



# 2021 10th International Conference on Software and Computer Applications

Kuala Lumpur, Malaysia  
February 23-26, 2021

Co-organized by



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# WELCOME MESSAGE

Welcome to the 10th International Conference on Software and Computer Applications (ICSCA 2021) to be held virtually.

The aim of ICSCA 2021 is to provide a platform for academicians, researchers, students, engineers as well as industrial professionals from all over the world to present their research results and development activities in Software and Computer Applications. Specifically, the conference provides opportunities for the delegates to exchange new ideas, to find cooperation and to establish business or research relations.

Due to the spread of Covid-19 pandemic across the globe, this 10th edition of ICSCA will mark the first time that the conference will be conducted via an online platform. The pandemic has greatly impacted all areas of our lives. The hard time that we are currently going through is indeed a blessing in disguise as the new norms compel us to adapt and embrace creative and innovative ways of living and working. In fact, virtual spaces have taken dominance as far as transaction and interaction between nations, companies, institutions and people across the globe are concerned.

As always, selection of the papers in ICSCA 2021 depends on their quality and relevance to the conference. Papers have been considered for presentation in ICSCA 2021. These papers capture the current issues of computer theory and applications, software design and development, data mining algorithms and techniques, image analysis and processing, information theory and network engineering, computer-based education and learning technologies. Despite undergoing the so-called new norm, I hope we can still exchange new research ideas, do networking among each other.

Finally, on behalf of the organizing committee, I would like to thank everyone for making this event possible. I wish all participants a very successful and productive conference.

Conference Chair of ICSCA2021

Prof. Kamal Zuhairi Zamli, Universiti Malaysia Pahang, Malaysia

# CONFERENCE COMMITTEE

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# CONFERENCE COMMITTEE

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Hiroshi Hosobe, Hosei University, Japan

Fangming Guo, Wuhan University of Technology, China

# ZOOM GUIDANCE

Conference Room Number:

Room I: 666 2397 8388, link: <https://zoom.com.cn/j/66623978388>

Room II: 635 1637 5141, link: <https://zoom.com.cn/j/63516375141>

Note:

Conference rooms will be open 30 mins before scheduled time.

If you have any question, please contact the Assistant in conference room.

Zoom Download:

URL: <https://zoom.us/>

Zoom Using Instruction: [click](#)

Tips:

Please unmute audio and start video while your presentation.

It's suggested to use headset with microphone or earphone with microphone.

**Please rename your screen name before entering the room**

**Authors: Paper ID-Name**

**Listener: Listener-Name**

**Keynote Speaker: Keynote-Name**

**Committee Member: Position-Name**



# DAY 1, TUESDAY, FEB. 23, 2021, ONLINE TEST

## MALAYSIA TIME, GMT+8

ZOOM LINK: [HTTPS://ZOOM.COM.CN/J/66623978388](https://zoom.com.cn/j/66623978388)

Test Time	Schedule
<b>10:30-11:00</b>	Session 1: A34, A78, A08, A18, A70, A74, A56, A57, A71 Session 2: A45, A54, A40, A72, A64, A61, A63, A36
<b>14:00-14:30</b>	Session 3: A09, A49, A42, A62, A28, A73, A76, A15 Session 4: A21, A38, A48, A58, A59, A75, A27, A44, A69
<b>15:00-15:30</b>	Session 5: A12, A20, A29, A32, A33, A51, A55, A67, A77 Session 6: A06, A30, A35, A01, A53, A23, A07, A14

### Note:

Please get your presentation ready to join our online test of your presentation file sharing, video and audio.

It's suggested to use headset with microphone or earphone with microphone.

If you missed your test time, please join the following test session.

# DAY 2, WEDNESDAY, FEB. 24, 2021

## MALAYSIA TIME, GMT+8

ZOOM LINK: [HTTPS://ZOOM.COM.CN/J/66623978388](https://zoom.com.cn/j/66623978388)

Time	Schedule
9:00-9:05	<b>Welcome Message from Conference Chair</b> Prof. Kamal Zuhairi Zamli, Universiti Malaysia Pahang, Malaysia
9:05-9:10	<b>Welcome Message from Conference Chair</b> Prof. Vitaliy Mezhujev, FH JOANNEUM University of Applied Sciences, Austria
9:10-9:55	<b>Keynote Speech 1</b> <b>Speech Title: Distributed Applications Based on Mobile Cloud and Software-Defined Networks</b> Prof. Dr. Sergei Gorlatch, University of Muenster, Germany
9:55-10:40	<b>Keynote Speech 2</b> <b>Speech Title: Optimum parallel computing targeting neural network computation</b> Prof. Masahiro Fujita, The University of Tokyo, Japan
10:40-11:00	Break Time
11:00-11:45	<b>Keynote Speech 3</b> <b>Speech Title: Combinatorial Approach to Constrained Interaction Testing</b> Prof. Dr. Kamal Zuhairi Zamli, Universiti Malaysia Pahang, Malaysia
11:45-13:00	Break Time

**DAY 2, WEDNESDAY, FEB. 24, 2021**

**9:10-9:55, MALAYSIA TIME, GMT+8**

**ZOOM LINK: [HTTPS://ZOOM.COM.CN/J/66623978388](https://zoom.com.cn/j/66623978388)**

**Keynote Speaker**



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

**Prof. Dr. Sergei Gorlatch,  
University of Muenster, Germany**

**DAY 2, WEDNESDAY, FEB. 24, 2021**

**9:10-9:55, MALAYSIA TIME, GMT+8**

**ZOOM LINK: [HTTPS://ZOOM.COM.CN/J/66623978388](https://zoom.com.cn/j/66623978388)**

**Keynote Speaker**



**Prof. Dr. Sergei Gorlatch,  
University of Muenster, Germany**

**Speech Title: Distributed Applications Based on Mobile Cloud and Software-Defined Networks**

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

**DAY 2, WEDNESDAY, FEB. 24, 2021**

**9:55-10:40, MALAYSIA TIME, GMT+8**

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**Keynote Speaker**



**Prof. Masahiro Fujita,  
The University of Tokyo, Japan**

Masahiro Fujita received his Ph.D. in Information Engineering from the University of Tokyo in 1985 on his work on model checking of hardware designs by using logic programming languages. In 1985, he joined Fujitsu as a researcher and started to work on hardware automatic synthesis as well as formal verification methods and tools, including enhancements of BDD/SATbased techniques. From 1993 to 2000, he was director at Fujitsu Laboratories of America and headed a hardware formal verification group developing a formal verifier for real-life designs having more than several million gates. The developed tool has been used in production internally at Fujitsu and externally as well. Since March 2000, he has been a professor at VLSI Design and Education Center of the University of Tokyo. He has done innovative work in the areas of hardware verification, synthesis, testing, and software verification-mostly targeting embedded software and web-based programs. He has been involved in a Japanese governmental research project for dependable system designs and has developed a formal verifier for C programs that could be used for both hardware and embedded software designs. The tool is now under evaluation jointly with industry under governmental support. He has authored and co-authored 10 books, and has more than 200 publications. He has been involved as program and steering committee member in many prestigious conferences on CAD, VLSI designs, software engineering, and more. His current research interests include synthesis and verification in SoC (System on Chip), hardware/software co-designs targeting embedded systems, digital/analog co-designs, and formal analysis, verification, and synthesis of web-based programs and embedded programs.

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**Keynote Speaker**



**Prof. Masahiro Fujita,  
The University of Tokyo, Japan**

**Speech Title: Optimum parallel computing targeting neural network computation**

Abstract: We discuss how optimum parallel scheduling problems for AI applications, in particular neural network computations can be developed. Taking dense and sparse matrix-vector multiplication as examples, we present how their optimum schedulings can be formulated as SAT problems. As we can solve them only for small instances of the problems due to the limitation of SAT solvers, we discuss ways to generalize the solutions for small instances of the problems to larger or general cases. Finally we show how the generalized solutions can be formally verified. We have applied the proposed approach to fully connected neural networks, convolutional neural networks, neural networks with sparse matrices, and attention-based neural networks, and the resulting schedulings are reported.

**DAY 2, WEDNESDAY, FEB. 24, 2021**

**11:00-11:45, MALAYSIA TIME, GMT+8**

**ZOOM LINK: [HTTPS://ZOOM.COM.CN/J/66623978388](https://zoom.com.cn/j/66623978388)**

**Keynote Speaker**



**Prof. Dr. Kamal Zuhairi Zamli,  
Universiti Malaysia Pahang,  
Malaysia**

Kamal Z. Zamli is the professor in the Faculty of Computing, Universiti Malaysia Pahang. His research interests are Search based Software Engineering, Combinatorial t-way Testing, Computational Intelligence and Artificial Intelligence.

**Speech Title: Combinatorial Approach to Constrained Interaction Testing**

**Abstract:** Our continuous dependencies on IoT applications can raise dependability issues. With the increase in demand for functionalities and constraints, more and more unwanted interactions amongst software systems, hardware components, and operating systems are to be expected, rendering increased possibility of faults. While traditional static and dynamic testing strategies (e.g. boundary value analysis, cause and effect analysis and equivalent partitioning) are useful for fault detection and prevention, they may not be sufficient to tackle bugs due to interaction.

This talk will discuss the sampling method based on the applications of covering arrays, termed Constraint Combinatorial Interaction Testing (CIT) applicable to support IoT testing. Additionally, this talk highlights the current progress in the area particularly in terms suitable strategies and algorithms to deal with combinatorial explosion problems when dealing with large connecting IoT devices.

**DAY 2, WEDNESDAY, FEB. 24, 2021**

**13:30-15:45, MALAYSIA TIME, GMT+8**

**ZOOM LINK: [HTTPS://ZOOM.COM.CN/J/66623978388](https://zoom.com.cn/j/66623978388)**

**Session 1: Intelligent Information System and Management**

**Session Chair: Prof. Kamal Zuhairi Zamli, Universiti Malaysia Pahang, Malaysia**

<p><b>A34</b> <b>13:30-13:45</b></p>	<p>Identification of Business Intelligence in Big Data Maintenance of Government Sector in Putrajaya Author: Ain Farhana Jamaludin, Muhammad Najib Razali, Rohaya Jalil, Hajar Othman, Yasmin Adnan Presenter: Ain Farhana Jamaludin, University Technology Malaysia, Malaysia</p> <p>Abstract: This paper contributes significantly, which focuses on an intelligent system that lets the government make an integral part of decision-making and can be applied horizontally to solve the problems in maintenance practice through business intelligence. Accordingly, a real-time data management system for maintenance management is proposed in this paper. It looks at a real case study highlighting the need for proper data management in the government sector. Our findings bridge the gap of information technology inserted in government office buildings, with maintenance management being the domain. This paper demonstrates the underlying structure of the developed simulation model.</p>
<p><b>A78</b> <b>13:45-14:00</b></p>	<p>Model of Business Intelligence Applied the Principle of Cooperative Society in the Business Forums Author: Al-Khowarizmi, Muharman Lubis, Arif Ridho Lubis, Fauzi, Ilham Ramadhan Nasution Presenter: Arif Ridho Lubis, Politeknik Negeri Medan, Indonesia</p> <p>Abstract: Business forums are activities between individuals and organizations that carry out the transactions on online media or within applications, which spread across countries. Along with the development of information technology towards business intelligence (BI), the business processes carried out in the business forum are modeled specifically in order to create an effort and attempt to follow the indicator and criteria from the industrial revolution 4.0. In this paper, a model is designed to combine three type of principles, namely the business forum, BI and the cooperative principle. Actually, cooperatives have been long abandoned since the existence of conventional and Islamic banking concept but it has kinship principle to divide the profits based on the size of the contribution given. Meanwhile, BI model is designed to obtain a formula from the cooperative principle, namely the residual income from operations where the transaction process is successfully implemented through the application to allocate a portion of the profits to the members based on the specified percent.</p>



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<p><b>A08</b> <b>14:00-14:15</b></p>	<p>Extension of Interaction Flow Modeling Language for Geographical Information Systems Author: Zara Hayat, Muhammad Rashid, Farooque Azam, Yawar Rasheed and Muhammad Waseem Anwar Presenter: Zara Hayat, Umm Al Qura University, Saudi Arabia</p> <p>Abstract: The Web-based Geographical Information Systems (WebGIS) are used to store, analyze and spread the geospatial information, facilitating an efficient decision-making. However, the issues of complexness and changing requirements in WebGIS severely delay the overall development process. Therefore, a Model Driven Architecture paradigm, along with the use of Interaction Flow Modeling Language (IFML), can be a great way to reduce the development complexities. While the IFML has several concepts pertaining to the modeling of user interface components in web applications, the concepts that are specifically required to model WebGIS user interactions are found to be missing in its standard specifications. Consequently, this article has extended the standard IFML meta-model with a UML profile, which allows to model user interactions for WebGIS. The validity of the proposed profile has been demonstrated via a real-world case study. The results prove that the proposed profile may be used for the modeling of simple and complex scenarios of WebGIS development. Based on the proposed UML profile, the IFML Editor Palette can be updated with the proposed stereotypes. Writing a Model to Text (M2T) transformation for transforming the system models into an executable java code is a milestone to be achieved in future.</p>
<p><b>A18</b> <b>14:15-14:30</b></p>	<p>Centralized Registration System as an E-Governance Service Author: Sowvik Kanti Das, H. M. Mahir Shahriyar, Kazi Bushra Al Jannat, Shatadru Shikta and Dr. Mahady Hasan Presenter: Sowvik Kanti Das, Independent University, Bangladesh</p> <p>Abstract: E-Governance can be a very lucrative offer, especially in the field of Bangladesh which has a rapidly growing population. Now this paper explores a central Registration System from which students can register for their courses and can help reduce dropouts and help encourage students to move towards tertiary education. Moreover, this system can help the government to increase employment, especially for the fresh graduates as well as reduce the overall cost of education in the long run in the process, thus saving billions for the government as well as generating more in the process.</p>

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<p><b>A70</b> <b>14:30-14:45</b></p>	<p>The role of industrial digitization in modularized supply chain management Author: Lan Wang and Ping Wang Presenter: Lan Wang, Beijing Language and Culture University, China</p> <p>Abstract: This study explores how industry digitization influence the relationship between supplier management capability, modularized supply chain management and channel flexibility. Modularized supply chain management is a new form of supply chain governance mechanism. The construction of modularized supply chain is the process of deconstructing industrial value network (Nearly decomposition System), which forms a network structure of strong connection within module and weak connection between modules. The results reveals that modularized supply chain management positively related with channel flexibility. Supplier management capability enhances channel flexibility through modularized supply chain management. Meanwhile, industrial digitization has a positive moderated effect on the above relationship. Theoretical and managerial implications are discussed.</p>
<p><b>A74</b> <b>14:45-15:00</b></p>	<p>Personalization of Learning Content in Learning Management System Author: Lim Ean Heng, Wong Pei Voon, Norazira A Jalil, Chan Lee Kwun, Tey Chee Chieh, Nor Fatiha Subri Presenter: Lim Ean Heng, UTAR, Malaysia</p> <p>Abstract: The implementation of personalization in learning management systems (LMS) is to cater the differences of students learning experience to fits to their profiles which helps in improving their learning performance. In general, traditional LMS does not consider the student's learning style and only provide the course content in a static way such as Powerpoint slides to every student. By integrating personalization into LMS, the personalized LMS will recommend the appropriate learning materials to the students based on their learning style so that they can maximize their learning performance. The proposed personalization is designed with the goal of matching the students learning style with the most appropriate learning materials. The personalize LMS will automatically suggesting the appropriate learning materials to the student's based on their learning style by using the learning style model from Felder-Silverman. The result reveals the system effectiveness for which it appears that the proposed approach may be promising.</p>

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<p><b>A56</b> <b>15:00-15:15</b></p>	<p>The Research on Multi-level Performance Optimization of Course Selection System Based on Full Credit System Author: Guo Fangming, Song Hua Presenter: Fangming Guo, Academic Affairs Office of Wuhan University of Technology, China</p> <p>Abstract: The full credit system is a trend in the teaching reform of Chinese universities in recent years. The comprehensive elective system is the core of the full credit system. For comprehensive universities, with the continuous expansion of enrollment scale, the number of majors, classes, and students has increased dramatically, and the amount of information about students' course selection has also doubled, making it very difficult to implement a comprehensive course selection system. In view of the characteristics of the comprehensive course selection system, this article starts with the basic needs of the course selection business, deeply analyzes the complexity of the course selection system, and adjusts the course selection strategy. At the same time, in view of the performance problems of the course selection system, a multi-level architecture optimization scheme was proposed, using data caching, data level segmentation, cloud platform and other technologies, which greatly reduced the concentration of data processing during the course selection. Practice shows that the performance of the optimized course selection system has been greatly improved, which can better meet the course selection requirements of comprehensive universities.</p>
<p><b>A57</b> <b>15:15-15:30</b></p>	<p>A Genetic Algorithm for Multi-Objective Optimization in Complex Course Timetabling</p> <p>Author: Ngo Tung Son, JAFREEZAL B JAAFAR , IZZATDIN ABDUL AZIZ , NGUYEN HOANG GIANG, BUI NGOC ANH Presenter: Nguyen Hoang Giang, FPT University, Vietnam</p> <p>Abstract: The article describes a new method to construct an enrollment-based course timetable in universities, based on a multi-objective optimization model. The model used mixed-integer and binary variables towards creating a schedule. It satisfies students' preferences for study time, with the number of students in the same class being optimal for training costs while ensuring timetabling business constraints. We use a combination of compromise programming and linear scalarizing to transform many objective functions into single-objective optimization. We designed a scheme of the Genetic Algorithm to solve the proposed model. The proposed method allows approaching several types of multi-objective combinatorial problems. The algorithm was tested by scheduling a study schedule for 3,000 students in the spring semester of 2020 at FPT University, Hanoi, Vietnam. The obtained results show the average students' preference level of 69%. More than 30% of students have a satisfaction level of more than 80% of the timetable after two hours of execution time.</p>

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<p><b>A71</b> <b>15:30-15:45</b></p>	<p>Study on the Role of Informatization Orientation on Smart Supply Chain Author: Lan Wang and Zimeng Guo Presenter: Lan Wang, Beijing Language and Culture University, China</p> <p>Abstract: In the context of industrial digitization, the development of information technology has facilitated supply chain integration and innovation, leading the way to the development of smart supply chains. Exploring how to optimize traditional supply chain practices and build smart supply chains is of great significance to the development of enterprises. The article aims to discover the relationship among information orientation, smart supply chain practice and firm performance. Based on resource-based theory, we select a part of the annual reports of Listed company in Shanghai and Shenzhen stock markets in manufacturing industry, and use content analysis to measure the level of informatization and smart supply chain practices. The results reveals that the informatization orientation positively affects the practice of smart supply chain. Both informatization orientation and smart supply chain practice have a positive impact on corporate performance, and the smart supply chain practice plays a full mediation role in the relationship of informatization orientation and corporate performance. Theoretical and managerial implications are discussed.</p>
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**13:30-15:30, MALAYSIA TIME, GMT+8**

**ZOOM LINK: [HTTPS://ZOOM.COM.CN/J/63516375141](https://zoom.com.cn/j/63516375141)**

**Session 2: Programming Language and Software Testing**

**Session Chair: Prof. Takuo Watanabe, Tokyo Institute of Technology, Japan**

<p><b>A45</b> <b>13:30-13:45</b></p>	<p>Functional Reactive Programming for Embedded Systems with GPGPUs Author: Yoshitaka Sakurai, Sosuke Moriguchi and Takuo Watanabe Presenter: Sosuke Moriguchi, Tokyo Institute of Technology, Japan</p> <p>Abstract: We propose new functionality for FRP language to support computations on GPUs. Some embedded systems equip GPUs, which enable us to process large amounts of data such as camera images. We have developed an FRP language for embedded systems, named Emfrp. However, Emfrp lacks two kinds of concepts for computations on GPUs; one is the representation for large amounts of data, and the other is the declaration of the calculational resources of computations. In this paper, we introduce node arrays and GPU nodes, which are time-varying values computed on GPUs. We also show a prototype language of these features and evaluation through some examples on it.</p>
<p><b>A54</b> <b>13:45-14:00</b></p>	<p>Sequence t-way Test Generation using the Barnacles Mating Optimizer Algorithm Author: Kamal Z. Zamli, Md. Abdul Kader Presenter: Kamal Z. Zamli, Universiti Malaysia Pahang, Malaysia</p> <p>Abstract: Software testing relates to the process of finding errors/defects and/of ensuring that a particular software of interest meets its specification. Although desirable, exhaustive testing is often practically impossible, given many constraints such as time to market deadline as well as unavailability of resources. Many sampling strategies have been designed to ensure sufficient and good enough testing including equivalence partitioning, boundary value analysis, cause and effect graphing, interaction-based sampling and many more. This paper presents a new test generation strategy based on sequence-based t-way testing (where t indicates the interaction strength), called BSS (Barnacle Sequence Strategy). More precisely, we focus on the generation of test cases due to the ordering of inputs (or sequence) using the newly developed Barnacles Mating Optimizer (BMO) Algorithm. Our experience with BSS is encouraging as we manage to match some of existing best test suite size for small interaction strength (<math>t &lt; 5</math>) with small number of event sequences (<math>\leq 10</math>). However, BSS performs poorly with large event sequences owing to the concatenation and scaling problem of its exploitation search operator.</p>

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**13:30-15:30, MALAYSIA TIME, GMT+8**

**ZOOM LINK: [HTTPS://ZOOM.COM.CN/J/63516375141](https://zoom.com.cn/j/63516375141)**

<p><b>A40</b> <b>14:00-14:15</b></p>	<p>ISO 9241-11 and SUS Measurement for Usability Assessment of Dropshipping Sales Management Application Author: Nik Azlina Nik Ahmad, Nabilah Safra Hasni Presenter: Nik Azlina Nik Ahmad, Universiti Kuala Lumpur, Malaysia</p> <p>Abstract: The growth of digital marketing or e-commerce opens up opportunity and increase the possibilities for any individual to start a business. This fits the current trends where online shopping seems to be more comfortable to many people as it cuts the hassle, cost, and time. This study endorsed a mobile dropshipping sales management application and investigates its usability evaluation by assessing task performance and measuring their satisfaction using System Usability Scale (SUS). This study closely worked with actual users for the application assessment using ISO 9241-11 standard. A number of 17 dropshippers involved in the assessment, where the effectiveness (task completion rate), efficiency (time spent), and satisfaction using SUS instrument were performed. In general, the results disclose that the application has agreeably met the users' satisfaction by passing the acceptable marginal level, but dissatisfied 11.8% of the participants, which in turn indicates that severe improvements are necessary. The approach used in this study indicates further research from multiple perspectives and contexts.</p>
<p><b>A72</b> <b>14:15-14:30</b></p>	<p>Developing Question Generation System for Bahasa Indonesia Using Indonesian Standard Language Regulation Author: Maulana Wisnu P, Indra Budi, Hari Budi Santoso Presenter: Maulana Wisnu P, University of Indonesia, Indonesia</p> <p>Abstract: In education, teacher will frequently ask his student to measure the level of understanding for each student. Meanwhile, the need for self-evaluation for students is requiring the system that able to automatically generate question whenever they want. In order to tackle that problem, there is an area of research, called as question generation (QG). Question generation is a task to make a system that able to automatically generate questions as good as human. In English, there are already many researches in this area, that is from traditionally using pattern matching, or statistically with machine learning. Meanwhile, there is still not many works in Bahasa Indonesia. This research tries to drive the research in question generation, especially in Bahasa Indonesia. Tata Bahasa Baku Bahasa Indonesia (TBBI) is a set of standard language rules in Bahasa Indonesia, is used in this work to convert statement sentence into interrogative sentence. This method allows the more directed pattern matching for converting statement into question. By using this method, the system is able to generate up to 5,000 different questions, with just one book.</p>

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Untyped lambda calculus with functionally referable environments

Author: Shin-ya NISHIZAKI, Ryotaro KASUGA

Presenter: Shin-ya NISHIZAKI, Tokyo Institute of Technology, JAPAN

**A64**

**14:30-14:45**

Abstract: The environment is the relationship between variables and their bound values during program execution and is a notion in program semantics. A first-class environment is a mechanism that allows the environment to be treated like data, such as integer values or Boolean values, and can be passed to a function as an argument or received as a return value. The environment calculus is a formal computational system proposed by Nishizaki and is a lambda calculus that extends the first-class environment mechanism. The formulation of the environment was based on explicit substitution by Curien et al., who viewed the environment as a substitution. The operational semantics of the environmental calculus, or the reduction, is based on the reduction of the lambda-sigma calculus. In the calculus, there are two constructs for first-class environments: one is the identity environment to reify the current environment, that is, to transfer a meta-level environment to object-level data; the other is the environment composition to reflect the object-level environment data, that is, to transfer object-level environment data back to a meta-level environment. In this paper, instead of the environment composition, we propose a new interface with a first-class environment, a functionally referable environment. If object-level environment data is given as an argument for a function application, the functional reflection brings the environment back to the meta-level and makes the lambda term evaluable under that environment. Using the functionally referable environment, one can unify the environment composition with the function application. We define the untyped lambda calculus with functionally referable environments: we give the syntax of the calculus and its reduction. Then we provide the semantics for the reduction using a translation of the environment calculus into the record calculus. We prove the soundness of the translation semantics. Finally, we discuss the evaluation strategy, especially the call-by-value reduction.

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Test Suite Generation Based on Hybrid Flower Pollination Algorithm and Hill Climbing  
Author: ABDULLAH B. NASSER, KAMAL Z. ZAMLI, NOR WARDAH BINTI MOHD NASIR, WAHEED ALI H. M. GHANEM AND FAKHRUD DIN  
Presenter: ABDULLAH B. NASSER, Universiti Malaysia Pahang, Malaysia

**A61**  
**14:45-15:00**

Abstract: One of the common application of search-based software testing (SBST) is generating test cases for all objectives characterized by a scope model (e.g. articulations, mutants, branches). The application of meta-heuristic algorithms in t-way tests generation, as an example of SBST, has as of late gotten to be predominant. Thus, numerous valuable meta-heuristic algorithms have been created on the premise of the usage of t-way techniques (where t shows the interaction quality). T-way testing technique is a sampling technique to produce an optimum test suite in a systematic manner. In other words, is to generate a smaller test suite size that can be used for testing the software in less time and coast. Here, all t-way techniques generate the test suite with the aim to cover every possible combination produced by the interacting inputs or parameters. All possible t-combinations of the system's components must be covered at least once. Besides, the purpose of the t-way testing technique is to overcome exhaustive testing. Studies reported that there is no single strategy that appears to be superior in all configurations considered. In this research paper, we propose a new software t-way testing tool based on hybrid Flower Pollination Algorithm and Hill Climbing for generating test suite generation, called FPA-HC strategy can be used for generating smaller test suite size. The FPA-HC evaluated against the existing t-way strategies including the original FPA. Experimental results have shown promising results as FPA-HC can produce very competitive results comparing with existing t-way strategies.

**A63**  
**15:00-15:15**

SMT-Based Theorem Verification for Testing-Based Formal Verification  
Author: Kenta Sugai, Hiroshi Hosobe and Shaoying Liu  
Presenter: Kenta Sugai, Hosei University, Japan

Abstract: Testing-based formal verification with symbolic execution (TBFV-SE) checks whether programs correctly implement their formal specification. Given a formal specification and a program, it first derives a theorem expressing the correctness property of the executed program paths and then formally verifies the validity of the theorem. However, such theorems still need to be verified manually due to the lack of a tool support for dealing with expressions involved. In this paper, we propose a method for automatically verifying theorems for TBFV-SE. This method uses an SMT solver to check whether a theorem is valid. For this purpose, the method converts the conditions in the theorems written in the SOFL specification language into appropriate constraints that are supported by the SMT solver. We present a tool to support the method, and present two case studies to demonstrate how the tool works in the context of Java programs and SOFL specifications.



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<p><b>A36</b> <b>15:15-15:30</b></p>	<p>Software Requirement-Related Information Extraction from Online News using Domain Specificity for Requirements Elicitation Author: Mutia Rahmi Dewi, Indra Kharisma Raharjana, Daniel Siahaan, Chastine Fatichah Presenter: Mutia Rahmi Dewi, Institut Teknologi Sepuluh Nopember Surabaya, Indonesia</p> <p>Abstract: Stakeholder involvement is vital in the requirements elicitation process. However, a lack of stakeholder involvement in the project often occurs. Various data sources, such as business processes and software documentation, will help determine what stakeholders need. The limitation of these documents is that they are technical and do not contain numerous stakeholder's needs. This paper aims to extract information related to software requirements from online news using domain specificity. The online news comprises elements that compose the user story, namely: the aspect of who (stakeholder), the aspect of what (functional), and the aspect of why (reason). User stories are standard practices used to capture and write functional software requirements in agile software development. This paper proposes to use domain specificity to extract aspects of what from online news to increase understanding of domain knowledge, especially software functionality. We use SRS documents and online news as data sources. Based on these datasets, domain specificity is calculated to produce software specific vocabulary. POS tags are being used to extract software requirements-related information from online news. When examining two datasets, our approach improved precision and recall with average values of 0.56 and 0.579.</p>
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**Session 3: Software Design and Development**

**Session Chair: Lecturer Nik Azlina Nik Ahmad, Universiti Kuala Lumpur, Malaysia**

<p><b>A09</b> <b>16:00-16:15</b></p>	<p>A Block-chain Oriented Model Driven Framework for handling Inconsistent Requirements in Global Software Development Author: Nayab Gull, Muhammad Rashid, Farooque Azam, Yawar Rasheed and Muhammad Waseem Anwar Presenter: Nayab Gull, Umm Al Qura University, Saudi Arabia</p> <p>Abstract: Requirements engineering (RE) is one of the most important phases in software development process. Therefore, the handling of inconsistent/conflicting requirements is considered as a major issue in the requirements phase. Due to the evolving practices of Global Software Development (GSD), where the development team is geographically spread, the phase of RE is more prone to inconsistencies. Many approaches have been suggested to overcome the problem, however, these solutions are very limited in their scope and does not fit the peculiarities of GSD configurations. On the other hand, Block Chain methodology has shown promising results in various domains and has very sophisticated features like transparency and decentralization to support the management of inconsistent requirements. Similarly, Model Driven Software Engineering (MDSE) is marked with abstraction and reducing complexity which may be benefited to handle inconsistent requirements. Consequently, this article introduces a Block chain Oriented Model Driven (BOMO) framework by integrating the concepts of RE and Block Chains in the context of MDSE. This allows the effective management of inconsistent requirements through block chain technique with simplicity as offered by MDSE. As part of the framework, a meta model is proposed which has been subsequently evolved into a Sirius graphical modelling tool. The applicability of the proposed framework has been demonstrated via a case study. Experimental results prove that the proposed framework may be used with sufficient reliability and can be further evolved to handle inconsistent requirements in a promising manner.</p>
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<p><b>A49</b> <b>16:15-16:30</b></p>	<p>Challenges in combining Agile Development and CMMI: A Systematic Literature Review Author: Alex Ferdinansyah, Betty Purwandari Presenter: Alex Ferdinansyah, Universitas Indonesia, Indonesia</p> <p>Abstract: Recently, Agile Development has emerged as an alternative approach in software engineering. The Agile Software Development (ASD) process provides the ability to cope with ever-changing requirements. On the other hand, the Capability Maturity Model Integration, one of the Software Process Improvement Framework, is widely used to provide software development organizations with structure and stability in their software process. It enables organizations to generate software processes with better quality software, the productivity increase of the development team, and minimal risk of failure. The idea behind combining the Capability Maturity Model Integration (CMMI) and Agile aims to create a software development procedure that is stable and continues to improve while also providing agility for dealing with dynamic business needs. This research compiles the experiences of combining both software and identifies challenges for the collaborative implementation process. This study also highlights the extent of the compatibility of CMMI and Agile Development. This research followed a standardized Systematic Literature Review procedure and used the approach known as Preferred Reporting Items for Systematic Reviews and Meta-Analyses or PRISMA. The findings indicate that the main challenges with regard to combining CMMI and Agile are the lack of relevant knowledge and experience and the culture of CMMI, Agile, or sometimes both. The limited scope of Agile itself poses another considerable challenge. Agile focuses on software development projects, while CMMI has a broader range, from project-level development to organization-level process improvement. This review also finds that Agile Development is compatible with CMMI at a maturity level of 2 and 3. Future studies should determine the optimal method for overcoming the obstacles associated with combining CMMI and Agile.</p>
<p><b>A42</b> <b>16:30-16:45</b></p>	<p>A Decentralized Self-Optimization Approach for Distributed Component-Based Software Systems Author: Emad Albassam, Jason Porter Presenter: Emad Albassam, King Abdulaziz University, Saudi Arabia</p> <p>Abstract: Self-optimization is the process in which a software system autonomously and continuously adapts itself based on environmental changes which negatively impact its overall performance. Most self-optimizing systems rely on an abstract model, with the majority relying on an abstract model representing the running software architecture to guide self-optimization decisions. However, existing approaches to self-optimization are centralized resulting in a single point of failure. This paper outlines a decentralized approach to self-optimization based on DARE, an architecture-based framework for providing component-based software systems with self-configuration, self-healing, and self-protection properties. We show how DARE services are extended to monitor and analyze the incoming message rate of components as well as how these services coordinate at runtime to self-optimize the controlled software system without losing any transactions. Experimental results demonstrate DARE's ability to achieve self-optimization at runtime and in a decentralized way.</p>

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<p><b>A62</b> <b>16:45-17:00</b></p>	<p>Software Craftmanship for Extreme Programming Quality Improvement: A Case of Small Software Organizations Author: Ahmadi, Eko K. Budiardjo, Kodrat Mahatma Presenter: Ahmadi, Universitas Indonesia, Indonesia</p> <p>Abstract: Software product release often sacrifices quality concerns and produces messy code to reach the market quickly. At some point, the software becomes difficult to maintain, and re-engineering is an available option to improve software quality. By finding a way to improve our software product quality effectively, we explore the available software re-engineering methods that match the business needs. This paper presents our case, a product development improvement effort in a very-small entity (VSE) company with limited resources and a tight development schedule. Our experiment shows that with careful software redesigning and implementing XP practices, supported well-crafted software manifesto, we can ensure software code quality improvement.</p>
<p><b>A28</b> <b>17:00-17:15</b></p>	<p>Evaluation of software tools in the domain of field service management Author: MARCO PRETTERHOFER, VITALIY MEZHUYEV Presenter: VITALIY MEZHUYEV, FH JOANNEUM, Kapfenberg, Austria</p> <p>Abstract: In the digital era, companies are switching from manual workforce management to the use of integrated tools, which automate planning steps and provide effective electronic business management solutions. The market for such software is growing rapidly. In addition to established software providers such as SAP and Oracle, many smaller software companies are now providing their independent software packages. Companies that have decided to deploy a field service management tool now face the challenge of evaluation and selection criteria. This paper proposes a model for the evaluation of software tools in the domain of field service management. The model was applied to evaluate the tools in the service processes of oil and gas companies. SAP Field Service Management was ranked as the top product in a case study. The tools from Odyssee and Salesforce received significant ratings in the categories that refer to their functional aspects. The results from the study can be used by corporate management to support decision making for selecting software applications.</p>

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<p><b>A73</b> <b>17:15-17:30</b></p>	<p>A Suite of Process Metrics to Capture the Effort of Developers Author: Enzo Camuto, Andrea Fornaia, Leonardo Pelonero and Emiliano Tramontana Presenter: Leonardo Pelonero, University of Catania, Italy</p> <p>Abstract: Software repositories are a valuable support for large teams working together on a project. Besides the code, a repository includes useful data related to development practices. This paper proposes novel metrics applied to data extracted from repositories and related to the development. Complete automation has been achieved for extracting data from repositories and for computing metrics, as well as representing them. This has been performed by using available tools, such as PyDriller, and our own developed components. The value of the proposed metrics is to reveal the effort of developers and their practices, in order to highlight strengths and weaknesses, then suggest improvements.</p>
<p><b>A76</b> <b>17:30-17:45</b></p>	<p>Classification of Inundation Level using Tweets in Indonesian Language Author: Kwee Felicia Ilona, Indra Budi Presenter: Kwee Felicia Ilona, Universitas Indonesia, Indonesia</p> <p>Abstract: Extreme flood events are expected to occur more frequently as climate change has yet to show signs of improvement. This has the potential to lead to higher rainfall and floods that would come more quickly. Early warning systems sometimes fail to provide quick information because sometimes conditions in the field do not match to what is known in the information center, such as a malfunctioning water pump or a water level that has increased relatively quickly. Therefore, this study aims to provide an alternative source of information that may provide information more quickly in flood conditions, namely through the social media twitter. The proposed model is expected to provide output in the form of inundation level categories, namely “high”, “medium”, “low”, and “unknown”. 10-fold stratified cross validation with seven variations of classifiers were used to evaluate the model. The best relevance classification resulted in 90.6% accuracy (SVM Linear SVC), 89.05% average precision (SVM RBF), and 82.03% average F1-score (SVM Linear SVC) and average recall of 84.10% (Logistic Regression). The best classification results of inundation level resulted in accuracy (82.74%), average precision (85.44%) average recall (68.07%) and average F1-score (71.43%). All of them were obtained by using the SVM Linear SVC.</p>

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Ensuring Source Code Propagation Procedures for a Large-Scale Software Development Scenario: An Experience Report

Author: Patrick Lima, Thiago Souza, Fabiano Pires, Ivan Bentes, Isabela Silva, Paulo Fonseca

Presenter: Thiago Lopes de Souza, Sidia R&D Institute, Brazil

**A15**

**17:45-18:00**

Abstract: Currently, software development demands continuous effort to manage source code changes, produced by several teams constantly. Usually Version Control Systems (VCSs) are used to manage these changes. It is very important to define and follow policies and procedures that helps avoiding error insertions while performing changes on software products, although in a large-scale scenario, with teams spread out globally, it is also difficult to verify and ensure that those procedures are correctly applied.

This paper describes an automation tool, developed in order to interface the process of source code propagation, ensuring the complete and correct following of company's defined policies and procedures, decreasing error occurrence as well as the effort to accomplish source code propagation, which may improve quality of software products.

This tool was evaluated in a large-scale scenario with hundreds of branches and dozens of monthly propagation operations. We observed that time spent on propagation activities decreased approximately 50%, causing a substantial gain in a large-scale scenario. This time reduction was possible, due to a complete comprehension of the automated process and good acceptance by company's developers.

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**Session 4: Data Model and Intelligent Computing**

**Session Chair: Prof. Vitaliy Mezhujev,**

**FH JOANNEUM University of Applied Sciences, Austria**

Simulation of Preemptive Scheduling of the Independent Tasks Using Timed Automata

Author: Amarat Pimkote, Wiwat Vatanawood

Presenter: Miss Amarat Pimkote, Chulalongkorn University, Thailand

**A21**

**15:45-16:00**

Abstract: To consider the effects of preemptive scheduling occurred in the concurrent threads of the independent tasks with priority values, we propose an alternative to simulate the preemptive scheduling using timed automata tool. Firstly, each independent task with priority value is expected to be represented as an ordinary timing diagram with its priority value. The timing diagram focuses on the state changings within and among lifeline along a linear timeline, of a particular independent task. Then, we propose a set of translating rules to map the timing diagrams and their associated priority values into the corresponding timed automata with the extra dormant states as to serve the task preemptions. Our resulting timed automata are sufficient and ready to be simulated using UPPAAL real-time simulation tool, yielding the model-in-loop simulation as to verify the logic hazards that might be found in the preemptive scheduling. The possibility of the violation of the hard time constraint and deadlock is checked.

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<p><b>A38</b> <b>16:00-16:15</b></p>	<p>Towards a Service-Driven Model for Industry-4.0 Author: Zakaria Benzadri, Takieddine Bouheroum, Youcef Ouassim Cheloufi, Faiza Belala and Mohamed Nadir Hassani Presenter: Zakaria BENZADRI, Abdelhamid Mehri University of Constantine 2, Algeria</p> <p>Abstract: In recent years, the digital transformation, characterizing the fourth generation of the industry, has emerged as a promising technological framework for supporting manufacturing processes at different levels. In the fourth-generation industry, the Smart Factory model covers several forms of future industrial systems. In particular, it refers to an interconnected system that links machines, management methods and products. In practice, this interconnection is only achievable if we adopt an architectural design that reduces the complexity of such a system. In this thought, Cyber-Physical Systems (CPSs) are recent complex systems, subject to distributed control, cooperation, influence, cascading effects and emerging behaviors. However, in the context of Industry 4.0, few research attempts are interested in integrating CPSs to study, design and implement more intelligent manufacturing systems.</p> <p>The main contribution of this paper is to propose a service-driven approach, based on CPS, to model intelligent production systems. We specify static and behavioral aspects of these complex and distributed systems, in terms of services, interfaces and choreography. Then, an executable model is deduced to implement and validate our proposal through a realistic case study, using IBM Rational Software Architect Designer (RSAD) tool. This allows us to study in depth the manufacturing process of a grader in an Algerian company (SOMATEL-ENMTP) and identify a set of findings to move this factory towards industry 4.0, while developing a digital plan.</p>
<p><b>A48</b> <b>16:15-16:30</b></p>	<p>Cost Modeling and Analysis of the Consumer Price Index in the Philippines Author: Jefferson A. Costales Presenter: Jefferson A. Costales, Eulogio "Amang" Rodriguez Institute of Science and Technology, Philippines</p> <p>Abstract: Rising expenses and uncontrolled market movements necessitate technology solutions to arm individual's adequate information for better decisions. These technologies supported processes can help people to strategize to budget their everyday expenses. One of the indicators to determine the prices of the commodity in the markets is called the Consumer Price Index (CPI). According to the Philippine Statistical Authority-formerly National Statistics Office, CPI is an indicator of the change in the average retail prices of a fixed basket of goods and services commonly purchased by households relative to a base year. It is a major statistical series used for economic analysis and as a monitoring indicator of government economic policy. Moreover, CPI is most widely used in the calculation of the inflation rate and purchasing power of the peso. The researchers utilized the data came from the official website of the Philippine Statistical Authority from 2000 to 2015. The researchers also adopted the modern forecasting techniques called the Box-jenkins time series analysis. This is a method to form a mathematical model designed to forecast a time series. The researchers sought to find the best model using the said forecasting method from January 2015 to December 2017. The results show that the plot of the Consumer Price Index of the Philippines. It can be seen that CPI is increasing with some fluctuation. In addition, the average CPI from 2000 to 2015 is 108.20 while the highest CPI in that span of time is 142.6 that happened December 2015 and the lowest CPI is 75.3 during January 2000. The analysis also includes the testing of the stationarity of the data using augmented dickey fuller, error diagnostics and model adequacy. Finally, the researchers arrived the best mathematical model that can predict the future values of the CPI based on the AIC as criteria in selecting the best model is SARIMA(1,1,0)(1,0,0){12} with drift.</p>



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<p><b>A58</b> <b>16:30-16:45</b></p>	<p>Multi-criteria recommender system model for lockdown decision of Covid-19 Author: Erna Hikmawati, Nur Ulfa Maulidevi, and Kridanto Surendro Presenter: Erna Hikmawati, Bandung Institute of Technology, Indonesia</p> <p>Abstract: A lockdown is an appropriate method to suppress the spread of COVID-19 in a region. However, apart from the spread of COVID-19, it also affects various aspects and sectors. Therefore, a lockdown decision for a region must go through a careful planning before being finalized. There are many criteria to be considered in a lockdown decision, among them are the number of positive cases, health facilities and demographic situation in an area. This article will discuss a recommender system model that may assist the lockdown decision in a region by considering several criteria originating from multiple databases. In this model had two kinds of inputs, namely internal and external databases. In this case, Internal database is reproduction number of covid-19 case in West Java. External Database is elderly age number ratiom health facility number ratio, nurse ratio and medical worker ratio (specialists and general practitioners), beds in health facilities and population density. The outputs of this method were decisions whether to implement lockdown or new normal for a region in accordance of predetermined parameters. The results of this model can be used for the government in formulating strategies to reduce the number of spread of Covid-19 in terms of determining which areas should apply lockdown.</p>
<p><b>A59</b> <b>16:45-17:00</b></p>	<p>Research on Data Generation Model Based on Improved SeqGAN Author: Jian Dou, Shuang Qie, Jizhe Lu, Yi Ren Presenter: Weiheng GUO, Dareway Software Co.,Ltd., China</p> <p>Abstract: With the demand of integrated energy metering business and the rise of artificial intelligence technology, the data generation model of digital equipment has become the focus of attention. As the most widely used method in the field of image generation, the implicit method based on GAN has great development potential and strong domain expansion ability. The addition of reinforcement learning method makes the GAN correlation algorithm suitable for data generation of discrete data. This paper proposes an improved SeqGAN model, reconstructs the original SeqGAN model, improves the roll-out module of the original model, uses model parameters lagging behind the generator, and increases the stability of long sequence reinforcement learning. Compared with some existing popular algorithms, the performance of the proposed model algorithm is significantly better than that of the comparison algorithm when the training times are enough (more than 150 times), which lays a foundation for its application in data generation of digital equipment.</p>

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<p><b>A75</b> <b>17:00-17:15</b></p>	<p>Predicting Movie Box-Office Success and The Main Determinants of Movie Box Office Sales in Malaysia using Machine Learning Approach Author: YEE MUN CHEANG, TAN CHYE CHEAH Presenter: YEE MUN CHEANG, Asia Pacific University of Technology and Innovation (APU), Malaysia</p> <p>Abstract: A movie's box office is the revenue generated by the movie via ticket sales. Predicting the success of a movie in the box office is never easy. There are many factors that could potentially affect movie box office, such as its reviews and ratings, star power, genre, seasonality, and et cetera. This study aims to explore the most vital factors that influence the Malaysian box office, and to build an accurate predictive model that is tailored to this market using knowledge discovery in databases (KDD) methodology. Movie data will be obtained from FINAS [1], Box Office Mojo [2] and IMDb [3], so that it can be cleaned and processed. The cleaned dataset will be used to build support vector machine (SVM), neural networks (NN) and multilayer perceptron (MLP) models. This paper analyses the efficiency of the three models to predict the box-office success of movies, while analysing the influence of variables. At the end of the study, the most suitable model will be selected. The analysis shows that the most important factors that influence movie box office are movie budget and movie review scores for both local and international movies. In addition, the multilayer perceptron (MLP) model with its accuracy of 0.7529 is the best fit model to predict Malaysia box office for local movies. On the other hand, for predicting the Malaysia box office performance of international movies, neural network (NN) is the best fit model with an accuracy of 0.6171.</p>
<p><b>A27</b> <b>17:15-17:30</b></p>	<p>Using Cloud Control Matrix to evaluate trust in cloud providers Author: LIVIA MARIA BRUMĂ Presenter: Livia Maria Brumă, The Bucharest University of Economic Studies, Bucharest, Romania</p> <p>Abstract: The increase in the number of users of cloud has led to an increase in the number of providers of this technology. The decision to migrate resources to cloud should be made after going through a process that provides relevant information about the security, availability, financial values involved, implicitly the trust that consumers can have in cloud service providers. In the first part of this article is presented the main methods for verifying trust in suppliers, following the proposal of a framework model for analyzing the parameters that can provide information on trust in CSP. In the second part of the article is proposed, a method of using CCM (Cloud control matrix) and CAIQ-Lite (Consensus Assessment Initiative Questionnaire) tools to determine a minimum level of CSP confidence.</p>

**DAY 2, WEDNESDAY, FEB. 24, 2021**

**15:45-18:00, MALAYSIA TIME, GMT+8**

**ZOOM LINK: [HTTPS://ZOOM.COM.CN/J/63516375141](https://zoom.com.cn/j/63516375141)**

<p><b>A44</b> <b>17:30-17:45</b></p>	<p>FU Covid-19 AI Agent built on Attention algorithm using a combination of Transformer, ALBERT model, and RASA framework Author: Phung Duc Thang, Nguyen Tan Viet, Tran Duy Dat, Nguyen Van Thai, Ngo Tung Son, Tran Quy Ban Presenter: PHUNG DUC THANG, FPT University, Vietnam</p> <p>Abstract: Potentialized by Natural Language Processing (NLP) technology, we can build a chatbot or an AI Agent to automatically address the need to automatically get credible and timely information, especially in the fight against epidemics. However, Vietnamese understanding is still a big challenge for NLP. This paper introduces an AI Agent using the Attention algorithm and Albert model to implement the question/answering task in the Covid-19 field for the Vietnamese language. In the end, we also built two other modules, one for Vietnamese diacritic auto-correction and another for updating Covid-19 statistics (using RASA framework), to deploy a Covid-19 chatbot application on mobile devices.</p>
<p><b>A69</b> <b>17:45-18:00</b></p>	<p>Graph Convolutional Matrix Completion via Relation Reconstruction Author: Chang Su, Min Chen, Xianzhong Xie Presenter: Min Chen, Chongqing University of Posts and Telecommunications, China</p> <p>Abstract: To alleviate sparsity and improve recommender systems performance, it is necessary to go beyond modeling user-item interactions and take auxiliary information into account. Besides user-item interactions, auxiliary information can be used to build relation graphs. Recently, Graph Convolution Networks (GCNs), which can integrate content information and structural information of nodes, have been demonstrated to be powerful in learning on graph data and applied in recommendation systems. However, existing approaches do not consider multiple types of relations between nodes and high-order structural information. In this paper, we propose a new model called Graph Convolutional Matrix Completion via relation reconstruction (RE-GCMC) to capture structural information and relations between nodes in the graph. We construct user-user, item-item, and user-item relation graphs by evaluating the feature similarity of the nodes. Then, we introduce the Graph Convolutional Networks (GCNs) and self-attention mechanism to be applied in the graphs to refine feature embeddings. We apply the proposed model to four datasets and experimental results demonstrate that our approach outperforms state-of-the-art recommender baselines.</p>

**DAY 3, THURSDAY, FEB. 25, 2021**

**9:30-11:45, MALAYSIA TIME, GMT+8**

**ZOOM LINK: [HTTPS://ZOOM.COM.CN/J/66623978388](https://zoom.com.cn/j/66623978388)**

**Session 5: Computer and Information Engineering**

**Session Chair:**

Overcoming Binary Instrumentation Challenges in Presence of Obfuscation Techniques and Problematic Features

Author: Amir Majlesi-Kupaei, Danny Kim, Rajeev Barua

Presenter: Amir Majlesi-Kupaei, University of Maryland, College Park, USA

**A12**

**9:30-9:45**

Abstract: This paper improves upon an earlier binary rewriter we designed called RL-Bin. Unlike static rewrites, which are inherently non-robust, RL-Bin uses a dynamic design and thus is more robust. However, although RL-Bin works for most compiled binaries, real-world features commonly found in obfuscated binaries are still not handled. The features include anti-disassembly, dynamically modified code, anti-rewriting, anti-debugging, and code convention violation. This paper presents RL-Bin++, an improved version of RL-Bin, that handles various problematic real-world features, thus correctly rewriting for nearly all benign binaries. We demonstrate that RL-Bin++ can efficiently instrument heavily obfuscated binaries (overhead averaging 2.76x, compared to 4.11x, and 5.31x overhead for DynamoRIO and Pin, which are comparable or lower overheads. However, the main achievement is that we achieved this while maintaining the low overhead of RL-Bin for unobfuscated binaries (only 1.05x). This makes RL-Bin++ the only robust binary instrumentation solution capable of being deployed in live systems since the overhead of DynamoRIO (1.16x), and Pin (1.29x) for unobfuscated binaries is too high for use in live systems.

**DAY 3, THURSDAY, FEB. 25, 2021**

**9:30-11:45, MALAYSIA TIME, GMT+8**

**ZOOM LINK: [HTTPS://ZOOM.COM.CN/J/66623978388](https://zoom.com.cn/j/66623978388)**

<p><b>A20</b> <b>9:45-10:00</b></p>	<p>911 4 COVID-19: Analyzing Impact of COVID-19 on 911 Call Behavior Author: Gülüstan Doğan, Rachel Carroll and Gözde Merve Demirci Presenter: Gülüstan Doğan, University of North Carolina Wilmington, United States</p> <p>Abstract: This paper explores the impact of COVID-19 on 911 Call behavior to help first responders develop effective solutions to emergent situations proactively. Correct prediction of call volume and call type helps first responders optimize resource allocation. We used time series regression to explore the relationship between the number of COVID-19 cases, weather, and stay-at-home orders using 911 Call records in New Hanover County, North Carolina, USA. We divided 911 calls into six categories: breathing, domestic violence, injury, psychiatric, traffic, and violence-related calls. We observed a positive correlation between the number of COVID-19 cases and the number of 911 calls in all categories except domestic violence. We also developed a Bayesian regression prediction model to forecast the number of 911 calls given the number of COVID-19 cases. Our model excelled regarding domestic violence and total calls, and achieved satisfactory results for traffic and violence calls. To our knowledge, there is no prior relevant work, so we were unable to compare our results with other models.</p>
<p><b>A29</b> <b>10:00-10:15</b></p>	<p>A Deep Learning Based Implementation for Self-Driving Car Author: Thanh Dat Vu, Quang Huy Phan, Dinh Tra Nguyen, Hai Anh Tran, Ngoc Anh Bui and Tung Son Ngo Presenter: Quang Huy Phan, FPT University, Vietnam</p> <p>Abstract: Today, self-driving cars are a part of our life. It has received much attention in recent years. Many big companies and developers have invested a lot in this area and developed their own autonomous driving car platforms. The intriguing area of self-driving car motivates us to build a self-driving platform. This paper proposes the self-driving car's architecture and its software components that have been solved in FPT's contest. Lane detection in different environmental conditions, dodging obstacles, and detecting traffic signs. In this competition, the vehicle is equipped with limited hardware such as a single low-cost camera, an Nvidia Jetson TX2 board. We analyze the results obtained in the game in the simulator. We see that our method has overcome limited hardware but still achieved good results in complex problems. The final product has been used to compete in the Digital Race competition 2020 - a competition held annually by FPT Corporation.</p>

**DAY 3, THURSDAY, FEB. 25, 2021**

**9:30-11:45, MALAYSIA TIME, GMT+8**

**ZOOM LINK: [HTTPS://ZOOM.COM.CN/J/66623978388](https://zoom.com.cn/j/66623978388)**

<p><b>A32</b> <b>10:15-10:30</b></p>	<p>Local Mean K General Nearest Neighbor Classifier Author: Nordiana Mukahar, Bakhtiar Affendi Rosdi Presenter: Nordiana Mukahar, Universiti Teknologi MARA, Malaysia</p> <p>Abstract: The well-known k-Nearest Neighbor classifier is a simple and flexible algorithm that has sparked wide interest in pattern classification. In spite of its straightforward implementation, the kNN is sensitive to the presence of noisy training samples and variance of the distribution. Local mean based k-nearest neighbor rule has been developed to overcome the negative effect of the noisy training sample. In this article, the local mean rule is implemented with the general nearest neighbors that are selected in a more generalized way. A new local mean based nearest neighbor classifier is proposed termed Local Mean k-General Nearest Neighbor (LMkGNN). The proposed LMkGNN classifier finds the local mean vector from general nearest neighbors of each class and classifies the test sample based on the distances between the test sample and local mean vectors. Fifteen real-world datasets from the UCI machine learning repository are used to assess and evaluate the classification performance of the proposed classifier. The performance comparison is also made with five benchmark classifiers (kNN, PNN, LMkNN, LMPNN and kGNN) in terms of the classification accuracy. Experimental results demonstrate that the proposed LMkGNN classifier performs significantly well and obtain the best classification accuracy compared to the five competing classifiers.</p>
<p><b>A33</b> <b>10:30-10:45</b></p>	<p>A Hybrid Compression Method of Streamlines for Flow Visualization Author: Donghan Liu, Wenke Wang Presenter: Donghan Liu, National University of Defense Technology, China</p> <p>Abstract: Streamline is one of the most commonly used visualization methods to describe flow field data. With the increase of data scale, accurate storage of streamlines needs a lot of storage space. How to store streamlines efficiently is an urgent problem to be solved. Streamline compression is an effective solution, however, the existing method can be further improved. This paper proposes an improved fitting algorithm based on piecewise Bézier curves, which is combined with a lossless compression algorithm for hybrid compression and provides a comparison with the existing method. This paper uses the streamlines generated by vector field data to carry out several comparative experiments to demonstrate our approach's effectiveness. The results show that the proposed method can achieve a higher compression ratio and strictly control the error.</p>

**DAY 3, THURSDAY, FEB. 25, 2021**

**9:30-11:45, MALAYSIA TIME, GMT+8**

**ZOOM LINK: [HTTPS://ZOOM.COM.CN/J/66623978388](https://zoom.com.cn/j/66623978388)**

<p><b>A51</b> <b>10:45-11:00</b></p>	<p>Design and Implementation of a Secured and Distributed System using CBC, Socket, and RMI Technologies Author: Quy Ban Tran, Duc Thang Phung, Van Thai Nguyen Presenter: Van Thai Nguyen, FPT University, Vietnam</p> <p>Abstract: This project aims to implement a tool that allows applications following the map-reduce principle and the AES encryption algorithm. The map-reduce policy is used in big data processing for speeding up the treatment of large data sets (large files). AES encryption algorithm is used to secure the data that is transmitted over the network. This principle is to split a large file into blocks (files) that are distributed on several nodes. An application (we call it Map) can be executed on each of these blocks in parallel. All the results (files) from these computations are then gathered on the original node where another application (we call it Reduce) is executed to compute the final result (one file). The typical application we will use is the word count application. This application counts the occurrences of each word in a big file. Each Map counts the presence of words in each block, producing a table &lt;word, count&gt;. Then the Reduce aggregates the created tables to obtain the final result (a table &lt;word, count&gt;)</p>
<p><b>A55</b> <b>11:00-11:15</b></p>	<p>A Hybrid Neural Network based on Particle Swarm Optimization for Predicting the Diabetes Author: Heng-Li Yang and Bo-Yi Li Presenter: Bo-Yi Li, National Cheng-Chi University, Taiwan</p> <p>Abstract: In recent years, more and more studies have applied hybrid models in order to improve the performance of traditional neural networks. By combining particle swarm optimization and neural network, this research proposes a new hybrid neural prediction algorithm named as PSONN. The algorithm was applied to Pima Indians Diabetes Database and compared with eight other algorithms including Logistic regression, Ridge regression, Lasso regression, Linear Discriminant Analysis, Quadratic Discriminant Analysis, Random Forest, Gradient Boosting Machine, and Adam (a neural network algorithm). The findings indicated that the proposed algorithm had higher accuracy and stability, but it took more time to execute. It is suggested that, future research could apply parallelization technology for reducing execution time.</p>

**DAY 3, THURSDAY, FEB. 25, 2021**

**9:30-11:45, MALAYSIA TIME, GMT+8**

**ZOOM LINK: [HTTPS://ZOOM.COM.CN/J/66623978388](https://zoom.com.cn/j/66623978388)**

<p><b>A67</b> <b>11:15-11:30</b></p>	<p>The Method and Metric of User Experience Evaluation: A Systematic Literature Review Author: Aulia Inan Nur, Harry Budi Santoso, Panca O. Hadi Putra Presenter: Aulia Inan Nur, Universitas Indonesia, Indonesia</p> <p>Abstract: With the growth of User Experience (UX) research field, researchers have developed various ways to implement UX evaluation method. These evaluation methods have different practice, evaluated application, and type of collected aspect. This article provides a systematic literature review on research papers from 2000 to 2019 related to UX evaluation, to better understand UX evaluation method and its implementation, what kind of application its applied to, and what type of collected metric. The result of this paper presents the most frequently used method is self-reported measurement that evaluates self-reported metric and issue-based metric and the least frequently used method is physiological measurement that evaluates emotion and stress metric.</p>
<p><b>A77</b> <b>11:30-11:45</b></p>	<p>Performance Evaluation and Estimation of Subflows in Next-generation Network Author: Wentao Zhang, Ting Zhu, Xiaohui Chen, Weidong Wang Presenter: Wentao Zhang, University of Science and Technology of China, China</p> <p>Abstract: With the growth of multi-homing devices, it becomes more and more attractive to send packets concurrently over multiple paths using Multipath TCP (MPTCP). Although higher aggregated bandwidth can be obtained, MPTCP introduces difficulties in performance evaluation and estimation because packets are sent by separated physical paths. Monitoring the performance of subflows at middle-boxes in the network is crucial for service providers to do resource allocation. Since physical paths of subflows are separated, the performance of subflows that can be monitored by middle-boxes is not always complete, so evaluating the performance of MPTCP subflows with incomplete information is also practical. Fortunately, correlations are introduced by the shared data sequence number (DSN) and coupled control algorithms among subflows in MPTCP and bring us the possibility to obtain the information of unavailable subflows. In this paper, we analyze the relationships among subflows in an MPTCP connection and propose the algorithms of estimating the incomplete subflow state information (packet loss rate, transmission rate, and round trip time (RTT)). A proxy-based MPTCP framework is proposed and the MPTCP data set is generated from it for performance estimation and algorithm validation. Rules and regression methods are applied in the estimation, results show that the algorithms perform well in MPTCP performance evaluation and estimation with incomplete subflow information.</p>



**DAY 3, THURSDAY, FEB. 25, 2021**

**13:30-15:30, MALAYSIA TIME, GMT+8**

**ZOOM LINK: [HTTPS://ZOOM.COM.CN/J/66623978388](https://zoom.com.cn/j/66623978388)**

**Session 6: Image Processing and Virtual Technology**

**Session Chair: Assoc. Prof. Rubita Sudirman, UTM, Malaysia**

The Improved Security System in Smart Wheelchairs for Detecting Stair Descent using Image Analysis

Author: Fitri Utaminingrum, Ahmad Wali Satria Bahari Johan Satria Bahari Johan, Yuita Arum Sari, I Komang Somawirata and Abass Abolarinwa Olaode

Presenter: Fitri Utaminingrum, Universitas Brawijaya, Indonesia

**A06**

**13:30-13:45**

Abstract: A smart wheelchair requires a security system for its users to feel safe and comfortable. The process of observing road conditions is one of the solutions to maintaining user safety, which one of these hurdles can be a sudden transition of the situation in surface road height level for example, such as a descending staircase. Integration system for safety in smart wheelchairs consists of three main parts, namely input (Camera), output (Driver motor Left and Right), and main processing (Mini PC). The proposed research will be carried out stair decent detection using a Gray Level Co-occurrence matrix (GLCM) algorithm method as an extraction feature algorithm. The usage of GLCM methods can be applied to images that have textures. While if we look at the descent of the stairs also has a different texture when compared to the usual floor. Support Vector Machine (SVM) is used for the classification of stairs descent and floor. SVM algorithms have advantageous in it is effortless and strong consistency of implementation in classification. In this research propose combination methods between the texture features using GLCM and classification method using SVM to obtain effective detection stairs descent and floor. The proposed method by setting the GLCM parameter with a value of  $d = 1$  and  $\Theta = 135^\circ$ , and SVM classification using the Radial Basis Function Kernel (RBF Kernel) has an accuracy of 87% for detecting the stair descent with relatively fast computation time equal to 0.007 second.

**DAY 3, THURSDAY, FEB. 25, 2021**

**13:30-15:30, MALAYSIA TIME, GMT+8**

**ZOOM LINK: [HTTPS://ZOOM.COM.CN/J/66623978388](https://zoom.com.cn/j/66623978388)**

<p><b>A30</b> <b>13:45-14:00</b></p>	<p>Vietnamese Sign Language Detection using Mediapipe Author: Khuat Duy Bach, Phung Thai Duong, Pham Thi Thu Ha, Bui Ngoc Anh, Ngo Tung Son Presenter: Khuat Duy Bach, FPT University, Vietnam</p> <p>Abstract: Sign language is the only way used in communication for deaf and dumb people who cannot hear and speak. Viet Nam has nearly 2.5 million people with hearing and speaking disabilities, while the number of sign language interpreters in Vietnam is tiny. The hearing impaired has the same need for normal communication, access to information, and public services such as hospitals as ordinary people. The lack of sign language interpreters and effective methods to assist ordinary people in communicating with the hearing impaired require a convenient tool that makes sign language friendly for everyone. This paper presents an implementation using a recurrent neural network (RNN) with a Mediapipe hand tracking framework for Sign Language Gesture Recognition. Training data is created from input video using Multi-Hand Tracking and deep learning model that can recognize gestures by Hand Landmark Features per frame with RNN training. The dataset contains gestures of the most common words in Vietnamese. This model produces good accurate results in word recognition.</p>
<p><b>A35</b> <b>14:00-14:15</b></p>	<p>Face Translation based on Semantic Style Transfer and Rendering from One Single Image Author: Peizhen Lin, Baoyu Liu, Lei Wang, Jun Cheng Presenter: Peizhen Lin, Shenzhen Institutes of Advanced Technology (SIAT) of the Chinese Academy of Sciences (CAS), China</p> <p>Abstract: Many avatar characters have been animated in films or games, which always need a lot of time for post-processing with the computer graphics technologies. In recent years, lots of deep learning based methods have been proposed for face translation and image generation, which always require a large amount of data for training. However, there are few samples for special characters' prototype. In this paper, we present one face translation framework for translating human faces to that with visual effects from one single prototype image. The proposed framework consists of three modules. We first design one module to generate semantic face mask--the semantic mask generating (SMG) module. According to the semantic mask, the face color tone can be changed to that of the prototype. So we design the semantic color transfer (SCT) module. For the local textures, we design the deformation and rendering (DR) module. Experiments show that the proposed framework can generate images with prototype's visual effects while preserving the original person's identification and expression information.</p>

**DAY 3, THURSDAY, FEB. 25, 2021**

**13:30-15:30, MALAYSIA TIME, GMT+8**

**ZOOM LINK: [HTTPS://ZOOM.COM.CN/J/66623978388](https://zoom.com.cn/j/66623978388)**

<p><b>A01</b> <b>14:15-14:30</b></p>	<p>A Preliminary Study on Requirement of Smart Tour Guide Application Using Augmented Reality Author: Meliana, Chit Su Mon Presenter: Chit Su Mon, UCSI University, Malaysia</p> <p>Abstract: Travelling is one of the most popular activity among people. With the advancement of technology nowadays, there are many applications that has been implemented to support the traveler such as smart tour guide system. Smart tour guide is a system which used to guide and give information about the tourism spot to tourist or traveler. As for current Augmented Reality (AR) application has been implemented in tourism to provide some historical or cultural information through text, picture or even virtual object form. Although the existing application is good enough for tourist usage, however there are some improvement that can be done to increase the efficiency and user interactivity, decrease the task and time spend for the trip. Therefore, this research gathered the requirement of the smart tour guide application with AR. This study gathered the requirement through preliminary study and survey result conducted in UCSI University, Kuala Lumpur, Malaysia comprises of 28 female and 22 male respondents with 39 respondents in the age of 18-23 years old, 9 people in 24-29 years old and 2 people are in 30-35 years old. The result shows although the existing application such as Google Map, Waze, Trip Advisor, and Klook satisfy most of the traveler respondents, the respondents still requires different application to support their trip especially for providing navigation and tour search services. As the result of the survey and preliminary study, most of participants prefer to have smart tour guide application with AR.</p>
<p><b>A53</b> <b>14:30-14:45</b></p>	<p>Accelerating Exemplar-based Image Inpainting with GPU and CUDA Author: Quy Ban Tran Presenter: Quy Ban Tran, FPT University, Vietnam</p> <p>Abstract: Compute Unified Device Architecture (CUDA), a parallel computing platform and programming model architecture developed by NVIDIA, has grown to become the defacto standard for using Graphic Computing Units (GPUs) to solve the problem of High-Performance Computing (HPC) at the moment. This paper presents a benchmarking to show CUDA and GPU's advantage in accelerating computing performance in image processing. We take the Exemplar-based inpainting algorithm of Criminisi et al. to be the case study for the research. This paper optimizes the Exemplar-based inpainting algorithm (EBII) using GPU instead of CPU like other implementations before. We justify that the GPU can improve the performance of the algorithm to state-of-the-art level. We compare the algorithm's velocity between multiple implementations: one public Matlab implementation, one public C++ implementation, and our version using GPUs.</p>

**DAY 3, THURSDAY, FEB. 25, 2021**

**13:30-15:30, MALAYSIA TIME, GMT+8**

**ZOOM LINK: [HTTPS://ZOOM.COM.CN/J/66623978388](https://zoom.com.cn/j/66623978388)**

Class-Based Analysis of Russell's Four-Quadrant Emotion Prediction in Virtual Reality using Multi-Layer Feedforward ANNs

Author: Nazmi Sofian Suhaimi, James Mountstephens, Jason Teo

Presenter: Nazmi Sofian Suhaimi, Universiti Malaysia Sabah, Malaysia

**A23**

**14:45-15:00**

Abstract: The following research describes the potential of classifying a four-class emotion using a wearable EEG headset and using VR to induce emotional responses from the users. Various researchers have conducted emotion recognition using medical-grade EEG devices supported with a 2D monitor screen to induce emotional responses. This method of approach could cause additional artifacts due to the lack of concentration focusing within the border of the monitor screen of the intended stimulation thus reducing the classification accuracies. The large and complex EEG machine used by medical professions are sensitive equipment must be operated by trained professions thus making it difficult to seek permit to access such device. Hence, using a wearable EEG headset which is small and portable was considered for the brainwave signal samplings. this favors the researchers for use in conducting experiments for a human recognition system. The wearable EEG headset collects the brainwave signals at TP9, TP10, AF7, and AF8 electrode placements sampled at 256Hz with the five-bands (Delta, Theta, Alpha, Beta, Gamma). Additionally, the wearable EEG headset combines with the virtual reality (VR) headset to induce emotional responses presented to the users using the prepared VR video stimulus. The VR video was presented using the Arousal Valence Space (AVS) model with each of the respective quadrant having four videos presented in 80-seconds with a 10-second rest interval during transitions totaling up to 360-seconds from beginning to end. The collected samples are classified using Feedforward Artificial Neural Network (FANN) with 10-fold cross-validation and the model was trained using 90% of the total dataset with 10% used for validation purposes. The highest average classification result obtained from FANN was at 41.04%. While the classification performance was low, the confusion matrix presented a different view of the four-classes performed using different trained epoch values. Observations of trained epoch (2000, 3000, and 5000) showed each of the emotion classes happy, scared, bored, and calm, achieved classification accuracy of 75.15%, 75.12%, 75.02%, and 74.24% respectively.

**DAY 3, THURSDAY, FEB. 25, 2021**

**13:30-15:30, MALAYSIA TIME, GMT+8**

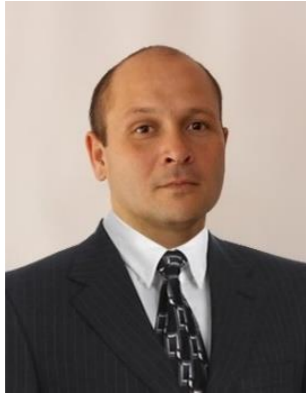
**ZOOM LINK: [HTTPS://ZOOM.COM.CN/J/66623978388](https://zoom.com.cn/j/66623978388)**

<p><b>A07</b> <b>15:00-15:15</b></p>	<p>A General Evaluation of Dermis Sores Identification using MOR-WAVELET Transforms Author: Chennaboina Kranthi Rekha and B. L. Prakash Leelaram Presenter: Chennaboina Kranthi Rekha, Bharat Institute Of Engineering and Technology, India</p> <p>Abstract: Dermis Canker detection is one of the significant image processing approach utilized in finding the Dermis sores, for example, malignancy and other pigmented sores. Because of the trouble and subjectivity of human understanding, mechanized examination of dermoscopy pictures has become a significant exploration territory. One of the most significant strides in dermoscopy picture investigation is the mechanized discovery of sore outskirts. In this paper we propose a novel approach for fringe recognition of sores in dermoscopy pictures. To begin with, the shading input picture is changed over into a dim level picture. At that point, the wavelet coefficients of dark level picture are determined. The wavelet coefficients are adjusted utilizing inclination of each wavelet band and a nonlinear capacity. The upgraded picture is acquired from the opposite wavelet change of altered coefficients. Morphology administrators are utilized to fragment the picture; lastly the injury is distinguished by a mechanized calculation. The outcomes show that the proposed technique has a low rate fringe error in a greater part of Dermis injuries.</p>
<p><b>A14</b> <b>15:15-15:30</b></p>	<p>A Fast and Robust Embedded Optical Flow Unit on Motion Estimation Author: Mubashara Rehman, Chung-Ming Own and Ziqi Li Presenter: Mubashara Rehman, Tianjin University, China</p> <p>Abstract: In the last few decades, deep learning is already being widely used to yield excellent performance, automate processes, pattern detection and natural language processing. Among different types of deep neural networks, convolutional neural network has been most extensively studied. In this study, the authors have introduced a network architecture named Fast Unit of Optical Flow (FUOF), which enables the network to estimate optical flow through a fast and robust approach. Our proposed method, FUOF based on the updating of FlowNetC, which includes a layer that correlates feature vectors at different image locations. We also introduced the Extended Sobel method to extract the spatial information to optimize further computation time. Moreover, to fuse the spatial and temporal information flexibly and comprehensively, two different fuse networks are defined as FUOF-Sum and FUOF-Concat in our study. The fuse mode's main difference is on the summarizing of each channel for concatenating of channels for the feature extraction this simple yet powerful idea validated by the experiments with MPI Sintel and Flying Chairs datasets. According to our results, the network with FUOF can achieve a competitive efficiency on the accuracy of standard error measure, convergence speed, and robustness for optical flow estimation.</p>

**DAY 3, THURSDAY, FEB. 25, 2021**  
**15:45-17:30, MALAYSIA TIME, GMT+8**

ZOOM LINK: [HTTPS://ZOOM.COM.CN/J/66623978388](https://zoom.com.cn/j/66623978388)

**Tutorial Speaker**



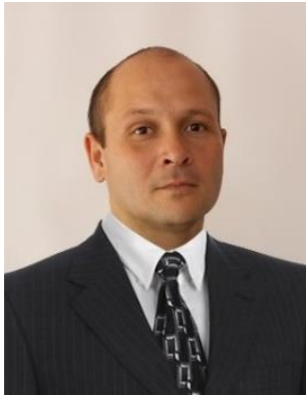
**Prof. Mag. Dr Vitaliy Mezhujev,  
FH JOANNEUM University of  
Applied Sciences, Austria**

Bio: Vitaliy Mezhujev received a specialist degree in informatics from Berdyansk State Pedagogical University (BSPU), Ukraine, in 1997. In 2002, he received a PhD in Educational Technology from Kyiv National Pedagogical University and, in 2012, an ScD (habilitation) in Information Technology from Odessa National Technical University, Ukraine. From 2004 until 2014, he was a Head of the Department of Informatics and Software Engineering at BSPU, Ukraine. From 2014 until 2019 he was a Professor at Faculty of Computer Systems and Software Engineering in University Malaysia Pahang, Head of the Software Engineering Research Group. Now he is a Professor at the Institute of Industrial Management in FH JOANNEUM University of Applied Sciences, Austria. During his career, Vitaliy Mezhujev participated in the multiple international scientific and industrial projects, devoted to the formal modelling, design, and development of advanced software systems as a network-centric real-time operating system; IDEs for the automation of development of parallel real-time applications; tools for specification, verification and validation of software products; visual environment for metamaterials modelling and others. His current research interests include formal methods, metamodeling, safety modelling and verification of software systems, IoT, and the design of cyber-physical systems.

**DAY 3, THURSDAY, FEB. 25, 2021**  
**15:45-17:30, MALAYSIA TIME, GMT+8**

**ZOOM LINK: [HTTPS://ZOOM.COM.CN/J/66623978388](https://zoom.com.cn/j/66623978388)**

**Tutorial Speaker**



**Prof. Mag. Dr Vitaliy Mezhujev, FH  
JOANNEUM University of Applied  
Sciences, Austria**

**Speech Title: Introduction to Formal Methods**

Abstract: Safety of software becomes one of the most important issues nowadays.

This tutorial introduces formal methods, which allow significantly increase the reliability and robustness of software systems.

Formal Methods will be introduced in Z, TLA, and UPPAAL notations and illustrated by using appropriate techniques and tools.

The tutorial also presents important properties of modern software systems as real-time, concurrency, liveness, and fairness.

**DAY 4, FRIDAY, FEB. 26, 2021**

**MALAYSIA TIME, GMT+8**

**ZOOM LINK: [HTTPS://ZOOM.COM.CN/J/66623978388](https://zoom.com.cn/j/66623978388)**

<b>Time</b>	<b>Schedule</b>
<b>9:00-12:00</b>	<b>Keynote Speech Replay</b>
<b>15:00-16:00</b>	<b>Closing Ceremony</b>

**Take Care and  
See You Next Year**

