range of classifiers to enhance resilience. This paper addresses this research gap by systematically assessing classifier efficacy in artificial speech detection. The objectives are

twofold: first, to evaluate various classifiers, not limited to SVM, and identify those best suited for artificial speech detection; second, to compare this approach's performance with existing methods. The evaluation demonstrated SVM-Polynomial as the top-performing classifier, surpassing the end-to-end learning approach. This work contributes to a deeper understanding of classifier efficacy and equips researchers and practitioners with a diversified toolkit for building robust ASV spoofing detection systems.

26

Agri-Water: An IoT-based System for Sustainable Agriculture
*Muhammad Azamuddin Adli Hanafi, *Salmah Fattah, Asni Tahir, Siti Hasnah Tanalol and Hassan Jamil Syed*
salmahf@ums.edu.my

Climatic conditions intricately influence agriculture, impacting optimal crop growth and reproduction through environmental factors. This study introduces a technological solution leveraging the Internet of Things (IoT), with Raspberry Pi 3 as the central controller. The system systematically collects crucial data on temperature, humidity, and soil moisture, ensuring the quality of crops. Subsequently, this information is used to formulate systematic crop watering plans. By efficiently using Raspberry Pi, the system regulates and monitors crops, contributing to water conservation by directing it precisely to the crops. This technology offers a practical and efficient approach to crop management, especially during challenging agricultural periods.

14

Research on the Evaluation of Teaching Quality in MOOC Based on the AHP Fuzzy Integrated Evaluation Method
*Wu Yangbo, *Ng Giap weng and Lin Ying*
nggiapweng@ums.edu.my

Due to the lack of scientific evaluation index system of MOOC evaluation of teaching effectiveness, the reliability of the corresponding evaluation results is low. Therefore, a study on MOOC evaluation of teaching effectiveness based on AHP fuzzy comprehensive evaluation method is proposed. Based on the comprehensiveness and systematicness of MOOC teaching, a preliminary evaluation index system covering the background, input, process and result of MOOC teaching is constructed. After revising it according to the teaching situation of MOOC, an evaluation index of MOOC evaluation of teaching effectiveness is constructed. After the weight of each index is set differently, the evaluation of MOOC teaching quality is realized by AHP fuzzy comprehensive evaluation method. In the test results, the evaluation results show high reliability.

22

Extraction of Association Rules from Cancer Patient's Records using F-P Growth Algorithm
*Razan Algilane, Mohammed Khalil, *Ashraf Ibrahim and Salih Hassan Babiker*
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Cancer is a leading cause of mortality worldwide, and Sudan has a high cancer burden. The issue is that the data acquired from cancer patients grows yearly, and standard methodologies for analyzing this data are no longer adequate. Data mining techniques such as frequent pattern analysis and association rule mining are utilized in this research to assist in identifying hidden patterns and relationships in data. These strategies were utilized to provide valuable insights into the spread of cancer in Sudan and to assist healthcare professionals in making better diagnosis and treatment decisions. Support and

confidence were utilized as measurement criteria. Support is used to evaluate the frequency of occurrence of an item or set of items among all transactions. In contrast, confidence is used to assess the strength of the relationship between groups of things. According to the findings, women are more likely than men to be diagnosed with cancer. The most common cancers in both genders include breast, prostate, ovarian, esophagus, and cervical cancers.

7

Certificate Authority Capacity and Digital Signature Market Demand in Promoting Interoperability in Malaysia

**Azni Haslizan Abhalim, Farida Mohd Ridzuan, Najwa Hayaati Mohd Alwi, Sakinah Ali Pitchay, Maziahtusima Ishak and Rozlinda Radzali*
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The adoption of digital signatures is becoming increasingly popular among Malaysian users due to its many advantages, including increased security, convenience, and cost savings. However, one of the challenges that users face is the lack of cross Certification Authority (CA) interoperability, which hinders the ability to use digital signatures across different platforms and services. To address this challenge, there is a growing need for promoting cross CA interoperability in Malaysia, which would enable users to use digital signatures seamlessly across various platforms and services. This paper aims to identify the CA capacity and digital signature market demand in promoting cross CA interoperability. This can be achieved through the qualitative interviews from CAs operating in Malaysia to gather views on interoperability across their platforms, the value and implications of such practice, and to establish the potential relationship between interoperability and increased Digital Signature efficiency and market demand. The interview data is analyzed using Atlas.ti and meta-analysis. Based on the result, the adoption of digital signatures and the promotion of cross CA interoperability are critical for advancing Malaysia's digital economy and enhancing the country's overall competitiveness. With the right infrastructure and policies in place, Malaysia can become a leader in the use of digital signatures and the promotion of cross CA interoperability, which would benefit both individuals and businesses alike.

5

A CNN Plastic Detection Model for Embedded Platform on ROV

*Anis Rashidah Aminurrashid and *M Norazizi Sham Mohd Sayuti*
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Plastic pollution has a negative influence on biodiversity especially in aquatic ecosystems, and it has been labelled as one of the greatest dangers to biota. This paper proposes a Convolutional Neural Networks (CNN) based plastic detection model for the embedded platform to identify different shapes of underwater plastics such as bags, bottles, containers, cups, nets, pipes, ropes, snack wrappers and tarps. The model is optimized for Raspberry Pi using OpenVINO framework, with the intention to produce a cost-effective edge system for a Remote Operating Vehicle (ROV) system. The development of the model utilizes a pre-trained object detection model from YOLOv5 and the TrashCan 1.0 dataset, for training and testing. The final model exhibits a good performance, achieving more than 85% accuracy in the overall prediction, which highlights the model's accuracy and reliability in detecting and classifying underwater plastic shapes. Results from this work highlight the potential of the deep learning (DL) real-time embedded processing at the edge rather by a separate computer on land, using a cost-effective embedded platform.

18**Cocoa Diseases Classification using Deep Learning Algorithm***Soh Ker Sing, *Ervin Moung, Ali Farzamnia and John Julius Danker Khoo**ervin@ums.edu.my*

This work addresses the critical issue of cocoa plant diseases, which pose a significant threat to global agriculture and the livelihood of millions of farmers. Convolutional Neural Networks (CNN) has been utilized for classifying cocoa diseases, focusing on combating the significant agricultural and economic impacts of black pod rot and pod borer. Utilizing a dataset of 4390 images, five CNN architectures—Custom CNN, VGG-16, EfficientNetB0, ResNet50, and LeNet-5—were assessed for their ability to accurately identify disease presence. The Custom CNN model was found to be the most effective, achieving an accuracy of 91.79%, precision of 91.79%, recall of 91.79%, F1 score of 82.08%, sensitivity of 96.69%, and specificity of 98.40%, indicating its strong capability in correctly classifying both healthy and diseased plants. The work methodically approached data preprocessing, model parameter tuning, and a structured machine learning evaluation process. While EfficientNetB0 and ResNet50 also displayed commendable performances, VGG-16 and LeNet-5 lagged, suggesting the need for further model refinement. This work underscores the importance of the F1 score in evaluating model performance, especially given the class imbalance within the dataset. The findings suggest future exploration into other pre-trained models and data augmentation strategies to further enhance classification accuracy. The goal of this work is the implementation of a real-time system to minimize cocoa production losses due to disease.

25**Detection of Botnet in the IoT Network***Syeda Lamiya Mumtaz, *Hassan Jamil Syed, Ayman Al-Ani, Ahmed K. Al-Ani, Salmah Fatah and Azeem Khan**shjamil@ums.edu.my*

The ubiquity of Internet of Things (IoT) devices has prompted security concerns, particularly in the face of evolving botnet attacks. This paper investigates the impact of botnet attacks on IoT devices and proposes a network-based detection and prevention system employing signature and anomaly-based mechanisms. Notably, our methodology extends beyond traditional detection, focusing on proactively impeding bot creation. Leveraging a Linux-based distributed system, Security Information and Event Management (SIEM) tools, and custom rules, our approach encompasses distinct phases Preprocessing, Network Security Monitoring, Rule-based IDS System, and Analysis. Experimental results with diverse PCAP files demonstrate the efficacy of custom rules, significantly enhancing alert counts for various security aspects, including network trojan detection and privacy violations. The significant finding is the substantial increase in alert counts after the integration of custom rules, exemplified in the 1.1 GB PCAP file scenario. Network trojan detection surged from 585 to 988, emphasizing the heightened efficacy of rule-based measures. Privacy breaches and bad traffic alerts also experienced significant increments, showcasing the system's improved sensitivity and responsiveness. This finding reinforces the pivotal role of custom rules in fortifying IoT network security comprehensively.

28**Virtual Reality and Emotional Responses: A Comprehensive Literature Review on Theories, Frameworks, and Research Gaps**

*Hariyady, *Ag Asri Ag Ibrahim, Jason Teo, Wildan Suharso, Muhammad Balya Firjaun Barlaman, Muhammad Aulanas Bitaqwa, Ng Giap Weng, Azhana Ahmad, Fouziah Md Yassin and Carolyn Salimun
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This extensive literature review examines virtual reality (VR) and emotional responses, including theories, paradigms, and research gaps. Foundational to VR is its ability to evoke profound emotional involvement through heightened presence. The study synthesizes presence theory, appraisal theory, and transportation theory to explain how they affect virtual emotional experiences. It also examines affective computing and multisensory integration frameworks for emotional design for VR and their importance in creating emotionally engaging VR experiences. Furthermore, the study highlights key research gaps and issues in the field. These include individual variances in emotional responses, the undiscovered long-term effects of repeated VR exposure, and ethical issues surrounding emotion manipulation and user permission. To fill these gaps, computer science, psychology, and allied sciences should work together to comprehend the complex relationship between VR and human emotions. The ethical, theoretical, and practical aspects of VR's emotional landscape are explored in this synthesis to guide future research.

12**Enhanced Bearing Fault Analysis under Inconstant Loads Conditions by Cosine Weighted K-Nearest Neighbours Model**

**Jee Siang Yap, Meng Hee Lim and M. Salman Leong
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Bearing faults often lead to machinery failures, underscoring the importance of analyzing bearing vibrations to avert undesirable consequences. Leveraging Artificial Intelligence (AI) in this context benefits from the strides in intelligent data processing and computing capabilities. Traditionally, signal processing and feature engineering play pivotal roles in achieving accurate classifications. However, classification accuracy can decline notably during variable loading scenarios due to the diverse vibration patterns exhibited under different loads. This study assesses an AI model's performance under variable loading conditions using raw vibration signals, without recourse to signal processing or feature engineering. Introducing an enhanced AI model, known as Cosine Weighted K-Nearest Neighbours (CWKNN), resulted in a slightly improved 85.2-88.7% under stable loading conditions and 64.3-72.6% under variable loading conditions.

29**A Survey on Vehicular Traffic Flow Anomaly Detection Using Machine Learning**

**Jackel Vui Lung Chew and Mohammad Fadhli Asli
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Vehicular traffic flow anomaly detection is crucial for traffic management, public safety, and transportation efficiency. It assists experts in responding promptly to abnormal traffic conditions and making decisions to improve the traffic flow. This survey paper offers an overview of the application of machine learning to detect anomalies in the traffic flow. Through an extensive review of the literature from the Scopus database, this paper explores the technical aspects of traffic flow anomaly detection using machine learning, including data sources, data processing approaches, machine learning algorithms, and evaluation

metrics. Additionally, the paper highlights the emerging research opportunities for researchers in enhancing traffic flow anomaly detection using machine learning.

17

**Advancing Curve and Surface Images Modeling with
Two-Parameters Polynomial-Based Quaternary Subdivision Schemes**

Rakib Mustafa, Muhammad Tahseen Iqbal, Ghulam Mustafa and

**Samsul Ariffin Abdul Karim*

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In the context of this paper, we introduce a novel polynomial function that relies on two parameters. This polynomial enables the creation of a family of quaternary subdivision schemes for curve and surface modeling. One of these parameters is responsible for determining the specific member of the family while the other parameter provides the means to finely control the shape of the resulting curve or the regular surface images. This two-parameter approach adds significant versatility to the subdivision schemes to meet specific requirements and preferences. The exploration of various family members within this class of quaternary schemes is a focal point of our research. By adjusting the parameters, we investigate and delineate the distinctive characteristics of specific family members. This provides valuable insights into how these schemes can be harnessed to achieve various modeling goals. This insight empowers users to select the most suitable family members in accordance with their specific needs and design objectives.

21

Cubic Bézier-Like Triangular Patches for Rainfall Scattered Data Interpolation and Visualization

**Samsul Ariffin Abdul Karim, Mohammad Fadhli Asli, Chin Kim On, Ghulam Mustafa, Faheem Khan, Mohammad Khatim Hasan, Jumat Sulaiman and Ahmed Kherd*

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Scattered data interpolation plays an important role in computer graphics and scientific visualization. This method can be used to interpolate any regular or irregular data sets. For instance, rainfall distribution is an example of an irregular data that usually appear in statistics. In this study, cubic Bézier-Like triangular patches defined on triangular domain is used to interpolate rainfall data sets. From graphical results, we obtain a very smooth surface. Therefore, the proposed scheme can be used to interpolate and provide a good visualization to the given irregular data sets.

23

A 3-Point Point Quinary Approximating Subdivision Schemes And Its Application In Geometric Modeling And Computer Graphics

**Samsul Ariffin Abdul Karim, Abdul Ghaffar and Ghulam Mustafa*

drsamsul.karim@gmail.com

This article discusses the significance of a subdivision scheme with shape parameters in geometric modeling and computational geometry. A new recursive method for generating the mask of 3-point quinary approximating subdivision schemes (ASSs) is presented. The proposed subdivision scheme exhibits all the geometric properties and offers better shape control than nonparametric subdivision schemes. The article includes several numerical examples to demonstrate the high practical value of the proposed schemes in geometric modeling and computer graphics.

10**Dissecting Denial Of Service (Dos) SYN Flood Attack Dynamics And Impacts
In Vehicular Communication Systems**

**Muhammad Arif Hakimi Zamrai, Kamaludin Mohamad Yusof and
Muhammad Afizi Azizan
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In the rapidly evolving landscape of vehicular networks, the resilience of vehicular communication systems against Denial of Service (DoS) attacks is critical. Existing research often overlooks the nuanced dynamics of such attacks, particularly in terms of packet size variability and vehicle mobility within Software-Define Internet of Vehicles (SD-IoV) systems. This study addresses this research gap by conducting a detailed analysis of SYN flood DoS attack patterns and their impact on SDNcontrolled vehicular networks. This research examines the effects of different packet sizes in SYN packet—1 byte, 200 bytes, 360 bytes, and 1400 bytes—and explore how these packet size variations influence the efficacy of the attacks and the resultant downtime experienced by the victim car. This research findings reveal that SYN flood attacks employing minimal 1-byte packets can cause prolonged unresponsiveness in the victim vehicle, leading to a drastic drop in packet throughput. This research underscores the subtleties of DoS attack strategies and their significant implications on the functionality and safety of IoV environments. The alarming potential of such refined and coordinated DoS attack highlights an urgent need for the development of robust defense mechanisms that can adapt to the sophisticated landscape of vehicular cyber threats.

11**Cost-Optimized Dynamic Access Control Policy Using Blockchain and
Machine Learning for Enhanced Security in IoT Smart Homes**

**Hafiz Adnan Hussain, Zulkefli Mansor, Zarina Shukur and Uzma Jafar
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The rapid adoption of Internet of Things (IoT) devices in smart homes has led to growing security vulnerabilities, primarily due to the limitations of traditional, static access control mechanisms. This paper presents a novel, dynamic access control policy that leverages the immutable and transparent nature of Blockchain technology, specifically Ethereum, along with machine learning algorithms to enhance security measures. By integrating machine learning algorithms like Support Vector Machines (SVM) and Neural Networks, the proposed system can adapt and respond to changing behavioural patterns and potential threats in real time. Additionally, a caching mechanism implemented on the Ethereum Blockchain is introduced to optimize system performance and reduce latency. Experimental results demonstrate significant improvements in access control security, system efficiency, and adaptability. The findings of this paper not only contribute to the advancement of secure access control policies for IoT smart homes but pave the way for future research in integrating Blockchain and machine learning for robust and scalable IoT security solutions.

30**Design and Development of IoT-Smart Mirror Information Display System for Organizational Efficiency***Daimler Benz Alebaba, *Suaini Sura, Nooralisa Mohd Tuah and Seungwon Lee
su_sura@ums.edu.my*

In the realm of the Internet of Things (IoT), a smart mirror is akin to a regular mirror possessed with intelligence, incorporating technology to provide useful information. The need for an integrated multi-functional information display, efficiently consolidating global information, optimizing electricity consumption, and monitoring fire hazards, has become crucial for increasing awareness among organizational staff and visitors. However, many organizations still rely on traditional information displays, leaving them vulnerable to issues such as electricity wastage and hazard oversight. To tackle these issues, we developed a smart mirror enhanced with voice recognition to quickly retrieve global information, simultaneously reducing electricity costs and enabling early detection of fire hazards. This paper details the design and development of smart mirror, following a systematic approach based on the System Development Life Cycle (SDLC) methodology. As a result, evaluations of user acceptance measured through the System Usability Scale (SUS) tool, confirms the operational efficiency and positive reception of the system. This paper significantly contributes to advancing smart mirror research, providing a valuable resource for developers, researchers, and practitioners constructing their iterations and offering inspiration for future enhancements.

31**Denoising Diffusion Implicit Model For Bearing Fault Diagnosis****Toong Yang Wong, Meng Hee Lim and Wai Keng Ngui
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Rotating machineries always operating under different loads and suffer from various types of bearing fault. Thus, bearing fault diagnosis is essential to prevent further loss or damage. Deep learning has been favoured over machine learning recently due to data explosion and its higher performance. In deep learning-based bearing fault diagnosis, vibration signals are usually transformed into images using time frequency analysis methods such as short-time Fourier transform, wavelet transform, and Hilbert-Huang transform. Convolutional neural network (CNN) is widely used for fault classification method. However, the training dataset and testing dataset usually have different load domains due to different working conditions. Obtaining training data of wide range of loadings are impractical and exhausting. Thus, this study is proposed to solve load domain adaptation using denoising diffusion implicit model (DDIM). In this study, synthetic images are generated using DDIM model while only convolutional neural network (CNN) is used as fault classification model. The classification accuracy of testing dataset is obtained using CNN models trained with original training dataset and augmented training dataset. The results showed that the synthetic scalograms could improve the performance of CNN model by 3.3% under different load domains.

Cryptographic Technique for Communication System

32

**Kartik Choudhary, *Surabhi Jain, *Ashwani Kumar and *Kumar Hiritik
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The area of cryptography has found its self in the forefront in the era that cannot be spared from the routine use of vulnerable data in the Internet space. The paper discusses challenges faced by modern cryptographic calculations like computational power of RSA & vulnerability to mild attack in MD5 algorithm. However, taking into account such constraints, the described set-up integrates the Vigenere and Polybius procedures into a hybrid cipher that combines their advantages. Vigenere cipher that is known for encrypting alphabetical texts with polyalphabetic substitution technique perfectly works with polybius square. It creates a weird but safer Hybrid Cipher that is capable of easing out problems associated with traditional cryptographic techniques. This approach strives to provide an adaptable shield for data transfer by utilizing highly skilled calculations that are novel and potent in the arena of modern cryptography.

ACKNOWLEDGEMENT OF SPONSORSHIPS

We extend our sincere gratitude to CWORKS Group and UNCLE BOB for their generous support and sponsorship of the AMICT 2023. Their commitment to technological innovation and advancement has played a pivotal role in making this event a resounding success.

Their dedication to advancement in machine intelligence and cybersecurity technology has not only enriched the overall conference experience but has also contributed significantly to the advancement of knowledge in our field.

We look forward to continuing this collaboration in future endeavors and together, creating more opportunities for technology growth and development.

Once again, thank you, CWORKS Group and UNCLE BOB, for your unwavering support and commitment to the success of the AMICT 2023.





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- ✓ CEOs, Directors, and Senior Managers
- ✓ Risk Managers/Officers and other risk management professionals
- ✓ Facility Managers, Engineers, or Maintenance Technicians
- ✓ Internal Audit Staff
- ✓ Enterprise Risk Management Staff
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OUTLINE

-  **Duration:** 1 day (9:00am - 4:00pm)

-  **Venue:** Client's workplace

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**Faculty of
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Master of Science (Computer Science) by Research

ADMISSION REQUIREMENTS

1. Possess a Bachelor's degree in Computing or its equivalent with a minimum CGPA of 3.00; **OR**
2. Possess a Bachelor's degree in Computing or its equivalent with a minimum CGPA of 2.75 may be accepted subject to a rigorous internal assessment by the faculty; **OR**
3. Possess a Bachelor's degree in Computing or its equivalent with a minimum CGPA of 2.50 may be accepted subjects to a minimum of five (5) years of working experience in the relevant fields and rigorous internal assessment by the faculty; **OR**
4. Possess a Bachelor of Science degree in any field other than Computing or its equivalent with a minimum CGPA of 3.00 may be accepted provided that the applicant has taken the prerequisite module in computing; **AND**
5. Fulfill other requirements set by the Senate: Degrees awarded by local/private institutions of higher learning, including those awarded under any collaborative/franchising schemes with local or foreign partners, must be accredited by the Malaysian Qualifications Agency (MQA).

Notes: The prerequisite module includes the following:

- Programming Principles
- Database
- Software Engineering
- Network Fundamentals

English Language Proficiency Requirements

1. International applicants or non-English speaking countries applicants must have at least IELTS Band 6.0 or TOEFL score of 60 (Internet-based) / 500 (paper-based) or MUET Band 4.0; **OR**
2. Fulfill the general language requirement outlined by the university.

DURATION OF STUDY

Full Time 2 – 6 semesters | Part Time 4 – 8 semesters

PROGRAMME STRUCTURE

Study areas under the Master of Science (Computer Science) by Research programme are:

1. Nature-inspired Computational Intelligence
2. Evolutionary Robotics, Behaviour-Based Robotics
3. Artificial Neural Networks
4. Evolving Game AI
5. Multi-Objective Optimization and Metaheuristics
6. Agent Technology
7. Semantic Technology
8. Natural Language Processing
9. Image Processing
10. Sentiment Analysis
11. Augmented Reality
12. Neuroinformatics

FEES	LOCAL (MYR)		INTERNATIONAL (MYR)
	FULL TIME	PART TIME	FULL TIME
Registration	580.00	580.00	2,930.40
Semester 1	2,033.00	1,923.00	4,380.00
Semester 2	2,008.00	1,898.00	4,380.00
Semester 3	2,033.00	1,923.00	4,380.00
Semester 4	2,008.00	1,898.00	4,380.00
Viva Voce	1,000.00	1,000.00	1,000.00

Requirements Before Submitting Notice of Dissertation Submission

No	Requirements
1	Fulfil the minimum candidature durations of 2 semesters (Full Time) and 4 semesters (Part Time)
2	Fulfil the English Language Proficiency Requirement*
3	Pass the Research Methodology Course
4	Pass the Proposal Defence
5	Present Progress Reports as required by the faculty
6	Pass the Pre Viva

Criteria on Conferment of Degree

1. Produce at least one (1) article published / accepted in Scopus / WoS indexed journals before submitting the final dissertation.
2. Present research work at least once at any conference and publish in Scopus indexed proceedings.

Graduate On Time Schedule

Semester	Activities	Milestone	Assessments
1	<ul style="list-style-type: none"> Attend Research Methodology Course Write research proposal Learn to use reference manager software (Mendeley) and document preparation system (LaTeX) 	<ul style="list-style-type: none"> Pass Research Methodology Course Pass Proposal Defence Pass Progress Report 	<ul style="list-style-type: none"> Research Methodology Course Proposal Defence Progress Report
2	<ul style="list-style-type: none"> Write dissertation chapter 1, 2 and 3 (Introduction, Literature Review and Methodology) Attend Research Literacy Course Write review or survey paper 	<ul style="list-style-type: none"> Submit review or survey paper to a Scopus / WoS indexed journal Pass Progress Report 	<ul style="list-style-type: none"> Progress Presentation Progress Report
3	<ul style="list-style-type: none"> Conduct experiment or field work Write dissertation chapter 4 (Results and Findings) Attend Research Literacy Course 	<ul style="list-style-type: none"> Present research work at a conference Pass Progress Report 	<ul style="list-style-type: none"> Progress Presentation Progress Report
4	<ul style="list-style-type: none"> Write dissertation chapter 5 (Conclusion) Write journal article Prepare a complete dissertation 	<ul style="list-style-type: none"> Submit article to a Scopus / WoS indexed journal Submit Dissertation 	<ul style="list-style-type: none"> Pre-Viva Viva Dissertation

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Master of Science (Information Technology) by Research

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2. Fulfill the general language requirement outlined by the university.

Requirements Before Submitting Notice of Dissertation Submission

No	Requirements
1	Fulfil the minimum candidature durations of 2 semesters (Full Time) and 4 semesters (Part Time)
2	Fulfil the English Language Proficiency Requirement*
3	Pass the Research Methodology Course
4	Pass the Proposal Defence
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1. Information Systems
2. ICT for Development
3. Knowledge Management
4. ICT Research Methodology
5. Enterprise Systems
6. Action Research
7. Human Computer Interaction
8. Web Development Usability
9. Intelligent Knowledge-based Systems
10. Information Visualisation
11. Web Engineering
12. E-commerce

FEES	LOCAL (MYR)		INTERNATIONAL (MYR)
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Viva Voce	1,000.00	1,000.00	1,000.00

Graduate On Time Schedule

Semester	Activities	Milestone	Assessments
1	<ul style="list-style-type: none"> Attend Research Methodology Course Write research proposal Learn to use reference manager software (Mendeley) and document preparation system (LaTeX) 	<ul style="list-style-type: none"> Pass Research Methodology Course Pass Proposal Defence Pass Progress Report 	<ul style="list-style-type: none"> Research Methodology Course Proposal Defence Progress Report
2	<ul style="list-style-type: none"> Write dissertation chapter 1, 2 and 3 (Introduction, Literature Review and Methodology) Attend Research Literacy Course Write review or survey paper 	<ul style="list-style-type: none"> Submit review or survey paper to a Scopus / WoS indexed journal Pass Progress Report 	<ul style="list-style-type: none"> Progress Presentation Progress Report
3	<ul style="list-style-type: none"> Conduct experiment or field work Write dissertation chapter 4 (Results and Findings) Attend Research Literacy Course 	<ul style="list-style-type: none"> Present research work at a conference Pass Progress Report 	<ul style="list-style-type: none"> Progress Presentation Progress Report
4	<ul style="list-style-type: none"> Write dissertation chapter 5 (Conclusion) Write journal article Prepare a complete dissertation 	<ul style="list-style-type: none"> Submit article to a Scopus / WoS indexed journal Submit Dissertation 	<ul style="list-style-type: none"> Pre-Viva Viva Dissertation



UMS
UNIVERSITI MALAYSIA SABAH



**Faculty of
Computing
& Informatics**

Doctor of Philosophy (Computer Science)

ADMISSION REQUIREMENTS

1. Possess a Master's degree in Computing or its equivalent from any university approved by the Senate; **OR**
2. Possess a Master's degree or its equivalent in any field other than Computing may be accepted, provided that the applicant has a Bachelor's degree in Computing; **OR**
3. Candidates who are registered as Master candidates at the Universiti Malaysia Sabah and have obtained approval to upgrade by the Faculty's Postgraduate Committee and approved by the Senate; **AND**
4. Fulfill other requirements set by the Senate: Degrees awarded by local/private institutions of higher learning, including those awarded under any collaborative/franchising schemes with local or foreign partners, must be accredited by the Malaysian Qualifications Agency (MQA).

English Language Proficiency Requirements

1. International applicants or non-English speaking countries applicants must have at least IELTS Band 6.0 or TOEFL score of 60 (Internet-based) / 500 (paper-based) or MUET Band 4.0; **OR**
2. Fulfill the general language requirement outlined by the university.

Requirements Before Submitting

Notice of Thesis Submission

No	Requirements
1	Fulfil the minimum candidature durations of 4 semesters (Full Time) and 6 semesters (Part Time)
2	Fulfil the English Language Proficiency Requirement*
3	Pass the Research Methodology Course
4	Pass the Proposal Defence
5	Present Progress Reports as required by the faculty
6	Pass the Pre Viva

Criteria on Conferment of Degree

1. Produce at least two (2) article published / accepted in Scopus / WoS indexed journals before submitting the final thesis.
2. Present research work at least once at any conference and publish in Scopus indexed proceedings.

DURATION OF STUDY

Full Time 4 – 8 semesters | Part Time 6 – 12 semesters

PROGRAMME STRUCTURE

Study areas under the Doctor of Philosophy in Computer Science programme are:

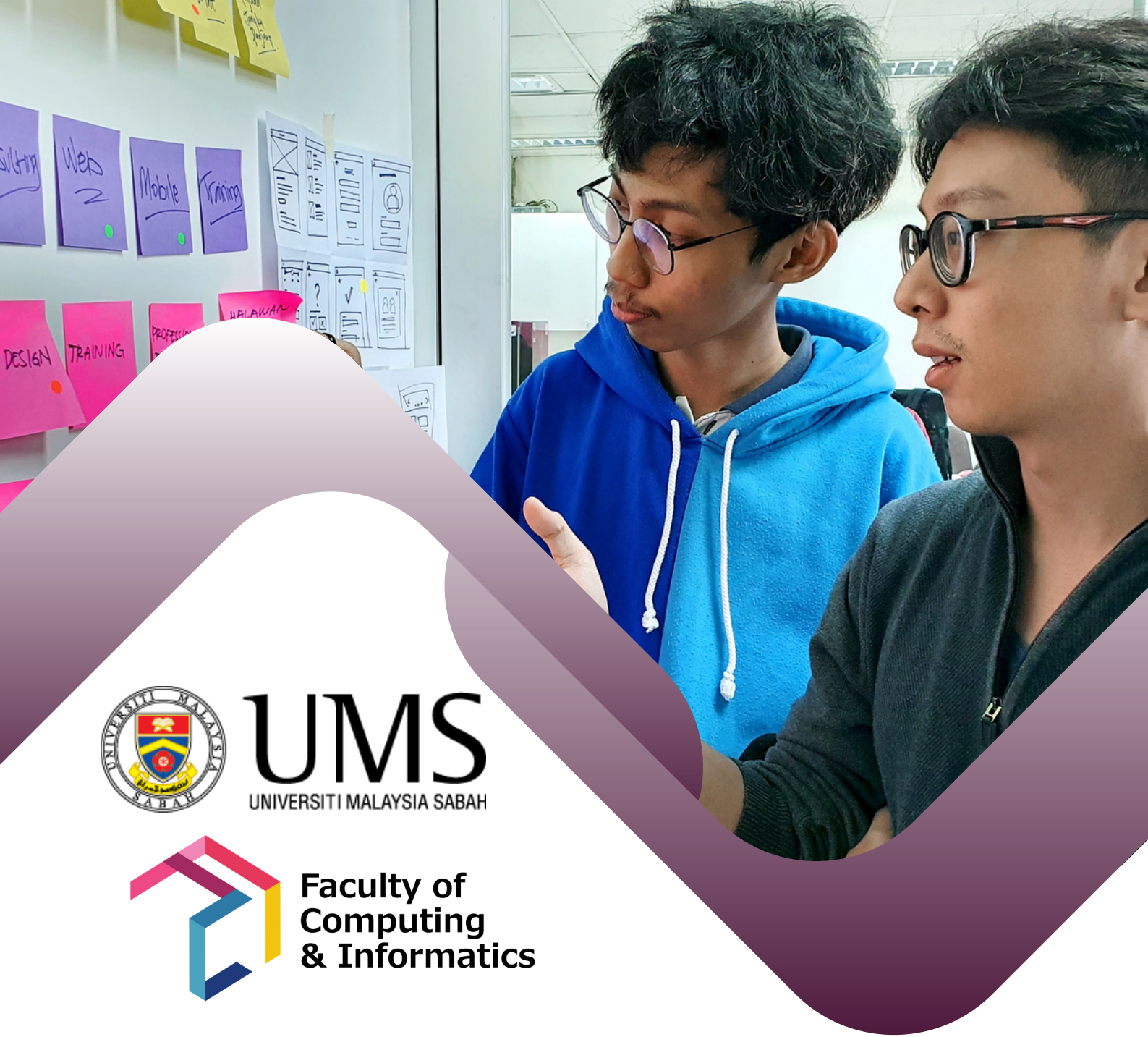
1. Nature-inspired Computational Intelligence
2. Evolutionary Robotics, Behaviour-Based Robotics
3. Artificial Neural Networks
4. Evolving Game AI
5. Multi-Objective Optimization and Metaheuristics
6. Agent Technology
7. Semantic Technology
8. Natural Language Processing
9. Image Processing
10. Sentiment Analysis
11. Augmented Reality
12. Neuroinformatics

FEES	LOCAL (MYR)		INTERNATIONAL (MYR)
	FULL TIME	PART TIME	FULL TIME
Registration	580.00	580.00	2,930.40
Semester 1	2,143.00	2,033.00	4,620.00
Semester 2	2,118.00	2,008.00	4,620.00
Semester 3	2,143.00	2,033.00	4,620.00
Semester 4	2,118.00	2,008.00	4,620.00
Semester 5	2,143.00	2,033.00	4,620.00
Semester 6	2,118.00	2,008.00	4,620.00
Viva Voce	1,500.00	1,500.00	1,500.00

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2	<ul style="list-style-type: none"> Write thesis chapter 1 (Introduction) Attend Research Literacy Course 	<ul style="list-style-type: none"> Pass Progress Report 	<ul style="list-style-type: none"> Progress Presentation Progress Report
3	<ul style="list-style-type: none"> Write thesis chapter 2 (Literature Review) Attend Research Literacy Course Write review/survey paper 	<ul style="list-style-type: none"> Submit review/survey paper to a Scopus/WoS indexed journal Pass Progress Report 	<ul style="list-style-type: none"> Progress Presentation Progress Report
4	<ul style="list-style-type: none"> Write thesis chapter 3 (Methodology) Attend Research Literacy Course 	<ul style="list-style-type: none"> Pass Progress Report 	<ul style="list-style-type: none"> Progress Presentation Progress Report
5	<ul style="list-style-type: none"> Conduct experiment or field work Write thesis chapter 4 (Results and Findings) Attend Research Literacy Course Write journal article 	<ul style="list-style-type: none"> Present research work at a conference Submit article to a Scopus/WoS indexed journal Pass Progress Report 	<ul style="list-style-type: none"> Progress Presentation Progress Report
6	<ul style="list-style-type: none"> Write thesis chapter 5 (Conclusion) Write journal article (optional) Prepare a complete thesis 	<ul style="list-style-type: none"> Submit article to a Scopus/WoS indexed journal (optional) Submit Thesis 	<ul style="list-style-type: none"> Pre-Viva Viva Thesis

*Applicable to all International Candidates



UMS
UNIVERSITI MALAYSIA SABAH



**Faculty of
Computing
& Informatics**

Doctor of Philosophy (Information Technology)

ADMISSION REQUIREMENTS

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2. Possess a Master's degree or its equivalent in any field other than Computing may be accepted, provided that the applicant has a Bachelor's degree in Computing; **OR**
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DURATION OF STUDY

Full Time 4 – 8 semesters | Part Time 6 – 12 semesters

PROGRAMME STRUCTURE

Study areas under the Doctor of Philosophy in Information Technology programme are:

1. Information Systems
2. ICT for Development
3. Knowledge Management
4. ICT Research Methodology
5. Enterprise Systems
6. Action Research
7. Human Computer Interaction
8. Web Development Usability
9. Intelligent Knowledge-based Systems
10. Information Visualisation
11. Web Engineering
12. E-commerce

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