The Institution of Engineers, Malaysia

Information and Communication Technology Special Interest Group

WEBINAR

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING FOR AGRICULTURAL APPLICATIONS

28 SEPTEMBER 2021 | TUESDAY | 3 PM – 5PM

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ABSTRACT

In recent years, predictive analytics involving big data or fast and real-time data streams has become a crucial process that makes artificial intelligence (AI) and machine learning a worthy paradigm for end-to-end agricultural management systems. Agricultural data are collected using vision systems and are then processed and analyzed via intelligent learning mechanisms for prediction (i.e., regression, classification and clustering), data mining and pattern recognition or data analytics in general. Pest and disease recognition for plants; and fruits detection and quality monitoring are among agricultural applications that use AI to replace human know-how. These applications utilize vision and image classification as their core intelligent service, that has a direct impact on computational complexity, cost (i.e., data storage and processing) and efficiency of transmission. The capacity of processing big data and optimizing transmission efficiency requires additional levels of intelligent computational methods such as deep learning.

This presentation discusses the current state of AI in agricultural applications. We presented our work at the Smart Farming Technology Research Center, University Putra Malaysia (UPM) in utilizing the deep learning technique for insect pest recognition in paddy fields. A pre-trained deep learning model called Faster Recurrent Convolutional Neural Network (R-CNN) was utilized under the Tensorflow framework was able to detect the insect-pests, classify and count the pests' population in the paddy field with an accuracy of 93%. With further complementary data and enhancement to the model, farmers may be able to select remedies or pesticides to improve crop production and/or quality.

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ABSTRACT

Deep Learning has also been used in our prior work on oil palm fresh fruit bunches (FFB) quality classification at the oil palm mill for automatic sorting of the fruit bunches. We used a deep convolutional network implemented using the Tensorflow framework at the processing center on the cloud. In this model, the FBB can be classified into five ripeness or quality categories, which are empty bunch, under ripe, unripe, ripe and overripe with approximately 80% accuracy. The images were subjected to noise such as very busy image background due to foreign objects like soil dirt on the conveyer during data acquisition. The accuracy can be improved when object processer is implemented locally at the edge to pre-process the image data more intensively.

Lastly, we recognize some of the challenges and share future research directions for successful AI and machine learning applications for agricultural applications.

SPEAKER'S PROFILE

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Dr. Samsuzana is an Associate Professor at the Department of Biological and Agricultural Engineering, Universiti Putra Malaysia. She had served as the department head for almost four years from 2013 until 2016. She received Young Female Leader Professional Development Award from IEEE-WiCAS in 2015. Her most recent research in 'Precision Agriculture' focuses on democratizing agriculture by bridging the knowledge gap between ageing farmers and digital natives. In 2018 she was the first runner up for ASEAN-US Science Prize for Women. Later, she was appointed as the Head of Smart Farming Technology Research Centre, UPM. She currently serves as the Deputy Dean of Postgraduate Studies Division at Faculty of Engineering, UPM.

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