CONFERENCE ABSTRACTS

ICCCI 2022

2022 4th International Conference on Computer Communication and the Internet

Chiba, Japan

July 1-3, 2022   Japan Time (GMT+9)

Acknowledgements

Co-sponsored by

Non-Sponsor Supported by

Patrons:

About ICCCI

The first IEEE ICCCI was sponsored by IEEE and Central China Normal University, P.R.China, which was held in the beautiful and historical city Wuhan in 2016. The second and the third ICCCI were successfully held as a virtual conference owing to COVID-19. The conference proceedings of the previous ICCCI were included in IEEE Xplore and indexed by Ei & Scopus. ICCCI 2022, the 4th ICCCI, serves to foster communication among researchers, engineers and relevant practitioners with a common interest of researching in the broad areas of computer communications and Internet, developing scientific and technological innovations in these areas. The primary focus of the conference is on new and original research results in the areas of theoretical findings, design, implementation, and applications of computer communications and Internet.

Contents Index

Welcome Message

You are immensely welcome to attend the 4th International Conference on Computer Communication and the Internet (ICCCI 2022). The conference focuses on the trending, highly popular, but exciting and extremely challenging areas from our keynote speakers of leading scientists and a variety of authors around the world. The outcome of our deliberations will play a crucial role in progress achieved in these areas. Due to the Covid-19, the organizing committee of ICCCI 2022 decided that this event will be held as a hybrid conference.

The conference brings together researchers looking for opportunities for conversations that cross the traditional discipline boundaries and allows them to resolve multidisciplinary challenging problems. It is the clear intent of the conference to offer excellent mentoring opportunities to participants. Through this hybrid platform, we trust that you will be able to share the state-of-the-art developments and the cutting-edge technologies in these broad areas.

We have the conference for three days. There will be 5 sessions (one onsite and four online), 3 keynote speeches and 2 invited speeches.

Special thanks are extended to our colleagues in program committee for their thorough reviews of all the submissions, which are vital to the success of the conference, and also to the members in the organizing committee and the volunteers who had dedicated their time and efforts in planning, promoting, organizing and helping the conference. Last but not least, our special thanks go to speakers as well as all the authors for contributing their latest researches to the conference.

In closing, we thank you for participating in ICCCI 2022 and we hope you enjoy the next three days.

Conference Chairs
Professor Shinji Sugawara
Chiba Institute of Technology, Japan
Professor Yutaka Ishibashi
Nagoya Institute of Technology, Japan

Organizing Committee

Conference Chairs
Shinji Sugawara
Chiba Institute of Technology,
Japan

Yutaka Ishibashi
Nagoya Institute of Technology,
Japan

Publicity Chairs
Takanori Miyoshi
Nagaoka University of Technology,
Japan

TPC Chairs
Chih-Yu Wen
National Chung Hsing University,
Taiwan

Chih-Peng Fan
National Chung Hsing University,
Taiwan

Kiyoshi Ueda
Nihon University,
Japan

Yu-Cheng Fan
National Taipei University of Technology,
Taiwan

Hiroshi Fujinoki
Southern Illinois University Edwardsville,
USA

Local Chair
Akihiro Fujihara
Chiba Institute of Technology,
Japan

Special Session Chairs
Tomio Goto
Nagoya Institute of Technology,
Japan

Pingguo Huang
Gifu Shotoku Gakuen University,
Japan

3

Technical Program Committee

Masaki Aida, Japan

Mohammad Ahmed Alomari, Malaysia

Abdelfattah Amamra, USA

Abdullah Aydeger, USA

Jordi Mongay Batalla, Poland

Riccardo Bettati, USA

Anthony Bianchi, USA

Rajendra V. Boppana, USA

Roy H Campbell, USA

Lin-Huang Chang, Taiwan

Elizabeth D Diaz, USA

Yuichi Fujino, Japan

Norihiro Fukumoto, Japan

Nobuo Funabiki, Japan

Kouichi Genda, Japan

Sotirios Goudos, Greece

Jiang Guo, USA

Khondker Shajadul Hasan, USA

Naohira Hayashibara, Japan

Minchuan Huang, China

Takashi Ikebe, Japan

Takeshi Ikenaga, Japan

Miyuki Imada, Japan

Satoshi Imai, Japan

Nobuhiro Inuzuka, Japan

Genya Ishigaki, USA

Wout Joseph, Belgium

Masaru Kamada, Japan

Shohei Kamamura, Japan

Yasunori Kawai, Ishikawa College, Japan

Ahmed Ezzeldin Khaled, USA

Kazuhiro Kikuma, Japan

Yeongkwun Kim, USA

Kazuyuki Kojima, Japan

Turgay Korkmaz, USA

Bernard Ku, USA

Shiann-Rong Kuang, Taiwan

Yaw-Wen Kuo, Taiwan

Palden Lama, USA

Yinman Lee, Taiwan

Ming Li, USA

Tsung-Jung Liu, Taiwan

Muhammad Tariq Mahmood, South Korea

Ericsson Santana Marin, USA

Kenichi Matsui, Japan

Melody Moh, USA

Islam Mohammad, USA

VP Nguyen, USA

Daiki Nobayashi, Japan

Hitoshi Ohnishi, Japan

Chikara Ohta, Japan

Habeeb Olufowobi, USA

Win Pa Pa, Yangon

Wuxu Peng, USA

Graciela Perera, USA

Katerina Potika, USA

Jihad Qaddour, USA

Heena Rathore, USA

Kosuke Sanada, Japan

Navrati Saxena, USA

Hongchi Shi, USA

Kohei Shiomoto, Japan

Radu Stoleru, USA

Hiroshi Sunaga, Japan

Tomokazu Takahashi, Japan

Chisa Takano, Japan

Sajedul Talukder, USA

Masato Tsuru, Japan

Tsang-Yi Wang, Taiwan

Jingyi Wang, USA

Wei Wang, USA

You-Chiun Wang, Taiwan

Shaoen Wu, USA

Hailu Xu, USA

Taku Yamazaki, Japan

Shingchern You, Taiwan

David Zeichick, USA

Overall Agenda

Day 1	July 1, 2022	Friday (Online)	
10:30-16:00	ZOOM Test

Day 2	July 2, 2022	Saturday (Hybrid)	
9:20-9:50	Onsite Registration (Sign-in and materials pick-up)
10:00-15:10	Opening Remarks, Keynote and Invited Speeches
15:30-17:15	Session 1

| Day 3 | July 3, 2022 | Sunday (Online) | |
|---|---|
| **10:00-15:45** | Sessions 2-5 |
| **16:20-16:40** | Closing & Awarding Ceremony |

Sessions at a Glance	
Session 1: Computer and Control System	**Session 2: Advanced Image Processing**
C054 C013 C019-A C009-A S0001 C034 C058	C010 C020 C051 C0005 C031 C039-A C056 C012

Session 3: Wireless Communication and Mobile Network	**Session 4: Big Data and Machine Learning**	**Session 5: Advanced Systems and Applications**
C014 C055 C002 C018 C1001 C050 C008 C028	C016 C032 C026 C036 C025-A C017 C015 C0007 C052	C033 C037 C041 C060 C053 C0002 C057 C0003 C035

Guideline & Tips

Onsite conference

Conference Venue

Chiba Institute of Technology (Tsudanuma Campus)

Address: 2-17-1 Tsudanuma, Narashino, Chiba 275-0016, Japan

Conference Hall:
3rd Floor, Building No. 2
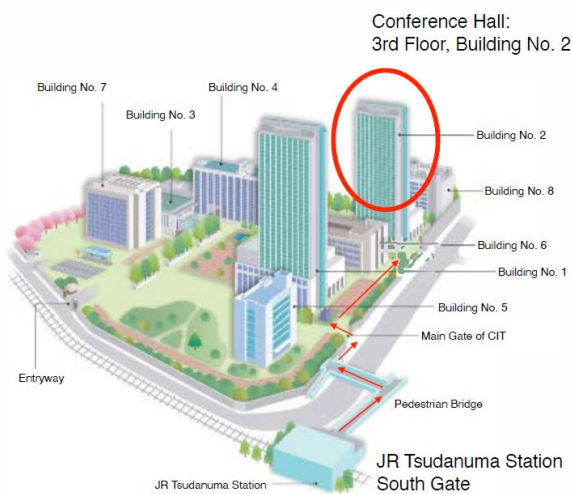
When you just get out of the south gate of JR Tsudanuma Station, you can see twin buildings of CIT.
Conference Hall is located on the 3rd floor of the Building No. 2.

Important Notes
- Please take care of your belongings during the conference. The conference organizer does not assume any responsibility for the loss of personal belongings of the participants.
- Accommodation is not provided for authors. Delegates are suggested make early reservation.
- For epidemic prevention and control, please wear a mask during the conference.

Recommended Hotel

JR-EAST Hotel Mets Tsudanuma

Website: https://www.hotelmets.jp/en/tsudanuma/

Online conference

Time Zone
Japan Time (GMT+9)

Platform: ZOOM

ZOOM, Download link:
- https://zoom.us/download
- https://zoom.com.cn/download (for Chinese authors)

Equipment Needed
- A computer with internet connection and camera
- Headphone/earphone

Environment Needed
- A quiet place
- Stable internet connection
- Proper lighting and background

Name
- Name yourself with your paper ID + Name
- Example: C001+Mary

Oral Presentation
- Timing: a maximum of **15 minutes** in total, including 3 minutes for Q&A.
- It is suggested that the presenter email a copy of his/her video presentation to the conference email box as a backup.

*Conference Recording

The whole conference will be recorded. We appreciate you proper behavior and appearance

Daily Schedule

Day 1 | July 1, 2022 | Friday (Online)		
10:30-11:30	ZOOM Test for Session 2-3	ZOOM ID: 857 2994 8737
	ZOOM Test for Session 4-5	ZOOM ID: 861 7606 2169
15:00-16:00	ZOOM Test for Keynote/Invited Speakers, Session Chairs	ZOOM ID: 857 2994 8737

Day 2 | July 2, 2022 | Saturday (Hybrid)		
Meeting Room: Conference Hall, 3rd floor, Building No. 2.		ZOOM ID: 857 2994 8737
9:20-9:50	**Onsite Registration** (Sign-in and materials pick-up)	
10:00-10:05	**Welcome Address:** Prof. Shinji Sugawara, Chiba Institute of Technology, Japan	
10:05-10:10	**Opening Remarks:** Prof. Yutaka Ishibashi, Nagoya Institute of Technology, Japan	
10:10-10:50	*Keynote Speech I: FILS15.4: Fingerprint-based Indoor Localization System Using IEEE 802.15.4* Prof. Nobuo Funabiki, Okayama University, Japan	
10:50-11:10	Coffee Break & Group Photo	
11:10-11:50	*Keynote Speech II: Modelling of Terahertz Antenna and Propagation Characteristics for Beyond 5G Mobile Communication* Prof. Akihiko Hirata, Chiba Institute of Technology, Japan	
11:50-13:50	Lunch Break	
13:50-14:30	*Keynote Speech III: New Applications with Flexible Color Electronic Papers* Prof. Wen-Chung Kao, IEEE Fellow, National Taiwan Normal University, Taiwan (Online)	
14:30-14:50	*Invited Speech I: Harmonization of Competition and Cooperation in Consensus Algorithm: Toward a Solution to the Blockchain Scalability Problem* Prof. Akihiro Fujihara, Chiba Institute of Technology, Japan	
14:50-15:10	*Invited Speech II: 6G-Enabled Massive Internet of Things* Prof. Kostas E. Psannis, University of Macedonia, Greece (Online)	
15:10-15:30	Coffee Break	
15:30-17:15	**Session 1:** Computer and Control System	

Day 3 | July 3, 2022 | Sunday (Online)		
10:00-12:00	**Session 2:** Advanced Image Processing	ZOOM ID: 857 2994 8737
	Session 3: Wireless Communication and Mobile Network	ZOOM ID: 861 7606 2169
12:00-13:30	Break	
13:30-15:45	**Session 4:** Big Data and Machine Learning	ZOOM ID: 857 2994 8737
	Session 5: Advanced Systems and Applications	ZOOM ID: 861 7606 2169
15:45-16:20	Break	
16:20-16:40	**Closing & Awarding Ceremony**	ZOOM ID: 857 2994 8737

Keynote Speech I

Speaker

Prof. Nobuo Funabiki

Chiba Institute of Technology, Japan

10:10-10:50

Short Bio: Nobuo Funabiki received the B.S. and Ph.D. degrees in mathematical engineering and information physics from The University of Tokyo, Japan, in 1984 and 1993, respectively, and the M.S. degree in electrical engineering from Case Western Reserve University, USA, in 1991. From 1984 to 1994, he was with the System Engineering Division, Sumitomo Metal Industries, Ltd., Japan. In 1994, he joined the Department of Information and Computer Sciences, Osaka University, Japan, as an Assistant Professor, and became an Associate Professor in 1995. He was a Visiting Researcher with the University of California, Santa Barbara, from 2000 to 2001. In 2001, he was a Professor with the Department of Communication Network Engineering (currently, Department of Electrical and Communication Engineering), Okayama University. His research interests include computer networks, optimization algorithms, educational technology, and Web technology.

"FILS15.4: Fingerprint-based Indoor Localization System Using IEEE 802.15.4"

Abstract: Nowadays, the Indoor Localization System (ILS) has gained a lot of interests for offering location-based services in indoor environments. Although the Global Positioning System (GPS) has been established for outdoor location-based services, it may fail to cover indoor fields that have multiple floors and many rooms. Then, the Wi-Fi-based ILS has been extensively studied in literature. However, it can be uncomfortable for users because they always need to carry the devices that can be large and heavy, and have short battery lives.

Currently, we are studying FILS15.4, the Fingerprint-based Indoor Localization System using the IEEE 802.15.4 standard, to solve this drawback of the Wi-Fi-based ILS. By adopting this standard, FILS15.4 is suitable for long-time use of users by carrying small and light transmitters with long-life coin batteries. The signal fluctuation issue in the narrow-band low-power wireless communication of the IEEE 802.15.4 standard is solved by limiting the detection unit to a room or a space and adopting the fingerprint-parameter optimization tool.

For evaluations of FILS15.4, we have designed and implemented the testbed system using Mono Wireless transmitters/receivers, Raspberry Pi for data relaying devices through the Internet, a Linux PC for the server, and the message queuing telemetry transport (MQTT) protocol for data communications between the receivers and the server. Our experiment results in Okayama University campus confirm that the detection accuracy exceeds 92% in any room including moving users.

Keynote Speech II

Speaker

Prof. Akihiko Hirata
Chiba Institute of
Technology, Japan

Short Bio: Akihiko Hirata completed his B.S. and M.S. degrees in chemistry and Dr. Eng. Degree in electrical and electronics engineering from the Tokyo University, Tokyo, Japan, in 1992, 1994, and 2007, respectively. He joined the Atsugi Electrical Communications Laboratories of Nippon Telegraph and Telephone Corporation (presently NTT Device Technology Laboratories) in Kanagawa, Japan, in 1994, where he worked as a senior research engineer and supervisor. Since 2016, he has been a professor for Chiba Institute of Technology. His current research involves terahertz passive devices, ultra-broadband terahertz wireless systems, and millimeter-wave and terahertz imaging. He was awarded the 2002 Asia-Pacific Microwave Conference APMC prize, the 2004 YRP Award, the 2007 Achievement Award presented by the Institute of Electronics, Information, and Communication Engineers (IEICE), the 2008 Maejima Award presented by the Post and Telecom Association of Japan, the 2009 Radio Achievement Award presented by the Association of Radio Industries and Businesses, the 2010 Foundation Award presented by the Hoso Bunka Foundation, the 2010, 2012, and 2013 Asia-Pacific Microwave Conference APMC prize, and the 2011 Commendation for Science and Technology from the Ministry of Education, Culture, Sports, Science and Technology. Prof. Hirata is a senior member of IEEE and IEICE.

11:10–11:50

"NTT R&D's Challenge toward Self-evolving Zero-Touch Network Operation with AI and Data analysis"

Abstract: Beyond the 5G era, network will serve as a critical social infrastructure that supports the cyber physical system with massive and diverse devices as well as service requirements. In such a situation, self-evolving zero-touch network operation with AI and data analysis will be essential to provide network functions and resources flexibly and dynamically. In addition, the key indicators of network value will expand from conventional parameters inside networks, such as throughput or latency, to the outside indicators such as user benefit or user behavior change. We introduce the concept and technologies concerning the self-evolving zero-touch and user-engagement as the direction of future network operation.

Keynote Speech III

Speaker

Prof. Wen-Chung Kao
National Taiwan Normal University, Taiwan

13:50-14:30

Short Bio: Prof. Wen-Chung Kao received his M.S. and Ph.D. degrees in electrical engineering from National Taiwan University, Taiwan, in 1992 and 1996, respectively. Before he joined academia in 2004, he was a Department Manager at SoC Technology Center, ITRI, Taiwan, an AVP at NuCam Corporation in Foxlink Group, and the co-founder of SiPix Technology Inc. He is currently a Chair Professor at Department of Electrical Engineering and the Dean of the College of Technology and Engineering. His current research interests include system-on-a-chip (SoC), embedded software design, flexible electronic paper, machine vision systems, and digital camera systems. Currently, he serves as President-Elect and VP of Publications in IEEE Consumer Electronics Society. He is a Fellow of IEEE.

"New Applications with Flexible Color Electronic Papers"

Abstract: The electronic paper (ePaper) made by electrophoretic display has been successfully used in e-books and other consumer products. Recently, the next generation of color electrophoretic materials has been announced. This new ePaper enables lots of new applications. However, the design of the corresponding signal processing for color ePaper is still under development. In the talk, Prof. Kao will share the latest developments in the improvements for the image quality as well as the user experience on ePaper. Finally, some possible interesting novel topics/applications for future research will be also introduced.

Invited Speech I

Day 2-July 2
ZOOM ID: 857 2994 8737 (https://us02web.zoom.us/j/85729948737)

Speaker

Prof. Akihiro Fujihara
Chiba Institute of
Technology, Japan

14:30–14:50

Short Bio: Akihiro Fujihara received the Ph.D. degree in science from Yokohama City University, Japan, in 2006. He was a Post-doc Researcher at Kwansei Gakuin University for seven years since 2007. In 2014, he joined Fukui University of Technology as an Associate Professor. In 2017, he joined Chiba Institute of Technology, where he is currently teaching graduate and undergraduate courses in the area of information and communication systems engineering. He is a Full Professor with the Department of Information and Communication Systems Engineering, Chiba Institute of Technology. He has authored or co-authored over 50 publications of research articles on stochastic processes, human mobility and communication behavior patterns, IoT, and blockchain. He has also been giving a number of invited talks on them. His research interests include blockchain architecture to solve the blockchain scalability problem and the use of blockchain technology in combination with AI and IoT for smart city services. He is a member of the IEEE and IEICE. He was a recipient of the COMPSAC Best Paper Award of 2014 and the International Conference on Intelligent Networking and Collaborative Systems (INCoS) Best Paper Awards of 2011 and 2018. He served on the editorial boards for the IEICE transactions on communications (EB).

"Harmonization of Competition and Cooperation in Consensus Algorithm: Toward a Solution to the Blockchain Scalability Problem"

Abstract: Since Bitcoin appeared in 2008, the word "blockchain" has been used in a variety of contexts. On the other hand, it is sometimes heard that blockchain is still not clearly defined, which may give the impression that it is a difficult technology. However, the essence of blockchain technology is not difficult to understand and does not require any knowledge of difficult mathematics or physics (except for the details of cryptography). In this talk, we show that the essence of blockchain technology does not lie in the database called blockchain, but in Internet-scale open participation of an unspecified number of nodes and consensus algorithms between them.

In blockchain systems, there is a serious problem in scalability, which is called the blockchain scalability problem. It is estimated that the transaction processing capacity of Bitcoin is only seven transactions per second at maximum. However, it is known that the credit card company VISA, whose cards are often used for payments in our daily lives, has a capacity of 56,000 transactions per second. This problem hinders innovative applications of blockchain technology, such as micropayment and blockchain for AI and IoT. By harmonizing consensus algorithms of existing distributed systems with Bitcoin's Nakamoto consensus or other variants, the blockchain scalability problem can be solved. The latest results of our theoretical consideration and experimental performance evaluation using a cross-referencing method will also be discussed.

Invited Speech II

Speaker

Prof. Kostas E. Psannis
University of Macedonia, Greece

14:50–15:10

Short Bio: KONSTANTINOS E. PSANNIS was born and raised in Thessaloniki, Greece. He is currently Associate Professor in Communications Systems and Networking at the Department of Applied Informatics, School of Information Sciences, University of Macedonia, Greece, Director of Mobility2net Research & Development & Consulting JP–EU Lab, member of the EU–JAPAN Centre for Industrial Cooperation and Visiting Consultant Professor, Graduate School of Engineering, Nagoya Institute of Technology, Nagoya 466–8555, Japan. Konstantinos received a degree in Physics, Faculty of Sciences, from Aristotle University of Thessaloniki, Greece, and the Ph.D. degree from the School of Engineering and Design, Department of Electronic and Computer Engineering of Brunel University, London, UK. From 2001 to 2002 he was awarded the British Chevening scholarship. The Chevening Scholarships are the UK government's global scholarship programme, funded by the Foreign and Commonwealth Office (FCO) and partner organisations. The programme makes awards to outstanding scholars with leadership potential from around the world to study at universities in the UK.

"6G-Enabled Massive Internet of Things"

Abstract: As 5G wireless communication technology becomes a reality in terms of performance and implementation, the transition to 6G wireless technology emerges as a necessity to face the state-of-the art issues and limitations of current 5G systems. Massive MIMO is already providing high data rates along with spectral and energy efficiency. High multiplexing gain and beamforming capabilities also set the stage for optimal performance. IoT technology involves the dense deployment of smart sensing units that provide information in an accurate and timely manner. With the integration of Massive MIMO technology, the 6G Massive IoT introduces new challenges both from the 6G perspective such as higher frequency zone exploitation and high data rate performance as well as IoT design challenges such as latency, coverage and localization. Numerous technologies have been utilized to face the emerging issues of such massively deployed networks, such as artificial intelligence, machine learning, deep learning as well as Compressed Sensing. Compressed Sensing provides optimized performance achieving the two fold benefits of computational and implementation complexity reduction. This is realized by efficient information processing and hardware simplification. Joint consideration of the issues of efficient sensing, communication, storing and information processing could render 6G Massive IoT networks the promising technology in future communications.

[15:30–17:15, July 2]

Session 1: Computer and Control System

Conference Hall: 3rd floor of the Building No. 2
Chair: Prof. Takanori Miyoshi, Nagaoka University of Technology, Japan

C054 15:30-15:45	*An Implementation of Job Running Backup Function in User-PC Computing System* **Mr. Hein Htet**, Nobuo Funabiki, Ariel Kamoyedji, Xudong Zhou, Xu Xiang, Shinji Sugawara, Wen-Chung Kao **Okayama University, Japan** Abstract: As a low-cost and high-performance distributed computing platform, we have studied the User-PC Computing (UPC) system based on the master-worker model. Docker container technology is adopted to run various application programs or jobs on heterogeneous PC environments for workers. Some jobs, such as physics simulations and neural networks, require long CPU time, which increases the probability of failure of running workers. The automatic backup of the job running state and migration to other worker will be essential to reduce the job completion delay. In this paper, we implement the job running backup function in the UPC system. Checkpoint-Restore in Userspace (CRIU) is periodically applied to capture the job running state of the running job at a worker. When the master detects the failure, it automatically migrates the job to another worker. To evaluate the function, we conducted experiments using the testbed UPC system with 14 jobs and six workers of different specifications, and confirmed that the proposal successfully resumes the job running from the interrupted point at another worker.
C013 15:45-16:00	*A Network-based IoT Covert Channel* **Mr. Kyle Harris**, Wayne Henry, Richard Dill **Air Force Institute of Technology, USA** Abstract: Information leaks are a top concern to industry and government leaders. The Internet of Things (IoT) is a rapidly growing technology capable of sensing real-world events. IoT devices lack a common security standard and typically use lightweight security solutions, exposing the sensitive real-world data they gather. Covert channels are a practical method of exfiltrating data from these devices. This research presents a novel IoT covert timing channel (CTC) that encodes data within preexisting network information, namely ports or addresses. This method eliminates the need for inter-packet delays (IPD) to encode data. Seven different encoding methods are implemented between two IoT protocols, TCP/IP and ZigBee. The TCP/IP covert channel is created by mimicking a Ring smart doorbell and implemented using Amazon Web Services (AWS) servers to generate traffic. The ZigBee channel is built by copying a Philips Hue lighting system and executed on an isolated local area network (LAN). Variants of the CTC focus either on Stealth or Bandwidth. Stealth methods mimic legitimate traffic captures to make them difficult to detect while the Bandwidth methods forgo this approach for maximum

throughput. Detection results are presented using shape-based and regularity-based detection tests.

The Stealth results have a throughput of 4.61 bits per second (bps) for TCP/IP and 3.90 bps for ZigBee. They also evade shape and regularity-based detection tests. The Bandwidth methods average 81.7 Kbps for TCP/IP and 9.76 bps for ZigBee but are evident in detection tests. The results show that CTC using address or port encoding can have superior throughput or detectability compared to IPD-based CTCs.

C019-A
16:00-16:15

Evaluation of QoE with Tranceparency of Force and Position in Tele-copy Robot
Prof. Takanori Miyoshi, Taketo Katakura, Ho Tho
Nagaoka University of Technology, Japan

Abstract: A robot that copies one's motion in a remote location is defined as "a tele-copy robot". By facilitating my own tele-copy robot at the your place (site B) in a remote location, and also facilitating the your tele-copy robot at my place (site A), I and you can recognize each other's motion through the copy robot. However, since it is not possible to completely match the positional relationship between site A and site B, it is difficult to match the sense of force. For example, even if I and your tele-copy robot are in contact with each other at site A, my tele-copy robot and you are not always in contact at site B. When they are not in contact, no force will be transmitted. Therefore, in order to match the sense of force, it is necessary to control the force by adding a special control algorithm and slightly changing the position of the copy robot.

In this study, we proposed a 4ch control algorithm based on force-force control, and evaluated QoE by considering the transparency of force and motion. In the simulation results, it was confirmed that, as originally intended, the control was stable even with an increase in communication delay, and it was possible to change the position of the robot so that the forces match. In the experimental results, the stability was confirmed, and it was also confirmed that the QoE did not change much regardless of the increase in communication delay.

C009-A
16:15-16:30

Position Accuracy of Self-Positioning System Using Omni-directional Camera and LED
Prof. Kazuyuki Kojima
Shonan Institute of Technology, Japan

Abstract: We have been developing a self-localization system using Omni-directional cameras and LEDs. So far, we applied this self-localization method and made a prototype as a basketball wheelchair player tracker. LEDs were extracted by clustering images masked with binarized images, and the frequency was obtained by FFT processing the RGB luminance change of the average image near the LEDs. The frequency and the location information in space are mapped in advance. Self-localization was estimated by matching this position information with the position of the image obtained by Omni-directional Camera. Although we have confirmed that we can obtain qualitative location information, we have not yet examined the accuracy in detail. In this study, we investigate the positioning accuracy of our proposed self-positioning system.

S0001 16:30-16:45	***BLE Beacon's Status Estimation on Edge Device for Generation of Inter-Processes Transactions on Kanban System*** **Asst. Prof. Kosuke Shima**, Masahiro Yamaguchi, Takumi Yoshida, Takanobu Otsuka **Nagoya Institute of Technology, Japan** Abstract: In recent years, industries have begun to require the digitalization of numerous manufacturing processes. The well-known Kanban system in manufacturing requires digital data of transactions, such as e-Kanban. Existing studies that focus on e-Kanban mostly use RFIDs, QR codes, or bar codes to identify Kanban cards. However, RFID increments entire implementing costs and QR/bar codes place additional operations on frontline workers. We focus on implementing an e-Kanban system using BLE beacons, which are effective for the inexpensive implementations of digitized systems. We propose a system that estimates a beacon's status at a base-station that has a microcontroller. Our proposed system receives Bluetooth waves emitted by BLE beacons and estimates the status of the beacons at base-stations. The base-station identifies the beacons using UUID, Major ID, and Minor ID and estimates the status once and terminates the estimation of the beacon by a downlink from the server. This process is driven for each beacon. We conducted an experiment that transported BLE beacons on two routes. In one of them, our proposed method estimated the status with 96.32% accuracy. In addition, our proposed system estimated the status with only 10% traffic compared to existing systems.
C034 16:45-17:00	***Machine Learning based Explainable Financial Forecasting*** Mandeep, Abhishek Agarwal, Amrita Bhatia, **Avleen Malhi**, Priyal Kaler, Husanbir Singh Pannu **Thapar Institute of Engineering and Technology, Patiala, India** Abstract: The non-linear nature of the stock market prices and trends make it one of the most highly researched areas in the financial domain. People invest in the stock market based on multiple prediction techniques, classified into two main categories: classic methods like fundamental and technical analysis and AI-based prediction models. Both these techniques have their benefits and shortcomings. While the classical methods provide high interpretability, they may not be able to predict the complex trends of the stock market. AI-based models like random forests and neural networks can predict the trends with higher accuracy but provide little to no interpretability for their predictions, making them an uncertain tool for investment advice. In this paper, we use explainable artificial intelligence XAI to predict stock market trends and explain the predictions using two of the most prominent XAI tools, LIME and SHAP. The proof of concept and the experimental results are presented which show the promising application of machine learning in financial forecasting.
C058 17:00-17:15	***Efficient Query Guidance Using Content Distribution Records in Unstructured Peer-to-Peer Network*** Tomohiro Kikuchi, Taichi Akiba, **Prof. Shinji Sugawara** **Chiba Institute of Technology, Japan** Abstract: Content sharing in unstructured P2P networks, where there is no function to centrally manage content location information on the network, is executed by sending queries from a peer requesting content to its neighbors one after another. This causes a problem of

large increase in network load. As a solution to this problem, a method has been proposed in which each peer keeps transmission records (TRs) of queries to efficiently direct queries. However, when a query is being guided through a TR and the link is broken due to peers leaving the system, the length of the search path increases until the system recognizes the broken link. In this paper, we propose a method to increase the number of replicas of the requested content item by considering the good location of replica deployment, thereby the search path length is constrained and the spread of replicas is speeding up in the network. This is expected to increase the discovery probability of requested content item and reduce network load. The effectiveness of the proposed method is confirmed using computer simulations.

[10:00–12:00, July 3]

Session 2: Advanced Image Processing

Meeting ID: 857 2994 8737
Meeting Link: https://us02web.zoom.us/j/85729948737
Chair: Prof. Yu-Cheng Fan, National Taipei University of Technology, Taiwan
Co-Chair: Assoc. Prof. Tomio Goto, Nagoya Institute of Technology, Japan

C010 10:00-10:15	*HEOPC-VGGNet Based Image Enhancement Algorithm* Chun-Hsiang Chang, **Wei-Zhe Yan**, Yu-Cheng Fan **National Taipei University of Technology, Taiwan** Abstract: With the advancement of technology, smart cars are becoming more and more important. Smart cars combine digital cameras, light detection and ranging (LiDAR), and various sensors to make their functions more and more powerful. Since the information provided by the LiDAR is limited, color images are needed to obtain more information. Nowadays, in addition to the point cloud map, self-driving technology also needs to be combined with color images to determine the correct route. Especially the color images are often too dark at night, which leads to deviations in judging routes and obstacles. Therefore, image enhancement technology becomes more important to protect the safety of self-drivers and pedestrians through nighttime image calibration. The proposed method uses the histogram equalization combined with neural networks to enhance images specifically for nighttime environments in this paper. The histogram equalization method is quite simple and fast for image enhancement, and deep learning technology has the advantage of high accuracy. In this paper, the architecture combines the characteristics of both, and is divided into two main parts. In the first part, the scheme uses histogram equalization to enhance the image, and in the second part, the enhancement factor of the image is adjusted by neural network to finally achieve a brightness enhancement, suppress overexposure, and noise in the image.
C020 10:15-10:30	*Effective Reduction of Memory Storage and Cost by HEVC-based Intra-Frame Video Encoding Technology with Region-Adaptive Quantization for Car Digital Video Recorders* Chih-Hsiang Chen, **Prof. Chih-Peng Fan** **National Chung Hsing University, Taiwan** Abstract: Dashcams are critical devices for ensuring transportation safety. Specifically, they provide onsite records for transportation incidents, which allows investigators to analyze the causes of the incidents. Therefore, dashcams are commonly used in public transport, automobiles, and motorcycles. Current dashcams can achieve 1080p and 4K resolution. In addition to high-resolution charge-coupled devices and components, dashcams require a powerful video encoder integrated circuit to encode images. The results obtained after image encoding are stored in memory cards or other digital memory components. The difference between commercial dashcams and general surveillance cameras lies in their memory components. The memory components of surveillance cameras are typically cheap and easily obtainable Secure Digital (SD) cards and flash ICs, whereas dashcams require small and cheap

memory components. In contrast to general surveillance equipment, dashcams do not contain a large-scale hard drive matrix and do not have access to a large server for maintaining records. Thus, dashcams must achieve an effective compression efficiency without causing distortion. Most SD cards on the market have a storage size of 8–64 GB. Advances must be achieved in image compression technology so that the image compression ratio can be increased to reduce the video size without causing problems in subsequent image reading and identification. In this study, the file compression ratio achieved with the developed technology was 1.7–2.1 times higher than that achieved without the application of this technology. Moreover, the storage space saving ratio of the aforementioned technology was 42%–53%.

C051
10:30-10:45

Implementing Biometric or Graphical Password Authentication in a Universal Three-Factor Authentication System

Mohammad Naveed Hossain, Sheikh Fahim Uz Zaman, Tazria Zerin Khan, Sumiaya Azad Katha, Md. Tawhid Anwar, **Dr. Muhammad Iqbal Hossain**

BRAC University, Bangladesh

Abstract: There are three critical aspects of cyber security: authentication, safety, and secrecy. Consumers have access to a wide range of alternatives for improving the safety of password based login systems. With two-factor authentication, the majority of this was done. Two-factor authentication combines single factor authentication processes. Two-factor authentication is becoming increasingly common and widely accepted in today's technological age due to the growing need for privacy and security. Customized security measures are more effective and bought if they are easy to use and implement. For increased website and mobile app security, this study examines the consequences of using a three- factor authentication scheme. This post will present an app we built that might provide a good three-factor authentication approach without losing the convenience.

C0005
10:45-11:00

Rapid Analysis of Thorax Images for the Detection of Viral Infections

Roman Radtke, Alexander Jesser

University of Applied Sciences Heilbronn, Germany

Abstract: At the end of December 2019, a person in the Chinse city Wuhan was probably infected for the first time with the novel SARS-CoV-2 virus. In order to be able to react as quickly as possible after infection rapid diagnostic measures are of the utmost importance so that medical treatment can be taken at an early stage. An image-processing algorithm is presented using chest X-rays to determine whether a lung infection has a viral or a bacterial cause. In comparison to other more complicated evaluation methods, focus was put on using a simple algorithm by using the Canny algorithm for edge detection of infected areas of the lung tissue instead of complex deep learning processes. Main advantage here is that the method is portable to many different computer systems with little effort and does not need huge computing power. This should contribute to a faster diagnosis of SARS-CoV-2 virus-infection, especially in medically underdeveloped areas.

C031 11:00-11:15	***Cyber-physical Networked Transport Modeling and Data Mapping*** **Mr. Jiacheng Zhang**, Lei Zhang, Ren Lou, Xinghua Li **Tongji University Shanghai, China** Abstract: This paper restricts, extracts and normalizes transport heterogeneous spatial-temporal data source based on road management information, such as safety warning signs for pedestrians or non-motor vehicles on the road and transport light signal timing in intelligent networked transport, information interaction and reminders among vehicles, and multimedia and functional content published online, gives feedback on and optimizes transport spatial-temporal data expression, refines strategies, and ultimately forms cyber-physical system (CPS) based on intelligent networked transport and its spatial-temporal data cloud control application, so as to promoturban transportation appications widely. Intelligent networked transport realizes information interconnection between physical objects of transport in real time under the interaction of network communication and cloud. Individual smart terminals, road test edge facilities and cloud network communication are deployed massively, transport events, status and data show a both related and independent processing and operating & maintaining trend, which is helpful to guide and divert transport flow in time and space, and can also effectively support parallel development of unmanned driving and manned driving.
C039-A 11:15-11:30	***A FPGA-based System Integration of DPU Unit and Single Image Fog Removal Method Using Improved Dark Channel Prior*** **Prof. Chi-Chia Sun**, Hoang Hai Pham Nguyen, Zhi-Hao Chen **National Formosa University, Taiwan** Abstract: The current application of deep learning networks in public monitoring systems and driver assistance systems has made great progress. However, it's need a lot of development effort in order to make these neural networks working effectively in a variety of weather. We propose a system integration solution which includes several accelerated digital image processors and Deep Learning Processing Unit (DPU). These digital image processors employ traditional image processing and single image fog removal based on an improved dark channel prior algorithm to enhance input images, while the DPU can run several pruned and quantized deep learning models. We implemented the system on a Field-Programmable Gate Array (FPGA) platform resulting in high accuracy and low power consumption, which is suitable for edge computing or embedded system applications.
C056 11:30-11:45	***A Federated Learning Approach for Enhancing Autonomous Vehicles Image Recognition*** **Ms. Konstantinos D. Stergiou**, Konstantinos E. Psannis, Vasileios Vitsas, Yutaka Ishibashi **University of Macedonia, Greece** Abstract: Traffic sign recognition is vital for the success of the autonomous vehicles paradigm in mobile edge computing. We present a Federated Learning implementation based on a Lenet-5 CNN architecture which can enhance edge computing systems on unsupervised feature classification problems. Experiments demonstrated that our model can deliver satisfactory performance on traffic sign image recognition. Also our research has shown that less resources can be utilized on client devices to run the local training models. However,

	heavy data processing must be shifted to intermediate edge computing layers requiring more computing resources and the optimization of parameters such as latency, bandwidth, and privacy.
C012 11:45-12:00	***High Resolution Image Generation Using Learning Super-Resolution for Low Resolution Images*** **Dr. Koki Nakayama** and Tomio Goto **Nagoya Institute of Technology, Japan** Abstract: Cameras have been installed in a variety of locations. This is to record evidence in case of trouble. However, many of these images have low resolution, which reduces the effectiveness of the evidence. In particular, license plate images can identify the parties involved, so it is important to read the characters. In this paper, we aim to improve the resolution of license plate images by using super-resolution with adversarial learning method.

[10:00–12:00, July 3]

Session 3: Wireless Communication and Mobile Network

Meeting ID: 861 7606 2169
Meeting Link: https://us02web.zoom.us/j/86176062169
Chair: Prof. Chih-Yu Wen, National Chung Hsing University, Taiwan

C014 10:00-10:15	***On the Security of an Optical Layer Encryption using Coherent-based TF-QKD in Classical Optical Fiber Links*** **Mr. Adrian Chan**, Mostafa Khalil, Kh Arif Shahriar, Lawrence R. Chen, David V. Plant, Randy Kuang **McGill University, Canada** Abstract: Twin-field quantum key distribution (TF-QKD) protocols have remained an enticing solution because it is able to overcome many of the limitations that are inherently found in QKD. However, the performance of this technology is still not adequate to be implemented for secure transmission of data. A variant of the TF-QKD protocol is Coherent-based Two Field QKD (CTF-QKD), which utilizes coherent states for both transmission and detections, is integratable with current infrastructure, and has similar performance to current classical optical communication systems. This proceeding is a continuation of the preliminary security analysis that was previously published in [1-2]. Key vulnerabilities in the current system are identified in simulation and guidelines to prevent an eavesdropper from obtaining data from a tapping attack. Finally, the practical security of the system is discussed and the challenges for an attacker to accomplish real-time decryption of data transmitted.
C055 10:15-10:30	***Load-Balanced Structure for RPL-Based Routing in Wireless Sensor Networks*** **Asst. Prof. Suphakit Awiphan**, Suttitee Jathuphornpaserd **Chiang Mai University, Thailand** Abstract: The communication on the wireless sensor network faces resource constraints and an unstable environment. The OF0 and MRHOF are two standardized objection functions for routing protocol for low-power and lossy networks (RPL). Both objective functions appear to have low performance on the congested network. In this paper, we introduce the load balancing approach for an RPL-based network. The node discovers its neighbor located in the same rank and exchanges the number of available degrees and expected transmission count metric. We evaluate the performance of the proposed method using the TSCH simulator. The simulation results show that the packet delivery ratio of the proposed method is greater than the OF0 and MRHOF. Moreover, on the small-scale network, the proposal provides a smaller number of packets lost with an acceptable overhead ratio.

C002 10:30-10:45	*Distributed-Antenna Energy Beamforming with One-Packet Feedback* **Dr. Masaaki Fujii** **MinebeaMitsumi Inc., Japan** Abstract: A transmit phase optimization scheme with only one-packet feedback of received signal strength indicators (RSSIs) is described for an antenna subset with the size of NT in a distributed wireless energy transfer system. For a subset antenna to be optimized, the RSSI values are measured at the device for three pre-set transmit phases while pausing the transmission from the other subset antennas except for a reference antenna. Thus, the measured RSSIs, of which number is only $3 \times (NT-1)$, are fed back collectively. A non–iterative optimization formula derived by differentiation from parabolic interpolation is applied for three measured RSSI values. The optimized $(NT-1)$ transmit phases can co-phase their corresponding receive phases to the unknown receive phase from a reference antenna. Our proposed scheme achieved almost the same received power as the perfectly optimized case.
C018 10:45-11:00	*A New Precoder Design for Precoder-aided Enhanced Spatial Modulation Systems* Hsin-Yen Li, **Prof. Chiao-En Chen** **National Chung Hsing University, Taiwan** Abstract: This paper investigates new precoder designs for a precoder-assisted enhanced spatial modulation (ESM) system. We showed that by better exploiting the channel spatial information (CSI) at the transmitter, an improved error rate performance can be achieved compared to the existing schemes. A low-complexity implementation of our proposed precoder design is presented. Simulation results showed that the proposed precoding algorithm exhibits the best error rate performance while admitting the lowest complexity in comparison to all the benchmark precoders.
C1001 11:00-11:15	*Low Complexity Joint Power and Bandwidth Allocation for 3D video SoftCast* **Mr. Saqr Khalil Saeed Thabet**, Emmanuel Osei-Mensah, Jamal N.A. Hassan, Olusola Bamisile **University of Electronic Science and Technology of China, China** Abstract: SoftCast transmission achieves a linear video quality transition commensurate with the wireless channel conditions, allowing it to avoid the cliff effect, unlike the digital video transmission system. When adopting SoftCast for three-dimensional video transmission, several issues arise. 1) Optimally allocate the power budget to texture and depth to minimize transmission distortion. 2) Select the appropriate number of texture and depth chunks to meet the bandwidth constraints. 3) Reduce the 3D video computation complexity. This paper aims to solve the joint power and bandwidth allocation optimally with low complexity. We derive a closed-form based on the power-distortion optimization problem to estimate the optimal power allocation ratio between the texture and depth map. Then to adapt to the bandwidth constraints. We first set the available bandwidth to be shared equally between texture and depth, this joint bandwidth allocation technique reduces the complexity. Then to improve the overall 3D video quality, joint power allocation is estimated at different bandwidth constraints. With low complexity, the proposed method achieves a graceful video quality transition with the improvement of channel conditions under bandwidth constraints, and better performance than its counterpart default fixed-ratio power allocation between

	texture and depth.
C050 11:15-11:30	*Cost Sensitive Self-normalized Deep Convolutional Neural Network for Pulsars Selection* **Dr. Irfan Tariq**, Meng Qiao, Shunyu Ya, Kalim Ullah, Sifat Ullah Khan, Liu Wei **Southeast University, China** Abstract: Machine learning and deep learning algorithms have been used to classify pulsar and non-pulsar signals in large radio astronomical datasets. These existing machine learning and deep learning algorithms improve classification efficiency, but they have limitations when dealing with large amounts of astronomical data, such as class imbalance and the polarization of high recall and precision. In this paper, a new classification ethod for dealing with the class imbalance problem as well as the data training process is proposed. The proposed method is based on a cost-sensitive, Scaled Exponential Linear Unit (SELU) activation function and a convolutional neural network (CNN). The proposed method is entitled (CS-SNDCNN). A cost matrix was generated and then applied to each misclassification depending on class distribution. After that, these costs were then applied to the training process in order to improve the final classification accuracy. The proposed method was compared with the state-of-the-art baseline models, which revealed that our model performed much better than existing approaches, almost gaining 3% and 4% better F1-score and precision, respectively.
C008 11:30-11:45	*Combining BERT with Bi-LSTM for Emotion-Cause Pair Extraction* Chunxiao Fan**, Mr. Dazhi Li**, Yuexin Wu **Beijing University of Posts and Telecommunications, China** Abstract: The emotion-cause pair extraction aims to extract emotion clause and the underlying cause clause for the emotion from documents. Existing methods for extracting emotion-cause pairs mostly focus on semantic representations of clauses, ignoring emotion and cause features in the emotional causality, which weakens the representation learning ability of emotion-cause pairs. In this paper, we propose an Emotion-Cause Pair Feature Extraction model (ECPFE) to solve the problem. Pre-training model BERT and graph attention network are used to obtain clause semantic information. Emotion extractor and cause extractor based on Bi-LSTM are utilized to learn valuable features from semantic information. The emotion extractor captures emotion features and cause extractor captures cause features in clauses. And these valuable features are used to design the specific emotion-cause pair representations to improve the model's representation learning ability. Moreover, relative position information between clauses obtained by functional relative position encoding is embedded in the specific representations to enhance position-awareness of the model. Experimental results demonstrate that our ECPFE model outperforms the existing models by 3.4% in F1 score.
C028 11:45-12:00	*A Case Study on the Multi-Vector Data Breach on Astoria* Jorge Nadjar, Yuxuan Liu, Jose Salinas, **Dr. Suman Bhunia** **Miami University, Ohio, USA** Abstract: Managing the security of big data has become increasingly more complex as threat actors continue to maliciously exploit legacy and outdated systems of smaller and medium-sized firms. In this paper, we explore Astoria Company's data breach, whereby the

attacker exfiltrated vast amounts of confidential user data by exploiting MySQL and PHP-based vulnerabilities in a popular database management tool. Furthermore, we analyze the attack methodology of the perpetrator and the range of impacts incurred by the breach. The novelty of this paper is centered primarily on the range of defensive solutions we propose for the firm and for similar companies to deter and mitigate such attacks. These defensive solutions and risk mitigation strategies range from relatively low-cost software updates to more wideranging IT governance changes. The aim of this paper is to highlight the increasing need to safeguard the security of the big data held by smaller businesses, which have become prime targets for such type of attacks.

[13:30–15:45, July 3]

Session 4: Big Data and Machine Learning

Meeting ID: 857 2994 8737
Meeting Link: https://us02web.zoom.us/j/85729948737
Chair: Prof. Chi-Chia Sun, National Formosa University, Taiwan

---

C016

13:30-13:45

English-Vietnamese Cross-Lingual Similarity Estimation Using Language-Agnostic Representation from Multilingual Sentence Encoders
Ms. Hằng Lê Thị Thúy, Điền Đinh
Vietnam National University, Ho Chi Minh City, Vietnam

Abstract: In this paper, we propose a method based on multilingual sentence encoders combined with distilling languageagnostic meaning embedding. First, we extract meaning embeddings from origin embeddings by removing language-specific information. Second, we train and validate model purely based on English-Vietnamese bilingual corpora without any human annotations. Finally, cross-lingual sentence similarity estimation uses a simple cosine similarity calculation. Reported results experimented on cross-lingual semantic textual similarity task and proved that our proposed method shows a strong performance compared with origin multilingual sentence encoders. In addition, our method also consistently improves many multilingual sentence encoder performances. With 11144 English-Vietnamese sentence pairs, our model helps to improve the Pearson correlation from 0.6699 to 0.7161.

C032

13:45-14:00

Resource Management in Cloud Based on Deep Reinforcement Learning
Ms. Chuyi Liu, Wenjing Li, Jianxiong Wan, Leixiao Li, Zhiqiang Ma, Yongsheng Wang
Inner Mongolia University of Technology, China

Abstract: In order to provide users timely and reliable services, resources and facilities in cloud data centers are often more than actual needs, which leads to low resource utilization and high operating costs. However, controling the quantity of resources and facilities may cause low throughput. Therefore, many researches are devoted to increasing resource utilization, improving jobs throughput and reducing operating costs through effective cloud resource management. The cloud resource management in cloud data center can be regarded as a multi-resource demand job allocation problem. This paper proposed an allocation algorithm of jobs based on deep reinforcement learning. The algorithm allocates waiting jobs to clusters respectively, so as to optimize throughput and improve resource utilization. The algorithm is implemented in cloud data center simulation model CloudSim. The experimental results show that the method based on Deep Reinforcement Learning is better than traditionalmethod in multi-resource job allocation problem.

C026 14:00-14:15	*Analyzing SocialArks Data Leak - A Brute Force Web Login Attack* Jun Qian, Zijie Gan, Jie Zhang**, Dr. Suman Bhunia** **Miami University, Ohio, USA** Abstract: In this work, we discuss data breaches based on the "2012 SocialArks data breach" case study. Data leakage refers to the security violations of unauthorized individuals copying, transmitting, viewing, stealing, or using sensitive, protected, or confidential data. Data leakage is becoming more and more serious, for those traditional information security protection methods like anti-virus software, intrusion detection, and firewalls have been becoming more and more challenging to deal with independently. Nevertheless, fortunately, new IT technologies are rapidly changing and challenging traditional security laws and provide new opportunities to develop the information security market. The SocialArks data breach was caused by a misconfiguration of ElasticSearch Database owned by SocialArks, owned by "Tencent." The attack methodology is classic, and five common Elasticsearch mistakes discussed the possibilities of those leakages. The defense solution focuses on how to optimize the Elasticsearch server. Furthermore, the ElasticSearch database's open-source identity also causes many ethical problems, which means that anyone can download and install it for free, and they can install it almost anywhere. Some companies download it and install it on their internal servers, while others download and install it in the cloud (on any provider they want). There are also cloud service companies that provide hosted versions of Elasticsearch, which means they host and manage Elasticsearch clusters for their customers, such as Company Tencent.
C036 14:15-14:30	*Sentiment Analysis for Twitter Tweets: A Framework to Detect Sentiment using Naïve Bayes Algorithm* Jefferson Costales, **Christian De Los Santos**, Jeff Jojer Jones Catulay, Michael Albino **Eulogio "Amang" Rodriguez Institute of Science and Technology, Philippines** Abstract: In today's society, people communicate through social media. Digital life has expanded dramatically. Twitter is a social media platform where users can post tweets. The researchers used sentiment analysis, a popular research topic in recent years. Correctly identifying sentiments is critical since it opens up a world of possibilities. The researchers used the Twitter API and the tweepy python module to extract real-time tweets from Twitter. To imprive the rigor of this study, we used a Kaggle dataset to create a model that using Naïve Bayes Algorithm to recognize sentiments better. The researchers also compared different algorithms to identify the best algorithm for the data. In addition, the researchers collected and obtained information from credible sources to assess the trained model's correctness and reliability. The analysis of the result highlights the implication of our studies.
C025-A 14:30-14:45	*Proactive Ransom-attack Preventions using Anti-Ransom Tokens and Anti-Ransom Interface for Zero-Day Ransomwares* **Prof. Hiroshi Fujinoki** **Southern Illinois University, Edwardsville, USA** Abstract: Ransomwares have been on a rampage over the past several years and have become one of the most serious threats nowadays. The popular approach to mitigate the losses from

ransomwares is mostly "prevention after detection of possible malicious activities (i.e., unauthorized encryptions)". Although there is no question to the fact that this reactive, rather than proactive, approach reduces that chances of successful ransomwares, unfortunately, ransomware attackers seem to be exploiting the lack of proactive approaches. We suspect that the current ransom-attackers' dominance is brought by the two major, but significant, delay factors in the reactive approaches: the delay to identify "signatures" of ransomwares for detection, and the delay to disseminate the signatures to those who need them. Machine learning for automating signature constructions has been a recent advance in the approach, but it still brings the chances of false negatives. To improve the situation, we propose a proactive solution, which does not allow ransomware attackers to successfully perform their first strikes or which at least prevents their first strikes from taking effects without depending on post-incident detections using signatures. Our proactive solution assumes that ransomwares are "crypto-ransom attacks" that demand attack targets financial payments for decryption keys.

We propose a proactive solution that does not require any prior signature for detecting unauthorized encryptions of production data to eliminate the delay, even for "zero-day" ransomwares at the same time it eliminates the chances for false negatives in recognizing attacks. To achieve the goal, the proactive solution proposes the anti-ransom tokens and a set of new system calls, "Anti-Ransom Interface (ARI)". The solution prevents crypto-ransom attacks from taking effects by having multiple copies of production data. The solution achieves the goal first by detecting any illegally encrypted copy using anti-ransom tokens and then by replacing such illegally encrypted copies by an intact copy without delay. The technical challenge lies in the requirement that legitimate users should be able to continue to perform their authorized activities to the production data, such as read, append, and delete, while ransom attackers are in action. We propose ARI and use of multiple copies of the production data to achieve the goal. To accommodate multiple copies of production data, which is the key mechanism to prevent ransom-attackers from illegally encrypting all existing copies of production data at a time, we propose a set of servers that should not be in the visibility scope of each individual ransom attacker at a time. The major contributions from this work, as it currently stands, are: recognizing the need for a proactive prevention for on-going ransomwares, proposing the ground design towards proactive preventions of crypto-ransom attacks, identifying its technical challenges and/or any missing features, and setting out a course for the deployment of the proposed proactive solution to practical uses.

C017

14:45-15:00

URBM: User-Rank-Based Management of Flows in Data Center Networks through SDN
Prof. You-Chiun Wang, Ting-Jui Hsiao
National Sun Yat-sen University, Taiwan

Abstract: A data center network (DCN) is composed of many servers and switches, and how to manage flows makes a great impact on its performance. The paper applies the software-defined networking technology to flow management in a fat-tree DCN with hybrid switches, where electrical switches form the network backbone, while optical switches provide fast links. Considering that flows have different ranks, we propose a user-rank-based management (URBM) scheme to improve DCN throughput and offer differentiated QoS supports to flows based on their ranks. Low-rank flows have limits on using fast links, and their

	users should pay extra fees. If some links become busy, URBM finds substitute paths to reroute their flows. Alternatively, it restricts bandwidth usage of flows, where high-rank flows can use more bandwidth to satisfy QoS demands. With the price elasticity of demand model, we develop a pricing method to compute extra fees for low-rank users to use fast links. Simulation results show that URBM can improve flow throughput, provide better QoS supports for high-rank users, and raise the operator's revenue.
C015 15:00-15:15	***ISO-Cloud: An Intelligent System for Optimizing the Overall Income in Cloud Providers*** Adrián Bernal, Pablo C. Cañizares, **Assoc. Prof. Alberto Núñez**, María Emilia Cambronero, Valentín Valero **Universidad Complutense de Madrid, Spain** Abstract: Nowadays, cloud systems are increasing their role as cost-effective solutions to deploy applications and services for a wide spectrum of companies and business models. Hence, properly designing and configuring the key parts of the cloud, such as the data center, the collection of offered VMs, and the SLAs, among others, is crucial to obtain the expected income. The main difficulty of this task lies in analyzing and studying the high number of inter-related parameters required to provide a proper cloud configuration. In this work, we focus on the impact of SLAs configuration on the global income, and we propose ISO-Cloud, an Intelligent System for optimizing the overall income of cloud providers, which uses simulation techniques to analyze how the different configurations of SLAs impact the obtained profits. Thus, ISO-Cloud automatically creates different cloud scenarios for certain cloud architecture and, then, potential SLAs configurations to improve the obtained profits are investigated. A thorough experimental evaluation is presented, which shows promising results. In this case, ISO-Cloud significantly improves the overall income in three different SLAs provided by an expert.
C0007 15:15-15:30	***Classification of Vulnerable Road Users based on Range-Doppler Maps of 77 GHz MIMO Radar using Different Machine Learning Approaches*** **Mr. Fatih Sultan Bayram**, Florian Pütz, Julian Weiß, Roman Radtke, Alexander Jesser, Nicolaj Stache **Heilbronn University of Applied Sciences, Germany** Abstract: This paper involves the development of an intelligent delineator for road traffic detecting potential conflict situations between motor vehicles and vulnerable road users at an early stage. By emitting warning signals, collisions between the road users concerned can then be prevented. The prototype used here includes, among other sensors, a high-resolution FMCW radar capable of detecting, and imaging objects. The goal of this work is to develop a Machine Learning (ML) model for object classification of vulnerable road users in radar frames. A 77 GHz chirp-sequence radar is used to record Range-Doppler maps from object classes of car, bicyclist, pedestrian and empty street at different locations. Objective of this is to cover different levels of background noise in the data caused by the different environments due to trees or bushes. For the data acquisition, simple traffic scenarios have been simulated at Heilbronn University. In selecting a suitable ML algorithm for the classifier, the main challenge was that modern machine learning methods are data-based models which require a lot of data and are generally lacking in explainability, such as neural networks. However, the

	great advantage is that the correlations in the data are learned automatically. With knowledge-based methods, on the other hand, the big advantage is that they are explainable and require much less data, but assume an extensive domain knowledge. Hybrid learning, also called Informed ML, represents a combination of the methods previously mentioned and their advantages. In this paper, one approach from each of these methods is selected as well as trained, and its results are compared to each other. The respective approaches investigated are a deep neural network (DNN), a Support Vector Machine (SVM), and a hybrid model of a SVM and a specific neural network for feature extraction called Autoencoder (AE). In this comparison the SVM performs with prediction accuracies around 80%. The hybrid model performs better achieving prediction accuracies around 90%. The best results of this comparator are achieved by the DNN, which has a prediction accuracy of around 98%.
C052 15:30-15:45	***Fuzzy Logic-Based N-Gram Graph Technique for Evaluating Textual Documents Indexes*** **Ms. Latifa Rassam**, Chaimae Aldiebesghanem, Ahmed Zellou, Elhabib Ben Lahmar **ENSIAS, Morocco** Abstract: Fuzzy logic is a term that is used more and more often by researchers specialized in information retrieval and indexing. It is supposed to fill the gaps of the current domain by adding meaning to the information. In this article, the main goal is introducing the fuzzy logic approach in the field of the representation of a corpus of documents, more precisely in the proposal of a new method based on fuzzy functions that allow the evaluation of the generated indexes of a specific corpus. The evaluation is based on calculating the degrees of relevance of a term in relation to another whether it is in the same document of the corpus or in two or more completely different documents of the same corpus.

[13:30–15:45, July 3]

Session 5: Advanced Systems and Applications

Meeting ID: 861 7606 2169
Meeting Link: https://us02web.zoom.us/j/86176062169
Chair: Prof. Chih-Peng Fan, National Chung Hsing University, Taiwan

C033 13:30-13:45	***An Integrated Patient Triage and Capacity Recommender System for Robust Outpatient Department Service Delivery*** Kambombo Mtonga, Santhi Kumaran, **Prof. Kayalvizhi Jayavel**, Omar Gatera and Willie Kasakula **ACEIoT, College of Science and Technology, University of Rwanda, Rwanda** Abstract: The Sub-Saharan Africa has few and scattered healthcare facilities that are characterized with overcrowded waiting rooms, and error-prone manual capturing of patient data. However, through proper integration of technology, a healthcare system characterized by timeliness in both diagnosis and access to treatment is possible. This paper proposes an integrated patient triage and capacity recommender system for outpatient departments. The system performs multi-priority scheduling of patients in the various acuity levels based on vital sings, syndrome, chief complaint and time of arrival. The vital signs are captured by a kit of bio-sensors, whilst the syndrome and chief complaint are captured by a nurse by selecting the relevant list of options provided in the graphical user interface. Each acuity level corresponds to an approximated time that each patient can safely wait for treatment. The system further alerts the nurse when the capacity of the hospital has been reached for the day. This is possible since the system periodically checks whether the approximated total waiting time of patients in a queue exceeds the remaining operational time. Hence, a healthcare facility only admits patient load that can be assisted within normal operational time. Furthermore, informing patients of the facility's capacity level can allow patients to visit nearby facilities where the patient load is minimal. This leads to reduced expenditure for the facilities due to elimination of overtime expenses.
C037 13:45-14:00	***Knowledge Map Recommendation System for Popular Scenic Spots of World Cultural Heritage*** **Assoc. Prof. Minchuan Huang** **Guangdong University of Petrochemical Technology, China** Abstract: Backpackers' free travel and free walking have been reduced, and gradually become the game tourism of script killing (deductive entertainment, selecting characters for case solving game). Tourists do as the Romans do when entering the country. They choose DIY deep Tour and to play the role of the game, cooperate with the background of the film story, and integrate the historical story experience mode seasonal changes and script killing, so that tourists can personally experience the characteristics of cosplay and shoot the plot of microfilm. This holiday is more vivid and interesting, becoming a customized new humanistic feast experience. Through the knowledge map tourism recommendation system, tourists can

choose to yearn for tourist cities and scenic spots, and pay long-term attention to the online status of cultural heritage scenic spots. Select high-quality travel companies and tour guides to arrive at scenic spots and historic sites, personally select scripts and roles, and obtain the experience and understanding of the value of new life through the cross historical era and regional space. The design of knowledge map tourism recommendation system uses MySQL and Python as the host language and Web Framework Flash to realize the world heritage tourism website, query and understand the current situation of cultural heritage, scenic spots and historic sites in different regions and levels, select the information collection of scenic spots, and refer to others' tourism strategies, microfilms and travel photos.

C041 14:00-14:15	*Computer Simulation Approach to Model Virtual Geography of Seablite Source* **Dr. Thanapong Chaichana**, Graham Reeve **Chiang Mai University, Thailand** Abstract: Food demands are increasing globally, and they were required a new agricultural material to boost the economic activities, production, and consumption. Physical survey must be completed to explore the local assets prior to supply agricultural material to the manufacture. Seablite has many benefits and can count as a new agricultural material. In this paper, the objective was to perform compute virtual geography of seablite origins and to create an illustrative maps of seablite sites digitally. Computer simulation approach (CSA) was purposed to cover virtual geography that included virtual survey and physical survey. CSA of virtual geography was performed for computation in Samut Sakhon, Thailand. Results showed that virtual geography reduces the complexities of physical survey. An illustrative map revealed the highest number of 1,365 seablite origins found in Ban Bo subdistrict. Virtual results were shown a good agreement between virtual survey and physical survey. Therefore, it can be noted that CSA system delivers a great value in economic efficiency and remotely perform the job task. Further studies based on the seablite smart agriculture system with online data development to create an economic plant are required to verify our results.
C060 14:15-14:30	*Using Social Media Applications in Active Collaborative Learning to Engage Learners' Performance in Learning* **Mr. Puttipong Anantasopon**, Singha Chaveesuk **Sripatum University, Thailand** Abstract: Social Media Application has become popular to adopt during the COVID-19 pandemic. The social media is ultimate devices to encourage students' engagement and active collaboration learning. This study tested the proposed framework. 140 learners in higher education in Thailand have been examined in this study. The PLS-SEM was used to analyze the data obtained. Convergent and discriminant analysis were used to measure the different variables. This study proved that all variables are supported to use social media application, which lead the learners have better performance in learning.
C053 14:30-14:45	*Issues on Japanese COVID-19 Exposure Notifications Application (COCOA)* **Prof. Isao Nakajima**, Masatsugu Tsuji **Seisa University, Japan** Abstract: This study investigates problems related to COCOA, which is a smartphone app

	officially provided by Japan's Ministry of Health, Labour and Welfare (MHLW) that is designed to notify users when they have been in close contact with coronavirus disease 2019 (COVID-19) positive persons, and thus help the government and healthcare organizations contain the spread of the virus. The information we have obtained thus far indicates that poor utilization rates of the app are due to significant program flaws, which caused the initial usage to be sluggish, as well as the failures of various health centers to adequately provide polymerase chain reaction (PCR) testing for COCOA notification recipients, which exacerbated sluggishness issues. Furthermore, a related survey revealed that although the government provides an integrated data system called the Health Center Real-time Information-sharing System on COVID-19 (Japanese abbreviation HER-SYS), information on fever outpatients (hospital names, locations, consultation times, presence or absence of PCR testing, etc.) corresponding to each local government is still not fully available.
C0002 14:45-15:00	*Social Media Analysis in Tour and Travel Industry* **Assoc. Prof. Yohannes Kurniawan** **Bina Nusantara University, Indonesia** Abstract: Tourism 4.0 has become a trend increasing in the tourism sector in several countries. Many countries have prepared for the development of Tourism 4.0. Tourism 4.0 itself should benefit from technological developments from industry 4.0, such as IoT (Internet of Things), Big Data, Augmented Reality (AR), Virtual Reality (VR), Technology-based Business Models, Mobile Technology, Artificial Intelligent (AI)). One of the most critical technologies in the Tour and Travel industry is social media and the Internet. This research aims to analyze social media analytics data in Tour and Travel Industry on the Instagram platform to examine the developments of Tour and Travel companies after promotions have been performed on Instagram. The platform uses a social media analytics tool, analisa.io. It is an AI-powered social analytics software-as-a-service (SaaS) that provides platforms like Instagram and TikTok.
C057 15:00-15:15	*Digital Twin and Industrial Internet of Things Architecture to Reduce Carbon Emissions* **Dr. Chrysi Metallidou**, Kostas E. Psannis, Dimitrios D. Vergados, Michael Dossis **University of Macedonia/ University of Western Macedonia, Greece** Abstract: The rapid growth of digital technology implies the progress of industry, by utilizing Industrial Internet of Things and Digital Twins, in collecting data through sensors and digitally monitoring and testing a product, with a view to improving its features, before the production of the physical product, in real world. At the same time, industrial carbon emissions are a major issue to be confronted. Since, Digital Twin is a connection between the physical and digital world, transferring data bidirectionally and providing insights into the lifecycle of a production process, it also can be utilized for the reduction of industrial carbon emissions. In this paper, we implement a method for the reduction of carbon emissions, by applying the Industrial Internet of Things to collect past data from manufacturing factors and a Digital Twin architecture to monitor present data, compose a model and predict its future behavior, considering renewable energy resources and less carbon emissions. This method contributes in improved decision making regarding the manufacturing process and energy efficient industrial operation.

C0003 15:15-15:30	*Optimization of Language Models by Word Computing* **Dr. Ka-Hou Chan**, Sio-Kei Im **Macao Polytechnic University, China** Abstract: Word computation is a type of sentiment analysis that requires the identification not only of linguistic features, but also of the correla-tions of these features. There has been a great deal of research in this area. In order to understand linguistic representations and their applications in various domains of analysis, various factors such as demographics, emotions, and gender are taken into account in a transactional context. In this paper, we focus on those factors that can be extracted from existing data using natural language process-ing. We find that the most successful personality trait prediction models rely heavily on NLP techniques. To automate this process, researchers around the world have used a variety of machine learn-ing and deep learning techniques. Different combinations of factors have led to different research results. We have conducted a com-parative analysis of these experiments in the hope of determining the future course of action.
C035 15:30-15:45	*Effects of Adaptive Viscoelasticity Control for Collaboration between Users in Remote Robot Systems with Force Feedback* **Mr. Ruzhou Ye**, Yutaka Ishibashi, Pingguo Huang, Yuichiro Tateiwa **Nagoya Institute of Technology, Japan** Abstract: By experiment, this paper investigates effects of the adaptive viscoelasticity control, which was previously proposed as QoS (Quality of Service) control to improve remote operations of haptic interface devices, for collaboration between users in two remote robot systems with force feedback. In the systems, each of two users operates haptic interface devices with his/her hand to carry an object grasped by two remote robot arms each of which has a force sensor while watching video. The paper also examines the influences of network delays between the two haptic interface devices, between the two robots, and between each haptic interface device and its corresponding robot. Experimental results demonstrate that the adaptive viscoelasticity control can suppress the force applied to the object.

16:20-16:40

Closing & Awarding Ceremony

Meeting ID: 857 2994 8737
Meeting Link: https://us02web.zoom.us/j/85729948737

ICCCI
2022