S1T1O1

Sentiment Analysis Model based on Tweet Expansion

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The plethora of Microblogging and social media platforms has spurred the evolution and the development of Sentiment Analysis Research that has been emerged since about 2000. Users' opinions and thoughts are expressed in natural language. For example, on Twitter, people use natural language to tweet about a product which consist of multiple linguistic features that serve to represent the intended sentiment/opinion about a specific aspect or feature of that product. Thus, successful Sentiment Analysis is very much dependent on the effective modelling and classification of the intended opinion.

In this research, we propose a method to model and recognize the polarity (Positive/Neutral/Negative) of users' opinions which can significantly contribute towards the understanding of public attitude towards various events, products and entities. Hence, to analyse these sentiments, various machine learning, and natural language processing-based approaches have been used in the past. However, deep learning-based methods are becoming very popular due to their high performance in recent times. Central to our discussion is the identification of the significant constituents that characterize the tweet intent and their enrichment through the addition of meaningful terms, phrases or even latent representations, to capture their intended polarity. Specifically, we discuss techniques to achieve the enrichment and in particular those utilizing the information gathered from statistical processing of term dependencies within a document corpus and from external knowledge bases. we used an ensemble model, combining Convolutional Neural Network and Long Short-Term Memory models, to predict the sentiment of 35,000 tweets. We lay down the anatomy of a generic linguistic based tweet expansion framework and propose its module-based decomposition, covering topical issues from text processing, information retrieval, computational linguistics and ontology engineering. The analysis indicates that tweet expansion method achieves an F1-score of 79.46%, which outperforms the direct usage of tweet which achieves F1-score of 64.6%.

Keywords: Deep Learning; Sentiment Analysis, Keyword Expansion

S1T1O2

DoubleQ: Hardware and Memory Efficient CNN Through Two Levels of Quantizations

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Due to adoption of Deep Learning techniques by Internet-of-Things (IoT), efficient hardware implementation of Convolutional Neural Network (CNN) is crucial, to fulfill IoT applications with tight area and memory constraint. Power-of-two (PoT) quantization enables efficient hardware implementation and memory consumption for CNN accelerator, but requires retraining of CNN to retain its accuracy. This work proposes a two-level post-training static quantization technique (DoubleQ) that combines the 8-bit and PoT quantization. DoubleQ first quantizes a CNN into 8-bit, and then further quantizes it into PoT form. On ResNet-56, the proposed DoubleQ can further reduce the memory consumption by 37.5% with -3.67% accuracy degradation when compared to 8-bit quantization. Aside from model compression, DoubleQ allows the processing element (PE) of the CNN accelerator to be implemented using lower complexity shifters rather than the costly Digital Signal Processing (DSP) units that is required in the case of 8-bit quantization. In terms of hardware implementation on Field Programmable Gate Array (FPGA), DoubleQ scheme allows saving of 79.2% Look-Up-Table (LUT) and 82.3% Flip-flops (FF) compared to when implementing with DSP units. With the proposed two-level post static quantization, DoubleQ, one can achieve a more efficient hardware architecture for convolutional neural network by trading off the accuracy.

Keywords: Convolutional Neural Network, Post-Training Quantization, Power-of-Two, Deep Learning, Field Programmable Gate Array

S1T1O3

A Study of Underwater Video System to Monitor Aquaculture Farm Using Computer Vision Techniques

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There are many existing fish monitoring methods to help fish farm industries automate their fish monitoring processes. However, there is still a gap in terms of research to monitor fishes specifically in highly turbid water conditions. Therefore, the purpose of this research is to investigate different computer vision techniques and combinations to extract out information of fishes in turbid water conditions. Employing Faster R-CNN trained with OIDv4 dataset, the system was not able to detect any fishes. The filters were not able to highlight any features from the turbid data. Therefore, the one set of turbid data was annotated and trained, however, the network only learned intensity information, other features such as shapes and edges were not learned. Employing YOLOv5 produces improvements, further tests were done by training using different image sizes. It is found that different dataset performs better with different training image size. In order to take advantage of the features learned from different sized training, fusion method is proposed to incorporate features from both models to improve overall performance.

Keywords: turbid condition; object detection; deep learning

S1T1O4

Cost-Effective Scraping and Processing of Real-time Traffic Data for Route Planning

Tee Hong Le

The emergence of e-commerce has increased the demand for fast parcel delivery. In order to service their customers, a logistics company will normally set up a number of outlets in different areas of a city so that the senders can submit their parcels to the nearest outlets. Upon receiving the parcels, logistics company will then sort and send these parcels to the outlets that are close to the recipients. The collection/delivery of parcels between outlets needs a fleet of vehicles, and this problem then can be formulated as a vehicle routing problem. However, most of the existing algorithms proposed to solve vehicle routing problem assume that the travelling time between places are static. This may not be realistic because the traffic in the real world is rather dynamic which causes the travelling time from one place to another varies over time. This affects the accuracy of time-cost estimation for the logistics company during their parcel delivery process. However, the acquisition of accurate time-cost estimation is normally very expensive, and it might not be affordable to logistics company. Thus, this paper will mainly focus on a low-cost solution to effectively scrap, pre-process, and analyze the real traffic data in order to provide route planning algorithms with a set of highly accurate time-cost inputs to improve the accuracy of time-cost estimation for the logistic company. The importance of effective and efficient scraping is also stated as the path provided by real-time traffic map's website is not optimal when traffic condition is heavier.

Research on Radar Precipitation Quantitative Estimation Based on Deep Learning

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We visited the Guangxi Meteorological Institute many times and conducted investigations involving multiple business departments. We learned that the Institute has gradually applied AI technology in the past four years, but not too much. I joined the short-term rainfall forecast research team. Our team intends to conduct short-term quantitative precipitation prediction research based on deep learning. We have obtained the dataset of the radar reflectivity from 2019 to 2020. The CNN and LSTM models will be combined to complete the precipitation estimation for the next 2-3 hours, and the calculation will be compared with the actual precipitation. The specific implementation method is as follows: establish a data set, perform data preprocessing, use machine learning and deep network model methods to use sequential radar echo image data sets to predict the cumulative precipitation in the adjacent period, and compare it with the existing precipitation prediction methods. Since some published papers use the real radar image to predict the future radar image, it has been found that the predicted image is blurred, the computing resources are consumed, and the block boundary prediction is inaccurate. Therefore, this paper will use the numerical radar reflectivity as the data set to estimate the precipitation. To improve the efficiency of data processing, the dimension of the matrix will be reduced. It is necessary to adopt a probability statement method, to select the mean, maximum, and root mean square value of the data, so that The estimated value and the overall parameters are within a certain allowable error range.GCN has a strong ability to establish relationships with non-Euclid model data. Its accuracy is currently not ideal, but its application prospects in the space-time field are worth looking forward to. With the development of Transformers, the capabilities of this model are constantly being explored and the Spatio-temporal data processing method based on self-attention is also worth studying.

Keywords: Deep Learning; Radar image; Precipitation Quantitative Estimation; Spatio-temporal data

S1T1O6

Usability Enhancement Model for Multifaceted Unstructured Text in Big data

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The rapid advancement in the modern world is characterized by adopting pervasive technology in every individual life. This rapid development has urged the unprecedented influx of unstructured data. 80% of the digital universe is unstructured data. Among the variety of data, unstructured text is found everywhere, which contains the most interesting and valuable information. The understanding of unstructured text not only deals with language but also the subjective intentions such as context and the surrounding real world. The usability of unstructured text is more critical than structured data, as unstructured data has diversity, sparsity, and heterogeneity issues. The usage of unreliable data from diverse sources, valueless, and irrelevant data may lead to unnecessary effort and cost for companies. Therefore, this study addresses the following objectives: to identify the usability dimensions and determinants of unstructured big data, to determine the relationship among different dimensions and determinants to formulate usability rules, and to design the usability enhancement model to reduce the usability issues of unstructured big data. A systematic literature review has been conducted to derive the usability enhancement model and its components. Experts' opinion has been selected as a methodology for model validation and Delphi Technique has been adopted. Two rounds of Delphi have been conducted to achieve the 80% consensus. It has been concluded that unstructured data usability is an important pragmatic data quality dimension. The results have shown that context is an important factor for usability. The usability issues of unstructured data should be handled at the early phases of the big data analytics pipeline. The proposed model will improve the usability of unstructured data which will lead to better knowledge extraction and business intelligence.

Keywords: Pragmatic data quality; unstructured text; big data; analytics; data usability

S1T1O7

Sentiment Analysis on Twitter Based on Aspect-Based Level Approach

Soong Hoong Cheng

With evolution of social network and Web 2.0, people not only consume content by downloading on web but also contribute and produce new contents. Due to the advent of Web 2.0 and Internet boom, social media is essential to generate vast amount of data that can be analysed for various purposes. For instance, we can use the vast amount of data for sentiment analysis and opinion mining. Nowadays, it is prevalent to find out the sentiments of the customers regarding products or services offered specially to increase the sales with proper actions taken from the predictions. In short, it is to determine how people feel about a specific topic. People became more eager to express and share their opinions on web regarding daily activities as well as local or global issues. Due to the proliferation of social media for instance Facebook, Twitter, YouTube and others, sentiment analysis and opinion mining grow rapidly. It branches out from the field of natural language processing and data mining particularly from web mining and text mining. Why sentiment analysis and also known as opinion mining is prevalent and relevant nowadays? When we try to decide to purchase a product, we are likely to get the opinions from friends or relatives and do some surveys before we purchase the product. Hence, opinions are undeniably the key influencer of our behaviour as well as the central to nearly all of the activities. Within the opinions, we often find the neutral, positive and negative polarities in the sentences. Although sentiment analysis and opinion mining are slightly different, there are often used interchangeably under the text mining and natural language processing fields. Based on the sentiment analysis taxonomy, it has opinion mining to have the opinion polarity classification, subjectivity detection, opinion spam detection, opinion summarization and argument expression detection. On the other hand, emotion mining has the emotion polarity classification, emotion detection, emotion cause detection and emotion classification. If it is based on granularity level, it has sentence level, document level and aspect/entity level of sentiment analysis. Two approaches for the sentiment analysis: lexicon analysis or machine learning. For the machine learning approaches, there are supervised, unsupervised and semi-supervised learning approaches. Deep learning is a new era of machine learning techniques that overcome the weaknesses of earlier machine learning techniques that is Artificial Neural Network (ANN) and Deep Neural Network (DNN). DNN has Convolutional Neural Network (CNN) and Recurrent Neural Network (RNN). In this study, the deep learning techniques will be surveyed to discuss the importance from moving towards from machine learning to deep learning for the classification. Deep learning has numerous models such as LSTM and others and each of them might be compared to yield the best results. There are ubiquitous accesses to the social media to acquire the dataset to perform the sentiment analysis. Twitter dataset is preferred because Twitter limits Tweet length to a specific number of characters for display (originally and historically, the well-known 140 characters, although this has been made more flexible over time). Lastly, I do not restrict and focus on one entity for sentiment analysis but it will be general to find the best methods and approaches.

S2T1O8

Batch Contrastive Regularization for Deep Neural Network

Muhammad Tanveer

As neural network becomes deeper, it becomes more capable of generating more powerful representation for a wide variety of tasks. However, deep neural network has a large number of parameters and easy to overfit the training samples. In this paper, we present a new regularization technique, called batch contrastive regularization. Regularization is performed by comparing samples collectively via contrastive loss which encourages intra-class compactness and inter-class separability in an embedded Euclidean space. To facilitate learning of embedding features for contrastive loss, a two-headed neural network architecture is used to decouple regularization classification. During inference, the regularization head is discarded and the network operates like any conventional classification network. We also introduce bag sampling to ensure sufficient positive samples for the classes in each batch. The performance of the proposed architecture is evaluated on CIFAR-10 and CIFAR-100 databases. Our experiments show that features regularized by contrastive loss has strong generalization performance, yielding over 8% improvement on ResNet50 for CIFAR-100 when trained from scratch.

Keywords: Batch Contrastive Loss, Batch Regularization, Center-level Contrastive Loss, Sample-level Contrastive Loss, Neural Network.

High-Speed RLWE-Oriented Polynomial Multiplier Utilizing Karatsuba Algorithm

Wong Zheng Yan

Lattice-based cryptography (LBC) is one of the promising post-quantum candidates which offers good security and performance. The most time consuming operations in LBC is the polynomial multiplication, which can be performed through widely explored algorithms like schoolbook polynomial multiplication algorithm (SPMA) and Number Theoretic Transform (NTT). However, Karatsuba algorithm with better complexity compared to SPMA, is not widely studied for FPGA implementation of LBC. In this paper, we proposed an optimized SPMA-Karatsuba (SK) architecture with novel technique to implement the negacyclic convolution. The proposed architecture is more than 2.09× faster in expense of 96.06% additional hardware resources compared to the state-of-the-art SPMA architecture. This shows that the combination of SPMA and Karatsuba algorithm can produce hardware architecture with higher speed yet maintain balanced area-time efficiency compared to SPMA-only architecture. This is especially useful for developing IoT edge nodes or gateway devices that require high speed but able to tolerate some additional hardware area.

Keywords: Hardware; Public Key Cryptography; Lattice-based Cryptosystem; Post-Quantum Cryptography

S2T1O10

Enhanced Self Organising Map Model for Surface Reconstruction of Unstructured Data

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Surface reconstruction plays a vital role in reverse engineering and computer aided-design (CAD). It allows the designers in these fields to recreate the 3-D file of the objects in a shorter time when their original 3-D file is missing or corrupted. The designing process of a 3-D object is often very tiring. Commonly, the data employed in the surface reconstruction are unstructured associated with imperfections such as noise, outliers, varying sample density and missing points. Such data are acquired from 3-D scanning technologies like Light Detection and Ranging (LiDAR) sensors or depth cameras. These data are making the surface reconstruction tasks more challenging. Throughout the years, numerous approximation, interpolation and learning-based techniques have been proposed to reconstruct the surface of the unstructured data; each of which possesses its own pros and cons. This research focuses on the limitation of a learning-based model in regaining the correct and accurate connectivity information of the unstructured data for open surface objects such as masks and discs. Thus, this research aims to propose a learning-based model and a surface approximation approach to reorganise the unstructured data to regain the connectivity information among the points and represent the output of proposed model with surface respectively. Besides, soft computing methods will be employed to optimise the surface represented by the surface approximation approach. The output of the proposed model, surface approximation approach and soft computing methods will be analysed both qualitatively and quantitatively. Qualitative analysis will be conducted by visualising every output with gnuplot or MeshLab to evaluate their presentation and shape. Meanwhile, quantitative analysis will be conducted on the proposed model, surface approximation approach and the soft computing methods by selecting the evaluation metrics that suit them respectively to determine their accuracy and efficiency.

Keywords: surface reconstruction; learning-based model; surface approximation approach; soft computing

S1T2O1

3D Face Reconstruction using Learning Based Approach

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3D reconstruction is the creation of 3D models from multiple images. It is widely used in many different fields such as medicine, gaming, robotic mapping, city planning and others. 3D face reconstruction will be the focused topic in this research. There are various existing conventional approaches and new methods to perform 3D reconstruction. In this new generations, most of the research are carried out with the new computerized approaches which are deep learning. There are still some challenges in 3D face reconstruction using single image. This is because of the impulsive poses, non-uniform illumination, expressions and occlusions. The problem statements for this research are some of the approaches are not suitable for the profile views of the face image because they are only considering on frontal face images and the other is unstable of the 3D estimates of wild facial faces and change for the different photos. The objectives of this research are to reconstruct the 3D face models from not only frontal view images and from a stable 3D estimates of wild facial faces. So, in this research, different methods to reconstruct 3D face models from single images will be discussed and compared. Lastly, an appropriate learning based method to reconstruct 3D face model will be determined after discussed and compared with all the methods.

Keywords: 3D face reconstruction；single image； learning-based approach；conventional approach

S1T2O2

The Effects of Blended Learning using Flipped Classroom Approach in Engineering Education

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Engineering education, especially Engineering Education 4.0, has undergone significant changes as a result of the forthcoming industrial revolution, Industry 4.0, and the resulting ICT technology-driven changes. This study will concentrate on the Mechanics Dynamics area, which is a crucial component of engineering education. Among engineering students, this course has a high failure rate. This may be due to visualization difficulties caused by static images, a complex engineering model, or a misunderstanding of a concept. Blended learning involves a variety of learning methods, including face-to-face learning, e-learning, student-centred learning, and self-paced learning. The aim of the preliminary study is to look at students' learning difficulties in Mechanics Dynamics and their perceptions of blended learning using a flipped classroom approach. An online platform was used to develop and distribute a questionnaire. The pilot study sample size is 30 students from Malaysian universities who have completed a Mechanics Dynamics course in less than five years. The findings were evaluated using descriptive statistics method. According to the preliminary findings, the students' key concern is the visualisation issue. Besides that, students have a positive attitude toward the blended learning flipped classroom approach that will be introduced in their classroom, despite their lack of understanding of the blended learning flipped classroom approach. The results from the actual data collection, which included more respondents with a greater sample size (n>100), will be presented in the future in order to better identify engineering students' difficulties in learning Mechanics Dynamic and their perceptions of using a blended learning method to help their learning. Based on the findings, a particular type of blended learning model, such as the flipped classroom model, will be included in a quasi-experimental study to examine its effectiveness in promoting learning in Mechanics Dynamics.

S1T2O3

A Content-Based Scientific Paper Reading List Recommender System for New Field Researchers

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The project aims to produce a high accuracy and usable content-based scientific paper recommender system (CBRS) to produce a reading path list to help new field researchers to identify seminal papers that will help provide adequate information for them to understand the most recent seed/query papers. Given a query paper q, the proposed CBRS approach exploits concepts of extracted unigram keywords from the paper by scoring each keyword based on a chosen decay function. Keywords that occur earlier in the text will have higher weight than those at the lower position. The novelty of the proposed approach is the document statistical-based document scoring method which tries to find the most relevant paper r, given q. Initial experiments with English news corpus and small corpus of scientific papers show some encouraging results. The proposed CBRS approach may emerge as a scientific paper recommender system for any digital libraries as the processes involved are totally unsupervised and can run in the background on a fast processor as new query or documents are added.

Keywords: Content-based Recommender System; CBRS; Statistical-based document scoring method

S1T2O4

Improve Cyber Security Behaviour through Cyber Hygiene among Employees of Software Development SMEs

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Cyber crime is increasing with the recent advancements in technology and era of Industrial Revolution 4.0 (IR 4.0). SMEs (small to medium sized enterprises) are facing existential threats by adopting ICT due to lack of awareness associate with it. Cyber threats or cyber-attacks are one example of issues which SMEs are currently facing and such attacks have increased tremendously. SMEs are the biggest group which is affected by cyber security attacks now-a-days. This is due to lack of awareness, expertise and resources. Therefore, SMEs do not have a proper cyber security culture and awareness. Although there were many initiative taken by academia, industry but the problem still exists for SMEs. Therefore there is a need to study the cyber-attacks from software employee perspective in Malaysian SMEs because people are weakest link when it comes to cyber-attacks. Although, SME employees are aware that they are at the risk but still they do not know what practices to follow. To overcome this issue, good cyber hygiene behaviour can help to reduce number of threats and improve security. Cyber hygiene plays a significant role in cybersecurity behaviour. Therefore, this study will explore human related variables that help to improve the cyber hygiene behaviours of end users and reduce the cyber-attacks. To conduct this research, questionnaire will be used in order to collect the data from employees of software developments. Identify the factors and test hypotheses based on linear relationships. From our study we can find that Cyber Hygiene will provide a better security, better protection and also monitoring and maintenance of the employees of software development SMEs. .

Keywords: Cyber security; Cyber security behaviour; Cyber hygiene; Software Developers; SMEs.

S1T2O5

An Optimized Approach for 3D Mesh Segmentation

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Three-dimensional (3D) mesh segmentation is to segment a 3D mesh into smaller and meaningful parts for easier analysis and processing. These parts became the cornerstone of pre-processing stage for various applications such as medical, mesh unfolding, surveillance system, visualization, robotics etc. Hence, there are tremendous amount of research in finding the optimal approach to partitioning a 3D mesh into parts, to suit the application at hand. This research is aimed to develop an optimized approach to decompose a 3D mesh into reasonably semantically segments, which will be used in assisting the orthopaedic implant design measurements, especially during the creation of intramedullary nail for patients with bow femur, who suffers from femoral shaft fracture. Therefore, this research is divided into two essential phases. In the first phase, an interactive binary segmentation approach on Computer-aided design (CAD) type model were established under a strictly controlled condition. The CAD models are composed of two primitive geometric shapes- the spheres. The user is required to mark two vertices as the terminals to provide hard constraints for segmentation. Additionally, six various weight functions as soft constraints that incorporate the level of details towards preserving the visual appearance geometry, boundary and volume properties of the 3D mesh were tested, together with the proposed max-flow min-cut to find the globally optimal binary segmentation. After the effectiveness of the proposed binary segmentation approach has been demonstrated, the research enters the second phase: The 3D skeletonization. In this phase, the inner structure of an overall complex 3D mesh can be captured by forming its own skeletons. These computed skeletons consist of the significant geometric and topological information that are used extensively to produce segmentation. Thus, maximum-minimum centre approach is proposed to obtain a reliable skeleton of a 3D femur. Several preliminary results and studies are included in the discussion.

Keywords: 3D Mesh Segmentation; 3D Skeletonization; Max-Flow Min-Cut; Maximum-Minimum Centre; Weight Assignment

S1T2O6

Determining the Precursors of Cyberbullying among Malaysian University Students

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Higher education requires access to Information and communication technologies (ICT's), which eventually expose university students to cyberbullying. The increased technological access, along with excessive usage of social media, gave birth to the problem of cyberbullying. Therefore, university students are relatively more prone to cyberbullying incidences. Previous studies have studied school students and overlooked university students, who are actually more engaged in cyberbullying perpetration. This study aims to understand the role of personal and psychological factors dragging Malaysian undergraduate students of public and private universities towards cyberbullying behaviour. The study is based on a quantitative research approach and employs a self-administered survey. The data has been analysed through the Structured Equation Modelling (SEM) technique using SmartPLS. The study has examined the role of individual and psychological factors to determine the precursors of cyberbullying among Malaysian university students by employing the "Theory of planned behaviour". The results reveal that individual factors that include personality are not associated with Malaysian undergraduate students' cyberbullying behaviour. However, psychological factors, including self-esteem, internalizing behaviour, and anti-social behaviour, play an instrumental role in developing Malaysian undergraduate students' cyberbullying attitude. The study also confirms that subjective norms assert a powerful positive impact on cyberbullying attitude of Malaysian undergraduates. Parents, universities and governments will benefit from this study by understanding factors to be considered when making a policy to reduce cyberbullying among university students. Lastly, the study aims to contribute to the research on cyberbullying behaviour by offering a conceptual model that predicts Malaysian university students' cyberbullying behaviour.

Keywords: Cyberbullying; Cyber-harassment; Undergraduate Students; University; Internet

S1T2O7

3D Deformable Convolution for Action Classification in Videos

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Action recognition is one of the popular research areas in computer vision because it can be applied to solve many problems especially in security surveillance, behavior analysis, healthcare and so on. Some of the well-known Convolutional Neural Network (CNN) in action classification using 3D convolution are C3D, I3D and R(2 + 1)D. These 3D CNNs assume that the spatial and temporal dimensions of motion are uniform where the 3D filters are uniformly shaped. However, the path in motion can be in any directions and a uniform shape filter might not be able to capture non-uniform spatial motion and this limits the performance of the classification. To address the above problem, we incorporate a 3D deformable filter in a C3D network for action classification. The deformable convolution adds offsets to the regular grid sampling locations in the standard convolution resulting in non-uniform sampling location. We will also investigate the performance of the network when apply the 3D deformable convolution in different layers and the effect of different dilation size of the 3D deformable filter. UCF101 dataset is used in the experiments. From our experiments, it is found that applying the deformable convolution in lower layer yield better result compare to other layers.

Keywords: Deformable Convolution; 3D action classification; human action; C3D model; video classification

S2T2O8

Sustainable Model for E-commerce

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Most of the time when we touch on the topic of e-commerce, the first thing that comes to mind is performing transactions online. The moment we match the word sustainable and model to the word e-commerce, many will have in mind, a profiting model on performing transactions online. A profiting model is only possible if it includes both ends of the business on top of the operation part of the e-commerce. In my research, I focus on the 6 components (business, system application, design model, technology, service and people) of the enterprise architecture framework that is most influential in the development of B2C e-commerce systems. 5 small and medium enterprises (SMEs) of different industries were roped in during my research. The business data from the 5 SMEs were analysed through the use of a customized customer relationship management system, web analytics and social media insights. The data from the influencing factors of existing systems were observed and compared with the new systems (either by improving current systems or developing a total new system). A 6 months' test and observation, shows the increase of orders but drops in revenue before the implementation of my proposed model. After the implementation of my proposed model, observation shows that it had not only softened the impact of Movement Control Orders (MCO) during the COVID-19 pandemic, but it also shows an increase in revenue by as much as 43% immediately after the end of the MCO period. The outcomes of this study contributed to a better understanding of the 6 components that leads to the development of a model which will be of value to help SMEs to own a sustainable e-commerce business for themselves during this era of post COVID-19 pandemic.

Keywords: e-commerce; sustainable; enterprise architecture framework

S2T2O9

The Realization of Privated Community-based Security Technology Platform with Coordinated responders as a New Way of Protection Eco-System

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The security and safety play an essential role in society. Social and economic growth can be developed gradually under a peaceful and secure environment. How can security help to improve in both social and economic development? Social development is about enhancing the welfare of every citizen.

There are two main types of security that can get to enhance our safety are public policing and private community-based security personnel. They are playing difference responsible on social community security and safety. Private community security personnel/agency provided by private companies and will have strict and rigorous training and certification standards. Many private security companies will not have the same process and lack of security standardization to every companies.

By new approach of community-based security technology platform methodology, we manage to bring up our country security and safety into different level. In term of Security standard, increase Job opportunity, leader of security digital economy, etc.

with participate of Persatuan Industri Keselamatan Malaysia (PIKM) and Asia Pacific Security Association (APSA), Community-based security technology platform can introduce more values and security coverage to stakeholder such as Security Responder, Security Company, Community end-user / Consumer as well as ministry of home affair in Malaysia.

Keywords: Security; Community Security Technology Platform

S2T2O10

Effects of IT Projects Management with Client-Involvement to Increase Projects Success Rate

Albert Burchard Mujuni

A number of research works have been presented on various management aspects of Information Technology projects. However, most of the work presented focuses on the achievement, accomplishment criteria, and basic success factors related to projects.

Basic achievement factors contribute to the progress and success of projects, but achievement in projects is mainly considered and associated with their accomplishment. In this regard, the limited work has been presented, mainly in domains other than software development. It requires more detailed research study to investigate the effect of accomplishment and achievement factors and their relationship with project success. Among other factors, client has been considered as one of the main critical factors that directly affect the progress, accomplishment and success of the project. It is more serious when software companies follow agile-based or user-centered approaches of development.

The present research works as presented on development, progress, achievements and success of software projects does not consider this important factor. The current study addresses this issue and investigates the client factor and its relationship with success of software projects. It would also identify the relationship between project management and customer-client management towards the success of a project.

Qualitative research approach will be used to accomplish the present study. Structured interviews would be conducted to collect data from software development companies in Malaysia. Interviews will be conducted from the selected companies to draw the analysis that how the proper Project Management and Customer-client Management can assist in the success of Software Projects. Software Development Companies in Malaysia being considered as population sample and project team members chosen from renowned Software Development Companies will be considered as the sample of study for the qualitative methodology analysis.

Keywords: Project management, customer-client management, project success

S2T2O11

IoT Intrusion Detection Framework using Deep Learning and Fog Network

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Fog computing is an emerging and promising technology for IoT integration in the coming generation that has the ability to link different gadgets, sensors, actuators and IoT devices with diverse application by using different communication techniques (wired or wireless). Exchange information intelligently and communicate IoTs with each other via the internet. However, the fast proliferation of IoT application and services, the accessibility and flexibility features of fog computing makes it more vulnerable to intrusion and novel security threats. The security issues are becoming a critical and challenging task in such growing IoT environment. Among the security technique, intrusion detection system (IDS) is important technique which plays a key role to detecting malevolent activities in IoT network. Most of the existing IDS technique are inadequate to correctly detect the recent modified are new attack, while the others are incompetent for real time security solution of IoT environment. To achieve the goal our methodology contains the development of a novel deep reinforce based IDS with dueling Deep-Q-learning algorithm to explore and exploit the IoT environment in fog with accurate detect of intrusion in IoT network. The performance of the propose scheme validates and guarantees to detect the new attack accurately with low FPR in fog computing networks.

Keywords: FOG computing,, Deep reinforcement (DRF), IDS, DDQN, IoT.

S1T3O1

Design and Development of Malaysian Cybersecurity Profiling Framework: Towards Creating a Recommendation System to Combat Cybercrime

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Although Malaysia has a series of laws to protect people against cybercrime, the cases of cybercrime still keep increasing year by year. Our government has established some organizations such as MyCERT and MySAFE that aim to increase the security awareness of the public by providing security recommendations. However, recommendations are not working as expected when people felt it is complicated and ambiguous. To provide suitable recommendations to people, security awareness plays an important role. Security awareness reflects the knowledge, attitude, and behavior of an individual in the security domain. Security awareness can be measured using some measurement techniques such as HAIS-Q. Most of the measurements were performed by a questionnaire. But people may not act correctly even they give the right answer in the questionnaire. This study aims to develop a framework of a recommendation system that profiling users using security awareness to provide suitable recommendations in order to address those problems. This study proposed a security awareness measurement program that is performed by collecting the security awareness information in the user's computer within the focus areas inherited from HAIS-Q which can be applied to an individual without a questionnaire. Then create user profiles using security awareness for the recommendation system. The outcome of this study contributed to successfully profiling users using security awareness, which will be of value to help to provide suitable recommendations to increase the security awareness of the public.

S1T3O2

RSSI-based Relay Selection on D2D Communication for 5G Systems in Free Space Path Loss (FSPL) Model

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In 5G D2D communication, the relay user equipment can be used for extending the communication coverage. This study aimed to explore the performance of relay selection based on RSSI parameter and network coding for spectral efficiency in 5G D2D communication. OMNeT++ is a system-level simulator for end-to-end simulation. In that framework, two package layers also are included, which are INET and Simu5G libraries. INET contains several network components, while Simu5G is built on the former library and extends it with 5G user plane protocols. The research is based on three procedures, modelling, experimental, and simulation. Initially, a 5G Inband network structure is modelled and extend with the D2D communication mode. In order to test the performance of D2D communication, some parameters are involved in the experiment, such as RSSI for relay selection, the distance between UEs, and channel quality between D2D users. The model will be tested in a free-space path loss (FSPL) and obstacle environment with and without network coding. In the FSPL model, the transmission power is controlled from 0mW to 15mW. As a result, the reception power increases as the rose of transmission power obeys the Friss transmission algorithm. The outcomes mainly focus on end-to-end delay and throughput in the application layer. This study shows that the maximum E2E delay has reached 2.85ms when transmitter power is turned to 12mW. On the other hand, the throughput is consistent because it only refers to received packets in the simulation period; the destination no received any packets when transmitter powers are 0mW and 3mW due to packet loss issues. Thus, relay-aided 5G D2D communication can be used in poor link connection, or buildings or trees block D2D devices to improve throughput and delay.

Keywords: Device-to-device(D2D); Relay Selection; 5G systems; Network Coding

S1T3O3

DDos Attack Detection in SDN using Feature Selection and Machine Learning Techniques

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Software-Defined Network (SDN) paradigm recently gained most significant interest in current days because it provides more control and network operation over the network infrastructure. The SDN controller, which is known as the operating system of the SDN network architecture is responsible to execute the several network application and maintain the various network functionalities and services. Despite all its tremendous capabilities, the SDN has many security issues and potential targets due to the introduction of several architectural entities. Distributed Denial of Services (DDos) is growing rapidly that damage the whole network. The control layer of the SDN is more vulnerable for DDos attack and the major aim of this paper is to efficiently detect the attack traffic. In recent years, several machine learning based techniques for the detection of DDos attack in SDN proposed by the researchers. The selection of the optimal features and the classification accuracy of the machine learning models is an open issue. In this paper a feature selection and machine learning based solution is proposed for the detection of DDos attack in SDN. The experimental results show that the proposed solution gives more effective performance as compared to the existing solutions.

Keywords: DDos; SDN; Feature Selection; Machine Learning; Security

S1T3O4

Non-Intrusive Operation Status Monitoring for Legacy Machines via Sound Recognition

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Nowadays in small and medium industry enterprise, there are still a lot of legacy manufacturing machine. Due to budget shortage, the enterprise is unable to replace old machines with new and advanced machines. Unlike smart machines that have monitoring functionality, legacy manufacturing machines are aged and unable to provide advanced functionality along with lack of access to internet connectivity. This causes problems for machine operator to track the operation status of these machines. Thus, external sensors such as current or vibration sensors are installed upon those machines to enable operation status tracking. Unfortunately, high temperature and dusty environment contains these machines. Therefore, some sensors are unable to have a long lifespan and broke down after short number of times whereas others can't be directly retrofitted on them due to high temperature on machine body itself. Thus, this work attempts to evaluate the feasibility of tracking operation status of a machine through sound-based approach. This approach is not only capable in solving the conventional sensor retrofitting issues as well as sensor placement restriction due to limited space.

Keywords: Machines Monitoring; Operation Status Monitoring; Machine Sound Recognition

S1T3O5

The Study and Evaluation of Fraud Detection in Internet of Things for a Smart Factory

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The evolution of the Industry 4.0 leads to various smart devices and machines that are interconnected and operate intelligently. Those intelligent components which is called Internet of Things (IoTs) have very specific characteristic and function in the heterogeneity environment. In addition, the IoT communicates in the Wireless Sensor Network (WSN) often with the internet connection. Revolution of the industry serve as the primary catalyst for innovation which maximizes of productivity through adoption of technologies, vertical and horizontal integration. The operation in the Smart Factory is designed to operate in autonomous and self-organized way with the intelligent devices. This open opportunities for the attacker and fraudster to attacks the system where the IoTs are currently suffer from security vulnerabilities. These technologies such as senor and smart devices which exposes with vulnerabilities. The security is afterthought to get the product to the market faster. While the threat is increasing, the lost is expected to be huge. This paper presents study the selected and important fraud or attacks that occur in Smart Factory which are Distributed Denial of Services (DDoS), Address Resolution Protocol (ARP) spoofing and Internet Protocol (IP) fragmentation attack. The model of each attacks is created using OMNeT++ discrete event simulator. Based on the simulation, each of the attacks is run with predefined scenario and successfully attacks the target vulnerabilities of the system. The simulation result serves as the input to evaluate with machine learning detection accuracy and performance output. The evaluation should base on the variable such as true positive rate (TPR), false positive rate (FPR), precision and recall. The variables are used for preparing the area under curve for receiving operating characteristic (AUC-ROC) and precision recall diagrams. The result of the evaluation will be served as references to come out with protection based on the proper classification of the attacks.

Keywords: Industry 4.0, Smart Factory, Machine Learning, Anomaly, Fraud Detection

Estimating IoT-gateway Resource Consumption using Predictive Analysis to Prevent QoS Violation.

Ng Wan Qing

One of the purposes of IoT-gateway is to store and forward data from IoT sensors to IoT cloud to mask the IoT system from network latency volatility and intermittent internet connection issues. In general, databases will be installed in an IoT-gateway to facilitate data storage to ensure data consistency in the event of concurrent processing. Although databases have been studied for many years and it is a matured technology, the databases used in IoT-gateway are different. Databases in IoT-gateway face different challenges such as limited resources, limited computing power and limited storage space compared to databases in the cloud which computational power is virtually unlimited. Therefore, it is important to be able to anticipate performance issues of databases in IoT-gateway. In this work, we proposed to study the characteristics of database usage in IoT-gateway and devise a method to anticipate potential performance issues due to insufficient computational resources.

Keywords: IoT; IoT-gateway; Quality of Service (QoS) Violation.

S1T3O7

On Multi-Robot Path-Planning Algorithms

Ch'ng Chee Henn

Multi-robot path planning algorithms have attracted people's attention recently. One of the reasons is the large-scale use of autonomous robots in various indoor environments (especially the logistics industry). Therefore, this presentation aims to provide some intuitive understanding of the field and introduce the direction of my research.

Traditionally, the A* search algorithm is the most popular single-agent pathfinding problem because of its excellent performance. Unfortunately, the problem search space increases exponentially as the agent number increases; even the A* doesn't work great. In literature, this problem is called Multi-agent Pathfinding (MAPF).

In general, we can classify algorithms for MAPF into the coupled or decoupled approach. The coupled approach (e.g., A*) searches the joint state space. While the decoupled approach (e.g., Cooperative A*) searches path for each robot sequentially. The decoupled approach is the sub-optimality and might incomplete. Notably, in 2012, the optimal solver Conflict-based search was proposed, and extensive research is conducted on top of it. As a result, it is now possible to apply optimal solver in real-life applications.

The above studies are impressive but still have shortcomings. MAPF is an ideal model and, therefore, with limitations. Especially, MAPF ignores the kinematic constraints and uncertainty. It is undesired and leading to the difficulty of practical implementation.

This is because the path calculated by MAPF is time dependent. Thus, kinematic constraints should be considered at the same time, which complicate the problem. Therefore, we proposed the dynamic path-cell allocation mechanism. The main idea is, each robot can calculate its time-independent path, and the mechanism allocates grid cells to robots.

In short, we separate motion and path planning, which gives us many desirable properties. As a quick result, we can utilize 300 robots to reach a throughput of 30000 per hour in an environment of 2000 m2.

S2T3O8

Power Optimization and Implementation for FPGA-based Customizable IoT Sensor Node

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FPGA-based sensor nodes are popular for its flexible design approach and field re-configurability. RISC32 is one of the recent IoT processors proposed for the development of FPGA based sensor nodes, with the ability to reconfigure the microarchitecture on the fly in order to reduce the dynamic energy consumption. However, such method does not minimize the static energy consumption, which is important in FPGA based system. In this work, clock gating and Dynamic Voltage-Frequency Scaling are applied to further reduce the energy consumption in RISC32. A software (Energy Reduction Program Analyser) was developed to estimate the parameters that can configure the sensor node to achieve minimum energy consumption, targeting the typical IoT application scenario. Experimental results show that the low power techniques applied in this work can reduce the energy consumption by 47% compared to RISC32

Keywords: Dynamic Voltage and Frequency Scaling, Energy Saving, Field Programmable Gate Array, Internet-of-Things, Low power, Partial reconfiguration, RISC, Sensor node

S2T3O9

Multi-tier Vehicle Routing Algorithm for Pickup-and-Delivery Problem with Deadline Constraint

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Consider a vehicle routing problem in the context of logistics service that provides deadline-guaranteed delivery service within a geographical area such as inter-district destinated goods. Given a set of vertices where each good arrives at a given source vertex prior to a cut-off time and must be delivered to its respective destination vertex within a deadline. This work aims to minimize the number of vehicles required to meet all deadline-based delivery demands. To resolve the problem in a structured manner, all goods collected from source vertices will be sent to a depot for sorting before being delivered to the destination vertices. This approach aggregates the goods destined for the same vertex or even the same region so as to save the transportation cost. However, additional time could be introduced. We propose Multi-Tier Pickup and Delivery framework that incorporates multi-tier routing with intermediate transhipment into deadline-constrained pickup and delivery phases with a sorting depot. In the proposed framework, in each cluster a vertex is nominated as the cluster depot which functions as an intermediate transhipment centre. We assume each cluster depot has the capacity to store parcels. The objective is to minimize the number of vehicles required yet to meet the deadline-based delivery. Two tiers of routes are used: Tier 1 for main static routes covering only cluster depots and start and end in a sorting depot. Tier 2 consist of dynamic local routes covering each cluster, performing goods delivery from/to the cluster depot. The novelty of this work is referred to the way constraints are formulated, improving the efficiency of the algorithm, and finding the minimal number of vehicles.

Keywords: Vehicle Routing Problem; Pickup-and-Delivery; Combinatoric

S2T3O10

Dynamic Order-based Scheduling Algorithms for Automated Retrieval System in Smart Warehouses

Liu Jia Lei

In typical warehouse operation, upon receiving the orders from customers, goods need to be retrieved from shelves and then packaged according to the customers' orders before delivery. A Smart Warehouse usually contains multiple parallel shelves, each with a stacker to retrieve goods, and an Automated Retrieval System (ARS) is employed to automate and manage the goods retrieval process of the shelves. The performance of ARS is very important because the goods retrieval sequence and throughput directly affect the subsequent processes, such as packaging and delivery, thus bringing a significant impact on the entire operation flow of the warehouse. In general, an order from a customer may contain several items and these items need to be packaged together into a parcel. The delay that an order experiences in the retrieval process can then be defined as the time duration from the order being placed until the last item of the order being retrieved from the shelve. In the past, the integrality of order has not received much attention in the parallel retrieval process of multiple shelves. To reduce the retrieval delay of orders, we combine the integrality of order with the job scheduling of ARS and introduce the concept of Order Tag. In our previous research, we focused on the scenario whereby all orders arrive before the retrieval process starts. However, in actual production environment of Smart Warehouse, orders from various merchants do not appear at the same time, but rather it is dynamic throughout the operation hours of the warehouse. In this paper, two algorithms based on the dynamics of the system and integrality of orders are proposed, namely Dynamic Order-Based Algorithm and Dynamic Order-Based with Threshold Algorithm. The simulation results show that, compared with the First-In-First-Out Algorithm, these two strategies can reduce the average order retrieval delay by about 30%.

Keywords: Smart warehouse; automated retrieval system; dynamic job scheduling; greedy algorithm; discrete event simulation.

S2T3O11

Magnetic Resonance Lumbar Spine Image Analysis Using Convolutional Neural Network

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Lumbar disc herniation is a frequent source of low Back Pain (LBP). It is still one of the most common health issues, posing a significant personal, community, and economic burden around the world. This study aims to determine how to utilize image processing techniques and deep learning models to provide a much convenient solution to aid the radiologist in analysing the lumbar disc MRI images. The dataset acquired to be diagnosed are the pre-processed T1-weighted and T2-weighted mid-sagittal view MRI images of 80 subjects which 64 have disc and vertebra related diseases and abnormalities. After image acquisition, the images were pre-processed for noise removal or noise reduction since raw images usually come with noise. Then the images were augmented to increase the number of images in turns improve the performance of deep learning model. Segmentation was then applied to the images to segment the region of interest from the remaining region. Consequently, post-processing was implemented to enhance the quality of the segmented image and then features were extracted by features descriptors. Finally, the classification step classified the segmented images by making use of the extracted features. The goal of the results is aimed to achieve high accuracy, specificity, and sensitivity of classifying lumbar disc images. The outcomes of this study contributed to reducing the time and effort required to analyse the lumbar disc by integrating the use of image processing and deep learning.

Keywords: Convolutional neural network; MRI image; Lumbar Disc Herniation; Classification

S1T4O1

Development of a Multiplex PCR Assay for Detection of Four Foodborne Pathogens

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Food contamination by *Listeria monocytogenes*, *Salmonella enterica*, enteropathogenic/enterohemorrhagic *Escherichia coli* (EPEC/EHEC), and *Campylobacter jejuni* has led to outbreaks with considerable morbidity and mortality. A robust and rapid method for the simultaneous detection of these pathogens in a single PCR reaction will be useful. This study aimed to develop an internally controlled multiplex PCR (mPCR) assay for the detection of these four foodborne pathogens, using primers adapted from other studies and designed in-house.

In the assay optimisation, the main challenges included the choice of compatible primer sets, an appropriate mastermix, and thermal cycling parameters that are suitable for all four pathogens in a single multiplex PCR. The test specificity was assessed using 20 common foodborne bacterial strains including ATCC strains of the four target pathogens. A PCR additive, Q-Solution (Qiagen), was added into the mPCR reaction to improve the specificity of the assay. The specificity results showed that a 100% inclusivity and 100% exclusivity for the assay.

An attempt was made to determine the mPCR sensitivity but the recovery of target pathogens from artificially inoculated vegetable samples was very low, even with inocula measuring at 0.5 McFarland unit. Hence, vegetable samples were incubated in enrichment broths before they were used for the mPCR detection. The results showed that after 24-48 hours of incubation, all four pathogens were detectable in the mPCR, regardless of the size of their initial inocula.

This mPCR protocol is now being used for the screening of ready-to-eat vegetables in Malaysian markets.

Keywords: *Listeria monocytogenes*; *Salmonella enterica*; enteropathogenic or enterohemorrhagic *E. coli*; *Campylobacter jejuni*; multiplex PCR

S1T4O2

Examination of Antenna and Ovipositor of *Tetrastichus* sp. (Hymenoptera: Eulophidae)

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Tetrastichus sp. (Hymenoptera: Eulophidae) is a primary parasitoid of the *Metisa plana* (Lepidoptera: Psychidae), an oil palm pest. As a natural enemy of the oil palm bagworm, *Tetrastichus* sp. has a great potential to become its biological control agent in the oil palm plantations. This gregarious parasitoid was found to be the most abundant among other species of bagworm parasitoids in our preliminary findings. To promote the use of this parasitoid in the control of the bagworm population, its host-searching behaviour could be investigated through the examination of its sensory organs. Therefore, the sensilla on the surface of the antenna and ovipositor of *Tetrastichus* sp. were examined using a scanning electron microscope. The antennae of both male and female *Tetrastichus* sp. are geniculate in shape and hinged at the scape-pedicel joint. The female antenna is about 200 µm longer than the male antenna. However, the male antenna has an additional flagellomere compared to the female antenna. In total, eight different types of antennal sensilla were observed on the antenna of *Tetrastichus* sp.: trichoid sensilla type 1, 2, 3, 4, placoid sensilla type 1 and 2, basiconic sensilla, and campaniform sensilla. The antenna of the female *Tetrastichus* sp. lacks placoid sensilla type 2 and campaniform sensilla. The distribution and abundance of the antennal sensilla were compared between the male and female *Tetrastichus* sp. and discussed. On the ovipositor stylet of *Tetrastichus* sp., coeloconic sensilla, styloconic sensilla and campaniform sensilla were observed. Trichoid sensilla were observed at the medial part of the distal extremity of the ovipositor. The findings in this study help to better understanding the different types of stimuli perceived by these sensory organs in the host-searching behaviour, which will benefit the behavioural investigations related to them.

Keywords: scanning electron microscopy; *Metisa plana*; parasitoid; oil palm

S1T4O3

Economic, Dietary, Genetic Factors (*Tmprss6* Variants) and Physiological Condition Associated with Anaemia in a Local Private University

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Anaemia is a condition with reduction of red blood cell amount in leading to insufficiency of oxygen-carrying capacity to meet the fundamental physiological demands. In Malaysia, the prevalence rate of anaemia was up to 24.2% in year 2017. Factors such as economic status, dietary uptake, genetic and physiological factors may lead to anaemia at different extent. Thus, this study was to elucidate these underlying factors in leading to anaemia. A total of 77 subjects were recruited at University Tunku Abdul Rahman with informed consent. Anthropometric reading and haemoglobin (Hb) level were measured. Economic status, dietary uptake and physiological condition were self-declared by respondents through questionnaire. A volume of 3 mL blood was taken for detection of hepcidin concentration and extraction of genomic DNA. Two *TMPRSS6* variants (rs855791 and rs4820268) were genotyped. Statistical analysis was done using SPSS version 22. The anaemia's prevalence rate in this study population was found at 16.88% (13/77). Both studied variants were found significant in this population with minor allele frequency > 0.05. Female and menstruation had significantly lower Hb and hepcidin concentration. Dietary uptake practices such as fruits or fruit juice consumption had significant difference on both Hb and hepcidin concentration. However, low body mass index, consumption of coffee or tea and bleeding history in the past month were found to be associated with lower Hb level. Supplement of vitamin C and red meat consumption were found to be significantly different with increased Hb level only but consumption of red pepper, supplement of zinc was found with significantly different with elevated hepcidin concentration only. There were no significant different on different genotypes for *TMPRSS6* variants. Gender, menstruation, bleeding history, BMI and dietary factor were found associated with anaemia. However, the influential of genetic factor to anaemia was not able to rule out due to low sample size. A larger sample size is suggested in future study to conclude the findings in this study.

Keywords: Anaemia; *TMPRSS6* variants; rs4820268; rs855791

S1T4O4

Haematococcus pluvialis: A Brief Introduction

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Sustainable sources of nutritional values are required for all the living creatures in the world. These autotrophic organisms are highly desired for use in nutraceuticals and nutritional supplements because of the diverse nutritional components that algae can generate and concentrate along with their easy and rapid growth characteristics. Microalgae are one of the promising sources of nutritious foods and chemopreventive nutrients as they contribute a wealth of high-quality ingredients including carotenoids, proteins, vitamins, essential amino acids, omega-rich oils, and generally anti-inflammatory and antioxidant compounds. Natural astaxanthin derived from microalgae *Haematococcus pluvialis* is a keto-carotenoid with a high content antioxidant and anti-inflammatory practices known as nutritional and functional food supplements for their broad variety of health-promoting and clinical benefits. This study discusses the taxonomy, cell morphology and cell cycle, chemical composition, and nutritional property of the bioactive compounds of *H.pluvialis*.

Keywords: Astaxanthin**,** Antioxidant, Microalgae, Nutraceutical, Nutrition

S1T4O5

Evaluation of Pathogenesis- Related (PR) Gene 1 Expression in Response to Multiple Pathogenic Infections in Dragon Fruit (*Hylocereus undatus*)

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Sustainable management of dragon fruit in Malaysia remains ambiguous. Dragon fruit plants are continuously challenged by multiple pathogens attack simultaneously and its defense mechanism is still unclear. Therefore, an early essential recognition of the pathogen detection is important in diseased dragon fruit stem to provide more effective treatment for disease management and minimize loss in production. This study aimed to evaluate the expression of pathogenesis-related (PR) gene 1 in plant stem in response to inoculation with targeted bacterial (*Enterobacter cloacae*) and fungal (*Neocystalidium dimidiatum* and *Fusarium spp*) at 0, 3, 6, 9, 12, 15, 18, 21 days-post-inoculation (dpi). The expression levels of PR-1 gene were quantified through the determination of levels of the corresponding mRNA using real-time PCR. Result showed that the expression of PR-1 gene level was upregulated in the treatments involving coinfection with these three pathogens. The upregulations were observed the highest in 12-dpi and 21-dpi for treatment involving these three pathogens and *E.cloacae- N.dimidiatum* treatment respectively. The PR-1 gene was also found to be associated with *E.cloacae* inoculation, indicating that *H. undatus* was less tolerant to *E.cloacae*. The outcome of this study contributed to better understanding of PR-1 genes and its extent of disease resistance in *H. undatus* towards bacterial and fungal infection. However, further investigation is still needed.

Keyword: Dragon fruit; PR1; Real-time PCR

S1T4O6

Therapeutic Applications of *Spirulina* against Human Pathogenic Viruses

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Viruses can be spread worldwide and the early detection of emerging infectious diseases and outbreaks in human and animal is important to the effective surveillance. Viruses such as human immunodeficiency virus (HIV), swine flu, and influenza virus are some of the viruses that spread disease worldwide. However, drug-resistant of virus and host become of the major problem in elucidating viral infections. Natural product alternatives from plants can be focus to provide safe, lowest and effective dosage to control viral infections in human. *Spirulina* is a well-known cyanobacteria that has been consumed by human as food and supplement for more than centuries without side-effects. *Spirulina* contains high nutritional values, providing various benefits upon consumption. *Spirulina* contains several bioactive compounds with proven antiviral effect on enveloped and non-enveloped viruses such as *Herpes simplex* virus (HSV), measles virus, mumps virus, astrovirus and rotavirus by inhibiting the spreading of virus in the host cells before or after the infection of virus. *Spirulina* also serves as a natural supplement that strengthens the immune system. This review focus on the antiviral properties and immunostimulant effects of *Spirulina* as a potential therapeutic supplement on human health.

Keywords: *Spirulina*; cyanobacteria; antiviral; virus; immunostimulant

S1T4O7

Valorization of Banana Leaf Residue for Biomedical Applications

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Banana (Musaceae) is one of the world's most important fruit crops that is widely cultivated in tropical countries for its valuable applications in the food industry. In 2017, National Geographic hailed bananas as the world's most popular fruit and indeed, it is prevalent in the diet of many Malaysians. Banana leaves are a good lignocellulosic source and have varieties of uses from feed to wrapping materials for food and even as thatching material in banana growing places. Other than that, numerous studies have reported the benefits of using banana leaves in biomedical applications. This study discusses the benefits of banana leaves in biomedical applications such as antibacterial, antifungal, antioxidant, anti-aging, anti-wrinkle, anti-depressant, antiulcer, antimalarial, anthelminthic, antihyperglycemic, wound healing, anticancer, anti-asthmatic, and larvicidal activity.

Keywords: Banana leaf, Extracts, Biomedical applications, Phytochemicals.