

CONFERENCE PROGRAM

**The 8th International Conference on Machine
Learning and Soft Computing (ICMLSC)**

with workshop

**The 4th Asia Conference on Information Engineering
(ACIE)**

January 26-28, 2024



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WELCOME MESSAGE

Dear delegates,

On behalf of the organizing committee, it is our pleasure to welcome you to Singapore and the 8th International Conference on Machine Learning and Soft Computing (ICMLSC) with workshop: the 4th Asia Conference on Information Engineering (ACIE).

We are happy to have been trusted with the responsibility to organize the 8th ICMLSC and 4th ACIE that take place at Singapore. The conference focuses on the trending, highly popular, but exciting and extremely challenging areas from our keynote speakers of leading scientists and a variety of authors around the world. The outcome of our deliberations will play a crucial role in progress achieved in these areas.

The conference brings together researchers looking for opportunities for conversations that cross the traditional discipline boundaries and allows them to resolve multidisciplinary challenging problems. It is the clear intent of the conference to offer excellent mentoring opportunities to participants. Although we cannot meet each other physically, through this online platform, we trust that you will still be able to share the state-of-the-art developments and the cutting-edge technologies in these broad areas.

We have 3 keynote speeches, 2 invited speeches and 6 sessions for oral presentations. The quality of this event builds on important contributions from many people. To all participants who have submitted their latest technical papers, to keynote & invited speakers, to the Program Committees, and the Organizing Committees – you have all done a great job.

In closing, we thank you for participating in this event and we hope you enjoy the next three days.

Warm welcome!

Conference Committees

ORGANIZING COMMITTEE

Conference Chairs

Nikola Kasabov, Auckland University of Technology, NZ & Ulster University, UK
Xudong Jiang, Nanyang Technological University, Singapore
Chengzhong Xu, University of Macau, Macau, China

Conference Co-Chairs

Hiep Xuan Huynh, Can Tho University, Vietnam
Yudong Zhang, University of Leicester, UK

Program Chairs

Ke-Lin Du, Concordia University, Canada
Venkata Duvvuri, Oracle Corporation, USA
Vijayakumar Varadarajan, The University of New South Wales, Australia

Program Co-chairs

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Iman AbouHassan, Technical University of Sofia, Bulgaria
Shihua Zhou, Dalian University, China

Track Chairs

Naoyuki Ishimura, Chuo University, Japan
Takahiko Fujita, Chuo University, Japan
Hiep Xuan Huynh, Can Tho University, Vietnam
Nhat Minh Viet Vo, Hue University, Vietnam
Xiangjie Kong, Zhejiang University of Technology, China
Chengming Li, Sun Yat-Sen University, China
Chengchao Liang, Chongqing University of Posts and Telecommunications, China

Organizing Committee

Ting Wang, Beijing Institute of Control Robotics and Intelligent Technology, China



Technical Program Committee

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Samarjeet Borah, Sikkim Manipal University, India
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Luh Joni Erawati Dewi, Universitas Pendidikan Ganesha, Indonesia
Chao-Yang Lee, National Yunlin University of Science and Technology, Taiwan
Gede Indrawan, Universitas Pendidikan Ganesha, Indonesia
Kenji Suzuki, Tokyo Institute of Technology, Japan

AGENDA AT A GLANCE

FRIDAY, JANUARY 26th, 2024		
10:00-16:00	Registration	Hotel lobby (unit no: 01-02), Level 1
13:00-14:00	Zoom Online Test – Keynote, Invited Speaker	Meeting ID: 854 2989 8127
14:00-16:00	Zoom Online Test – Oral Presenters	Meeting ID: 854 2989 8127
SATURDAY, JANUARY 27th, 2024 Royal Room 1. Level 3		
09:00-12:00	Host: Prof. Hiep Xuan Huynh , Can Tho University, Vietnam	
09:00-09:05	Opening Remarks: Prof. Xudong Jiang , Nanyang Technological University, Singapore	
09:05-09:45	Keynote: Machine Learning and Soft Computing of Spatio-temporal Data: The Neuromorphic Approach Prof. Nikola Kasabov , Auckland University of Technology & Ulster University, UK	
09:45-10:25	Keynote: How Deep CNN and Transformer Solve Machine Learning Problems of Traditional ANN Prof. Xudong Jiang , Nanyang Technological University, Singapore	
10:25-10:55	Group Photo & Coffee Break	
10:55-11:35	Keynote: Connected Autonomous Driving: Challenges and Opportunities Prof. Cheng-Zhong Xu , University of Macau, China Meeting ID: 854 2989 8127 https://us02web.zoom.us/j/85429898127	
11:35-12:00	Invited: Intelligent Distributed Applications Based on Mobile Clouds and Software-Defined Networks Prof. Sergei Gorlatch , University of Muenster, Germany	
12:00-13:30	Lunch Time--Trishaw Coffee House, Level 1	
13:30-15:30	Royal Room 1, Level 3	Royal Room 2A, Level 3
	Session 1- Image Detection and Recognition CM156-A, CM243, CM0051, CM018, CM501, CM029, CM445, CM653-A	Session 2- Data Analysis and Computing Methods Based on Machine Learning CM0111, CM014, CM015, CM019, CM039, CM555, CM041
15:30-16:00	Coffee Break	

16:00-18:00	<p>Session 3- Digital Image Analysis and Security Management CM004, CM0015, CM007, CM344, CM350-A, CM0021, CM259-A, CM012</p>	<p>Session 4- AI-Based System Model and Data Security CM552-A, CM001, CM032, CM031, CM042-A, CM546, CM451</p>
18:00-20:00	Conference Dinner--Trishaw Coffee House, Level 1	
SUNDAY, JANUARY 28th, 2024		
09:35-11:45	<p>Invited: A Dropout-Tolerated Privacy-Preserving Decentralized Federated Learning Framework Prof. Xiaofen Wang, University of Electronic Science and Technology of China, China</p> <p>Session 5- Machine Learning Theory and Predictive Models CM016, CM028, CM303, CM0091, CM461, CM142, CM647 Meeting ID: 854 2989 8127 https://us02web.zoom.us/j/85429898127</p>	
14:00-15:30	<p>Session 6- Image Processing and Model Analysis Based on Machine Learning CM008, CM302, CM264, CM663, CM1033, CM562 Meeting ID: 854 2989 8127 https://us02web.zoom.us/j/85429898127</p>	

CONFERENCE VENUE



Address: 36 Newton Road Singapore 307964

Transportation Guide

By MRT (Subway) -

Alight at the Novena MRT station and proceed to exit towards Thomson Road. Hotel Royal is only 8 minutes walking distance from the Novena MRT station.

If you wish to take the MRT (subway), the sequence for travel is as follows:

From MRT Station	To MRT Station
Changi International Airport MRT station	Tanah Merah MRT station
Tanah Merah MRT station	City Hall MRT station
City Hall MRT station	Novena MRT station

On arriving at the Novena MRT station, please look for the escalator leading to the exit showing Thomson Road. There is also a signage showing "Hotel Royal" at the MRT station.

By Public Bus -

Public Bus numbers:

SBS 54, 124, 143, 162, 167 & 518 will stop at the bus stop just in front of Hotel Royal. Please refer to map on the right side of page for bus routes.

Important Notes

- Take care of your personal belongings and materials, and lock the door when you leave the room or take a break.
- The conference venue multimedia equipment will be provided by the conference team, reporters can copy into a USB stick, and prepare an electronic version of the presentation (PPT/PDF) in advance for testing, reporting, etc; the length of each speaker's report includes the presentation and question exchange time.
- Please bring your badge with you to the conference and your meal ticket with you to the conference.
- Please turn your mobile phone to silent before the meeting starts to keep the venue quiet.

PRESENTATIONS GUIDELINES

Instructions for Presenters

- The duration of a keynote presentation is 40 minutes. The duration of a regular presentation is 15 minutes. This includes 12 minutes for the presentation and 3 minutes for Q&A. We would appreciate if all presenters can adhere strictly to this time limit.
- Presentation must be carried out using Microsoft PowerPoint or PDF, and upload the files before the session starts. No slide projectors will be made available.
- Speakers are requested to be in their respective session rooms at least 10 minutes prior to the commencement of each session.
- One Best Presentation will be chosen for each session, so it's encouraged to stay the whole session.

Instructions for Presiders

- Please time the presentation.
- It is a good idea to remind your speakers at the start of the session that you will timing the speech. Please remember the time frame. Keeping the program to time is very important. Please be aware of the time periods speakers have been designed to present.
- If someone in your session didn't show up, please go on with next speaker, and recall the missing one every time when it's next speaker's turn. In this case, we require the speakers of each session should stay the whole session.
- Please organize a session group photo at the end of your session

Instructions for Poster Presentation

- Poster presenter can leave your post at the registration desk and our staff will help you to put up the posters at least 1 hour prior to the commencement of each poster session.
- At least one author should be present for each poster during the poster session.

ONLINE GUIDELINES

Before the Conference

Time Zone

Singapore Time (GMT+8)

You're suggested to set up the time on your computer in advance.

Platform: ZOOM

Download link:

1. <https://zoom.us/download>
2. <https://zoom.com.cn/download>

(Chinese authors only)



Equipment Needed

- ◆ A computer with internet connection and camera
- ◆ Headphone/earphone

Environment Needed

- ◆ A quiet place
- ◆ Stable internet connection
- ◆ Proper lighting and background

Meeting Room

Zoom ID: 854 2989 8127

Zoom link: <https://us02web.zoom.us/j/85429898127>

Test Your Presentation

Time: **14:00-16:00, January 26th, 2024 Friday**

Singapore Time (GMT+8)

Prior to the formal meeting, presenters shall join the test room to ensure everything is on the right track.

During the Conference

Name

Name yourself with Paper ID + Name

Example: CM001+Maggie

Voice Control Rules

- ◆ The host will mute all participants while entering the meeting.
- ◆ The host will unmute the speakers' microphone when it is turn for his or her presentation.
- ◆ Q&A goes after each speaker, the participant can raise hand for questions, and the host will unmute the questioner.
- ◆ After Q&A, the host will mute all participants and welcome next speaker.
- ◆

Oral Presentation

Timing: a maximum of 15 minutes in total, including 3 minutes for Q&A. Please make sure your presentation is well timed.

Conference Recording

The whole conference will be recorded. We appreciate you proper behavior and appearance

KEYNOTE SPEAKER I

Keynote Speaker I**Time: 09:05-09:45, Jan. 27, Saturday, GMT+8****(Royal Room 1)**

Machine Learning and Soft Computing of Spatio-temporal Data: The Neuromorphic Approach

Prof. Nikola Kasabov

Fellow of IEEE

Auckland University of Technology & Ulster University, UK

Abstract:

The majority of data that is dealt with across domain areas are temporal or spatio/spectro temporal data (SSTD), including: biological and brain signals; audio-visual; environmental; financial and economic; communication, etc.. Still there are no efficient methods for machine learning and soft computing (MLSC) to model both spatial and temporal components of the data in their dynamic interaction and integration. In many cases this data is simplified as just temporal or spatial, due to lack of methods.

In the lecture, the main concepts that are dealt with, are defined first [1], such as: spatio-temporal learning (STL); spatio-temporal associative memory (STAM); transfer learning of explainable fuzzy spatio-temporal rules; multimodal SSTD processing. STL relates to evolvable and explainable learning systems that are first structured according to spatial-, spectral or other relevant information from temporal or spatio-temporal data and then they are trained to further evolve their structure by learning spatio-temporal associations of the data resulting in explainable models. STL leads to STAM, which are systems that are trained on full SSTD, but can be activated with a smaller size of incomplete and imprecise input SSTD in both time and space to recall previously learned spatio-temporal patterns to classify input data or make a prediction.

The talk introduces a brain-inspired neuromorphic computation framework NeuCube [2] and demonstrates how it can be used to achieve the above tasks. Software development systems of NeuCube in Python and in Matlab, along with a development system for multimodal data modelling NeuroGeMS in Python are available free from [3]. Applications [4] are given for classification and prediction of biological and brain signals, audio-visual data, environmental data, seismic data, air pollution multisensory data, financial and economic data. When compared to traditional machine learning techniques, including deep neural networks, these systems demonstrate significantly better accuracy and a clear interpretability and explainability of the dynamics of the SSTD. These systems are more energy efficient, as during STL, the spatial structure of the model helps to learn data faster and to recall it associatively. To implement such systems, highly and massively parallel hardware of thousands and millions neurons in a chip can be used.

[1] N.Kasabov (2023). STAM-SNN: Spatio-Temporal Associative Memories in Brain-inspired Spiking Neural Networks: Concepts and Perspectives. TechRxiv. Preprint. <https://doi.org/10.36227/techrxiv.23723208.v1>

[2] N.Kasabov, NeuCube: A spiking neural network architecture for mapping, learning and understanding of spatio-temporal brain data, Neural Networks, vol. 52, pp. 62-76, 2014.

[3] NeuCube: <https://kedri.aut.ac.nz/neucube>

[4] N.Kasabov, Time-Space, Spiking Neural Networks and Brain-Inspired Artificial Intelligence, Springer, 2019, <https://www.springer.com/gp/book/9783662577134>.

Bio:

Nikola K Kasabov is a Life Fellow of IEEE, Fellow of the Royal Society of New Zealand, Fellow of the INNS College of Fellows, DVF of the Royal Academy of Engineering UK. He has Doctor Honoris Causa from Obuda University, Budapest. He is the Director of <https://knowledgeengineering.ai>, New Zealand, Founding Director KEDRI and Professor Emeritus at Auckland University of Technology. He is George Moore Chair Professor of Data Analytics at the University of Ulster UK and a Visiting Professor at IICT Bulgarian Academy of Sciences and Dalian University, China. He holds also Honorary Professor at the Teesside University UK, University of Auckland NZ and Peking University in Shenzhen. Kasabov is Past President of the Asia Pacific Neural Network Society (APNNS) and the International Neural Network Society (INNS). He has been a chair and a member of several technical committees of IEEE Computational Intelligence Society and Distinguished Lecturer of IEEE (2012-2014). He is Editor of Springer Handbook of Bio-Neuroinformatics, EiC of Springer Series of Bio-and Neuro-systems and co-EiC of the Springer journal Evolving Systems. He is Associate Editor of several other journals. Kasabov holds MSc in computer engineering and PhD in mathematical sciences from TU Sofia, Bulgaria. His main research interests are in the areas of neural networks, intelligent information systems, soft computing, bioinformatics, neuroinformatics. He has published more than 700 publications, highly cited internationally. He has extensive academic experience at various academic and research organisations in Europe and Asia, including: TU Sofia Bulgaria; University of Essex UK; University of Otago, NZ; Shanghai Jiao Tong University and CASIA Beijing, ETH/University of Zurich. Kasabov has received a number of awards, among them: INNS Ada Lovelace Meritorious Service Award; NN journal Best Paper Award for 2016; APNNA 'Outstanding Achievements Award'; INNS Gabor Award for 'Outstanding contributions to engineering applications of neural networks'; EU Marie Curie Fellowship; Bayer Science Innovation Award; APNNA Excellent Service Award; RSNZ Science and Technology Medal; 2015 AUT NZ Medal; Medal "Bacho Kiro" and Honorary Citizen of Pavlikeni, Bulgaria; Honorary Member of the Bulgarian-, the Greek- and the Scottish Societies for Computer Science. More information of Prof. Kasabov can be found in: <https://academics.aut.ac.nz/nkasabov>.

KEYNOTE SPEAKER II

Keynote Speaker II**Time: 09:45-10:25, Jan. 27, Saturday, GMT+8****(Royal Room 1)**

How Deep CNN and Transformer Solve Machine Learning Problems of Traditional ANN

Prof. Xudong Jiang

Fellow of IEEE

Nanyang Technological University, Singapore

Abstract:

The powerfulness of machine learning was already proven more than 30 years ago in the boom of neural networks but its successful application to the real world is just in recent 10 years after the deep convolutional neural networks (CNN) have been developed. This is because the machine learning alone can only solve problems in the training data but the system is designed for the unknown data outside of the training set. This gap can be bridged by regularization: human knowledge guidance or interference to the machine learning. This speech will analyze these concepts and ideas from traditional neural networks such as MLP to the deep convolutional neural networks (CNN) and Transformer. It will answer the questions why the traditional neural networks fail to solve real world problems even after more than 30 years' intensive research and development and how the deep CNN and Transformer neural networks solve the problems of the traditional neural networks and now are very successful in solving various real world AI problems.

Bio:

Xudong Jiang (Fellow, IEEE) received B.E. and M.E. degrees from University of Electronic Science and Technology of China (UESTC), and Ph.D. degree from Helmut Schmidt University, Hamburg, Germany. From 1986 to 1993, he was a Lecturer with UESTC. From 1998 to 2004, he was with Institute for Infocomm Research, A*STAR, Singapore, as a Lead Scientist, and the Head of the Biometrics Laboratory. He joined Nanyang Technological University (NTU), Singapore as a Faculty Member in 2004, where he served as Director of Centre for Information Security from 2005 to 2011. He is currently a professor with the School of EEE, NTU and serves as Director of Centre for Information Sciences and Systems. He has authored over 200 papers with over 50 papers in IEEE journals, including 9 papers in T-PAMI and 18 papers in T-IP, and presented over 20 papers in top conferences CVPR/ICCV/ECCV/AAAI/ICLR. He served as IFS TC Member of IEEE Signal Processing Society and Associate Editors for IEEE SPL and IEEE T-IP. Currently Dr. Jiang is an IEEE Fellow and serves as Senior Area Editor for IEEE T-IP and Editor-in-Chief for IET Biometrics. His current research interests include computer vision, machine learning, pattern recognition, image processing and biometrics.

KEYNOTE SPEAKER III

Keynote Speaker III**Time: 10:55-11:35, Jan. 27, Saturday, GMT+8****(Royal Room 1)***Connected Autonomous Driving: Challenges and Opportunities***Prof. Cheng-Zhong Xu****Fellow of IEEE****University of Macau, China****Room ID: 854 2989 8127 | Room link: <https://us02web.zoom.us/j/85429898127>****Abstract:**

Autonomous driving is breaking the dawn of a new era, mainly due to breakthroughs of AI technologies. This talk will provide a comprehensive review of state-of-the-art technologies in environment perception, scenario understanding, mapping and location, intelligent path planning. It will also introduce a MoCAD project for Macau Connected and Autonomous Driving, which is under development at University of Macau. It aims to develop key enabling technologies in open environments with assistance of vehicle-infrastructure networking and cloud/edge computing technologies, and to construct a first-class test and evaluation platform for autonomous driving in the greater bay area. It will present recent research results on robustness deep machine learning algorithms in open environments and transfer learning approaches for model adaptivity in corner driving scenarios. Model compression and acceleration techniques for the inference and cloud/edge systems support for autonomous driving will also be discussed.

Bio:

Dr. Cheng-Zhong Xu, IEEE Fellow, is the Dean of the Faculty of Science and Technology, University of Macau, Macao SAR, China and a Chair Professor of Computer Science of UM. He is also a Chief Scientist of a key project on "Internet of Things for Smart City" of Ministry of Science and Technology of China and a key project on "Intelligent Driving" of Macau SAR. He was a Chief Scientist of Shenzhen Institutes of Advanced Technology (SIAT) of Chinese Academy of Sciences and the Director of Institute of Advanced Computing and Digital Engineering. Prior to these, he was in the faculty of Wayne State University, USA for 18 years. Dr. Xu's research interest is mainly in the areas of parallel and distributed systems, cloud and edge computing, and data-driven intelligent applications. He has published over 400 peer-reviewed papers on these topics and awarded more than 120 patents. Dr. Xu was the Chair of IEEE Technical Committee of Distributed Processing. He received his B.S. and M.S. degrees in Computer Science from Nanjing University and his Ph.D. from the University of Hong Kong in 1993.

INVITED SPEAKER I

Invited Speaker I**Time: 11:35-12:00, Jan. 27, Saturday, GMT+8****(Royal Room 1)**

Intelligent Distributed Applications Based on Mobile Clouds and Software-Defined Networks

Prof. Sergei Gorlatch

University of Muenster, Germany

Abstract:

We consider an emerging class of challenging software applications called Real-Time Online Interactive Applications (ROIA). ROIA are networked applications connecting a potentially very high number of users who interact with the application and with each other in real time, i.e., a response to a user's action happens virtually immediately. Typical representatives of ROIA are multiplayer online computer games, advanced simulation-based e-learning and serious gaming. All these applications are characterized by high performance and QoS requirements, such as: short response times to user inputs (about 0.1-1.5 s); frequent state updates (up to 100 Hz); large and frequently changing numbers of users in a single application instance (up to tens of thousands simultaneous users). This talk will address two challenging aspects of software for future Internet-based ROIA applications: a) using Mobile Cloud Computing for allowing high application performance when a ROIA application is accessed from multiple mobile devices, and b) managing dynamic QoS requirements of ROIA applications by employing the emerging technology of Software-Defined Networking (SDN).

Bio:

Sergei Gorlatch is Full Professor of Computer Science at the University of Muenster (Germany) since 2003. Earlier he was Associate Professor at the Technical University of Berlin, Assistant Professor at the University of Passau, and Humboldt Research Fellow at the Technical University of Munich, all in Germany. Prof. Gorlatch has more than 200 peer-reviewed publications in renowned international books, journals and conferences. He was principal investigator in several international research and development projects in the field of software for parallel, distributed, Grid and Cloud systems, machine learning, and networking, funded by the European Community and by German national bodies.

INVITED SPEAKER II

Invited Speaker II

Time: 09:35-10:00, Jan. 28, Sunday, GMT+8



A Dropout-Tolerated Privacy-Preserving Decentralized Federated Learning Framework

Prof. Xiaofen Wang

University of Electronic Science and Technology of China, China

Room ID: 854 2989 8127 | Room link: <https://us02web.zoom.us/j/85429898127>



Abstract:

Federated Learning (FL) enables participants to collaboratively train a global model by sharing their gradients without the need for uploading privacy-sensitive data. Despite certain privacy preservation of FL, local gradients in plaintext may reveal data privacy when gradient-leakage attacks are launched. To further protect local gradients, privacy-preserving FL schemes have been proposed. However, these existing schemes that require a fully trusted central server are vulnerable to a single point of failure and malicious attacks. Although more robust privacy-preserving decentralized FL schemes have recently been proposed on multiple servers, they will fail to aggregate the local gradients with message transmission errors or data packet dropping out due to the instability of the communication network. To address these challenges, we propose a novel privacy-preserving decentralized FL scheme system based on the blockchain and a modified identity-based broadcast encryption algorithm. This scheme achieves both privacy protection and error/dropout tolerance. Security analysis shows that the proposed scheme can protect the privacy of the local gradients against both internal and external adversaries, and protect the privacy of the global gradients against external adversaries. Moreover, it ensures the correctness of local gradients' aggregation even when transmission error or data packet dropout happens. Extensive experiments demonstrate that the proposed scheme guarantees model accuracy and achieves performance efficiency.

Bio:

Xiaofen Wang, associate professor and master supervisor of the School of Computer Science, University of Electronic Science and Technology of China. In 2009 and 2006, respectively, she received her Ph.D. and master's degree in cryptography from Xidian University, supervised by Professor Xiao Guozhen. Received a bachelor's degree in computer science and technology from the University of Electronic Science and Technology of China in 2003. She was fully funded by the China Scholarship Council, and worked as a research scholar at the University of Wollongong in Australia for one year from August 2014 to August 2015, under the tutelage of Professor Mu Yi and Willy Susilo. She visited the University of Wollongong again from January to April 2017. Her main research directions are cryptographic algorithms and protocols, network security, cloud security, privacy computing, blockchain, artificial intelligence security, etc. She has published more than 70 papers in top international journals and conferences such as IEEE Transactions on Industrial Informatics, IEEE Transactions of Information Forensics and Security, Australasian Conference on Information Security and Privacy (ACISP), and presided over and researched 20 national, provincial and ministerial projects. She has served as a member of the program committee of the conferences including the First EAI International Conference on Security and Privacy in New Computing Environments, the 17th IEEE International Conference on Computer and Information Technology (IEEE CIT-2017), the 9th EAI International Conference on Big Data Technologies and Applications (BDTA 2018), etc.

SESSIONS

SESSION 1

Image Detection and Recognition

13:30-15:30 | January 27th, 2024 | Royal Room 1. Level 3

Session Chair: Gabriela Mogos, Xi'an Jiaotong-Liverpool University, China

<p>CM156-A 13:30-13:45</p>	<p><i>Machine Learning-Based Analysis of Rice Crop Phenology in Satellite Imagery</i> Mr. Komang Harry Sudana, Luh Joni Erawati Dewi, Komang Setemen, Pariwate Varnakovida, Kadek Yota Ernanda Aryanto Universitas Pendidikan Ganesha, Indonesia</p> <p>Abstract-The agricultural sector is central to the national economic structure, significantly contributing to the overall Gross Domestic Product (GDP). Efficient and effective management of agricultural areas is crucial in optimizing the sector's role in the economy. A deep understanding of plant phenology, particularly in rice crops, is essential to enhance production and the sustainability management of agricultural resources in countries like Thailand and Indonesia. This research aims to identify and analyze the phenological stages of rice crops using a machine-learning approach. In satellite images, several vegetation indexes such as Normalized Difference Vegetation Index (NDVI), Enhanced Vegetation Index (EVI), Land Surface Water Index (LSWI), and Bare Soil Index (BSI) are used to monitor the condition of vegetation area. This work uses a Sentinel-2 high-resolution 10-meter satellite images dataset acquired in a time series over four years with monthly intervals. A set of vegetation indices were extracted from 50 coordinate points based on the acquired data. The extracted vegetation indices values are processed as features in model development. Therefore, a total of 48 images were further processed using machine learning. We use the Random Forest algorithm to identify stages in the phenology of rice plant growth, namely the start of the season (SOS), the peak of the season (POS), and the end of the season (EOS). The analysis results depict that the developed model achieves an overall accuracy level of 99% with a Cohen's Kappa value of 0.98. It reflects a very high level of accuracy in identifying phenological stages. The implications of this research are significant in efforts to improve crop management practices. Information regarding phenological stages is expected to provide a strong foundation for more informed agricultural decision-making and management or further analytics regarding the possible changes in planting patterns when linked to other conditions, such as climate change. A data visualization was also conducted. In conclusion, our research has provided an understanding of rice plant phenology using the machine learning approach that can support sustainable agriculture development, aligning with future demands for sustainable food production and resource efficiency.</p>
<p>CM243 13:45-14:00</p>	<p><i>Early Fire Detection and Segmentation Using Frame Differencing and Deep Learning Algorithms with an Indoor Dataset</i> Assist. Prof. John Paul Tomas, Jean Isaiah Dava, Tia Julienne Espejo, Hanna Katherine Medina, Bonifacio Doma Mapua University, Philippines</p> <p>Abstract-Deep learning models, such as YOLOv5, well-known for object detection, and U-Net, used for segmentation, are known for their respective capabilities within computer vision tasks. In this study, the researchers introduced a novel framework that uses YOLOv5 and U-Net models and frame differencing techniques to achieve early fire detection in an indoor setting. The primary objective is (1) to classify early fire incidents based on fire features such as smoke presence, fire motion patterns, color attributes, and shape characteristics. (2) To optimize the performance of</p>

	<p>these deep learning models, hyperparameter tuning was conducted. YOLOv5 was trained on a diverse fire, smoke, and non-fire scenarios dataset, while U-Net was exclusively trained on fire data. Motion detection was then implemented using frame differencing that effectively identified fire movements. The developed framework achieved an overall accuracy of 88%, outperforming the standalone YOLOv5 model's 81% accuracy. This improvement of 7% in detection performance was influenced by the incorporation of fire motion analysis, which has effectively reduced false positive results. In summary, the study presents a robust framework that significantly improves fire detection in indoor environments with the help of motion analysis alongside the used deep learning models.</p>
<p>CM0051 14:00-14:15</p>	<p><i>A Robust Coverless Image Steganography Method Based on Face Recognition and Camouflage Image</i> Mr. Shih-Yu Lu, Chen-Yi Lin National Taichung University of Science and Technology, Taiwan</p> <p>Abstract-Information exchange and communication have been gradually integrated into life due to the development of technology. With the awareness of information security rising, image steganography which uses images as a carrier is also gradually growing in the field of data hiding. Compared with traditional embedded steganography, coverless image steganography has been attracting much attention in recent years. Coverless image steganography makes it possible to hide secret information without modifying the image information. However, the existing coverless image steganography still has some drawbacks, such as the huge size of auxiliary information, the inability to resist geometric attacks, and low image-visual correlation. To resolve the above shortcoming, we propose a coverless image steganography method based on face recognition and camouflage image. We use a camouflage image instead of the stego-image for transmission. To enhance robustness, we also propose a retrieval algorithm based on Structural Similarity Index to obtain images that have not been attacked. Further, we reduce the time complexity of our method through face recognition. In experiments, we utilized two datasets CACD and CelebA. The experimental results show that our method is highly robust and has behavioral security without the auxiliary information.</p>
<p>CM018 14:15-14:30</p>	<p><i>Severity Estimation of Coffee Leaf Disease using U-Net and Pixel Counting Mechanism</i> Sagar Deep Deb, Rachit Kashyap, Arjun Abhishek, Assoc. Prof. Rajib Kumar Jha Indian Institute of Technology Patna, India</p> <p>Abstract-Coffee leaf disease (CLD) is a major threat to coffee production worldwide, causing significant economic losses for farmers. Accurate and timely estimation of the severity of CLD is crucial for implementing effective control measures. In this paper, we propose a novel approach for severity estimation of CLD using a combination of the U-Net deep learning architecture and a pixel counting mechanism. The U-Net architecture is used to generate the segmented masks of the coffee leaf images. Finally to estimate the severity of CLD, we introduce a pixel counting mechanism that quantifies the proportion of affected pixels in the segmented regions. By summing the total number of diseased pixels and dividing it by the total number of pixels in the region, we obtain a severity score that reflects the extent of CLD infections. The algorithm proposed by us achieves a five class accuracy of 89.10%.</p>
<p>CM501 14:30-14:45</p>	<p><i>Study on Removing Superimposed QR Code on Object Image using an Autoencoder</i> Prof. Kazutake Uehira, Hiroshi Unno Kanagawa Institute of Technology, Japan</p> <p>Abstract-This paper presents a technique for removing unnecessary QR code patterns from captured images of subjects using a U-Net type autoencoder. This study is a part of our series focusing on optical watermarking embedded invisibly in the light illuminating the subject. The purpose of optical watermarking is to include useful or valuable information about the subject in the captured images taken with a camera and provide it to the user as needed. We utilized QR codes as the watermarking in this study. A negative and a positive pattern are projected onto the</p>

	<p>subject alternately, making them invisible to the human eye. Although it is invisible to the human eye on the subject, the image taken by the camera contains positive or negative patterns, allowing users to extract information about the subject from the QR code in the captured image. However, if users want to save an image taken of a subject, the QR code is not necessary, and it is desirable to delete it after acquiring the necessary information, as it degrades the quality of the subject image. In this research, an image with a superimposed QR code on a subject image was created through simulation by multiplying the subject image and the QR code image. The autoencoder was then trained using the original subject image as the truth image. Using the trained model, we attempted to remove the QR code by inputting a subject image with a superimposed QR code that was not used during the training of the autoencoder. The evaluations of the difference from the truth image, measured using PSNR (Peak Signal to Noise Ratio) and SSIM (Structural Similarity), were 34 and 93, respectively, indicating that the QR code can be visually removed from the subject image.</p>
<p>CM029 14:45-15:00</p>	<p><i>COVID-19 Detection from CT Scan Images using Transfer Learning Approach</i> Navjot Singh Bajaj, Pavinder Yadav, Assist. Prof. Nidhi Gupta National Institute of Technology Kurukshetra, Haryana, India</p> <p>Abstract- In the past years, since 2020, the outbreak of COVID-19 has alarmed the world with the speed and its spread around the world. This raised the demand of early, accurate and automated detection system for the COVID-19 as there is a scarcity of manpower in medical field. This attracted many researches using deep learning to build COVID-19 detection model. For the diagnosis of COVID-19, computed tomography scanning are being used as more accurate, non-invasive and efficient method in real-time. In this work, we have proposed a model using six different image classification techniques of deep learning on CT scan images and compared the accuracy to find the most suitable and reliable model for transfer learning to achieve best result on ResNet50 as 97.19% training and 98.05% testing accuracy. The model will automate the process of detection of the COVID-19, leading to the advancement in the field of smart health-care.</p>
<p>CM445 15:00-15:15</p>	<p><i>A Computer Vision Approach to Ambulance Classification in the Philippines using YOLOv5 Small</i> Assist. Prof. John Paul Q. Tomas, Jose Rafael A. Franco, Hans C. Laguna, Steve Vincent Phillip C. Feria Mapua University, Philippines</p> <p>Abstract-This study outlines the creation of an object detection model utilizing YOLOv5 Small, designed to identify and categorize ambulances on the road, distinguishing them based on various types and characteristics. The research process included the assembly of a specific dataset of ambulance images from the Philippines, which comprised seven classes. The project made use of image augmentation, leading to a dissimilarity score of 0.1574 between the original and augmented images, signifying the successful introduction of variations. The process of hyperparameter tuning was carried out, with a batch size of 8 proving to be the most effective, resulting in a mAP@50 score of 93% for the detection and classification of ambulances and vehicles.</p>
<p>CM653-A 15:15-15:30</p>	<p><i>Study on Necessary Structures of Deep Learning Models for Detection of Lesions in Medical Images</i> Prof. Kenji Suzuki Tokyo Institute of Technology, Japan</p> <p>Abstract-In deep learning applications to artificial-intelligence-(AI)-aided diagnosis in medical images, a necessary structure of a deep learning model for a given lesion detection task is a very important topic. The purpose of this study was to study deep learning structures adequate for achieving the target performance in detection of lesions in medical images. To achieve the goal, a database of 27 polyps in 140 CT colonography scans in 70 patients was used for detection of colorectal polyps. Convolutional neural networks were used to investigate the necessary architecture for the simplicity reason. The initial structures of the deep learning models consisted</p>

of 10 convolutional and max-pooling layers, one fully-connected layer, and one soft-max layer. From the first to fifth convolutional layers, 3 to 7 two-dimensional kernels were used. Different convolutional neural network models with five different depths were trained for the investigation purpose. The number of convolutional and max-pooling layers were reduced from the initial structures to create those different five models. The number of filters in the convolutional layers were changed as well to see if the number of the filters would affect the performance. Training and validation were done through 10-fold cross validation. The performance was evaluated by using receiver-operating-characteristic analysis for the detection task with the area under the curve as a metric. There was no statistically significant difference (p -value > 0.05) among different deep learning models when relatively large numbers of network filters were used in the convolutional layers. That result would indicate that deeper structures were not effective if deep learning models had sufficiently large numbers of network filters. Deep learning models with 4 convolutional layers got a performance higher than shallower networks, but a much higher performance was not obtained by using deeper networks as well. Therefore, convolutional neural network models with relatively large numbers of network filters with 4 convolutional layers might be adequate for lesion detection in CT colonography; deeper structures may not be necessary for this specific task group. This study suggests that a properly deep deep-learning model should be used for obtaining an adequate performance for a given task.

SESSION 2

Data Analysis and Computing Methods Based on Machine Learning

13:30-15:15 | January 27th, 2024 | Royal Room 2A, Level 3

Session Chair: Hiep Xuan Huynh, Can Tho University, Vietnam

<p>CM0111 13:30-13:45</p>	<p><i>EEG Signals Decoding of Freely Moving Rats Based on Support Vector Machine Algorithm</i> Jiange Kou, Chenfei Sun, Yan Shi, Liman Yang, Yanxia Niu, Zhiguo Yang, Mr. Yulong Nie, Jiaqi Chang Beihang University, China</p> <p>Abstract-Brain-Computer Interface (BCI) technology can record spike signals and local field potential signals (LFP). The research on spike signals have achieved results, but the effect of spike recording will still decrease over time. The LFP can record the signal stably for a long time and make up for the deficiency of recording the spike signal alone. This paper took rats as its research object and researched the spike signals and LFP of the primary motor cortex of the rats after gait training. Meanwhile, the gait signals of the rats are collected. Based on the gait data, the rats' "running" and "standing" motion states are divided. The corresponding time periods are determined to obtain LFP in different motion states. The time domain, frequency domain, and nonlinear neural dynamics characteristics of the two signals are analyzed respectively. The zero-crossing ratio, power spectral density and sample entropy characteristics of the signals under different behaviors are extracted. The support vector machine algorithm is used to train and predict the extracted features. The feature classification based on power spectrum density has achieved good results, and the classification accuracy can reach 79.14%. In addition, based on the spike signal to predict the movement speed of the rat, the predicted value and the actual value follow better, which can achieve the purpose of control of external equipment. This article provides a new complete method for identifying the movement intention of the hind limbs of freely moving rats from a variety of EEG signals and provides a research idea for the control of brain-controlled smart equipment.</p>
<p>CM014 13:45-14:00</p>	<p><i>A Machine learning and Empirical Bayesian Approach for Predictive Buying in B2B E-commerce</i> Mr. Tuhin Subhra De, Pranjal Singh, Alok Patel Indian Institute of Technology Kharagpur, India</p> <p>Abstract-In the context of developing nations like India, traditional business-to-business (B2B) commerce heavily relies on the establishment of robust relationships, trust, and credit arrangements between buyers and sellers. Consequently, e-commerce enterprises frequently employ telecallers to cultivate buyer relationships, streamline order placement procedures, and promote special promotions. The accurate anticipation of buyer order placement behaviour emerges as a pivotal factor for attaining sustainable growth, heightening competitiveness, and optimizing the efficiency of these telecallers. To address this challenge, we have employed an ensemble approach comprising XGBoost and a modified version of Poisson Gamma model to predict customer order patterns with precision. This paper provides an in-depth exploration of the strategic fusion of machine learning and an empirical Bayesian approach, bolstered by the judicious selection of pertinent features. This innovative approach has yielded a remarkable 3 times increase in customer order rates, showcasing its potential for transformative impact in the e-commerce industry.</p>

<p>CM015 14:00-14:15</p>	<p><i>Machine Learning-based Models for Predicting Defective Packages</i> Yushuo Wang, Assoc. Prof. Ran Mo, Yao Zhang Central China Normal University, China</p> <p>Abstract-Software defects are often expensive to fix, especially when they are identified late in development. Packages encapsulate logical functionality and are often developed by particular teams. Package-level defect prediction provides insights into defective designs or implementations in a system early. However, there is little work studying how to build prediction models at the package level. In this paper, we develop prediction models by using seven machine-learning algorithms and code metrics. After evaluating our approach on 20 open-source projects, we have presented that we can build effective models for predicting defective packages by using an appropriate set of metrics. However, there is no single set of metrics that can be generalized across all projects. Our study demonstrates the potential for machine-learning models to enable effective package-level defect prediction. This can guide testing and quality assurance to efficiently locate and fix defects.</p>
<p>CM019 14:15-14:30</p>	<p><i>Federated Learning with MLPerfTiny Tasks and Server-side Momentum</i> Mr. Lawrence Roman Africa Quizon, Anastacia Ballesil Alvarez University of the Philippines Electrical and Electronics Engineering Institute, Philippines</p> <p>Abstract-Federated learning can bring significant benefits to edge IoT systems in their scalability, efficiency, and application space by increasing the amount of computing for the nodes while decreasing the amount of network traffic required. On the other hand, the rise efficient techniques in TinyML has been a significant boon for ultra low-power IoT ML sensors. Sadly, works on federated learning either use standard networks that are too large for TinyML devices, or are applied to relatively easier tasks to compensate for the performance degradation. In this work, we model federated learning on all four the MLPerfTiny tasks with their respective baseline models and show that applying federated learning TinyML models causes significant performance degradation. We also show that the performance degradation is exacerbated when the number of nodes are increased. Finally, to address the performance degradation without compromising the original task or increasing the computational load for the client devices, we propose adding momentum to server-side learning optimizer and show that this significantly mitigates the performance degradation effect, again reaching MLPerfTiny standards on all tasks.</p>
<p>CM039 14:30-14:45</p>	<p><i>Opinion Mining with Interpretable Random Density Forests</i> Phuc Quang Tran, Hanh My Thi Le, Prof. Hiep Xuan Huynh Can Tho University, Vietnam</p> <p>Abstract-Interpreting and explaining complex models such as ensemble machine learning models for opinion mining is essential to increase the level of transparency fairness and reliability of positive and negative opinion prediction results. Although ensemble learning models offer significant benefits, their lack of interpretability poses a major challenge in understanding the rationale behind their prediction, creating a complex problem related to the interpretation of the model. There is also limited research on developing ensemble learning models that describe the internal function and behavior of the model. In this paper, we propose a new approach for opinion mining with random density forest interpretation to provide explanatory power in opinion mining. Using the Local Interpretable Model-agnostic Explanation (LIME), we further interpret the random density forest model leading to the prediction of opinion polarization in opinion mining according to specific domains related to online reviews of restaurants and hotels. It has demonstrated accurate results in terms of the contribution of opinion features in mining the overall opinion. In addition, we also compared the probability density of opinion feature words and were interested in the contribution of essential features to the results. Model prediction using the SHAPLEY value, based on the interaction value of opinion feature words, has shown the level of influence in predicting positive or negative opinion polarization results. Empirical results show that the proposed system tries to explain efficiency.</p>

<p>CM555 14:45-15:00</p>	<p><i>Attention based Convolutional Neural Network for Active Noise Control</i> Deepali Singh, Rinki Gupta, Arun kumar, Rajendar Bahl Indian Institute of Technology Delhi, India</p> <p>Abstract-Active noise control (ANC) is a technology that uses sound waves to reduce or eliminate unwanted ambient noise in a given environment. We approached ANC using a deep neural network consisting of convolutional and attention layers, followed by deconvolutional layers. The proposed deep learning model processes the acoustic signal samples in frames. A piece-wise non-linear function is employed to represent the secondary path and loudspeaker saturation non-linearities. To assess the efficacy of the proposed model, we conducted tests using filtered white noise across different frequency bands and various tonals from a diverse database. The proposed convolutional model with attention layers yields a normalized mean square error (NMSE) reduction of upto 3 dB more as compared to that achieved using just convolutional model. Experiment results are presented for both confined and anechoic environments, providing a comprehensive evaluation of the proposed ANC approach.</p>
<p>CM041 15:00-15:15</p>	<p><i>Retailers' Order Decision with Setup Cost using Machine Learning</i> Ms. Pissacha Jintanasonti, Aussadavut Dumrongsiri, Phattarasaya Tantiwattanakul Thammasat University, Thailand</p> <p>Abstract-The objective of this study was to gain valuable insights into retailer behavior and develop a predictive model to inform their purchasing decisions. This process involved a comprehensive analysis of the various factors that influence retailers when they make choices regarding product or service purchases. To gather the data for the study, a simple random sampling method was employed to extract retailer purchase data from a mathematical model using Excel Solver. While Excel Solver can determine optimal solutions quickly but, with hundreds of retailers, reoptimizing the model every time a price is changed it is not practical and the manufacturer must contact trial and error many times to optimize has price. To address this challenge, Artificial Neural Network techniques were utilized to analyze the sample data. The resulting equations were subsequently integrated into manufacturer model to assist manufacturers in forecasting retailer decisions. With an understanding of the expected patterns of retailer behavior, manufacturers can strategically plan their purchase orders to align with different promotion and marketing strategies. The study demonstrated that the model achieved an average minimum cost increase of 5.02% when tested with a new dataset consisting of 5,000 retailers. Based on these findings, it is recommended that manufacturers adjust their order policies by placing orders at the beginning of period 2 and making the most of the earliest discount period. Furthermore, manufacturers should consider a range of factors, including total holding cost, reorder cost, and expected demand, when formulating their order policies. This comprehensive approach will help manufacturers optimize their purchasing decisions and enhance their overall operational efficiency.</p>

SESSION 3

Digital Image Analysis and Security Management

16:00-18:00 | January 27th, 2024 | Royal Room 1. Level 3

Session Chair: John Paul Tomas, Mapua University, Philippines

<p>CM004 16:00-16:15</p>	<p><i>Quantum Matching Algorithm for Biometric Fingerprints</i> Assoc. Prof. Gabriela Mogos Xi'an Jiaotong-Liverpool University, China</p> <p>Abstract-Fingerprints remain constant throughout life. In over 140 years of fingerprint analysis, no two fingerprints have ever been found to be identical, even in identical twins. Each of us is born with a unique set of fingerprints, although experts still don't know with what exactly what we use them for. In information technology terms, biometrics is associated with technologies and techniques designed to secure and confirm identity based on individual, measurable biological characteristics of the person. Fingerprints can be used in systems and schemes designed to gain access to a computer, a room and, why not, a bank account. A verification system authenticates the person's claimed identity by comparing the fingerprints provided by the person at a given point in time with the measures of these features previously stored in the system and associated with the person's claimed identity. This paper presents a quantum matching algorithm for biometric fingerprints. For this, classical fingerprinting was encoded into quantum states using an adapted Novel Enhanced Quantum model and the quantum circuits, for storage and for matching, were implemented and tested on the IBM Quantum Experience platform and on a local virtual quantum simulator.</p>
<p>CM0015 16:15-16:30</p>	<p><i>Robust Coverless Image Steganography Based on SIFT and DWT Sequence Mapping</i> Ms. Su-Ho Chiu, Chen-Yi Lin National Taichung University of Science and Technology, Taiwan</p> <p>Abstract-With the rapid development of technology in recent years, people are increasingly concerned about transmission security. The emergence of coverless image steganography has addressed the limitations of traditional image steganography and greatly enhanced transmission security. However, existing coverless image steganography generally suffers from the problem of exponential growth in the number of images while gradually developing a reliance on encrypted auxiliary information. Therefore, this study proposes a coverless image steganography based on Scale-Invariant Feature Transform (SIFT) and Discrete Wavelet Transform (DWT) sequence mapping, which significantly increases sequence diversity by adopting a dual method for generating feature sequences, thus reducing the requirement of the number of images. In addition, transmitting the collage stego-image avoids the suspicion caused by sending the encrypted auxiliary information, significantly enhancing security. The experimental results show that this study demonstrates excellent robustness and mapping integrity, an essential contribution to information security.</p>
<p>CM007 16:30-16:45</p>	<p><i>Stereo Network for Blind Image Super-Resolution</i> Guangyi Ji, Prof. Xiao Hu Guangzhou University, China</p> <p>Abstract-Single image super-resolution method using neural networks has achieved remarkable strides. However, most existing works rely on the architecture of Convolutional Neural Networks (CNNs) with shared kernel and the increasing of vertical depth, as result, super-image would loss high-frequency information. In every layer of human retina exists huge of neurons and some</p>

	<p>neurons in the same layer connect each other by horizontal neurons. Inspired by the neural network of human retina, a Stereo Neural Network (SterNet) is designed for blind image super-resolution. As the basic block of SterNet, Dynamic Filter Block (DFB) performs through unshared kernel, hence SterNet is able to easily obtain more spatial features and high-frequency semantic information. To expand the network width, one DFB with unshared kernels and one RRDB with shared kernels connect in parallel to construct Dynamic Filter and Rense Residual Blocks (DFDRB) and two DFDRBs are in parallel to form a Stereo feature extraction Block (SterB). At last, several SterBs are in series into a SterNet. Extensive experiments on several benchmarks show the effectiveness of the proposed method. This indicates that simulating the structure and operation of real neural networks is beneficial for improving vision application system.</p>
<p>CM344 16:45-17:00</p>	<p><i>Tomato (<i>Solanum lycopersicum</i> L.) Fruit Ripeness Classification based on VGG16 Convolutional Neural Network</i> Assist. Prof. Mary Christine A. Tomas, Yñigo Erick G. Arañez, Angelo James V. Beltran, Elixeline E. Britanico Mapua University, Philippines</p> <p>Abstract-Addressing the challenge of overproduction in the tomato industry, this research introduces a unique approach for detecting and classifying the ripeness stages of the Diamante Max tomato variant, utilizing Mask R-CNN and VGG16. By leveraging a self-collected dataset from a local farm, which included 302 images augmented to 464, the study achieved balanced classes for five tomato ripeness stages through expert-consulted annotations. The Mask R-CNN model, optimally configured with a learning rate of 0.001, gradient clip norm of 10.0, and learning momentum of 0.9, showcased superior performance when trained only on its final layers, with a detection mAP of 0.651, detection mAR of 0.828, segmentation mAP of 0.735, and a segmentation mAR of 0.736. The segmented tomato images then served as input for ripeness classification using the VGG16 model, where three modified architectures were compared against the baseline. The third modified model emerged as the most effective, attaining average testing precision, recall, and F1-measure scores of 70.01%, 60.13%, and 54.87%, respectively. This research underscores the potential of combining Mask R-CNN and modified VGG16 models as a robust solution for classifying tomato ripeness stages, offering a practical application to mitigate tomato overproduction. Future research endeavors may focus on optimizing detection for transitional ripeness stages and expanding the solution to encompass other agricultural products sharing similar features or ripeness classifications.</p>
<p>CM350-A 17:00-17:15</p>	<p><i>Crop Classification Model using Convolutional Neural Network Algorithm</i> Assoc. Prof. Luh Joni Erawati Dewi, Kadek Yota Ernanda Aryanto, Gede Indrawan, Ketut Agus Seputra, Pariwate Varnakovida Universitas Pendidikan Ganesha, Indonesia</p> <p>Abstract-Classification using machine learning methods can be applied to the agricultural sector. This research aims to apply machine learning classification techniques to build a model that can identify four types of agricultural crops, namely rice, corn, sugar cane and cassava. We used TensorFlow Keras as the framework with the Convolutional Neural Network (CNN) algorithm. CNN was chosen because it is powerful for classifying images. The number of datasets used in this research is 245 images, which is divided into the training dataset (80%), and the testing dataset (20%). Testing was carried out by varying the image size (pixel) in the training dataset and the number of epochs. There are four image sizes used, namely: 32x32, 50x50, 75x75, and 100x100. Three epoch variations were used, namely, 50, 100, and 150. From the tests carried out, maximum accuracy of 74.47% was obtained, which was achieved at an image size of 32x32, with epochs 100, and the F1 score is 73.58%. The same accuracy value is also obtained from the image size of 75x75, with epochs equal 100, but the F1 score is 71.11%. In the confusion matrix, a quite large classification error was obtained occurs in the corn plants. As much as 36% of the corn crop is classified as cassava, and 18% of the corn crop is classified as sugarcane. In the graph of training and validation accuracy, there is quite a significant gap, so there is a possibility of overfitting. The</p>

	<p>number of datasets used in this research is still relatively small and the pixel size of each image is thought to be the cause. Therefore, further research is needed to find the real cause of this problem.</p>
<p>CM0021 17:15-17:30</p>	<p><i>Coverless Image Steganography Based on Multi-Object Mapping Rules</i> Mr. Shu-Wei Liang, Chen-Yi Lin National Taichung University of Science and Technology, Taiwan</p> <p>Abstract-Existing coverless image steganography methods mainly focus on improving the hiding capacity and robustness against attacks. However, most of them ignore the number of images for constructing a complete index of feature sequences could be huge, thus making it challenging to apply to the datasets. In this study, we propose a coverless image steganography based on multi-object recognition, which builds an image sequence index based on objects to make the mapping rules more flexible. It enables a single image to generate multiple sequence combinations and effectively reduces the number of images required to construct a complete sequence index. The experimental results show that the proposed method can build a comprehensive sequence index using the existing datasets and be applied to the real data-hiding task. In addition, it can enhance the capacity while maintaining good robustness.</p>
<p>CM259-A 17:30-17:45</p>	<p><i>A Comparative Analysis of Machine Learning Algorithms for Land Use and Land Cover Classification in Chachoengsao Province, Thailand</i> Kadek Prima Giant Marta Dinata, Luh Joni Erawati Dewi, Pariwate Varnakovida, Assoc. Prof. Kadek Yota Ernanda Aryanto Universitas Pendidikan Ganesha, Indonesia</p> <p>Abstract-This research aims to compare the performance of three machine learning algorithms, namely Support Vector Machine (SVM), Random Forest, and Maximum Likelihood Classifier (MLC), in the context of Land Use Land Cover (LULC) classification. The classification focused on five main classes of LULC: Water, Vegetation Type 1 (vegetated areas without crops), Vegetation Type 2 (vegetated areas with crops), Forest, and Building. The research methodology involves collecting LULC data and implementing the three algorithms on the dataset. The research data was obtained using the Sentinel-2 dataset, comprising a total of 1000 points. Each class is represented by 200 randomly selected points. These points are scattered throughout the Chachoengsao area of Thailand. The selected data extracted six features for the classification: the NDVI, LSWI, NDSVI, NDTI, ViGreen Index, and Tasseled Cap Transformation. The data were split into two parts: 80% of the data was used to train the model, and the remaining 20% was used to test data. The overall accuracy of the classification achieves over 90% for every method being compared. The classification providing a good performance based on the obtained F-1 score in most of the task. Furthermore, the Kappa Coefficients were measured for each method to show consistencies between the model's predictions and the actual outcomes, and values above 85% were provided for each technique. In Conclusion, the Maximum Likelihood model shows strong potential to provide more accurate and reliable classification results in this context. Therefore, implementing the Maximum Likelihood model is considered a strategic step to improve the accuracy and reliability in understanding the pattern and distribution of land use and land cover.</p>
<p>CM012 17:45-18:00</p>	<p><i>A Color Image Encryption Algorithm Based on Complementary Map and Iterative Convolutional Code</i> Yanlu Xie, Shihua Zhou, Assoc. Prof. Hui Lv, Bin Wang, Chao Che Dalian University, China</p> <p>Abstract-Encryption is a valid means to safeguard the safety of images, and for color images, encryption should be performed considering the intrinsic correlation between R, G, and B components. In this paper, we propose an image encryption algorithm based on a complementary map and an iterative convolutional code. Firstly, the plain image is input into the convolutional encoders for iteration to generate the correctional secret key. Secondly, we design a new complementary map. From the test data, the new chaotic map has passed the NIST testing,</p>

exhibits a good chaotic characteristic, and has a wider range of chaotic parameters. Thirdly, global scrambling is performed on the color image to disrupt the distribution between R, G, and B. Then, a row-layer and a column-layer are randomly selected to form a set of elements to be encrypted. Finally, performing global diffusion on the image further increases the safety of our scheme. Experimental results show that our algorithm has a preferable encryption effect and elevated safety.

SESSION 4

AI-Based System Model and Data Security

16:00-17:45 | January 27th, 2024 | Royal Room 2A, Level 3

<p>CM552-A 16:00-16:15</p>	<p><i>An Efficient Vision Navigation Strategy for Drones in Urban</i> Assist. Prof. Chao-Yang Lee National Yunlin University of Science and Technology, Taiwan</p> <p>Abstract-Drones, or unmanned aerial vehicles (UAVs), have become integral to daily life due to their flexible flying capabilities and cost-effectiveness. Navigation, a critical component in the era of autonomous drones, has prompted recent studies to address the challenging task of determining feasible and safe paths. In this context, our research focuses on achieving safe and reliable UAV navigation in densely populated city environments, specifically emphasizing efficient lane-following. In this study, we proposed an efficient vision navigation strategy for drones in urban. Our proposed method, called road-keeping vision navigation (RKVN), employs a deep learning approach, enabling UAVs to autonomously navigate dynamic urban environments by following predefined roads. RKVN facilitates swift lane tracking by leveraging predictive yaw and linear velocity control from input depth data and RGB images captured by both front and downward cameras. A convolutional neural network (CNN) processes raw visual inputs, capturing high-level features through attention and residual mechanisms. Three concurrent CNN pipelines handle raw visual inputs, outputting high-level features that feed into a self-head attention mechanism. Various attention mechanisms within each convolutional block extract relevant features, reducing computational costs compared to deeper networks. The integration of self-attention from concurrent feature fusion leads to improved estimation of control commands. This mechanism encapsulates both dynamic and static information to predict yaw and linear velocity, modulating these predictions into final control commands for smooth drone operation. Experimental evaluations demonstrate the efficacy of our proposed method in learning the drone's vision navigation strategy. Additionally, the study addresses the surge in drone usage for smart city applications, recognizing challenges posed by complex urban environments and heightened collision risks. Comprehensive evaluations, including error prediction on unseen environments and flight tests at various altitudes, demonstrate RKVN's reliability and generalization. Performance assessments at 30, 50, and 80 altitudes showcase RKVN's superiority over existing methods, providing reliabilities of 94.22%, 95.89%, and 94.38%, respectively. Future work includes real-world environment experiments with more extensive and diverse datasets to enhance model robustness. In conclusion, our proposed approach outperforms existing methods and addresses the challenges posed by complex urban landscapes, ensuring efficient UAV operation.</p>
<p>CM001 16:15-16:30</p>	<p><i>Crossover Consideration in Genetic Algorithm</i> Mr. Warayu Intawongs, Wirat Leenavonganan, Tanin Sammanee Deepscope Investment Advisory Securities Co., Ltd., Thailand</p> <p>Abstract-Crossover is an important process in genetic algorithms. This process will swap genes between the chromosomes of the parents. The results from the crossover process may not be better than those of the parents, which affect the result of the genetic algorithm. We are interested in considering whether we should or should not crossover by checking the results before making a decision to crossover. If the result of the crossover from checking is not better than the parents, we do not crossover, but if the results of the crossover from checking are better than the parents, we do crossover. In the results from the test with one maximum problem in</p>

	<p>different lengths, where the size of the population is 100, the size of the generation is 100, the crossover rate is 0.7, and the mutation rate is 0.10, we found that the results from crossover consideration were better than those from a simple genetic algorithm in all lengths tested. In future work, we will apply this methodology to real-world problems.</p>
<p>CM032 16:30-16:45</p>	<p><i>Load Balancing for Task Scheduling Based on Multi-Agent Reinforcement Learning in Cloud-Edge-End Collaborative Environments</i> Zhuo Li, Jie Yu, Prof. Xiaodong Liu, Long Peng National University of Defense Technology, China</p> <p>Abstract-With the increasing variety of computational scenarios and task types in cloud-edge-end collaborative networks, task scheduling in cloud-edge-end collaborative environments can better adapt to various task types and application scenarios, thereby enhancing the flexibility and adaptability of cloud-edge-end systems. This paper introduces a multi-agent reinforcement learning approach to conduct research on task load balancing scheduling in the context of cloud-edge-end collaboration, aiming to improve the efficiency of finding optimal task scheduling strategies in a distributed cloud-edge computing environment. In this paper, task scheduling is viewed as a competitive multi-agent system, where intelligent agents compete for a sufficient number of computing resources through the design of efficient task scheduling algorithms. This competition allows agents to reduce task completion latency and energy consumption while meeting task computational requirements. The paper employs Decentralized Partially Observable Markov Decision Process to model the reward maximization problem and designs a multi-agent reinforcement learning algorithm based on attention communication to solve it. Finally, experimental validation is conducted to evaluate the performance of the proposed task scheduling method.</p>
<p>CM031 16:45-17:00</p>	<p><i>Robust Anomaly Detection for Offshore Wind Turbines: A Comparative Analysis of AESE Algorithm and Existing Techniques in SCADA Systems</i> Chenglin Fan, J. G. Hur, Chang Gyoon Lim Chonnam National University, South Korea</p> <p>Abstract-Offshore wind turbines (OWTs) installed far from land have historically faced significant maintenance costs and loss of power generation resources due to system failures. As the era of artificial intelligence progresses, predictive and anomaly detection algorithms continue to mature. There is a prevalent trend of generating exception labels for time series data using self-determined thresholds and applies in anomaly detection. However, such an approach may compromise the integrity and robustness of the data. This paper aims to address these challenges by implementing a real-time sensor data Supervisory control data acquisition(SCADA) detection mechanism for offshore wind turbines using the Squeeze and Excitation (SE) block Auto Encoder (AESE) algorithm point-to-point data anomaly detection technique. Then, verify unsupervised results with the real label generated by the fault log. Comparative analysis with prevalent algorithms confirms the superiority and credibility of the AESE algorithm in this application.</p>
<p>CM042-A 17:00-17:15</p>	<p><i>Together is Better: Knowledge-Aware Model with Resume Fusion for Online Job Recommendation</i> Xiao Gu, Ling Jian, Chongzhi Rao, Zhaohui Bu, Xianggang Chen, Peng Ding China University of Petroleum (East China), China</p> <p>Abstract-Widespread adoption of online recruitment platforms has led to explosive growth in employment information, resulting in an ever-increasing demand from job seekers for accurate and effective job recommendations. Existing studies on the Person-Job Fit models focus on the correlation between resumes and job descriptions, with rare consideration given to user historical behavior such as click and delivery. On the contrary, job recommendation methods always ignore the crucial information lurking in the resume text. In addition, the continuous influx of a vast amount of job data poses challenges to the updating of online recommendation results. To this end, we propose a novel Online Job Recommendation model via Resume Fusion (OJRRF) in this</p>

	<p>paper, aimed at making accurate and efficient online job recommendations with the merits of addressing job cold start and long tail problems. The key contribution lies in two facets:(1) incorporating resume text information into the knowledge graph attention framework to enhance job seekers' vector representations jointly;(2) designing a hybrid recommender strategy by combining the knowledge-aware offline model with the content-based online model. Finally, we conducted extensive comparison experiments and online A/B test on the recruitment platform of JiuYeJie big data company to validate the effectiveness and real-time capability of OJRRF.</p>
<p>CM546 17:15-17:30</p>	<p><i>A Secure Certificateless Multi-signature Scheme for Wireless Sensor Networks</i> Prof. Han-Yu Lin, Tung-Tso Tsai, Jing-Yu Hsu National Taiwan Ocean University, Taiwan</p> <p>Abstract-In the application of wireless sensor networks (WSNs), lots of deployed sensor nodes will forward authenticated message to a base station for verification. The technique of data aggregation is thus become important, since it can gain more bandwidth savings and the base station can also verify the authenticity of aggregated data within one logical step. To fulfill such an application requirement, the so-called multi-signature scheme is applicable, since it allows multiple signers cooperatively to sign a message so that any verifier can authenticate the generated multi-signature with the aggregated public keys of all participated signers within one logical step. In a traditional multi-signature scheme, a public key has to be verified before using it, so as to prevent from the public substitution attack. A public key certificate issued by a trusted certificate authority is a commonly utilized solution. However, it will increase extra costs for transmitting and verifying the certificate. To avoid the troublesome certificate management, a certificateless public key system is a better alternative. In such a cryptosystem, each entity's complete private key is divided into two parts. The first part is a partial private key issued by a key generation center (KGC) while the second part is a secret integer chosen by the entity. In this paper, the authors propose a certificateless multi-signature scheme to fulfill the requirement of data aggregation in WSNs. The security of existential unforgeability for the proposed mechanism is formally proved on the basis of the hardness of Computational Diffie-Hellman (CDH) problem. Furthermore, the efficiency comparisons with related works are also evaluated.</p>
<p>CM451 17:30-17:45</p>	<p><i>TensAIR: Real-Time Training of Neural Networks from Data-streams</i> Mr. Mauro D L Tosi, Vinu E. Venugopal, Martin Theobald University of Luxembourg, Luxembourg</p> <p>Abstract-Online learning (OL) from data streams is an emerging area of research that encompasses numerous challenges from stream processing, machine learning, and networking. Stream-processing platforms, such as Apache Kafka and Flink, have basic extensions for the training of Artificial Neural Networks (ANNs) in a stream-processing pipeline. However, these extensions were not designed to train ANNs in real-time, and they suffer from performance and scalability issues when doing so. This paper presents TensAIR, the first OL system for training ANNs in real time. TensAIR achieves remarkable performance and scalability by using a decentralized and asynchronous architecture to train ANN models (either freshly initialized or pre-trained) via DASGD (decentralized and asynchronous stochastic gradient descent). We empirically demonstrate that TensAIR achieves a nearly linear scale-out performance in terms of (1) the number of worker nodes deployed in the network, and (2) the throughput at which the data batches arrive at the dataflow operators. We depict the versatility of TensAIR by investigating both sparse (word embedding) and dense (image classification) use cases, for which TensAIR achieved from 6 to 116 times higher sustainable throughput rates than state-of-the-art systems for training ANN in a stream-processing pipeline.</p>

SESSION 5

Machine Learning Theory and Predictive Models

9:35-11:45 | January 28th, 2024

Room ID: 854 2989 8127 | Room link: <https://us02web.zoom.us/j/85429898127>**Session Chair: Xiaofen Wang, University of Electronic Science and Technology of China, China**

<p>Invited Speech II 9:35-10:00</p>	<p><i>A Dropout-Tolerated Privacy-Preserving Decentralized Federated Learning Framework</i> Prof. Xiaofen Wang University of Electronic Science and Technology of China, China</p> <p>Abstract-Federated Learning (FL) enables participants to collaboratively train a global model by sharing their gradients without the need for uploading privacy-sensitive data. Despite certain privacy preservation of FL, local gradients in plaintext may reveal data privacy when gradient-leakage attacks are launched. To further protect local gradients, privacy-preserving FL schemes have been proposed. However, these existing schemes that require a fully trusted central server are vulnerable to a single point of failure and malicious attacks. Although more robust privacy-preserving decentralized FL schemes have recently been proposed on multiple servers, they will fail to aggregate the local gradients with message transmission errors or data packet dropping out due to the instability of the communication network. To address these challenges, we propose a novel privacy-preserving decentralized FL scheme system based on the blockchain and a modified identity-based broadcast encryption algorithm. This scheme achieves both privacy protection and error/dropout tolerance. Security analysis shows that the proposed scheme can protect the privacy of the local gradients against both internal and external adversaries, and protect the privacy of the global gradients against external adversaries. Moreover, it ensures the correctness of local gradients' aggregation even when transmission error or data packet dropout happens. Extensive experiments demonstrate that the proposed scheme guarantees model accuracy and achieves performance efficiency.</p>
<p>CM016 10:00-10:15</p>	<p><i>Shore Pollution Simulation Based on Tidal Currents and Ground Effects</i> Ngoan Thanh Trieu, Hiep Xuan Huynh, Vincent Rodin, Bernard Pottier Can Tho University, Vietnam</p> <p>Abstract-Marine pollution comes from different sources including agricultural, industrial, and domestic wastewater discharge from human activities in coastal areas. Environmental simulation can represent ground and sea characteristics, modeling spreading occurring in both spaces. These characteristics are variable, due to soil capability and reaction, and sea behavior, in particular currents and tides. This work presents a heterogeneous tiling approach modeling sea behavior in coastal areas based on tidal currents and ground effects. The ground is segmented into irregular cells following administrative divisions for collecting observations while the sea area is segmented into regular geographical tiles. The impact of the interactions is represented by messages carrying qualities and quantities of physical pollution. Channels link cells following cellular automata or distributed system paradigms. This system architecture allows to produce a synchronous message passing program suitable for massive parallel execution. The status of cells and messages are produced step by step and can be interpreted graphically. Green tides caused by eutrophication appear when nutrients circulate in high concentrations in coastal waters. These nutrients come from land use, accumulate, and propagate to the shores mainly through rivers end up joining the sea or the oceans. Our simulations show when and where tides are able to increase concentration levels, producing space and time characteristics.</p>

<p>CM028 10:15-10:30</p>	<p><i>Evaluation of Generative AI Q&A Chatbot Chained to Optical Character Recognition Models for Financial Documents</i> Yu Qiu, Prof. Venkata Duvvuri, Pratibha Yadavalli, Neal Prasad SiriusMindShare LLC., USA</p> <p>Abstract-Financial statements are cornerstones of several analyses, such as loan applications, as well as for legal firms collecting evidence and analysis. They exert a significant influence on the decisions of these institutions. Streamlining the processing of these statements, regardless of their form—be it digital or hard copies—stands as a pivotal objective for banks and similar firms. This research explores the integration of Optical Character Recognition (OCR) and generative AI for automating the extraction of crucial financial data from bank statement images. Furthermore, we design an architecture to make a generic analysis possible on multiple types of financial documents by utilizing a classification model tailored to categorize bank statement documents. This facilitates seamless data preparation for subsequent analysis or model training. Emphasizing precision and efficiency, we investigate OCR model architectures designed specifically to enhance text extraction accuracy from low-resolution bank statement images. The study evaluates two different OCR model architectures—the accuracy of FSRCNN model being the best—achieving an accuracy above 93% in OCR. Additionally, we analyze a generative AI-based Q&A chatbot to simplify analysis for novice users.</p>
<p>CM303 10:30-10:45</p>	<p><i>Research on Online Consumer Demand Ranking and Content Prediction Based on Kano Model</i> Xiaogang Zhao, Ms. Yuerui Liu, Hai Shen, Yiwei Dang, Jun Hou, Zitong Pu Xi'an International Studies University, China</p> <p>Abstract-Aiming at the shortcomings of high cost, low efficiency and coarse granularity of traditional consumer demand sequencing methods in practical applications, this paper proposes an online consumer demand ranking and content prediction method based on Kano model. First, this method combines SnowNLP sentiment analysis and consumer attention to classify the demand attributes. Then, the probability of topic words under different demands is obtained by LDA topic model. Finally, the ARIMA model is introduced to predict the probability of topic words and sentiment values under different demands in the future, which can accurately and efficiently recognize the rapidly changing consumer demands. Example calculations show that this method can classify and sort consumer demands in a more fine-grained way, which provides a reference for consumer demand prediction research of enterprises and solves the problem of priority level of enterprise marketing resource allocation.</p>
<p>CM0091 10:45-11:00</p>	<p><i>An Improved Convolutional Neural Networks Framework with Flexible Channel Shift</i> Peng Li, Assoc. Prof. Shuzhuang Zhang, Chen Qing Beijing University of Posts and Telecommunications, China</p> <p>Abstract-With the popularity of mobile device terminals, it will become more and more common for visual models to run on mobile device terminals. Particularly, the accuracy and speed requirements for recognition will become higher and higher. A good design balances the accuracy and speed of models by reducing the amount of parameters and calculations so that these models are deployed easier on mobile terminals. Fortunately, FE-Net, as one of the state-of-the-art model architectures, introduces features into computation progressively through a limited feature space. However, the feature mapping is not diverse enough, which affects the applications of FE-Net on mobile terminals. To address this challenge, we propose an improved convolutional neural network framework with flexible channel shift, Fe-CsNet. It introduces a channel-shift operation to adjust the channel-wise dependencies dynamically in the FE-Net. The flexibility allows the network to better capture and exploit the feature maps. The experimental results show that our Fe-CsNet improves channel information communication via the channel shift operation, and improves performance without increasing inference speed and computational cost.</p>

<p>CM461 11:00-11:15</p>	<p><i>An Interpretable Anomaly Detection Model for Cloud POS Data</i> Lin Gao, Mr. Yongzhen Fan, Duoxi Xiao, Yuanyuan Li, Bing Zhu, Zhengqian Sun Sichuan University, China</p> <p>Abstract-Anomaly detection of Cloud POS data plays a significant role in the management activities of the tobacco industry. Effective anomaly detection helps retailers mitigate anomalous losses and optimize business plans. However, existing research related to anomaly detection of Cloud POS data is relatively insufficient and lacks interpretable detection approaches applicable to Cloud POS data. In this paper, we focus on the interpretable anomaly detection model and offer a new hybrid approach to detect anomaly in Cloud POS data. The proposed anomaly detection scoring method is based on Lasso algorithm and WOE (Weight of Evidence) coding. This detection method allows for the calculation of anomaly detection scores for Cloud POS data, with lower scores indicating a higher likelihood of anomalies. To validate the effectiveness of the method proposed in this paper, we conduct experiments using real Cloud POS data from the tobacco retail industry in QD city. The experimental results indicate that the proposed method not only has a comparable prediction accuracy, but also shows better interpretability compared with the benchmark methods such as SVM (Support Vector Machine) and Random Forest model.</p>
<p>CM142 11:15-11:30</p>	<p><i>Multi-task Learning LSTM-based Traffic Prediction in Data Center Networks</i> Xiongfei Ren, Xiaoyue Su, Yisong Zhao, Yuanzhi Guo, Changsheng Yang, Jiaming Ji, Xinwei Zhang, Bingli Guo and Xuwei Xue Beijing University of Posts and Telecommunications, China</p> <p>Abstract-Multi-task learning LSTM algorithm is deployed to predict the proportion of traffic flows to each server in DCNs achieving the MSE of 6.61E-3, which can guide the bandwidth scheduling for high utilization in DCNs.</p>
<p>CM647 11:30-11:45</p>	<p><i>ARIMA and Attention-based CNN-LSTM Hybrid Neural Network for Battery Life Estimation</i> Mr. Yang Liu, Hanqing Zhang, Lingfeng Wang Beijing University of Chemical Technology, China</p> <p>Abstract-Benefiting from the rapid development of the modern new energy automobile industry, lithium-ion batteries as the core components of new energy vehicles, the demand is rising. For both industry and consumers, accurately predicting the remaining useful life of lithium-ion batteries is an urgent need to avoid accidents and reduce range anxiety. Therefore, we propose a new method to solve this problem, the ARMI-CNN-LSTM-AT model. The innovative use of pre-ordered ARIMA models to predict battery decay data enhances the data entry quality of the second stage. In the second stage, the attention mechanism was added to the output of CNN-LSTM to redistribute the weight of unbalanced input features, The network input and output through sliding Windows. In the case of 40 rounds of data training, the final average prediction result reached 0.0136 RMSE and 0.0079 MAE. We demonstrated the importance of adding predicted data to predict battery decay, and also experimentally demonstrated that the network can maintain good prediction results on different batteries.</p>

SESSION 6

Image Processing and Model Analysis Based on Machine Learning

14:00-15:30 | January 28th, 2024

Room ID: 854 2989 8127 | Room link: <https://us02web.zoom.us/j/85429898127>

Session Chair: Shahzad Ashraf, NFC Institute of Engineering and Technology Multan, Pakistan

<p>CM008 14:00-14:15</p>	<p><i>Face Recognition via Thermal Imaging: A Comparative Study of Traditional and CNN-Based Approaches</i> Prof. Shinfeng Lin, Luming Chen, Wensheng Chen, Boyu Chang National Dong Hwa University, Taiwan</p> <p>Abstract-In this article, a face recognition via thermal imaging: a comparative study of traditional and CNN-based approaches is proposed. The methodology comprises two distinct components: traditional face recognition and CNN-based face recognition. In the traditional face recognition, we employ Random Forest (RF) and Support Vector Machine Classifier (SVM) techniques. Conversely, CNN-based face recognition leverages Convolutional Neural Networks (CNN) to identify individuals. Our research involves a comprehensive evaluation conducted across different databases, including the PUCV Drunk Thermal Face (PUCV-DTF) and the UCH Thermal Temporal Face (UCH-TTF) datasets. To emulate real-life scenarios, we introduce elements such as glasses, face mask, and noise into the original thermal images during experimentation. The recognition rates of traditional and CNN-based methods for small size and middle size databases achieve 90% and 100%, respectively, under a challenging condition, wearing glasses and mask. Experimental results demonstrate the feasibility and effectiveness of our proposed method, showcasing its robustness in tackling various challenges.</p>
<p>CM302 14:15-14:30</p>	<p><i>FedCVD: Towards a Scalable, Privacy-Preserving Federated Learning Model for Cardiovascular Diseases Prediction</i> Mr. Abdelrhman Gaber, Hassan Abd-Eltawab, Tamer Elbatt American University in Cairo, Egypt</p> <p>Abstract-This paper presents <i>FedCVD</i>, a federated learning model designed for predicting cardiovascular disease (CVD) by employing logistic regression and Support Vector Machine (SVM) algorithms. <i>FedCVD</i> utilizes the privacy and scalability advantages offered by federated learning to facilitate collaborative model training using decentralized patient data, ensuring confidentiality. To evaluate the effectiveness of the proposed model, experiments were conducted using the 10-year risk of coronary heart disease Kaggle dataset. To address data imbalance challenges, three techniques — Random Over Sampling, Random Under Sampling, and Synthetic Minority Oversampling Technique (SMOTE) — were explored. The study demonstrates promising performance, For the federated logistic regression with SMOTE achieving an AUC value of 0.7048. Comparative analysis with a centralized logistic regression model shows competitive results, with an AUC value of 0.7081 using Random Over Sampling. For the federated SVM model, an AUC value of 0.7340 is achieved using Random Under Sampling. In comparison, a centralized machine learning approach utilizing SVM and Random Over Sampling achieves an AUC value of 0.6962. These findings highlight the effectiveness of the proposed federated learning approach, surpassing the performance of centralized machine learning models for CVD prediction.</p>

<p>CM264 14:30-14:45</p>	<p><i>Visualization Research on the Market Structure of China's SSE 50 Index Based on the Affinity Propagation Machine Learning Algorithm</i> Fuxiang Yu, Xiaowen Wang, Yakun Wang Nanning University, China</p> <p>Abstract-With a comprehensive review of relevant literature, data, and theories, this study collects post-pandemic data from the Shanghai Stock Exchange 50 Index. Utilizing the Sparse Inverse Covariance Estimation method (GraphicalLassoCV), the research computes the conditional correlation among stocks. Additionally, an unsupervised learning method, the Affinity Propagation algorithm from machine learning, is employed to further analyze and explore the market structure of the Shanghai Stock Exchange 50 Index in the post-pandemic period. The results reveal that the constituent stocks of SSE 50 are divided into 11 clusters, and specific clusters exhibit industry cohesion, reflecting similar intraday volatility patterns within sectors. Clusters 5 and 6 encompass various industries, implying shared price fluctuations across different sectors. Clusters 8 and 9, predominantly composed of financial listed companies, emerge as the largest clusters with the highest total market capitalization, signifying significant influence in the market. Furthermore, Cluster 5 exhibits noteworthy market capitalization, representing diverse manufacturing stocks. This underscores the potential risk of common fluctuations among stocks from the cluster.</p>
<p>CM663 14:45-15:00</p>	<p><i>Facial Expression Recognition using Data Augmented Convolutional Neural Network</i> Dr. Manisha Sawant, Harshavardhan Deshaboina, Sanjay Viswanath Indraprastha University, India</p> <p>Abstract-Facial expression recognition (FER) is a burgeoning field within computer vision and artificial intelligence, with significant implications for human-computer interaction and emotion analysis. Recent advancements in deep learning, particularly convolutional neural networks (CNN), have revolutionized facial expression recognition by enabling the automatic extraction of discriminative features from facial images. These breakthroughs have led to remarkable accuracy improvements in recognizing basic emotions such as happiness, anger, sadness, surprise, fear, and disgust. In this paper, we focus on the fusion of data augmentation techniques with CNN to improve facial expression recognition. By leveraging the power of deep learning, transfer learning, and augmenting the training data, we aim to enhance the model's ability to accurately classify facial expressions across a wide spectrum of emotions. The proposed approach is particularly beneficial in scenarios where the availability of labeled training data is limited. Experimental results on the CK+ dataset show improvements in accuracy compared to state-of-the-art methods.</p>
<p>CM1033 15:00-15:15</p>	<p><i>Research on Long Text Similarity Calculation Method Based on TextRank and BERT</i> Mr. Xi Zhao, Binglin Zhu, Xiaofeng Liu China West Normal University, China</p> <p>Abstract-Aiming at the problem that the text input length of the BERT model is limited to 512 characters, and the number of words in long text is large, it is impossible to input long text directly into the BERT model to better obtain the meaning of words, this paper proposes a new long text similarity calculation method based on TextRank and BERT. Firstly, the method uses TextRank algorithm to extract a certain number of key words and sentences from the long text, in order to reduce the length of the text and retain the most important semantic information as far as possible. Then, the vector representation of the extracted sentence information is obtained through the BERT model, and it is input into the network layer of Bi-LSTM and attention mechanism to further extract features. Finally, the feature representation of the two pieces of text is obtained and the similarity is calculated to determine whether it matches. Experiments show that the proposed method can effectively solve the problem that the number of words in long text cannot be input into the BERT model, and effectively reduce the amount of calculation of the model, and the model can also better extract deep semantic information. Experiments on the public Chinese long text News datasets CNSE (Chinese News Same Event) and CNSS (Chinese News Same Story) achieve 82.86%and 87.91%accuracy respectively.</p>

CM562 15:15-15:30	<p><i>Sequential Generative-Supervised Strategies for Improved Multi-Step Oil Well Production Forecasting</i></p> <p>Mina Mikhael, Nourhan Sakr, Tamer Elbatt The American University in Cairo, Egypt</p> <p>Abstract-Generative Adversarial Networks (GANs) exhibit great potential in many areas. In this paper, we explore their potential in multi-step time series forecasting. To the extent of our knowledge, this task has not been extensively researched yet, possibly due to its unique challenges when trying to model the original temporal behavior of the data. We propose a model for concrete multi-step forecasting where we mix the generative power of the unsupervised GAN loss with the deterministic prediction capabilities of supervised losses. We do this in a rather simple, sequential manner that proves to be helpful for both components of the architecture. The unsupervised component does its job by offering multiple generated predictions that follow the temporal dynamics of the time series, while the supervised component acts as a prediction selector that inspects the provided outputs and creates the most accurate one. We apply this approach in the energy sector, particularly using real industry data on oil well production, as provided to us by Raisa Energy. This learning approach leverages the generative component to provide superior results to those of the supervised counterpart. The approach also stabilizes the overall training, thereby improving the results and providing a more reliable training process.</p>
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DELEGATES

NAME	AFFILIATION
Yan Shi	Beihang University, China
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Surachai Intachuen	MUIC, Thailand
Shihua Zhou	Dalian University, China
Qiang Zhang	Dalian University, China
Chao Che	Dalian University, China
Doobae Jun	Gyeongsang National University, South Korea
Ojeong Kwon	Korea Advanced Institute of Science and Technology, South Korea
Soowon Lee	Soongsil University, South Korea
Jiwon Kim	Sungkyunkwan University, South Korea
Sarang Han	Sungkyunkwan University, South Korea
Dongryul Lee	Sungkyunkwan University, South Korea

