4TH IEEE INTERNATIONAL CONFERENCE ON ARTIFICIAL INTELLIGENCE IN ENGINEERING AND TECHNOLOGY IICAIET 2022

13 – 15 September 2022
Kota Kinabalu, Sabah

CO-ORGANIZED BY

IEEE
IEEE Sabah Subsection

UMS
UNIVERSITI MALAYSIA SABAH

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Message from Conference Chair

Dear Colleagues,

Welcome to the 4th IEEE International Conference on Artificial Intelligence in Engineering and Technology 2022 (IICAIET 2022).

It is our great pleasure to have you with us on the 20th anniversary of IICAIET. In 2002, we started the first ICAIET aiming to provide a place to exchange knowledge between researchers and postgraduates working in the areas of Artificial Intelligence (AI) and related fields. In 2018, ICAIET was then rebranded as IICAIET with IEEE sponsorship and marched towards advancing AI-related technologies that support humanity in many ways.

This year, IICAIET 2022 has a total of 250 submissions, which is the most paper submission in IICAIET history. Among the papers reviewed, we have 62.8% of papers accepted for oral presentation. Over the next three days, we will host 27 sessions with over 130 papers presentation. We are pleased to welcome presenters and participants from 14 countries, namely Algeria, Bangladesh, Brazil, China, India, Indonesia, Iraq, Japan, Korea, New Zealand, Philippines, Saudi Arabia, Taiwan, and Malaysia.

We are honoured to have 3 keynote speakers and 1 technical speaker with us this year. They are Prof. Dr. Mehdi Bennis (University of Oulu, Finland); Prof. Dr. Sazali Yaacob (University Kuala Lumpur Malaysian Spanish Institute, Malaysia); Assoc Prof. Ir. Dr. Rosdiazli Ibrahim (Universiti Teknologi Petronas, Malaysia), and Dr. David Leal-Ayala (Policy Links (Institute for Manufacturing), University of Cambridge, United Kingdom). I believe their sharing will hugely benefit us in future AI technologies and applications.

I hope you enjoy IICAIET 2022 with the broadening possibilities of bright ideas and making a link with great minds.

Assoc. Prof. Dr. Kenneth Teo Tze Kin
Chair, IICAIET 2022
Faculty of Engineering, Universiti Malaysia Sabah

About IICAIET

IEEE International Conference on Artificial Intelligence in Engineering and Technology (IICAIET) is the annual flagship technical event of IEEE Sabah Subsection. The IICAIET conference series has gained great interests from scholars, researchers, academicians, professionals, and students in the Asia-Pacific Region, covering all over technical areas related to Artificial Intelligence.

The first ICAIET conference goes 20 years back to 2002, held in Kota Kinabalu, co-organized by Universiti Malaysia Sabah (UMS) and the Artificial Intelligence Research Unit (AiRU). ICAIET was subsequently held biannually in 2004 and 2006. Significant scientific findings towards the trend of Artificial Intelligence were presented by international and local participants who have attended ICAIET. The reviewed papers presented at the conference were then published as proceedings. With the establishment of the IEEE Sabah Subsection in 2018, ICAIET was then rebranded as IICAIET with IEEE sponsorship. ICAIET was subsequently held in 2020 before changing into annual event in 2021. With the technical sponsorship of IEEE Sabah Subsection, the conference proceeding for IICAIET 2018, IICAIET 2020, and IICAIET 2021 were published in IEEE Xplore and Scopus-indexed.

This year, IICAIET 2022 received 250 submissions from 14 countries, which is the most paper submission in IICAIET history. Among the papers reviewed, over 130 accepted papers will be presented orally in the 27 sessions during 13 to 15 September 2022. IICAIET has become an important platform to exchange and discuss the new ideas, opinions, and prospects in Artificial Intelligence.

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Keynote and Technical Speakers

Prof. Dr. Mehdi Bennis is a tenured full Professor at the Centre for Wireless Communications, University of Oulu, Finland, Academy of Finland Research Fellow and head of the intelligent connectivity and networks/systems group (ICON). His main research interests are in radio resource management, heterogeneous networks, game theory and distributed machine learning in 5G networks and beyond. He has published more than 200 research papers in international conferences, journals and book chapters. He has been the recipient of several prestigious awards including the 2015 Fred W. Ellersick Prize from the IEEE Communications Society, the 2016 Best Tutorial Prize from the IEEE Communications Society, the 2017 EURASIP Best paper Award for the Journal of Wireless Communications and Networks, the all-University of Oulu award for research, the 2019 IEEE ComSoc Radio Communications Committee Early Achievement Award and the 2020 Clarviate Highly Cited Researcher by the Web of Science. Dr Bennis is an editor of IEEE TCOM and Specialty Chief Editor for Data Science for Communications in the Frontiers in Communications and Networks journal. Dr Bennis is also an IEEE Fellow.

Prof. Dr. Sazali Yaacob was born in 1960. He received his Bachelor of Engineering degree in Electrical Engineering in from Universiti Malaya. Upon graduation, he worked in oil palm estate before joining Universiti Malaya as an academic staff in 1986. He pursued his Master of Science degree in System Engineering at University of Surrey,1987 and later his Doctor of Philosophy in Control Engineering from University of Sheffield, United Kingdom, 1995. He was promoted to Associate Professor in 1998 by Universiti Malaysia Sabah and later appointed as the first dean of the School of Engineering and Information Technology from August 1998 till 2004. From 2004 till 2015, he served at University Malaysia Perlis as Professor in School of Mechatronic Engineering and was the Dean of the School from 2005 till 2007 and as Deputy Vice Chancellor (Academic) from 2009 till 2010. Currently, he is with University Kuala Lumpur Malaysian Spanish Institute at Kulim, Kedah as Professor in School of Mechatronic Engineering and was the Dean and Head of Campus from 2020 till 2022. He had published more than 300 papers in National and International Journals and Conference Proceedings. He has supervised more than 40 of postgraduate students in either Master or Doctor of Philosophy levels. His research interests are in Artificial Intelligence applications in the fields of acoustics, vision and robotics. He was conferred a Charted Engineer status by the Engineering Council, United Kingdom in 2005 and Member to the Institute of Engineering and Technology, United Kingdom.

Assoc. Prof. Ir. Dr. Rosdiazli Ibrahim is an Associate Professor at the Electrical & Electronics Engineering Department, Universiti Teknologi PETRONAS, Malaysia. He started his career as an Engineer at Sony (V) Sdn. Bhd. and subsequently served PETRONAS Fertilizer Kedah Sdn. Bhd. as an Instrument Engineer prior to joining Universiti Teknologi PETRONAS (UTP) in 1999. He has held the post of Head of Department, Dean of Centre for Graduate Studies and is now the Dean for Faculty of Engineering. He is a senior member of IEEE (SMIEEE) and a registered Professional Engineer from Board of Engineers Malaysia. He is actively involved in research works focusing in Artificial Intelligence, Intelligent Control, Condition Monitoring and Fault Diagnosis and Wireless Control.

Dr. David Leal-Ayala is the Deputy Head of Policy Links, responsible for designing, managing, and delivering a variety of industrial innovation policy consulting projects and capacity building programmes for civil servants and policy makers. A manufacturing engineer by training, David provides policy expertise in industrial technology development and commercialisation, assessment and development of policy recommendations and action plans for strengthening national innovation systems, characterisation of technological, manufacturing and industrial systems, and industrial ecology and sustainability. With wide regional expertise in Europe, the Caribbean, Middle East and South East Asia, David has extensive advisory experience on how to develop effective industrial innovation policy mechanisms for governments and international organisations including UNIDO, UNDP, WEF, IDB, and ADB. He has authored numerous policy reports and news articles in various specialised websites such as UNIDO and WEF and he regularly speaks at high-profile international events such as the Hannover Messe and the Global Manufacturing and Industrialisation Summit (GMIS), among other forums. David is actively involved with teaching and supervising in the Manufacturing Engineering Tripos (MET) programme of the Engineering Department at Cambridge University ("How do companies and governments respond to a changing and complex industrial landscape").

Conference Program

DAY 1: 13 SEPTEMBER 2022 (Tuesday)	
TIME	PROGRAMME
8:30 – 9:00	Registration
9:00 – 9:10	Welcome Address by IICAIET 2022 Chair
9:10 – 9:20	Opening Ceremony
9:20 – 9:30	Photo Session
9:30 – 10:30	Keynote 1 Prof. Dr. Sazali Yaacob Title: AI from Inception to Applications and Future
10:30 – 10:45	Short Break
10:45 – 12:15	Parallel Session A A1: Pattern Recognition and Classification (I) A2: Intelligent Control and Robotics (I) A3: Machine Learning (I)
12:15 – 14:00	Lunch Break
14:00 – 15:00	Parallel Session B B1: Pattern Recognition and Classification (II) B2: Intelligent Control and Robotics (II) B3: Machine Learning (II)
15:00 – 15:15	Short Break
15:15 – 16:15	Parallel Session C C1: Pattern Recognition and Classification (III) C2: Intelligent Transportation System (I) C3: Machine Learning (III)
16:15 – 16:30	Short Break
16:30 – 17:30	Technical Talk Dr. David Leal-Ayala Title: Industry 4.0 and Its Adoption in the Asia and Pacific Region

DAY 2: 14 SEPTEMBER 2022 (Wednesday)	
TIME	PROGRAMME
8:30 – 9:00	Registration
9:00 – 10:00	Keynote 2 Assoc Prof. Ir. Dr. Rosdiazli Ibrahim Title: Artificial Intelligence Research Directions in Oil and Gas Industries
10:00 – 10:15	Short Break
10:15 – 11:15	Parallel Session D D1: Pattern Recognition and Classification (IV) D2: Intelligent Transportation System (II) D3: Machine Learning (IV)
11:15 – 11:30	Short Break
11:30 – 12:30	Parallel Session E E1: Pattern Recognition and Classification (V) E2: Smart Energy (I) E3: Machine Learning (V)
12:30 – 14:00	Lunch Break
14:00 – 15:00	Keynote 3 Prof. Dr. Mehdi Bennis Title: Distributed and Communication-Efficient ML Over and For Wireless
15:00 – 15:15	Short Break
15:15 – 16:30	Parallel Session F F1: Pattern Recognition and Classification (VI) F2: Smart Energy (II) F3: Biomedical Engineering (I)

DAY 3: 15 SEPTEMBER 2022 (Thursday)	
TIME	PROGRAMME
8:30 – 9:00	Registration
9:00 – 9:10	Closing Ceremony
9:10 – 9:15	Short Break
9:15 – 10:30	Parallel Session G G1: Pattern Recognition and Classification (VII) G2: Signal and Image Processing (I) G3: Biomedical Engineering (II)
10:30 – 10:45	Short Break
10:45 – 12:15	Parallel Session H H1: Communication Technology H2: Signal and Image Processing (II) H3: Biomedical Engineering (III)
12:15 – 14:00	Lunch Break
14:00 – 15:30	Parallel Session I I1: Affective Computing I2: Signal and Image Processing (III) I3: Internet of Things

Technical Program

Parallel Session A
13 September 2022
10:45 – 12:15 MYT

A1: Pattern Recognition and Classification (I)	
Session Chair: Dr. Lorita Angeline	
Time	**Papers**
10:45 - 11:00	**31:** Rice (Oryza Sativa) Grading Classification using Hybrid Model Deep Convolutional Neural Networks – Support Vector Machine Classifier *Kevin Marc Bejerano, Carlos Hortinela IV and Jessie Jaye Balbin*
11:00 - 11:15	**33:** Classification of Lanzones Tree Leaf Diseases using Image Processing Technology and a Convolutional Neural Network (CNN) *Adzmer Muhali and Noel Linsangan*
11:15 - 11:30	**52:** Hand-Foot-Mouth Disease classification using Features from Fibre Grating Biosensor Spectral Data *Atif Mahmood, Saaidal Razalli Azzuhri, Adnan N. Qureshi, Palwasha Jaan and Iqra Sadia*
11:30 - 11:45	**53:** Medicinal Plant Classification using Convolutional Neural Network and Transfer Learning *Daryl Valdez, Chris Jordan Aliac and Larmie Feliscuzo*
11:45 - 12:00	**79:** Hand Gesture Recognition for Filipino Sign Language Under Different Backgrounds *Mark Christian Ang, Karl Richmond Taguibao and Cyrel Manlises*
12:00 - 12:15	**44:** Classification of Contaminants in Glass Recycling using Hybrid CNN-SVM Model *Juliana Ho Qiu Ann, Novita Sakundarini and Lim Chin Seong*

A2: Intelligent Control and Robotics (I)	
Session Chair: Ir. Dr. Chua Bih Lii	
Time	**Papers**
10:45 - 11:00	**20:** Four Wheeled Mobile Robots: A Review *Jovina Seau Ling Leong, Hou Pin Yoong and Kenneth Tze Kin Teo*
11:00 - 11:15	**21:** A Review of SCARA Robot Control System *See Han Tay, Hou Pin Yoong and Wai Heng Choong*
11:15 - 11:30	**60:** A Microcontroller-Based and Cost-Efficient Computer Numerical Control (CNC) Soldering Station *Bryan Christopher Wong, Mario Laureta, Olwyn Barcoma, Angelino Pimentel and Renann Baldovino*
11:30 - 11:45	**125:** A PI Controller-Based Water Supplying and Priority Based SCADA System for Industrial Automation using PLC-HMI Scheme *Ahsan Kabir Nuhel, Mir Mohibullah Sazid, Kaushik Ahmed, Md. Nafim Mahmud Bhuiyan and Md Yeasib Bin Hassan*
11:45 - 12:00	**91:** Smart Wheelchairs: A Review on Control Methods *Norheliena Aziz, Zulkifli Mohamed, Nurul Syuhadah Khusaini, Aminuddin Hamid, Ya'Akob Yusof and Mohd Rozaiman Aziz*
12:00 - 12:15	**239:** A Safe Overtaking Control Scheme for Autonomous Vehicles using Rapid-Exploration Random Tree *Yincong Ma, Kit Guan Lim, Min Keng Tan, Helen Sin Ee Chuo, Lorita Angeline and Kenneth Tze Kin Teo*

A3: Machine Learning (I)	
Session Chair: Dr. Tan Soo Fun	
Time	**Papers**
10:45 - 11:00	**246:** Computing Non-Contactable Drowsiness Monitoring System with Mobile Machine Vision *Alixson Polumpung, Lorita Angeline, Helen Sin Ee Chuo, Min Keng Tan, Kit Guan Lim and Kenneth Tze Kin Teo*
11:00 - 11:15	**3:** Comparing Machine Learning Models for Heart Disease Prediction *Stephanie Chua, Valerine Sia and Puteri Nor Ellyza Nohuddin*
11:15 - 11:30	**13:** Rice Leaf Disease Detection with Transfer Learning Approach *A.K.M. Salman Hosain, Md Humaion Kabir Mehedi, Tamanna Jahan Jerin, Md. Manik Hossain, Sanowar Hossain Raja, Humayra Ferdoushi, Shadab Iqbal and Annajiat Alim Rasel*
11:30 - 11:45	**25:** Performance Evaluation of HMI based on AHP and GRT for GUI *Jian Bang Liu, Mei Choo Ang, Jun Kit Chaw and Kok Weng Ng*
11:45 - 12:00	**28:** Wasserstein Generative Adversarial Networks with Meta Learning for Fault Diagnosis of Few-shot Bearing *Ouyang Chengda and Noramalina Abdullah*
12:00 - 12:15	**92:** Analysis and Forecasting of Blockchain Based Cryptocurrencies and Performance Evaluation of TBATS, NNAR and ARIMA *Iqra Sadia, Atif Mahmood, Miss Laiha Binti Mat Kiah and Saaidal Razalli Bin Azzuhri*

Parallel Session B

13 September 2022

14:00 – 15:00 MYT

B1: Pattern Recognition and Classification (II)	
Session Chair: Dr. Suraya binti Alias	
Time	**Papers**
14:00 - 14:15	**242:** Optimizing High-Density Aquaculture Rotifer Detection using Deep Learning Algorithm *Alixson Polumpung, Kit Guan Lim, Min Keng Tan, Sitti Raehanah Muhamad Shaleh, Renee Ka Yin Chin and Kenneth Tze Kin Teo*
14:15 - 14:30	**81:** Health Classification System of Romaine Lettuce Plants in Hydroponic Setup using Convolutional Neural Networks (CNN) *Jerome Martin Desiderio, Angelo John Tenorio and Cyrel Manlises*
14:30 - 14:45	**127:** Improving Dynamic Hand Gesture Recognition based IR-UWB using Offline Data Augmentation and Deep Learning *Djazila Korti and Zohra Slimane*
14:45 - 15:00	**134:** Voice Recognition System for User Authentication using Gaussian Mixture Model *Novario Perdana, Dyah Herwindiati and Nor Sarmin*

B2: Intelligent Control and Robotics (II)	
Session Chair: Dr. Lim Kit Guan	
Time	**Papers**
14:00 - 14:15	**177:** Real-Time Trajectory Tracking Control of an Electro-Hydraulic System using a Fuzzy Logic Sliding Mode Controller *Muhamad Fadli Ghani, Rozaimi Ghazali, Hazriq Izzuan Jaafar and Chong Chee Soon*
14:15 - 14:30	**204:** Efficient Distributed Consensus Algorithm for Swarm Robotic *Sathishkumar Ranganathan, Muralindran Mariappan and Karthigayan Muthukaruppan*
14:30 - 14:45	**236:** UAV Path Planning using Rotated TOR in Structured Environment *Shaliza Hayati A. Wahab, Azali Saudi, Nordin Saad and Ali Chekima*
14:45 - 15:00	**198:** Artificial Intelligence-based Safety Helmet Recognition on Embedded Devices to Enhance Safety Monitoring Process *Sharjeel Anjum, Syed Farhan Alam Zaidi, Rabia Khalid and Chansik Park*

B3: Machine Learning (II)	
Session Chair: Dr. Aroland Kiring	
Time	**Papers**
14:00 - 14:15	**47:** Discrete Wavelet Transform based EEG Feature Extraction and Classification for Mental Stress using Machine Learning Classifiers *Kah Kit Ng, Hafeez Ullah Amin and Ahmad Rauf Subhani*
14:15 - 14:30	**73:** Computer-assisted Table Tennis Posture Analysis using Machine Learning *Mel Jay Llanos, Jecee Ryn Obrero, Lhora Mae Alvarez, Chun-Hung Yang and Chris Jordan Aliac*
14:30 - 14:45	**83:** K-Zones: A Machine Learning-Based System to Estimate Social Distancing Violations During Pandemic Eras *Mohammad Saatialsoruji and Eihab Saatialsoruji*
14:45 - 15:00	**85:** Open Agricultural Burning Detection with Natural Inspired Swarm-based Detection Platform *Liew Jia Jun, Kian Meng Yap, Kok Seng Eu and Qiang Ni*

Parallel Session C

13 September 2022

15:15 – 16:15 MYT

C1: Pattern Recognition and Classification (III)	
Session Chair: Dr. Norazlina binti Khamis	
Time	**Papers**
15:15 - 15:30	**122:** Chicken Meat Freshness Classification Based on VGG16 Architecture *Mary Bettina P. Garcia, Eugene A. Labuac and Carlos C. Hortinela IV*
15:30 - 15:45	**137:** Classification of Defects in Robusta Green Coffee Beans using YOLO *Vince Amiel Luis, Marc Vincent Quiñones and Analyn Yumang*
15:45 - 16:00	**152:** Ripeness Classification of Cacao Using Cepstral-based Statistical Features and Support Vector Machine *Juvy Amor Galindo, Jamie Eduardo Rosal and Jocelyn Villaverde*
16:00 - 16:15	**153:** Comparing Zero-Shot Text Classification and Rule-Based Matching in Identifying Cyberbullying Behaviors on Social Media *Wei Jiek Chong, Hui Na Chua and May Fen Gan*

C2: Intelligent Transportation System (I)	
Session Chair: Dr. Tan Min Keng	
Time	**Papers**
15:15 - 15:30	**82:** Development of a Virtual Vehicle Identification for Tracking Hit-and-Run Vehicle *Khoo Boon Sheng, Associate Professor Dr. Abdullah Aziz Bin Saad and Dr. Mohamad Khairi Bin Ishak*
15:30 - 15:45	**202:** Visual Odometry Based Vehicle Lane-changing Detection *Dayang Nur Salmi Dharmiza Awang Salleh, Emmanuel Seignez and Kuryati Kipli*
15:45 - 16:00	**121:** A Low-Cost Prototyping Approach for Autonomous Unmanned Ground Vehicle for Real-Time Surveillance *Vishnu S, Anil Kumar M, Manjesha G M, Zaheer Pasha and Madhu S*
16:00 - 16:15	**172:** Vehicle Type Classification and Counting using YOLOv4 Algorithm *Ana Lowela Lucas, Samuel Ii Imperial and Meo Vincent Caya*

C3: Machine Learning (III)	
Session Chair: Dr. Florence Sia Fui Sze	
Time	**Papers**
15:15 - 15:30	**89:** Comparisons of DNA Sequence Representation Methods for Deep Learning Modelling *Shu En Chia and Nung Kion Lee*
15:30 - 15:45	**93:** Optimizing Deep Learning Inference to Detect PCB Soldering Defects *Mau-Luen Tham, Boon Yoong Chong, Yu Han Tan, Yen Khai Wong, Swee Ling Chean and Wei Kun Tan*
15:45 - 16:00	**111:** Determination of Tomato Fruit Stages using Principal Component Analysis and Fuzzy Logic Algorithm *Cochise Alfonso Dela Cruz, Erson Macatangay and Jocelyn Villaverde*
16:00 - 16:15	**117:** Fast Blind Source Separation with Fast Iterative Shrinking Threshold and Adaptive Initialization *Yangjie Wei, Zhongqi Hu, Ke Zhang and Ben Niu*

Parallel Session D

14 September 2022

10:15 – 11:15 MYT

D1: Pattern Recognition and Classification (IV)	
Session Chair: Dr. Farashazillah binti Yahya	
Time	**Papers**
10:15 - 10:30	**163:** Dense-par-AttNet: An Attention Based Deep Learning Model for Skin Lesion Classification by Transfer Learning Approach *Mohammad Rakin Uddin and Talha Ibn Mahmud*
10:30 - 10:45	**186:** Fall and Normal Activity Classification via Multiple Wearable Sensors *Rabia Khalid, Sharjeel Anjum and Chansik Park*
10:45 - 11:00	**12:** Bengali Speech Recognition: An Overview *Mashuk Arefin Pranjol, Farhin Rahman, Ehsanur Rahman Rhythm, Rajvir Ahmed Shuvo, Tanjib Ahmed, Bushra Yesmeen Anika, Md. Abdullah Al Masum Anas, Jahidul Hasan, Saiadul Arfain, Shadab Iqbal, Md Humaion Kabir Mehedi and Annajiat Alim Rasel*
11:00 - 11:15	**15:** Bangladeshi Paper Currency Recognition using Lightweight CNN Architectures *Tazwar Mohammed Shoumik, Sartaj Jamal Chowdhury, Tanzim Mostafa, Adib Muhammad Amit, Shah Abul Hasnat Chowdhury, Oyshik Ahmed Aadi, Sifatul Amin, Md Humaion Kabir Mehedi, Shadab Iqbal and Annajiat Alim Rasel*

D2: Intelligent Transportation System (II)	
Session Chair: Dr. Helen Chuo Sin Ee	
Time	**Papers**
10:15 - 10:30	**244:** On-Demand Priority Traffic Optimizer with Fuzzy Logic Microcontroller *Helen Sin Ee Chuo, Yee En Seah, Min Keng Tan, Kit Guan Lim, Chung Fan Liau and Kenneth Tze Kin Teo*
10:30 - 10:45	**248:** Traffic Signal Optimization using Cultural Algorithm *Min Keng Tan, Hon Yang Vun, Helen Sin Ee Chuo, Kit Guan Lim, Soo Siang Yang and Kenneth Tze Kin Teo*
10:45 - 11:00	**250:** Local Traffic Network Formulation and Signalisation via Benchmark Webster Model *Helen Sin Ee Chuo, Min Keng Tan, Kit Guan Lim, Lorita Angeline, Tienlei Wang and Kenneth Tze Kin Teo*
11:00 - 11:15	**168:** Efficient Spectrum Allocation in Cognitive Radio using Multi-Objective Yellow Saddle Goatfish Algorithm *Debashree Brahma, Swati Swayamsiddha and Ganapati Panda*

D3: Machine Learning (IV)	
Session Chair: Dr. Ali Farzamnia	
Time	**Papers**
10:15 - 10:30	**123:** Toxic Voice Classification Implementing CNN-LSTM & Employing Supervised Machine Learning Algorithms Through Explainable AI-SHAP *Mahmudul Hasan Shakil and Md. Golam Rabiul Alam*
10:30 - 10:45	**184:** Detection of Social Media Hashtag Hijacking using Dictionary-Based and Machine Learning Methods *Wei Ling Cheah and Hui Na Chua*
10:45 - 11:00	**197:** Highway Surveillance System using Deep Learning Artificial Neural Networks *Chuan-Hsian Pu and Chun-Shen Sea*
11:00 - 11:15	**227:** Improved Performance in Distributed Estimation by Convex Combination of DNSAF and DNLMS Algorithms *Ahmad Pouradabi, Amir Rastegarnia, Azam Khalili and Ali Farzamnia*

Parallel Session E

14 September 2022

11:30 – 12:30 MYT

E1: Pattern Recognition and Classification (V)	
Session Chair: Dr. Herwansyah bin Lago	
Time	**Papers**
11:30 - 11:45	**22:** Snail Recognition using YOLO *Juan Ricardo Borreta, Justin Bautista and Analyn Yumang*
11:45 - 12:00	**151:** Depression Detection on Social Media with User Network and Engagement Features using Machine Learning Methods *Aik Seng Liaw and Hui Na Chua*
12:00 - 12:15	**49:** Optical Character Recognition of Baybayin Writing System using YOLOv3 Algorithm *Angel Mikaela Ligsay, John Rivera and Jocelyn Villaverde*
12:15- 12:30	**58:** Real Time Bangla License Plate Recognition with Deep Learning Techniques *Mahmudol Tusar, Md. Bhuiyan, Md. Hossain, Anika Tabassum and Riasat Khan*

E2: Smart Energy (I)	
Session Chair: Dr. Nur Aqilah binti Mohamad	
Time	**Papers**
11:30 - 11:45	**30:** Energy Saving and Safety Street Lighting System *Yii Sze Hang, Nurfauza Jali, Cheah Wai Shiang, Suriati Khartini Jali and Lim Phei Chin*
11:45 - 12:00	**90:** A GA Optimization Model for the Appliance Category-based Electricity Consumption of Philippine Households *Renann Baldovino and Justin Bernard Carlos*
12:00 - 12:15	**103:** Conceptualizing a Battery Swapping Station: A Case Study in Malaysia *Elvin E.S. Cheah, Christina Chin May May, Novita Sakundarini and Akhil Garg*
12:15- 12:30	**181:** Energy Efficient Scheduling in Smart Home using Deep Reinforcement Learning *Fauzun Abdullah Asuhaimi, Muhammad Akram Roslann and Khairul Nabilah Zainul Ariffin*

E3: Machine Learning (V)	
Session Chair: Dr. Nooralisa Mohd Tuah	
Time	**Papers**
11:30 - 11:45	**209:** Environment-Based Oil Palm Yield Prediction using K-Nearest Neighbour Regression *Nuzhat Khan, Mohamad Anuar Kamaruddin, Muhammad Paend Bakht, Usman Ullah Sheikh and Yusri Yusup*
11:45 - 12:00	**220:** River Water Level Prediction for Flood Risk Assessment using NARX Neural Network *Mazlina Mamat, Zizi Zulaikha Zulkifli and Hoe Tung Yew*
12:00 - 12:15	**1:** Prediction of Maximum Temperatures by Time Series and Artificial Neural Networks (Case Study: Isfahan Station) *Mohammad Heydari, Hamed Benisi Ghadim and Mohammad Salarian*
12:15- 12:30	**148:** A Hybrid TDNN-HMM Automatic Speech Recognizer for Filipino Children's Speech *John Andrew Ing, Ronald Pascual and Francis Dimzon*
12:30 – 12:45	**37:** Application Water Level Prediction Through Seasonal Autoregressive Integrated Moving Average: Red Hills Reservoir Case Study *Abdus Samad Azad, Rajalingam Sokkalingam, Hanita Daud and Sajal Kumar Adhikary*

Parallel Session F

14 September 2022

15:15 – 16:30 MYT

F1: Pattern Recognition and Classification (VI)	
Session Chair: Dr. Rosalyn R Porle	
Time	**Papers**
15:15 - 15:30	**142:** A Real-Time Approach to Classify the Water Quality of the River Ganga at Mehandi Ghat, Kannuaj *Abhishek Bajpai, Srishti Chaubey, Bdk Patro and Abhineet Verma*
15:30 - 15:45	**143:** Detection and Identification of Intestinal Parasites on Dogs using AlexNet CNN Architecture *Khaye Fajardo, Jerald Gonzales and Carlos Hortinela IV*
15:45 - 16:00	**144:** Bacterial Leaf Blight Identification of Rice Fields using Tiny YOLOv3 *Jeruel Krystian Tulfo, Mc Henry Tan, Analyn Yumang and Jocelyn Villaverde*
16:00 - 16:15	**50:** Intelligent Modular Camera Rig for Classroom Lecture Video Recording System with Automatic Lighting Adjustment *Rolland Christopher Gamez, Gio Tolores and Jesus Martinez*
16:15 - 16:30	**140:** Non-Destructive Determination of Sweetness of Philippine Fruits using NIR Technology *Alvin Borras, Ronald Andrew Ganotisi, Noel Linsangan and Roben Juanatas*

F2: Smart Energy (II)	
Session Chair: Dr. Chai Chang Yii	
Time	**Papers**
15:15 - 15:30	**187:** Harmonic Minimization in Multilevel Inverter using PSO-based Soft-Computing Technique *Yee Wei Sea, Wei Teik Chew, Siok Lan Ong, Wui Ven Yong and Jenn Hwai Leong*
15:30 - 15:45	**188:** GA-Optimized Switching Angles for 13-Level Asymmetrical Multilevel Inverter *Wei Tik Chew, Yee Wei Sea, Siok Lan Ong, Wui Ven Yong and Jenn Hwai Leong*
15:45 - 16:00	**241:** Efficient Transmission based on Genetic Evolutionary Algorithm *Jin Fan, Kit Guan Lim, Min Keng Tan, Helen Sin Ee Chuo, Ali Farzamnia and Kenneth Tze Kin Teo*
16:00 - 16:15	**232:** Design and Analysis of Solar Powered Portable Refrigerator Unit *Yuslinda Wati Mohamad Yusof, Murizah Kassim and Wan Amir Azrin Wan Shuhaimi*
16:15 - 16:30	**245:** Maximizing Power Generation in Variable Speed Micro-Hydro with Power Point Tracking *Min Keng Tan, Norafe Maximo Javinez, Kit Guan Lim, Ahmad Razani Haron, Pungut Ibrahim and Kenneth Tze Kin Teo*
16:30 – 16:45	**166:** Modelling Hydrology Bioretention System with HYDRUS-1D *Jason Lowell Jitolis, Farrell Nereus Aegidius and Nurmin Bolong*
16:45 – 17:00	**87:** A Prototype Model of Monitoring Energy Consumption and Optimizing Distribution of Smart Buildings *Abdulrahman Shalaby, Manjit Singh Sidhu and Jason Tan*

F3: Biomedical Engineering (I)	
Session Chair: Dr. Mazlina Mamat	
Time	**Papers**
15:15 - 15:30	**7:** Identification of COVID-19 from Chest CT Scan using CNN as Feature Extractor and Voting Classifier *Ferdib-Al-Islam and Pintu Chandra Shill*
15:30 - 15:45	**11:** A Comparative Study of Chatbot Catered Towards Mental Health *Pranto Dev, Sameeha Haque, Asmita Noor, Abir Alam Srabon, Mashruk Mohammed Wasik, Sumaiya Mim, Shadman Bin Sharife, Fariha Rahman, Syeda Rifa Syara, Shadab Iqbal, Md Humaion Kabir Mehedi and Annajiat Alim Rasel*
15:45 - 16:00	**59:** A Small Scale COVID-19 Diagnosis Program: A Philippine Perspective *Renann Baldovino and Justin Bernard Carlos*
16:00 - 16:15	**88:** A Volume and Assist Controlled Mechanical Emergency Ventilator for Respiratory Support *Asher Angelo Buan, Erika Faye Cataina, Glynn Kenneth Marañon, Silverio Magday, Angelino Pimentel and Renann Baldovino*
16:15 - 16:30	**173:** Text Classification of Medical Transcriptions using N-Gram Machine Learning Approach *Kah Win Lee and Keng Hoon Gan*

Parallel Session G

15 September 2022

9:15 – 10:30 MYT

G1: Pattern Recognition and Classification (VII)	
Session Chair: Dr. Lai Po Hung	
Time	**Papers**
09:15 - 09:30	**249:** Speech-Based Number Recognition using KNN and SVM *Rosalyn R Porle and Suzanih Embok*
09:30 - 09:45	**135:** Real-time Detection of Aquarium Fish Species using YOLOv4-tiny on Raspberry Pi 4 *Cyril Jay Chan, Ethan James Reyes, Noel Linsangan and Roben Juanatas*
09:45 - 10:00	**138:** A Chinese Business License Text Detection Algorithm Based On Multi-Scale Features *Xingxing Sun, Mohan Wu, Boquan Cheng, Aidong Yang, Xiaozhou Ye and Ye Ouyang*
10:00 - 10:15	**139:** Detection of Forged Handwriting Through Analyzation of Handwritten Characters using Support Vector Machine *Ma. Crisanta Jasmin, Mark Jayson Dela Cruz and Analyn Yumang*
10:15 - 10:30	**56:** An Investigation of Automating Fungus Inspection Process of Aircraft Fuel Tank via Image Processing *Sin Yee Beh, Veronica Jauw, Chin Seong Lim and Leong Liew Chee*

G2: Signal and Image Processing (I)	
Session Chair: Dr. Norfarariyanti Parimon	
Time	**Papers**
09:15 - 09:30	**63:** GAN-Based Data Augmentation Considering Correlation with Finger Vein Images *Yusuke Matsuda, Tomo Miyazaki and Shinichiro Omachi*
09:30 - 09:45	**66:** Blended QR Code for Digital Advertising *Wan-Er Ho, Lee-Yeng Ong and Meng-Chew Leow*
09:45 - 10:00	**74:** A Spoof Detecting Fingerprint Reader Based on a Combination of Total Internal Reflection and Direct Image Capture *Noel Linsangan, Bob Laurence Caridad, Ar Jay De Vera and Roben Juanatas*
10:00 - 10:15	**76:** Comparison of Dark Channel Prior and Contrast Limited Histogram Equalization for the Enhancement of Underwater Fish Image *Mohd Hanafi Ahmad Hijazi and Jing Mei Leong*
10:15 - 10:30	**108:** Third Eye Hand Glove Object Detection for Visually Impaired using You Only Look Once (YOLO)v4-tiny Algorithm *Angelika Ice Labininay, Jeloux P. Docto and Jocelyn Villaverde*

G3: Biomedical Engineering (II)	
Session Chair: Dr. Ervin Gubin Moung	
Time	**Papers**
09:15 - 09:30	**175:** An Empirical Model of Classifying Lung Affected Diseases to Detect COVID-19 using Chest X-ray Employing Convolutional Neural Architecture *Ovi Sarkar, Md. Robiul Islam, Tahmim Hossain, Md Khalid Syfullah, Md. Tohidul Islam and Md Moniruzzaman*
09:30 - 09:45	**194:** A Comparative Study of COVID-19 CT Image Synthesis using GAN and CycleGAN *Kin Wai Lee and Renee Ka Yin Chin*
09:45 - 10:00	**212:** A Hybrid Biosignal Compression Model for Healthcare Sensor Networks *Dheepa T., Sekar K., Satish Kumar Satti and Raja Reddy Gnv*
10:00 - 10:15	**78:** A Comparative Analysis of Lumpy Skin Disease Prediction Through Machine Learning Approaches *Dibyo Fabian Dofadar, Hasnat Md. Abdullah, Riyo Hayat Khan, Rafeed Rahman and Md. Sabbir Ahmed*
10:15 - 10:30	**215:** Pre-trained Deep Learning Models for COVID19 Classification: CNNs vs. Vision Transformer *Maisarah Mohd Sufian, Ervin Moung, Jamal Dargham, Farashazillah Yahya and Sigeru Omatu*

Parallel Session H

15 September 2022

10:45 – 12:15 MYT

H1: Communication Technology	
Session Chair: Dr. Megat Muhammad Ikhsan bin Megat Hasnan	
Time	**Papers**
10:45 - 11:00	**240:** Energy-Efficient Ant Colony Based LEACH Routing Algorithm in Wireless Sensor Network *Muhammad Zahir Abd Latif, Kit Guan Lim, Min Keng Tan, Helen Sin Ee Chuo, Tienlei Wang and Kenneth Tze Kin Teo*
11:00 - 11:15	**243:** Adapting Perturbation Voltage for Variable Speed Micro-Hydro using Particle Swarm Optimization (PSO) *Kit Guan Lim, Mohd Izzat Fikri Md Zainal, Min Keng Tan, Ahmad Razani Haron, Chang Yii Chai and Kenneth Tze Kin Teo*
11:15 - 11:30	**105:** Concurrent Architecture of High Speed Viterbi Decoder using Xilinx HLS Tool *Jyoti Zunzunwala and Dr. Atul Joshi*
11:30 - 11:45	**169:** Performance Evaluation of V2V Propagation Channels Under Different Link Types *Azlan Abd Aziz, Azwan Mahmud, Nur Asyiqin Amir Hamzah, Hadhrami Ab Ghani and Nurul Asyiqin Mamat*
11:45 - 12:00	**211:** Sleep-Wake Scheduling Scheme for Small Cell Base Stations: A Review *Charis Shwu Chen Kwan, Yeh Ching Low and Kok-Lim Alvin Yau*
12:00 – 12:15	**205:** Factors Promoting Digital Transaction through Adoption of NFC Technology *Chinnasamy Agamudainambhi Malarvizhi, Rajee Supramani and Rajee Supramani*

H2: Signal and Image Processing (II)	
Session Chair: Assoc. Prof. Dr. Renee Chin Ka Yin	
Time	**Papers**
10:45 - 11:00	**136:** Image Quality Assessment for Wood Images *Heshalini Rajagopal, Norrima Mokhtar and Anis Salwa Mohd Khairuddin*
11:00 - 11:15	**145:** Investigating Vision Based Sorting of Used Items *Praneel Chand*
11:15 - 11:30	**150:** EZM-AI: A Yolov5 Machine Vision Inference Approach of the Philippine Corn Leaf Diseases Detection System *Yolanda C. Austria, Maria Concepcion A. Mirabueno, Dylan Josh D. Lopez, Dexter James L. Cuaresma, Jonel R. Macalisang and Cherry D. Casuat*
11:30 - 11:45	**162:** A Feature-Based Stochastic Morphological Analyzer for Filipino Affixed Words *Great Allan Ong and Melvin Ballera*
11:45 - 12:00	**165:** A Hybrid Xception-Ensemble Model for the Detection of Computer Generated Images *Sychandran C S and Shreelekshmi R*
12:00 – 12:15	**84:** Classification of Cacao Pod If Healthy or Attack by Pest or Black Pod Disease using Deep Learning Algorithm *Rey Anthony Godmalin, Chris Jordan Aliac and Larmie Feliscuzo*
12:15 – 12:30	**45:** Simulation of Smart Traffic Light by using Image Processing and Reinforcement Learning *Chin Chun Keat and Sharifah Sakinah Syed Ahmad*

H3: Biomedical Engineering (III)	
Session Chair: Dr. Yew Hoe Tung	
Time	**Papers**
10:45 - 11:00	**101:** Diagnosis of Acute Respiratory Syndromes from X-Rays Using Customised CNN Architecture *Palaniappan S, Varshaa Sai Sripriya S, Lalitha Pranathi Amalladinna Rama and Muthulakshmi M*
11:00 - 11:15	**141:** Ad-Gency: Hospital Patients' Admission Management Information System and Analytics Development on Health Emergency Situation *Alyssa Bautista, Ailah Carelle Bunag, Mariz Menorca and Alfio Regla*
11:15 - 11:30	**156:** Development of Smart Elderly Care Mobile Application for Health Management System *Zuraini Dahari, Choong Chee Jun, Poh Jin Ze, Nurul Najwa Mohd Zakir, Mohd Noor Faidhi Mohd Fauzi, Muhammad Hafiz Syazwan Mohamad Azam and Nurhaniza Hamiri*
11:30 - 11:45	**170:** Detection of Sickle Cell Anemia in Blood Smear using YOLOv3 *John Paolo De Leon, John Michael Vincent Dayego, Noel Linsangan and Roben Juanatas*
11:45 - 12:00	**210:** Automated Retinal Blood Vessel Feature Extraction in Digital Fundus Images *Nasiruddin Zaman Huri, W Mimi Diyana W Zaki, Assyareefah Hudaibah Saad and Nur Asyiqin Amir Hamzah*
12:00 – 12:15	**65:** Web-Based Brain Tumor Detection and Classification using Convolutional Neural Network *Kalab Kiros and Dinesh Kumar*

Parallel Session I

15 September 2022

14:00 – 15:30 MYT

I1: Affective Computing	
Session Chair: Dr. Chin Pei Yee	
Time	**Papers**
14:00 - 14:15	**23:** Stock Market Price Prediction: Text Analytics of the GameStop Short Squeeze *Ng Wei Xiang and Mohammad Dabbagh*
14:15 - 14:30	**95:** Performance of Content-Based Features to Detect Depression Tendencies in Different Text Length *Nur Zareen Zulkarnain, Noor Fazilla Abd Yusof, Sharifah Sakinah Syed Ahmad, Zuraini Othman and Azura Hanim Hashim*
14:30 - 14:45	**94:** Extracting Graphological Features for Identifying Personality Traits using Agglomerative Hierarchical Clustering Algorithm *Noor Fazilla Abd Yusof, Nur Zareen Zulkarnain, Sharifah Sakinah Syed Ahmad, Zuraini Othman and Azura Hanim Hashim*
14:45 - 15:00	**229:** Journaling System with Embedded Machine Learning Text Depression Detection Alert *Lai Po Hung and Esther Mary Tadius*
15:00 - 15:15	**237:** Factors Affecting Customer Loyalty on Starbucks Malaysia using Binary Logistics and Probit Model *Ng Tze Ling, Mohd Saifullah Rusiman, Suparman Suparman, Firdaus Mohamad Hamzah and Nur Ain Ebas*
15:15 – 15:30	**97:** Forest Fire Detection for Edge Devices *Khai Xian Teo and Hermawan Nugroho*
15:30 – 15:45	**102:** Fuzzy-based Control System of Unmanned Surface Vehicle (USV) for Floating Garbage Collection *Adam Mun Wai Wong, Jia Long Chong, Han Shen Kew, Jian An Ong, Hermawan Nugroho and Muhammad Ilhamdi Rusydi*

I2: Signal and Image Processing (III)	
Session Chair: Assoc. Prof. Dr. Jamal Ahmad Dargham	
Time	**Papers**
14:00 - 14:15	**71:** Improved VGG Architecture in CNNs for Image Classification *Nurzarinah Zakaria and Yana Mazwin Mohmad Hassim*
14:15 - 14:30	**216:** A Comparison of RGB and RGNIR Color Spaces for Plastic Waste Detection Using the YOLOv5 Architecture *Owen Tamin, Ervin Moung, Jamal Dargham, Farashazillah Yahya, Sigeru Omatu and Lorita Angeline*
14:30 - 14:45	**185:** A New Face Image Manipulation Reveal Scheme Based on Face Detection and Image Watermarking *Zahraa Aqeel Salih, Rasha Thabit, Khamis A. Zidan and Bee Ee Khoo*
14:45 - 15:00	**10:** GPU Accelerated Metaheuristics for Integrated Production Lot Sizing and Scheduling Problems *Attilio Sbrana, Deisemara Ferreira and Renato Fernandes Cantão*
15:00 - 15:15	**120:** Online Courier Management System with Text Blast and QR Code Technology *Alfio Regla and Bryan Dadiz*
15:15 - 15:30	**119:** Pick-by-vision of Augmented Reality in Warehouse Picking Process Optimization – A Review *Shaliza Jumahat, Manjit Singh Sidhu and Sharulhizam Mohamad Shah*

I3: Internet of Things	
Session Chair: Dr. Leau Yu Beng	
Time	**Papers**
14:00 - 14:15	**34:** Performance Evaluation of Machine Learning Algorithms for Intrusion Detection in IoT Applications *Yee Jien Ng, Mohammad Tahir, Mohammad Dabbagh, Kian Meng Yap and Ali Farooq*
14:15 - 14:30	**80:** IoT-Based Smart Agriculture Monitoring System *Riasat Khan, Md Musfiq Us Saleheen, Md Shariful Islam, Rabbul Fahad and Md Jayed Bin Belal*
14:30 - 14:45	**132:** A Real-Time Web-Based Monitoring System for Stingless Bee Farming *Bill Acherllys Jailis, Aroland Kiring, Hoe Tung Yew, Liawas Barukang, Yan Yan Farm and Farrah Wong*
14:45 - 15:00	**222:** Evaluation of an Electronic Sensor-Based Agility Test System for Badminton Players' Development *Jeckta Emmi Marrylin Yalin, Hazlihan Haris, Megat Muhammad Ikhsan Megat Hasnan and Ismail Saad*
15:00 - 15:15	**226:** Internet-of-Things for Smart Dryers: Enablers, State of the Arts, Challenges, and Solutions *Mohd Khairulanwar Rizalman, Ervin Moung, Jamal Ahmad Dargham, Zuhair Jamain, Nurul'Azah Mohd Yaakub and Sigeru Omatu*

Abstracts

1	**Prediction of Maximum Temperatures by Time Series and Artificial Neural Networks (Case Study: Isfahan Station)** *Mohammad Heydari, Hamed Benisi Ghadim and Mohammad Salarian*

Due to climate changes, global warming, and the recent drought, forecasting, checking, and analyzing maximum temperatures as one of the foremost imperative climatic parameters allows planners to plan and provide the necessary arrangements. The main reasons for checking the temperature as a parameter influencing nature are agriculture, pests, diseases, melting ice and flooding, evaporation and transpiration, and drought. Today, artificial neural networks are used to predict time series like temperature because of their feature for understanding the random mechanism of fully nonlinear and complex series. This study used data from 1953 to 2005, two methods, and multi-layer perceptron artificial neural networks with the learning algorithm after the error propagation to analyze and check the monthly maximum temperature. This issue used an input layer, five hidden layers of TANSIG, and an output layer of the pure line for artificial neural networks. The mean squared error criterion was also used to assess the results. In the following study, 70% of the total data were used as training data (RMSE = 1.8622 and MSE = 3.4677); in order to avoid the phenomenon of the over-load network, 15% of the data were used for validation data (RMSE = 1.7667 and MSE = 3.1213). The remaining 15 percent has also been used to check and test data. (RMSE = 2.134 and MSE = 4.5538). A comparison of monthly maximum temperature forecast results for 1953 and 2005 with observed data shows good agreement of the model. The overall results indicate that approximately every 64 years will add a degree to the temperature.

3	**Comparing Machine Learning Models for Heart Disease Prediction** *Stephanie Chua, Valerine Sia and Puteri Nor Ellyza Nohuddin*

One of the top causes of death globally is heart disease. Each year, an estimated 17.9 million people die due to heart disease, contributing to 31 percent of all deaths worldwide. Heart diseases, particularly cardiac arrest, could happen anytime and anywhere, without prior warnings or indications. Thus, being able to predict if heart disease is present in a patient can help both the patients and doctors be aware of a potential cardiac arrest and take necessary precautions. Early prognosis of heart disease can essentially help in effective and preventive treatments of patients and reduce the risk of complication of heart disease. In this study, a machine learning approach is used on clinical data of patients to learn models for the prediction of heart disease in patients. A correlation study of the features in the data was carried out to support feature selection for the study. Then, a comparative study of five machine learning techniques, namely Logistic Regression, Naïve Bayes, K-Nearest Neighbour, Decision Tree and Support Vector Machine, was conducted to compare the performance of the models for heart disease prediction. The results obtained were from 13 clinical parameters used to learn models for predicting heart disease. Logistic Regression seemed to perform comparatively well compared the other techniques.

7	**Identification of COVID-19 from Chest CT Scan Using CNN as Feature Extractor and Voting Classifier** *Ferdib-Al-Islam and Pintu Chandra Shill*

COVID-19 was first identified in Wuhan (China) and swiftly spread over the world, resulting in a global pandemic emergency. It has had a profound effect on everyday living, general well-being, and international finance. Rapid diagnosis of susceptible people is critical. There is no precise testing for COVID-19 except for RT-PCR, which is expensive and time-consuming. Recent studies conducted using radiological imaging techniques suggest that such pictures include characteristics of the COVID-19 infection. The implication of machine learning algorithms in conjunction with chest imaging may aid in the accurate detection of this illness and help to overcome the shortage of specialized physicians. This work aims to construct a model for the automated recognition of COVID-19 infection using chest CT scans. To extract features from patient's chest CT scans, a convolutional neural network was used, and Principle Component Analysis was used to decrease computing cost. The proposed model (an ensemble of machine learning classifiers) was created to offer accurate diagnostics by incorporating the five categories (Normal, Mycoplasma pneumonia, Bacterial pneumonia, Viral pneumonia, and COVID-19). The proposed model reached an accuracy of 99.3%, positive predictive value (ppv) of 99.3%, and sensitivity of 99.2%.

10	**GPU Accelerated Metaheuristics for Integrated Production Lot Sizing and Scheduling Problems** *Attilio Sbrana, Deisemara Ferreira and Renato Fernandes Cantão*

This paper presents an investigation of GPU-accelerated multi-population algorithms for two-stage multi-machine lot scheduling problems. While the literature suggests a variety of optimization techniques for this class of problems, here we investigate GPU vectorized Differential Evolutionary and Dispersive Flies Optimization algorithms combined with an exact Branch-and-Cut method. Computational tests with instances from the literature have shown that the GPU-accelerated heuristics can offer, in some cases, computational times that are not attainable with exact methods. Finally, in the conclusionpotential areas for further study are discussed.

11	**A Comparative Study of Chatbot Catered Towards Mental Health** *Pranto Dev, Sameeha Haque, Asmita Noor, Abir Alam Srabon, Mashruk Mohammed Wasik, Sumaiya Mim, Shadman Bin Sharife, Fariha Rahman, Syeda Rifa Syara, Shadab Iqbal, Md Humaion Kabir Mehedi and Annajiat Alim Rasel*

The number of people suffering from severe de-pression has risen in recent years. The majority of patients are apprehensive about seeking counseling and are unwilling to open up. A chat bot might be a viable tool for involving customers in artificial intelligence-powered behavioral health therapies. Chat bots are artificial intelligence entities that answer to users in normal language, exactly like a person would. Social chat bots, in particular, are those that form a deep emotional bond with the user. We shall explore and compare such chat bots in this paper, as they play an important role in assisting patients with mental illness. The study will compare and contrast chat bots such as CARO, XiaoIce, DEPRA, PRERONA, and Eviebot, as well as their role in resolving the depression problem. The article will show how the different chat bots compare in terms of methodology, underlying algorithms, accuracy, population demographics, and limitations. Finally, the paper will provide a quick overview of chat bots' future advancements in this field. The therapeutic component, which determines a person's level of depression, is also a priority.

12	**Bengali Speech Recognition: An Overview** *Mashuk Arefin Pranjol, Farhin Rahman, Ehsanur Rahman Rhythm, Rajvir Ahmed Shuvo, Tanjib Ahmed, Bushra Yesmeen Anika, Md. Abdullah Al Masum Anas, Jahidul Hasan, Saiadul Arfain, Shadab Iqbal, Md Humaion Kabir Mehedi and Annajiat Alim Rasel*

This study outlines the notable efforts of creating of automatic speech recognition (ASR) system in Bengali. It describes data from the Bengali language's existing voice corpus and the major reports that have contributed to the recent research scenario. It provides an overview of dataset or corpus that has been created for bengali ASR, challenge faced to create bengali ASR as well as techniques used to build Bengali ASR system. ASR techniques for the Bengali language have made significant progress in recent years. Our article contains studies from 2016 through 2020. We examined the results of these investigations, as well as the strategies used to accomplish this goal, for Automated voice recognition. We have examined these publications to obtain a feel of the present state of Bengali ASR. We have observed a dearth of sufficient datasets among these researchers, which is important for any automated system. Due to the language's abundance of consonant clusters, the Machine Learning (ML) system has difficulty interpreting Bengali words. As a result of these modifications, the system now confronts a new set of difficulties in terms of effectiveness and efficiency. Additionally, numerous words have nearly identical pronunciations. These are only some of the issues that the papers we examined face. This research makes use of a variety of techniques, including linear prediction coding, Mel Frequency Cepstral Coefficient, Hidden Markov Model, Neural Network, and Fuzzy logic. Bengali ASR will require further investigation shortly. While recent research is encouraging, ASR of other languages, such as English, is far from perfect and efficient.

13	**Rice Leaf Disease Detection with Transfer Learning Approach** *A.K.M. Salman Hosain, Md Humaion Kabir Mehedi, Tamanna Jahan Jerin, Md. Manik Hossain, Sanowar Hossain Raja, Humayra Ferdoushi, Shadab Iqbal and Annajiat Alim Rasel*

Rice (Oryza sativa) is among the most widely cultivated crops all over the world. The seed of the grass species Oryza sativa is commonly identified as rice. Rice is consumed all over the world as a main source of carbohydrate, specially in Asian countries. As a South Asian country, our homeland Bangladesh has identified rice as its staple food. Throughout the world, rice leaf diseases cause a huge loss in rice production each year. Traditionally, rice leaf diseases are detected in laboratory tests, which is time consuming. If machine learning and computer vision based approaches- which are faster and more accurate comparing to manual detection of rice leaf diseases- can be implemented to detect rice diseases, a substantial amount of production loss pertaining to these diseases can be mitigated. Deep learning frameworks, such as, convolutional neural networks (CNN) shows higher efficacy in image classification and object detection from images. They can be utilized to classify various rice diseases and, as a result, can play an important role in early detection of rice diseases and, consequently, improving the production. In this paper, we have utilized transfer learning approach by using three pretrained CNN models: InceptionV3, DenseNet201, and EfficientNetV2S to detect five prominent diseases of rice (Oryza Sativa) leaves along with healthy leaves seen in our country and have demonstrated extensive comparison between these models. Among the models, DenseNet201 showcased the highest accuracy which was 92.05%.

15	**Bangladeshi Paper Currency Recognition Using Lightweight CNN Architectures** *Tazwar Mohammed Shoumik, Sartaj Jamal Chowdhury, Tanzim Mostafa, Adib Muhammad Amit, Shah Abul Hasnat Chowdhury, Oyshik Ahmed Aadi, Sifatul Amin, Md Humaion Kabir Mehedi, Shadab Iqbal and Annajiat Alim Rasel*

Paper note currency is the most frequently used way of completing a transaction globally, which applies to most developing countries such as Bangladesh. Hence, it is essential to recognize any currency notes within seconds to save time for an uninterrupted transaction. This paper aims to identify different banknotes of Bangladesh using the avant-garde convolutional neural network (CNN) models with transfer learning by utilizing the dataset at hand and updating and augmenting the dataset. To achieve a robust, lightweight, and efficient model for this research problem, we have used various augmentation techniques on a current publicly available dataset and applied custom hyperparameter tuning to various pre-trained CNN models to attain a maximum accuracy of 99.97%.

20	**Four Wheeled Mobile Robots: A Review** *Jovina Seau Ling Leong, Kenneth Tze Kin Teo and Hou Pin Yoong*

Wheeled mobile robots are becoming popular in recent years due to their applications that have impacted various aspects of daily life. With the advancement of technology, the demand for wheeled mobile robots especially four wheeled mobile robots has risen. The rise in demand had urged further research and development of more advanced wheeled mobile robots. In this paper, the recent development and focused on four wheeled mobile robots such as the types of wheels, types of steering systems, and control methods are reviewed. For the four wheeled mobile robots to have better steerability and superior cornering stability, the four-wheel steering systems are employed. Depending on the application, the used of standard or fixed wheels in four-wheel steering system also has better efficiency and accuracy compared to the Omni or mecanum wheels with similar maneuverability for indoor designs application. To effectively deal with the four-wheel steering mobile robot dynamic behavior, the payload uncertainty, system uncertainties and unknown disturbances including the parametric vibrations that lead to tracking performance limitations have to be overcome. For further improvement in tracking the performance of four-wheel steering mobile robots, the main issue is to tackle the payload uncertainty. An adaptive control method is proposed to overcome the issue and this method provided future research directions for the four-wheel steering mobile robot.

21	**A Review of SCARA Robot Control System** *See Han Tay, Wai Heng Choong and Hou Pin Yoong*

In the era of industrial revolution 4.0 (IR4.0), robotics is a common automation tool to comply the repetitive and dangerous jobs for assisting the human workforce. Among the robotic arm, the SCARA robot is one of the well-established robots in the industry due to its high speed and high accuracy. To achieve good control at high speed, the controller is key to ensuring the SCARA robot at such a performance. This paper presents a brief review of the controllers and their pros and cons when applying to the SCARA robot. The reviewed controllers include PID Control, fuzzy logic control, neural networks control, sliding mode control, impedance control, adaptive control and robust control. Besides that, the review also covers the implementation of the Internet of Things (IoT) and artificial intelligence (AI) on the SCARA robot as the trend of IR 4.0.

22	**Snail Recognition Using YOLO** *Juan Ricardo Borreta, Justin Bautista and Analyn Yumang*

Many species of snails inhabit different areas in the world. Some species have made their way to farmlands and the urban regions, surviving through eating plants and breeding unnoticed making them a cause for concern and a known threat to some crops. A study on snail detection has been previously conducted, but recognizing individual species for their risk has not yet been pursued. This study aims to develop a Tiny-YOLOv4 snail recognition system using a Raspberry Pi. The model focuses on four snail species subject to an input image processed through the system. The outputs show the image with the relevant bounding boxes and labels and notify a user through email for any recognitions. The system produced an overall accuracy of 92%, proving successful in the study's objectives and providing a basis for future literature.

23	**Stock Market Price Prediction: Text Analytics of the GameStop Short Squeeze** *Ng Wei Xiang and Mohammad Dabbagh*

Analytics on the stock market is always a topic of interest by many including researchers to prove that financial outcomes could be analyzed beforehand therefore producing insights. In the year 2020 where the pandemic hit globally, the share price of GameStop suffered an unprecedented short squeeze which was a result of selling activities by major investors and buying activities by netizens primarily active on Reddit. Online media was actively covering surface stories about the short squeeze but detailed and extensive research about the event was not seen and done by many. Upon further investigation, a research gap was found that a limited scale of research had performed analysis on the event with text analytics approach and that formulates the larger goal of this research. In this paper, the scope of analytics was mainly split into two approaches, where we first build a clustering model to understand the text behavior of the community, and then a regression model to predict the changes of share price based on the features of their text. With that, we will not only be able to discover the behaviors and sentiment of the community towards the stock, but also predicting the movement of share price using textual data.

25	**Performance evaluation of HMI based on AHP and GRT for GUI** *Jian Bang Liu, Mei Choo Ang, Jun Kit Chaw and Kok Weng Ng*

With consideration to the multi-factor and multi-level characteristics of the human-machine evaluation system for graphical user interface (GUI), the main factors affecting the interactive performance are analyzed. The evaluation system was established to evaluate the performance of human-machine interaction (HMI) for the GUI based on the analytic hierarchy process (AHP) and grey relational theory (GRT) model. Furthermore, we conducted an actual HMI experiment for four interactive products (desktop computer, intelligent refrigerator, smart car, and recreational machine) to verify the validation of the performance evaluation system. The application value of the evaluation model is demonstrated through the calculation. In conclusion, this study can provide a reference to designers for the scientific evaluation of human-machine performance of interactive products, which will help them design user-friendly interactive products with higher interaction efficiency.

28	**Wasserstein Generative Adversarial Networks with Meta Learning for Fault Diagnosis of Few-shot Bearing** *Ouyang Chengda and Noramalina Abdullah*

In practical work situations, the bearing fault diagnosis is a small and imbalanced data challenge. However, the intelligent fault diagnosis model relies on a mass of label data. This research, presents a different method, Wasserstein GAN with Meta Learning, for overcoming the difficulty of few-shot fault diagnosis under imbalanced data constraints. The WGAN module can generate synthetic samples for the data argument, and the first-order model agnostic meta-learning (FOMAML) to initialize and modify the network parameters. Validation of the comparative performance has been made using a benchmark dataset, i.e. CWRU datasets, which show that can achieve excellent diagnostic accuracy with small data. It's successfully overcome that the imbalanced data lead to the sample distribution bias and over-fitting. In addition, it can leverage that can precisely identify the bearing fault health types in a variety of working environments, even with noise interference. It is also found that the proposed model performs better in the testing set after training difficult datasets.

30	**Energy Saving And Safety Street Lighting System** *Yii Sze Hang, Nurfauza Jali, Lau Sei Ping, Cheah Wai Shiang, Suriati Khartini Jali and Lim Phei Chin*

Today, vast amounts of energy are required to power streetlights. Also, the death caused by accidents due to the blockage of the vehicle on the road is increasing especially on the highway. Thus, this paper aims to assemble an intelligent system that implies an automatic switch for detecting vehicle passage with keeping the existing system. Besides, this system uses solar energy to generate free electric energy through the natural resource that our country has gifted sunlight. Besides building an energy-saving system, a safety feature is also one of the aspects considered. This is done by utilising the sensors inserted in the streetlight system and a collaboration between the hardware and coding. By having this safety feature, any blockage due to a car crash or vehicles' break happening at a certain distance in front will activate the hazard warning function in the system while sending a notification to the streetlight management department. This gives the drivers enough time to slow down the vehicles instead of on-the-spot emergency breaks. On the one hand, this system lowers the electricity consumption and increases the safety of the road system.

31	**Rice (Oryza Sativa) Grading Classification using Hybrid Model Deep Convolutional Neural Networks – Support Vector Machine Classifier** *Kevin Marc Bejerano, Carlos Hortinela IV and Jessie Jaye Balbin*

Rice grading plays an essential role in identifying the rice production industry's rice quality method, including its market price. Rice quality is one of the critical selection criteria highly prioritized by farmers and rice consumers, primarily determined by its different rice characteristics. This research paper focuses on developing a hybrid model in classifying rice milled grading: Premium, Grade 1-5 using Raspberry Pi microcomputer based on the physical features extracted such as damaged, discolored, broken, and chalky rice grains present in the sample by integrating the key properties of Deep Convolutional Neural Networks (DCNN) for feature extraction and Support Vector Machine (SVM) as a classifier. An enclosed staging platform with constant and uniform illumination was used for image acquisition with 150 grains per image sample. The proposed model has identified and classified rice grading proficiently and achieved a classification training and validation of 98.33% and 98.75%, respectively.

33	**Classification of Lanzones Tree Leaf Diseases Using Image Processing Technology and a Convolutional Neural Network (CNN)** *Adzmer Muhali and Noel Linsangan*

Nowadays, many artificial intelligence systems are developed to detect and classify plant leaf diseases via image classification, and those researches achieved high-performance results. However, those Artificial Intelligence Systems categorize various leaf diseases, but none precisely for Lanzones. Briefly, no existing or current research has been studied to detect and classify leaf diseases of Lanzones tree in the early stages using an Artificial Intelligence System. This paper presents a device for categorizing the healthy and with diseases (Algal Leaf Spot and Leaf Blight Spot) on the leaves of the Lanzones tree thru image classification using deep learning. It is limited to the device's development and implementation in the target locale. The methods applied include data pre-processing and augmentation techniques to the created CNN model. This will be integrated into a system using the Raspberry Pi 4 Model B and the Tensorflow Lite Interpreter. The performance analysis and evaluation of the system were based on the confusion matrix, which shows how the system successfully classified the healthy and disease of Lanzones leaves with an accuracy rate of 80%.

34	**Performance Evaluation of Machine Learning Algorithms for Intrusion Detection in IoT Applications** *Yee Jien Ng, Mohammad Tahir, Mohammad Dabbagh, Kian Meng Yap and Ali Farooq*

It is estimated that the number of IoT devices will reach 50 billion by 2030, with its wide range of applications and ease of use. However, in recent years, it has been established that there are numerous attacks targeting IoT devices and various challenges to securing them due to their limited computing capacity. One of the main problems that need to be solved is detecting and reporting malicious packets that are attempting to enter the IoT device before they are executed, also known as intrusion detection. An Intrusion Detection System (IDS) is a tool that monitors the network for potentially malicious packets and raises an alert when one is detected. With the usage of technologies such as machine learning and published datasets of IoT traffic that contain malicious traffic and normal traffic, an optimal approach to intrusion detection can be identified. This paper provides an overview of existing machine learning approaches for intrusion detection and evaluates different ap-proaches using multiple datasets. The available datasets were evaluated on several machine learning models based on accuracy, F1-score, and efficiency.

37	**Application Water Level Prediction Through Seasonal Autoregressive Integrated Moving Average: Red Hills Reservoir Case Study** *Abdus Samad Azad, Rajalingam Sokkalingam, Hanita Daud and Sajal Kumar Adhikary*

Predicting water levels has become difficult because of spatiotemporal variations in meteorological circumstances and complex physical processes. The Red Hill Reservoir (RHR) serves as an essential derivation of the water system in its locality. It is also anticipated that it would be transformed into other useful services. Climate change in the region, on the other hand, is predicted to have an impact on the RHR's prospects. In a nutshell, accurate water level forecasting is crucial for the reservoir to meet the needs of the population. In this paper, the time series modeling technique is suggested for the water level prediction in RHR using Box-Jenkins autoregressive integrated moving average (ARIMA) and seasonal autoregressive integrated moving average (SARIMA) models. The models were trained using average monthly water level data from January 2004 to November 2020. The models' performance was analysed with the Akaike information criterion (AIC), mean absolute error (MAE), root mean square error (RMSE), and correlation coefficient (R2). The results revealed that among the models, the SARIMA model performed better than the ARIMA model. The selected SARIMA model was further used for forecasting the water level in RHR for 25 months starting from December 2020 to December 2022. The model well predicted the future reservoir levels data.

44	**Classification of Contaminants in Glass Recycling Using Hybrid CNN-SVM Model** *Juliana Ho Qiu Ann, Novita Sakundarini and Lim Chin Seong*

The sorting process of glass recycling is crucial to determine the grade of glass cullet. Hence, this paper aims to develop an algorithm for the classification of contaminants in glass recycling, presenting a hybrid model integrating two remarkable classifiers: Convolutional Neural Network (CNN) and Support Vector Machines (SVM), which have been proven to achieve the state-of-the-art results in solving classification problem. The proposed approach utilizes pre-trained CNN model as automatic feature extractor and SVM as an output predictor. The hybrid model extracts feature of contaminants from raw images and predicts the corresponding class. A contaminant database consisting around 2000 images is collected with a set of constraints to best portray the realism in practical environment. The performance of three different pretrained CNN models (i.e. AlexNet, VGG-16 and GoogLeNet) in the hybrid model is tested and evaluated using comparative analysis. Since there is no similar approach used in this research field of interest in the past, the performance of the hybrid models is compared to the fine-tuned CNN models in the aspect of classification accuracy. In this study, the integration of VGG-16 and SVM was improved by 0.17% with SVM as classifier and 0.50% with data augmentation, achieving the highest classification accuracy of 100% among the other models. Among the factors that cause the VGG-16+SVM model with data augmentation to outperform are the depth of network, input size, stride size, size of filters and total number of weights and MACs. The proposed method is more accurate and efficient as compared to current existing method, producing high grade glass cullet at low cost.

45	**Simulation of Smart Traffic Light By Using Image Processing and Reinforcement Learning** *Chin Chun Keat and Sharifah Sakinah Syed Ahmad*

Vehicle travel is on the rise across the world, particularly in metropolitan cities. As a result, simulating and optimizing traffic control algorithms is required to better handle this growing demand. In this research, we investigate the simulation and optimization of traffic light controllers in a city and provide a reinforcement learning-based approach. The algorithm that is used is deep Q-learning. There are four processes in this study. The first is data collection. Next, a simulation is built. Then, a reinforcement learning model is trained and tested in the model. Last, the results are compared between the traditional traffic lights and traffic lights that were applied with the reinforcement learning model. The results obtained in this study are queue length of vehicles in front of traffic light and delay time of vehicles after given green signal in two scenarios, which are an environment that uses traditional traffic light and an environment that uses traffic light that applied with reinforcement learning model. From the result, the environment that applied with reinforcement learning agent has shorter time delay and queue length of vehicles. Queue length of vehicles is reduced from 58 to 18 and time delay is reduced from 3900 seconds to 380 seconds.

47	**Discrete Wavelet Transform based EEG Feature Extraction and Classification for Mental Stress using Machine Learning Classifiers** *Kah Kit Ng, Hafeez Ullah Amin and Ahmad Rauf Subhani*

This paper aims to develop a discrete wavelet transform-based EEG feature extraction method for the classification of mental stress using machine learning classifiers. It has been evidence that EEG Oscillations can discriminate mental states, for instance, stressed and non-stressed. However, it is still not clear in which range of EEG oscillations the neural activities are associated with the mental states. Hence, in this analysis, wavelet-based EEG power analysis was performed on an EEG dataset of 22 participants, where the dataset has both stress and control conditions. The EEG alpha, theta, and beta frequency bands showed promising results for the classification of mental stress vs. control conditions by achieving an average accuracy of 95% using the decision tree. The results of the proposed method were superior to the Fast Fourier Transform in feature extraction. The proposed method has the potential to be used in Computer-Aided Diagnosis (CAD) systems for mental stress assessment in the future.

49	**Optical Character Recognition of Baybayin Writing System using YOLOv3 Algorithm** *Angel Mikaela Ligsay, John Rivera and Jocelyn Villaverde*

In the Philippines, Baybayin is one of its writing systems that originated in pre-Hispanic colonialism. The centuries-old writing system gained attention and popularity, which later turned into an approved bill in 2018. The recent development of research aimed at translating Baybayin characters into Alphabets, the globally recognizable writing system, uses Artificial Intelligence or A.I. Different researchers have developed an optical character recognition system for the Baybayin script but are incapable of translating multiple characters in single image and are all using object classification algorithms. Therefore, there is a need for a system using a YOLOv3 based CNN architecture capable of recognizing Baybayin scripts in word form. Using the YOLOv3 algorithm, the system was able to achieve an accuracy of 98.92%. It was observed that some of the misclassifications are due to distorted or illegible handwriting. It can be concluded that the optical character recognition of Baybayin characters using the YOLOv3 algorithm is of high accuracy when it comes to detecting and classifying Baybayin characters.

50	**Intelligent Modular Camera Rig for Classroom Lecture Video Recording System with Automatic Lighting Adjustment** *Rolland Christopher Gamez, Gio Tolores and Jesus Martinez*

In today's scheme where COVID-19 is the biggest problem faced by the entire world in which it almost forced all schools to suspend and obliged the students to stay at home for their safety, a video recorded lecture is one of the best solutions and ways to help students in their studies. The researchers were intended to improve distance learning as well as its effectiveness to deliver a high-quality video by developing an intelligent system that can be beneficial for both users and viewers. The usage of Arduino Uno served as the brain that controls everything, which makes the system a one-person operation. Given the scenarios of having different values of lux in a room caused by multiple kinds of events, achieving the preferred luminance will be difficult. Nevertheless, our prototype will automatically produce and attain the necessary amount of lighting needed using the LDR sensor along with the code in Arduino. The movement of the platform where the camera is placed follows wherever the user goes in front of the rig as much as the face is recognized. It was then tested using different calibrations by testing and simulating different situations where there are different variables included, such as camera movement and light. The data will be examined using ANOVA test.

52	**Hand-foot-mouth Disease Classification using Features from Fibre Grating Biosensor Spectral Data** *Atif Mahmood, Saaidal Razalli Azzuhri, Adnan N. Qureshi, Palwasha Jaan and Iqra Sadia*

Hand, Foot and Mouth disease (HFMD) is a com-mon viral childhood disease affected by the family of enterovirus and Coxsackie. Current laboratory identification is based on the RT- PCR test, which is expensive, time-consuming, and unsuitable for the pandemic. The SPR-TFBG was biofunctionalized with monoclonal antibody (Mab). Mab is a bioreceptor with an affinity for the virus for detecting EV-A71. A dataset of reflectance spectra of 660 samples of different virus impurities measured with SPR-TFBG biosensor to detect EV-71 virus was developed. The extracted signal has around 4000 different features based on wavelength information. The first subset was selected based on the region of interest analysis, and the dimension has reduced from 4000 to 1496 features. The dimensionality of the large feature set is reduced based on the statistical feature engineering procedure using 10 features including mean, variance, skewness, RMS, kurtosis, standard deviation, range, crest factor, impulse factor and shape factor. Subsequently, classification of the virus (signal) data is achieved through SVM and it is evaluated with different types of kernels. For the evaluation of classifiers, we used accuracy, sensitivity, precision and F1 score performance metrics. The obtained results of accuracy are 87.88 for linear SVM, 86.06 for radial basis, 75.76 for sigmoid SVM, and 75.15 for polynomial SVM, respectively. The results show that for our experiments, Linear SVM performs better than radial, polynomial and sigmoid kernels. This is because projecting the data onto higher dimensions is not required as data exhibits linear properties confirmed by White Neural Network (WNN) test for nonlinearity.

53	**Medicinal Plant Classification using Convolutional Neural Network and Transfer Learning** *Daryl Valdez, Chris Jordan Aliac and Larmie Feliscuzo*

Medicinal plants are not only an essential source of therapeutic compounds but also an alternative source of medications used by most people around the world. Due to recent advances in computer vision, plant identification from images has become a rapidly developing research field. Var-ious results showed good accuracy, precision, and real-world applications. This paper aimed to investigate an accurate and precise automated identification of medicinal plants. We present a new medicinal plant dataset containing images of ten (10) classes of medicinal plant species and one (1) class containing a mixed variety of weeds, vines, and non-medicinal plants. Then we proposed a model based on MobileNetV3 architecture for a low-cost, reliable, and efficient medicinal plant classification. Using the proposed model and Transfer Learning, results revealed a 97.43% accuracy on the challenging task. Overall, the findings revealed the feasibility of an efficient and reliable medicinal plant classifier for real-world applications.

56	**An Investigation of Automating Fungus Inspection Process of Aircraft Fuel Tank via Image Processing** *Sin Yee Beh, Veronica Jauw, Chin Seong Lim and Leong Liew Chee*

Fungus growth in the fuel tank can be harmful to the safety of an aircraft due to its corrosive nature and the sludge it produced. Thus, maintenance is often conducted within a definite period of time by draining the fuel tank to inspect the presence of fungus manually via limited access points. This hinders the full view of the tank resulting in the undiscovered fungus growth, which is contrary to the aim of the inspection, at the expense of resources. This study aims at automating the inspection process to detect the presence of fungus colonies in the aircraft's fuel tank based on the camera's image. It was observed that fungus colonies are often formed irregularly surrounding the bolts of the tank's inner structure. This makes it challenging to differentiate as the color of bolt's edge and fungus colonies is similar. The proposed algorithm aims at addressing the challenge through background and edge removal by Gaussian filtering, adaptive thresholding, convolution for eliminating rogue pixels and boundary calculation. It was tested against the images taken from both experimental rig and aircraft's fuel tank, where the algorithm detected the fungus colonies from the experimental rig with 100% accuracy. In contrary, there were several false detections observed in detecting the fungus grown in the aircraft's fuel tank but it is still satisfactory.

58	**Real Time Bangla License Plate Recognition with Deep Learning Techniques** *Mahmudol Tusar, Md. Bhuiyan, Md. Hossain, Anika Tabassum and Riasat Khan*

Automatic license plate recognition now plays a critical role in vehicle monitoring and administration system. This system may be applied to car parking and toll collection system, vehicle security, road management, etc. It is one of the most cost-effective solutions for managing or regulating cars on the road or in a car parking area. This paper develops an automatic license plate detection and recognition system using deep learning and transfer learning approaches. Transfer learning was used to educate the model. The open-source dataset of the vehicles has been collected from Kaggle. We also created a custom dataset of our own Bangla license plates, containing around 1 thousand pictures of vehicles. Next, a deep learning model has been used to detect license plates from an image and the optical character recognition technique to extract the information from the detected plates. We choose the You Only Look Once version 5 framework for detecting license plates and EasyOCR to recognize the characters in the number plate. Numerical results demonstrate that the accuracy of license plate detection for YOLOv5 is 98%, and the EasyOCR reached 78% accuracy in recognizing the characters. Finally, the implemented system deployed with Raspberry Pi and Pi camera successfully detects and recognizes the license plate. The overall cost to build this project was approximately USD 200$.

59	**A Small Scale COVID-19 Diagnosis Program: A Philippine Perspective** *Renann Baldovino and Justin Bernard Carlos*

The world is still currently facing a pandemic. In the Philippines, the number of cases is rapidly rising. Since there is yet a cure to be found, the best cure to such is prevention such as being aware of the adverse effects that it has on people along with the symptoms commonly felt by those who have the disease. Constant sanitation is also necessary to kill the bacteria causing the disease before it even has the chance to spread throughout the human body. In this research, a small scale AI program that could diagnose a person with the probability of having the disease was developed. The program used patients' symptoms who have the disease, along with the corresponding severities of such, as input. Fuzzy logic was used in developing the program through the development and integration of a fuzzy inference system (FIS). Moreover, the testing accuracy of the proposed system was 70.83% which was based on the number of diagnoses that produced a medium or high verdict of a patient contracting the virus. The inputs for such diagnoses were the symptoms felt by confirmed COVID-19 patients along with their corresponding severities which were obtained from the data set acquired containing information regarding COVID-19 patients in the Philippines. Additionally, MATLAB was the software used to develop both the program and the FIS.

60	**A Microcontroller-based and Cost-efficient Computer Numerical Control (CNC) Soldering Station** *Bryan Christopher Wong, Mario Laureta, Olwyn Barcoma, Angelino Pimentel and Renann Baldovino*

Soldering is already a hazard as it may cause burns to whoever touches it. The fumes are dangerous and toxic when inhaled. An unskilled solderer most likely will run into health or quality of work problems while soldering. This research aims to design and develop a cost-efficient automated computer numerical- controlled soldering station equipped with temperature controls, an emergency stop button, and a ventilation system capable of vacuuming the soldering fumes out of the system. Circuits made in ExpressPCB can be converted to a g-code file using bCNC and a Python code programmed by the researchers. Then, this g-code was processed by the program, Pronterface, and was uploaded to the Arduino MEGA + RAMPS v1.4 CNC Shield. The g-code was executed by stepper motors and servo motors holding the soldering iron at an angle. Analyzing the results statistically using Minitab software, the prototype was able to match the time of the test subjects proving that it was time efficient. It was also consistent in its accuracy - being on par with the test subjects in their soldering capabilities. The integrated ventilation system of the prototype was able to vacuum out the soldering fumes in the system. It is capable of meeting the standards of proper and quality soldering techniques based on literature reviews and experimentations. Nonetheless, with a final cost of around 20,000 PHP, it was fourteen times (14x) cost-efficient with improved capabilities compared to the commercially available automated soldering station.

63	**GAN-based Privacy-Conscious Data Augmentation With Finger Vein Images** *Yusuke Matsuda, Tomo Miyazaki and Shinichiro Omachi*

The lack of sufficient data for evaluation and development is a major problem in biometrics. A novel GAN-based data-augmentation method for finger-vein authentication is proposed and evaluated in this study. Based on the GAN model structure, a subnetwork is added that lowers the similarity between the real data used for training and the fake data from the generator; the fake data looks remarkably similar to the real data, and the correlation between the real and fake data is lowered. Because the real data and fake data are different individuals, the privacy of a particular person is not considered when examining authentication technologies using only generated fake data. Moreover, the possibility of improving the authentication accuracy is confirmed by using both real data and generated fake data for training. The effectiveness of the proposed method is proved experimentally.

65	**Web-Based Brain Tumor Detection and Classification using Convolutional Neural Network** *Kalab M. Kiros, Dinesh Kumar*

A brain tumor is a mass of abnormally developing cells in the brain or skull. There are around 120 different types of brain tumors based on the brain tissues that they affect. Even benign (or noncancerous) brain tumors can be fatal due to their size or location. Unlike other types of cancer, primary brain cancer seldom spreads. When a tumor grows in size, it compresses and damages other areas of the brain. If the tumor is detected early enough, it can be treated, extending the patient's life. One of the most useful and important strategies is the use of Deep Neural Networks (DNN). In this paper, the TensorFlow framework was used to develop a convolutional neural network (CNN) to detect a tumor using Magnetic Resonance Imaging (MRI) images. We were able to boost the diversity of our training set by making random (but realistic) alterations to the MRI images, resulting in a more robust training model. The data was then entered into the model for training and prediction. Based on the tumor identification results, the technique proposed an accuracy of 97.37% on the test data.

66	**Blended QR Code for Digital Advertising** *Wan-Er Ho, Lee-Yeng Ong and Meng-Chew Leow*

Quick Response (QR) code has been widely used in everyone's daily lives for advertising purpose. This is a new norm lifestyle for worldwide customers during the pandemic and post-pandemic. Due to the dull appearance of traditional QR code, blended QR code is created by overlaying an advertisement with a QR code to strengthen the advertising effectiveness. Creating pleasant visibility of blended QR codes can catch the attention of customers and thus able to further engage with them. However, the direct embedding of a traditional QR code with its black and white modules will negatively affect the advertising impact when the advertisement is distorted. Hence, these data modules are the major reason that affects the appearance and yet they are the most critical aspect of decoding capability. As a result, it is a challenge to identify the tradeoff between decoding capability and visual appearance. Therefore, this paper proposes an algorithm that manages the number of data modules and the size of each data module to increase the advertising impact. The proposed algorithm provides more weightage to the pixels that are closer to the center region of each module, which maintains the data on hold inside the modules. The performance comparison between advertisement visibility and decoding capability is presented to verify the robustness of the proposed algorithm.

71	**Improved VGG Architecture in CNNs for Image Classification** *Nurzarinah Zakaria and Yana Mazwin Mohmad Hassim*

Apart from computer vision, deep learning has brought the concept to a new era of machine learning. One of the deep learning approaches for classification analysis is Convolutional Neural Networks (CNNs), a model of artificial neural network that has often been the most popular approach in computer vision. In recent decades, many approaches for image classification have been proposed. To obtain high accuracy, most studies focused on deepening and enlarging the CNNs architecture such as the VGG network. However, deep and complex architecture, on the other hand, can result in extraordinarily long execution time. This study primarily aims to classify images using the improved VGG architecture to minimize the execution time and enhance the classification performance. The comparative experiments of the proposed architecture with another three existing architectures have been made and trained with six different datasets from Kaggle. As a result, the execution time and the classification accuracy of the proposed architecture is better than the other three existing architecture. Hence, the proposed architecture indicates that the execution time and the classification performance can be improved by downsized the VGG architecture.

73	**Computer-assisted Table Tennis Posture Analysis using Machine Learning** *Mel Jay Llanos, Jecee Ryn Obrero, Lhora Mae Alvarez, Chun-Hung Yang and Chris Jordan Aliac*

Manual assessments for table tennis players, done in person or virtually, can be tedious, inefficient, and error-prone. Existing machine learning software tries to eliminate these gaps; however, its capability is only limited to one technical skill at a time. In this study, a software was developed to help assess the key technical skills of a table tennis player: (1) upper body position (leaning and not leaning), (2) lower body position (knees bending and straight), (3) basic hand strokes (forehand and backhand), and (4) footwork (side-to-side and in-and-out); these four would be used as performance metrics for the video input. Datasets of five OpenTTGames videos depicting professional player's postures and three videos from YouTube portraying amateur player's postures were extracted into frames, resulting to 32,395 frames. Posture detection was first carried out on the extracted frames using OpenPose library, generating a total of 519,320 key points. Then, various machine learning models were trained using the key points for posture analysis, and their performances were compared and benchmarked. The models with the highest accuracies would be integrated into one assessing model. Among Backpropagation, SVM-Linear, SVM-RBF, and SVM-Polynomial models, the SVM-RBF model yielded the highest in all performance metrics: 95.03% for upper body, 95.28% for lower body, 95.72% for hand stroke, and 92.78% for footwork. These results indicated that the software successfully assessed the player's posture, providing relevant data for coach's assessment of the player's performance. This software will help coaches and players analyze and evaluate their performance for improvements in lacking areas.

74	**A Spoof Detecting Fingerprint Reader Based on a Combination of Total Internal Reflection and Direct Image Capture** *Noel Linsangan, Bob Laurence Caridad, Ar Jay De Vera and Roben Juanatas*

This study aims to develop a Spoof Resistant Fingerprint Reader based on a combination of Total Internal Reflection and Direct Image Capture. The system is built using a Raspberry Pi and uses two cameras connected to a multi-camera adapter to capture the picture of the fingerprint. To thoroughly examine the minutiae of the fingerprint, the project uses a series of methods using computer vision to enhance the Histogram Equalization in digital image processing. The data for this involves 60 fingerprint molds constructed by using 3 different material combinations. These being Hot Glue-Glue, Candle Wax-Wood Glue, and Clay-Gelatin. The Hot glue & Glue and Candle Wax & Wood Glue molds were tested 5 times per mold while the Clay & Gelatin mold was tested 3 times because it melts quickly. The system garnered a 95% accuracy in determining whether a fingerprint was a spoof or not.

76	**Comparison of dark channel prior and contrast limited histogram equalization for the enhancement of underwater fish image** *Mohd Hanafi Ahmad Hijazi and Jing Mei Leong*

The application of artificial intelligence (AI) in aquaculture may improve the efficiency of fish farming management. Computer vision is one of the fields in AI beneficial for aquaculture. However, the underwater image quality is usually low due to light scattering through the water. Therefore, image enhancement is necessary before any further processing can be done. There are numerous image enhancement techniques for underwater images reported in the literature. In this paper, the comparison of the two most common image enhancement techniques for underwater images, the Dark Channel Prior (DCP) and Histogram Equalization (HE), is presented. The strength and weaknesses of each technique pertaining to the underwater images are also described.

78	**A Comparative Analysis of Lumpy Skin Disease Prediction Through Machine Learning Approaches** *Dibyo Fabian Dofadar, Hasnat Md. Abdullah, Riyo Hayat Khan, Rafeed Rahman and Md. Sabbir Ahmed*

Lumpy Skin Disease is a highly infectious, fatal ill-ness that is commonly observed in cattle. The common symptoms of this disease are fever, infertility, reduced milk production, and so on. Furthermore, the mortality rate of cattle infected by Lumpy Skin Disease is quite low, hence predicting the outcome of this disease earlier can reduce economic loss significantly. This research was conducted to predict if cattle are infected with Lumpy Skin Disease or not with the use of various machine learning models. A total of ten machine learning classifiers have been used and evaluation metrics were calculated for determining how well the classifiers have performed. Among all the classifiers, Random Forest Classifier and Light Gradient Boosted Machine Classifier have outperformed the other models with the F1 score of 98%.

79	**Hand Gesture Recognition for Filipino Sign Language Under Different Backgrounds** *Mark Christian Ang, Karl Richmond Taguibao and Cyrel Manlises*

The article implements a hand gesture Filipino Sign Language recognition model using Raspberry Pi. Numerous studies on Filipino Sign Language (FSL) frequently identify a letter with a glove and using a plain background, which may be challenging if implemented in a more complex background. Limited research on the implementation of YOLO-Lite and MobileNetV2 on FSL were also observed. Implementing YOLO-Lite for hand detection and MobileNetV2 for classification, the average accuracy achieved for differentiating 26 hand gestures, representing FSL letters, was 93.29%. The model demonstrated dependability in a variety of complex backgrounds. However, challenges in recognizing letters Q, J, and Z were encountered. Additionally, in letters N and M, due to their similar hand structures, N is sometimes mistakenly interpreted as M. The model developed by the researchers performed well and demonstrated better accuracy compared to a different model. The system was able to achieve higher accuracy while running on limited resources and in various environments.

80	**IoT-Based Smart Agriculture Monitoring System** *Riasat Khan, Md Musfiq Us Saleheen, Md Shariful Islam, Rabbul Fahad and Md Jayed Bin Belal*

A farmer manually collects data from the farming fields in a traditional agriculture system. Sometimes these data may not be accurate, and the collection process is tedious and human labor-consuming. Also, during irrigation, water is tremendously wasted. In this paper, an internet of things-based smart agriculture monitoring system has been developed to reduce manual labor and water wastage. In this proposed system, a Node MicroController Unit integrates all of the sensors and sends the sensors' data to an internet of things-based cloud framework known as Adafruit IO. Consequently, Adafruit IO stores all the sensors' data. A soil moisture sensor acquires the moisture data of the farm field. The acquired moisture data is in a percentage value, where 0% means no moisture content, and 100% indicates high moisture content. Depending on the moisture content, a message is sent automatically to the user to turn on/off irrigation. Through Adafruit IO, a user can control the irrigation process remotely. A waterproof temperature sensor is employed to measure soil temperature, and a temperature and humidity sensor measures the temperature and humidity of the surrounding environment of the farming field. An air quality sensor reads the air quality of the farming field and a barometric pressure sensor measures the sudden change of atmospheric pressure in this system, which can help predict rainfall. In this proposed system, a light-dependent resistor measures the amount of light. Finally, the DHT11 sensor gives 20% and 28% errors in temperature and humidity value, respectively.

81	**Health Classification System of Romaine Lettuce Plants in Hydroponic Setup Using Convolutional Neural Networks (CNN)** *Jerome Martin Desiderio, Angelo John Tenorio and Cyrel Manlises*

Hydroponics farming setup has many challenges that target the health condition of the plants, specifically romaine lettuce plants. One of the critical elements for their excellent health condition is their nutrition. Nutrients are essential components for the plant to grow, and insufficient nutrients may lead to a significant nutritional disorder that is difficult to spot during its growth stage. This may also cause marked yield and quality losses. It is also tedious to manually determine it without knowing about the plant. Plants require various ions as essential nutrients. One of the objectives of the research is to implement the convolutional neural network in determining the health condition of the leaves of the romaine lettuce. In the result of data gathering, the overall accuracy of the device in detecting and classifying leaf health is 90%. From the gathered data, the researchers have accomplished the research objectives that the proposed system can distinguish the condition of the romaine lettuce plants.

82	**Development of a virtual vehicle identification for tracking hit-and-run vehicle***Pranto Khoo Boon Sheng, Associate Professor Dr. Abdullah Aziz Bin Saad and Dr. Mohamad Khairi Bin Ishak*

In general, the vehicle registration plate number and the witness are essential clues for police investigating hit-and-run accidents. Without these clues, it will be difficult for police to trace the suspect and lead to a closed case even though a fatal victim is involved. In this work, the virtual vehicle identification tracking system is developed by using wireless communication interfaces to transfer useful data for road accidents and traffic surveillance. This system uses vehicle access points and employs Vehicular Ad Hoc Network (VANET) to assist the vehicle identity tracking system. The IoT development board scans all the vehicle Wi-Fi access points within the beacon frames. With the characteristics of different positions of signal strength and the distance of station to access point, it is difficult to accurately determine the offender's vehicle identity. Hence, this paper proposes a hybrid tracking method to combine pre-accident and post-accident tracking methods to track vehicle identity. Moreover, this paper shows unique Wi-Fi access point identities such as Service Set Identifier (SSID) and Media Access Control (MAC) addresses can be used as virtual vehicle identities for vehicle tracking and traffic surveillance systems. Overall, the result shows this system can track the suspect vehicle's identity with positive detection. The maximum distance for the system to track vehicle access point signal can be up to 45 meters and is workable above 50 km/h of driving speed.

83	**K-Zones: a Machine Learning-Based System to Estimate Social Distancing Violations During Pandemic Eras** *Mohammad Saatialsoruji and Eihab Saatialsoruji*

The outbreak of pandemics adversely influences various aspects of people's lives, including economies, education, careers, and social relations. Therefore, many authorities worldwide resort to imposing social distancing regulations to flatten the curve of new confirmed cases. This paper proposes a Machine Learning-based social distancing violation detection system. Unlike many contributions in the literature that use pairwise distance computation running in quadratic execution time, this paper introduces a novel technique that runs in linear time. The solution is considered a Video Surveillance System, and the experimental results show how the system effectively detects not only social distancing violations but also the severity of those violations.

84	**Classification of Cacao Pod if Healthy or attack by Pest or Black pod Disease Using Deep Learning Algorithm** *Rey Anthony Godmalin, Chris Jordan Aliac and Larmie Feliscuzo*

Cacao farming is a worldwide industry and a vital resource for some businesses. But it is constantly threatened by diseases and pest attacks that can cause significant loss to cacao farmers. Using Artificial Intelligence and Deep Learning Algorithm, an automated recognition of these attacks can help the farmers respond immediately to control this event. This paper used Deep Learning Algorithm to address the automatic classification of a cacao pod condition. An experimental research design method is utilized, and a convolutional neural network is used for training. The model can classify three conditions of a given cacao pod image: healthy, black pod disease attack, and pest attack. Under controlled conditions, the model correctly classifies the cacao pod condition with an accuracy of 94%. Thus, using the trained lightweight model, it is possible to accurately and automate the classification of cacao pod conditions. Further study is recommended to integrate it with hardware monitor-ing/surveillance devices to perform real-time classification of the cacao pod condition on the actual field. With this in place, it can then support fast and immediate responses mitigating the loss of production.

85	**Open Agricultural Burning Detection with Natural Inspired Swarm-based Detection Platform** *Liew Jia Jun, Kian Meng Yap, Kok Seng Eu and Qiang Ni*

Agriculture often plays a big part in economic growth in most countries such as India, Indonesia, Thailand as well as Malaysia. Countries such as Thailand and Indonesia contribute a large volume of rice imports and export, however, in Indonesia, this major rice production comes with a large setback. Agriculture practices in Indonesia utilize open burning to process by-products of harvested rice fields to process it into bio-fertilizers which later fertilize the crop field. This is a problem as open burning on large scale causes major haze storms which spreads from Indonesia to the majority of parts of Malaysia annually. The composition of haze which includes carbon monoxide and nitrogen dioxide is hazardous to the human body when inhaled, they also contribute to the cause of air pollution. To reduces the severity of illegal open burning, we must first understand the overall characteristic of the smoke plume before introducing detection methods. Platforms such as drones and gliders with olfaction sensors can detect the plume thus locating the fire source. With the introduction of Swarm intelligence (SI), a drone detection platform can be deployed at large volumes to cover larger areas while localizing fire sources in a much more efficient fashion. Thus, this paper provides a review of swarm intelligence with the collaboration of sensors in optimizing plume dispersion problems and suggestions for future research ideas in collaborating detection platforms and SI. Open Burning has been a decade-long issue that the world trying to tackle when it comes to climate change. In Southeast Asia countries often, left-over crops are burnt openly, and the by-product of these open burning are utilized as bio-fertilizers which nourishes the crop fields. This has not only addressed the source of global warming but contributes to annual haze storm that affects countries like Malaysia and Thailand severely. To reduce the severity of open burning problems, we must first tackle the source of the problem, thus detecting the smoke plume emitted by these open burning can be the key to shutting down the possibility of open burning. However, detecting a smoke plume can be challenging as it is a dynamic problem that changes over time with external influences. Introducing Swarm Intelligence (SI) into the drone platform can reduce the time taken to localize the source of these open burning, and thus distinguishing these fire sources can minimize the impact of already ongoing open burning.

87	**A Prototype Model of Monitoring Energy Consumption and Optimizing Distribution of Smart Buildings** *Abdulrahman Shalaby, Manjit Singh Sidhu and Jason Tan*

Given the upcoming post-pandemic times, there are more universities considering adopting the hybridization model. As such, not all the facilities and building utilities will be fully utilized as only half of the student population will be expected, thus wasting the campus's energy consumption. An intelligent management system can be implemented into smart campuses to reduce the overall electrical bills to adapt to the hybrid education model. The research was then conducted on existing prior work around intelligent buildings and energy optimization. It was found that many of the energy optimization models utilized an IoT application highly specific to the designed IoT system only. This inspired developing an open source generalized IoT application to provide two-way communication between the energy optimization models and IoT devices. This would allow researchers to test their intelligent energy optimization models without building a support application from scratch. During the development phase, Firebase and open-source Chart JS were used to create an interactive web application with features including a dashboard, insightful data analysis, and remote-control features to be applied in a smart campus. A successful connection was established with a Raspberry Pi-based IoT system, where data could be stored and retrieved from the database into the web application. The second phase is going to be implementation of AI model which is currently in progress and being trained to fulfill the required criteria.

88	**A Volume and Assist Controlled Mechanical Emergency Ventilator for Respiratory Support** *Asher Angelo Buan, Erika Faye Cataina, Glynn Kenneth Marañon, Silverio Magday, Angelino Pimentel and Renann Baldovino*

Even before the COVID-19 pandemic, most hospitals in the Philippines, especially the rural and small hospitals, lacked respirators such as medical ventilators. With only a few thousand of these devices, the lack of emergency ventilators is a crucial problem in battling the COVID-19 pandemic in the Philippines. Hence, the study aimed to design an economical and portable mechanical emergency ventilator for respiratory support. It was achieved by effectively calibrating, automating, and controlling the working principle of BVM. Particularly, a CAM arm was designed to allow constant, smooth, and repeatable compression on the bag. Subsequently, driving the arm is a motor that was selected carefully according to the necessary motor torque and power calculations. Consequently, an effective close loop control system using a PID controller was implemented to control the motor position and speed. Although, the controller contains small inaccuracies that generate discrepancies in the volume measurement, and the pressure sensor records unusual readings due to breathing connection issues. The overall prototype confirms the minimum clinical specifications for a mechanical ventilator. As a result, the prototype has two ventilator modes, volume and assist control. It weighs 6.75 kg and has a dimension of 385 x 270 x 235 mm.

89	**Comparisons of DNA Sequence Representation Methods for Deep Learning Modelling** *Shu En Chia and Nung Kion Lee*

Learning the enhancer sequence grammar from protein-DNA interaction via a computational approach is a challenging task because the features associated with the recognition codes are ill-defined. While sequence features are not the only way to define the sequence characteristics, they are the most effective. Deep learning neural networks have become the key technique for modeling those features for the classification task. Nevertheless, effective learning of deep learning requires enhancer sequence features to be represented and encoded into suitable matrix form. The aims of this paper is to evaluate six sequence feature representation/encoding methods for convolutional neural networks modelling. Using a histone marks dataset as input data, our results indicate k-mer feature achieved the best performance, followed by word-based features, which performed favorably better than one-hot encoding. The random-walk feature, nevertheless, performed the worst. Moreover, our finding provides strong evidence to use kmer/word features instead of the popular one-hot encoding for histone sequence in CNN modeling.

90	**A GA Optimization Model for the Appliance Category-based Electricity Consumption of Philippine Households** *Renann Baldovino and Justin Bernard Carlos*

Electricity is very common around the globe. It is used in powering various electrical devices like air conditioners, refrigerators, electric fans, and many more. In the Philippines, electricity loss is no stranger to Filipinos mainly because the total electricity consumption of the said country is quite high due to its large customer base. In fact, there is already a shortage in electricity supply due to the high demand for this utility as a result of the increasing population per year. Moreover, out of all the sectors that use electricity, those in the residential sector consume the most electricity per year. In this research, a genetic algorithm program that could minimize the total electricity consumption per household within a specific area of interest was developed. Some of the inputs that were used in the algorithm include common categories of household appliances, ranking of each category based on its importance, average hourly electricity consumption per household within an area of interest, and many other more. For the output of the program, it displayed the minimized monthly electricity consumption per household with regards to the area of interest and income class along with the recommended daily operating hours of each category of household appliances. Moreover, MATLAB was the platform used in developing the program.

91	**Smart Wheelchairs : A Review on Control Methods** *Norheliena Aziz, Zulkifli Mohamed, Nurul Syuhadah Khusaini, Aminuddin Hamid, Ya'Akob Yusof and Mohd Rozaiman Aziz*

Recent advancement in research fields involving computer science and Artificial Intelligence has influence the rapid growth in smart wheelchair research. Another factor adding to this growth is the evolution of sensor and computing technology. Basically, a smart wheelchair is a powered wheelchair that has been modified by adding necessary sensors and instruments that able to read, collect and send information that can be used to modify the status of the wheelchair, as well as interacting with the environment or the user. The modification can be done on various part of the wheelchair system, and can be categorized with their input methods, operating system or their navigation system itself. This paper discussing on various input methods used in recent smart wheelchair research and summarizes the ideas presented.

92	**Analysis and Forecasting of Blockchain based Cryptocurrencies and Performance Evaluation of TBATS, NNAR and ARIMA** *Iqra Sadia, Atif Mahmood, Miss Laiha Binti Mat Kiah and Saaidal Razalli Bin Azzuhri*

The rapid growth of cryptocurrencies has gained much attention by media, investors and scholars, since it is widely used for investment purposes as an alternative to regular currencies. Therefore the intelligent management and under-standing the characteristics of cryptocurrencies are becoming more interesting. The price of cryptocurrencies are characterized by linear and nonlinear trend, seasonality and high volatility, which increases the risk factors for investors. This study experiments with three different time series forecasting methods, specifically considered for Cryptocurrencies price such as Bitcoin (BTC), Ethereum (ETH), Litecoin (LTC), Monero (XMR) and Cardano (XRP), and devises a procedure to evaluate their performance. Time series data are collected and examined using descriptive statistics. In next step, the White Neural Network is used for Non-Linearity and Dickey-Fuller for nonstationary and correlation among different settings of datasets. Based on these analyses, we evaluate efficient financial forecasting models such as Autoregressive Integrated Moving Average (ARIMA), Trigonometric, Box-Cox transformation, ARMA errors, Trend and Seasonal (TBATS) and Neural Network Autoregressive (NNAR) with reference to different parameters configuration of these models. The performance is evaluated using Root Mean Square Error (RMSE) and Mean Absolute Percentage Error (MAPE) criterion and models are ranked by statistical mean and standard deviation of MAPE values. The NNAR model gives minimum MAPE of 2.823 while the minimum convergence time of 4.9835s is observed with TBATS and hence, these are ranked at top amongst other models respectively. These results underpin that neural network-based models perform equally well on both types of nonlinear and linear financial data and, thus, have the potential to improve the impact of financial transaction and cryptocurrencies price bringing more innovation in the decision making process.

93	**Optimizing Deep Learning Inference to Detect PCB Soldering Defects** *Mau-Luen Tham, Boon Yoong Chong, Yu Han Tan, Yen Khai Wong, Swee Ling Chean and Wei Kun Tan*

Rapid and accurate defect detection in printed circuit board (PCB) manufacturing plays a vital role in the quality control (QC) of consumer electronic products. Automated visual inspection is gaining increased popularity owing to low production cost and high portability. Prior works rely on a combination of image subtraction and processing techniques whereas the recent works utilize the generalization capability of deep learning. The former operates poorly in a mismatch condition of image pairs whereas the latter consumes higher computation time and processing power. In this paper, we propose a YOLOv4-based PCB detection framework which detects six types of defects. To attain production-ready capability, we optimize the models using the Intel OpenVINO toolkit. Experiment results reveal that the optimized models yield good accuracy for defect detection with significant execution speed on low-power embedded platform.

94	**Extracting Graphological Features for Identifying Personality Traits using Agglomerative Hierarchical Clustering Algorithm** *Noor Fazilla Abd Yusof, Nur Zareen Zulkarnain, Sharifah Sakinah Syed Ahmad, Zuraini Othman and Azura Hanim Hashim*

Handwriting/graphology is a unique and exclusive tool that describes one's non-verbal expression, which indirectly portrays the mental state and psychological state of a writer in a subconscious manner. The graphology analysis has been proven to identify and predict the signs of mental health disorders. This study explores the distinctive graphological features in Malaysian handwritings towards the identification of early sign of mental health disorders. The Agglomerative Hierarchical Clustering algorithm was proposed to build up clusters over the handwriting data. The promising finding suggests that the distinctive features could be useful in the personality traits analysis. The results from this study could be extended and further explored for identifying the early signs of depression through one's handwriting.

95	**Performance of Content-Based Features to Detect Depression Tendencies in Different Text Lengths** *Nur Zareen Zulkarnain, Noor Fazilla Abd Yusof, Sharifah Sakinah Syed Ahmad, Zuraini Othman and Azura Hanim Hashim*

Text analytics have been widely used nowadays in the field of mental health to predict onset mental health issues such as depression and anxiety, with the intention to perform early intervention. Most existing works focuses on looking at how such mental health issues can be predicted based on social media data. These texts are often short and straightforward as compared to blogs and journals. In this paper, we are interested in comparing the performance of a classification model in classifying long texts and short texts as having depression tendencies. An existing model that can perform well in classifying short texts using content-based features was adopted and tested on longer texts. From the result, it is found that compared to shorter text, content-based features performed worst in long texts whereby all five classifiers used produced an accuracy of less than 0.65.

97	**Forest Fire Detection for Edge Devices** *Mashuk Arefin Pranjol, Farhin Rahman, Ehsanur Rahman Rhythm, Rajvir Ahmed Shuvo, Tanjib Ahmed, Bushra Yesmeen Anika, Md. Abdullah Al Masum Anas, Jahidul Hasan, Saiadul Arfain, Shadab Iqbal, Md Humaion Kabir Mehedi and Annajiat Alim Rasel*

It is observed that the forest land mass was reducing rapidly from 1990 to 2020. As many plants and animals are depending on the forest, this is very alarming. Forest fire is one of the major causes of such loss. Forest fires tend to spread quickly and are difficult to control in a short time. Early detection of these forest fires is the key to mitigate the forest fire. There are many methods developed by researchers to monitor forest fire. An aerial-based detection system with unmanned aerial vehicles (UAVs) is one of the emerging methods which can provider a bird's eye view of the forest from above. Monitoring with UAVs however requires trained personnel to operate and manually monitor the forest. In this paper, we develop a fire detection algorithm that can analyzed images taken by UAVs and can be equipped into an autonomous UAV. The developed method does not require a lot computing power. It is based on YOLOv5 which is build and converted into optimized model that can run on an embedded board. Result shows that the method has a high MAP (>97%) with acceptable inference time indicating a good potential of the developed model.

101	**Diagnosis of Acute Respiratory Syndromes from X-Rays using Customised CNN Architecture** *Palaniappan S, Varshaa Sai Sripriya S, Lalitha Pranathi Amalladinna Rama and Muthulakshmi M*

This work presents the diagnosis of various acute respiratory syndromes using customized CNN architecture from X-ray images. Complications of viral pneumonia results in influenza and COVID-19. The respiratory syndromes occur due to bacterial and fungal infections as well. Hence, the objective was to use customized CNN architecture to perform a multi-class pneumonia classification. VGG16 architecture is carefully trained for pneumonia classification with ReLU activation and categorical cross-entropy loss function. The proposed model is efficient and robust and yielded 97.87% accuracy on the train set and 90% accuracy on the test set. The experimental results suggest that the model efficiently detects all sorts of lung diseases, including COVID 19.

102	**Fuzzy-based Control System of Unmanned Surface Vehicle (USV) for Floating Garbage Collection** *Adam Mun Wai Wong, Jia Long Chong, Han Shen Kew, Jian An Ong, Hermawan Nugroho and Muhammad Ilhamdi Rusydi*

Floating garbage is a usual form of water pollution and is typical in urban areas where the human population is high. To clean up floating garbage, Unmanned Surface Vehicles (USVs) can be implemented as an automated trash collector. The usage of automated USV in river cleaning of floating garbage is more cost-efficient than manual efforts. In this paper, a lightweight USV that is capable of autonomously collecting floating garbage on surfaces of still water bodies is developed. To governs its maneuver, the USV required a control system that precise and dependable, but it should not require a complex sensors system and high computing power. To address the issue, the control system is developed based on Fuzzy logic. During the test, the developed Fuzzy logic control (FLC) system is acceptable in controlling the USV with ±4° overshoot with ±2° of error. The test is conducted with and without load. The maximum load is set as 13 kg.

103	**Conceptualizing A Battery Swapping Station : A Case Study in Malaysia** *Elvin Cheah Ee Sheng, Christina Chin May May, Novita Sakundarini and Akhil Garg*

One of the key aspects for the successful implementation of electric vehicles (EVs) is a fast and convenient way to recharge the batteries. Currently, there are two solutions (i) a battery swapping station (BSS); and (ii) a charging station. BSS may well be the key to shift Malaysian attention from internal combustion engine (ICE) vehicles to EVs as BSS can refuel depleted batteries faster by swapping it. This paper aims to study the current status of BSS technology in the market and propose a conceptual BSS design suitable for EVs operating conditions in Malaysia. An e-survey was conducted to determine the consumer needs for BSS and its corresponding challenges leading to a conceptual design of BSS for a 4-wheeler vehicle in Malaysia. The BSS was designed via SolidWorks along with its operating framework. The findings also provide appropriate solutions to the challenges discussed in order to encourage the growth of the EVs market in Malaysia.

105	**Concurrent Architecture of High Speed Viterbi Decoder Using Xilinx HLS Tool** *Jyoti Zunzunwala and Dr. Atul Joshi*

Viterbi decoder finds its applications in different areas like radio communication, satellite communication, hard disk drives and automatic speech recognitions. The general building blocks implementing the Viterbi decoder are the Branch Metric Unit, Path Metric Unit and Traceback Unit. Viterbi decoder becomes possible because it uses maximum likelihood decoding to interpret the coded message, but, on the other hand, is considered to be the high resource consuming block. To address this issue, in the proposed research work, concurrent architecture of the Viterbi decoder is proposed. The architecture is described using hardware description language and it is targeted to the Kintex series Field Programmable Gate Arrays (FPGA) which are fabricated at 28nm technology.For describing the architecture Xilinx Vivado High Level Synthesis (HLS) tool is preferred. The outcome of the proposed architecture is evaluated using different ascendency parameters like time, frequency, power utilization and resource utilization.

108	**Third Eye Hand Glove Object Detection for Visually Impaired Using You Only Look Once (YOLO)v4-tiny Algorithm** *Angelika Ice Labininay, Jeloux P. Docto and Jocelyn Villaverde*

An estimate of 1.3 billion people suffers visual problems, which causes a lower quality of life because sight is recognized to be vital for humans and is core in assisting them in their day-to-day activities. The study proposes a system to develop a third eye-hand glove object detection for visually challenged people with the You Only Look Once (YOLO)v4-tiny algorithm that detects indoor objects. The system captures the image using the camera attached to the Raspberry Pi 4B will be fed to the system. The object detection process will then proceed to identify object types. Distance estimation comes afterward to calculate the distance of the identified object away from the camera, both outputted through an audio output. The system included forty (40) tests of the objects from the Common Objects in Context (COCO) dataset found indoors. The system's overall F1 score, precision, recall, and accuracy is 83.00%.

111	**Determination of Tomato Fruit Stages Using Principal Component Analysis and Fuzzy Logic Algorithm** *Cochise Alfonso Dela Cruz, Erson Macatangay and Jocelyn Villaverde*

E-Nose Technology is an excellent non-destructive way to identify different gases and perform diverse working environments. It also provides accurate data and is less expensive. Philippine Statistic Authority data shows that the country's tomato production is still rising. The goal is to develop a portable e-nose device that uses fuzzy logic and principal component analysis to identify tomato ripeness. The researchers used MQ3, MQ4, MQ6, MQ7, and MQ135 sensors for the 60-day data acquisition of unripe tomatoes, where the researchers used principal component analysis. After applying the algorithm, MQ3 and MQ135 show low sensor responses. An Arduino Uno controlled the prototype and was connected to the Raspberry Pi 4 for its portability. The three essential sensors demonstrate a rise with each ripeness stage, while MQ6 and MQ7 show little differences in values. The result of the model's overall accuracy is 88%, while the weighted average precision for each classification is 88.7%, indicating that the method is reasonably accurate.

117	**Fast Blind Source Separation with Fast Iterative Shrinking Threshold and Adaptive Initialization** *Yangjie Wei, Zhongqi Hu, Ke Zhang and Ben Niu*

In blind source separation, the ambiguous permutation of separation signals in the time-frequency domain and huge consumption of iterative optimization are two important factors that affect the 1 separation accuracy and speed of traditional frequency-domain independent component analysis (FDICA). In this paper, a speech separation method based on ICA combing fast iterative shrinking threshold and adaptive initialization was proposed. First, to solve the degradation of separation performance caused by the ambiguity of permutation in the traditional FDICA method, an initialization method of the ICA separation matrix and a post permutation processing were used, which improve the global convergence of the traditional ICA based on the analysis of the characteristics of mixed signals in the time-frequency domain. Second, an acceleration operator and an adjustment factor of step-size were introduced to optimize the iterative direction and step-size adaptively. A series of experiments were conducted on two-source mixed speech signals with a variety of angular differences in two reverberation environments, and the experimental results showed that the proposed method was superior to the traditional ICA algorithms.

119	**Pick-by-vision of Augmented Reality in Warehouse Picking Process Optimization – A Review** *Shaliza Jumahat, Manjit Singh Sidhu and Sharulhizam Mohamad Shah*

Augmented Reality (AR) is one of the most notable technologies in the Fourth Industrial Revolution (IR4.0), which uses the capabilities of computer-generated display, sound, text, and effects to improve the user's real-world experience through wearable equipment. Order picking operations in warehouse management systems (WMS) have a significant impact on overall operating efficiency. The conventional picking process is laborious to handle, which may result in deviations from predefined picking performance. Pick-by-vision, a new technology solution for order picking, is becoming increasingly popular and has been recognized as an essential technology supporting WMS nowadays. This article is a short review of AR pick-by-vision utilization to investigate the potential benefits and opportunities in optimizing warehouse picking operations. Besides presenting the basic concept of AR pick-by-vision, this study also produces a taxonomy layout of literature reviews for AR technology in WMS, to demonstrate the focus of the main area of the study. By reviewing 23 documents of AR pick-by-vision technology application, the analysis has produced important key findings, which are significant to the potential benefits of AR pick-by-vision implementation in optimizing the warehouse operation. The accumulation of knowledge and actionable insights in this study will benefit both academics and practitioners interested in this emerging smart technology for future research.

120	**Online Courier Management System with Text Blast and QR Code Technology** *Alfio Regla and Bryan Dadiz*

Commonly people move from one place to another for some significant reasons. The usual demand is the service that can support the delivery of packages, goods, and documents from the sender's location to a particular destination. Courier services support these processes and enable speedy and efficient delivery. However, transactions monitoring, hiding customers' information, and notification about the status of packages like arrival date and time to the destination branch are practical situations that need to improve the service. This study aims to develop a courier service management system to manage and monitor the package; employ a QR Code technology to secure customers' information, and design a system that integrates a text blast technology for customers' notification about updates to their package. The courier management system with QR Code and Text blast technology can potentially improve the existing transaction processing of the courier firms in Romblon, Philippines. The unit testing results indicate that all the designed modules are 100% working as expected. Using the Technology Acceptance Model or TAM construct can successfully perform software evaluation to gather the level of adaptation among the respondents that gained a grand mean score of 4.24, which is interpreted as Very High.

121	**A Low-Cost Prototyping Approach for Autonomous Unmanned Ground Vehicle for Real-Time Surveillance** *Vishnu S, Anil Kumar M, Manjesha G M, Zaheer Pasha and Madhu S*

The Unmanned Ground Vehicle (UGV) system architecture is a versatile platform for surveillance. The use of such technology improves the reach of security personnel in remote patrolling areas. The main objective of this paper is to design and develop a low-cost autonomous Unmanned Ground Vehicle prototype using open-source platforms for surveillance. The system consists of Wireless Sensor Network (WSN) for real-time data acquisition, an Ardupilot system for the UGV control, and LoRa (Long Range) transceiver system for internet-free sensor data transmission for security. The GPS and the inertial sensor are interfaced with the Ardupilot system to achieve autonomous operation with preset waypoints mapping. The real-time video obtained from the UGV is processed with OpenCV to detect the human face and eyes. Different electrical test data of the UGV under various operating conditions are presented. Integration of such systems results in an effective autonomous UGV to provide better patrolling in remote and harsh environmental conditions.

122	**Chicken Meat Freshness Classification Based on VGG16 Architecture***Pranto Dev, Mary Bettina P. Garcia, Eugene A. Labuac and Carlos C. Hortinela IV*

The freshness and quality of the meat is one of the most important factors to consider. To assess the standard quality these products, a certain level of knowledge is required. This opens the possibility of using the VGG16 architecture of Convolutional Neural Network to categorize chicken meats based on freshness. The Raspberry Pi 3B+ board and a Raspberry Pi Camera Module V1.3 are the study's main hardware components. Additionally, image pre-processing aids in improving object classification accuracy by removing the darker parts of the image. Thresholding and morphological transformation of the image is applied for the image mask in which unnecessary regions are removed. To evaluate the model, 102 photos of chicken meat were used, which were separated into two categories: fresh and old. A total of 578 photos were used in the training of the network, with the remaining 102 images being used for testing. The system correctly predicted 50 fresh chicken meats out of 51 photos, with a 98.04% accuracy. Meanwhile, the system correctly classified 46 out of 51 aged chicken meats, resulting in a 90.2% accuracy. The algorithm has a 94.11% overall accuracy, with 96 out of 102 photos properly categorized as fresh or old chicken meats.

123	**Toxic Voice Classification Implementing CNN-LSTM & Employing Supervised Machine Learning Algorithms Through Explainable AI-SHAP** *Mahmudul Hasan Shakil and Md. Golam Rabiul Alam*

Data innovation has advanced rapidly in recent years, and the network media has undergone several problematic changes. Places where consumers can express their thoughts through messages, photos, and notes, such as Facebook, Twitter, and Instagram, are gaining popularity. Unfortunately, it has become a place of toxic, insults, cyberbullying, and mysterious dangers. There is a lot of research here, but none has found a sufficient level of accuracy. This paper proposes a Convolutional Neural Network with Long Short-Term Memory (CNN-LSTM) and Natural Language Processing (NLP) fusion strategy that characterizes malicious and non-malicious remarks with a word embedding technique at an initial stage. And this model can categorize any voice data into six levels of classification. Furthermore, the processed dataset is applied to two traditional Machine Learning Algorithms (Random Forest and Extra Tress Algorithm) with an estimator (Logistic Regression) and interprets these algorithms with an Explainable AI (XAI)-SHAP. In the final step, two classifiers and the estimator are ensembled with Stacking Classifier, which is better than any previous activity.

125	**A PI Controller-based Water Supplying and Priority Based SCADA System for Industrial Automation using PLC-HMI Scheme** *Ahsan Kabir Nuhel, Mir Mohibullah Sazid, Kaushik Ahmed, Md. Nafim Mahmud Bhuiyan and Md Yeasib Bin Hassan*

As for the case with many other emerging industry, certain shortage of water causes mechanical devices to shut down. In addition to that, some instruments need a controlled water supply to run efficiently. On the other hand, many SMEs suffer from unnecessary power consumption, which can be controlled by a SCADA system. In a country like Bangladesh, where most of the labour is uneducated, it is essential to have a dominance of computers to command for machinery remotely. In this study, A PI controller-based water supply System is designed using a programming logic controller (Siemens s7-1200), HMI (Siemens KTP basic 400) and factory IO 3D environment. The priority-based SCADA System has been introduced for the SMEs (Small and medium Enterprises) using the ladder logic, which will be useful for controlled power consumption.

127	**Improving Dynamic Hand Gesture Recognition based IR-UWB using Offline Data Augmentation and Deep Learning** *Djazila Korti and Zohra Slimane*

This paper presents a dynamic hand gesture recognition method that relies on combining a deep learning model with a traditional classifier, with the aim of eliminating the manual feature extraction phase. To this end, we proposed to use a multi-stream CNN-LSTM for automatic feature extraction in conjunction with a multi-class Support Vector Machine (SVM) for classification. The proposed model consists of an efficient and lightweight architecture based on depth-separable convolution layers, which effectively reduces the computational cost and learning time while maintaining high recognition performance. The model is trained on the public UWB Gestures dataset and can automatically learn range-time information to identify different types of hand gestures. In order to achieve optimal results and avoid overfitting, we adopted offline data augmentation strategies to expand the training sample size. The results obtained showed that our proposed model achieves high performance on several measures, including precision, recall, F1-score and accuracy.

132	**A Real-Time Web-Based Monitoring System for Stingless Bee Farming** *Bill Acherllys Jailis, Aroland Kiring, Hoe Tung Yew, Liawas Barukang, Yan Yan Farm and Farrah Wong*

The low yields in stingless honeybee production have impacted the daily earnings of small size farmers. The IoT-based monitoring system is presented to improve the earnings of stingless bee farmers by helps farmers to gain a better under-standing of their farm and boost honey production. The system uses an Arduino Uno ATmega328P and DHT22 sensor to monitor the temperature and humidity inside the hive continuously and transmit the data wirelessly to a server for monitoring and analysis. Furthermore, 30 days of practical monitoring indicates that the system can operate without human intervention and was successfully observed the living condition inside the stingless beehive. Data is collected every 30 minutes for 30 days by the sensor and stored in the cloud. The temperature inside the hive has to be maintain not exceeding 35 ◦ C and the humidity level is proposed to be not exceeding 78% to achieve optimal living condition for stingless beehives. The system can be extended with multiple sensors to allow farmers make informed decisions on the condition and activity within the beehive.

134	**Voice Recognition System for User Authentication Using Gaussian Mixture Model** *Novario Perdana, Dyah Herwindiati and Nor Sarmin*

The use of biometrics in the user authentication process is the leading choice today. One of the biometrics that can be used is the human voice. In this paper, a voice authentication system using the Gaussian Mixture Model (GMM) is proposed. GMM was chosen because of the ease and accuracy in classifying the data. Voice data features are extracted using Linear Predictive Coding (LPC) before being classified using GMM. Voice data was recorded directly from 30 respondents using laptops and smartphones. Additional devices in the form of earphones were added to get better results. The system's learning process has an accuracy of 84%, and the overall testing process has an accuracy of 82%. There are also differences in the accuracy of user authentication between data that use enhancements and those that do not. They are 87% and 72%, respectively.

135	**Real-time Detection of Aquarium Fish Species Using YOLOv4-tiny on Raspberry Pi 4** *Cyril Jay Chan, Ethan James Reyes, Noel Linsangan and Roben Juanatas*

A version of the YOLO detection algorithm, the YOLOv4, has yet to find much use on aquatic species. Detection systems optimized for aquarium fish species are also currently lacking. This study provides a detection program for select fish species, namely the dwarf gourami, guppy, and zebrafish, using the YOLOv4-tiny detection model. The program was implemented in the Raspberry Pi 4 Model B single-board computer with an 8MP camera. The YOLOv4-tiny model was trained using images from Kaggle, FishBase, and the Global Biodiversity Information Facility, along with local images. The program was tested on live samples of the three fish species along with one irrelevant fish species, the petticoat tetra. There were three live samples of each species. Close shots for each sample were taken from the aquarium's front, left, right, and back sides, making a total of 48 images for detection. Training data and the confusion matrix from the experiment were utilized to determine the program's reliability in detecting the fish species. For the results, the trained model achieved a mAP of 97.81% during training and a global accuracy of 91.67% during the experiment. The program exhibited reliable performance across the board, achieving above 90% AP and accuracy in all classes.

136	**Image Quality Assessment for Wood Images** *Heshalini Rajagopal, Norrima Mokhtar and Anis Salwa Mohd Khairuddin*

This work proposed the implementation of subjective and objective assessment on wood images to analyse the quality of wood images for wood species recognition purposes. Several distorted images are generated from the reference images by applying Gaussian White Noise (GWN) and Motion Blur (MB) at various levels of distortions for comparison purposes. Ten subjects from Negeri Sembilan Forestry Department were selected to assess the distorted images for the subjective evaluation. In the objective evaluation, five Full Reference-IQAs (FR-IQAs) were used to evaluate the distorted images. The subjective scores were used as the benchmark to determine the most suitable objective FR-IQA to assess wood images. The relationship between the subjective scores and objective FR-IQAs are examined using performance metrics, namely PLCC and RMSE. It was found that FSIM is the most suitable FR-IQA to assess wood images distorted with GWN and MB.

137	**Classification of Defects in Robusta Green Coffee Beans Using YOLO** *Vince Amiel Luis, Marc Vincent Quiñones and Analyn Yumang*

Agriculture is one of the most prominent industries in the Philippines, and a branch of agriculture includes coffee bean production. Extracting the coffee beans from their original fruits requires significant effort to accomplish. Apart from that, filtering between the normal and defected coffee beans has its difficulties, just from the sheer amount of each yield of harvests. Thus, the researchers proposed an automatic coffee bean defect detection system that utilized image processing to identify the broken, black, and normal coffee bean types. The system had the You Only Look Once algorithm (YOLO) implemented, and the latest iteration of the algorithm (YOLOv5) was utilized. The confusion matrix was used to measure the accuracy of the system. The overall accuracy of the whole system yielded 94.44 percent. The system will benefit coffee bean farmers and consumers, for they can use the coffee bean detection system as an option for detecting coffee bean defects.

138	**A Chinese Business License Text Detection Algorithm Based On Multi-Scale Features** *Xingxing Sun, Mohan Wu, Boquan Cheng, Aidong Yang, Xiaozhou Ye and Ye Ouyang*

In practice, text detection is needed for document image recognition, where the images have long text, large text, as well as dense small text areas. Connection Text Proposal Network (CTPN) is a classical model for text detection, but it is challenging for CTPN to detect dense small text areas. To overcome the challenge, a text detection model is proposed based on CTPN in this paper. The proposed model includes the following components: the residual network (ResNet50) and Feature Pyramid Network (FPN) are used to extract the feature layers with both high-level semantic information and shallow detail information; A Bi-directional Long Short-Term Memory (BiLSTM) network is applied to augment the representation of context information by the multi-scale feature layers; The text boxes on each scale are predicted by the feature layer, by which effectively detecting the text areas on various of scales; The ground-truth bounding box of each text box can be matched to the most appropriate anchors using a centralized approach, and the bounding box of text line is obtained by the post-processing method for text line construction. In particular, our experiment focuses on the text detection for Chinese business license. The experimental results show that the proposed model is more effective than the CTPN in terms of generating higher F-score and using less training data, which is only one third of that for the CTPN. Furthermore, the proposed model works well for the images with long text, large text and dense small text areas simultaneously, for which the CTPN fails.

139	**Detection of Forged Handwriting Through Analyzation of Handwritten Characters Using Support Vector Machine** *Ma. Crisanta Jasmin, Mark Jayson Dela Cruz and Analyn Yumang*

People often use a keyboard to input data in digital form. However, there are still some cases where handwriting is still used and often in significant scenarios such as cheques. The current study focuses mainly on detecting forgery in a person's signature or cases where original handwriting was altered or additional characters were added. Thus, the study proposed a handwriting forgery detection system that utilizes image processing and Support Vector Machine (SVM), a linear classification model. The system will take the original handwriting of a person as its training data to create a model that would evaluate whether the presented handwriting is original or forged. In addition, SVM will also be used for text recognition of handwritten letters. The models are then evaluated using a confusion matrix and F1 score. The evaluated result for the text recognition model achieved an F1 score of 0.9052. On the other hand, the forgery detection model had an F1 score of 0.6013.

140	**Non-destructive Determination of Sweetness of Philippine Fruits using NIR Technology** *Alvin Borras, Ronald Andrew Ganotisi, Noel Linsangan and Roben Juanatas*

Near-infrared (NIR) spectroscopy is a rapid and non-destructive method for evaluating internal quality, including TSS and firmness. A non-destructive NIR device can be used to accurately determine the sugar content of fruit in degrees Brix, enough to match a destructive commercial refractometer. This study aims to determine if a non-destructive NIR device can be used to accurately determine the sugar content of fruit in degrees Brix, enough to match a destructive commercial refractometer. The lowest R2 value belongs to the Mango with 0.761, while the highest belongs to the Strawberry with 0.9147. For Oranges, Papayas, Chicos, and Grapes - their respective R2 values are 0.8776, 0.8447, 0.7845, and 0.8407. Fruits were cleaned thoroughly before subjecting to NIR spectroscopy to reduce interference, and the AS7265x spectral triad spectrometer captured their respective absorbance spectra. From the ranges gathered, the researchers developed a regression model that can be used with the Arduino UNO to create a program that could detect the sugar content of the fruit.

141	**Ad-Gency: Hospital Patients' Admission Management Information System and Analytics Development on Health Emergency Situation** *Alyssa Bautista, Ailah Carelle Bunag, Mariz Menorca and Alfio Regla*

The problem of getting admitted to the hospital is one of the concerns that patients are experiencing right now; due to circumstances where the hospital cannot accommodate the emergency patient. This study aims to develop a computing solution that could ease patients' pain points about trying to find and get admitted into a hospital during emergencies. While simultaneously helping the healthcare institutions to have a better way of processing their pre-admissions. The SCRUM approach is utilized in this study to guide and efficiently handle the applications' development stage. The study was completed with a survey of potential consumers to obtain feedback. The result shows that the participants had good impressions of the application, saying that it was easy to use, user-friendly, and a great help for finding hospitals that could take care of them.

142	**A Real-Time Approach to Classify the Water Quality of the River Ganga at Mehandi Ghat, Kannuaj** *Abhishek Bajpai, Srishti Chaubey, Bdk Patro and Abhineet Verma*

Only 0.3 percent of the total water on Earth is available in rivers and ponds, and the majority of it is polluted to the point where drinking it directly can cause disease. In this paper, we will identify the quality of the river Ganges and check if it is portable and healthy. We aim to classify the water on some parameters using different classification algorithms, such as Random Forest, which is a supervised machine learning algorithm. This model's accuracy is around 99 percent, which is far superior to other approaches taken for water quality prediction.

143	**Detection and Identification of Intestinal Parasites on Dogs Using AlexNet CNN Architecture** *Khaye Fajardo, Jerald Gonzales and Carlos Hortinela IV*

Roundworms and whipworms are examples of intestinal parasites that feeds on its host. These parasites pose a threat and danger to the health of both non-domesticated and domesticated dogs, this concern also extends to dog owners especially to young and elderly. In this study, a deep learning model named Convolutional Neural Network is used in detection and identification of roundworm and whipworm eggs. The CNN trained model is build using AlexNet architecture. It is trained using the image dataset collected from Vet Central Lab Philippines and tested using the image dataset captured using the prototype which is the raspberry pi camera module mounted to the microscope. To determine the efficiency and correctness of the system, confusion matrix is applied. The system obtained an accuracy of 96% and 90.74% in classifying whipworm and roundworm eggs respectively. The study shows promising result that AlexNet CNN architecture can be used in detection of intestinal parasite eggs.

144	**Bacterial Leaf Blight Identification of Rice Fields Using Tiny YOLOv3** *Jeruel Krystian Tulfo, Mc Henry Tan, Analyn Yumang and Jocelyn Villaverde*

Rice plantations are frequently affected by various rice diseases, one of which being bacterial leaf blight. Although there are scientific methods for determining bacterial blight using various molecular techniques, these tests are frequently more suitable for specific reasons such as genome identification rather than broad applications due to the same effect of bacterial blight. As a result, image processing techniques such as Convolutional Neural Network (CNN) are commonly utilized for general rice disease identification due to their reliability. The purpose of this research is to identify bacterial leaf blight using the Tiny YOLOv3 algorithm. With a total of 20 test photos, 10 of which were bacterial leaf blight and the other 10 were healthy, the prototype was able to predict bacterial blight infected leaves, with 19 correct predictions and one wrong prediction. During its evaluation, the model used to detect the diseases generated acceptable mean average precision and a precision and accuracy of detecting the disease of 90.91% and 95%, respectively.

145	**Investigating Vision Based Sorting of Used Items** *Praneel Chand*

This preliminary research investigates the development of vision-based methods for identifying objects in a sorting task. It addresses the issue of economic and environmental sustainability by exploring options to identify parts for reuse/recycling. Specifically, the problem of identifying electrical parts such as capacitors, voltage regulators, and potentiometers is investigated. The proposed solution will utilize a robotic arm and an overhead camera. A multiple object workspace scenario is investigated. A feature extraction algorithm identifies regions of interest and extracts data for classification. Three classes of objects are detected and classified by a backpropagation trained shallow neural network. An overall accuracy of 85.6% is currently achievable when tested in a real environment with new data.

148	**A Hybrid TDNN-HMM Automatic Speech Recognizer for Filipino Children's Speech** *John Andrew Ing, Ronald Pascual and Francis Dimzon*

Previous studies presented in the literature in the recent years have shown the feasibility of developing an automatic speech recognition (ASR) system for Filipino-speaking children. However, most of these studies are solely based on the Hidden Markov Model (HMM) with Gaussian Mixture Model (GMM). In this paper, we present the development of a hybrid ASR system using both HMM and Time Delay Neural Network (TDNN). The Filipino Children's Speech Corpus (FCSC), which is purely com-posed of read speech, was used to train and test all the models. We performed several sets of experiments on various phoneme sets, various numbers of HMM states, and various enhanced models that employed vocal tract length normalization (VTLN), linear discriminant analysis (LDA), and speaker adaptive training (SAT). Our experiments show that a basic TDNN-HMM model could consistently outperform an HMM-GMM model regardless of how many HMM states are present. We also present that VTLN slightly enhances the performance of the model. The best performing model is the 4-state TDNN-HMM hybrid that obtained the lowest word error rate (WER) of 0.97%.

150	**EZM-AI: A Yolov5 Machine Vision Inference Approach of the Philippine Corn leaf Diseases Detection System** *Yolanda C. Austria, Maria Concepcion A. Mirabueno, Dylan Josh D. Lopez, Dexter James L. Cuaresma, Jonel R. Macalisang and Cherry D. Casuat*

The Philippines is an agricultural country, and one of the issues in today's farming environment is the prevalence and exacerbation of diseases caused by fungus, which impact the overall quality of the produced or harvested crop. This study focuses on a corn field, especially the top three corn crop diseases in the Philippines, which are corn rust, leaf blight, and grey leaf spot. The YOLO V5 architecture was used to identify corn crop diseases. After training, the result had an mAP score of 0.97. The model also achieved 100 percent testing accuracy and detection accuracy ranging from 98.90 percent to
99.43 percent. The accuracy of training, testing, and validation were promising, and it could be implemented into the device to solve the issue of detecting corn leaf diseases.

151	**Depression Detection on Social Media With User Network and Engagement Features Using Machine Learning Methods** *Aik Seng Liaw and Hui Na Chua*

Depression is a complicated mental health disorder with many different forms and symptoms. Traditional methods face barriers when detecting and diagnosing depression, including social stigma and societal labeling. As social media platforms became commonplace for information sharing, their anonymity meant that the barriers had considerably lessened. An alternative method to depression detection being researched is using social media data to build machine learning models for depression detection. To that end, this research uses machine learning models to incorporate new user networks and user engagement features into depression detection on Twitter users. These two features provide an additional understanding of users and may significantly affect depression detection. A Twitter dataset is constructed to include additional data on users' following list and the history of liked tweets not examined in prior studies. Ten machine learning models are constructed using five different machine learning algorithms tested on two sets of features. Models with proposed features outperformed other machine learning models without proposed features, with the best model yielding 82.05% performance for both accuracy and F1 score. This study discovered that the most important feature is the number of depression keywords in liked tweets, with at least twice the gain compared to 88% of other features used. Topic modelling features for liked tweets also have high gain and are important in detecting depression. Additionally, features derived from original tweets, replies, and liked tweets have higher gain and are more important than retweets and quote tweets in detecting depression.

152	**Ripeness Classification of Cacao using Cepstral-based statistical features and Support Vector Machine** *Juvy Amor Galindo, Jamie Eduardo Rosal and Jocelyn Villaverde*

High quality fine cocoa beans come from farms on which the cacao is grown, harvested and processed properly. Harvesting under-ripe cacao pods would result in poor-quality yield because it won’t have developed all its flavors and aromas and it will not continue to ripen after harvest and not suitable for fermentation. On the other hand, over-ripe cacao pods may germinate and possibly will lead to fungal-infective, defective and generate poor quality yields. The best way of harvesting cacao pods is when it is about to ripe. The conventional way of determining the ripeness of a cacao pod is by manual tapping to get a hollow sound. Hollow sound will indicate ripeness because the cacao beans are no longer tightly packed inside the pod. This paper recommends an approach to classify the ripeness of cacao using the acoustic sensing technology. The device will generate an acoustic signal from cacao pods which was recorded for acoustic signal analysis. Cepstral-based technique was used for feature extraction and Support Vector Machine (SVM) algorithm model and tested using nested cross validation resulted in 94% mean test score.

153	**Comparing Zero-Shot Text Classification and Rule-Based Matching in Identifying Cyberbullying Behaviors on Social Media** *Wei Jiek Chong, Hui Na Chua and May Fen Gan*

The incidences of cyberbullying have skyrocketed due to the continuous expansion of social media users. Therefore, proactive efforts are necessary to address cyberbullying, including countermeasures for handling the various cyberbullying behaviors. Nevertheless, due to the large volume of social media texts being generated persistently, it is challenging to identify cyberbullying behaviors in a social text and not scalable in using the manual approach of human annotation. Most previous studies adopt the human annotation approach to determine whether a text is a cyberbully or non-cyberbully. Therefore, this paper aims to experiment with approaches that can improve the efficiency of recognizing the different cyberbullying behaviors through textual data using zero-shot classification and rule-based matching, and compare how they perform in classifying cyberbullying behaviors. This study uses techniques such as topic modelling, zero-shot text classification, and information extraction with rule-based matching to identify and classify the cyberbully behaviors underlying a cyberbully comment. The human annotation approach serves as the benchmark to compare the performance of both models in identifying cyberbullying behaviors. Our results show that zero-shot classification performed better accuracy in categorizing cyberbullying behaviors. Among the behaviors, the zero-shot model we generated presents a better accuracy rate in recognizing the flaming behavior, but it achieves a lower accuracy rate in identifying the other cyberbully behaviors.

156	**Development of Smart Elderly Care Mobile Application for Health Management System** *Zuraini Dahari, Choong Chee Jun, Poh Jin Ze, Nurul Najwa Mohd Zakir, Mohd Noor Faidhi Mohd Fauzi, Muhammad Hafiz Syazwan Mohamad Azam and Nurhaniza Hamiri*

Elderly care management has great potential to be further developed and shaped with smart healthcare solutions. In general, elderly care is defined as a service that serves the needs and requirements of senior citizens. As age progresses, the physical strength, health condition and mental stability deteriorate, especially when people reached a certain age (also known as elderly). It also brings about more medical appointments, medication and health issues. For elderlies, it is not easy to have a systematic management on medical appointments, medications and their health status on their own. It would be difficult for them to update or explain in details on their health conditions to their children or authorized caregivers. In most cases, family members are taking turns and responsibility to take their parents for medical appointments and check-up. It is quite a challenging task to keep up with the health status, medication details and others if more than one person act as the caregivers. This project proposes a smart health management system called Smart Elderly Care App (SECA). The main objective of this project is to develop a mobile apps to facilitate the health management issues. In general, SECA has five main features which are medical appointment, medication, daily health data, health summary, and elderly profile. By having these features, users can shape elderly care with innovative healthcare solutions to help the elderly people and their caregivers in the health management.

162	**A Feature-based Stochastic Morphological Analyzer for Filipino Affixed Words** *Great Allan Ong and Melvin Ballera*

This paper papers presents a featured-based stochastic stemming methods for obtaining affixes in Filipino language. The method aims to introduce a statistical stemming approach that is based on the morphological attributes of Filipino words. Various Filipino word forms from different types of sources were obtained and test for affix removal system. The stemmer initially performs lexicon check from the created lexis which is comprises of common based words and various categorical language forms. Feature examinations are executed to check the data entry's structure. These includes affix removal, word assimilation, partial duplication, derivational words, and inflectional words. A KSTEM assimilatory method from Hybrid Stemming Algorithm are utilized to support derivational and inflectional conditions. From the created stochastic featured-based template algorithm, the entries were analyzed and perform the final phase of the stemming process. An average of 92.46 percent was obtained using the test data and stemming technique.

163	**Dense-par-AttNet: An Attention Based Deep Learning Model For Skin Lesion Classification By Transfer Learning Approach** *Mohammad Rakin Uddin and Talha Ibn Mahmud*

The classification of dermatoscopy images is of great significance, especially in the case of skin cancer, as the chance of survival degenerates with the passage of time. Yet, detection of a particular class of skin cancer has become a challenge in medical diagnosis due to the close resemblance among various lesions. As existing Computer-Aided Diagnosis (CAD) methods that optimize deep networks fail to perform up to the mark due to fuzzy boundaries, low contrast and limited training sets, this paper proposes a new attention-based transfer learning approach for the classification of skin lesions. In this method, pre-trained DenseNet-201 has been imported in addition to a spatial attention-based CNN network. The extracted feature of both networks are merged together to make the optimum prediction. The experimental results demonstrate the considerable performance of 82.576% overall accuracy for the HAM10000 dataset. The proposed system has a great prospective to be applied in hospitals to help dermatologists make accurate decisions in the case of skin lesion classification.

165	**A hybrid Xception-Ensemble model for the detection of Computer Generated images** *Sychandran C S and Shreelekshmi R*

Digital images play a vital role in digital communi-cation due to their applications in various domains like games, movies, and medical and legal spheres. Entities fabricate content through computer-generated images, which causes severe adverse consequences. We propose a novel hybrid Xception-Ensemble approach for distinguishing computer-generated images using the depthwise separable convolution of the Xception architecture. We use depthwise separable convolution and the parameters transferred from the pre-trained ImageNet weights to distinguish the features in computer-generated images with ensemble average learning for efficient classification. The accuracy of the proposed system is better than that of state of the art systems on DSTok, Columbia PRCG and Rahmouni datasets.

166	**Modelling and Simulation of Bioretention System with HYDRUS-1D** *Jason Lowell Jitolis, Farrell Nereus Aegidius and Nurmin Bolong*

The design of lab-scale bioretention cell column was constructed based on Urban Stormwater Management Manual for Malaysia (MSMA) specifications. The stormwater runoff flowrate applied to each column was calculated to mimic the actual scale impervious area for generation of runoff. An inflow and outflow of water was measured using water flow sensor, simulating rainfall runoff correlation with depth and hydraulic conductivity parameters effects. A model to simulate the water movement beneath the engineered soil media, one dimensional (1-D) model of water flow was used to study the effect of different media depth and rainfall intensity on hydraulic conductivity parameter value. It resulted that at lower rainfall intensity of 5.3mm/min small percentage of runoff volume reduction was observed at low height of media (150mm) with a total of 11% compared to 55% of 250 mm media height. The recommended media depth values for moderate storm event are <250mm but not less than 150mm to achieve half of the volume to be treated and maintain the acceptable contact time for higher treatment capabilities. An average of 0.03mm/min hydraulic conductivity is suitable for moderate rainfall scenario as simulate by HYDRUS 1D. On the other hand, results at higher rainfall intensity (12mm/min), no large deviation was observed in terms of percentage of runoff volume reduction between both heights. The thickness ranges are not within the required control volume runoff. Thus, further optimization at lower depth is essential.

168	**Efficient Spectrum Allocation in Cognitive Radio using Yellow Saddle Goatfish Algorithm** *Debashree Brahma, Swati Swayamsiddha and Ganapati Panda*

Spectrum shortage and spectrum scarcity are the burning issues in wireless communication. To overcome these challenges, Cognitive Radio Networks (CRNs) can be deployed as an alternative technology to gainfully employ the underutilized radio spectrum of licensed users. In the current research work, multi-objective optimization based approaches are introduced for spectrum allocation in CRNs by minimizing interference, maximizing throughput, and improving network efficiency. Several constraints such as ambient noise, power transmission, and interference have been taken into consideration for equitable channel assignment to secondary users. Total network utilization and average capacity of secondary users are simultaneously optimized using multi-objective particle swarm optimization (MOPSO), multi-objective differential evolution (MODE), and non-sorting genetic algorithm (NSGA-II).The multiobjective optimization based spectrum allocation models have been simulated in a MATLAB environment and the obtained results are compared with a recently proposed yellow saddle goatfish algorithm (MOYSGA). The simulation results demonstrate that, total network capacity is inversely proportional to the average capacity of secondary users and further, the proposed approach provides fair channel allocation and optimal power to secondary users (SUs) under both the downlink and the uplink cases.

169	**Performance Evaluation of V2V Propagation Channels Under Different Link Types** *Azlan Abd Aziz, Azwan Mahmud, Nur Asyiqin Amir Hamzah, Hadhrami Ab Ghani and Nurul Asyiqin Mamat*

Accurate and realistic propagation channel is of paramount requirement in the design of vehicle-to-vehicle (V2V) communications which cover the realistic channel properties and characteristics. Obstructions and propagation link types give significant impact on the communication link and are often ignored in the modelling and analysis of the V2V design and simulation. In this paper, we demonstrate an overview of V2V propagation channel model and wireless channel requirements based on the different link types and obstruction types. We investigate three different environments such as urban, suburban and highway which are in the state of Malacca. We analyze the neighborhood size (defined as the number of vehicles that can communicate with the ego vehicle), received signal power and traffic density under the different environment and link types. The numerical results show that the performance of the V2V communications is directly affected by the link types and the environments. The link quality deterioration is more severe due to the buildings than that due to the vehicles. Majority of the link types are still considered to be line-of-sight (LOS) and this is a promising sign for higher throughput and reliable V2V communication links. This analysis provides insightful planning and modelling foundation in V2V networks.

170	**Detection of Sickle Cell Anemia in Blood Smear using YOLOv3** *John Paolo De Leon, John Michael Vincent Dayego, Noel Linsangan and Roben Juanatas*

Object recognition algorithms such as the YOLOv3 algorithm have a lot of possible applications in the field of medicine. One such application is the study's aim of recognizing the presence of sickle cell-shaped red blood cells (sickle cell disease) in blood smear samples. As YOLOv3 uses features learned from a trained model using deep convolutional neural networks, it is possible to use it in automating the process of morphologically recognizing the presence of sickle cells in blood smear samples. Additionally, as blood smear samples may have different staining methods, the images must be processed prior to recognition which will result in a grayscale image frame. Based on the results generated by the system when processing 12 blood smear samples, a confidence level of 50% corresponding to a threshold value of 0.5 provided the highest accuracy rate when using YOLOv3-Tiny custom weights. Further testing by the researchers showed that the detections in unstained test slides have a higher confidence level per detection than in test slides stained using a darker pigment caused by the stain's effect on the illumination of the image. Overall, the design system was able to achieve 100% accuracy in detecting the presence of sickle cell-shaped RBCs in 12 blood smear samples.

172	**Vehicle Type Classification and Counting Using YOLOv4 Algorithm** *Ana Lowela Lucas, Samuel Ii Imperial and Meo Vincent Caya*

The study implements a system that detects, classify and count vehicles based on their body type. Classifying and counting has proven to be beneficial when monitoring and managing traffics. However, there are few of studies that focuses on classifying and counting vehicles based on their car types. Implementing the YOLOv4 for classification and counting for the car types coupe, pickup, sedan, sports utility vehicle (SUV) and van, obtained an accuracy of 92.13% for classification and 89.14% for counting. The system was able to successfully classify and count vehicles based on their car type under one system compared to other system that only counts vehicles without classifying the car types.

173	**Text Classification of Medical Transcriptions using N-Gram Machine Learning Approach** *Kah Win Lee and Keng Hoon Gan*

Medical domain is in a data rich environment that a variety of knowledge can be extracted for positive outcomes. This research work will show multiclass classification of medical transcriptions using a real dataset. The objective of this paper is to classify medical transcriptions based on the medical specialty labels, namely Discharge Summary, Neurosurgery and ENT. Text normalisation has performed followed by extracting five different n-gram feature representations are. Moreover, three supervised learning classifiers were trained on each of the n-gram feature representations, namely K-Nearest Neighbours, Decision Tree, and Random Forest. The classification performance was evaluated by the metric score of macro F1. The best score achieved was 0.93 macro F1 on testing set using tuned Random Forest and unigram feature vectors.

175	**An Empirical Model of Classifying Lung Affected Diseases to Detect COVID-19 Using Chest X-ray Employing Convolutional Neural Architecture** *Ovi Sarkar, Md. Robiul Islam, Tahmim Hossain, Md Khalid Syfullah, Md. Tohidul Islam and Md Moniruzzaman*

The earlier detection and accurate diagnosis of COVID seem to be a global problem. It is difficult to make a large number of testing equipment, but then again, their reliability is relatively poor. Recent research indicates the usefulness of chest x-ray pictures in identifying COVID. This study presents a deep learning algorithm developed from the ground up to categorize as well as confirm the existence of COVID in a set of X-ray imaging data. We designed a CNN architecture from the ground up to retrieve elements from provided X-ray data to categorize them and identify the individual contaminated with COVID. Our strategy may aid in mitigating the consistency issues while working with medical data. In contrast to some other classifying activities with a large enough image database, obtaining large X-ray datasets for this classification job is challenging. So, we applied multiple data enhancement techniques to maximize the accurateness, achieving a significant accuracy of 97.75 percent.

177	**Real-Time Trajectory Tracking Control of an Electro-Hydraulic System Using a Fuzzy Logic Sliding Mode Controller** *Muhamad Fadli Ghani, Rozaimi Ghazali, Hazriq Izzuan Jaafar and Chong Chee Soon*

This paper presents the trajectory tracking control of an electro-hydraulic actuator (EHA) system using a fuzzy logic sliding mode control approach. To establish the proposed controller, a linear model of the EHA system is determined using the parametric Grey-box identification technique, and the model's parameters are estimated using the MATLAB System Identification Toolbox. Then, a fuzzy logic sliding mode controller is proposed by substituting the signum function with the fuzzy logic function in the conventional sliding mode control algorithm, and the MATLAB Fuzzy Logic toolbox was utilized to design the continuous fuzzy logic function. The stability of the closed-loop system with the proposed controller is assessed using Lyapunov's theory of stability. The control output for the tracking control system was acquired through simulation and real-time implementation in order to evaluate the trajectory tracking control performance. The real-time implementation for Sinusoidal trajectory tracking was conducted on an EHA workbench equipped with a PCIe-6321 card. For trajectory tracking control, experimental results indicate that the proposed controller is more effective than the conventional sliding mode controller.

181	**Energy Efficient Scheduling in Smart Home using Deep Reinforcement Learning** *Fauzun Abdullah Asuhaimi, Muhammad Akram Roslann and Khairul Nabilah Zainul Ariffin*

In a smart home, the scheduling of the period of time that household appliances are allowed to be operational necessarily requires the adjustment of multiple parameters in accordance with the amount of available energy. Nevertheless, the scheduling of the operational time of multiple appliances in a smart home itself is a difficult problem, and as a result, it requires an intelligent, heuristic method in order to be solved in polynomial time. In this piece of research, we propose scheduling of household appliances based on a well-known value iterative reinforcement learning technique called Quality learning. This technique is used to learn values over time. The proposed method will be carried out in two stages. The first step in the Q learning process involves the agents interacting with the environment of the smart home in order to earn a reward for their efforts. The value of the reward is then used to schedule the operating times of various household appliances in the subsequent state so that the total amount of energy consumed is kept to a minimum. In the second phase, the user's dissatisfaction is maintained due to the scheduling of the household appliances. This is accomplished by classifying the household appliances into two groups: shiftable and non-shiftable. In addition, by making use of the phenomenon of shared memory synchronisation, the agents that are connected to each individual appliance in a smart home become synchronised. The simulations are carried out in a model of a smart home that consists of a single person and a number of different types of appliances. It has come to our attention that, in contrast to manual scheduling algorithm and scheduling that was based on a demand-response strategy, the operational time of the household appliances has been revealed to be effectively scheduled in order to reduce the amount of energy that is consumed.

184	**Detection of Social Media Hashtag Hijacking Using Dictionary-based and Machine Learning Methods** *Wei Ling Cheah and Hui Na Chua*

Nowadays, hashtags are widely utilized on all social media platforms since they deliver numerous benefits, particularly for corporations aiming to reach a larger audience. However, hashtag exploitation has resulted in the problem of hashtag hijacking, which is a type of cyber content threat that anyone or any organization can carry out. As a result, this research presents a framework for detecting social media hashtag hijacking through machine learning algorithms. This paper aims to identify methods to classify relevant and irrelevant hashtags to their contents. This paper demonstrates the unsupervised machine learning method, namely the dictionary-based approach, to classify the relevance of hashtags with the content of tweets on an unlabeled dataset, and also the implementation of supervised machine learning methods, including the Support Vector Machine (SVM), Naïve Bayes classifier, and Decision Tree algorithms, to classify the relevance of hashtags used with their contents and compare the machine's performances on labeled datasets. Our results showed that the Support Vector Machine (SVM) performs the best in classifying the relevance of hashtags with an accuracy of 93.36%, an F1 score of 96.19% and ROC-AUC score of 97.22%. The findings of the study present an automated detection framework for hashtag hijacking that can overcome the limitations of previous studies and adapt to external threats with high performance over time.

185	**A new face image manipulation reveal scheme based on face detection and image watermarking** *Zahraa Aqeel Salih, Rasha Thabit, Khamis A. Zidan and Bee Ee Khoo*

Face image manipulation (FIM) algorithms and applications are increasing and distributing rapidly. Nowadays, one can easily find an application to manipulate face images for different purposes. After the development and popularity of “DeepFakes”, the research community highlighted the necessity of implementing new detection techniques that can reveal FIM. The available FIM detection techniques have different limitations and most of the presented schemes require a prior knowledge of the FIM method that has been applied to generate the manipulated face image which makes them restricted. In this paper, we present a new face image manipulation reveal (FIMR) scheme based on face detection algorithm and image watermarking technique in the transform domain. The proposed scheme does not need a prior knowledge of the FIM method thus it can reveal different types of FIM. Experiments have been conducted to evaluate the performance of the proposed FIMR scheme for face images with different sizes. The results proved that the proposed scheme can successfully reveal different manipulation attacks such as face swap, expression swap, attribute attacks, retouching attacks, and morphing attacks.

186	**Fall and Normal Activity Classification via Multiple Wearable Sensors** *Rabia Khalid, Sharjeel Anjum and Chansik Park*

A fall detection and classification system is crucial for reducing the severe consequences of falls, which account for the leading cause of accidents on construction sites. Wearable sensors are one of the technologies used to detect falls. Although much academic work has been dedicated to the study of this class of systems, little attention has been paid to the evaluation of simpler algorithms prior to training on complex ones. This study utilizes the open-source UP Fall Detection Dataset and proposes that effective data processing and simpler baseline models give better results for fall-direction classification. Several data-processing techniques like windowing and filtering are used prior to using simpler baseline models like Neural Network (NN), K-Nearest Neighbor (kNN), Support Vector Machine (SVM), Naïve Bayes (NB) and Discriminant Analysis (DA) Classifiers. It is also investigated how to minimize multisensor cost while achieving acceptable detection accuracy. Based on this robustness analysis, fine kNN and wide NN yield 99.5% accuracy for all five wearable sensors. In comparison, using the best of these sensors (belt and pocket) results in 99% accuracy, with accuracy of all 11 individual activities exceeding 93%. The findings of this study bode well for the development of real-world fall-prediction systems as they enable accurate fall direction identification.

187	**Harmonic Minimization in Multilevel Inverter Using PSO-based Soft-computing Technique** *Yee Wei Sea, Wei Teik Chew, Siok Lan Ong, Wui Ven Yong and Jenn Hwai Leong*

A conventional asymmetrical cascaded H-bridge multilevel inverter (CHBMLI) requires a total number of twelve power switches to generate an output voltage waveform with 15 voltage levels. In this paper, the operating principle and performance of a 15-level asymmetrical multilevel inverter (MLI) with a reduced number of power switches are presented. The 15-level asymmetrical MLI is constructed with only ten power switches, which is reduced by 16.67 % compared to the 15-level asymmetrical CHBMLI. The switching-angle calculation applied to the MLI is another important design aspect in MLI research and the switching angles must be computed properly to obtain an output voltage waveform with low total harmonic distortion (THD). In this work, a particle swarm optimization (PSO) based selective harmonic minimization pulse-width modulation (SHMPWM) technique is used to obtain the optimal switching angles applied to the 15-level asymmetrical MLI. A PSIM simulation model is developed to validate the effectiveness of the optimal switching angles applied in the 15-level asymmetrical MLI. Simulation results suggest that the 15-level asymmetrical MLI is able to produce a sinusoidal-like staircase output voltage waveform using PSO-based SHMPWM optimized switching angles at modulation index of 0.70. At the same modulation index, the performance of the 15-level asymmetrical MLI connected with different inductive loads is also validated.

188	**GA-Optimized Switching Angles for 13-level Asymmetrical Multilevel Inverter** *Wei Tik Chew, Yee Wei Sea, Siok Lan Ong, Wui Ven Yong and Jenn Hwai Leong*

In this paper, the operating principle of a 13-level asymmetrical multilevel inverter (13L-AS-MLI) with three binary-based asymmetric DC voltage sources (Vdc) is presented. The 13L-AS-MLI is constructed using 8 active power semiconductor switches and it is able to generate a 13-levels output voltage waveform. Unlike the voltage waveform generated by 13-level symmetrical multilevel inverter (13L-S-MLI) in which all the voltage step sizes are equal in magnitude, the output voltage waveform produced by the 13L-AS-MLI consists of two different voltage step sizes, which are Vdc and 2Vdc. The switching angles utilized by the 13L-AS-MLI are derived using selective harmonic minimization pulse-width modulation (SHMPWM) concept. A nature-inspired optimization algorithm known as genetic algorithm (GA) is applied in the SHMPWM to determine the optimum switching-angle solutions. The GA-based SHMPWM switching-angle computation has been formulated to retain the fundamental voltage component of the output voltage waveform, while minimize five selected undesired low-order harmonics. A PSIM simulation model is developed to validate the operating principle of the 13L-AS-MLI. The performance of the 13L-AS-MLI is evaluated and compared to that of a 13L-S-MLI. Simulation results show that the total harmonic distortion (THD) of the output voltage generated by the 13L-AS-MLI is more or less similar to that generated by the 13L-S-MLI, whilst at certain modulation indexes the THD of the output voltage generated by the 13L-AS-MLI is lower. It is worth to note that the 13L-S-MLI requires a total number of 14 active power semiconductor switches, whilst the 13L-AS-MLI has the advantage of requiring 43 % less power semiconductor switches to produce an output voltage waveform with quality nearly similar to that generated by the 13L-S-MLI.

194	**A Comparative Study of COVID-19 CT Image Synthesis using GAN and CycleGAN** *Kin Wai Lee and Renee Ka Yin Chin*

Generative adversarial networks (GANs) have been very successful in many applications of medical image synthesis, which hold great clinical value in diagnosis and analysis tasks, especially when data is scarce. This study compares the two most adopted generative modelling algorithms in recent medical image synthesis tasks, namely the traditional Generative Adversarial Network (GAN) and Cycle-consistency Generative Adversarial Network (CycleGAN) for COVID-19 CT image synthesis. Experiments show that very plausible synthetic COVID-19 images with a clear vision of artificially generated ground glass opacity (GGO) can be generated with CycleGAN when trained using an identity loss constant at 0.5. Moreover, it is found that the synthesis of the synthetic GGO features is generalized across images with different chest and lung structures, which suggests that diverse patterns of GGO can be synthesized using a conventional Image-to-Image translation setting without additional auxiliary conditions or visual annotations. In addition, similar experiment setting achieves encouraging perceptual quality with a Fréchet Inception Distance score of 0.347, which outperforms GAN at 0.383 and CycleGAN at 0.380 with an identity loss constant of 0.005. The experiment outcomes postulate a negative correlation between the strength of the identity loss and the significance of the synthetic instances manifested on the generated images, which highlights an interesting research path to improve the quality of generated images without compromising the significance of synthetic instances upon the image translation.

197	**Highway Surveillance System Using Deep Learning Artificial Neural Networks** *Chuan-Hsian Pu and Chun-Shen Sea*

This paper proposes a novel moving vehicle detection model for highway surveillance. The models are developed based on machine learning-based models by leveraging the powerful deep learning neural network. The purpose of the research is to study and analyze drivers' behaviours on the road. Methods are proposed to detect moving vehicles using the Darknet and TensorFlow frameworks. The results show that Tensorflow framework could barely correctly identify three vehicles out of nine vehicles on the video frame with one car being incorrectly classified as a truck with confident levels varying widely from 19.10% to 92.52% inconsistently having wide spreading in percentages. The darknet framework shows that all eight out of nine vehicles are correctly classified as a car with only one car being labelled incorrectly. The darknet framework has shown with improved confident levels ranging from 46.38% to 77.59% with lower spreading in percentages.

198	**Artificial Intelligence-based Safety Helmet Recognition on Embedded Devices to Enhance Safety Monitoring Process** *Sharjeel Anjum, Syed Farhan Alam Zaidi, Rabia Khalid and Chansik Park*

Construction workers can be adequately protected by wearing a safety helmet while working. Due to the discomfort, the workers take off safety helmets while working, which is unsafe behavior and causes an injury or fatality in case of a fall. Therefore, a practical and handy solution is needed on the construction site to recognize workers safety helmets in order to determine their unsafe behavior. However, conventional safety monitoring methods are labor-intensive, time-consuming, and require a safety manager's presence, which is impossible for him to monitor all the construction workers performing different activities. Therefore, this research presented efficient and cost-effective Artificial Intelligence (Computer Vision) based mobile solution to monitor worker safety helmets and generate an alarming message to the safety manager and the workers. The proposed solution consists of (1) CV based object detection approach to recognize workers with and without a safety helmet, (2) deployment on edge devices such as Android smartphones (3) uses SMS'Manager API and ToneGenerator class to notify safety manager and worker, (4) and real-time firebase database to keep a record of the workers activities (safe and unsafe). Once the worker is detected without a safety helmet, the application generates and sends an SMS on the safety manager's cellphone with workers details and an audible alarm on the device speaker to make the worker aware of his unsafe action. The developed application will be extended with other case scenarios and include rewarding and penalising functionality based on records in the database.

202	**Visual Odometry Based Vehicle Lane-changing Detection** *Dayang Nur Salmi Dharmiza Awang Salleh, Emmanuel Seignez and Kuryati Kipli*

Lane-changing detection is necessary for accurate positioning, to allow vehicle navigation system to generate more specific path planning. Lane-changing detection method in this paper is more of a deterministic task, proposed based on curve analysis obtained from visual odometry. From the visual odometry trajectory, we have the estimation of vehicle lateral/longitudinal position, yaw, and speed. We also used the road lane information from digital map provided by OpenStreetMap to narrow the lane-changing event possibility. The analysis is conducted on sequences from KITTI dataset that contains lane-changing scenarios to study the potential of lane-changing detection by using visual odometry trajectory curve. Cumulative sum and curve fitting methods were utilized for the lane-changing detection from visual odometry curve. The detection was conducted on several visual odometry approaches for comparison and system feasibility. Our analysis shows that trajectory generated by visual odometry is highly potential for a low-cost and effective lane-changing detection with 90.9% precision and 93.8% recall accuracy to complement more accurate routing service and safety application in Advanced Driver Assistance System.

204	**Efficient Distributed Consensus Algorithm For Swarm Robotic** *Sathishkumar Ranganathan, Muralindran Mariappan and Karthigayan Muthukaruppan*

Swarm robotics is a network based multi-device system designed to achieve shared objectives in a synchronized way. This system is widely used in industries like farming, manufacturing, and defense applications. In recent implementations, swarm robotics is integrated with Blockchain based networks to enhance communication, security, and decentralized decision-making capabilities. As most of the current blockchain applications are based on complex consensus algorithms, every individual robot in the swarm network requires high computing power to run these complex algorithms. Thus, it is a challenging task to achieve consensus between the robots in the network. This paper will discuss the details of designing an effective consensus algorithm that meets the requirements of swarm robotics network.

205	**Factors Promoting Digital Transaction through Adoption of NFC Technology** *Chinnasamy Agamudainambhi Malarvizhi and Rajee Supramani*

Over the years, information technology has been so advanced and it is making human life easier and better day by day. Even the world also depends on the information technology regardless of young or old generation. With this progression, information technology has expanded into e-commerce where the business is taking place nowadays. As this culture or pattern is increasing towards adoption of technology, it is important to identify the factors promoting digital transaction through adoption of NFC technology. Near Field Communication, abbreviated as NFC is a form of contactless communication between devices like smartphone or tablets. Since the usage of smartphone and tablets are increasing in Malaysia, this services provides better connecting towards the digital transaction. Thus, several factors such as consumer expectation, convenience, website design, transaction payment security, and lastly seller's reputation is considered. Hence, the main aim of this research is to investigate the factors promoting digital transaction through adoption of NFC technology.

209	**Environment-Based Oil Palm yield Prediction Using K-Nearest Neighbour Regression** *Nuzhat Khan, Mohamad Anuar Kamaruddin, Muhammad Paend Bakht, Usman Ullah Sheikh and Yusri Yusup*

Oil palm is a profitable tree crop, producing two types of oil from fresh fruit bunch (FFB). Oil palm yield prediction is required for import/ export, global food security, and field management. However, complex variations in oil palm yield on account of weather and soil conditions complicate the predictability. Supervised machine learning models can learn nonlinear patterns from complex agrometeorological data. However, environment-based predictive analysis of oil palm yield with machine learning methods is not widely explored. Therefore, this work presents the application of a non-parametric regression algorithm k-nearest neighbor (KNN) for oil palm yield prediction using weather and soil data. This work utilized 35 years of yield, soil, and weather records from Pahang state Malaysia. Data visualization during preprocessing assessment led to an in-depth understanding of environmental impacts on yield patterns. After model selection and training, the statistical evaluation using six different metrics along with an examination of the model's learning process was performed. Results suggested that a substantial amount of data from multiple sources allows reliable forecasts with machine learning models. It is concluded that machine learning is a great potential tool for oil palm yield prediction as an essential part of precision agriculture.

210	**Automated Retinal Blood Vessel Feature Extraction in Digital Fundus Images** *Nasiruddin Zaman Huri, W Mimi Diyana W Zaki, Assyareefah Hudaibah Saad and Nur Asyiqin Amir Hamzah*

The retinal microvascular network manifests the well-being of other systems and organs as they are structurally and physiologically similar. It offers a unique window to assess numerous disorders such as hypertension, heart disease and nervous system illnesses. However, manually analysing retinal blood vessels in digital fundus images is challenging. In addition, the low contrast images limit the diagnosis of retinal blood vessel-related eye diseases. Thus, this work uses the digital image processing approach to automate the extraction and selection of significant blood vessel features, i.e., the width and pixel intensity of the artery and vein. The digital fundus images are collected from the Digital Retinal Images for Vessel Extraction (DRIVE) database, consisting of twenty 584 x 565-pixel digital fundus and ground truth images. The proposed method automatically extracts the retinal width and intensity based on the identified coordinates of the blood vessel's skeleton images. Using a one-way ANOVA statistical test computation, we found that the width and the green channel intensity pixel are significant features (p-value <0.005) that can be used to differentiate artery and vein in digital fundus images.

211	**Sleep-Wake Scheduling Scheme for Small Cell Base Stations: A Review** *Charis Shwu Chen Kwan, Yeh Ching Low and Kok-Lim Alvin Yau*

Energy efficiency is emerging as one of the key performance indicators for the next generation wireless communication systems. The motivation behind energy efficiency arises due to the current increasing energy cost of running access networks, which is a significant factor of operational expenditures. The total number of subscribers and the amount of traffic volume in cellular networks have increased exponentially. 5G network is aspired as the next generation wireless communication systems. In 5G networks, the width and depth of user services are expected to enhance significantly. Specifically, for this implementation to take place, the trend is towards the utilization of small cells to achieve the high data rate requirement. However, small cells can increase energy consumption if they are not equipped with intelligent power saving and distribution mechanisms. Thus, the purpose of this paper is to present a review of energy efficient (or green) ways to deploy small cells in 5G networks.

212	**A Hybrid biosignal Compression Model for Healthcare Sensor Networks** *Dheepa T., Sekar K., Satish Kumar Satti and Raja Reddy Gnv*

Recent development in wearable sensor technology helps to collect biological signals at a low cost. Collecting and analyzing different biomarkers are anticipated to improve the preventative health care system through customized medical applications. The wearable sensors are battery-operated and based on technology with restricted resources, and they must use simple approaches to handle storage and energy properly. To achieve this goal, apply a lossy predictive coding-based method to compress signals at the sensors to reduce the energy needed to transmit data, minimize the storage space required, and extend battery life. This paper proposes a combination of Long-Short-Term-Memory(LSTM) and XGBoost-based hybrid model to address the challenge of sparse signal reconstruction in terms of multiple sampling vectors under compressed sensing, based on the assumption that the signal vectors are jointly correlated. The Proposed model achieves better compression efficiency than the baseline models considered for comparison and minimizes the energy consumption and storage space required. The perfor-mance results show that the proposed model extends the lifetime of the sensors and HSN.

215	**Pre-trained Deep Learning Models for COVID19 Classification: CNNs vs. Vision Transformer** *Maisarah Mohd Sufian, Ervin Moung, Jamal Dargham, Farashazillah Yahya and Sigeru Omatu*

The fast proliferation of the coronavirus disease 2019 (COVID19) has pushed many countries' healthcare systems to the brink of disaster. It has become a necessity to automate the screening procedures to reduce the ongoing cost to the healthcare systems. Although the use of the Convolutional Neural Networks (CNNs) is gaining attention in the field of COVID19 diagnosis based on medical images, these models have disadvantages due to their image-specific inductive bias, which contradict to the Vision Transformer (ViT). This paper conducts comparative study of the use of the three most established CNN models and a ViT to deal with the classification of COVID19 and Non-COVID19 cases. This study uses 2481 computed tomography (CT) images of 1252 COVID19 and 1229 Non-COVID19 patients. Confusion metrics and performance metrics were used to analyze the models. The experimental results show all the pre-trained CNNs (VGG16, ResNet50, and IncetionV3) outperformed the pre-trained ViT model, with InceptionV3 as the best performing model (99.20% of accuracy).

216	**A comparison of RGB and RGNIR color spaces for plastic waste detection using the YOLOv5 architecture** *Owen Tamin, Ervin Moung, Jamal Dargham, Farashazillah Yahya, Sigeru Omatu and Lorita Angeline*

Plastic waste is a serious environmental issue that damages human health, wildlife, and habitats. Many researchers have come out with multiple solutions on the problem. One of the most efficient ways is to implement machine learning approaches to detect plastic waste in common areas. Deep learning is a powerful machine learning approach that automatically learns image features for object recognition tasks using an object detector. Therefore, this paper proposed a recent object detection model, YOLOv5m, to develop a plastic waste detection model. Two plastic waste datasets, which consist of red, green, and blue (RGB) and red, green, and near-infrared (RGNIR) images, are introduced to train the proposed model. The performance of the proposed model is evaluated using 10-fold cross-validation on the two datasets. The proposed model achieves the best result on RGNIR datasets for validation and testing with an average mAP@0.5:0.95 value of 69.39% and 69.45%, respectively. These results indicate that near-infrared information can be a valuable feature representation in machine learning. This opens more possible opportunities, such as the development of automated plastic detection for the robotic and waste management industry.

220	**River Water Level Prediction for Flood Risk Assessment using NARX Neural Network** *Mazlina Mamat, Zizi Zulaikha Zulkifli and Hoe Tung Yew*

Flood is one of the primary natural disasters in Malaysia and becoming more frequent and on a large scale lately. Not excluded, Sabah encounters repeated floods caused by river overflow. Therefore, an efficient mechanism for flood risk assessment is needed until a more viable solution exists. This paper proposes using the Nonlinear Autoregressive with Exogenous Input (NARX) neural network to model the river water level as an approach for assessing flood risk. The NARX was trained, validated, and tested using the hydrological data obtained at the target areas: Wariu River (Sungai Wariu), Kota Belud, and Padas River (Sungai Padas), Beaufort. Inputs to the NARX are the current and previous water levels at the upstream and downstream rivers and rainfall at the target area. The output is the predicted water level at the downstream river that can be used to assess flood risk. Results show that NARX trained with the Levenberg-Marquardt training algorithm (trainlm) performs best compared to other training algorithms. Results also show that the NARX could predict up to thirty days ahead of water level prediction, with an R2 of 0.75 and above. However, it is more safe to conclude that a reliable prediction for up to five days ahead, with R2 above 0.85 can be obtained.

222	**Evaluation of an Electronic Sensor-Based Agility Test System for Badminton Players' Development** *Jeckta Emmi Marrylin Yalin, Hazlihan Haris, Megat Muhammad Ikhsan Megat Hasnan and Ismail Saad*

Badminton requires quick movements, high-intensity repeated actions, and precise foot movements to maximize shot accuracy. This emphasizes the need for agility in badminton games. Numerous tests are used to assess agility. However, badminton lacked a specialized agility test based on the game's nature. This project aims to create a modified version of an agility test system specified for amateur badminton players that emphasizes footwork, change of direction speed (CODS), and reactive agility (RA). The ATmega328, Adjustable Infrared Sensor Switch, Force Sensitive Resistor, and RF communication module created Badminton Agility System (BAS). This combination allows players to control the test flow according to their abilities. This study presents a new technological approach to sensor system design for sports measurement, focusing on measuring parameters for assessing agility in amateur athletes. Second is the capability to perform precise and accurate semi-automatic measures in sync with the player's abilities. The system's functioning was tested using a replica court prototype and the actual prototype. The data tested for five participants showed that the mean total time for each direction was between four and five seconds, with a maximum of 25 seconds and a minimum of 15 seconds required to complete the test. This data indicates that the Badminton Agility System optimizes badminton agility testing. Due to the reactive agility factor, the reaction time to different targets revealed that amateur players need more time for forward movement than backward movement. The reaching time and return time have demonstrated significant variances, and the system could communicate between the control part without substantial changes. In addition, the total time spent at each position revealed the participant's areas for future improvement. The test results show that the system can perform the agility process reliably. All three components considered while constructing this test might well be studied in the future.

226	**Internet-of-Things for Smart Dryers: Enablers, State of the arts, Challenges, and Solutions** *Mohd Khairulanwar Rizalman, Ervin Moung, Jamal Ahmad Dargham, Zuhair Jamain, Nurul'Azah Mohd Yaakub and Sigeru Omatu*

Smart devices have grown to becoming an indispensable part of many individuals' lives. This is due to cloud computing and connectivity, that enabled wireless controls and real-time monitoring that benefits various industries. Soft-computing techniques that has been integrated to many online services such as Amazon allows machine to understand consumer activity and autonomously cater to a personalized experience for each user. In the agricultural industries, smart system is a tool to enhance controls and increase farming precision to improve yield and product quality. Challenges in implementing smart agriculture system are still apparent to this day; (i) Mathematical Modelling of Operation, (ii) Lack of Data and Attention in Smart Farming System, (iii) Complexity of Drying Process. In this paper, state of the art in the smart system in agricultural field, challenges of executing smart farming system are further described and the proposed solution is presented.

227	**Improved Performance in Distributed Estimation by Convex Combination of DNSAF and DNLMS Algorithms** *Ahmad Pouradabi, Amir Rastegarnia, Azam Khalili and Ali Farzamnia*

In diffusion estimation of distributed networks two characteristic parameters are crucial, the speed of convergence and steady-state error. Diffusion normalized least mean square (DNLMS) algorithm has low misadjustment error, but it is slow in convergence. On the contrary, the diffusion normalized subband adaptive filter (DNSAF) algorithm has faster convergence than DNLMS, but final steady-state error is higher. In this paper, the overall performance is improved by combining these algorithms. Convex combination of DNLMS / DNSAF has a quick convergence rate and little steady-state error. The introduced algorithms execute tracking more effectively than traditional algorithms, in addition. We use a number of experimental findings to show how well the suggested method performs.

229	**Journaling System with Embedded Machine Learning Text Depression Detection Alert** *Lai Po Hung and Esther Mary Tadius*

Depression is a common mental issue that is suffered by many whether they realised it or not. Early on set of depression could be easily ignored, however if it turns severe, it could result in more dangerous behaviors. Therefore, it is helpful if there could be some warning signs to indicate to a person whether they are depressed or not and enable them to seek help soon. In this work, a journaling system with embedded text depression detection is proposed. Although it cannot be used as a formal diagnosis, but it serves as a warning to the users. A personal journal or diary enables someone to release and express all their inner thoughts and feelings. It is where there are genuine expressions of feelings. By implementing text depression detection in the journal system, honest feelings are able to be captured and analysed to detect any early signs of onset depression. The system will embed a machine learning model which analyses and classifies texts as depressed or non-depressed. An experiment is performed to compare the performance between several machine learners and Logistic Regression showed better performance and was implemented in the system. Tests were performed on the system to evaluate the system functionality and it was seen that the system could perform well and classify texts accurately.

232	**Design and Analysis of Solar Powered Portable Refrigerator Unit** *Yuslinda Wati Mohamad Yusof, Murizah Kassim and Wan Amir Azrin Wan Shuhaimi*

Portable solar powered refrigerator unit today is important due to transmission of clinical samples to many broad areas. Some medical samples are kept in a cooler box for a short term for sampling by health staff. The drawback of the box is that it always needs a lot of ice cubes for active coolant until the ice melted. Places that have no access to electricity will damage the samples due to the box is not cool anymore. This study has designed a portable solar battery mini fridge that harnesses solar energy for cooling. It is flexible to the existing mini fridge and has enough capacity to supply the load for hours. The design consists of a solar panel to harvest the energy, a battery to keep the energy, a control panel to control its charging and discharging as well as protection measures. Arduino controller is embedded as the control designed system to the temperature sensor, current sensor, and LCD as input and output. Two tests had been carried out for compatibility of a solar system on the mini fridge which is battery charging to PV modules and load testing to the mini fridge. The result shows that the battery was able to supply for more than two hours since 14.29% of the battery is still available before the supply ends. The mini fridge was able to keep on cooling about 16 degrees after 2 hours. This research is significant for portable mini fridge design using a solar battery which lasted longer than 2-hour usage time for medical officers.

236	**UAV Path Planning using Rotated TOR in Structured Environment** *Shaliza Hayati A. Wahab, Azali Saudi, Nordin Saad and Ali Chekima*

Path planning is one of the crucial criteria for an unmanned aerial vehicle (UAV) in providing a safe path to fly from any location to the specified goal. Global approach to autonomous path planning often used the harmonic potentials technique to guide the planner. The harmonic potentials are essentially the solutions of Laplace's equation that are employed to model the environment. The computational resources required to obtain these harmonic potentials often involve a large number of mathematical calculations. In the previous work, fast iterative methods that apply the use of full-sweep iteration were suggested. This study examines a fast-iterative numerical approach, namely Rotated Two-Parameter Successive Over-Relaxation (RTOR), to UAV path planning. The algorithm is implemented in a self-developed UAVPlanner Simulator where hills are generated randomly in grid areas. The proposed method was tested using several simulation scenarios which demonstrated the efficiency of the algorithm in finding the path, where it was evaluated in terms of the number of iterations and computational time efficiency with the different number of outdoor static obstacles. The results show that RTOR outperformed the previous methods and gives faster computational time and iteration in generating a path for UAVs.

237	**Factors Affecting Customer Loyalty on Starbucks Malaysia using Binary Logistics and Probit Model** *Ng Tze Ling, Mohd Saifullah Rusiman, Suparman Suparman, Firdaus Mohamad Hamzah and Nur Ain Ebas*

Coffee culture is growing in popularity among Malaysians. Starbucks was up against a lot of competition in Malaysia because of the growing number of coffee brands and cafes. Hence, this study aims to identify the significant variables towards customer loyalty at Starbucks Malaysia. Secondary data were used in this study and it consist of 113 respondents in Malaysia with various independent variables. The R software was used to analyse the data. Binary logistics regression and probit model were applied for analyzing the data. In overall, there was 79.60% of respondents remain loyal to Starbucks. This study revealed that there were 8 significant variables in binary logistic models and 3 significant variables in probit model that affect customer loyalty. Lastly, this study indicated that binary logistic model performed better than probit model as its Akaike Information Criteria (AIC) value is lower and higher percent of accuracy. This study can aid the management team of Starbucks to explore more information on these variables to increase customer loyalty.

239	**A Safe Overtaking Control Scheme for Autonomous Vehicles using Rapid-Exploration Random Tree** *Yincong Ma, Kit Guan Lim, Min Keng Tan, Helen Sin Ee Chuo, Lorita Angeline and Kenneth Tze Kin Teo*

In order to enhance the commuting ability of autonomous vehicles on the road and ensure the comfort and safety of passengers, the Rapid-exploration Random Tree (RRT) algorithm is applied to the research of safe overtaking control of autonomous vehicles. Firstly, the kinematics and dynamic model of the vehicle are implemented. Secondly, the RRT algorithm and the A-star algorithm are expounded, and the idea of the A-star algorithm is applied to the RRT algorithm for improvement. The improved algorithm is used to obtain the rough obstacle avoidance of the vehicle. The rough path is optimized by applying the cubic spline interpolation method to solve the problem that the path cannot be applied to the actual vehicle driving task. Finally, the simulation of the overtaking scheme is carried out. The results reveal that the safe overtaking scheme based on RRT algorithm achieves the predetermined requirements in the two actual cases under the premise of ensuring safety, controlling the swing of the sideslip angle of the vehicle's center of mass within a reasonable range. It has certain practical significance for ensuring the road safety of autonomous vehicles.

240	**Energy-Efficient Ant Colony Based LEACH Routing Algorithm in Wireless Sensor Network** *Muhammad Zahir Abd Latif, Kit Guan Lim, Min Keng Tan, Helen Sin Ee Chuo, Tienlei Wang and Kenneth Tze Kin Teo*

Wireless sensor network (WSN) is a network consist of multiple sensor nodes which sense and transmit data to a base station for data collection. Since the nodes in WSN are battery powered devices and nodes loss energy mostly due to transmission, an energy efficient routing protocol is needed to reduce the nodes energy consumption and prolong the network lifetime. However, existing routing protocols produce some drawbacks such as selection of cluster head with low residual energy and formation of different sizes of cluster which leads to uneven energy consumption among the nodes. Therefore, an Ant Colony Optimization based Low Energy Adaptive Clustering Hierarchy (LEACH-ACO) protocol for energy efficient transmission in WSN is proposed in this paper. This research aims to develop a routing protocol that utilize the existing LEACH routing protocol to improve the performance of WSN and prolong the lifetime of the network. The results showed that LEACH-ACO protocol outperformed Direct Transmission (DT) and LEACH protocol in terms of network lifetime, energy consumption and remaining energy per transmission round.

241	**Efficient Transmission based on Genetic Evolutionary Algorithm** *Jin Fan, Kit Guan Lim, Min Keng Tan, Helen Sin Ee Chuo, Ali Farzamnia and Kenneth Tze Kin Teo*

Today's society has grappled with the age of big data. Widespread use of informatization technology has promoted the development of artificial intelligence and communication technologies, which can play an important role in communication networks. In this paper, an energy-saving mechanism based on genetic algorithm in wireless sensor network (WSN) is proposed. The basic working principle and main characteristics of genetic algorithm (GA) are summarized, and the theory, technology and existing problems of GA are discussed. Through the analysis of the transmission efficiency of GA, a new genetic evolutionary algorithm combined with the characteristics of ant colony algorithm (ACO) is proposed. Through the simulation of the transmission performance of genetic optimization algorithm, the comparison of transmission energy consumption between GA and evolutionary algorithm is analyzed, and the evolutionary algorithm with higher transmission performance is obtained. Results showed that the proposed hybrid genetic algorithm with ant colony optimization (GACO) delivers 78.70% and 73.51% lower number of transmission failures than GA and ACO respectively.

242	**Optimizing High-Density Aquaculture Rotifer Detection Using Deep Learning Algorithm** *Alixson Polumpung, Kit Guan Lim, Min Keng Tan, Sitti Raehanah Muhamad Shaleh, Renee Ka Yin Chin and Kenneth Tze Kin Teo*

The dynamics of marine aquaculture depend heavily on zooplankton, which is the basis of the marine food chain. Zooplankton like Rotifer brachionus plicatillis, which are rich in nutrients, small size and rapid reproductive rate are necessary for fish in the larval stage. Rotifer must therefore be supplied to larvae culture in the correct quantity, which can be determined by counting it. In addition, it is necessary to estimate the rotifer population to ensure that, aside from care, it can support the demands of all larvae batches. Currently, the traditional method of counting small-sized rotifers still involves counting it manually. One easy potential way to count rotifer is by using binary image segmentation provided that the sample is clear from debris. In this paper, we present the method and performance to detect rotifer Brachionus plicatilis in 1ml sample automatically using deep learning algorithm YOLOv3. Detected rotifer will be counted for estimating the amount of rotifer for feeding or the density population in a rotifer culture. The method of this project consists of following steps. First, dataset acquisition from digital microscope and manual labelling annotation divided by 60, 20 and 20 percent for training, validation and testing consecutively. Second, is to develop the deep learning algorithm based on YOLOv3. Third step is to training and evaluate the model using loss function. Finally, the model is tested with average precision of 85.1 percent with average of 1.4645s inference detection speed.

243	**Adapting Perturbation Voltage For Variable Speed Micro-Hydro Using Particle Swarm Optimization (PSO)** *Kit Guan Lim, Mohd Izzat Fikri Md Zainal, Min Keng Tan, Ahmad Razani Harun, Chang Yii Chai and Kenneth Tze Kin Teo*

The aim of this research is to explore a technique that can be implemented to the Variable Speed Micro-hydro Power Generation (VS-MHPG) system to search the optimum operating point for the maximum power extraction. Micro-Hydro that operates in variable speed mode are sensitive to the changes of flow rate and proved to have wide operating point. The Perturb and Observe (P&O) based maximum power point tracking (MPPT) was applied to the VS-MH and based on simulation. However, oscillation occur at maximum point due to the large perturbation speed. The existing Micro-hydro Power Generation (MHPG) system commonly suffers from the non-optimal input control as the controller estimate the changes of flow rate without anticipating the global maximum power curve. Hence the implementation of P&O based MPPT is expected to improve the efficiency of MHPG system while reducing the fluctuation of output power. Results show that the value of perturbation speed affects the performance of MPPT algorithm to search the maximum operating point. Low perturbation signal requires many numbers of iteration before it reaches the steady state. Meanwhile, high perturbation signal will cause the fluctuation that led to unstable power production. Thus, new method was introduced which is Particle Swarm Optimization (PSO) that is expected to improve the performance of conventional MPPT. Simulation result shows that PSO based MPPT was able to track the global maximum point under extreme condition with no power fluctuation compared to P&O MPPT. Also, PSO based MPPT provides adaptive perturbation speed that show improvement in maximum power tracking by 20.88%.

244	**On-Demand Priority Traffic Optimizer with Fuzzy Logic Microcontroller** *Helen Sin Ee Chuo, Yee En Seah, Min Keng Tan, Kit Guan Lim, Chung Fan Liau and Kenneth Tze Kin Teo*

Current traffic control system in Malaysia is developed based on predetermined setup, where the system is not able to analyse the surrounding condition to optimize the green time. When there is an unusual traffic flow, the control system fails to control traffic flow efficiently, causing delays and requiring the assistance of traffic police. The main objective of this project is to explore the potential of fuzzy logic embedded control system in optimizing the traffic congestion corresponding to the priority traffic signal. The developed real time traffic-adaptive control system operates by prioritising the green light based on the received priority signals such as high flow rate phases and the emergency vehicles. A microcontroller-based traffic controller with computed algorithm was developed. The performance of the controller in reducing average waiting time and average vehicle queue length at a traffic intersection was evaluated. In overall, Fuzzy Logic managed to reduce 23% of average waiting time and 11% of average vehicles in queue at the intersection as compared to the conventional control.

245	**Maximizing Power Generation in Variable Speed Micro-Hydro with Power Point Tracking** *Min Keng Tan, Norafe Maximo Javinez, Kit Guan Lim, Ahmad Razani Haron, Pungut Ibrahim and Kenneth Tze Kin Teo*

Conventional variable speed micro-hydro controller systems suffer from non-optimal input control. The controllers estimate changes of flow rate without anticipating the global maximum power curve. As such, this paper aims to explore and develop a feasible maximum power point tracker (MPPT) with perturb and observe (P&O) and genetic algorithm (GA) in providing optimal power generation for variable speed micro-hydro system. This research first introduces a mathematical model for an experimental variable speed micro-hydro platform and then simulate the micro-hydro in MATLAB. Conventional P&O MPPT algorithm used fixed perturbation size which requires large computation time when the perturbation size is small and suffers from power fluctuation issues when the perturbation size is large. Thus, a GA-based P&O MPPT algorithm with adaptive perturbation size is proposed to provide large perturbation size during transient response and small perturbation size at steady state. The simulation results showed that the proposed GA-based P&O MPPT algorithm was able to track the global maximum power point (MPP).

246	**Computing Non-Contactable Drowsiness Monitoring System with Mobile Machine Vision** *Alixson Polumpung, Lorita Angeline, Helen Sin Ee Chuo, Min Keng Tan, Kit Guan Lim and Kenneth Tze Kin Teo*

This project proposes a human facial features detection based on color segmentation via skin color and Viola- Jones algorithm for real time application. YCbCr color space is used to detect the presence of skin in an image where the image is normalized, and luminance is removed to increase face detection accuracy. The second method, Viola-Jones which use Haar feature to detect facial feature such as face and eye also developed and tested. To perform in real time detection, CamShift algorithm and template matching are used to track face and eyes sequentially in Android platform. Then, the real time detection and tracking are evaluated to assess its performance. Finally, the algorithm is applied to drowsiness detection using PERCLOS.

248	**Traffic Signal Optimization using Cultural Algorithm** *Min Keng Tan, Hon Yang Vun, Helen Sin Ee Chuo, Kit Guan Lim, Soo Siang Yang and Kenneth Tze Kin Teo*

The technologies and machines are evolving as well as human population numbers. Consequently, the traffic congestion problem is growing especially in urban areas. The conventional traffic signal system is facing trouble on releasing high traffic flow density during peak hour due to its fixed-timing sequence characteristic. However, the traffic congestion condition also influenced by the neighbouring intersections traffic flow as well. Hence, with thorough parameter utilisation of the green-light timing and queue length, this study aims to build a self-learning traffic signal control system to adapt real-time condition of the road then regulates traffic signal timings using Cultural Algorithm.

249	**Speech-Based Number Recognition Using KNN and SVM** *Rosalyn R Porle and Suzanih Embok*

Speech-Based Number Recognition is a system that recognizes numbers based on the speech of the user. Most of the research makes use of English, Bangla, Tamil, etc., but the Malay language has received little attention. In this paper, the Malay numbers one through ten are recognized and implemented on devices consisting primarily of the Arduino UNO, the ELECHOUSE Voice Recognition Module v3, Microphone, and Light Emitting Diode. This system employs database creation, preprocessing, feature extraction, Mel-frequency cepstral coefficients, and classification utilizing using K-Nearest Neighbour and Support Vector Machine. Two experiments were carried out using 900 samples. In the first experiment, 80 percent of the training samples and 20 percent of the test samples were used. The second experiment utilized 70 percent of the training samples and 30 percent of the testing samples. The results show that the Support Vector Machine outperformed K-Nearest Neighbour with an average accuracy of 91.27 percent.

250	**Local Traffic Network Formulation and Signalisation via Benchmark Webster Model** *Helen Sin Ee Chuo, Min Keng Tan, Kit Guan Lim, Lorita Angeline, Tienlei Wang and Kenneth Tze Kin Teo*

Traffic models have been widely studied for general traffic understanding and transportation variable relations, but unreadily exert for real time transportation decision and planning. With the present advancement in computer technology, the used-to-be-lengthy and complicated modelling technique is now more computable and executable than ever for putting into good use. This paper discusses extensively on the formulation of local traffic network in Kota Kinabalu, Malaysia and the signal settings as referred to the Jabatan Kerja Raya (JKR) using benchmark Webster Model. This paper is crucial for bridging the current traffic network modelling towards advanced modelling techniques and transportation network optimisation strategies to be incorporated in intelligent transportation systems. The traffic responses and results from the Webster model simulation and signalization were reported in this paper as a realistic reference under different case studies including normal traffic and congested traffic scenarios, besides when traffic delays occurred.