



2024



# PROGRAM BOOK

The 2024 IEEE International Conference  
on Industry 4.0, Artificial Intelligence, and  
Communications Technology (IAICT)



Bali Rani Hotel  
BALI, INDONESIA  
**July 4-6, 2024**



<https://iaict.org/>



[info@iaict.org](mailto:info@iaict.org)

Organized and Sponsored by:



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# IAICT 2024

The 2024 International Conference on Industry 4.0, Artificial Intelligence and Communication Technology (IAICT) provides a forum for researchers, academicians, professionals, and students from various engineering fields and with cross-disciplinary interests and working in industry 4.0, artificial intelligence and communications technology to interact and disseminate information on the latest developments. Organized and sponsored by IEEE Indonesia Communication Society Chapter, IAICT has a strong foundation of bringing together industry and academia.

Prospective authors are invited to submit original technical papers for presentation at the conference and publication in the conference proceedings. Accepted papers will be submitted for inclusion into IEEE Xplore subject to meeting IEEE Xplore's scope and quality requirements. IAICT'2024 invites papers, original and unpublished work from individuals active in the broad theme of the conference. Potential topics includes, but are not limited to:

## 1. Industry 4.0

- Ecosystem & Infrastructure
- Industry 4.0 Factory
- Big Data
- Internet of Things (IoT)
- Industrial Internet of Things
- Internet of Services
- Smart Manufacturing
- Smart Devices and Products
- Smart Logistics
- Smart City
- Predictive Analytics
- Cyber-physical Systems
- Robotic and Automation
- Support System for Industry 4.0
- Mobile Computing
- Cloud Computing for Industry 4.0
- Security
- Applications in other Industries such as Healthcare, Education, Media, Retail and related Fields

## 2. Artificial Intelligence

- Adaptive Systems
- Fuzzy Logic
- Data Mining
- Machine Learning
- Deep Learning
- Inductive Learning
- Intelligent and Knowledge Based System
- Expert Systems
- Geographic Information Systems
- Intrusion Detection
- Agents and Multi-agent Systems
- Natural Language Processing

- Signal Processing
- Computer Vision
- Virtual Reality
- Augmented Reality
- Hybrid and Nonlinear system
- Intelligent Control
- Context-aware Pervasive Systems
- Bioinformatics

### 3. **Communications**

- Advanced Networks
- Cloud Computing
- Cross-layer Optimization and Control
- Cyber-physical Systems
- Data Center Networking
- Delay Tolerant Networks
- Game Theory in Networks
- Localization and Location-based Services
- MIMO-based Networking
- Mobile Cloud Computing
- Network Management
- Network Measurement and Analysis
- Quality of Service and Resource Management
- Smart Communications Systems
- Vehicular Networks
- Wireless Sensor Networks

## Welcome Message from Chair of IAICT 2024



Dear Participants of IAICT 2024,

Honourable Guests, Distinguished keynote speakers, All of participants, Ladies and Gentlemen. We proudly present The 2024 IEEE International Conference on Industry 4.0, Artificial Intelligence, and Communications Technology (IAICT 2024) held on July 4-6, 2024 in a **hybrid event**. It is our pleasure to welcome you to the conference which focuses on Industry 4.0 and Artificial Intelligence and Communications Technology. The conference has wide acceptances from researchers, scientists, students, and professionals around the globe.

Organized and Sponsored by IEEE Indonesia Communications Society Chapter, IAICT 2024 has a strong foundation of bringing together industry and academia. IAICT 2024 has supported by 357 International Technical Program Committee (TPC) members from 58 Countries and 181 Reviewers from 43 Countries.

We received more than 133 submitted papers from 24 countries and 79 accepted papers after each paper has been carefully reviewed minimum by 3 international reviewers. The acceptance ratio of submission is 59.4% to maintain the quality of the papers presented at the conference. Registered papers in IAICT 2024 are 62 papers :

- Artificial Intelligence : 41 papers;
- Communications : 9 papers;
- Industry 4.0 : 12 papers.

It is our goal to make IAICT 2024 as a wonderful forum to refresh knowledge, to explore the innovations and to disseminate information among researchers, scientists, students, and professionals on the latest developments of Industry 4.0 and their pillars including artificial intelligence and communications technology. We have been striving to offer plenty of networking opportunities and to provide meeting and interacting with leading scientists and researchers, friends and colleagues.

We thank all those who have contributed to the success of IAICT 2024, such as organizing committee from Telkom University, Tanjungpura University, and IEEE Communications Society Chapter Indonesia. We also say thank you to the TPC chair, the TPC members, TPC reviewers, keynote speakers and technical-sessions chair of IAICT 2024.

We have chosen Bali since we believe that Bali is always an exceptional location for leisure as well as for conference. It is renowned as one of the world's most outstanding island which provides a unique and spectacular setting. Bali is always amazing for both local and international visitors. Here, we can find a variety of visitors from around the globe from those who love the panoramic beauty mountains, lakes, and to those who merely spend endless days on the beautiful beach.

We wish you a very successful conference and enjoy Bali.

Chair of IAICT 2024

**Muhammad Nasrun**

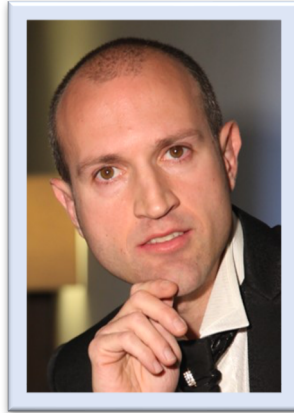
Telkom University & IEEE ComSoc Indonesia Chapter

## Program At a Glance

Day	Time	Activity
<b>Day 1</b>	08:15 AM – 08:30 AM	Opening Ceremony
	08:30 AM – 09:50 AM	Keynote Speech
	09:50 AM – 10:10 AM	Coffee Break
	10:10 AM – 11:50 AM	Papers Presentation 1 - Onsite
	11:50 AM – 01:00 PM	Lunch Break
	01:00 PM – 03:00 PM	Papers Presentation 2 - Onsite
	03:00 PM – 03:20 PM	Coffee Break
	03:00 PM – 05:00 PM	Papers Presentation 3 – Online (Breakout Room 1)
		Papers Presentation 3 – Online (Breakout Room 2)
	03:20 PM – 05:20 PM	Papers Presentation 3 – Onsite
	05:20 PM – 06:30 PM	Break
	06:30 PM – 08:00 PM	Gala Dinner
<b>Day 2</b>	08:00 AM – 10:00 AM	Papers Presentation 4 – Online (Breakout Room 1)
		Papers Presentation 4 – Online (Breakout Room 2)
	10:00 AM – 11:45 AM	Papers Presentation 5 – Online (Breakout Room 1)
		Papers Presentation 5 – Online (Breakout Room 2)
	11:45 AM – 12:00 PM	Closing Ceremony
<b>Day 3</b>	08:00 AM - End	Tour in Bali

**Note:** Central Indonesia Time (WITA) eight hours ahead of Coordinated Universal Time (UTC+8).

## Keynote Speaker



### **Assoc. Prof. Danilo Pelusi, Ph.D**

Associate Professor of Computer Science at the Department of Communication Sciences  
University of Teramo, Italy

#### **Short Bio:**

Danilo Pelusi received the degree in Physics from the University of Bologna (Italy) and the Ph.D. degree in Computational Astrophysics from the University of Teramo (Italy). Currently, he is an Associate Professor of Computer Science at the Department of Communication Sciences, University of Teramo. Editor of Springer, Elsevier and CRS books, and Associate Editor of IEEE Transactions on Emerging Topics in Computational Intelligence (2017-2020), IEEE Access (2018-present), IEEE Transactions on Neural Networks and Learning Systems (2022-present), IEEE Transactions on Intelligent Transportation Systems (2022-present) and IEEE Transactions on Fuzzy Systems (2024-present) he is Guest Editor for Elsevier, Springer and MDPI journals. Keynote speaker, Guest of Honor and Chair of IEEE conferences, he is inventor of international patents on Artificial Intelligence. World's 2% Top Scientist 2021 and 2022, his research interests include Fuzzy Logic, Neural Networks, Information Theory, Machine Learning and Evolutionary Algorithms.

#### **“Suitable Ways to Combine Fuzzy Techniques and Evolutionary Algorithms”**

#### **Abstract:**

Although the computational power of computer is increased, finding the solution of huge complexity problems is a hard task. The application of exact methods leads to unreasonable waiting times. Therefore, suitable intelligent strategies have be useful to obtain optimal solutions in reasonable times. Among pillars of artificial intelligence, fuzzy logic and evolutionary algorithms can be combined to solve high complexity problems. The speech will illustrate suitable ways to combine fuzzy logic and evolutionary computation to solve complex problems. The challenge is to find the suitable trade-off between the knowledge supplied by fuzzy logic and biological evolution of evolutionary algorithms.

## Keynote Speaker



### **Dr. Kemas Muslim Lhaksamana**

Assistant Professor of Informatics, School of Computing and  
Director of Research and Community Services, Telkom University, Indonesia

#### **Short Bio:**

Kemas Muslim received his bachelor's degree in informatics from the Institut Teknologi Bandung, Bandung, Indonesia, in 2005, his master's degree in information systems development from the HAN University of Applied Sciences, Arnhem, The Netherlands, in 2009, and his Ph.D. in social informatics from Kyoto University, Kyoto, Japan. He has been a lecturer in the Department of Informatics at Telkom University, Indonesia, since 2011. His research interests include text mining, services computing, and multiagent systems. Since 2021, he has served as the Director of Research and Community Services at Telkom University. Additionally, he was the Treasurer of the IEEE Indonesia Section from 2019 to 2022.

### **“Humanity-Centric Machine Learning to Address Global South Challenges”**

#### **Abstract:**

Since its inception in the 1950s, AI has regained momentum in the 2000s with the advent of Big Data and rapid advances in computational power. The following decade saw breakthroughs in deep learning, leading to the emergence of conversational AI and large language models (LLMs). In the near future, advancements in AI, coupled with other computing technologies such as quantum computing, will likely accelerate, making AI even more ubiquitous and impactful for humanity.

Despite these promising achievements, the world continues to face serious challenges, particularly in the Global South. Recent reports on the progress of Sustainable Development Goals (SDGs) in 2023 indicate that most goals are alarmingly off track. While there have been efforts to harness technology to address issues in the Global South, much work remains to be done. Our research aims to explore how AI, and specifically machine learning, can help address these critical issues in the Global South and beyond. This aligns with Telkom University's aspiration to become a world-class entrepreneurial university known for advanced humanity-centric innovations.

Although there is debate surrounding the term “human-centered” machine learning, we use the term “humanity-centric” to encompass not only the individual human but also the collective human society. Our approach to machine learning is twofold. First, we investigate how machine learning can be applied to solve humanity's challenges. Second, we address AI ethics to ensure that every stage of AI development and use

is guided by principles that protect humanity from potential harm. Our research includes projects on people analytics, conversational AI for education, Quranic computing, and AI ethics in the Global South. These research directions focus on, but are not limited to, addressing local problems that are also pertinent to the Global South. By adopting a humanity-centric approach, we aim to leverage machine learning to create solutions that benefit both individuals and society as a whole, ensuring ethical considerations are integral to our innovations.

## Technical Sessions Day 1

Tuesday, July 4, 2024 (10:10 AM – 11:50 AM)

### Papers Presentation 1 - Onsite

Papers	Authors
<i>A Low Complexity MobileNetV2 Based CNN Model for Brain Tumor Detection in MRI Images</i>	Aman Kumar (National Institute of Technology, Hamirpur, India); Akanksha Jaiswal (Indian Institute of Technology, Delhi, India); Sachin Kumar (NIT Hamirpur, India).
<i>Dictionary-Based Sentiment Analysis at Subword Level</i>	Janghoon Yang (Penn State Abington, USA).
<i>Online Multi-Object Thermal Tracking and Reidentification Using YOLO and DeepSORT in Low Light Environment</i>	Ricky Rahman Papudi, Septian Fahrezi, Aldy Sipahutar and Bryan Firjatullah (University of Indonesia, Indonesia); Nur Ibrahim (University of Indonesia and Telkom University, Indonesia); Benyamin Kusumoputro (University of Indonesia, Indonesia).
<i>Optimization for Multiple-Beams Through K-Means Clustering Algorithm</i>	Icheon Kim (Samsung Electronics, Korea (South)).
<i>Proposing a Personalized Quiz Service for Assisting Self-Evaluation of Elderly Cognitive Memory</i>	Yousuke Oshima, Takuya Nakata and Sinan Chen (Kobe University, Japan); Sachio Saiki (Kochi University of Technology, Japan); Masahide Nakamura (Kobe University, Japan); Kiyoshi Yasuda (Osaka Institute of Technology, Japan).

**10:10 AM** ***A Low Complexity MobileNetV2 Based CNN Model for Brain Tumor Detection in MRI Images***

**Authors:** Aman Kumar (National Institute of Technology, Hamirpur, India); Akanksha Jaiswal (Indian Institute of Technology, Delhi, India); Sachin Kumar (NIT Hamirpur, India).

**Abstract:** A brain tumor is a disease caused by the growth of abnormal brain cells. Due to their rarity and variety in appearance, tumors often have a tough time predicting a patient's survival rate. These tumors can be identified through Magnetic Resonance Images (MRI), which play an essential role in determining the tumor location, however, manual detection is a time-consuming and difficult process that can cause some errors in results. To effectively categorize and detect brain tumors, our suggested layers are applied to a deep convolutions neural network (CNN) MobileNetv2 base model. To improve the quality of the images, several filters are applied using image enhancement techniques. To improve the training of our suggested model, data augmentation techniques are used to expand the data samples. The findings demonstrate that the suggested optimized state-of-the-art MobileNetV2 performs better than other CNN models, outperforming them in terms of classification accuracy and Number of parameters used with an overall classification and detection accuracy of 99%.

**10:30 AM** *Dictionary-Based Sentiment Analysis at Subword Level*

**Authors:** Janghoon Yang (Penn State Abington, USA).

**Abstract:** While deep learning can offer a promising approach to sentiment analysis, it presents challenges in complexity and technical difficulty for some researchers. Alternatively, sentiment analysis based on dictionaries has been explored. In this paper, subword-level dictionaries is considered to address performance degradation resulting from domain mismatches. To work at subword level, a framework based on naïve bayes machine learning algorithm is exploited. Furthermore, stopwords at the subword level has been proposed to removed additional interference intrinsic to subword tokenization. Numerical experiments demonstrate that the proposed method achieves higher accuracy and F1 scores compared to conventional dictionary-based method when there is a mismatch between the dictionary and the corpus of documents while performing marginally worse than state-of-the-art deep learning methods when applied to datasets from the same domain.

**10:50 AM** *Online Multi-Object Thermal Tracking and Reidentification Using YOLO and DeepSORT in Low Light Environment*

**Authors:** Ricky Rahman Papudi, Septian Fahrezi, Aldy Sipahutar and Bryan Firjatullah (University of Indonesia, Indonesia); Nur Ibrahim (University of Indonesia and Telkom University, Indonesia); Benyamin Kusumoputro (University of Indonesia, Indonesia).

**Abstract:** Multi-object tracking plays a pivotal role in various domains such as surveillance, human-machine interface, and vehicle navigation. However, existing methods primarily rely on deep learning and tracking-by-detection (TBD) techniques using RGB cameras, which face challenges in low-light conditions. To address this, we propose a novel multi-object tracking approach utilizing thermal cameras to overcome visibility issues in such environments. Our method integrates the YOLOv7 for precise image detection and the DeepSORT algorithm for efficient tracking amidst occlusion and object similarities. Given the scarcity of publicly available thermal datasets, we curated a thermal reidentification dataset comprising 10,000 thermal images captured in diverse low-light settings. Our dataset includes various poses and perspectives to enhance model performance. We structure our study to present related works, detail our proposed methodology, and analyze experimental results, highlighting the efficacy of our approach in multi-object tracking under low-light conditions.

**11:10 AM** *Optimization for Multiple-Beams Through K-Means Clustering Algorithm*

**Authors:** Icheon Kim (Samsung Electronics, Korea (South)).

**Abstract:** This paper deals with the problem of determining the optimal number and angle among the multiple beams in a single-cell scenario. In order to solve this problem, we proposed a novel interference algorithm called the K-means Interference Avoidance Algorithm (KIA) in Conventional One-beam Tilting (COT), Conventional Double-beams Tilting (CDT) and Fractional Frequency Double-beams Tilting (FFDT). Furthermore, we propose Practical K-means Interference Avoidance Algorithm (P-KIA) to select the number and angle of beams adaptively for alleviating the Inter-Beam interference (IBI) in each environment of User Equipment (UE) and gNB. Finally, this paper shows both cell throughput and throughput distribution over System Level Simulation (SLS) for performance evaluation of the proposed algorithm.

**11:30 AM** *Proposing a Personalized Quiz Service for Assisting Self-Evaluation of Elderly Cognitive Memory*

**Authors:** Yousuke Oshima, Takuya Nakata and Sinan Chen (Kobe University, Japan); Sachio Saiki (Kochi University of Technology, Japan); Masahide Nakamura (Kobe University, Japan); Kiyoshi Yasuda (Osaka Institute of Technology, Japan).

**Abstract:** Currently in Japan, the number of elderly people with dementia is increasing. Dementia is difficult to treat fundamentally, and treatment is mainly aimed at slowing down the progression, making early detection important. However, dementia progresses slowly without the person's awareness, making it very difficult for the person to notice. Also, many elderly people feel burdened by going to the hospital for examination. Our research group focuses on supporting the elderly with technology. In previous study, we have developed a service that analyzes the user's mind by conversing with the user on a daily basis using an agent that communicates via text using the LINE application. We thought that we could use this agent to help detect dementia early in daily conversations. In this study, we propose and implement the "Memory Keeper Quiz Service", a service that conducts quizzes on users through daily conversations with agents using the LINE application to help the elderly notice the decline in cognitive memory.

**Tuesday, July 4, 2024 (01:00 PM – 03:00 PM)**

**Papers Presentation 2 - Onsite**

Papers	Authors
<i>Knowledge Graph Fusion for Maintenance Management in Cement Production</i>	Nurul Hannah Mohd Yusof (Universiti Teknologi Malaysia, Malaysia); Nurul Adilla Mohd Subha (Faculty of Electrical Engineering, Universiti Teknologi Malaysia, Malaysia); Norikhwan Hamzah, Mohammad Ikmal Abdul Amir, Noorhazirah Sunar and Nurulaqilla Khamis (Universiti Teknologi Malaysia, Malaysia).
<i>Optimal Dynamic Task Scheduling in Heterogeneous Cloud Computing Environment</i>	Wenlong Ni (JiangXi Normal University, China); Yuhong Zhang and Wei Li (Texas Southern University, USA).
<i>A Context-Aware Approach Framework to Algorithm Selection for Search Based Procedural Content Generation</i>	Sana Alyaseri and Parma Nand (Auckland University of Technology, New Zealand); Roopak Sinha (Professor, Software Engineering, Australia).
<i>Expert Phishing Detection System</i>	Ayoub Alsarhan (Hashemite University, Jordan); Issa Zuhair Al-aiash (The Hashemite University, Jordan); Dimah Al-Fraihat (ISRA University, Jordan); Mohammad Aljaidi (Zarqa University, Jordan); Dena Abd Al Hakem Abu Laila (Zarqa Technical Intermediate College Zarqa, Jordan).
<i>Anomaly Detection in Wireless Body Area Networks Using Generative Adversarial Networks</i>	Ashrith Rao and Ravindra Rao (BITS Pilani Hyderabad Campus, India); Chittaranjan Hota (Birla Institute of Technology & Science, Pilani, Hyderabad Campus, India).
<i>Study of Promoting Energy Saving Behavior in Homes with Personalized Adaptive Interaction</i>	Shun Hirai, Hiro Okamoto and Sinan Chen (Kobe University, Japan); Sachio Saiki (Kochi University of Technology, Japan); Masahide Nakamura and Takuya Nakata (Kobe University, Japan).

**01:00 PM** ***Knowledge Graph Fusion for Maintenance Management in Cement Production***

**Authors:** Nurul Hannah Mohd Yusof (Universiti Teknologi Malaysia, Malaysia); Nurul Adilla Mohd Subha (Faculty of Electrical Engineering, Universiti Teknologi Malaysia, Malaysia); Norikhwan Hamzah, Mohammad Ikmal Abdul Amir, Noorhazirah Sunar and Nurulaqilla Khamis (Universiti Teknologi Malaysia, Malaysia).

**Abstract:** Valuable operation and maintenance management data that requires exploration, and its efficient utilization is crucial for enhancing the operation of the manufacturing system. This paper constructs a knowledge graph database on Neo4j for the unstructured and structured data fusion and implements using the operational data of a milling machine for industrial implementation. First, the structured and unstructured data related to milling

machine failures are retrieved from the manufacturing environment. Then, the structured data is divided into corresponding nodes and attribute relations accordingly. At the same time, unstructured data employs a columnar processing strategy, which involves organizing and analyzing data based on columns rather than rows, optimizing performance and resource utilization. Finally, the Neo4j-based knowledge graph is constructed and presented inclusively and exclusively for better understanding. The research enhances data fusion through the use of graph databases, promoting adaptive and responsive industrial landscapes.

**01:20 PM**    ***Optimal Dynamic Task Scheduling in Heterogeneous Cloud Computing Environment***

**Authors:** Wenlong Ni (JiangXi Normal University, China); Yuhong Zhang and Wei Li (Texas Southern University, USA).

**Abstract:** Cloud computing (CC), often necessitates dynamic adjustments due to its inherently fluid nature. In this paper, we introduce a novel dynamic task scheduling model that incorporates reward and holding cost considerations, leveraging the Continuous-Time Markov Decision Process (CTMDP) framework in heterogeneous CC systems. The primary goal of this model is to maximize the overall system reward for the Cloud Service Provider. By solving the Bellman Optimality Equation using the value-iteration method, we can derive an optimal scheduling policy for the dynamic task scheduling model. Additionally, to enhance its practicality in real-world scenarios, we incorporate a model-free reinforcement learning algorithm to obtain the optimal policy for our proposed model without requiring explicit knowledge of the system environment. Simulation results demonstrate that our proposed model outperforms two common static scheduling methods.

**01:40 PM**    ***A Context-Aware Approach Framework to Algorithm Selection for Search Based Procedural Content Generation***

**Authors:** Sana Alyaseri and Parma Nand (Auckland University of Technology, New Zealand); Roopak Sinha (Professor, Software Engineering, Australia).

**Abstract:** This study challenges the idea that a single optimal algorithm exists for Procedural Content Generation (PCG). This emphasises the crucial role of task-specific considerations in determining the most appropriate algorithm for a given task. Through a novel comparative analysis, we demonstrate the importance of contextual superiority: PSO emerges as highly effective in generating race tracks, whereas ABC demonstrates superior performance in map generation. Depending on the time constraints, the rapid exploration capability of PSO is advantageous for quick results, whereas the detailed search ability of ABC is preferable for achieving higher quality outcomes over a longer duration. This study extends beyond the traditional focus on GAs by highlighting the unique strengths of PSO and ABC. It advocates broader exploration beyond the confines of GA-centric approaches to PCG. We propose an approach termed "Context-Aware Approach" for algorithm selection, which underscores the importance of analyzing the complexity of the task, quality requirements, and desired solution speed. By adopting this context-aware approach and comprehending the interactions between task characteristics and algorithm capabilities, researchers and developers can make well-informed decisions, ultimately leading to the creation of engaging and personalized PCG experiences.

**02:00 PM**    **Expert Phishing Detection System**

**Authors:** Ayoub Alsarhan (Hashemite University, Jordan); Issa Zuhair Al-aiash (The Hashemite University, Jordan); Dimah Al-Fraihat (ISRA University, Jordan); Mohammad Aljaidi (Zarqa University, Jordan); Dena Abd Al Hakem Abu Laila (Zarqa Technical Intermediate College Zarqa, Jordan).

**Abstract:** Phishing attacks are a threat that continuously emphasizes the need for effective detection methods. This paper presents a machine learning detection method that employs a random forest classifier, which is an adaptable algorithm that can handle a variety of feature sets. The dataset used in this work offers a range of features extracted from various URLs, addressing elements such as URL length, domain structure, and keyword presence. We deployed a computational approach for feature engineering. The random forest classifier is employed for both prediction and to assess feature importance, guiding an automated feature selection process. By doing this, the model's performance is optimized, and the most important features are utilized. The findings of this study show the effectiveness of our method with an impressive accuracy of 98.45% on a test set. The classifier exhibits balanced precision and recall for both phishing and legitimate instances. Moreover, the automated feature selection process improves the interpretation of the model, emphasizing key indicators of phishing attacks. The proposed approach not only produces outstanding outcomes but also offers a flexible and scalable approach to address the dynamically evolving threat landscape of phishing attempts.

**02:20 PM**    **Anomaly Detection in Wireless Body Area Networks Using Generative Adversarial Networks**

**Authors:** Ashrith Rao and Ravindra Rao (BITS Pilani Hyderabad Campus, India); Chittaranjan Hota (Birla Institute of Technology & Science, Pilani, Hyderabad Campus, India).

**Abstract:** The Wireless Body Area Network (WBAN) seamlessly interconnects wearable devices on the human body, facilitating the monitoring of various physiological parameters for better health outcomes. Ensuring the accuracy and security of data transmission is paramount to prevent false alarms and maintain the overall reliability of WBANs. In response to these challenges, we propose a cutting-edge solution, the WBAN-GAN model. This innovative approach integrates a Generative Adversarial Network (GAN) to assist in the detection of anomalies within WBANs. We have employed a convolutional neural network with a lookback in the data to design our generator and discriminator to explore the spatiotemporal correlations in detecting anomalies. In this work, we fully utilize the outputs of both the generator and discriminator in identifying anomalies by calculating the anomaly score using reconstruction error and discriminator output. To the best of our knowledge, very little research has been done using GANs for anomaly detection in WBANs. To validate the efficacy of our WBAN-GAN model, we conducted extensive testing using the MIMIC dataset [11]. Comparative analysis with a CNNAutoencoder-based anomaly detection model demonstrates the superior performance of our proposed approach. Our results show an accuracy of 97% in detecting the anomalies.

**02:40 PM** *Study of Promoting Energy Saving Behavior in Homes with Personalized Adaptive Interaction*

**Authors:** Shun Hirai, Hiro Okamoto and Sinan Chen (Kobe University, Japan); Sachio Saiki (Kochi University of Technology, Japan); Masahide Nakamura and Takuya Nakata (Kobe University, Japan).

**Abstract:** In recent years, the escalating concerns of climate change and global warming have urged nations, including Japan, towards the ambitious goal of achieving a zero carbon society. Achieving zero carbon emissions involves nullifying the net amount of greenhouse gases released into the atmosphere by equalizing the amount of emissions with the amount that is absorbed, playing a pivotal role in minimizing CO<sub>2</sub> emissions. This research delves into minimizing energy consumption through domestic energy-conservation measures, tackling challenges like the unavailability of specific appliance energy use data, the absence of personalized adjustments, and the negligence of alerts. To counter these challenges, a novel approach was developed that combines a power consumption management service facilitated by IoT devices and baseline comparisons with a virtual agent (VA). The implementation and subsequent evaluation of this method revealed that the integration of a VA significantly contributed to a decrease in electricity usage, alongside notable enhancements in awareness regarding energy conservation and modifications in energy-related behaviors.

**Tuesday, July 4, 2024 (03:20 PM – 05:20 PM)**

**Papers Presentation 3 - Onsite**

Papers	Authors
<i>Enhancement of High-Definition Map for Autonomous Vehicle Application by Light Intensity Equalization Technique</i>	Pattarapoom Nokkaew and Nikorn Sutthisangiam (King Mongkut's University of Technology North Bangkok, Thailand).
<i>Assessing Performance of Morphology Particle Swarm Optimization (Morph-PSO) on Standard Benchmark Functions</i>	Mohd Nadhir Ab Wahab (Universiti Sains Malaysia, Malaysia); Samia Nefti-Meziani (University of Birmingham, United Kingdom (Great Britain)); Edmund Chadwick (University of Salford, United Kingdom (Great Britain)); Adham Atyabi (University of Colorado Colorado Springs, USA).
<i>Improvement of Drawing Process-Based Cognitive Function-Testing Application for Group Assessment</i>	Keisuke Yoshida (Kobe University, Japan); Sachio Saiki (Kochi University of Technology, Japan); Naoki Kodama (Niigata University of Health and Welfare, Japan); Atsushi Satou (Aichi Shukutoku University, Japan); Sinan Chen and Masahide Nakamura (Kobe University, Japan).
<i>AI-Facilitated Dynamic Threshold-Tuning for a Maritime Domain Awareness Module</i>	Steve Chan (Harvard University, USA).
<i>UAV Path Planning Using Informed Search Techniques on Custom Flight Controller</i>	Shashidhar Kota and Chittaranjan Hota (Birla Institute of Technology & Science, Pilani, Hyderabad Campus, India).

**03:20 PM**    ***Enhancement of High-Definition Map for Autonomous Vehicle Application by Light Intensity Equalization Technique***

**Authors:** Pattarapoom Nokkaew and Nikorn Sutthisangiam (King Mongkut's University of Technology North Bangkok, Thailand).

**Abstract:** This research aims to enhance point cloud data and simulate the operations of autonomous vehicles following data refinement. The study utilizes high-resolution point cloud data generated by a mobile mapping system and employs histogram equalization techniques to broaden the range of intensity levels, enhance contrast, and overall improve intensity values. The findings demonstrate a heightened density of dispersed intensity values and an expanded range of intensity levels compared to previous states. The point cloud data file size contribute to a 30% increase from additional shade values recording format, allows for clearer displays of road details and surrounding areas. while simultaneously increasing the accuracy of coordinates on these maps by 15%, as evaluated through simulations. Additionally, this process can aid in the creation of vector maps, a component of high-resolution maps for autonomous vehicles, thereby enhancing performance in various scenarios such as decision-making at intersections and obstacle detection.

**03:40 PM**    ***Assessing Performance of Morphology Particle Swarm Optimization (Morph-PSO) on Standard Benchmark Functions***

**Authors:** Mohd Nadhir Ab Wahab (Universiti Sains Malaysia, Malaysia); Samia Nefti-Meziani (University of Birmingham, United Kingdom (Great Britain)); Edmund Chadwick (University of Salford, United Kingdom (Great Britain)); Adham Atyabi (University of Colorado Colorado Springs, USA).

**Abstract:** The search boundary is a critical aspect of optimization problems. Understanding the limits of the search boundary can help prevent solutions from exiting the search area and assist optimization algorithms in converging more rapidly. Typically, optimization algorithms require manual setting of boundary limits before execution. Consequently, many researchers are exploring adaptive approaches to address this challenge. This paper introduces a self-limiting behavior for Particle Swarm Optimization, inspired by Hooke's Law, and names this algorithm Morphological Particle Swarm Optimization (Morph-PSO). Additionally, the study presents an extension of Morph-PSO, wherein a constriction factor,  $K$ , is integrated, resulting in the Constricted Morphological Particle Swarm Optimization (CMorph-PSO). These two novel methods were tested on thirteen selected benchmark functions to assess their performance. Morph-PSO emerged as the best-performing algorithm, achieving top performance in seven out of the selected benchmarks, compared to a range of alternative optimization methods. CMorph-PSO did not perform as well, primarily due to the small step size affected by the double constriction factor (morphology and constriction). However, both proposed methods demonstrated high performance in convergence time.

**04:20 PM**    ***Improvement of Drawing Process-Based Cognitive Function-Testing Application for Group Assessment***

**Authors:** Keisuke Yoshida (Kobe University, Japan); Sachio Saiki (Kochi University of Technology, Japan); Naoki Kodama (Niigata University of Health and Welfare, Japan); Atsushi Satou (Aichi Shukutoku University, Japan); Sinan Chen and Masahide Nakamura (Kobe University, Japan).

**Abstract:** Amid Japan's rapidly aging population, there is a growing challenge posed by dementia patients, underscoring the importance of regular cognitive function assessments conducted in group settings. In our earlier investigation, we focused on digitizing drawing tests and developed the web-based platform "EVIDENT," which facilitates comprehensive administration, diagnosis, and analysis. However, concerns regarding security and operational logistics have constrained its applicability for group-based assessments. This paper presents "EVIDENT-GROUP," a refined version of EVIDENT tailored specifically for conducting group drawing assessments. Initial trials conducted in day care facilities demonstrate the smooth execution of drawing tests in real-world environments.

**04:40 PM**    ***AI-Facilitated Dynamic Threshold-Tuning for a Maritime Domain Awareness Module***

**Authors:** Steve Chan (Harvard University, USA).

**Abstract:** This paper presents a Decision Support Engine (DSE), which utilizes a unique Lower Ambiguity, Higher Uncertainty (LAHU) and Higher Ambiguity, Lower Uncertainty (HALU) Module (LHM) to facilitate decision engineering pathways under compressed decision cycles. Central to this is the identification of isomorphic paradigms, via the discernment of relevant sparse and "Very Small/Non-Obvious" (VSNO) High Dimensional Data (HDD). Accordingly, it is found that an amalgam of a particular sequence of transformations, a Robust Convex Relaxations (RCR)-centric neural network

construct, and a Type II Fuzzy Set/Three-Way Soft Clustering approach (and other components buttressing the LHM) can be of value-added proposition in the challenge of employing fuzzy logic and deep learning to adaptive systems for intelligent control within this proxy as well as other domains.

**05:00 PM** ***UAV Path Planning Using Informed Search Techniques on Custom Flight Controller***

**Authors:** Shashidhar Kota and Chittaranjan Hota (Birla Institute of Technology & Science, Pilani, Hyderabad Campus, India).

**Abstract:** Autonomous drones are pivotal in various applications like surveillance, delivery of goods, emergency rescue etc., emphasizing the need for seamless navigation. This research centers on running path planning algorithms on UAVs to facilitate autonomous and optimal route determination. Evaluating Astar( A\*), and Greedy Best-First Search (GBFS), we highlight A\*'s superiority in computational efficiency and path optimality. To bridge the gap between real-world terrains and algorithmic requirements, we propose a novel integration of computer vision, transforming geographical maps into adaptive grids for UAVs. Path planning is done on a pre-shot image and the optimal navigation path for the UAV is calculated. In a real-time system, a camera is used to capture video continuously of the environment and the flight controller works on feature extraction and classifies obstacles frame by frame (typically using a software like Open- CV). In our case, the implementation was done on a custom flight controller based on the ESP platform which uses a Tensilica processor. Our findings demonstrate the efficiency of this approach, and offer a promising solution for autonomous UAV navigation in dynamic environments.

**Tuesday, July 4, 2024 (03:00 PM – 05:00 PM)**

**Papers Presentation 3 – Online (Break Room 1)**

<b>Papers</b>	<b>Authors</b>
Compound Jamming Detection Technique Under High Similarity Background	Zhaobin Li, Jiaxiang Zhang and Quanhua Liu (Beijing Institute of Technology, China); Sanyuan Zhao (Beijing Institute of Technology, China).
A Survey on Machine Learning Approaches for Intrusion Detection in Cloud Computing Environments for Improving Routing Payload Security and Network Privacy	V Vivek (National University of Singapore, Singapore); Bharadwaj Veeravalli (National University of Singapore, Singapore).
Digital Traces in Tourism: Leveraging NLP to Evaluate Tourist Experiences Across Southeast Asian Destinations	Andry Alamsyah, Muhammad Nadhif Fajriananda and Dian Puteri Ramadhani (Telkom University, Indonesia).
Enhancing Covid-19 Detection in X-Ray Images Through Image Preprocessing and Transfer Learning	Bayu Kembara, Darlis Herumurti and Ahmad Saikhu (Institut Teknologi Sepuluh Nopember, Indonesia).
Decision Support Framework: Integrating Analytic Hierarchy Process with Support Vector Machine and Top-K Algorithms	Mervin Jommel T. De Jesus and Melvin A. Ballera (Technological Institute of the Philippines, Philippines).
Identification of Clustering BRISK Keypoint Feature in Grocery Product Using the Elbow Method	Rissa Rahmania and Maria Anggreainy (Bina Nusantara University, Indonesia); Iman Kartowisastro (BINUS University, Indonesia); Widodo Budiharto (Bina Nusantara University, Indonesia).
Identification of Potential Harmful Drug-Drug Interactions Using Electronic Medical Records Text-Mining on Atherosclerotic Heart Disease Patient	Mukhlis Fuadi (Institut Teknologi Sepuluh Nopember & Universitas Islam Negeri Maulana Malik Ibrahim Malang, Indonesia); Adhi Dharma Wibawa and Edwin Nugroho Njoto (Institut Teknologi Sepuluh Nopember, Indonesia); Ghulam Asrofi Buntoro (Institut Teknologi Sepuluh Nopember & Universitas Muhammadiyah Ponorogo, Indonesia).
Loss-Based Decentralized Federated Learning for Robust IoT Intrusion Detection System	Made Adi Paramartha Putra (Primakara University, Indonesia); Nengah Widya Utami (Universitas Primakara, Indonesia); I Gede Juliana Eka Putra (STMIK Primakara, Indonesia); Nyoman Karna, Tia Rahmawati and Rama Shiddiq (Telkom University, Indonesia); Ahmad Zainudin (Kumoh National Institute of Technology, Korea (South)); Gabriel Avelino R Sampedro (University of the Philippines, Philippines & Kumoh

	National Institute of Technology, Korea (South).
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**03:00 PM** *Compound Jamming Detection Technique Under High Similarity Background*

**Authors:** Zhaobin Li, Jiaxiang Zhang and Quanhua Liu (Beijing Institute of Technology, China); Sanyuan Zhao (Beijing Institute of Technology, China).

**Abstract:** In view of the similarity between suppression jamming and background noise on the time-frequency graph, misidentification is easy to occur during radar jamming detection. Hence, this paper proposes a signal amplitude detection method based on empirically preset thresholds to distinguish suppression jamming from noise. Considering the challenge of misidentifying dense false targets and target signals due to their identical mathematical models and similar features in time-frequency graphs-both appearing as linear shapes with the same tilt angle-we distinguish them by leveraging the evenly spaced distribution pattern of the dense false targets.

**03:15 PM** *A Survey on Machine Learning Approaches for Intrusion Detection in Cloud Computing Environments for Improving Routing Payload Security and Network Privacy*

**Authors:** V Vivek (National University of Singapore, Singapore); Bharadwaj Veeravalli (National University of Singapore, Singapore).

**Abstract:** Distributed denial-of-service (DDoS) attacks can significantly impair the network's availability, and recent statistics show that 30% of cyber-attacks are based on network intrusion, with 27% of incidents occurring in the financial sector. To effectively monitor large volumes of sensitive data in real-time and actively defend against these attacks, an efficient intrusion detection system (IDS) is essential. Considering the high volume of data as data-centric and Intrusion Detection (ID) as a data analysis process, Machine Learning (ML) models are capable of detecting nonconforming/ atypical network traffic through the application of signature and anomaly-based methodologies. Signature based method is prone to false negatives while anomaly-based method suffers from false positive rates. As attackers continuously evolve and create innovative malware injection techniques with new malware patterns and behaviors, there is a high demand for adaptive rule-based ML models for anomaly detection. In this paper, we attempt to rigorously review the latest trends in supervised and semi-supervised ML approaches for network traffic analysis to detect anomaly-based DDoS attacks. As the volume of the ML literature is overwhelming, our interest is specifically centered around eliciting some of the best suitable ML models that are in practice for traditional networks, IoT, Cloud, and SDN environments and can be adopted for the ensemble approach to construct adaptive rule-based ML algorithms. We believe such a consolidated overview for a broad set of platforms will help readers to quickly make a choice on the required platforms, datasets involved, and methods that suit their applications.

**03:30 PM** *Digital Traces in Tourism: Leveraging NLP to Evaluate Tourist Experiences Across Southeast Asian Destinations*

**Authors:** Andry Alamsyah, Muhammad Nadhif Fajriananda and Dian Puteri Ramadhani (Telkom University, Indonesia).

**Abstract:** The tourism industry significantly influences the global economy. Along with technological advancements, digital reviews have become crucial in guiding tourists to their preferred destinations. However, the inherently textual nature of reviews presents

challenges for traditional processing methods, necessitating specialized approaches. This research leverages Natural Language Processing (NLP) to analyze tourist reviews for popular destinations in Indonesia and Thailand. The sentiment analysis identified high tourist satisfaction levels across destinations, quantifying at 77.18% for Indonesia and 78.52% for Thailand. Furthermore, we applied multiclass text classification methodologies to identify the primary dimensions of perceived tourist experiences. Entertainment emerged as the predominant reason for tourists visiting destinations in Indonesia and Thailand. Each country offering distinct favored entertainment experiences; nature-based entertainment in Indonesia, whereas nightlife and festive entertainment in Thailand. This study provides valuable insights for government authorities and tourism stakeholders on the perception of tourist experiences, supporting and enhancing destination appeal within both countries.

**03:45 PM** *Enhancing Covid-19 Detection in X-Ray Images Through Image Preprocessing and Transfer Learning*

**Authors:** Bayu Kembara, Darlis Herumurti and Ahmad Saikhu (Institut Teknologi Sepuluh Nopember, Indonesia).

**Abstract:** In this study, we assess the efficacy of convolutional neural networks (CNNs) for classifying chest X-ray images into COVID-19, Lung Opacity, Viral Pneumonia, and Normal categories using a dataset of 21,165 images from Kaggle. Through rigorous preprocessing, including RGB to grayscale conversion and contrast enhancement via contrast-limited adaptive histogram equalization (CLAHE), we aim to improve diagnostic accuracy. We explore four CNN architectures: VGG-16, ResNet-50, GoogleNet, and AlexNet, employing Adam and Nadam optimizers to determine the optimal model and optimization strategy for disease classification. This research highlights the importance of image preprocessing and careful selection of CNN architectures and optimizers in enhancing diagnostic precision. The study's outcomes not only provide insights into leveraging deep learning for medical imaging analysis, especially in detecting COVID-19 from X-ray images, but also lay a foundation for future research to explore further image preprocessing techniques and their impact on diagnostic accuracy. This research contributes to the broader effort of applying advanced computational methods to improve healthcare outcomes. It offers a promising approach to enhancing the accuracy and efficiency of medical diagnostics through technology. Our study reveals that applying a grayscale preprocessing technique significantly enhances the accuracy of models in diagnosing diseases. Specifically, GoogleNet and VGG-16 models were found to be highly effective in disease classification. When these models were fine-tuned using the Nadam optimizer, GoogleNet achieved an outstanding accuracy rate of 91%. This indicates the potential of combining advanced neural networks with optimized preprocessing for more accurate medical imaging analysis.

**04:00 PM** *Decision Support Framework: Integrating Analytic Hierarchy Process with Support Vector Machine and Top-K Algorithms*

**Authors:** Mervin Jommel T. De Jesus and Melvin A. Ballera (Technological Institute of the Philippines, Philippines).

**Abstract:** The study presents a novel framework for enhancing decision-making processes by integrating Analytic Hierarchy Process (AHP) methodology with Support Vector Machine (SVM) and Top-K algorithms. Traditional decision-making frameworks such as AHP are susceptible to subjectivity and inconsistencies, necessitating innovative approaches to improve their reliability and effectiveness. Top-TCAHP addresses these

challenges prioritizing important criteria through the use of text classification and Top-K algorithms, thereby facilitating more objective and data-driven decision-making. The framework combines structured decision-making with computational techniques, offering a comprehensive solution for guiding decision-makers through complex decision scenarios. Performance evaluation metrics, including consistency ratio, time complexity, and throughput will be employed to assess the effectiveness and reliability of the modified framework.

**04:15 PM** ***Identification of Clustering BRISK Keypoint Feature in Grocery Product Using the Elbow Method***

**Authors:** Rissa Rahmania and Maria Anggreainy (Bina Nusantara University, Indonesia); Iman Kartowisastro (BINUS University, Indonesia); Widodo Budiharto (Bina Nusantara University, Indonesia).

**Abstract:** In smart retail, the problem in grocery product image classification is fine-grained image representation. Product variants are characterized by differences in color, text, and size. However, while the process of image classification involves quite complex stages, there is still a misclassification of grocery products. This is because there are many areas of the image being calculated, which makes the models not optimally calculate the most important area. This paper aims to identify a number of patch image formations as an important area of the product by involving Binary Robust Invariant Scalable Keypoints (BRISK) as a feature descriptor, K-Means Clustering, and the elbow method. First, we experiment with the BRISK keypoint feature for grocery products with different categories of brands. Second, the keypoint features are clustered using K-Means clustering. Lastly, the number of clusters is analyzed using the elbow method to find the optimal number. The result shows that the number of clusters from 8 products has variations of 5, 5, and 6 clusters. Finally, each cluster represents an important area in forming patches to support fine-grained grocery product image classification.

**04:30 PM** ***Identification of Potential Harmful Drug-Drug Interactions Using Electronic Medical Records Text-Mining on Atherosclerotic Heart Disease Patient***

**Authors:** Mukhlis Fuadi (Institut Teknologi Sepuluh Nopember & Universitas Islam Negeri Maulana Malik Ibrahim Malang, Indonesia); Adhi Dharma Wibawa and Edwin Nugroho Njoto (Institut Teknologi Sepuluh Nopember, Indonesia); Ghulam Asrofi Buntoro (Institut Teknologi Sepuluh Nopember & Universitas Muhammadiyah Ponorogo, Indonesia).

**Abstract:** Atherosclerotic heart disease patients often exhibit comorbidities, leading to polypharmacy and a heightened risk of Drug-Drug Interaction (DDI). This study investigates the harmful potential of Drug-Drug Interactions (DDIs) in patients diagnosed with atherosclerotic heart disease using Electronic Medical Records (EMR) from a private hospital in the East Java region, Indonesia. The research employed a comprehensive methodology encompassing preprocessing, drug name extraction, mapping, and assessing concomitant medications by leveraging text-mining technology on 24,672 records. DDI identification is carried out based on the DDInter database. Based on 24,660 data that have been cleaned, 149 generic drugs were obtained, and 117 of them are available in the DDInter database. The findings revealed 33 DDIs at the major risk level among 117 drugs. Among those data, the DDIs found were 10.45% (2,577 records) at the major risk level, 46.80% (11,542 records) at the moderate risk level, and 44.78% (11,043 records) at the minor risk level. The prominent presence of major-risk and moderate-risk interactions underscores the significance of addressing DDIs in clinical practice. Healthcare services can be reinforced through education,

adopting computerized prescribing systems, and enhancing drug information dissemination to mitigate these risks. The results contribute valuable insights into the prevalence of DDIs in atherosclerotic heart disease patients, guiding efforts to improve patient safety and optimize pharmaceutical interventions.

**04:45 PM** *Loss-Based Decentralized Federated Learning for Robust IoT Intrusion Detection System*

**Authors:** Made Adi Paramartha Putra (Primakara University, Indonesia); Nengah Widya Utami (Universitas Primakara, Indonesia); I Gede Juliana Eka Putra (STMIK Primakara, Indonesia); Nyoman Karna, Tia Rahmawati and Rama Shiddiq (Telkom University, Indonesia); Ahmad Zainudin (Kumoh National Institute of Technology, Korea (South)); Gabriel Avelino R Sampedro (University of the Philippines, Philippines & Kumoh National Institute of Technology, Korea (South)).

**Abstract:** This research paper proposes a loss-based decentralized federated learning (FL) that supports collaborative learning mechanisms for Internet of Things (IoT) intrusion detection systems (IDS). Recent works in a similar field mainly focus on developing IDS systems via centralized learning approaches of Artificial Intelligence (AI), which require participants to forward their information. Another solution that has been introduced is utilizing FL with a centralized server, which successfully preserves participant privacy and reduces communication overhead. However, the threat of adopting centralized FL still remains. To mitigate the single point of failure, decentralized FL can be considered. We propose a mechanism that controls the aggregation flow in decentralized FL by introducing a loss-based approach in an independent and identically distributed (IID) environment. This method allows the system to train the model based on participants' losses. By utilizing this, the performance of the decentralized FL system can be improved as the bias from the learning process is reduced. The results show that the proposed loss-based decentralized FL is capable of preserving participant privacy while also improving the overall model performance with an F1-score of 80.04% under the CICIoT2023 dataset. It is worth noting that compared with traditional decentralized FL, the proposed system is able to deliver better performance, up to 7.83%.

**Tuesday, July 4, 2024 (03:00 PM – 05:00 PM)**

**Papers Presentation 3 – Online (Break Room 2)**

Papers	Authors
Inpainting-Based Anomaly Detection System with Self-Supervised Learning	Chia-Yu Lin (National Central University, Taiwan); Yi-Zhen Chen (Yuan Ze University, Taiwan).
POFM: Profit-Oriented Flow Management in SDN-Based Data Center Networks	You-Chiun Wang and Jhong-Ting Liang (National Sun Yat-Sen University, Taiwan).
Image Enhancement Using Deblur Generative Network and Deep Deblur Adversarial	Purbandini Purbandini (Institut Teknologi Sepuluh Nopember Surabaya, Indonesia & Universitas Airlangga, Indonesia); Chastine Faticah and Bilqis Amaliah (Institut Teknologi Sepuluh Nopember, Indonesia).
Image-Based Natural Disaster Classification with Deep Learning: A Comparative Analysis	Samuel Eka Alamsyah, Simen Ferdinand Djamhari, Salomo H Sudjono and Alexander Agung Santoso Gunawan (Bina Nusantara University, Indonesia); Karli Eka Setiawan (Binus University, Indonesia).
Spectral Gating for Noise Reduction in Speech Stress Recognition System	Barlian Henryranu Prasetio, Dahnil Syauqy, Syahrul Chilmi and Delfi Olivia Yusuf (Universitas Brawijaya, Indonesia).
LSTM Architecture Valuation in Recognizing Speech-Based Emotion	Noor S Halimah (Gadjah Mada University & UGM, Indonesia); Risanuri Hidayat (Gadjah Mada University (UGM), Indonesia); I Wayan Mustika (Universitas Gadjah Mada, Indonesia).
Mood Classification from Song Lyrics Using the Naive Bayes Algorithm, Support Vector Machine (SVM) and XGBoost	Mc Rore Rangga Punne, Indrabayu Indrabayu and Ingrid Nurtanio (Hasanuddin University, Indonesia).
Sentiment Analysis of Local Water Company Customer Using Naive Bayes Algorithm	Hanif Fakhurroja (National Research and Innovation Agency, Indonesia & Telkom University, Indonesia); Tasya Maeza Chiqamara, Faqih Hamami and Dita Pramesti (Telkom University, Indonesia).

**03:00 PM** *Inpainting-Based Anomaly Detection System with Self-Supervised Learning*

**Authors:** Chia-Yu Lin (National Central University, Taiwan); Yi-Zhen Chen (Yuan Ze University, Taiwan).

**Abstract:** Deep learning for defect detection has become a critical imperative in contemporary electronics manufacturing. We propose an inpainting-based anomaly detection system to identify defects without labeled defects. An image inpainting model, which discerns disparities between the original and restored versions of the defective image, is designed as the core of our methodology. To further address issues related to reconstructing asymmetric images with defects, we incorporate self-supervised learning (SSL) to extract a broader spectrum of features. In experiments, we compare the proposed method to state-of-art models based on MVTec open dataset. Our proposed method can reach a best performance of 97%, and surpasses the SOTA model by a margin of 57%.

**03:15 PM** *POFM: Profit-Oriented Flow Management in SDN-Based Data Center Networks*

**Authors:** You-Chiun Wang and Jhong-Ting Liang (National Sun Yat-Sen University, Taiwan).

**Abstract:** In a data center network (DCN), there are numerous hosts connected by well-organized switches, usually involving a large amount of data transmission to offer cloud services. How to manage flows in a DCN by deciding packet routes is critical. This paper applies the software-defined networking (SDN) technique to flow management in fat-tree DCNs. Unlike previous studies, we consider that flows have different values and associate flows with profits to reflect their values. The practical profit acquired from each flow will depend on the proportion of successfully sent packets. The paper proposes a profit-oriented flow management (POFM) scheme to maximize the profit obtained while reducing packet loss in flows. In POFM, once a link becomes congested, some flows on that link may be rerouted to other paths. When no alternative path can be found, POFM adjusts the data rates of flows on the congested link based on multiple factors, including their demanded rates, profits, and transmission durations. With simulations, we show that POFM can effectively raise the overall profit and decrease the packet loss rate in the DCN.

**03:30 PM** *Image Enhancement Using Deblur Generative Network and Deep Deblur Adversarial*

**Authors:** Purbandini Purbandini (Institut Teknologi Sepuluh Nopember Surabaya, Indonesia & Universitas Airlangga, Indonesia); Chastine Fatichah and Bilqis Amaliah (Institut Teknologi Sepuluh Nopember, Indonesia).

**Abstract:** The increased use of digital cameras has given rise to new challenges such as reduced image quality resulting in poor clarity or distortion, which can result in loss or unclarity of recorded information. To overcome this problem, deep learning-based approaches such as DeblurGAN and Deep Deblur have been developed for the clarity of blurry images. This research aims to compare the performance of the two approaches in the context of improving the clarity of blurry images. The research steps include collecting data from the GoPro dataset, dividing the data into training data and test data, analyzing the data using the DeblurGAN and Deep Deblur methods, and evaluating the results using Structural Similarity Index Measure (SSIM), Mean Square Estimation (MSE), and Peak Signal-to-Noise Ratio (PSNR). The evaluation results show that the DeblurGAN method achieves the best results with SSIM values of 0.958, MSE of 0.00057, and PSNR of 33.18. This shows that

DeblurGAN has better evaluation performance compared to Deep Deblur in improving the clarity of blurry images

**03:45 PM** *Image-Based Natural Disaster Classification with Deep Learning: A Comparative Analysis*

**Authors:** Samuel Eka Alamsyah, Simen Ferdinand Djahhari, Salomo H Sudjono and Alexander Agung Santoso Gunawan (Bina Nusantara University, Indonesia); Karli Eka Setiawan (Binus University, Indonesia).

**Abstract:** Natural disasters, including earthquakes, cyclones, floods, and wildfires, cause significant environmental damage and have emerged as a major global issue. With social media becoming a primary source of real-time information during such events, many images of these disasters are shared, though some may not be accurately labeled. Therefore, the purpose of this study is classifying natural disaster images, mainly cyclone, wildfire, flood, earthquake from social media images. This paper is to conduct a comparative analysis over 4 models namely VGG16, VGG19, EfficientNetB0, and ResNet-50. This paper uses a dataset that contains 4428 human-annotated images including cyclones, earthquakes, floods, and wildfires. Results concluded that ResNet-50 and EfficientNetB0 gives the best result with both got over 96% average accuracy. ResNet-50 delivers more stable and more convergent results compared to EfficientNetB0, but it delivers slightly less classification accuracy. VGG16 and VGG19 are both outclassed in terms of accuracy, but better in training time, with VGG19 having a more convergent result.

**04:00 PM** *Spectral Gating for Noise Reduction in Speech Stress Recognition System*

**Authors:** Barlian Henryranu Prasetyo, Dahnia Syauqy, Syahrul Chilmi and Delfi Olivia Yusuf (Universitas Brawijaya, Indonesia).

**Abstract:** In recent years, speech-based unconscious emotion (stress) recognition systems have been widely explored. The biggest challenge in recognizing emotions is signal distortion due to noise. This is because the process of collecting speech data is disturbed by the influence of the patient's response. Traditional methods of recognizing stressful emotions that only rely on fundamental frequencies in recognizing stress have proven to be less effective. Therefore, this paper proposes a new approach to stress emotion recognition based on audio signal denoising using a spectrum gating algorithm. The Mel-Frequency Cepstral Coefficient (MFCC) technique and the Convolutional Neural Network (CNN) method are used which support the Spectral Gating algorithm to adapt more efficiently to new data. Spectrum gates are able to eliminate noise at predetermined frequencies thereby improving signal quality and accuracy. The proposed system is embedded in a smartphone-based application to increase the flexibility of the measuring instrument. The effectiveness of the proposed system reaches 60%. By involving sound-based stress emotion measurement and noise reduction technology, this work contributes to the development of a more effective and reliable system in supporting mobile monitoring of mental health concerns.

**04:15 PM** *LSTM Architecture Valuation in Recognizing Speech-Based Emotion*

**Authors:** Noor S Halimah (Gadjah Mada University & UGM, Indonesia); Risanuri Hidayat (Gadjah Mada University (UGM), Indonesia); I Wayan Mustika (Universitas Gadjah Mada, Indonesia).

**Abstract:** Using Long Short-Term Memory Recurrent Neural Networks (RNN-LSTM) as a classification model can yield varied results. The objective of this research is to explore the effectiveness of LSTM as a classification model for speech emotion recognition (SER), and how its architecture influences accuracy. The study will compare various LSTM models with different layer and cell configurations using the TESS dataset. These models will be evaluated through univariate ANOVA, as well as ANOVA and correlation tests. Our results indicate that the number of LSTM cells has a significant impact on accuracy, while the number of layers does not. The LSTM model with 3 layers and 128 cells exhibited the highest accuracy, with a training accuracy of 0.991067469 and a test accuracy of 0.991071403.

**04:30 PM** *Mood Classification from Song Lyrics Using the Naive Bayes Algorithm, Support Vector Machine (SVM) and XGBoost*

**Authors:** Mc Rore Rangga Punne, Indrabayu Indrabayu and Ingrid Nurtanio (Hasanuddin University, Indonesia).

**Abstract:** Music has become an integral part of human daily life, with an increasing number of people listening to music through streaming applications. This study aims to analyze song extraction using natural language processing to obtain mood information. One of the main features used in the analysis process is song lyrics. We first conduct text preprocessing and use feature extraction methods such as TFIDF, Smoothed TF-IDF, ITC, and ITC Smoothed. Then, we perform lyric-based mood classification using machine learning classifiers such as Naïve Bayes, Support Vector Machine (SVM), and XGBoost algorithms. The results of this study indicate that the SVM algorithm outperforms several feature extraction methods. The best combination in terms of accuracy is the use of ITC Smoothed with the SVM algorithm, achieving an accuracy of 91.52%.

**04:45 PM** *Sentiment Analysis of Local Water Company Customer Using Naive Bayes Algorithm*

**Authors:** Hanif Fakhurroja (National Research and Innovation Agency, Indonesia & Telkom University, Indonesia); Tasya Maeza Chiqamara, Faqih Hamami and Dita Pramesti (Telkom University, Indonesia).

**Abstract:** The rapid evolution of technology has precipitated several transformations in the understanding of human life, including the widespread availability of diverse knowledge and solutions to previously acknowledged challenges. Researchers now harness the potential of Twitter, a social media platform, for conducting sentiment analysis studies aimed at elucidating feelings, attitudes, and public opinions. The employed processing technique takes the form of text mining. Furthermore, investigations were carried out utilizing the Naive Bayes Classifier algorithm, specifically focusing on Multinomial Naive Bayes. The experiment entailed utilizing imbalanced data and applying the Random Over Sampling method to both training and test data sets, with ratios ranging from 90:10 to 60:40. The assessment of the Naive Bayes algorithm revealed that the highest accuracy, reaching 76%, was achieved with a data distribution ratio of 80:20 for training and test data, coupled with random over sampling.

## Technical Sessions Day 2

Friday, July 05, 2024 (8:00 AM – 10:00 AM)

Papers Presentation 4 – Online (Breakout Room 1)

Papers	Authors
<i>A Neuro-Symbolic Learning System for Analyzing Listing Images in the Short-Term Rental Industry</i>	David Johnstone, Larbi Esmahi and M. Ali Akber Dewan (Athabasca University, Canada).
<i>Ensemble Method for System Failure Detection Using Large-Scale Telemetry Data</i>	Priyanka Mudgal and Rita H. Wouhaybi (Intel Corporation, USA).
<i>A Strategic Framework for Reducing Decision Bias in Driverless Car Object Detection</i>	Swarnamouli Majumdar (Zenext AI, Canada); Sonny Kirkley (Indiana University, USA).
<i>Aspect-Based Subjectivity Identification Using a BERT-Based Approach</i>	Hu Ng, Wing Kin Chong and Yu Zhang Chia (Multimedia University, Malaysia); Timothy Tzen Vun Yap (Heriot-Watt University, Malaysia); Vik Tor Goh and Lai-Kuan Wong (Multimedia University, Malaysia); Ian K.T. Tan (Heriot-Watt University, Malaysia & Innov8tif Solutions Sdn Bhd, Malaysia); Cher Dong Theng (SIRIM Berhad, Malaysia).
<i>Analyzing Nickel Stock Price Prediction: A Comparative Study of Long Short-Term Memory and Convolutional Neural Network Models</i>	Ferry Irwanto, Muhammad Farrell Hafizh Sasongko, Stevanus Febrian and Alexander Agung Santoso Gunawan (Bina Nusantara University, Indonesia); Karli Eka Setiawan (Binus University, Indonesia).
<i>Blockchain for Traceability and Security in Pharmaceutical Supply Chain</i>	Adinda Amalia Putri Abidin, Andry Alamsyah and Herry Irawan (School of Economic and Business Telkom University, Indonesia).
<i>Classification of Ripeness of Coffee Fruits Using Support Vector Machine Based on Computer Vision</i>	Clara Diva, Indrabayu Indrabayu and Ingrid Nurtanio (Hasanuddin University, Indonesia).
<i>Comparison LoRaWAN and Wi-Fi HaLow: Study Case for Smart Metering in Urban Area</i>	Delfin Daffa Pebrian (Institut Teknologi Telkom Purwokerto, Indonesia); Devita Rahma Safitri (Institut Teknologi Telkom Purwokerto, Indonesia); Fikri Nizar Gustiyana (Telkom University, Indonesia); Alfin Hikmaturokhman (Institut Teknologi Telkom Purwokerto, Indonesia); I Ketut Agung Enriko (Institut Teknologi Telkom Purwokerto & PT Telkom Indonesia, Indonesia).

**08:00 AM** *A Neuro-Symbolic Learning System for Analyzing Listing Images in the Short-Term Rental Industry*

**Authors:** David Johnstone, Larbi Esmahi and M. Ali Akber Dewan (Athabasca University, Canada).

**Abstract:** In this paper, we propose the automation of listing image related tasks in the short-term rental industry using neuro-symbolic AI system. The tasks performed by the system are the selection of main "hero" images from the pool of images available for each listing, and the recommendation of content-based image enhancement such as reducing clutter, incorporating accent colors, etc. Automating these tasks using approaches that rely exclusively on deep learning (end-to-end trained neural networks) are unable to produce accurate, explainable models due to two main issues: first, the lack of labelled training data available across the many segments (different geographical locations and listing types/sizes) that comprise the market. Second, the black box nature of neural networks makes it difficult to leverage knowledge that has been previously learnt and apply it to new rental market segments. To overcome these limitations, we used a hybrid system with a neural component for identifying features (symbols/objects) in images, and a symbolic component for reasoning over those symbols to produce a logic knowledgebase. The inclusion of a symbolic reasoning component produces a more explainable and market segment transferable model due to the creation of a knowledgebase that captures the abstract concepts amongst image features that drive listing click-through performance. This logic can be inspected, decomposed, and queried to produce explainable image recommendations, predict the image that will perform best in the market as hero images, and provide useful background knowledge when operating the system in new market segments.

**08:15 AM** *Ensemble Method for System Failure Detection Using Large-Scale Telemetry Data*

**Authors:** Priyanka Mudgal and Rita H. Wouhaybi (Intel Corporation, USA).

**Abstract:** The growing reliance on computer systems, particularly personal computers (PCs), necessitates heightened reliability to uphold user satisfaction. This research paper presents an indepth analysis of extensive system telemetry data, proposing an ensemble methodology for detecting system failures. Our approach entails scrutinizing various parameters of system metrics, encompassing CPU utilization, memory utilization, disk activity, CPU temperature, and pertinent system metadata such as system age, usage patterns, core count, and processor type. The proposed ensemble technique integrates a diverse set of algorithms, including Long Short-Term Memory (LSTM) networks, isolation forests, one-class support vector machines (OCSVM), and local outlier factors (LOF), to effectively discern system failures. Specifically, the LSTM network with other machine learning techniques is trained on Intel® Computing Improvement Program (ICIP) telemetry software data to distinguish between normal and failed system patterns. Experimental evaluations demonstrate the remarkable efficacy of our models, achieving a notable detection rate in identifying system failures. Our research contributes to advancing the field of system reliability and offers practical insights for enhancing user experience in computing environments.

**08:30 AM** *A Strategic Framework for Reducing Decision Bias in Driverless Car Object Detection*

**Authors:** Swarnamouli Majumdar (Zenext AI, Canada); Sonny Kirkley (Indiana University, USA).

**Abstract:** Bias in machine learning is a significant problem that demands industry-wide attention, and even more so in the case of computer vision applications. In the case of autonomous

cars, the issue is life or death. The debate is whether autonomous vehicles are safe, yet more likely to strike a pedestrian of color than a person of white skin color. The question is whether autonomous cars are safe, but more likely to run over a black or brown pedestrian than a white person. What is the safety benchmark for such a vehicle? To what extent are pedestrians expected to be struck by an AV? It is essential to obtain a greater understanding of the algorithmic bias that occurs during driving-centric object recognition. This research attempts to understand algorithmic bias that emerges during driving-centric object recognition. This project is opportune since several jurisdictions have recently permitted autonomous cars to run on public roads and several businesses are testing their AVs on public roads, often resulting in a notable number of fatalities. Autonomous systems are vulnerable to algorithmic bias because they do not need an active or passive person to identify and correct such biases. To reduce bias, design and implementation methodologies can be enhanced in accordance with new ethical norms. The aim is to continue efforts to reduce object detection bias that affects autonomous system decision-making to promote safety and increase technology adoption. Autonomous cars must evaluate safe operating options when a collision can't be prevented. This may persist due to the fluidity and unpredictability of human-automobile interactions. Artificial intelligence (AI) systems are biased because to their reliance on data, individuals, and model design. Data bias has been connected to obstacles associated with the deployment of ethical AI and has detrimental effects on underrepresented demographic groups. This study addresses training data bias, algorithmic processing bias, transfer context bias, and interpretation bias. The first two biases relate to the computational aspects of the problem. The latter two relate to the improper deployment of algorithms and autonomous systems. If the training data are condition-specific, the model cannot make precise judgments in the actual world. This research studies and reviews strategies that would mitigate object detection biases in an autonomous vehicle system, specifically whether several simple building blocks used for research-grade pedestrian detection have comparable ability to detect pedestrians with cognitive and physical disabilities.

**08:45 AM** *Aspect-Based Subjectivity Identification Using a BERT-Based Approach.*

**Authors:** Hu Ng, Wing Kin Chong and Yu Zhang Chia (Multimedia University, Malaysia); Timothy Tzen Vun Yap (Heriot-Watt University, Malaysia); Vik Tor Goh and Lai-Kuan Wong (Multimedia University, Malaysia); Ian K.T. Tan (Heriot-Watt University, Malaysia & Innov8tif Solutions Sdn Bhd, Malaysia); Cher Dong Theng (SIRIM Berhad, Malaysia).

**Abstract:** Aspect-based subjectivity analysis stands as an important task in natural language processing, seeking to identify the subjectivity of various aspects or features within a text. A new method for aspect-based subjectivity analysis using BERT is introduced in this paper. BERT has demonstrated impressive performance across various NLP tasks, and its capabilities are utilized to accurately ascertain the subjectivity of specific aspects within a given text. The approach involves fine-tuning BERT on a sizable dataset annotated with aspect-level subjectivity labels, enabling the model to grasp the subtleties of aspect-based subjectivity analysis. Extensive experiments on benchmark datasets are conducted to showcase the effectiveness of this approach and compare it with existing methods. The results reveal that this proposed approach surpasses state-of-the-art techniques in aspect-based subjectivity analysis, underscoring the potential of leveraging BERT for such purposes.

**09:00 AM** *Analyzing Nickel Stock Price Prediction: A Comparative Study of Long Short-Term Memory and Convolutional Neural Network Models*

**Authors:** Ferry Irwanto, Muhammad Farrell Hafizh Sasongko, Stevanus Febrian and Alexander Agung Santoso Gunawan (Bina Nusantara University, Indonesia); Karli Eka Setiawan (Binus University, Indonesia).

**Abstract:** This research delves to predict PT Vale Indonesia Tbk stock price as an experiment on Indonesian stock using three models: naïve, LSTM, and 1D-CNN. Our analysis emphasizes the importance of matching model architectures to data properties. We compare models' performance with five day window for predict one-day prediction output. Interestingly, the single-layer LSTM outperforms the 1D-CNN even with similar hyperparameters, showcasing its strength in capturing long-term temporal dependencies crucial for nickel prices. While the 1D-CNN excels at identifying short-term patterns, its limited receptive field hinders long-term dependence. Recognizing the potential of both models, we encourage exploring hybrid architectures combining LSTM and CNN strengths for further improvement in financial forecasting. The experiment result shows single-layer LSTM outperforms a 1D-CNN with similar settings.

**09:15 AM** ***Blockchain for Traceability and Security in Pharmaceutical Supply Chain***

**Authors:** Adinda Amalia Putri Abidin, Andry Alamsyah and Herry Irawan (School of Economic and Business Telkom University, Indonesia).

**Abstract:** Pharmaceutical plays an important role in healthcare. It ensures safe and quality patient care, focusing on tracking medication origins and expiration dates. However, limitations in the complex and non-transparent pharmaceutical supply chain ultimately allow the circulation of counterfeit or expired medicines. The circulation of counterfeit medicines has the potential to cause health problems for consumers and even death. Therefore, we harnessed blockchain technology's capability of detecting fraud and errors to improve safety and transparency in pharmaceutical supply chain. Additionally, it revolutionizes pharmaceutical supply chain management by combining security and transparency, enabling a decentralized network across manufacturers, distributors, pharmacists, doctors, and patients, ensuring patient data security and collaboration. The author conducted this research by reviewing the existing literature and observations, then proposed a blockchain-integrated model that allows stakeholders to track pharmaceutical information securely.

**09:30 AM** ***Classification of Ripeness of Coffee Fruits Using Support Vector Machine Based on Computer Vision***

**Authors:** Clara Diva, Indrabayu Indrabayu and Ingrid Nurtanio (Hasanuddin University, Indonesia).

**Abstract:** This research implements computer vision to detect and classify the ripeness level of coffee fruits. The main contribution of this research is to improve the image quality that is degraded due to blur caused by the movement of objects on the conveyor belt. Image quality restoration is done using a Wiener filter on images detected using the YOLOv4 model. This allows the classification performed using a Support Vector Machine to achieve higher accuracy. Experiments were conducted using coffee fruit images taken using a conveyor moving at 60rpm and 90rpm, using a Logitech Brio camera with a resolution of 1920x1080 pixels. The total image samples used were 300, of which 80% were used as training data. The experimental results show that the blurred image repair using Wiener filter produces a PSNR value of 27.25dB for the ripe class, 27.2dB for the semi-ripe class and 27.57dB for the unripe class, where the classification of the ripeness level of coffee fruit without using an improved image with an accuracy of 93.3% compared to the classification of the ripeness level of coffee fruit using an restoration image reaches an accuracy of 98.3%.

**09:45 AM**    **Comparison LoRaWAN and Wi-Fi HaLow: Study Case for Smart Metering in Urban Area**

**Authors:** Delfin Daffa Pebrian (Institut Teknologi Telkom Purwokerto, Indonesia); Devita Rahma Safitri (Institut Teknologi Telkom Purwokerto, Indonesia); Fikri Nizar Gustiyana (Telkom University, Indonesia); Alfin Hikmaturokhman (Institut Teknologi Telkom Purwokerto, Indonesia); I Ketut Agung Enriko (Institut Teknologi Telkom Purwokerto & PT Telkom Indonesia, Indonesia).

**Abstract:** The rapid growth of WiFi technology, predominantly driven by the IEEE 802.11 family of standards, particularly highlights the emergence of the 802.11ah standard tailored for the Internet of Things (IoT) era. This standard endeavors to furnish a cost-effective operational mode capable of servicing numerous devices per cell across expansive coverage areas. This study delves into the IEEE 802.11ah Standard Network Planning for IoT Applications, focusing on enhancing network quality in terms of capacity and coverage to bolster WiFi network efficacy for supporting IoT services. Through simulations conducted for Smart Meters in the Grand Wisata Bekasi Cluster Area, it's discerned that LoRaWAN Coverage Planning necessitates only one site to encompass the Smart Meters, while Wi-Fi HaLow Coverage Planning demands between 7 to 211 sites contingent on the modulation utilized. Examination of various parameters reveals that LoRaWAN maintains a consistent Average Effective Signal Analysis value across spreading factors at -74 dBm, with a stable Average Coverage by Signal Analysis value at -67 dBm. Conversely, Wi-Fi HaLow exhibits a spectrum of Average Effective Signal Analysis values for each modulation, ranging from -69 dBm to -34 dBm, alongside Average Coverage by Signal Analysis values spanning from -60 dBm to -34 dBm.

**Friday, July 05, 2024 (8:00 AM – 10:00 AM)**

**Papers Presentation 4 – Online (Breakout Room 2)**

Papers	Authors
<i>Impact of Data Heterogeneity on AI/ML Model Accuracy in Assisting Pneumonia Type Prediction</i>	Manasvi Pinnaka (IntelliScience Institute, USA); Krishnaveni Parvataneni (Massachusetts Institute of Technology, USA); Sohail Zaidi (San Jose State University, USA).
<i>Enhancing Autonomous Robotics Through Cloud Computing</i>	Arjun Subramaniam, Deep Prajapati, Khalifa Alremeithi and Winston Sealy (Purdue University, USA).
<i>Analysis of Industry 4.0 Barriers: A Fuzzy DEMANTEL Approach</i>	Kavitha R Gurralla and Sharuti Choudhary (Woxsen University, India).
<i>Comparison of Multiclass Classification and Topic Modeling to Identify Technology Acceptance in Popular E-Commerce in Indonesia Based on UTAUT3 Model</i>	Fikri Samal Yerzi, Dian Puteri Ramadhani and Andry Alamsyah (School of Economics and Business Telkom University, Indonesia).
<i>LoRaWAN and 6LoWPAN Simulations in Medium to Large-Scale IoT Applications</i>	Mark Godfrey F. Corbo, Herwin Jeff O. Bartolome, Gerome Hansen M. Panes, Elyris Mae Sanchez, Rafael Gerard C. Sanvictores and Josyl Mariela Rocamora Reyes (University of Santo Tomas, Philippines).
<i>People Counting and Gesture Recognition System Using Indoor Wi-Fi Sensing</i>	Aron G. Padua, Carlos John A. Dela Cruz, Giana Elise S. Miranda, Ram Cedric C. Surara and Josyl Mariela Rocamora Reyes (University of Santo Tomas, Philippines).
<i>Deep Feature Extraction of Pap Smear Images Based on Convolutional Neural Network and Vision Transformer for Cervical Cancer Classification</i>	Mohammad Sholik (Institut Teknologi Sepuluh Nopember, Indonesia & Universitas Telkom, Indonesia); Chastine Faticah and Bilqis Amaliah (Institut Teknologi Sepuluh Nopember, Indonesia).
<i>Designing and Developing a Portable Water Ionizer Using Internet of Things (IoT) with Battery Power and Portability Features</i>	Uke Kurniawan, Usman (JL Telekomunikasi no 1 Bandung & Telkom University, Indonesia); Antonio Abhinyano Mitto, Ekki Kurniawan and Hieronimus Mao Putra Koban (Telkom University, Indonesia).

**08:00 AM** *Impact of Data Heterogeneity on AI/ML Model Accuracy in Assisting Pneumonia Type Prediction*

**Authors:** Manasvi Pinnaka (IntelliScience Institute, USA); Krishnaveni Parvataneni (Massachusetts Institute of Technology, USA); Sohail Zaidi (San Jose State University, USA).

**Abstract:** Pneumonia is the fourth most common cause of mortality, resulting in more than 50,000 deaths in the U.S. alone every year. Cases of this respiratory infection have only been exacerbated by the COVID-19 pandemic as the virus tends to attack airways and gas exchange regions. The diagnosis of COVID-19 pneumonia depends on various factors,

including the severity as well as the type of the disease, which physicians attempt to determine preliminarily by analyzing chest X-ray scans. With the enormous amounts of X-ray data, one can utilize an automated procedure to identify the defects in scanned images that in conjunction other clinical diagnostics can lead to the verification of disease presence. Machine learning has emerged as a powerful tool to enable high-accuracy medical diagnostics. In the current work, various neural network algorithms, including the convolutional neural network (CNN), CNN+DenseNet121, CNN+EfficientNetB7, and CNN+ResNet50 were employed to classify chest X-ray images as one of the following diagnoses: Negative for COVID-19 pneumonia, Mild Atypical COVID-19 pneumonia, Moderate Atypical COVID-19 pneumonia, Severe Atypical COVID-19 pneumonia, Mild Indeterminate COVID-19 pneumonia, Moderate Indeterminate COVID-19 pneumonia, Severe Indeterminate COVID-19 pneumonia, Mild Typical COVID-19 pneumonia, Moderate Typical COVID-19 pneumonia, and Severe Typical COVID-19 pneumonia. The CNN, CNN+DenseNet121, CNN+EfficientNetB7, and CNN+ResNet50 models achieved training accuracies of 47.62%, 84.08%, 64.08%, and 74.30% and validation accuracies of 42.29%, 50.25%, 53.98%, and 43.28% respectively. Moderate classification performance across all four of the models suggests that data heterogeneity, particularly the presence of ten similar diagnostic scenarios, greatly limits the potential of machine learning in medical diagnostics. Nevertheless, data manipulations and advanced modeling are being studied further to overcome this barrier.

**08:15 AM** *Enhancing Autonomous Robotics Through Cloud Computing*

**Authors:** Arjun Subramaniam, Deep Prajapati, Khalifa Alremeithi and Winston Sealy (Purdue University, USA).

**Abstract:** This paper presents a comprehensive study on the integration of Cyber-Physical Systems (CPS) and the Industrial Internet of Things (IIoT), with a focus on cloud-based swarm robotics systems for virtual commissioning. Utilizing Pololu Romi robots equipped with Lidar sensors and leveraging advanced SLAM algorithms from ROS2, the research explores the enhancement of robotics autonomy and coordination through cloud computing. The study emphasizes the significance of digital twins in testing and refining swarm strategies, reducing operational risks and commissioning resources. The adoption of Docker and Portainer for efficient container orchestration and GitLab for a robust CI/CD framework underlines the application of cutting-edge methodologies in virtual commissioning. The paper highlights the practical implications of digital twins and containerization in industrial robotics, showcasing scalability and efficiency in swarm deployment. Moreover, it contributes to the discourse on cloud computing and IoT in advancing robotic autonomy. Through a systematic investigation, the paper outlines the technological architecture, virtual commissioning processes, and the operational effectiveness of the explored cloud-based swarm robotics system, marking a significant stride in the field of industrial automation and robotics.

**08:30 AM** *Analysis of Industry 4.0 Barriers: A Fuzzy DEMANTEL Approach*

**Authors:** Kavitha R Gurrula and Sharuti Choudhary (Woxsen University, India).

**Abstract:** The fourth Industrial Revolution (4th IR) i.e., Industry 4.0 features the deployment of extensive automation in the form of smart factories and smart machines facilitating improved information and data flows across the value chains. It facilitates the integration of intelligent digital technologies into the production processes for enhanced productivity, efficiency, flexibility, quality, transparency, intelligent decision making, and customization. Consequently, research has been embarked on studying the main elements of the 4th IR i.e., technology pillars (Autonomous Robots/Advanced Robotics,

Augmented Reality/Virtual Reality, Smart Sensors, Big Data Analytics/Machine Learning, Cloud Computing/Cognitive Computing/Edge Computing, Additive Manufacturing etc.), role of people within the highly automated environments, level of mass personalization/adaptability, sustainability performance, and the economic prospects. In this pursuit, a few studies also concentrated on listing common challenges associated with Industry 4.0 deployment within manufacturing systems. Nonetheless, a dearth of research is observed with regards to listing, comprehensive analysis, and prioritization of barriers towards the implementation of the 4th IR within small to medium-sized enterprises. Hence, this study aims at identifying and prioritizing an exhaustive set of barriers for successful deployment of Industry 4.0 within manufacturing systems through Fuzzy DEMANTEL Analysis towards making the manufacturing processes more intelligent, efficient, and precise.

**08:45 AM** *Comparison of Multiclass Classification and Topic Modeling to Identify Technology Acceptance in Popular E-Commerce in Indonesia Based on UTAUT3 Model*

**Authors:** Fikri Samal Yerzi, Dian Puteri Ramadhani and Andry Alamsyah (School of Economics and Business Telkom University, Indonesia).

**Abstract:** Technological advancements have streamlined many daily activities, transforming consumer shopping behaviors. A significant shift from traditional in-person shopping to e-commerce platforms has occurred due to the convenience and user-friendly features of online shopping. There has been a discernible preference for e-commerce in Indonesia, with Shopee and Tokopedia leading the market. Projections indicate a sustained increase in e-commerce adoption within the country from 2019 to 2028. The Unified Theory of Acceptance and Use of Technology 3 (UTAUT3) provides a contemporary framework for understanding the factors influencing e-commerce adoption, such as consumer reviews. This study explores the efficacy of multiclass classification and topic modeling methods in discerning technology acceptance patterns within user reviews on Shopee and Tokopedia. Employing the IndoBERT model for multiclass classification yielded a trained model with approximately 99% accuracy. Conversely, Latent Dirichlet Allocation (LDA) for topic modeling achieved optimal coherence at a five-topic structure. The research compared these methods' capabilities to extract insights from a substantial corpus of user reviews, comprising 253,742 from Shopee and 251,859 from Tokopedia, utilizing the UTAUT3 model as an analytical lens.

**09:00 AM** *LoRaWAN and 6LoWPAN Simulations in Medium to Large-Scale IoT Applications*

**Authors:** Mark Godfrey F. Corbo, Herwin Jeff O. Bartolome, Gerome Hansen M. Panes, Elyris Mae Sanchez, Rafael Gerard C. Sanvictores and Josyl Mariela Rocamora Reyes (University of Santo Tomas, Philippines).

**Abstract:** Some widely-used IoT protocols for short-range and long-range applications are IPv6 over Low-Power Wireless Personal Area Networks (6LoWPAN) and Long Range Wide Area Networks (LoRaWAN), respectively. 6LoWPAN runs on top of IEEE 802.15.4 and offers low resource consumption and high packet throughput, while LoRaWAN supports bigger-scale applications with fewer data rates. However, recent related works on 6LoWPAN and LoRaWAN typically focus on smaller systems (e.g., 3-7 nodes), which may lack further analysis for medium- and large-scale scenarios. In this paper, we compared the simulation performance of 6LoWPAN and LoRaWAN at a higher number of nodes arranged in a star topology in both low and high data rates. The results from the NS-3 simulator showed that

while LoRaWAN had lower latency values than 6LoWPAN, the latter consumed less energy on average and better throughput in our target scenarios. Overall, the evaluation of the simulation results shows that 6LoWPAN can perform just as well as LoRaWAN and can be deployed in medium to large-scale applications.

**09:15 AM** *People Counting and Gesture Recognition System Using Indoor Wi-Fi Sensing*

**Authors:** Aron G. Padua, Carlos John A. Dela Cruz, Giana Elise S. Miranda, Ram Cedric C. Surara and Josyl Mariela Rocamora Reyes (University of Santo Tomas, Philippines).

**Abstract:** This paper proposes a human activity recognition (HAR) system that detects the number of people and the corresponding gestures they are performing through Wi-Fi channel state information (CSI). Existing CSI-based gesture recognition (GR) systems are only limited to one person, while CSI-based crowd-counting (CC) systems do not detect gestures or human activity. The CSI data is collected using an off-the-shelf Raspberry Pi single-board computer (SBC) with Nexmon CSI firmware over four days with several person-gesture combinations and trials. Support vector machine (SVM) models with different kernels were trained using CSI data and performed well, particularly in the two-person gesture recognition scenario, with up to 93% accuracy.

**09:30 AM** *Deep Feature Extraction of Pap Smear Images Based on Convolutional Neural Network and Vision Transformer for Cervical Cancer Classification*

**Authors:** Mohammad Sholik (Institut Teknologi Sepuluh Nopember, Indonesia & Universitas Telkom, Indonesia); Chastine Fatichah and Bilqis Amaliah (Institut Teknologi Sepuluh Nopember, Indonesia).

**Abstract:** Cervical cancer is a cancer that women commonly experience. This cancer can be prevented if screening is carried out early using the pap smear method. The pap smear technique yields a subjective diagnosis. An appropriate decision-making method is needed to overcome this obstacle, such as using a computer-based diagnosis method and applying machine learning. We apply a combination of deep feature extraction using transfer learning from convolutional neural network models and vision transformers to obtain local and global features. Local and global features can represent an image's more comprehensive variety of features. The combined features are then reduced using two steps, principal component analysis, and linear discriminant analysis, to obtain a representation of the essential features of the data. The reduced features are then analyzed using several classifiers, including SVM, K-NN, MLP, and LR. The proposed framework was evaluated on three publicly accessible datasets, namely Herlev, Mendeley LBC, and SIPaKMeD, achieving classification accuracies of 97.83% (SVM, K-NN, MLP, and LR), 100% (SVM, K- NN, MLP, and LR), and 98.52% (SVM, K-NN, and LR) respectively.

**09:45 AM** *Designing and Developing a Portable Water Ionizer Using Internet of Things (IoT) with Battery Power and Portability Features*

**Authors:** Uke Kurniawan, Usman (JL Telekomunikasi no 1 Bandung & Telkom University, Indonesia); Antonio Abhinyano Mitto, Ekki Kurniawan and Hieronimus Mao Putra Koban (Telkom University, Indonesia).

**Abstract:** A portable water ionizer device has been developed as an innovative solution to provide access to healthy and high-quality water while on the move. This device utilizes six lithium-ion 18650 batteries arranged in series, with a maximum voltage of 25.2 Volts DC and a current capacity of 1500 mAh, as the primary power source for the water electrolysis process. Additionally, two series of 8.4 Volts DC batteries are employed to power the microcontroller and sensors. The total power required for all device components is

approximately 13.274 Watts, enabling the device to function for about 3 hours. Portability testing was conducted through a questionnaire involving 22 respondents. The majority of respondents, 15 out of 22, expressed that the device is easy to carry while traveling and demonstrates good portability. This can be attributed to its compact dimensions (17 cm x 13 cm x 37 cm) and relatively lightweight (1.5 kg when dry and 2.5 kg when filled with water). Another advantage of this device is its ability to operate without a connection to household electricity, making it a practical and easily transportable option for users on the move. The positive results from the portability testing affirm that the portable water ionizer device successfully meets desired portability standards. With its convenient design for transportability, this device can serve as an efficient and convenient solution for individuals who frequently travel and prioritize the quality of the water they consume.

**Friday, July 05, 2024 (10:00 AM – 11:45 AM)**

**Papers Presentation 5 – Online (Breakout Room 1)**

Papers	Authors
<i>Predicting Company Default Risks: A Machine Learning Perspective on Importance Features</i>	Fanes Hanestan (University of Bina Nusantara, Indonesia); Fritz Nathaniel (Bina Nusantara University, Indonesia); Raiyen Dewi Kusuma (Binus University, Indonesia); Alexander Agung Santoso Gunawan (Bina Nusantara University, Indonesia); Karli Eka Setiawan (Binus University, Indonesia).
<i>Sensitivity Analysis for Normal and Canonical Internal Descriptions of A Notch Digital Filter</i>	Yoichi Hinamoto (National Institute of Technology, Kagawa College, Japan); Akimitsu Doi (Hiroshima Institute of Technology, Japan).
<i>Neuromarketing Study of Purchase Decisions Using Advertising Videos Based on EEG Signal Analysis</i>	Bima Gerry Pratama and Adhi Dharma Wibawa (Institut Teknologi Sepuluh Nopember, Indonesia); Diah Wulandari (Institut Teknologi Sepuluh Nopember Surabaya, Indonesia); Stralen Pratasik (Institut Teknologi Sepuluh Nopember & Universitas Negeri Manado, Indonesia).
<i>Prediction of Organoleptic Score Based on Electronic Nose Dataset Using Bagging Algorithms</i>	Renaldi Dafa Saputra, Dedy Rahman Wijaya and Guntur Kusuma (Telkom University, Indonesia).
<i>BiLSTM Based Traffic Prediction for the Reduction of Energy Consumption on a Tri-Sector Radio Site of an EDGE Mobile Network</i>	Mahugnon Géraud Azehoun Pazou (National University of Sciences, Technologies, Engineering and Mathematics (UNSTIM) & COSIT BENIN LIMITED, Benin); Régis Donald Hontinfinde (UNSTIM & UR-Phoran, Benin); Raïssa Tchiboza Houessou, Aurel Agbodoyetin, Jean-Louis Comlan Fannou and Christian Djidjoho Akowanou (UNSTIM, Benin).
<i>Pre-Emptive Conflict Detection Architecture for O-RAN Service Management and Orchestration</i>	Joss Armstrong (Ericsson, Ireland); Enda Fallon (Technological University of the Shannon (TUS), Ireland); Sheila Fallon (Athlone Institute of Technology, Ireland).
<i>Parameter Reduction Optimisation for Analysis of E-Commerce Consumer Purchase Patterns</i>	Paul Connolly (Circana, Ireland & Technological University of the Shannon (TUS), Ireland); Kieran Flanagan (The NPD Group, L. P., Ireland); Enda Fallon (Technological University of the Shannon (TUS), Ireland).

**10:00 AM** *Predicting Company Default Risks: A Machine Learning Perspective on Importance Features*

**Authors:** Fanes Hanestan (University of Bina Nusantara, Indonesia); Fritz Nathaniel (Bina Nusantara University, Indonesia); Raiyen Dewi Kusuma (Binus University, Indonesia); Alexander Agung Santoso Gunawan (Bina Nusantara University, Indonesia); Karli Eka Setiawan (Binus University, Indonesia)

**Abstract:** The 2008 Global Financial Crisis was a devastating event for financial market investors worldwide, as it came unexpectedly and affected every financial market in the world, causing millions of people to suffer massive loss of value of their pension funds and assets. The trigger cause of this Global Financial Crisis was the default of Lehman Brothers, one of the biggest companies in the United States. This paper is intended to prevent this event from happening again by predicting the most important variables causing company default. So that company management and investors could take preventive measures when they see signs of these variables in their company. This experiment uses XGBoost, Support Vector Machine, and Random Forest machine learning model, with data retrieved from the Taiwan Economic Journal from 1999 to 2009. The experiment suggests the top 5 most important variables regarding company default are Continuous interest rate (after tax), Persistent EPS in the Last Four Seasons, Total debt/Total net worth, Interest Expense Ratio, and Net Value per Share, with an importance score of 0.447, 0.104, 0.038, 0.033, and 0.032, respectively. These findings show that features related to a company's profitability and liabilities have a strong impact on a company's risk of defaulting.

**10:15 AM** *Sensitivity Analysis for Normal and Canonical Internal Descriptions of A Notch Digital Filter*

**Authors:** Yoichi Hinamoto (National Institute of Technology, Kagawa College, Japan); Akimitsu Doi (Hiroshima Institute of Technology, Japan).

**Abstract:** This paper analyzes  $l_2$ -sensitivity for the internal descriptions (state-space models) of a 2nd-order recursive notch digital filter. To this end, a 2nd-order recursive notch digital filter is realized by a normal-form or canonical-form internal description. The  $l_2$ -sensitivity for each internal description is then analyzed to derive the  $l_2$ -sensitivity measure. Moreover, the  $l_2$ -sensitivity of the normal-form internal description is compared with that of the canonical-form counterpart by means of numerical experiments. The simulation results clarify that the normal-form internal description has much lower  $l_2$ -sensitivity than the canonical-form counterpart.

**10:30 AM** *Neuromarketing Study of Purchase Decisions Using Advertising Videos Based on EEG Signal Analysis*

**Authors:** Bima Gerry Pratama and Adhi Dharma Wibawa (Institut Teknologi Sepuluh Nopember, Indonesia); Diah Wulandari (Institut Teknologi Sepuluh Nopember Surabaya, Indonesia); Stralen Pratasik (Institut Teknologi Sepuluh Nopember & Universitas Negeri Manado, Indonesia).

**Abstract:** Advertising video is a form of marketing and advertising that uses video content to promote a product, service, brand, or message to a target audience. Neuromarketing seeks to elucidate how advertising video can influence customer purchasing decisions processed in the brain. Recently, researchers have extensively employed electroencephalogram (EEG) technology to analyze and record brain activities. This research focuses on comparing buy decisions and not-buy decisions based on EEG data after watching advertising videos. This research involved 30 volunteers to examine two types of video advertisements. A questionnaire was given regarding their purchasing decisions for these

two types of videos. The four EEG channels used were F7, F8, FP1, and FP2. EEG pre-processing was carried out to facilitate feature extraction. This research used Mean Absolute Value (MAV) and Shannon Entropy as feature extraction. The analysis was done on Beta and Gamma sub-bands. The result found that the MAV and Shannon Entropy value on the buy decision tends to be higher compared to the not-buy decision in all channels and all sub-bands. We also found that the average percentage difference between the buy decision and baseline condition is higher than the average percentage difference between the not-buy decision and baseline condition. This finding is adequate to show the different EEG patterns between buy decisions and not-buy decisions to be used in analyzing consumer decision-making processes.

**10:45 AM** *Prediction of Organoleptic Score Based on Electronic Nose Dataset Using Bagging Algorithms*

**Authors:** Renaldi Dafa Saputra, Dedy Rahman Wijaya and Guntur Kusuma (Telkom University, Indonesia).

**Abstract:** Tea quality, influenced significantly by aroma, is a key determinant of consumer satisfaction. This paper introduces a novel paradigm by integrating Electronic Nose (E-nose) technology with Bagging Algorithms to predict organoleptic scores in organic green teas. The study meticulously evaluates diverse regression models, focusing on hyperparameter optimization within the Bagging framework. Decision Tree Regressor and Random Forest emerge as robust models, showcasing exceptional predictive accuracy with low Mean Squared Error (MSE) and elevated R-squared values. Specifically, the Decision Tree Regressor exhibits remarkable proficiency in capturing intricate dataset patterns, while the Random Forest's ensemble approach mitigates overfitting, ensuring reliable predictions in complex scenarios. In contrast, Support Vector Regressor (SVR) and Linear Regression struggle, emphasizing the necessity for models adaptable to non-linear relationships. This research underscores the efficacy of Bagging Algorithms, particularly Decision Tree-based ensembles, in predicting organoleptic scores, offering insights crucial for model selection in regression tasks. Beyond methodology, the implications extend to the tea industry, where these models promise to revolutionize quality control and production optimization. This study represents a pioneering advancement in leveraging Bagging Algorithms for precise and efficient tea quality assessment, aligning with the ongoing quest for excellence in the tea industry.

**11:00 AM** *BiLSTM Based Traffic Prediction for the Reduction of Energy Consumption on a Tri-Sector Radio Site of an EDGE Mobile Network*

**Authors:** Mahugnon Géraud Azehoun Pazou (National University of Sciences, Technologies, Engineering and Mathematics (UNSTIM) & COSIT BENIN LIMITED, Benin); Régis Donald Hontinfinde (UNSTIM & UR-Phoran, Benin); Raïssa Tchiboza Houessou, Aurel Agbodoyetin, Jean-Louis Comlan Fannou and Christian Djidjoho Akowanou (UNSTIM, Benin).

**Abstract:** In this article, the performance of the BiLSTM prediction model was carried out to estimate the traffic of an EDGE mobile network. Mean absolute error (MAE) and root mean square error (RMSE) are used to evaluate the model. An optimization algorithm based on the proposed model was developed for the reduction of energy consumption on a tri-sector radio site without affecting the quality of service required by the telecommunications operator. The obtained results show a reduction in energy consumption of approximately 17% on a tri-sector radio site. Furthermore, considering only the hours of low traffic (01 a.m.-07 a.m.), this reduction in energy consumption is very significant and is around 50%.

**11:15 AM** *Pre-Emptive Conflict Detection Architecture for O-RAN Service Management and Orchestration*

**Authors:** Joss Armstrong (Ericsson, Ireland); Enda Fallon (Technological University of the Shannon (TUS), Ireland); Sheila Fallon (Athlone Institute of Technology, Ireland).

**Abstract:** The evolution of telecommunications networks from closed to open architectures has led to the development of the Open Radio Access Network (O-RAN) standard. O-RAN's Service Management and Orchestration (SMO) typically contains multiple autonomic management agents that simultaneously make configuration changes to optimize aspects of the network. Dealing with competing and conflicting configuration changes from these autonomic management agents remains a major issue. This paper proposes an extension to the O-RAN SMO architecture to incorporate a component that can predict when configuration changes are likely to degrade network performance. The purpose of this approach is to safeguard the actions taken by the management agents against unintended effects. The approach involves the use of two levels of clustering based on cell similarity and cell configuration. The results consist of predictions of network performance degradation based on statistical correlation with network performance.

**11:30 AM** *Parameter Reduction Optimisation for Analysis of E-Commerce Consumer Purchase Patterns*

**Authors:** Paul Connolly (Circana, Ireland & Technological University of the Shannon (TUS), Ireland); Kieran Flanagan (The NPD Group, L. P., Ireland); Enda Fallon (Technological University of the Shannon (TUS), Ireland).

**Abstract:** This research seeks to use parameter reduction optimization to improve the understanding of consumer behavior gained from Association Rule mining where the density of the data set is low. Low density occurs where small basket sizes are the norm, where very few and frequently only single items are purchased in each transaction and when there are large numbers of items being tracked across large numbers of transactions. The objective is to understand and optimize the aggregation levels that will provide consumer behavior insights of sufficient quality to the holders of relevant data sets. To achieve this goal, we analyze a publicly available dataset using a time-series Association Rule analysis for multiple time-period baskets contained in the dataset and at multiple item categorization levels with a view to optimizing the support levels of the output association rules. Purchases per consumer are viewed across days, weeks months and quarters to determine more suitable periods for analysis. The strength of the relationships is increased by also analyzing the data at the item category level where all items of a given category are correlated. We observe that increases to the support of the generated rules sets can be achieved, and that increase is dependent on the level at which the analysis is performed.

**Friday, July 05, 2024 (10:00 AM – 11:45 AM)**

**Papers Presentation 5 – Online (Breakout Room 2)**

Papers	Authors
<i>Improvement Monocular ORB SLAM for Indoor Drone 3D Localization Using Inertial Navigation System</i>	Riza Agung Firmansyah, Ronny Mardiyanto and Tri Sardjono (Institut Teknologi Sepuluh Nopember, Indonesia).
<i>T5-Based Named Entity Recognition for Social Media: A Case Study for Location Extraction</i>	Ahmad Faisal Dahlan (King Mongkut's Institute of Technology Ladkrabang, Thailand).
<i>Stock Price Prediction Using Technical Data and Sentiment Score</i>	Angga Kurniawan, Indrabayu Indrabayu and Mukarramah Yusuf (Hasanuddin University, Indonesia).
<i>Multi-UAV Employed Secure Product Management and Surveillance System in Industry 4.0 Using Blockchain</i>	Md. Masduzzaman (Postdoctoral Research Fellow at Kumoh National Institute of Technology, South Korea, Korea (South)); Syed Muhammad Raza (Research Assistant at Kumoh National Institute of Technology, Korea (South)); Soo Young Shin (Kumoh National Institute of Technology, Korea (South)).
<i>Predicting Green Tea Organoleptic Scores Based on Electronic Nose Dataset Using Boosting Algorithms</i>	Muhammad Hanif Aulia Rasyid, Dedy Rahman Wijaya and Guntur Kusuma (Telkom University, Indonesia).
<i>Study on Effects of Line Coding and Power Variations on the Uplink Scheme of 8-Channel WDM-FSO HAP for 5G Applications</i>	Valerie Olive Suryono (Universitas Indonesia, Indonesia); Yus Natali (Universitas Telkom, Indonesia); Catur Apriono (Universitas Indonesia, Indonesia).
<i>Deep Learning Method for Multi-Class Face-Mask Classification in Real-Time</i>	Saurin Parikh, Deepika Shukla, Jainish Parekh and Madhav Kotak (Nirma University, India).

**10:00 AM** ***Improvement Monocular ORB SLAM for Indoor Drone 3D Localization Using Inertial Navigation System***

**Authors:** Riza Agung Firmansyah, Ronny Mardiyanto and Tri Sardjono (Institut Teknologi Sepuluh Nopember, Indonesia).

**Abstract:** 3D localization for indoor drones has challenges due to poor GPS signals caused by building structures. One of popular solution to this problem is to use Monocular ORB SLAM. However, Monocular ORB SLAM is highly dependent on RGB image quality. The accuracy of monocular ORB SLAM will decrease if the input image is dark or blurry, resulting in loss of feature tracking. Missing feature tracking causes position estimation to be inaccurate. To solve this problems, Monocular ORB SLAM will combine with an Inertial Navigation System (INS) to estimate the drone's position when feature tracking fails. INS estimates the drone's speed based on linear acceleration data and estimates the drone's heading based on absolute orientation data. Orientation data is obtained from the drone's built-in Inertial Measurement Unit sensor. In this research, the algorithm for determining pose estimation changes using Monocular ORB SLAM and INS is called

ORB+INS Switch. ORB+INS Switch has smaller absolute errors than Monocular ORB SLAM or INS independently. In the feature tracking loss condition, Monocular ORB SLAM has a total position error (TPE) 4.933 m, and ORB+INS Switch has a TPE of 1.008 m. To compare absolute heading error (AHE) values, Monocular ORB SLAM has a more excellent AHE value  $16,97^\circ$ , compared to ORB+INS, which has an AHE value  $7,01^\circ$ .

**10:15 AM** *T5-Based Named Entity Recognition for Social Media: A Case Study for Location Extraction*

**Authors:** Ahmad Faisal Dahlan (King Mongkut's Institute of Technology Ladkrabang, Thailand).

**Abstract:** Social media serves as a valuable source of real-time information. Accurate and efficient location name extraction from social media text can significantly enhance response efforts to such events. This study evaluates the performance of the T5 and SpaCy models for extracting location names from social media text. The results demonstrate that the T5 model significantly outperforms SpaCy, achieving 95% and 93% accuracy in training and testing, respectively, compared to 45% and 41% for SpaCy. The T5's superiority stems from its Transformer architecture and extensive pre-training, which enable it to handle complex language patterns and indirect location references. SpaCy, on the other hand, struggles with diverse location representations and non-local text patterns due to its reliance on Convolutional Neural Networks (CNNs).

**10:30 AM** *Stock Price Prediction Using Technical Data and Sentiment Score*

**Authors:** Angga Kurniawan, Indrabayu Indrabayu and Mukarramah Yusuf (Hasanuddin University, Indonesia).

**Abstract:** An investor often uses technical and sentiment analysis to predict stock prices before determining investment decisions. Technical analysis can generally predict short-term stock prices but cannot predict long-term stock prices, partly because it does not consider market sentiment. Combining technical and sentiment analysis is an excellent way to solve this problem. It has been tried in several studies, but the previously proposed methods still need to be improved and can still be developed. This paper presents a long-term stock price prediction based on technical and sentiment analysis using the BERT algorithm modified in the feed-forward layer using sigmoid activation. In contrast, technical analysis uses the LSTM and XGBoost algorithms. The proposed model is compared with previous research to determine the success of using sentiment scores in stock prediction. The modified BERT model obtained an accuracy of 92.73%. On the other hand, BERT-LSTM, BERT-XGBoost, and the LSTM models evaluated using MAE, RMSE, MSE, and MAPE metrics showed satisfactory results.

**10:45 AM** *Multi-UAV Employed Secure Product Management and Surveillance System in Industry 4.0 Using Blockchain*

**Authors:** Md. Masduzzaman (Postdoctoral Research Fellow at Kumoh National Institute of Technology, South Korea, Korea (South)); Syed Muhammad Raza (Research Assistant at Kumoh National Institute of Technology, Korea (South)); Soo Young Shin (Kumoh National Institute of Technology, Korea (South)).

**Abstract:** One of the significant challenges in Industry 4.0 is delivering secure data management during pre- and post-production. Furthermore, surveillance in restricted areas is also crucial since individuals can forfeit or seize the products in various circumstances. Therefore, using unmanned aerial vehicles (UAVs) can create new opportunities to

improve surveillance and product management in Industry 4.0. This paper presents a multi-UAV-employed secure data management and surveillance system to overcome the above-mentioned challenges in Industry 4.0. Firstly, an inventory data management UAV-based automated product counting technique is developed using the radio frequency identification technique to avoid human involvement in production storage. Moreover, a surveillance UAV-based person detection technique using a deep learning (DL) model is proposed to detect humans in restricted areas. Additionally, blockchain-based secure product tracking techniques using a multi-access edge computing (MEC) server are utilized to provide integrity in the overall Industry 4.0 environment. The experimental result shows that the proposed UAV-based secure product management is efficacious for using the MEC server in the network in terms of latency analysis. Moreover, the surveillance UAV can successfully detect the person using the You Only Look Once (YOLOv8-small) DL model with higher accuracy.

**11:00 AM** *Predicting Green Tea Organoleptic Scores Based on Electronic Nose Dataset Using Boosting Algorithms*

**Authors:** Muhammad Hanif Aulia Rasyid, Dedy Rahman Wijaya and Guntur Kusuma (Telkom University, Indonesia).

**Abstract:** This research paper combines Electronic Nose (E-Nose) and artificial intelligence to predict tea quality based on aroma. The data used is the green tea quality label from the Gambung green tea and quinine research centre, including the Organoleptic Score. We perform Hyperparameter Optimization (HPO) for several machine learning algorithms, including XGBoost, K-Nearest Neighbors, Decision Tree, and AdaBoost. The results show XGBoost as a superior algorithm with excellent R2 and MSE values, demonstrating its ability to model tea quality from aroma. Scatter plot analysis shows a consistent pattern in XGBoost, while K-Nearest Neighbors shows a good level of prediction. However, Decision Tree shows significant variation, and AdaBoost shows more varied predictions. These results prove XGBoost's ability to be the best algorithm in predicting tea quality based on aroma, including the Organoleptic Score. In conclusion, this study highlights the importance of using E-Nose and artificial intelligence to determine tea quality objectively through aroma.

**11:15 AM** *Study on Effects of Line Coding and Power Variations on the Uplink Scheme of 8-Channel WDM-FSO HAP for 5G Applications*

**Authors:** Valerie Olive Suryono (Universitas Indonesia, Indonesia); Yus Natali (Universitas Telkom, Indonesia); Catur Apriono (Universitas Indonesia, Indonesia).

**Abstract:** This study discusses the Wavelength Division Multiplexing-based Free-Space Optics (WDM-FSO) communication system over HAPs for 5G applications. It aims to evaluate the potential of this system in meeting the need for reliable 5G connectivity. Through simulations using OptiSystem, the research explores the implementation of HAPs with a focus on uplink connectivity between ground stations and HAPs. The study examines the influence of line coding, transmission power, atmospheric conditions, and altitude on the Bit Error Rate (BER) and system quality factor. The results show that RZ line coding is effective in altitude variations, while NRZ is better in weather variations. However, power variations do not show significant changes in line coding. This research illustrates the potential of WDM-FSO technology on HAPs to support reliable wireless connectivity in the future.

**11:30 AM** *Deep Learning Method for Multi-Class Face-Mask Classification in Real-Time*

**Authors:** Saurin Parikh, Deepika Shukla, Jainish Parekh and Madhav Kotak (Nirma University, India).

**Abstract:** The paper presents a real-time face mask detection system employing MobileNet through transfer learning. The main novelty of the paper is to even detect faces with improperly worn masks. In the context of the COVID-19 pandemic, the importance of adhering to safety measures, such as wearing face masks has become important and hence, this research provides a valuable contribution to ensuring public health. The approach combines the power of RetinaNet used for face detection and localization with MobileNet for efficient and accurate mask wearing-style classification.

The proposed system showcases promising results in terms of speed and accuracy, demonstrating its potential for practical deployment in various settings where face-mask compliance is crucial, such as airports, healthcare facilities, and public transportation hubs. This innovative approach to real-time face mask detection through the fusion of RetinaNet and MobileNet opens new avenues for efficient and effective monitoring of safety protocols. The work achieves multi-class classification of images into with-mask, without-mask, and incorrectly-worn mask with an accuracy of 85%.

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- 264 Dr. Max Hashem Eiza (Liverpool John Moores University, United Kingdom (Great Britain))
- 265 Dr. Md. Masuduzzaman (Postdoctoral Research Fellow at Kumoh National Institute of Technology, South Korea, Korea (South))
- 266 Dr. Mera Kartika Delimayanti (Politeknik Negeri Jakarta (PNJ), Indonesia)
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- 326 Dr. Srinivasa Rao Balasani (Prasad Institute of Technology, India)
- 327 Dr. Sritrusta Sukaridhoto (Politeknik Elektronika Negeri Surabaya, Indonesia)
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- 343 Dr. Vasilis Friderikos (King's College London, United Kingdom (Great Britain))
- 344 Dr. Wahmisari Priharti (Telkom University, Indonesia)
- 345 Dr. Watcharapan Suwansantisuk (King Mongkut's University of Technology Thonburi, Thailand)
- 346 Dr. Wei Zhan (Texas A&M University, USA)
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- 350 Dr. Wiseto Agung (ARS University, Indonesia)

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- 356 Dr. Zeeshan Kaleem (COMSATS University Islamabad, Wah Campus, Pakistan)
- 357 Dr. Zuhanis Mansor (University of Kuala Lumpur British Malaysian Institute (UniKL-BMI), Malaysia)

**Reviewer:**

- 1 Prof. A K Saini (The ICFAI University, Jaipur, India)
- 2 Prof. Achmad Rizal (Telkom University, Indonesia)
- 3 Prof. Anand Nayyar (Duy Tan University, Vietnam)
- 4 Prof. Andriyan B. Suksmono (Bandung Institute of Technology, Indonesia)
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- 112 Dr. Husneni Mukhtar (Telkom University, Indonesia)
- 113 Dr. Indra Adji Sulistijono (Politeknik Elektronika Negeri Surabaya (PENS), Indonesia)
- 114 Dr. Iouliia Skliarova (University of Aveiro, Portugal)
- 115 Dr. Istikmal Istikmal (Telkom University, Indonesia)
- 116 Dr. István GÜdor (Ericsson Research, Hungary)
- 117 Dr. Jad Nasreddine (i2CAT Foundation, Spain)
- 118 Dr. Janus Heide (Steinwurf, Denmark)
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- 131 Dr. Marwan Nafea (University of Nottingham Malaysia, Malaysia)
- 132 Dr. Mas Rina Mustaffa (Universiti Putra Malaysia, Malaysia)
- 133 Dr. Md. Masuduzzaman (Postdoctoral Research Fellow at Kumoh National Institute of Technology, South Korea, Korea (South))
- 134 Dr. Mera Kartika Delimayanti (Politeknik Negeri Jakarta (PNJ), Indonesia)
- 135 Dr. Michael McGuire (University of Victoria, Canada)
- 136 Dr. Mohammad Khaja Shaik (St. Ann's College of Engineering and Technology Chirala AP India, India)
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- 162 Dr. Srinivasa Rao Balasani (Prasad Institute of Technology, India)
- 163 Dr. Stefan Mangold (Lovefield Wireless GmbH, Switzerland)
- 164 Dr. Suppakarn Chansareewittaya (Mae Fah Luang University, Thailand)
- 165 Dr. Suyoto (Lembaga Ilmu Pengetahuan Indonesia, Indonesia)
- 166 Dr. Syamsul Rizal (Telkom University, Indonesia)
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- 181 Dr. Zuhanis Mansor (University of Kuala Lumpur British Malaysian Institute (UniKL-BMI), Malaysia)