CONFERENCE ABSTRACT

2020 5th International Conference on Intelligent Information Technology (ICIIT 2020)

February 19-22, 2020

Silk Path Hotel Hanoi, Hanoi, Vietnam

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Conference Venue

Silk Path Hotel Hanoi
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Introduction

Welcome to 2020 5th International Conference on Intelligent Information Technology (ICIIT 2020). It is co-organized by FPT University and Hong Kong Chemical, Biological & Environmental Engineering Society (HKCBEES).

ICIIT conference series will be held annually to provide an interactive forum for presentation and discussion on Intelligent Information Technology and related fields. Aside from researchers in Vietnam, the conference group welcomes participants from all over the world who are interested in developing professional ties to and/or exploring career opportunities in the region. The conference should serve as an ideal forum to establish relationships from within Vietnam and other countries of the world.

Papers will be published in the following conference proceedings or journal:

Conference Proceedings by **ACM (ISBN: 978-1-4503-7659-4)**, which will be archived in **ACM Digital Library**, indexed by **Ei Compendex** and **Scopus**, and submitted to be reviewed by Thomson Reuters Conference Proceedings Citation Index (ISI Web of Science).

Or

Journal of Advances in Information Technology (JAIT, ISSN:1798-2340), which will be indexed by **EBSCO**; ULRICH's Periodicals Directory; WorldCat; CrossRef; Genamics JournalSeek; **Google Scholar**; Ovid LinkSolver; etc.

Conference website and email: http://www.iciit.org/; iciit@cbees.net

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Prof. Zuriati Ahmad Zukarnain, Universiti Putra Malaysia, Malaysia

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Dr. Ivan Izonin, Lviv Polytechnic National University, Ukraine
Assoc. Prof. Zurina Mohd Hanapi, Universiti Putra Malaysia, Malaysia

Program-at-a-Glance

February 19, 2020 (Wednesday)	10:00-16:00	**Arrival Registration** **Venue: Lobby of Hang Bong**	
February 20, 2020 (Thursday)	09:00-17:00	**Arrival Registration Venue: Lobby of Hang Bong**	
	Morning Conference Venue: Hang Bong 1+2 (1F)		
	09:00-09:05	**Opening Remarks** Prof. Anand Nayyar, Duy Tan University, Vietnam	
	09:05-09:10	**Welcome Address** Dr. Hoang Viet Ha, Executive Director of Swinburne Vietnam, FPT University, Vietnam	
	09:10-09:45	**Keynote Speech I** Prof. Ford Lumban Gaol, Bina Nusantara University, Indonesia Topic: "The Infusion of Socioinformatics on the Social Learning"	
	09:45-10:20	**Keynote Speech II** Prof. Zuriati Ahmad Zukarnain, Universiti Putra Malaysia, Malaysia Topic: "The Effect of Blockchain in Traceability and Authentication of the Food Product"	
	10:20-10:45	**Coffee Break & Group Photo**	
	10:45-11:20	**Keynote Speech III** Prof. Hiroshi Noborio, Osaka Electro-Communication University,Japan Topic: "Depth-depth Matching of Virtual and Real Images for a Surgical Navigation System"	
	11:20-11:55	**Keynote Speech IV** Prof. Tae-Seong Kim, Kyung Hee University, Republic of Korea Topic: "Deep Learning AI Methodologies and Their Applications in Biomedical Technologies"	
	11:55-12:30	**Keynote Speech V** Prof. Anand Nayyar, Duy Tan University, Vietnam Topic: "Industry 4.0: Transforming Industries and Digital Revolution"	
	12:30-13:30	**Lunch** **Venue: La Soie De Hanoi Restaurarnt (1F)**	
	Afternoon Conference		
	13:30-13:50	**Invited Speech I** **Venue: Hang Bong 1+2 (1F)** Prof. Xingbo Wang, Foshan University, China Topic: "New Discoveries on Integer Factorization by Valuated Binary Tree"	
	13:50-15:50	**Session 1** **Venue: Hang Bong 1+2 (1F)** Topic: "Advanced Information Technology and Application" 8 presentations	**Session 2** **Venue: Hang Bong 3+4 (1F)** Topic: "Information Network and System Security" 8 presentations

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<tr><td rowspan="4">February 20, 2020 (Thursday)</td><td>15:50-16:10</td><td colspan="2">Coffee Break</td></tr>
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Venue: Hang Bong 1+2 (1F)
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Tips: Please arrive at the Conference Room 10 minutes before the session begins to upload PPT into the laptop; submit the poster to the staff when signing in.

Presentation Instruction

Instruction for Oral Presentation

Devices Provided by the Conference Organizer:

Laptop Computer (MS Windows Operating System with MS PowerPoint and Adobe Acrobat Reader); Digital Projectors and Screen; Laser Stick

Materials Provided by the Presenters:

PowerPoint or PDF Files (Files should be copied to the Conference laptop at the beginning of each Session.)

Duration of each Presentation (Tentatively):

Keynote Speech: about **30** Minutes of Presentation and **5** Minutes of Question and Answer
Invited Speech: about **15** Minutes of Presentation and **5** Minutes of Question and Answer
Oral Presentation: about **12** Minutes of Presentation and **3** Minutes of Question and Answer
Poster Presentation: about **3** Minutes of Presentation and **2** Minutes of Question and Answer

Instruction for Poster Presentation

Materials Provided by the Conference Organizer:

The place to put poster

Materials Provided by the Presenters:

Home-Made Posters: Submit the poster to the staff when signing in; Poster Size: A1 (841*594mm); Load Capacity: Holds up to 0.5 kg

Best Presentation Award

One Best Oral or Poster Presentation will be selected from each session, and the Certificate for Best Presentation will be awarded at the end of the session on February 20-21, 2020.

Dress Code

Please wear formal clothes or national representative of clothing.

Disclaimer

Along with your registration, you will receive your name badge, which must be worn when attending all conference sessions and activities. Participants without a badge will not be allowed to enter the conference venue. Please do not lend your name badge to the persons who are not involved in the conference and do not bring the irrelevant persons into the conference venue.
The conference organizers cannot accept liability for personal injuries, or for loss or damage of property belonging to conference participants, either during, or as a result of the conference. Please check the validity of your own insurance.

Keynote Speaker Introduction

Keynote Speaker I

Prof. Ford Lumban Gaol
Bina Nusantara University, Indonesia

Dr Ford Lumban Gaol is currently Professor of Informatics Engineering and Information System, Bina Nusantara University. He is the Chair of Bina Nusantara University Doctorate Program in Computer Science and Research Interest Group Leader "Advance System in Computational Intelligence & Knowledge Engineering "(IntelSys). Dr Ford is the Vice Chair of IEEE Indonesia section on the period of 2013 – 2016. He is the Director of Region Office Ford Lumban Gaol, Ph.D., Co-Chair, IIAI Southeast Region (Indonesia Office) Dr Ford was the ACM Indonesia Chapter Chair on year 2012. Dr Ford already involved with some project relate with Technology Alignment in some of multinational companies as well as some government projects. For International highliht, Dr Ford is the recipient of Visiting Professor in Kazan Federal Universty, Russia 2014 and 2015, Visiting Professor in Vladimir State University, Russia 2016, Visiting Professor in Financial State University 2017 and Southern Federal University, Russia 2018. He also Visiting Researcher in Advanced Institute of Industrial Technology, Tokyo Metropolitan University Japan 2018 and 2019. He was Invited Scholar in Aligarh Muslim University, keynote speaker in ICCNT 2014 and Invited Scholar in ICTP Trieste Italy. He has 164 papers that indexed in SCOPUS and 12 books that published by Springer-Verlag German. He was General Chairs or Co-Chairs for some International conferences and IEEE conferences including ACIIDS, Tensymp and Tencon. Dr Ford is member of Indonesian Mathematical Society (IndoMS), The Association for Computing Machinery (ACM) Professional, The International Association of Engineers (IAENG), and the Indonesia Society for Bioinformatics. He held the B.Sc. in Mathematics, Master of Computer Science, and the Doctor in Computer Science from the University of Indonesia, Indonesia in 1997, 2001 and 2009, respectively.

Topic: "The Infusion of Socioinformatics on the Social Learning"

Abstract—On this talk, I will review and explore the Socioinformatics on the Social Learning on the pedagogical considerations of Social Learning to consider the e-learning enterprise as a whole. The talk also discuss the relevance and importance of applying a social informatics perspective to Social Learning. I am also will present a framework for exploring the multiple inputs and outputs relating to Social Learning. The end of the talk will discuss some of these inputs and outputs, as well as some wider impacts.

Keynote Speaker II

Prof. Zuriati Ahmad Zukarnain
Universiti Putra Malaysia, Malaysia

Prof. Zuriati Ahmad Zukarnain is a Professor at the Faculty of Computer Science and information Technology, University Putra Malaysia. She is the Deputy of Dean at the Faculty of Computer Science and information Technology, University Putra Malaysia. She received her PhD in the area of Quantum Computing from the University of Bradford, UK in 2006. Prof. Zuriati is one of the Malaysian Quantum Computing expert and Network Security expert. Her research interests include: Developing Cashless Payment System based on Blockchain Technology, Efficient multiparty QKD protocol for classical network and Quantum Protocol for Quantum Communication. Prof. Zuriati has been awarded as a Distinguished Woman In Computer Science at 4th Venus International Women Awards(VIWA) 2019. She has developed a blockchain-based cashless payment system, known as 'Zchain4U' that could be one of solution to a save transaction of any cryptocurrency in Malaysia. Prof. Zuriati also produced a book entitled as 'Bitcoin' that has been published in March 2018. She is actively conducting various of talks and workshops to educate the people on the cyber security threats and cyber security. She has been invited to educate users and being broadcasted life on TV3, TV9 and Astro Awani, the television broadcast of Malaysia.

Topic: "The Effect of Blockchain in Traceability and Authentication of the Food Product"

Abstract—When competition among companies are emerging into competition between supply chains in order to survive and grow indeed, it is important to provide added value to customers. Traceability has emerged as one of the main operational efficiency initiatives within supply chains and customer service in the end. Over the years, various approaches have been deployed by organizations to provide food traceability. This research explores potential methods of food traceability currently in existence and proposed a prototype using blockchain and product identifiers to implement more reliable food traceability. The prototype extracts data classifies it and eventually uses food quality index (FQI) algorithm to produce FQI value from different stakeholders across the food supply chain. The FQI value helps to decide if the food is good for consumption on specified parameters. The FQI value is generated on the basis of existing standard storage and handling regulations specified by food safety authorities and checks whether the resulting value is within the allowed range. The prototype helps to determine the quality of food for human consumption as well as strengthening the traceability of food product.

Keynote Speaker III

Prof. Hiroshi Noborio
Osaka Electro-Communication University, Japan

Hiroshi Noborio received the B.Eng. and M.Eng. in Department of Computer Science from Shizuoka University in 1982 and 1984, respectively. In succession, he received the Ph.D. in Department of Mechanical Engineering, Faculty of Engineering Science, Osaka University in 1987. Then, he moved to the Osaka Electro-Communication University in Precision Engineering, Engineering Informatics, and Computer Science departments. Also, he worked in TU Munich supported by the Humboldt-Fellowship as a guest researcher. His research interests have spanned various areas of Robotics, CV (computer vision), CG (computer graphics), XR (VR+MR+AR). Prof. Noborio has developed the sensor-based and model-based navigation. Lately he has started to research surgical guiding of dental implant and surgical simulation/navigation of Liver, Kidney and Brain. They were mainly supported by Grants-in-Aid for Scientific Research program established by MEXT and JSPS and so on. Dr. Noborio nominated his research "Interference Check Algorithm Based on the Representation" as one of works in "The History of Robot Research and Development in Japan" as the 20th anniversary of RSJ. Also, he published more than 200 papers and 35 international book chapters, and in addition he has received best paper awards several times.

Topic: "Depth-depth Matching of Virtual and Real Images for a Surgical Navigation System"

Abstract—The key idea of our surgical navigation system is the depth-depth matching (DDM) of virtual and real organ images. The depth image of virtual organ comes from Z-buffer of GPU (Graphics Processing Unit) for a virtual organ modeled by STL (Stereolithography) data. On the other hand, a depth image of real organ comes from some depth image by an arbitrary depth camera for a real organ. Therefore, in DDM, we need only non-combinatorial L subtractions and additions between virtual and real 2D depth images whose pixel number is to be L. L is about hundred thousand. On the other hand, the most popular Iterative Closest Point (ICP) algorithm in Point Cloud Library is time consuming for checking the coincidence of two kinds of point clouds of whole organs. The reason are as follows: (1) The ICP needs combinatorial M*N calculation of the Euclidean distances of 3D cloud points (M and N are usually near hundred thousand). (2) Since a real organ is obstructed by its patient's body, a captured direction is restricted as the top view on or near the shadow-less lamp.

Keynote Speaker IV

Prof. Tae-Seong Kim
Kyung Hee University, Republic of Korea

Tae-Seong Kim received the B.S. degree in Biomedical Engineering from the University of Southern California (USC) in 1991, M.S. degrees in Biomedical and Electrical Engineering from USC in 1993 and 1998 respectively, and Ph.D. in Biomedical Engineering from USC in 1999. After his postdoctoral work in Cognitive Sciences at the University of California at Irvine in 2000, he joined the Alfred E. Mann Institute for Biomedical Engineering and Dept. of Biomedical Engineering at USC as Research Scientist and Research Assistant Professor. In 2004, he moved to Kyung Hee University in Republic of Korea where he is currently Professor in the Department of Biomedical Engineering. His research interests have spanned various areas of biomedical imaging, bioelectromagnetism, neural engineering, and assistive lifecare technologies. Dr. Kim has been developing novel methodologies in the fields of signal and image processing, pattern classification, machine learning, and artificial intelligence. Lately Dr. Kim has started novel projects in the developments of smart robotics and machine vision with deep learning methodologies. Dr. Kim has published more than 350 papers and ten international book chapters. He holds ten international and domestic patents and has received ten best paper awards.

Topic: "Deep Learning AI Methodologies and Their Applications in Biomedical Technologies"

Abstract—In the era of artificial intelligence (AI), biomedical technologies are being transformed into a new domain of biomedical AI. As AI has wide applications in the field of biomedical engineering and technologies, it will transform medicine and healthcare in the near future. Among various machine learning principles and techniques, deep learning is leading this new development of biomedical AI. In this presentation, major deep learning principles and methodologies including convolutional neural networks, recurrent neural networks, auto-encoders, and reinforcement learning will be introduced. Then their AI applications to biomedical technologies will be presented including biomedical computer-aided diagnostic (CAD) systems, human activity recognition of assistive lifecare systems, biomedical machine vision systems, and humanoid robotics.

Keynote Speaker V

Prof. Anand Nayyar
Duy Tan University, Vietnam

Dr. Anand Nayyar received Ph.D (Computer Science) from Desh Bhagat University in 2017 in the area of Wireless Sensor Networks. He is currently working in Graduate School, Duy Tan University, Da Nang, Vietnam. A Certified Professional with 75+ Professional certificates from CISCO, Microsoft, Oracle, Google, Beingcert, EXIN, GAQM, Cyberoam and many more. Published more than 250 Research Papers in various National & International Conferences, International Journals (Scopus/SCI/SCIE/SSCI Indexed). Member of more than 50+ Associations as Senior and Life Member and also acting as ACM Distinguished Speaker. Associated with more than 400 International Conferences as Programme Committee/Advisory Board/Review Board member. Currently working in the area of Wireless Sensor Networks, MANETS, Swarm Intelligence, Cloud Computing, Internet of Things, Blockchain, Machine Learning, Deep Learning, Cyber Security, Network Simulation, Wireless Communications and many more.

Topic: "Industry 4.0: Transforming Industries and Digital Revolution"

Abstract—Industry 4.0 leads to the digitalization era. Everything is digital; business models, environments, production systems, machines, operators, products and services. It's all interconnected inside the digital scene with the corresponding virtual representation. The physical flows will be mapped on digital platforms in a continuous manner. On a higher level of automation, many systems and software are enabling factory communications with the latest trends of information and communication technologies leading to the state-of-the-art factory, not only inside but also outside factory, achieving all elements of the value chain on a real-time engagement. Everything is smart. This disruptive impact on manufacturing companies will allow the smart manufacturing ecosystem paradigm. Industry 4.0 is the turning point to the end of the conventional centralized applications. The Industry 4.0 environment will be covered in the lecture describing the so-called enabling technologies and systems over the manufacturing environment.

Invited Speaker Introduction

Invited Speaker I

Prof. Xingbo Wang
Foshan University, China

Dr. & Prof. Xingbo Wang got his Master and Doctor's degrees at National University of Defense Technology (NUDT) of China. Since 1994, he had worked at NUDT on CAD/CAM/CNC technologies till 2010. Since 2010, he has been a professor in Foshan University with research interests in intelligent manufacturing system and computer applications. Prof. Wang is now in charge of Guangdong Engineering Center of Information Security for Intelligent Manufacturing System, where a lot of cryptography problems have to be dealt with the elementary number theory. He then set up a new method to study odd integers by means of perfect full binary tree and derived out many new properties of the odd integers, including genetic property that makes it easier to factorize an odd integer. Now Prof. Wang is devoting himself to developing a fast algorithm to integer factorization and intending to solve the hard problem of integer factorization.

Topic: "New Discoveries on Integer Factorization by Valuated Binary Tree"

Abstract—The paper proves that an odd composite integer N can be factorized in O(log2N) time if N's big divisor is in the form or and its small divisor does not exceed . Theorems and corollaries around the conclusion are proved with detail mathematical reasoning. The results in the paper again demonstrate the significance of applying the valuated binary tree on analyzing the odd integers.

Session 1

Tips: The schedule for each presentation is for reference only. In order not to miss your presentation, we strongly suggest that you attend the whole session.

Afternoon, February 20, 2020 (Thursday)
Time: 13:50-15:50
Venue: Hang Bong 1+2 (1F)
Topic: "Advanced Information Technology and Application"
Session Chair: Prof. Cong-Kha Pham & Prof. Anand Nayyar

H0035 Session 1 Presentation 1 (13:50-14:05)	Legal Protection of Copyright on Copyrighted Content Downloaded Through the Internet Arvin Indrawan, Garry Stevens Gratianus Martin Brianto, **Ford Lumban Gaol** and Tanty Oktavia Bina Nusantara University, Indonesia *Abstract*—The development of the internet made new problems within the scope of copyright. The internet is used to download copyrighted content and use it without permission from the creators. The legal protection of copyright the creators of content downloaded through the internet done in a way that the administration, through the instrument of criminal law and civil lawsuit. Legal efforts to protect the copyright of songwriters downloaded via the internet are carried out in several ways, namely the Ministry of Information and Technology to play an active role in blocking sites that provide free song download facilities and prepare human resources in the field of investigation such as from the National Police The Republic of Indonesia as well as Civil Servants and other Investigators such as prosecutors and judges who have the ability and knowledge in the field of IPR as well as the role of the Copyright Council to provide knowledge of the importance of IPR.
H1002 Session 1 Presentation 2 (14:05-14:20)	A Question Detection Algorithm for Text Analysis **Tran Duc Chung**, Ha Hong Son and Alexandra Khalyasmaa FPT University, Vietnam *Abstract*—In this paper, an effective question detection algorithm for Vietnamese text analysis is proposed. The proposed algorithm takes an audio file as input, converts its speech to text, and returns question detection result. This is extremely useful for a text analyzer to determine if a given sentence generated from an audio file is a question or not, particularly in chatbot or voicebot systems where very often there are needs for automatic replies to questions queried by users. The algorithm uses two tiers of question words and a customized question phrases to achieve 88.64 % accuracy on a sub-dataset of 176 questions prepared based on FPT Open Speech Dataset.

H0006 Session 1 Presentation 3 (14:20-14:35)	Analysis of Atmospheric Quality based on Cellular Automata Simulation **Hiep Xuan Huynh**, Phuoc Thanh Luu, Huong Hoang Luong, Nghia Duong-Trung, Minh Thai Truong, Nga Quynh Thi Tang and Tu Cam Thi Tran Can Tho Univeristy, Vietnam *Abstract*—Urban environmental problems are contributed by numerous factors, such as greenhouse gas emissions and air quality. Material combustion from vehicles, manufacturing plants, fossil fuel consumption, and many other industrial activities are the primary sources of atmospheric pollution. These noxious implications cause thousands of premature deaths, million years of life lost, and a contributor to climate change, primarily in developing countries. Therefore, pollution forecast and simulation before happening are the main focus of this paper. It helps address pollution levels, infrastructure installation of cities and underpins a range of environmental policies. Awareness of the characteristics of the atmospheric quality, including the mathematical basis for assessing pollution, allows building the pollution assessment models required to understand air quality and controls. In this paper, an effective model for simulating and analyzing atmospheric quality using cellular automata is proposed. Our model employs three novel underlying rules, e.g. rules of gravity, diffusion, and wind. Four experimental scenarios have been conducted to demonstrate the applicability of update rules necessitated to apprehend air pollution.
H0007 Session 1 Presentation 4 (14:35-14:50)	Offshore Development Center Management in Action Le Gia Cuong, **Phan Duy Hung**, Nguyen Luu Bach and Ta Duc Tung FPT University, Vietnam *Abstract*—Serving as a virtual extension of the Customer's IT Department, the Offshore Development Center (ODC) model provides certain benefits in comparison with in-house teams including reduced development complexity, reduced operating expense, and access to a larger pool of talents. Nevertheless, ODCs are prone to problems in Scope, Schedule, Quality, Human Resources, and Communication. From the experiences of Project Managers who have worked in Offshore Development Centers set up by FPT Software- a leading IT Outsourcing Service provider, this paper offers a look at actual problems encountered in ODCs. We then provide a reference ODC Management Framework, which consists of Best Practices that we have applied into an ODC serving a Media Industry customer over the last 4 years. The results of applying the model are discussed to prove its effectiveness.
H0019 Session 1 Presentation 5 (14:50-15:05)	Physiological and Mental Effects of Membrane-structured Architectural Spaces Emi Yuda, Yutaka Yoshida and **Junichiro Hayano** Nagoya City University, Japan *Abstract*—Membrane structures of architecture that provide a naturally bright light space are increasingly used for various facilities. In this study, we

	investigated the physiological and mental effects of membrane-structured architectural spaces by comparing them to conventional architectural spaces with a crossover study design. We observed that a membrane-structured warehouse reduces alertness, improves continuous performance, and causes positive subjective feelings, although there was no significant effect on operational accuracy, autonomic function, or sleep quality of the day.
H0018 Session 1 Presentation 6 (15:05-15:20)	Planning System Architecture of Fat-client Management for Customized Healthcare Services in Edge Computing Environment Dohyung Kim, Jonghyeok Mun, Yoosang Park, **Jongsun Choi** and Jaeyoung Choi Soongsil University, South Korea *Abstract*—To provide customized healthcare services in edge computing environment, it is necessary to process perspectives related to delivering context information such as procedures of data collection and analysis in various data formats. It is required to have a fat-client concept that performs, data preprocessing and converting data formats where generated data sets have different structure. Furthermore, the fat-client concept has advantages of covering data acquisitions and job allocations in edge computing environment. Once data sets are collected, then users can have healthcare reports, analyzed in a different level. When dealing with procedures of analysis, their models are necessary because data sets have different formats and ranges, moreover models will be required for user customizing it by adjustment the data sets being collected. This paper proposes a method for managing fat-client to provide customized healthcare services in edge computing environment. The proposed method, provides a fat-client profile for managing each fat-client user. The fat-client profile includes information such as sequences of data sources and analysis methods. In the experiment, the fat-client management is demonstrated through data collection and monitoring of instances created by the Fat-Client profile.
H0020 Session 1 Presentation 7 (15:20-15:35)	Hardware-assisted High-performance DNA Alignment System **Binh Kieu-Do-Nguyen**, Cuong Pham-Quoc and **Cong-Kha Pham** Ho Chi Minh City University of Technology, Vietnam *Abstract*—The investigations of DNA become more and more important in this era. A plethora of new algorithms that were published over the last decade are apparent evidences for this fact. In the DNA's researches, alignment is one of the most important steps that is especially taken care and continuously developed. Despite they already have a lot of algorithms for this problems, and some of them provide impressive enhancements. But it is still far more to state that DNA alignment has already achieved the ideal performance. Therefore, in this work, we promote an efficient architecture which is based on our improved BWA-MEM algorithm that we have already published in [14]. Beside that, we also propose a communication protocol as well as as its API in order to ensure the accuracy and stability of the system. The system offers a

	speed-ups by 18.14x when compared with modern computing platforms.
H3001 Session 1 Presentation 8 (15:35-15:50)	Microfluidic Sensor for Rapid DNA Methylation Analysis **Ryoji Kurita**, Takaaki Kurinomaru and Naoshi Kojima National Institute of Advanced Industrial Science and Technology (AIST), Japan *Abstract*—Heritable phenotype changes without DNA sequence changes (epigenetics) due to DNA methylation is not only associated with development and differentiation, but its association with various diseases such as cancer and psychiatric disorders has been reported, and its rapid analysis is becoming more important. New reagent was developed for immobilizing DNA in a microchannel by "flowing DNA only" for the rapid epigenetic analysis. In order to capture DNA in a microchannel, a molecule having a nitrogen mustard and a cyclic disulfide was synthesized. Nitrogen mustard is known as a first-generation anticancer agent, and its mechanism is to form an aziridinium ion covalently linked to the N7 position of guanine in a DNA duplex, resulting in interstrand cross-linking. In this study, the linker was prepared for the purpose of rapid DNA immobilization on a surface plasmon resonance (SPR) chip, and DNA capture and subsequent immunoassay were performed. All cytosine variants (methyl- hydroxyethyl- formyl- carboxy-methylcytosine) could be measured by exchanging recognition antibody by our SPR-based immunochemical approach. We can apply our linker material and method to a commercially available BIACORE and a handy-sized SPR equipment developed in collaboration with a Japanese company.

Session 2

Tips: The schedule for each presentation is for reference only. In order not to miss your presentation, we strongly suggest that you attend the whole session.

Afternoon, February 20, 2020 (Thursday)
Time: 13:50-15:50
Venue: Hang Bong 3+4 (1F)
Topic: "Information Network and System Security"
Session Chair: Prof. Sugwon Hong

H0009 Session 2 Presentation 1 (13:50-14:05)	TargetNet Backdoor: Attack on Deep Neural Network with Use of Different Triggers **Hyun Kwon**, Jungmin Roh, Hyunsoo Yoon and Ki-Woong Park Korea Advanced Institute of Science and Technology, South Korea *Abstract*—Deep neural networks (DNNs) provide good performance in image recognition, speech recognition, and pattern analysis. However, DNNs are vulnerable to backdoor attacks. Backdoor attacks allow attackers to proactively access DNN training data to train it on additional data that are malicious, including a specific trigger. Normally, DNNs correctly classify normal data, but malicious data with a specific trigger trained by attackers can cause misclassification by DNNs. For example, if an attacker sets up a road sign that includes a specific trigger, an autonomous vehicle equipped with a DNN may misidentify the road sign and cause an accident. Thus, an attacker can use a backdoor attack to threaten the DNN at any time. However, in certain cases, when an attacker wants to perform a targeted attack, it may be desirable for the data introduced through the backdoor to be misrecognized as a particular class chosen by the attacker according to the position of a trigger. For example, if a specific trigger is attached to the top right side of the road sign, it may be misunderstood as a left-turn sign; if a specific trigger is attached to the top left side of the road sign, it may be misunderstood as a right-turn sign; and if a specific trigger is attached to the bottom left side of the road sign, it may be misunderstood as a U-turn sign. In this paper, we propose the TargetNet backdoor, which is designed to be misidentified as a particular target class chosen by the attacker according to a specific trigger location. The proposed method additionally trains the target classifier on the TargetNet backdoor data so that data with a trigger at a specific location will be misidentified as the target class selected by the attacker.We used MNIST and Fashion-MNIST as experimental datasets and Tensorflow as a machine learning library. Experimental results show that the proposed method applied to MNIST and Fashion-MNIST has a 100% attack success rate for the TargetNet backdoor and 99.17% and 91.4% accuracy rates on normal test data, respectively.

H0034 Session 2 Presentation 2 (14:05-14:20)	The Design of Smart Cashless Transaction Anthony Bryan Fernando, Shreevasta, and Ferry Desprianto, **Ford Lumban Gaol** and Tanty Oktavia Bina Nusantara University, Indonesia *Abstract*—Cashless Transaction describes as a state where financial transactions are not bound by physical form such as banknotes or coins, but rather trough transfer of digital information (electronic representation of money). Cashless Transaction exists because of fast majorities of human transaction evolved towards digital environment, this creates an opportunity where legal money exists, recorded, and exchanged in digital form. Thus cashless transaction will make less effort in currency operation cost, keep on track with expenses, connected anytime everywhere as long as connected with internet, and eliminates the needs of banknotes or receipt. Cashless Transaction have done over the past few years making life easier by reducing a number of objects to merge into 1 functional object that could make payments faster and simpler starting with check the first mark of cashless transaction that's still being used nowadays, but cashless transaction doesn't stop evolving in this modern era where money is demonetized, cashless transaction is moving into the digital grid resulting a breakthrough mobile wallets and online transfer that offers people flexibility because its technology advancement makes it possible to make payments anytime and anywhere since it's only depend on a secure network(internet) and a platform, therefore cashless transaction could be done as fast as possible saving precious time. Cashless transaction has some of key components such as security, UX, Functionality, Performance and Data Integrity. Five key components could make cashless transaction become reality but also poses a different threat to cashless transaction. Hacking is one of them. Hacking could be done by anyone that have the ability to compromise the transmission, the transmission needs to have more data protection thus the cashless transaction could be done safely and free of risk.
H1003 Session 2 Presentation 3 (14:20-14:35)	Security Monitoring for the SCADA Systems **Sugwon Hong** and Jae-Myeong Lee Myongji University, South Korea *Abstract*—Security monitoring is considered to be a promising approach to prevent and detect possible attacks in the SCADA systems. The intrusion detection system (IDS) is a main tool to do security monitoring. The techniques of IDS for the SCADA system is the anomaly-based detection. The anomaly detection is the process to determine which events are to be identified as abnormal because it has significant deviation from normal behavior which is called 'profile.' The difficult part is how to decide or derive profiles which reflect all semantics of the SCADA system. Here, we classify four kinds of information to derive profiles for SCADA-aware IDS: network flows, application protocols, process features, and data features for self-learning. Then, we evaluate these network-based SCADA IDSs, considering the recent

	sophisticated attacks against SCADA/ICS systems. Judging from the evaluation, the network-based IDS cannot provide sufficient security measures. Their attack vectors are the vulnerabilities of the software underlying the host systems. In this respect, we need a security monitoring running on host systems which can provide the protection of processes. The measure can provide a holistic security monitoring strategy for SCADA systems.
H1005 Session 2 Presentation 4 (14:35-15:50)	Indoor Location Tracking System based on Android Application using Bluetooth Low Energy Beacons for Ubiquitous Computing Environment **Khamla Non Alinsavath**, Lukito Edi Nugroho, Widyawan and Kazuhiko Hamamoto Universitas Gadjah Mada, Indonesia *Abstract*—Indoor positioning and tracking systems have become enormous issue in location awareness computing due to its improvement of location detection and positioning identification. The locations are normally detected using position technologies such as Global Positioning System, radio frequency identification, Bluetooth Beacon, Wi-Fi fingerprinting, pedometer and so on. This research presents an indoor positioning system based on Bluetooth low energy 4.0 Beacons; we have implemented Bluetooth signal strength for tracking the specific location and detect the movement of user through Android application platform. Bluetooth low energy was addressed to be an experiment technique to set up into the real environment of interior the building. The signal strength of beacons is evaluated and measured the quality of accuracy as well as the improvement of provide raw data from Beacons to the system to get better performance of the direction map and precise distance from current location to desire's positioning. A smartphone application detects the location-based Bluetooth signal strength accurately and can be achieved the destination by provided direction map and distance perfectly.
H0036 Session 2 Presentation 5 (14:50-15:05)	Emotional Dictionary Construction Algorithm for Emoticon and Newly-coined Words of Social Network Services Analysis Jin Sol Yang and **Kwang Sik Chung** Korea National Open University, South Korea *Abstract*—The numbers and amount of SNS posts are growing exponentially and is rapidly spreading. Social data emotion analysis based on social data can help companies and public organizations understand people's social opinion, consumption aspects and product evaluations, as well as establish corporate sales and policies. The newly-coined word implicitly includes social opinion and social trends, and emoticons are an electronic quasi-language made up of letters, symbols, etc., which expresses emotional state more implicitly than general words and text. If newly-coined words and emoticons as like emoji would be used to analyze social trends or opinion, the accuracy of emotional analysis of society could be improved. But, the emotional dictionary construction and the classification of newly-coined words and emoticons takes a lot of time, since the human operator must sort them manually. In this

	research, in order to deal with management of emotional dictionary for newly-coined words and emoticons, emotional statement is proposed and have emotion polarity strength more than 4 point. And emotional dictionary management algorithm is proposed. If newly-coined words and emoticons are not in emotional dictionary, polarity strength of the newly-coined words and emoticons would have polarity strength of the emotional statement that includes the newly-coined words and emoticons. The emotional statement includes newly-coined words and emoticons that have negative or positive emotion polarity, and strong emotional tendency. The emotional statement is defined as statement that has strong negative or positive emotion polarity more than 4 point. Newly-coined words and emoticons not included in emotional dictionary are automatically added according to emotion polarity strength of emotional statement.
H0008 Session 2 Presentation 6 (15:05-15:20)	Industrial Wireless Networked Control System with Dynamically Tuned EWMA Filter **Tran Duc Chung** and Rosdiazli B Ibrahim FPT University, Vietnam *Abstract*—Wireless technology has permitted wireless monitoring and control applications for industrial process plants. Most related works have addressed delay issues in networked control system using common predictive techniques such as Smith predictor, and Kalman filter. However, they are complex and only applicable for high performance controllers. Thus, they are not suitable for implementation at microcontroller-based plant actuators which are normally computationally limited. A suitable approach to overcome this shortcoming is to use exponentially weighted moving average (EWMA) filter which is computationally efficient while still achieving desired control performance. Common practice for design of EWMA filters is to fix the filter weight. The drawback of this approach is that it results in longer time to reach the desired setpoint. Therefore, in this paper, a dynamically tuned EWMA filter is proposed to improve control performance of the process plant. Here, the weight of the filter is tuned adaptively using fuzzy logic technique. From the results obtained, it is shown that the proposed method is robust against time-varying delay and significantly improves the control performance by reducing both settling time and percent overshoot.
H0004 Session 2 Presentation 7 (15:20-15:35)	Seismic Data Analysis Regression Model on Reactor Pressure Vessel using Fast Fourier Transform and Machine Learning **Youjeong Park**, Sung-Ho Yoon, Jun Hyeok Choi, Moon Ki Kim and Jae-Boong Choi Sungkyunkwan University, South Korea *Abstract*—The paper presents a way for data analysis of seismic data in order to predict stress intensity data on reactor pressure vessel because it is important to investigate the integrity of the reactor pressure vessel. As the seismic waveform data are time-series data, fast Fourier Transform is implemented for

	data processing. After feature extraction using fast Fourier Transform, machine learning algorithms were used to analyze and predict the stress intensity data for regression. We applied Support Vector Regression, Random Forest Regression, K-nearest Neighbor Regression and Gradient Boosting Regressor and compared these algorithms in order to improve good accuracy on the regression. This research shows that it is possible to make the correlation between the seismic waveform data and the stress intensity for reliability on the reactor pressure vessel.
H1001 Session 2 Presentation 8 (15:35-15:50)	Design of State of Health Prediction Model for Retired High Power Linimncoo2 Cell with Holts Exponential Smoothing Method Hyunjun Lee, **Joung-Hu Park**, Jonghoon Kim and Taesic Kim Soong-sil University, South Korea Abstract—In order to recycle retired battery, it is necessary to know the state of health (SOH) of the retired battery correctly. However, as the battery ages, nonlinearity of the parameter representing SOH becomes more severe. So, the different estimation method is required from the SOH estimation method of a fresh battery. The parameters representing SOH such as discharge capacity, internal resistance, peak point of incremental capacity (IC) curve values that change with aging are time-series data. The SOH estimation of retired batteries requires a technique to analyze nonlinear time-series data. This paper presents design of SOH prediction model for retired high power LiNiMnCoO2 (NCM) cell with holt's exponential smoothing (ES) method. The holt's EX method is the method of nonelinear time-series data analysis. And, the result of the SOH prediction model with the holt's ES is compared with linear regression analysis (LRA) and the moving average (MA) method.


15:50-16:10	**Coffee Break**

Session 3

Tips: The schedule for each presentation is for reference only. In order not to miss your presentation, we strongly suggest that you attend the whole session.

Afternoon, February 20, 2020 (Thursday)
Time: 16:10-17:55
Venue: Hang Bong 1+2 (1F)
Topic: "Computer and Information Engineering"
Session Chair: Assoc. Prof. Hiep Xuan Huynh

H0013 Session 3 Presentation 1 (16:10-16:25)	Deep Reinforcement Learning for Stock Portfolio Optimization **Le Trung Hieu** National University of Singapore, Singapore *Abstract*—Stock portfolio optimization is the process of constant re-distribution of money to a pool of various stocks. In this paper, we will formulate the problem such that we can apply Reinforcement Learning for the task properly. To maintain a realistic assumption about the market, we will incorporate transaction cost and risk factor into the state as well. On top of that, we will apply various state-of-the-art Deep Reinforcement Learning algorithms for comparison. Since the action space is continuous, the realistic formulation were tested under a family of state-of-the-art continuous policy gradients algorithms: Deep Deterministic Policy Gradient (DDPG), Generalized Detreministic Policy Gradient (GDPG) and Proximal Policy Optimization (PPO), where the former two perform much better than the last one. Next, we will present the end-to-end solution for the task with Minimum Variance Portfolio Theory for stock subset selection, andWavelet Transform for extracting multi-frequency data pattern. Observations and hypothesis were discussed about the results, as well as possible future research directions.
H0022 Session 3 Presentation 2 (16:25-16:40)	An Affinity Propagation Approach for Entity Clustering with Spark Phuc Quang Tran, **Ngoan Thanh Trieu**, Huong Hoang Luong, Nghi C. Tran and Hiep Xuan Huynh Can Tho University, Vietnam *Abstract*—With the dramatically increasing amount of electronic data, the automatic detection and extraction of information in the text is the first step for all other data analysis activities. Clustering entities is the important methods for discovering knowledge and extracting appropriate data applied in several applications. The clustering methods often need to pre-determine the number of clusters and the initial centers thus the problem of "initial staring conditions" usually occurs. In this paper we propose a new approach that overcome this problem for clustering entities without pre-defining the number of clusters with

	the Affinity Propagation algorithm. The algorithm is built on the Spark platform for speed up the clustering process. The experiments are conducted on different characteristics datasets.
H0016 Session 3 Presentation 3 (16:40-16:55)	Evaluating Huge Matrix Multiplication on Real Hadoop Cluster Phan Duy Hung and **Nguyen Ngoc Chung** FPT University, Vietnam *Abstract*—The matrix multiplication is the dominant of many business applications such as calculate profits based on price and quantity matrices, predict various weather phenomena following the study of Markov Chains, create Similarities table in a recommendation system and so forth. Some real word problems, matrices are very large in size that is very time-consuming operation even though there are execution strategies on regular matrices and sparse matrices. This study focuses on a recently parallel matrix multiplication approach using MapReduce in big data by tuning Hadoop configuration parameters to improve performance. The results show that changing the number of mappers and reducer numbers would reduce execution time. However, it only decreases to a certain value, if the number of mappers and reducers continues, the execution time does not decrease. In addition, increasing the DataNode is not much impact on reducing matrix multiplication time.
H0023 Session 3 Presentation 4 (16:55-17:10)	Korean Font Synthesis with GANs Debbie Honghee Ko, Ammar Ul Hassan, Jungjae Suk and **Jaeyoung Choi** Soongsil University, South Korea *Abstract*—Font synthesis for CJK based languages that consists of large number of characters and complex structures is still a major challenge and ongoing research problem for computer vision and AI. In this paper, we propose a generative model based on GANs as a solution for Korean font synthesis problem with a small set of characters. Korean Hangul includes 11,172 characters and composes of writing in multiple patterns. Normally font design involves heavy loaded human labor that can easily hit to one year to finish for one style set. Various methods have been proposed to solve this character generation problem using generative models such as GANs, but the results are often blurry or broken and are far from realistic. We generate visually appealing Korean Hangul characters with a skeleton-driven approach. We demonstrate that this approach is effective at synthesizing characters from their corresponding skeletons. With 114 samples, the proposed method automatically generates the rest of the characters in the same given font style. Our approach resolves long overdue shortfalls such as blurriness, breaking, and unrealistic shapes and styles of characters using GANs. We demonstrate via our experiments that our approach has better quality then other methods.
H0024 Session 3	Toponym Extraction in Thai Tweets Using A Hybrid Approach **Manassanan Boonnavasin** and Prapaporn Rattanatamrong Thammasat University, Thailand

Presentation 5 (17:10-17:25)	*Abstract*—Crowdsourcing has become an important tool in areas such as business and marketing. It can help organizations solve large-scale problems in areas including traffic management and political campaigning. Toponym extraction is necessary when analyzing crowdsourced data for traffic tracking or event reporting. Dictionaries and rule-based analysis are commonly used for matching and extracting entities from text. However, the creation of an effective dictionary is not an easy task, especially when the goal is to name a large number of locations. Named Entity Recognition (NER) can help address this, but the approach has certain limitations. In this paper, we describe an improved approach to toponym extraction from Twitter messages that combines a dictionary and NER. As tweets are limited to 280 characters, any locations mentioned are usually referred to using abbreviations. The variety of forms that location names take, and the unstructured language of tweets, are challenging both to the dictionary and NER methods. We divided tweets into four categories to investigate the effect of analyzing messages from different domains. The average accuracy was 49.18% when using only the dictionary, 59.30% when using only NER, and 75.43% when using the hybrid method.
H1011 Session 3 Presentation 6 (17:25-17:40)	Fuzzy Logic based Hybrid Model for Automatic Extractive Text Summarization Akshi Kumar, Aditi Sharma and **Anand Nayyar** Duy Tan University, Vietnam *Abstract*—In the contemporary age of information, accessing data becomes easy, but finding knowledge is very difficult. The participation & publishing of information has consequently escalated the suffering of 'Information Glut'. Assisting users' informational searches with reduced reading or surfing time by extracting and evaluating accurate, authentic & relevant information are the primary concerns in the present milieu. Automatic text summarization condenses an original document into shorter form to create smaller, compact version from the abundant information that is available, preserving the content & meaning such that it meets the needs of the user. Though many summarization techniques have been proposed but there are no 'silver bullets' to achieve the superlative results as of human generated summaries. Fuzzy logic has appeared as a powerful theoretical framework for studying human reasoning. A new hybrid model based on fuzzy logic has been proposed using two graph-based techniques named as TextRank and LexRank and one semantic based technique named Latent semantic analysis (LSA). The techniques are evaluated on Opinosis dataset using 'ROUGE-1' (Recall-Oriented Understudy for Gisting Evaluation-1) and 'time to extract the keywords'. The proposed technique has outperformed the existing techniques, when compared with the results given by the original studies.
H0031 Session 3	Applying Code Quality Detection in Online Programming Judge ***Xiao Liu*** and Gyun Woo Pusan National University, South Korea

Presentation 7 (17:40-17:55)	*Abstract*—This article presents an enhanced programming online judge system that not only evaluates the correctness of the submitted program code but also detects its code quality. Both results of the correctness and quality detection are responded through web once the compilation, the execution and the quality detection of the submitted source code have been finished. We take advantage of SonarQube to provide code quality detection in our online judge system named neoESPA. Comparing with other online judges, our proposed work has significant advantages in helping both the instructor to discover the weaknesses in the lecture and the students to locate their mistakes efficiently.

Session 4

Tips: The schedule for each presentation is for reference only. In order not to miss your presentation, we strongly suggest that you attend the whole session.

Afternoon, February 20, 2020 (Thursday)
Time: 16:10-17:55
Venue: Hang Bong 3+4 (1F)
Topic: "Image Analysis and Processing"
Session Chair: Assoc. Prof. Thomas Grenier

H2006 Session 4 Presentation 1 (16:10-16:25)	Convergence Stability of Depth–depth-matching-based Steepest Descent Method in Simulated Liver Surgery **Miho Asano**, Tomohiro Kuroda, Satoshi Numata, Tuneo Jozen, Tomoki Yoshikawa and Hiroshi Noborio Kyoto University Hospital, Japan *Abstract*—We recently established that our digital potential function was globally stable at the point where a virtual liver coincided with its real counterpart. In particular, because three rotational degrees of freedom are frequently used in a surgical operation on a real liver, stability of the potential function concerning three rotational degrees of freedom was carefully verified in the laboratory, using fluorescent lamps and sunlight. We achieved the same stability for several simulated liver operations using a 3D printed viscoelastic liver in a surgical operating room equipped with two light-emitting diode shadowless lamps. As a result, with increasing number of lamps, stability of our depth–depth matching in the steepest descendent algorithm improved because the lamps did not emit an infrared spectrum such as the one emitted by our depth camera. Furthermore, the slower the angular velocity in a surgical sequence, the more overall stability improved.
H0029 Session 4 Presentation 2 (16:25-16:40)	Research on Improving the Algorithm to Recognize Korean Text in Images using Deep Learning Kangbae Lee, **Sang Ha Sung** and **Sung-Ho Park** Dong-A University, South Korea Abstract—Research utilizing artificial intelligence is an ongoing progress and applied in various areas. Thanks to the advancement in computing performance, its applications in the field of computer vision continue to expand. Among many areas of such applications, this research particularly investigated image text recognition. Previous researches on text recognition in images include optical character recognition (OCR), which is a typical text extraction technique using image data. However, the recognition accuracy of OCR drops when images deviate from certain specifications or undergo

	modifications. Furthermore, OCR has limitations in recognizing various fonts. Although there have been attempts to overcome such limitations using an artificial neural network technique, deep learning, the text recognition range in most researches included only English characters and numbers; research on the recognition of Korean characters is clearly lacking. Therefore, this research proposes an enhanced OCR that utilizes deep learning techniques to overcome the limitations of Korean OCR.
H1009 Session 4 Presentation 3 (16:40-16:55)	Estimation of the Line of Sight from Eye Images with Eyelashes Kiyoshi Hoshino, Satoshi Shimanoe, **Yuya Nakai**, Noguchi Yuki and Maki Nakamura University of Tsukuba, Japan Abstract—There are two methods for tracking the line of sight: the corneal reflection method and the pupil method. The former allows highly accurate measurement because the focus point is detected, however, its weakness is that deviations can occur in the positional relations between the eye and the camera. The latter has a strong positional relation between the eye and the camera because the pupil is shot by the camera, but because elliptical approximation is used, its weakness is masking of the pupil by eyelashes and the eyelid. When using an HMD or headgear in sports such as Japanese fencing, in either method, trying to estimate the user's line of sight is easier if the small cameras are facing down at an angle from the forehead at the eyes because the user's field of vision is not obstructed. Therefore, in this study, the authors proposed a line of sight estimating method that uses eye images that include eyelashes. Specifically, we proposed using inexpensive small cameras to take images of the eyes from slightly above. We also proposed processing to separate the eyelashes and pupils in the images to allow estimating the line of sight, and an eyeglasses-type device. Additionally, in order to achieve a stable line of sight estimation, we also made proposals for adjusting the various parameters to suit the sizes of the heads and distances between the eyes of individual users, such as the positioning and facing of the small cameras and the optical axes and intensity of supplementary light sources.
H2008 Session 4 Presentation 4 (16:55-17:10)	Impact of Distortion on Local Radiomic Analysis of Quadriceps based on Quantitative Magnetic Resonance Imaging Data **Hoai-Thu Nguyen**, Sylvain Grange, Benjamin Leporq, Magalie Viallon, Pierre Croisille and Thomas Grenier Univ Lyon, France Abstract—This study investigates the impact of the MRI distortion that appears between 3D T1 Dixon Water-only images and both spoiled gradient echo and multi-echos T2 weighted spin-echo images when sequentially acquired. Recent studies focusing on radiomic features locally computed on muscle heads or bone marrow segmentations require precise corrections of the bias field and the distortion. Our results suggest that classically used rigid registration are not optimal for such fine study and that deformable registration should be preferred

	to limit significant error in radiomic feature extraction. However, from our experiments on our data, no significant change in radiomic statistic is observed whatever segmentation correction approach was applied. This indicates that radiomic features are not sensitive to segmentation refinement when considering large 3D regions.
H1010 Session 4 Presentation 5 (17:10-17:25)	Estimation of Rotational Eye Movement based on Intensity Gradients in the Eye Images Kiyoshi Hoshino, **Yuya Nakai**, Yuki Noguchi and Nayuta Ono University of Tsukuba, Japan Abstract—The cycloduction or the rotational eye movement is regarded as rotational movement around the z axis of the eye. The feature may be caused due to physical deconditions including dizziness, car-sickness, visually-induced motion sickness and nausea. In this study, the authors propose a method that allows rotational eye movement measurement with high accuracy without using a blue auxiliary light for users between whom blood vessels in the white part of the eye differ considerably in terms of thickness and density on the image. In the system, in order to select a template image that includes a thick, dense blood vessel suitable for tracking in the white part of the eye, feature points are first extracted from the white part of the eye on the acquired image based on the intensity gradients, and the number of feature points in a candidate template image is counted. Next, from among the candidate template images that include a larger number of feature points, those with a reflection of external light source are excluded. Lastly, blood vessels with no similar shape nearby are selected as a candidate template image. The results of an evaluation experiment showed that, among the methods in which rotational eye movement estimation is performed by tracking a blood vessel in the white part of the eye, the method proposed in this study can, even without a blue auxiliary light, reduce the standard deviation of estimation errors to 56% of that of the conventional method developed by Hoshino et al. that uses a blue auxiliary light to enhance the contrast of blood vessels.
H1004 Session 4 Presentation 6 (17:25-17:40)	Facial Emotion Detection to Assess Learner's State of Mind in an Online Learning System Moutan Mukhopadhyay, Saurabh Pal, **Anand Nayyar**, Pijush Kanti Dutta Pramanik, Niloy Dasgupta and Prasenjit Choudhury Duy Tan University, Vietnam *Abstract*—Despite the success and the popularity of the online learning system, it still lacks in dynamically adapting suitable pedagogical methods according to the changing emotions and behaviour of the learner, as can be done in the face-to-face mode of learning. This makes the learning process mechanized, which significantly affects the learning outcome. To resolve this, the first and necessary step is to assess the emotion of a learner and identify the change of emotions during a learning session. Usually, images of facial expressions are analysed to assess one's state of mind. However, human emotions are far more

	complex, and these psychological states may not be reflected only through the basic emotion of a learner (i.e. analysing a single image), but a combination of two or more emotions which may be reflected on the face over a period of time. From a real survey, we derived four complex emotions that are a combination of basic human emotions often experienced by a learner, in concert, during a learning session. To capture these combined emotions correctly, we considered a fixed set of continuous image frames, instead of discrete images. We built a CNN model to classify the basic emotions and then identify the states of mind of the learners. The outcome is verified mathematically as well as surveying the learners. The results show a 65% and 62% accuracy respectively, for emotion classification and state of mind identification.
H1008 Session 4 Presentation 7 (17:40-17:55)	Gaze Estimation with Easy Calibration Method Kiyoshi Hoshino, **Noguchi Yuki** and Yuya Nakai University of Tsukuba, Japan *Abstract*—In the corneal reflection method for gaze estimation, the user is asked to look at multiple calibration points with known lines of sight, and the central pupil point is captured for each vision angle. Therefore, the center of the eye in the images can be acquired for each known eye rotation angle. However, because the spherical center of the eye is captured in two-dimensional images and because measurement errors are, of course, included, in order to map eye rotation angles from two-dimensional images, normally, the approximate solution is calculated by using the least squares method in the overdetermined system linear equation. Normally, six coefficients are calculated from nine points of regard for calibration. This study proposes a new gaze estimation method that uses fewer calibration points while maintaining accuracy equivalent to using nine points.

Poster Session

Morning, February 20, 2020 (Thursday)
Time: 16:10-17:55
Venue: Lobby of Hang Bong

H0001 Poster 1	The Emerging AI Policy for e-Commerce Industry **Zehra Ozge Yildiz** and Natalia Beloff University of Sussex Brighton, United Kingdom *Abstract*—For the fast-growing e-Commerce industry, the AI is the game-changer but is it really utilised in a most effective way or is it just a risky 'artificial balloon'? Is it gambling to rely on AI technologies without forming a dedicated policy? To answer these questions and propose a cautious approach towards the emerging technologies, in this explanatory research, the risks related to the fast adaptation of AI technologies addressed with recommended actions. Within the scope of the research, e-Commerce industry is analysed to reveal the issues related to AI implementations. Accordingly, the challenges of AI technologies have been questioned so that necessary precaution, preparation, and considerations can be pointed out. Accordingly, an AI policy for e-Commerce industry is formed for the businesses to benefit from the most recent technologies without risking the possible issues. Three main policy subjects have been determined as transparency of the technologies, accountability for the purpose, process and performance of them, and lastly, emerging user privacy and security related issues. For each policy subject, a review of the AI implementations, recent critics and forecasted expectations are investigated to list the recommendations for the candidate AI implementer. The research aims to provide an AI policy guideline for e-Commerce industry with a detailed overview of the outstanding issues, best practices and recommendations from scholars.
H0014 Poster 2	Low Resource Call of FFT Circuit Design **Rongshan Wei** and Zhiyun Zhu Fuzhou University, China *Abstract*—Existing studies mainly focus on parallel structures and FFT circuit designs with a large sample sizes, and circuits will consume a lot of resources.To compensate for the abovementioned deficiencies, this paper proposed a new FFT circuit design method to reach the low-resource call goal of the FFT circuit. Under the framework of decimation-in-time (DIT) butterfly plot of 8,192 sampling points, the block operation scheme of recursive structure was adopted, and Euler's formula was used to optimize rotation factors in the butterfly plot. Results show that the proposed FFT design method

	in this paper can save register (REG) quantity by about 96.87% and look-up-table (LUT) quantity by an average of about 98.75% under the same quantity of sampling points, thus, resource call is reduced by a large margin. The study scheme can provide a reference for low resource call design of the FFT circuit.
H0026 Poster 3	Block Watermarking Authentication Scheme for Image Tamper Detection **Ki-Hyun Jung** Kyungil University, South Korea *Abstract*—As the Internet has spread over in the world, the multimedia security has become an important issue to transmit multimedia data safely. Authentication is a very important factor for a copyright and ownership of multimedia data. Tamper detection and localization are two important factors in authentication watermarking. In this paper, a block watermarking authentication scheme for image tamper detection is proposed. In the embedding step, a parity bit and 3-bit LSB are used to detect for tampering. In the detecting step, three steps for tampering are used to improve tamper detection and recovery. Experimental results show that the proposed method can investigate three detecting steps to find whether the image has tampered or not. And also detect the location of tampering images.
H0027	Realistic Sound Generation for Free Movement in VR Junhyoung Lee, Jaeuk Choung and **Kwangki Kim** Korea Nazarene University, South Korea Abstract—Binaural rendering is a technology that delivers realistic sound to users without a multi-channel playback environment through a stereo headphone environment such as VR service. While the binaural rendering produces realistic sound for stereo headphone playback environments, there is a problem that binaural rendering alone cannot reflect the user's free movement in the VR. To reduce the discrepancy between sound and visual scenes in VR caused by the user's free movement, we have proposed a complex plane based realistic sound generation method. In the proposed method, the distance and orientation between the user and the speaker, which changes according to the user's movement, is reflected in the stereo realistic sound generated by the binaural rendering. In order to calculate the distance and azimuth between the user and the speaker by changing the user's position, the 5.1 multi-channel speaker reproduction system and the user are placed in a complex plane. Then, the distance and orientation between the user and the speaker can be simply calculated as the distance and angle between two points in the complex plane. The original multi-channel audio signals are scaled using the estimated distance and they are mapped to the newly generated virtual multi-channel speaker layout according to the measured orientation. Finally, the stereo realistic sound to reflect the user's movement in VR through the binaural rendering using the scaled and mapped multi-channel audio signals and the HRTF coefficients.

H2001 Poster 6	A New Conjugation of Examethasone-carbon Nanotube Reduces Rheumatoid Arthritis **Sang-Hyun Kim** and Jong-Sup Bae Kyungpook National University, South Korea *Abstract*—Prolonged treatment of corticosteroid is inevitable for synovial inflammation in advanced arthritis. However, short- and long-term use of corticosteroids usually triggers serious adverse effects. This study demonstrated that conjugation of a corticosteroid (dexamethasone) on polyethyleneglycol (PEG)-fabricated multi-walled carbon nanotubes enhances intracellular drug delivery via increased lysosome transport and ultimately suppresses the expression of major pro-inflammatory cytokines and matrix metalloproteinases from fibroblast-like synoviocytes at a very low drug dose. Specifically, conjugation of dexamethasone and multi-walled carbon nanotubes inactivated nuclear factor-kB via inhibition of the phosphorylation of mitogen-activated protein kinases and the serine/threonine kinase. In summary, low-dose dexamethasone conjugation with carbon nanotubes significantly inhibited the inflammatory response of fibroblast-like synoviocytes by achieving highly efficient intracellular trafficking and suggested a potential drug candidate for resolving side effects associated with conventional arthritis treatment.
H2003 Poster 7	BMP11 Regulates Thermogenesis in Adipocytes Huong Giang Pham and **Jong Won Yun** Daegu University, South Korea *Abstract*—Bone morphogenetic protein-11 (BMP11), also known as a growth differentiation factor-11 (GDF11), has been implicated in skeletal development and joint morphogenesis in mammals. However, its functions in adipogenesis and energy homeostasis have been mostly unknown. To investigate these functions, we used siBmp11 or treatment with recombinant BMP11 (rBMP11) in white and brown adipocytes. Here, we show a crucial role of BMP11 in cultured 3T3-L1 white and HIB1B brown adipocytes. The silencing of Bmp11 markedly decreased the expression levels of brown-fat signature proteins and beige-specific genes in white adipocytes and significantly elevated the expression levels of brown fat specific genes in brown adipocytes. The deficiency of Bmp11 reduced the expression of the adipogenic transcription factors in white adipocytes, as well as in HIB1B cells. Further examination of the molecular mechanism of BMP11 revealed that rBMP11 promoted adipogenesis in 3T3-L1 adipocytes through both SMAD2/3 and SMAD1/5/9 signals and induced browning of 3T3-L1 adipocytes via coordination of multiple signaling pathways. Overall, the results provide evidence for the first time the potential roles of BMP11 on the improvement of lipid catabolism in both cultured white and brown adipocytes and its effect on browning of white adipocytes, thereby demonstrating its therapeutic potential for the treatment of obesity.

H3002 Poster 8	Analysis of Postural Balance in SWEDD Patients **Ji-Won Kim**, Yoon Hyeok Choi, Yu- Ri Kwon and Do-Young Kwon Konkuk University, South Korea *Abstract*—It is important to distinguish between SWEDD (Scans without evidence of dopaminergic deficit) and PD (Parkinson's disease) in order to avoid inappropriate treatment. The aim of this study was to investigate static postural balance of SWEDD patients. Eleven PD patients and 11 SWEDD patients participated in this study. COP (center of pressure) was measured during quiet standing. PD patients showed a greater averaged COP distance as compared to SWEDD patients. This finding suggests that static postural balance test may help early identify SWEDD patients from PD patients.
H2009 Poster 9	Morphological Signature for Improvement of Weakly Supervised Segmentation of Quadriceps Muscles on Magnetic Resonance Imaging Data Hoai-Thu Nguyen, Sylvain Grange, Magalie Viallon, Rémi Grange, Pierre Croisille and **Thomas Grenier** Univ Lyon, France *Abstract*—Automatic segmentation allows advancement in medical diagnosis and follow-up but remains a challenging task. Thanks to new machine learning approaches, this task tends to be more and more robust but still required many manual segmentations. Here we proposed to improve segmentation results obtained by multi-atlas segmentation with corrective learning (CL) approach using a selection of atlases based on morphological similarity to the image to process. We first introduce our morphological measurement dedicated for quadriceps segmentation of 3D T1 Water-only MR images and then use it to select closest atlases. Our results show that using few atlases (3 in lieu of 6) based on our morphological measurement improves segmentation quality and decrease computational time for multi-atlas segmentation with CL. Based on the measurements, we also defined a data augmentation strategy to train U-Net (a well-known and efficient deep learning segmentation approach), expecting better generalization capability, with very promising results.
H0032 Poster 10	Prediction of Robot Technology using Multi-phase Model **Juhyun Lee**, Junseok Lee, Jiho Kang, Sangsung Park and Dongsik Jang Korea University, South Korea *Abstract*—Technology changes with the times. It is difficult to predict, as technology develops under the influence of several factors. We analyze the technology by carrying out the patent from a time series perspective. The study consists of two phases. In the first phase, time series models detect the trend, cycle, and seasonality of the technology. Next phase performs to predict the importance of term. In order to confirm the practical applicability of the proposed method, 2,268 industrial robot patents were collected and tested. As a result, it was found that technologies beyond the dual control based on carbon materials among industrial robots will continue to develop.

H3003 Poster 11	Kinematic Analysis on Infant-care Posture **Yu-Ri Kwon**, Yoon Hyeok Choi, Ji-Won Kim and Gwang-Moon Eom Konkuk University, South Korea *Abstract*—Repeated high loads during infant care are deeply related to musculoskeletal disorders. As a basic study to suggest the correct posture of infant caregivers, the purpose of this study is to analyze the kinetic data on lifting infants. Three healthy men participated in this study. Kinematic data was measured during infant lifting by motion capture system (Eagle, Motion analysis, USA). As the infant weight increased, the hip joint angle was larger and the elbow joint angle was smaller. These results are expected to be helpful in understanding caregivers' postures and removing ergonomic risk factors that may occur in infant care.
H0033 Poster 12	A Study on the Development of Medical Robotics Technology Commercialization Model Youngho Kim, Junseok Lee, Jiho Kang, Sangsung Park and Dongsik Jang Korea University, South Korea *Abstract*—The robot industry is a key field of the Fourth Industrial Revolution. Among them, the interest in medical robotics is increasing due to aging and changes in living patterns. In the medical robotics market, a small number of companies dominate the market, causing problems such as increased costs. To prevent such problems, various companies need to enter the market. In order for new entrants to secure technology efficiently, technology commercialization such as technology transfer is necessary. However, in the field of medical robotics, few companies have major skills and perform most of the technology transfer. In this paper, we propose a model for providing technology commercialization information to new entrants. The experimental data uses patents related to vascular surgery robots registered in the USPTO. As a result of the experiment, high applicants have advanced into various countries in order to secure market power, and have a technique for analyzing the internal image of the body mainly through endoscopy.
H0017 Poster 13	FAST I/O: QoS Supports for Urgent I/Os in NVMe SSDs **Kyusik Kim**, Seongmin Kim and Taeseok Kim Kwangwoon University, South Korea *Abstract*—NVMe SSDs employ lots of I/O submission queues to dispatch I/O requests simultaneously and exploit the parallelism of SSDs actively. Although this architecture can improve the I/O bandwidth and IOPS of NVMe SSDs, the QoS of each I/O request is never guaranteed. Especially, when many I/O requests are pending in the submission queues, I/O requests to be processed urgently can be delayed. In this paper, we present a scheme that handles the urgent I/O requests without a delay. Since the pending I/O requests in the submission queues cannot be controlled in the host, we use the host memory buffer (HMB) as a fast track for processing urgent I/O requests. Instead of

	sending urgent I/O requests into the SSDs through a legacy I/O path, the proposed scheme removes the latency by directly inserting them in the HMB that can be accessed from both host and SSDs. Through the experiments on our emulator, we show that the proposed scheme could reduce the average and tail latencies significantly.
H0015 Poster 14	Developing Anti-tamper Functionalities through Continuous Integration **Ara Hur** and Yeonseung Ryu Myongji University, South Korea Abstract—Anti-tamper is the security engineering activity that frustrates or prevents the reverse-engineering or modification of the computing devices. As the number of advanced computing devices such as autonomous vehicles and robots increases, the necessity of anti-tamper functionality is also increasing so that sensitive information or intellectual property stored in the devices are not leaked by reverse engineering. In this paper, we study a continuous integration development environment that can effectively apply anti-tamper functionality during the development of computing device. Proposed anti-tamper automation in continuous integration development environment can reduce development cost and time burden by eliminating manual anti-tamper implementation activity.
H0005 Poster 15	Fault Diagnosis based on Modified BiLSTM Neural Network **Tianqi Zhang**, Qing Fei, Nannan Li and Dailiang Ma Beijing Institute of Technology, China Abstract—Fault diagnosis of industrial processes has recently received widespread attention. Some studies applied neural networks to fault classification algorithms, which directly take the raw data as input of the neural network for training, and then use classifier to classify faults. However, the raw data of industrial usually has high dimension and the variables has linear correlations between each other, which may not only lead to higher computational complexity and cause the neural network difficult to converge. In this paper, a fault diagnosis algorithm based on a modified bidirectional long-short term memory network (BiLSTM) is investigated. The proposed method introduces the linear discriminant analysis (LDA) before the architecture of networks to reduce the dimension of input data. Then the LDA-BiLSTM is tested in Tennessee Eastman Process (TEP) platform. Experiment results show that the dimension reduction procedure can speed up the convergence of neural network, and may improve the classification accuracy. Extensive experimental results indicate that developed algorithm provides better diagnosis performance.
H0028 Poster 14	DenseNet with I-vectors for Reverberant Speech Recognition Sunchan Park, Min Sik Kim, Jaemin Han, Jaehyoun Bae and Hyung Soon Kim Pusan National University, South Korea Abstract—Automatic Speech Recognition (ASR) has been greatly improved

	using deep neural networks, but reverberation space is still a challenging environment. In our previous work, we adopt Densely connected convolutional Networks (DenseNet) that showed robustness for image classification, as acoustic model of Deep Neural Network Hidden Markov Models (DNN-HMM) system and achieved improvement in reverberant speech recognition. In this paper, we propose the architecture that combines DenseNet with an i-vectors that includes speaker and environmental information for further improvement. Because DenseNet consists of many densely connected convolutional layers, simply connecting the i-vector to each frame of the Mel-spectrogram or passing it to the input of the classification layer could not propagate environmental information. However, if we concatenate i-vectors to all feature maps of DenseNet for dense connection, time-frequency structure of network is broken. In order to effectively convey environmental information, our proposed model propagates i-vectors to 1 x 1 convolutional bottleneck layers of DenseNet while preserving time-frequency structure. Evaluating our architecture with the REVERB Challenge 2014 ASR task, we get an average Error Reduction Rate (ERR) of 5.7% for simulated sets and 9.1% for real recordings compared to DenseNet without i-vectors.

Note

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