IPB University
Bogor Indonesia

UPM
UNIVERSITI PUTRA MALAYSIA

PROGRAM BOOK

INTERNATIONAL SYMPOSIUM

COMPUTER SCIENCE FOR SMART AGRICULTURE, EDUCATION AND MEDICAL (CSSAEM)

PERSPECTIVE FROM INDONESIA AND MALAYSIA

30 May 2023
08:30 to 15:30 GMT+7

FMIPA IPB Auditorium and
Zoom Meeting

cssaem.apps.cs.ipb.ac.id

International Symposium Computer Science for Smart Agriculture, Education and Medical
Bogor, Indonesia, 30 May 2023

Program Book

International Symposium Computer Science for Smart Agriculture, Education and Medical (CSSAEM)

Perspective from Indonesia and Malaysia

Tuesday, 30 May 2023, Pkl 08.30 – 15.30 Jakarta Time

Venue: FMIPA IPB Auditorium and Zoom Meeting

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Assoc. Prof. Dr. Masnida Husin (UPM)

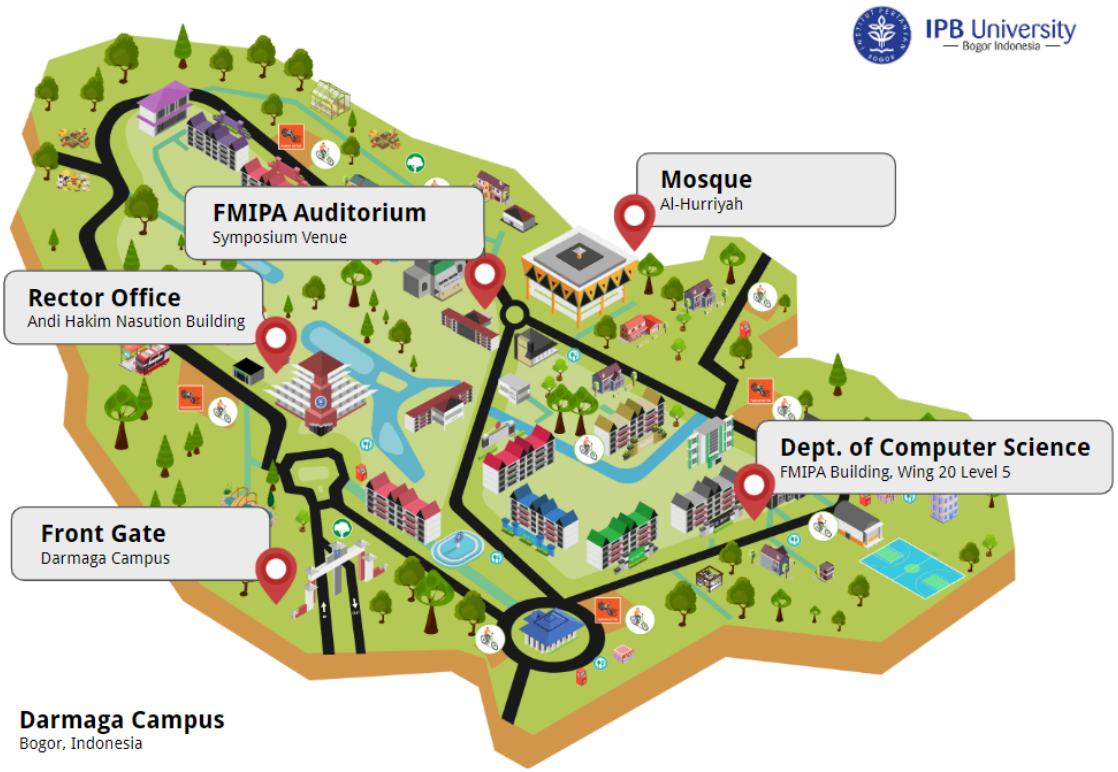
Assoc. Prof. Dr. Azizol Hj Abdullah (UPM)

IPB University and Universiti Putra Malaysia Collaboration

MoA Signing, Universiti Putra Malaysia, 2 December 2019

Universiti Putra Malaysia (UPM) and Institut Pertanian Bogor (IPB), Indonesia have initiated cooperation in a Memorandum of Agreement (MoA) signing ceremony at the Faculty of Computer Science and Information Technology, UPM. The signing ceremony was witnessed by the Vice-Chancellor (Research and Innovation), Prof. Dr. Zulkifli Idrus. The delegates from Indonesia were Prof. Dr. Agus Buono, Dr. Imas Sukaesih Sitanggang, Dr. Sri Wahjuni, and Auzi Asfarian. Through the MoA, UPM, and IPB will cooperate through sharing of expertise, knowledge, research, and organization.

Symposium Venue and Information Sheet



Interactive Map: campustour.ipb.ac.id

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Symposium Program

Time	Agenda
08.30 – 09.00	Registration
09.00 – 09.15	Opening Speech by Dean of Faculty of Mathematics and Natural Science, IPB University Dr. Berry Juliandi, S.Si., M.Si
09.15 – 09.30	Speech by Faculty of Computer Science and Information Technology, Universiti Putra Malaysia (UPM) Prof. Madya Dr. Razali Yaakob
09.30 – 09.50	Coffee break
	Session 1 Moderator: Assistant Professor Auzi Asfarian, S.Komp., M.Kom.
09.50 – 10.10	Keynote 1: **The Necessity for Copyright and Patent Protection for the Research Output Arises as the Focus of Research Shifts from Fundamental to Applied, with an Eye Toward Pre-Commercialization** *Prof. Dr. Rahmita Wirza O.K. Rahmat* *Faculty of Computer Science and Information Technology, UPM*
10.10 – 10.30	Keynote 2: **The Significance of Building Undergraduates' Self-confidence and the Activities that Go Along with it** *Dr. Hizmawati Madzin* *Faculty of Computer Science and Information Technology, UPM*
10.30 – 10.50	Keynote 3: **Empowering Rural Education of Malaysia's Lower Income School Children from the Agricultural Sector : Insights on the Concept and Funding** *Dr. Noris Norowi* *Faculty of Computer Science and Information Technology, UPM*
10.50 – 11.20	Discussion
11.20 – 11.40	Certificate and token appreciation for speakers of session 1 Group Photo
11.40 – 12.00	Poster Session (Hybrid and recording presenters)

Time	Agenda
12.00 – 13.30	Break
	Session 2 Moderator: Dr. Mushthofa, S.Kom, M.Sc
13.30 – 13.50	Keynote 4: **Machine Learning in Agriculture (Case study: Garlic Field Classification)** Prof. Dr. Imas Sukaesih Sitanggang. S.Si., M.Kom. Computer Science Department, IPB University
13.50 – 14.10	Keynote 5: **IoT System Development for Smart Agriculture: Recent Advances in IPB University** Dr. Ir. Sri Wahjuni, MT Computer Science Department, IPB University
14.10 – 14.30	Keynote 6: **The Role of Software Engineering in Building the Digital Village Ecosystem** Dr. Yani Nurhadryani, S.Si, MT Computer Science Department, IPB University
14.30 – 15.00	Discussion
15.00 – 15.10	Certificate and token appreciation for speakers of session 2
15.10 – 15.30	Closing by Head of Department of Computer Science, IPB University Photo Group
15.30 - 16.15	Discussion on future collaboration and grant co-application
16.15 - 17.00	IPB campus tour

Online Presentation Program

Pre-recorded presentations are available at Ilmu Komputer IPB YouTube Channel. Kindly watch the video you found interesting and give feedback through comments.

- CSSAEM 2023 Presentation: Smart Agriculture Track
  https://ipb.link/cssaem-agriculture
- CSSAEM 2023 Presentation: Smart Education Technology Track
  https://ipb.link/cssaem-education
- CSSAEM 2023 Presentation: Smart Health Information Technology Track
  https://ipb.link/cssaem-health

Track: Smart Agriculture (AGRI)

No	Presenter	Title	Institution
01	Dr. Nor Azura Husin	Time-Series Forecasting Model for The Risk Management System	UPM
02	Assoc. Prof. Dr. Puteri Suhaiza Sulaiman	Formulating Ground Normalized Difference Vegetation Index (G-NDVI) for Detecting Stressed Crops	UPM
03	Dr. Normalia Samian	Reshaping Food Security and Farm Production using Internet of Things (IoT) and Blockchain	UPM
04	Assoc. Prof. Ts. Dr. Masnida Hussin	Designing of Edge Infrastructure for Cost-Effective Signal Transmission in Palm Oil Field	UPM
05	Dr. Ng Seng Beng	IOT-enabled Interactive Aquaponics to Raise Awareness among Younger Generations	UPM
06	Assoc. Prof. Dr. Azizol Hj Abdullah	Detecting Wormhole Attack in Environmental Monitoring System for Agriculture using Deep Learning	UPM
07	Assoc. Prof. Dr. Fatimah Khalid	Herbs Image Classification using Transfer Learning and Fine Tuning Deep Learning Models	UPM
08	Ts. Dr. Nurul Amelina Nasharuddin	Non-Parametric Machine Learning for Pollinator Image Classification: A Comparative Study	UPM

No	Presenter	Title	Institution
09	Dr. Noris Norowi	Sound Analysis for Paddy Pests Control	UPM
10	Dr. Eng. Heru Sukoco, S.Si., M.T.	Smart Livestock Management System for Livestock Smallholder Communities in Indonesia	IPB
11	Dr. Sony Hartono Wijaya, SKom, MKom	Systematization of Indonesian Herbal Medicine using Data-Intensive Science and Machine Learning Approach	IPB
12	Dr. Yeni Herdiyeni, S.Si., M.Kom	Smart Health Monitoring System for Rubber Plantation	IPB
13	Ir. Meuthia Rachmaniah, M.Sc.	One Indonesian Agricultural Data - Challenges and Opportunities	IPB
14	Auriza Rahmad Akbar, SKomp MKom	Low Power Air Quality Monitoring IoT System based on ESP8266 with Deep-Sleep Method	IPB
15	Dr. Hari Agung Adrianto, S.Si., M.Kom	Groundwater Level Monitoring System on Peatland using IoT and R Shiny Cloud	IPB
16	Dr. Shelvie Nidya Neyman, S.Kom, M.Si	Framework Cyber Security for IOT System	IPB
17	Dr. Karlisa Priandana, S.T., M.Eng.	Development of Intelligent Irrigation System for Paddy Field in Indonesia	IPB
18	Endang Purnama Giri, S.Kom., M.Kom.	Digital Watermarking for Shape File Data Protection	IPB
19	Irman Hermadi, PhD.	Smart Algae Pond	IPB
20	Muhammad Asyhar Agmalaro, S.Si, M.Kom	Image Reconstruction on EIT CT-Scan with Tropical Fruit Phantom Resistor Object	IPB
21	Medria Kusum Dewi Hardhienata, S.Komp., Ph.D	Bio-Inspired Computing Approach for Solving Multi-Agent Task Allocation Problem in Indoor Farming	IPB

No	Presenter	Title	Institution
22	Lailan Sahrina Hasibuan, SKom, MKom	Analysis of Synthetic Minority Oversampling Technique (SMOTE) implementation on Support Vector Machine (SVM) performance	IPB

Track: Education Technology (EDU)

No	Presenter	Tittle	Institution
01	Prof. Dr. Rahmita Wirza O.K. Rahmat	Interactive and Integrated AR Flipped Classroom to Influence Medical students' Experience and Learning Performance	UPM
02	Ts. Dr. Siti Nurulain Mohd Rum	Identifying Political Polarization in Social Media: A Literature Review	UPM
03	Assistant Professor Auzi Asfarian, S.Komp., M.Kom.	The Potential of Virtual Reality Tour to Introduce Digital Village Ecosystem to Computer Science Students	IPB
04	Dr. Eng. Annisa, S.Kom., M.Kom.	Two-ways Recommendation System for Supervisor Selection using History Data and Skyline Query	IPB
05	Dr. Toto Haryanto, S.Kom, M.Si	Effectiveness of Online Learning Using Analytical Hierarchy Process during COVID-19 (Case Study:: Student of Department of Computer Science)	IPB
06	Ts. Dr. Nurul Amelina Nasharuddin	Keyword Extraction Techniques in Building A High Quality Multilingual Comparable Corpus	UPM
07	Dr. Aziah Asmawi	Learn Cyber Security Mobile Apps: An Alternative Assessment Towards Better Learning Experience Through a Mobile Application	UPM

Track: Health Information Technology (HEALTH)

No	Presenter	Title	Institution
01	Dr. Hizmawati Madzin	Segmentation of Pulmonary Cavity in Lung CT Scan for Tuberculosis Disease	UPM
02	Dr. Maslina Zolkepli	Covid-19 Heatmap Visualization Approach For Descriptive Analytics Of Covid-19 Cases In Malaysia	UPM

No	Presenter	Title	Institution
03	Ts. Dr. Raihani Mohamed	Pattern Recognition with Deep Learning for Human Activity in Healthcare	UPM
04	Ts. Dr. Siti Khadijah Ali	Improved Pose Estimation Method for Motion Retargeting	UPM
05.	Dr. Toto Haryanto	The Role of Deep Learning on Digital Histopathology Images for Cancer Identification: Present and Future	FMIPA IPB University
06	Dr. Eng. Wisnu Ananta Kusuma, ST., MT.	A Network Pharmacology-Based Approach to Explore Potential Target Proteins for Type 2 Diabetes Mellitus Disease	FMIPA IPB University
07	Prof. Dr. Imas Sukaesih Sitanggang. S.Si., M.Kom.	Layer Selection on Residual Network for Feature Extraction of Pap Smear Images	FMIPA IPB University

Abstract: Keynote Speakers

Keynote 1: The necessity for copyright and patent protection for the research output arises as the focus of research shifts from fundamental to applied, with an eye toward pre-commercialization

Prof. Dr. Rahmita Wirza O.K. Rahmat, Faculty of Computer Science and Information Technology, UPM

Protection of intellectual property (IP) is essential for promoting innovation towards commercialization. Without intellectual property protection, institutions, companies, and individuals would not fully profit from their creations and would devote less time to R&D. The main purpose of submitting intellectual property is to offer the protections and incentives required to promote new knowledge discovery, development, and transfer for the benefit of the public. A secondary purpose is to increase money generation for the university and the inventors. By submitting IP, the universities will be able to reach a wider audience of people who actively take part in the innovation ecosystem and economic development and share their knowledge and innovative research solutions. In the year 2021, UPM filed more than 2,600 IP applications and won the National Intellectual Property Awards for Best Organisation IP Submission. 209 IPs were commercialised, with gross sales of more than RM65.8 million from those submissions, while 57 start-up businesses received RM17 million in secured financing or investments.

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Keynote 2: The significance of building undergraduates' self-confidence and the activities that go along with it

Dr. Hizmawati Madzin, Faculty of Computer Science and Information Technology, UPM

Educational goal in UPM is to produce superior graduates who are holistic, patriotic and resilient. The significance of building undergraduates' self-confidence is crucial to ensure the success of the students in academic also in personal lives. Self-confidence enables students to believe in their abilities, take risks, overcome challenges, and strive for excellence. There are several initiatives or activities that university can do to help the undergraduates to develop their self-confidence. Lecturers encourage students to engage in classroom discussions, group projects, and presentations. This allows students to express their ideas, receive feedback, and

develop confidence in their knowledge and communication skills. It is also significant to assist students to determine realistic and attainable goals for them to achieve. Small victories along the way boost self-confidence and motivation. Students also need to develop their soft skills such as communication, critical thinking, and leadership as for preparation to face challenges in future. It is also important for the university to recognize students' achievements. These also can help to reinforces their self-confidence and motivates them to continue striving for success. By incorporating these activities, educational institutions can effectively contribute to the development of undergraduates' self-confidence, empowering them to navigate challenges and pursue their goals.

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Keynote 3: Empowering Rural Education of Malaysia's Lower Income School Children from the Agricultural Sector : Insights on the Concept and Funding

Dr. Noris Norowi, Faculty of Computer Science and Information Technology, UPM

This talk presents the processes and challenges in designing a low-bandwidth, high immediacy, and high social connectedness app for teaching and learning in three schools located in the rural agricultural areas of Malaysia. In these areas, children face educational disparities due to limited resources and infrastructure. The situation worsened during the COVID-19 pandemic when online education became necessary. Lack of devices, high bandwidth requirements for videos, and connectivity issues were major obstacles. To empower these children, fast, intermediary solutions were needed. Conventional video conferencing software demanding high bandwidth proved unsuitable. Thus, a WhatsApp-like platform was proposed as its familiar and user-friendly interface, coupled with low bandwidth consumption, made it a viable option. However, conducting user studies while designing and evaluating the app was a huge challenge, as it had to be conducted online. Thus, the talk also touches on the effective strategies that were proposed and carried out to overcome this. This project received funding from the Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA) for year 2020-2023 under the Seed Fund for Research and Training (SFRT) grant. Some insights on the steps taken to secure the grant are also shared in this talk. This abstract provides a glimpse into the experience of securing the grant and the journey in conducting the project of designing an app to address the educational challenges faced by children in the agricultural sector of rural Malaysia during COVID-19 lockdown.

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Keynote 4: Machine Learning in Agriculture (Case study: Garlic Field Classification)

Prof. Dr. Imas Sukaesih Sitanggang. S.Si., M.Kom., Computer Science Department, IPB University

Major drivers of change in the 21st century include population growth, urbanization, and aging; climate change; transboundary pests and diseases; conflicts, crises, and natural disasters; poverty, inequality, and food insecurity; and nutrition and health (FAO 2017). These changes lead to the need for smart agriculture. Machine learning is one of the technologies 4.0 is required in smart agriculture development. On-farm and off-farm data analysis has been conducted by applying supervised and unsupervised machine learning algorithms. In our study, supervised machine learning algorithms have been used to classify garlic fields in Sembalun, East Lombok, West Nusa Tenggara, Indonesia, using Sentinel 1-A satellite imagery. The garlic classification models were developed using several algorithms, including K-Nearest Neighbor (k-NN), Decision Tree (DT), Support Vector Machine (SVM), Random Forest (RF), and Convolutional Neural Network (CNN). The best model has an accuracy of 86.36%, which is obtained from CNN. The classification results can be used to estimate garlic production.

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Keynote 5: IoT System Development for Smart Agriculture: Recent Advances in IPB University

Dr. Ir. Sri Wahjuni, MT, Computer Science Department, IPB University

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Keynote 6: The Role of Software Engineering in Building the Digital Village Ecosystem

Dr. Yani Nurhadryani, S.Si, MT, Computer Science Department, IPB University

The Software Engineering and Information Science Division at IPB University explores the role of software engineering in building the digital village ecosystem in Indonesia. We emphasize the importance of digital transformation in villages and its impact on connecting villages with agri-food stakeholders through digital services. Several major challenges hinder the digitalization process in Indonesian villages, including the lack of digital competence among residents, limited understanding of user requirements in rural areas, and concerns regarding the sustainability of digital services. The division has been actively involved in this field and has undertaken various activities, such as assessing digital village innovations in

West Java Province, developing a knowledge management system tailored to palm oil farmers, and creating digital services to support the agriculture supply chain in fisheries, chili, and coffee sectors. Moving forward, we present our future direction that focuses on maximizing the impact of research by fostering collaborations with digital village stakeholders. This collaborative approach aims to enhance the sustainability and inclusivity of digital development, ensuring that software engineering plays a pivotal role in the growth and empowerment of rural communities within the digital village ecosystem.

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Abstract: Smart Agriculture Track

CSSAEM 2023 Presentation: Smart Agriculture Track

Recorded Presentation: https://ipb.link/cssaem-agriculture

Time-Series Forecasting Model for The Risk Management System

Nor Azura Husin, Vishnuu A/L Sivajiganason, Nurul Nadhrah Kamaruzzaman (Universiti Putra Malaysia)

The Risk Management System is a decision support system aimed at increasing the yield of paddy fields by providing farmers with a tool for informed decision making. The goal of this system is to develop a monitoring system that aids in focusing monitoring and control efforts on the paddy plantations. It uses forecasting algorithms to predict the likelihood and impact of potential pest outbreaks, weed infestations, and changes in weather patterns, such as temperature and rainfall. This system integrates precision agriculture technologies with predictive modelling and integrated pest monitoring and decision support system for the pest, weeds, abiotic factors and rainfall patterns. It will monitor the quantity of pests and diseases in paddy fields and notify farmers to take immediate action if certain levels are exceeded. The system will also monitor abiotic factors that may cause an increase in pests and disease infections. This will enable extension officers to analyse data efficiently and take quick actions during emergency situations. In conclusion, the system will provide an efficient and effective solution to the challenges faced by paddy farmers. It will enhance their decision-making capabilities, increase their yield of production, and help them manage pests and diseases in a timely and effective manner.

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Video: https://youtu.be/M99GVFl3-ug

Formulating Ground Normalized Difference Vegetation Index (G-NDVI) for detecting stressed crops

Puteri Suhaiza Sulaiman, Fatimah Khalid, Azreen Azman, Marsyitah Ghazali (Universiti Putra Malaysia)

The Normalized Difference Vegetation Index (NDVI) has become one of the most successful tools to assess plant and crop health easily and quickly. NDVI calculates the different between red and infrared wavelength to estimate how vigorously plants are photosynthesizing. More infrared being reflected indicated healthier or less stress a plant is. The proposed Ground-NDVI (G-NDVI) uses smartphone camera with an added Infra-Red lens filters. Most

smartphones use CMOS (Complementary Metal-Oxide Semiconductor) sensors, with the ability to capture between 400nm to 900 nm, without IR cut filter, providing the ability to capture both visible light (400-700nm) and NIR (720-850 nm) images. The G-NDVI adopts 'infrablue' image approach by selectively blocks red light channel in the visible light spectrum. The new G-NDVI formulation combines NIR with Blue and Green channel replacing the Red channel in RGB images. Remixing of this combination requires corresponding chrominance and luminance value in the LUT that quickly offset to perform colour grading the results into meaningful NDVI values. Since crops stress sooner in the NIR than they do in the visual spectrum, with the proposed G-NDVI mobile application, farmers are able to detect stressed crops in a field before the human eye would be able to detect.

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Reshaping Food Security and Farm Production using Internet of Things (IoT) and Blockchain

Normalia Samian, Xiao Guixia, Muhammad Alif Zakwan Mohd As'ad, Muhammad Faiz Mohd Faizal, Muhammad Firdaus Mohamad Fadzil (Universiti Putra Malaysia)

Food security, as defined by the United Nations' Committee on World Food Security, means that "all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their food preferences and dietary needs for an active and healthy life". Food security is not just ensuring food sufficiency, but also ensuring the quality and the reliability of supply chains which have become more complex with diversified sources of farm productions. Some common issues in food supply chains are lacking efficient traceability of product origins and distributions. Blockchain is an emerging technology for the agricultural supply chain which could monitor food quality and safety by digitally tracking data and processes of material resources. Meanwhile, the IoT system is used for diagnosis and control in smart agriculture such as crop growth observation that can produce good quality and sustainable farm production. This work proposes a framework of the integration of blockchain with IoT to improve the reliability of food supply chains by focusing on optimizing the consensus algorithm of blockchain. The outcome is to produce an efficient traceability and higher quality transactions which can integrate all procedures and dealings in real-time across the agricultural supply chain.

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Video: https://youtu.be/9aPO-TLg5NA

Designing of Edge Infrastructure for Cost-Effective Signal Transmission in Palm Oil Field

Masnida Hussin, Ahmad Alauddin Ariffin, Zurita Ismail, Zahari Mahad (University Putra Malaysia)

Edge computing has become one of the IoT era's computing solutions because it improves signal transmission while preventing network delays. It is advantageous for farm management to be able to monitor farm activities in real time, which helps increase palm oil production. However, the farm's remote location limits the amount of signal transmission available from Internet services. Hence, suitable edge infrastructure must be designed for establishing signal accessibility for data communication. It also required determining the optimal number of edge nodes to be allocated in the palm field due to different terrain and various tree sizes. Our work focuses on developing edge computing infrastructure to maintain stable signal transmission in the palm oil field. A network topology is designed to identify suitable locations for placing edge nodes in the field. It includes properly chosen margins and protection sections. We then measured the capacity of the edge node for real-time processing. It aims to ensure each node can communicate among them and receive a consistent wavelength. By having the right topology and signal frequency settings, the optimal number of edge nodes can be determined. Our study can provide guidance for supporting better signal transmission in areas with limited Internet services.

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IOT-enabled Interactive Aquaponics to Raise Awareness among Younger Generations

Ng Seng Beng, Rahmita Wirza, Phang Kok Wai (Universiti Putra Malaysia)

This study aims to investigate the aspects to attract the interest of younger generation and to increase their understanding regarding urban gardening and organic lifestyle. An Augmented Reality - Internet of Things (AR-IoT) Aquaponics Urban Farming mobile prototype application has been developed which consisted of a mobile application and a modified mini aquarium with IoT sensors. The prototype was designed to attract young urban residents to start keeping fish and taking care of plants even if they lack basic understanding about fish and plant care. IoT sensors were used to read and transmit readings of the water pH value, ambient temperature, and humidity to the mobile prototype application to be displayed once the data is retrieved by the user. The application included a simple mobile game and an AR component that acts as a handbook for setting up their planting method. 15 randomly selected potential users were asked to evaluate the complete prototype. Through a 5-point Likert scale questionnaire, 8 respondents strongly agreed and 4 agreed that the AR-IoT Aquaponics Urban Farming Mobile application is useful and effective in attracting the interest of young adults. The study proceeded by conducting interviews and application testing sessions with five predetermined experts.

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Detecting Wormhole Attack in Environmental Monitoring System for Agriculture using Deep Learning

Ali Nasser Albaihani, Azizol Abdullah, Baharudin Osman (Universiti Putra Malaysia)

The Internet of Things (IoT) is a rapidly growing field that connects various devices and systems to the internet, enabling them to communicate and share data. However, this increased connectivity also makes IoT networks vulnerable to various types of attacks, one of which is the wormhole attack. A wormhole attack is a type of security threat in which an attacker creates a tunnel between two or more nodes in an IoT network, allowing the attacker to intercept, modify or inject malicious packets into the IoT networks. In the agriculture industry, IoT networks are often used for environmental monitoring, such as monitoring temperature, humidity, soil moisture levels, and other environmental conditions. As such, the problem of wormhole attack detection in IoT networks used for environmental monitoring in agriculture is a crucial issue that must be addressed to ensure the integrity of the data collected from these networks. This research paper presents a deep learning approach for wormhole attack detection in Internet of Things (IoT) networks using Long Short-Term Memory (LSTM) model and compared with traditional machine learning techniques which are Decision Tree, and Naive Bayes. The performance of the proposed approach is evaluated using a malware dataset for predicting the type of wormhole attack (WHR) through accuracy, F1 score, precision, recall and confusion matrix. The implementation of the proposed approach is performed using Python programming and the Anaconda Navigator (Spyder notebook) tool. The results show that the proposed LSTM-based approach outperforms traditional machine learning techniques in terms of accuracy and F1 score which is 99%. The output results of this paper demonstrating the effectiveness of deep learning in wormhole attack detection in IoT networks.

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Herbs Plant Image Classification using Transfer Learning and Fine-Tuning Deep Learning Models

Fatimah Khalid, Amirul Azuani Romle (Universiti Putra Malaysia)

Herbs plants are highly significant to the local community in Malaysia, as the country's fertile land is rich in diverse species that are widely used for various purposes, including traditional medicine, culinary, aromatherapy, and even in the cosmetic industries. This situation demands numerous applications and activities, including plant species identification, medicinal plant research, agriculture research, and environmental monitoring, which makes image classification of herbs plants a substantial task. However, this task is complicated by the complex nature of the plants, particularly includes plants variations in appearance, close similarities between species, and limited availability of labeled data and images. Motivated to mitigate the issues, this paper investigated the use of transfer learning and fine- tuning the deep learning neural network to classify different herbs plant species. Transfer learning is an

algorithm that learns to recognize image features in one domain and having the capability to generalize the learnt knowledge to a new domain with a smaller dataset. Additionally, fine-tuning can be used to further improve the performance of the model on the new task with less training time and fewer training data. The authors performed experiment on ResNet-50 which been previously trained with ImageNet dataset. The experiments were carried out on a subset of the MYLPherbs-1 dataset, which consisted of two local perennial herbs plant species. Different hyperparameters were used across the various experiment settings, and the authors observed the behavior and relationships of the distinct models, datasets, and hyperparameters toward the classification task's accuracy. The authors also employed two different transfer learning approaches: (i) using pre-trained models as feature extractors with different classifiers, (ii) fine-tuning the pre-trained models. Based on the results and discussion, fine-tuning the ResNet-50 models on the MYLPherb-1 dataset demonstrated the best overall performance.

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Non-Parametric Machine Learning for Pollinator Image Classification: A Comparative Study

Nurul Amelina Nasharuddin, Nurul Shuhada Zamri (Universiti Putra Malaysia)

Pollinators play a crucial role in maintaining the health of our planet's ecosystems by aiding in plant reproduction. However, identifying and differentiating between different types of pollinators can be a difficult task, especially when they have similar appearances. Insects such as ants, ladybugs, and wasps are some of the most common pollinators, but distinguishing between them is not always easy. This difficulty in identification can cause significant problems for conservation efforts, as effective conservation requires knowledge of the specific pollinator species present in an ecosystem. Thus, the aim of this research is to identify the most effective methods, features, and classifiers for developing a reliable pollinator classifier. Specifically, this initial study uses two primary features to differentiate between pollinator types: shape and color. To develop the pollinator classifiers, a dataset of 186 images of black ants, ladybugs, and yellow jacket wasps were collected. The dataset was then divided into training and testing sets, and four different non-parametric classifiers were used to train the extracted features. The classifiers used were the K-Nearest Neighbor (KNN), Decision Tree, Random Forest, and Support Vector Machine (SVM) classifiers. The results showed that the Random Forest classifier was the most accurate, with a maximum accuracy of 92.11% when the dataset was partitioned into 80% training and 20% testing sets. This suggests that a pollinator classifier based on non-parametric machine learning algorithm, specifically the Random Forest classifier, can be an effective method for identifying different types of pollinators. By developing a reliable pollinator classifier, researchers and conservationists can better understand the roles of different pollinator species in maintaining ecosystem health. This understanding can lead to better conservation strategies to protect these important creatures, ultimately helping to preserve our planet's biodiversity.

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Sound Analysis for Paddy Pests Control

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Agriculture is an important economic sector in Malaysia, covering almost a quarter of the land. However, one of the persistent problems in agriculture is pest control - typically solved using harmful pesticides. This study proposes a solution to this problem by analyzing the sounds made by pests in paddy fields. The Paddy Pest Sound Classification system (PaddyPesk) extracts audio features and uses machine learning to classify pest sounds into different classes. Five pests commonly found in paddy fields were included in the study: grasshoppers (Valanga nigricornis), crickets (Metioche vittaticollis), termites (Macrotermes gilvus), rats (Rattus argentiventer), and sparrows (Passer montanus). 250 sound files of 1 second duration were segmented and used as training dataset. Audio features including energy, pitch, Zero-Crossing Rate (ZCR), cepstrum and harmonicity were extracted. Using the Support Vector Machine (SVM), the classification of the pest class was then performed. The classification result can be used to recommend necessary pesticides or actions to remove the pests. The system achieved a 68% correct classification rate, demonstrating its feasibility in utilizing sound analysis for pest control. This system offers a potential alternative to harmful pesticides, providing a safer solution for pest control in paddy fields.

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Smart Livestock Management System for Livestock Smallholder Communities in Indonesia

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Systematization of Indonesian Herbal Medicine using Data-Intensive Science and Machine Learning Approach

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Smart Health Monitoring System for Rubber Plantation

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One Indonesian Agricultural Data - Challenges and Opportunities

Meuthia Rachmaniah (IPB University)

Indonesia's inflation measures eleven inflation determinant groups: food, health, transportation, education, healthcare, information and communication, and others. The strategic food groups comprise vegetable commodities (rice, shallots, garlic, red chilies, and cayenne pepper), animal products (beef, chicken meat, and chicken eggs), and processed products (granulated sugar and cooking oil). These ten strategic food commodities are non-core inflation because shocks dominantly influence them due to volatile components, not fundamental factors such as the interaction of supply and demand. Meanwhile, Indonesia's inflation calculation is measured monthly. The challenge is collecting data from the data owner regularly throughout the year. Another challenge is that many applications of various government institutions are independent and not closely linked. As an illustration, the Ministry of Agriculture has more than 700 agricultural data collection applications aimed at each data owner in the smallest regional unit (village/district) and reported hierarchically. The development of the One Indonesian Agricultural Data application at the data owner level is an inevitability. Data owners must be motivated to deposit their data via a holistic one-data application using their mobile phone device. Automated data collection is likely to succeed if the data owner is given tangible or intangible incentives according to the data owner's needs.

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Low Power Air Quality Monitoring IoT System based on ESP8266 with Deep-Sleep Method

Auriza Rahmad Akbar, Ahmad Syauqi (IPB University)

The air pollution is always increasing, so we need an air quality monitoring system to ensure our well-being. This study aims to build a standalone energy-efficient air pollution sensor that can detect air quality. The results of these sensors will then be displayed in real time using ThingSpeak IoT platform. The sensor that will be used are BME680 with ESP8266 Wemos D1 mini as the microcontroller. There are two energy saving method used: delay and deep-sleep, each with time interval of 1, 5, and 30 minutes. Power consumption is measured with Nordic Power Profiler Kit 2 at source voltage of 3.3 and 5 V. The most efficient power consumption is achieved with deep-sleep, 30 minutes interval, and voltage of 3.3 V, which is 2.05 mA (6.76 mW).

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Groundwater Level Monitoring System on Peatland using IoT and R Shiny Cloud

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Framework Cyber Security for IOT System

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Development of Intelligent Irrigation System for Paddy Field in Indonesia

Karlisa Priandana, Muhammad Hafiduddin, Auriza Rahmad Akbar (IPB University)

A prototype of intelligent irrigation system for paddy field has been developed based on information from real-time sensors using Fuzzy algorithm. The developed prototype consists of sensor nodes and actuator nodes connected to cloud-based IoT platform via WiFi. In the

case where the paddy field is divided into some grids, each grid is designed to be controlled by one sensor node and one actuator node. Irrigation decision making is carried out by a Fuzzy Sugeno algorithm that is directly embedded in the sensor node. The fuzzy input taken from the sensor node includes: soil moisture (dry, moist, wet), air temperature (cold, warm, hot) and rain intensity (mild, medium, overwhelming). The output is the condition of the faucet as the actuator, i.e., fully-closed, half-open and fully-open. The data are sent to the cloud and displayed in website for the purpose of real-time monitoring, so that manual irrigation can be done when some discrepancy occurs. Laboratory experiments were conducted to test the developed prototype. The results showed that the sensor node can take data from the environment and generate decisions properly according to the determined Fuzzy rules. The system can also send data to the server and can control the actuator correctly.

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Digital Watermarking for Shape File Data Protection

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Image Reconstruction on EIT CT-Scan with Tropical Fruit Phantom Resistor Object

Muhammad Asyhar Agmalaro, Agah Drajat Garnadi, Agung Dwi Prasetyo (IPB University)

Tomography is the primary method of object reconstruction to know the internal cross-section of an object without destroying it. One technique of tomography is electrical impedance tomography (EIT). The advantages of EIT to others are cheaper, simpler, faster, and more secure. This research aims to apply image reconstruction to the EIT system. The result of the

measurement of an object through an EIT device is an adjacent matrix of 208 x 1 voltage data generated from a tropical fruit phantom resistor object. The primary process of image reconstruction is divided into two problems: forward problem and inverse problem. The forward problem aims to determine the voltage distribution of the adjacent matrix, whereas the inverse problem aims to determine the conductivity or resistivity symptom in each mesh or pixel in the object and display it in the colour plot. EIT image is displayed through the front-end dashboard to facilitate the user in predicting the resistivity symptoms of the measured object.

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Bio-Inspired Computing Approach for Solving Multi-Agent Task Allocation Problem in Indoor Farming

Medria Kusuma Dewi Hardhienata, Karlisa Priandana, Daffa Rangga Putra, Mamiek Sriatun, Wulandari, Agus Buono, Made Widhi Surya Atman, Azwirman Gusrialdi (IPB University)

This paper considers the problem of task allocation where the goal is to find a coalition of UAVs (agents) to complete on-farm agricultural tasks. To find the best coalition of agents, we employ the Ant Colony Optimization (ACO) algorithm. In this study, the performance of the basic ACO algorithm for solving task allocation is improved by modifying the efficiency factor. In the proposed algorithm, the efficiency factor is defined as a function that relates not only to the capability of the agents and the distance between the agents, but also to the distance between the agents and the target. To solve the task allocation problem, we have also adjusted the capability list of the agents using common UAV capabilities in agricultural application. Simulation results showed that the proposed ACO algorithm with the modified efficiency factor improved the performance of basic ACO algorithm for solving task allocation problem in terms of the average total travel cost for each agent. The optimum number of ants and agents in the proposed algorithm was also analyzed for robust performance. Simulation results revealed that the addition of the numbers of agents and ants increases the average efficiency of the algorithm. A simple experiment using five ground robots with a centralized control was also carried out as a prove of concept for the proposed algorithm.

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Analysis of Synthetic Minority Oversampling Technique (SMOTE) implementation on Support Vector Machine (SVM) performance

Lailan Sahrina Hasibuan, Wadudi Muthahari (IPB University)

Model training using a dataset with imbalanced distribution within classes will lead the model to ignore minority class and tend to classify all data into majority class, although minority class is more important. Generally, this problem could be addressed by two approaches: algorithm level and data level. This study analyzed the data level approach which is implemented by resampling using Synthetic Minority Oversampling Technique (SMOTE). The case for this research is Single Nucleotide Polymorphism (SNP) identification of DNA data of Glycine Max L Mer. The balanced dataset was used to build Support Vector Machine (SVM) classification model. The balancing process was focused on data that is located on and around the SVM hyperplane which was called as critical. Evaluation shows that performance of models which were trained using balanced critical data is higher than models which were trained using imbalanced dataset and models which were trained using balanced raw data. Based on the results, it shows that implementation of balancing technique to critical data may has chance to improve SVM model performance.

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Abstract: Smart Education Technology Track

CSSAEM 2023 Presentation: Smart Education Technology Track

Recorded Presentation: https://ipb.link/cssaem-education

Interactive and Integrated AR Flipped Classroom to Influence Medical Students' Experience and Learning Performance

Rahmita Wirza O.K. Rahmat, Che Nur Shafareen Afera, Rafidah Hod (Universiti Putra Malaysia)

A flipped classroom model enables students to acquire fundamental knowledge outside of class time; thus, include reading materials or video lectures. In competency-based medical education, the flipped classroom concept is becoming more and more popular. However, flipped learning has not yet been demonstrated to improve medical education, and it presents a significant challenge to students who have not mastered self-regulated learning techniques. Thus, they may not be able to understand the information presented in the course materials or to strategically use learning resources outside of class. To understand further the usage of flipped classroom for medical students, we have created three mobile AR (MAR) applications which those with markers and notes on printed notebooks (BARA1), those with markers and notes are on a website (BARA2), and those with all notes in the MAR application and the marker are a tangible 3D object (BARA3). These three applications were tested to the same students and 5 medical educators and further tested these three MARs to students in the Faculty of Medical, UITM, Sungai Buloh branch. The study concluded that without a well-designed interface and guidance for the students, AR technology can be too complicated to be used.

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Identifying Political Polarization in Social Media: A Literature Review

Siti Nurulain Mohd Rum, Shengguo Ge, Raihani Muhammed (Universiti Putra Malaysia)

Online social media platforms are frequently held responsible for the rise of fake news, which can occasionally prevent people from knowing the truth and fuels partisan political conflict. The idea of "echo chambers" and “filter-bubbles” draws attention to how social media is incredibly fragmented, individualized, and niche-focused, all of which serve to further

polarize public opinion. These terms have been associated with the referendum of Brexit in the UK and the victory of Donald Trump in 2016's US presidential election. The term homophily on the other hand refers to the tendency of people to be in a circle that shares the same thought and interest, that could also contribute to political division in social media. In the positive side, high political polarization demonstrates the freedom of expression, on the other hand it can heighten political tensions and inequalities, which may have an adverse effect on a nation's stability. Determining political division and its origins via social media is therefore a crucial topic for discussion. In this research work, several articles were examined to discover the computing methods and approaches employed by the existing works for identifying political polarization in social media.

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The Potential of Virtual Reality Tour to Introduce Digital Village Ecosystem to Computer Science Students

Auzi Asfarian, Yani Nurhadryani, Arhammirza Ibrahim, Tifanee Anindhita (IPB University)

The virtual field trip format offers several advantages over a fully three-dimensional world, including its ease and cost-effectiveness in creation and development. By utilizing a 360 camera, capturing images becomes convenient, portable, and viable even in remote regions. At IPB University, renowned for its expertise in agro-maritime studies and the recent focus on the digital twin for agriculture, the potential for integrating these field trip experiences into a learning experience is significant. Bridging the gap between students and society is important, especially in the computer science field. In this research, we present our current progress on utilizing virtual reality tours to introduce the digital village ecosystem to computer science students. We captured the 360 scenes in a digital village we visited in West Java and developed an immersive learning plan with the aim to introduce the digital village ecosystems. We design the learning path using the cone of learning principle and have implemented 5 out of 7 phases of reading, hearing, seeing, and watching a demonstration immersively in a virtual environment. We measure the presence of the virtual reality system using presence questionnaires, give a knowledge test, and interview 7 students to evaluate the systems. The results are promising and in future research, we plan to implement the rest of the learning phases in the systems. This synergy between virtual field trips and agricultural innovation holds promising prospects for enriching the offerings of the IPB Museum and enhancing visitor experiences.

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Two-ways Recommendation System for Supervisor Selection using History Data and Skyline Query

Annisa, Muhammad Rayhan Adyatma (IPB University)

Many students cannot finish their study on time. One of the affecting factors is selecting supervisor that does not correspond with the student's final thesis. To help overcome this issue, a recommendation system for supervisor selection is developed. Student's preferences can be captured from the alumni's research topics. Skyline view query concept is used in the previous research to capture the preferences from both student's and supervisor's preferences. However, there are still some limitations in the previous recommendation system; the choice of topics provided is too small, and there are still some students who do not get any recommendation at all. This research tries to overcome those issues. We expanded the choice of topics provided by adding abstract data and modifying the topic extraction process using n-grams filtered labelled with POS Tagging. We also refine the recommendation system from previous research by applying k-skyband concept. This study succeeded in expanding the choice of topics given in the previous research, from 48 topic choices to 258 topic choices. This study also succeeded in providing recommendations to all students and adding the number of recommendation both to students and lecturers.

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Effectiveness of Online Learning Using Analytical Hierarchy Process during COVID-19 (Case Study: Student of Department of Computer Science)

Jovano Amor Nathaniel Brycko, Toto Haryanto (IPB University)

The outbreak of Covid-19 in Indonesia, has made the Government make hard efforts to prevent the spread from getting worse in order to reduce its spread which affects various sectors, especially education and has an impact on learning patterns from offline to online learning. Therefore, this study will analyze the determination of the effectiveness of online learning using the Analytical Hierarchy Process (AHP) for IPB computer science students. Data were obtained through questionnaires given to respondents and in-depth interviews to obtain some variables. Respondents are selected using simple random sampling techniques. The research method uses the AHP because in this study there are many alternatives in online learning that can be implemented and there are criteria that must be met so that the learning carried out by students can be more effective and conducive. As a result, we can obtain two important criteria for considering online learning such as media and delivery methods. Zoom is selected as the most important media platform meanwhile interactive learning is selected as the best delivery method of online learning.

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Keyword Extraction Techniques in Building A High-Quality Multilingual Comparable Corpus

Nurul Amelina Nasharuddin, Muhamad Taufik Abdullah, Azreen Azman (Universiti Putra Malaysia)

In today's data-driven world, the ability to extract valuable insights from large amounts of text data has become increasingly important. Keyword extraction is a common text mining technique used to identify and extract the most relevant words or phrases from a document. We aimed to explore the current studies that are working on keyword or keyphrase extraction in the top scientific journals, particularly aiming at the state-of-the-art techniques that have been published in the last five years. The literature review on keyword extraction was explained within the context of two dimensions. Firstly, a general map of the domain through bibliometric analysis was revealed. With this aim, an initial keyword search was conducted using SCOPUS for the years 2002–2023 and 240 publications were included in the analysis. Following a title, abstract, keywords and full-text screening of articles, and consensus decision on study inclusion, further selection was being conducted. 18 articles were selected to identify the techniques of research papers to determine the trend. The results of the analysis explained the most frequent keywords, the most productive countries. Our review found that several effective new keyword extraction methods for multilingual text documents have been introduced in the past five years. Other studies were focusing on the usage of the extraction technique to other natural language processing tasks such as text summarisation, categorisation and topic modelling. The choice of method depends on the specific task, the characteristics of the text data, and the resources available.

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Learn Cyber Security Mobile Apps: An Alternative Assessment Towards Better Learning Experience Through a Mobile Application

Ezzah Mawadah Binti Saifulbahri, Aziah Binti Asmawi (Universiti Putra Malaysia)

Cybersecurity is an essential thing in Information Technology (IT). Every computer, system, website, network, or mobile application needs security to protect it from unauthorized persons or threats. Nowadays, cybersecurity in education must start from a young, for example, do not install any suspicious applications on computers or mobile, do not plug in unidentified USB drivers, or any other important lesson vital for any organization's security. It is very important to educate users about cybersecurity to prevent them from being victims as cybercrime in Malaysia is getting higher. There is a platform to learn cybersecurity through online learning, such as a website with an article about cybersecurity that users can search for when googling about cybersecurity, but most of the website shows only a sneak peek of cybersecurity. Users need to read more to learn about cybersecurity, most website has an article without proper citing which can lead to false information. In this research, an interactive mobile application will be developed that can be used by users to increase their knowledge of cybersecurity. They also can test their knowledge and assess their performance at the end of every topic.

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Abstract: Health Information Technology Track

CSSAEM 2023 Presentation: Smart Health Information Technology Track

Recorded Presentation: https://ipb.link/cssaem-health

Segmentation of Pulmonary Cavity in Lung CT Scan for Tuberculosis Disease

Zhuoyi Tan, Hizmawati Madzin, Fatimah Khalid (Universiti Putra Malaysia)

The complexity of pulmonary tuberculosis (TB) lung cavity lesion features significantly increases the cost of semantic segmentation and labeling. However, the high cost of semantic segmentation has limited the development of TB automatic recognition to some extent. To address this issue, we developed an algorithm that automatically generates a semantic segmentation mask of TB from the TB target detection boundary box. Professional doctors only need to roughly label the location of TB, and the algorithm can automatically generate the semantic segmentation mask of TB lesions in the labeled area. The implementation principle of this algorithm involves a preliminary judgment on the image type to find the best threshold for the separation of lesions and background areas. The algorithm then extracts the lesion tissue within the bounding box and forms a mask that can be used for semantic segmentation tasks. Finally, we use the generated TB semantic segmentation mask to train Unet and Vnet models to verify the effectiveness of the algorithm.

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Covid-19 Heatmap Visualization Approach For Descriptive Analytics Of Covid-19 Cases In Malaysia

Isa Ramlan, Maslina Zolkepli (Universiti Putra Malaysia)

The Covid-19 pandemic has presented unparalleled obstacles to the world, including Malaysia and Indonesia. A visual analytics approach known as the Covid-19 heatmap visualization is proposed to provide relevant and timely information about Covid-19 daily cases and deaths in Malaysia. The aim of this approach is to offer a platform for various stakeholders to make informed decision based on descriptive analytics. The Covid-19 information visualization approach allows users to compare different types of visualizations such as heatmaps, line charts, and bar charts to detect Covid-19 trends or patterns. The approach is implemented as a web-based system using D3 JavaScript library and tested using the data collected from Coronavirus Pandemic Data Explorer. Results show that the Covid-19 heatmap visualization

approach is an invaluable approach for understanding pandemic trends as it provides users with easy access to visualizations and fast understanding of Covid-19 situations such as daily cases, deaths and recoveries. The target users for the proposed approach are the National Security Council and Ministry of Health staff, company crews, and the general public. Future upgrades to the approach includes adding additional attributes such as the number of tests and recoveries to assist users in making predictive analytics using machine learning models.

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MARDA: Design and Model Three Residents' Activity Recognition for Healthcare Monitoring With Machine Learning

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Human activity recognition is a popular research area nowadays, and it plays a crucial role in health monitoring, particularly for the elderly. Human activity recognition involves a machine's ability to recognize, comprehend, and anticipate activities using data from various sensors, such as an accelerometer, gyroscope, GPS, temperature, and pressure mat in performing of Activities of Daily Living (ADL). Many techniques have been developed to recognize human activity for multi-residents' settings where multiple residents live in the same home performing either individual or collaborative ADL. In this paper, we present Multi-Resident Recognition of Activity Daily Life (MARDA): a novel multi-resident ADL dataset that combines both wearable sensor and ambient bases sensors. Two days data collection of ADLs considering scripted but realistic scenarios where three subjects live in the same home environment. MARDA also providing details on the design of data collection and tools. We also present initial benchmarks of ADLs recognition on MARDA, obtained by applying state-of-the-art deep learning methods. Hence, the dataset is imbalance dataset, require using SMOTE-Tomek algorithm to balance the class and decision tree for classification. Additionally, this model also uses MARBLE dataset, a publicly available dataset to validate the proposed model, which produced an accuracy of 98.36% for MARBLE and 97.45% for MARDA. The execution time for training and testing the classification model has also been measured, and the Decision Tree has the fastest execution time among other models, with MARBLE training and testing taking 6.51 ms and 12.90 ms, respectively, while MARDA training and testing taking 41.30 ms and 1.30 ms, respectively. Consequently, we hope to deliver the outcomes of a laborious and intricate process of collecting and labeling data, with the expectation that enhancing the existing benchmarks on MARDA would advance the development of multi-resident activaity recognition in assisted daily living environments

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Improved Pose Estimation Method for Motion Retargeting

Siti Khadijah Ali, Siti Humairah Syakirah Razali, Fatimah Khalid, Azrul Hazri Jantan, Hyreil Anuar Kasdirini (Universiti Putra Malaysia)

The proposed approach of improving the pose estimation algorithm by linking the MediaPipe landmarks to the armatures to create a 3D skeleton suitable for animation has been found to be effective in addressing the time-consuming nature of traditional animation techniques such as stop-motion and clay motion, as well as the inaccuracies of 3D motion retargeting. Specifically, the proposed approach was implemented in wave and zigzag motion using Blender with Python script editor function, and the pattern of errors in both motions was observed for validation purposes. Based on the results, it can be concluded that the proposed approach is able to retarget the motion accurately to the skeleton, providing animators with a more efficient and reliable method for creating engaging animations with natural movements.

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The Role of Deep Learning on Digital Histopathology Images for Cancer Identification: Present and Future

Toto Haryanto, Mushthofa, Aziz Kustiyo (IPB University)

Histopathology as a modality in medical images is the gold standard for diagnosing cancer patients. Several types of cancer with the highest mortality rates, from lung, colorectal, and liver cancer, still use histopathology images in order to perform further analysis. Digital medical image analysis significantly contributes to accelerating the application of Computer Assisted Design (CAD) in making earlier diagnoses. Deep learning, currently, still a state of the art, also plays a major role in various digital histopathology image research for cancer detection. Until 2023, more than 600 articles have been published within the topics of the application of deep learning on breast cancer histopathology alone. This shows that deep learning still has the potential to be developed in the future with all of its uses. This article describes the current role of deep learning and the future potentials of deep learning in histopathology image analysis.

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A Network Pharmacology-Based Approach to Explore Potential Target Proteins for Type 2 Diabetes Mellitus Disease

Wisnu Ananta Kusuma, Abdul Halim Umar (IPB University)

Diabetes mellitus (DM) is a metabolic disorder that affects 463 million people worldwide (aged 20–79) and is expected to rise to 700 million by 2045. One approach to treating DM is to use natural ingredients, one of which is derived from plants as herbal medicines. Herbal medicine can be seen as a drug developed based on the principle of multicomponent multitarget. Each plant that makes up herbal medicine contains several active compounds that can work together to target multiple proteins. Target proteins are proteins associated with a disease. In the context of systems biology, this principle of multicomponent multitarget can be described as a pharmacology network that exhibits complex interactions between active compounds present in plants and target proteins associated with certain diseases. In this study, we apply network pharmacology to look at the pharmacological mechanisms of the compounds present in Curculigo spp. In dealing with DM, Curculigo spp. is a herb commonly used in Indonesia to treat diabetes mellitus (DM). The main active components of Curculigo spp. were identified through our previous metabolomics study and also collected from literatures and databases. This study used a pharmacology network to explore the active compounds of Curculigo spp. and their potential molecular mechanisms for treating DM.

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Layer Selection on Residual Network for Feature Extraction of Pap Smear Images

Alfian Hamam Akbar, Imas Sukaesih Sitanggang, Muhammad Asyhar Agmalaro, Toto Haryanto, Riries Rulaningtyas (IPB University)

Pap smear screening test is one of the early prevention efforts to detect cervical cancer. Manual screening tests are still prone to observation errors. This study aims to create a convolutional neural network (CNN) model and support vector machine (SVM) model to identify cervical cancer through pap smear images. The data used are 4049 normal and pathological cervical cells in pap smear images sourced from SIPaKMeD, which were divided into 5 classes based on the level of cancer malignancy. The CNN model is used to extract features on the pap smear image, and SVM is used to carry out the classification. The results of this study are four cervical cancer classification models on pap smear images using Resnet50 and Resnet50V2 architecture and SVM algorithms with different scenarios on freeze and unfreeze of the convolution layer. The classification model with the best performance has an accuracy of 97.09%. CNN model with freezing the convolution layer provides much faster in the pre-trained model and the integration of this model with the SVM as the classifier results in the classification model of cervical cells in pap smear images with high accuracy.

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