2020 2nd International Conference on Big-data Service and Intelligent Computation (BDSIC 2020)

December 3-5, 2020

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Welcome Message from Organizing Committee

It is our great pleasure to invite you to join our international conference -2020 2nd International Conference on Big-data Service and Intelligent Computation (BDSIC 2020). This event will provide a unique opportunity for editors and authors to get together and share their latest research findings and results.

We're confident that over the two days you'll get the theoretical grounding, practical knowledge, and personal contacts that will help you build long-term, profitable and sustainable communication among researchers and practitioners working in a wide variety of scientific areas with a common interest in Big Data and Intelligent Computation.

On behalf of all the conference committees, we would like to thank all the authors as well as the technical program committee members and reviewers. Their high competence, their enthusiasm, their time and expertise knowledge, enabled us to prepare the high-quality final program and helped to make the conference become a successful event.

We truly hope you'll enjoy the conference and get what you expect from the conference.

Organizing Committee
November 20, 2020

Conference Introductions

Welcome to 2020 BDSIC conference. This conference is organized by ACM Chapter Singapore. The objective of the conference is to provide a platform for researchers, engineers, academicians as well as industrial professionals from all over the world to present their research results and development activities in Big Data and Intelligent Computation.

Papers will be published in the following proceeding:

International Conference Proceedings Series by ACM, which will be archived in the ACM Digital Library, and indexed by Ei Compendex, Scopus and submitted to be reviewed by Thomson Reuters Conference Proceedings Citation Index (ISI Web of Science).

Conference website and email: http://www.bdsic.org/and bdsic@acm-sg.org

Table of Contents

General Chair Introduction

Prof. Gou Jin
Huaqiao University, China

Prof. Gou Jin, born in 1978, is a professor, doctoral supervisor and the dean of college of computer science and technology, Huaqiao University. He graduated from Fuzhou University with a bachelor's degree in computer science and technology in 1999, a master's degree in computer application in Fuzhou University in 2002, and a doctor's degree in computer science and technology in Zhejiang University in 2006. His research interests include data mining, computing intelligence, software engineering and other related fields. His research has been supported by National Natural Science Foundation of China, Natural Science Foundation of Fujian province, and several projects from IT enterprises. He has published more than 30 papers in refereed conferences and journals, obtained 2 authorized invention patents and 4 computer software copyrights.

Organizing Chair Introduction

Prof. Hui Tian
Huaqiao University, China

Prof. Hui Tian received the PhD degree in 2010 in computer science and technology from Huazhong University of Science and Technology, Wuhan, China. He is now a full professor and vice dean of the college of computer science and technology, Huaqiao University, Xiamen, China. His present research interests include network and information security, artificial intelligence security and digital forensics. He has published more than 80 papers in refereed proceedings of conferences, journals and books, and got 21 patents. He is a senior member of IEEE, a senior member of China Computer Federation (CCF), a member of the Technical Committee on Internet of CCF and a member of the Technical Committee on Information Storage of CCF.

Keynote Speakers Introductions

Keynote Speaker I

Prof. Chin-Chen Chang
Feng Chia University, Taiwan

Professor C.C. Chang obtained his Ph.D. degree in computer engineering from National Chiao Tung University. He's first degree is Bachelor of Science in Applied Mathematics and master degree is Master of Science in computer and decision sciences. Both were awarded in National Tsing Hua University. Dr. Chang served in National Chung Cheng University from 1989 to 2005. His current title is Chair Professor in Department of Information Engineering and Computer Science, Feng Chia University, from Feb. 2005.

Prior to joining Feng Chia University, Professor Chang was an associate professor in Chiao Tung University, professor in National Chung Hsing University, chair professor in National Chung Cheng University. He had also been Visiting Researcher and Visiting Scientist to Tokyo University and Kyoto University, Japan. During his service in Chung Cheng, Professor Chang served as Chairman of the Institute of Computer Science and Information Engineering, Dean of College of Engineering, Provost and then Acting President of Chung Cheng University and Director of Advisory Office in Ministry of Education, Taiwan.

Professor Chang's specialties include, but not limited to, data engineering, database systems, computer cryptography and information security. A researcher of acclaimed and distinguished services and contributions to his country and advancing human knowledge in the field of information science, Professor Chang has won many research awards and honorary positions by and in prestigious organizations both nationally and internationally. He is currently a Fellow of IEEE and a Fellow of IEE, UK. On numerous occasions, he was invited to serve as Visiting Professor, Chair Professor, Honorary Professor, Honorary Director, Honorary Chairman, Distinguished Alumnus, Distinguished Researcher, Research Fellow by universities and research institutes. He also published over 1,100 papers in Information Sciences. In the meantime, he participates actively in international academic organizations and performs advisory work to government agencies and academic organizations.

Keynote Speaker II

Prof. Chiharu Ishii
Department of Mechanical Engineering,
Faculty of Science and Engineering, Hosei University, Japan

Prof. Chiharu Ishii received his PhD in Mechanical Engineering from Sophia University, Japan in 1997. He worked at Ashikaga Institute of Technology between 1997 and 2002, at Kogakuin University between 2002 and 2009, and at Shibaura Institute of Technology between 2009 and 2010. He has been working at Hosei University since 2010, and currently working as a Professor with the Department of Mechanical Engineering, Faculty of Science and Engineering at Hosei University. Dr. Chiharu Ishii has received several awards such as The Best Paper Award in the area of Tactile and Haptic Interfaces at the 4th International Conference on Human System Interaction (HSI 2011); Best Paper Award at the 1st International Conference on Computer Science, Electronics and Instrumentation (ICCSE 2012); Best Presentation Award at the International Conference on Intelligent Mechatronics and Automation (ICIMA 2013); Excellent Oral Presentation Award, at the 4th International Conference on Soft Computing & Machine Intelligence (ISCMI 2017). He is currently a member of IEEE, SICE, JSME, RSJ, IEEJ and JSCAS. His research interests are in medical robotics, assistive technology and robust control.

Keynote Speaker III

Prof. Chuan Qin

University of Shanghai for Science and Technology, China

Prof. Chuan Qin received his Ph.D. degree in signal and information processing from Shanghai University, Shanghai, China, in 2008. Since Dec. 2008, he has been with the faculty of the School of Optical-Electrical and Computer Engineering, University of Shanghai for Science and Technology, where he is currently a Professor. He was with Feng Chia University at Taiwan as a Postdoctoral Researcher and Adjunct Assistant Professor from July 2010 to July 2012. He has served as the Editorial Board Member for Signal Processing (Elsevier), Journal of Real-Time Image Processing (Springer) and International Journal of Network Security. He has been the Associate Editor for Journal of Visual Communication and Image Representation (Elsevier), EURASIP Journal on Image and Video Processing (Springer) and EURASIP Journal on Advances in Signal Processing (Springer), Area Editor for Signal Processing: Image Communication (Elsevier), and the Editor for KSII Transactions on Internet and Information Systems, and IETE Technical Review (Taylor & Francis). He also has been the Leading Guest Editor for JRTIP, MTAP, JIT and IETE TR for six special issues. He has been the technical reviewer for 30+ international journals, such as IEEE TIP, IEEE TIFS, IEEE TMM, IEEE TCSVT, Pattern Recognition, Information Sciences, Signal Processing and IET Image Processing. He was the program co-chair of ICMSS 2019, the co-chair of the international workshop "Multimedia Content Security and Privacy Protection" for ICAIS 2019 and ICCCS 2018, and the co-chair of the invited session "Security and Privacy in Computer Forensics Applications" for IEEE IIHMSP 2014-2015. He served on the Technical Program Committee of 30+ academic conferences, such as NCIG 2020, SICBS 2018, ICAIP 2017-2018, IWDCF 2015-2016, UBICOMM 2014-2015, ICS 2014, IUCC 2013, MINES 2010-2013, and FCST 2011-2012.

His research interests include image processing and multimedia security. He has published over 130 peer-reviewed papers in journals and conferences including IEEE TIP, IEEE TCSVT, IEEE Multimedia Magazine, Information Sciences, Signal Processing and Pattern Recognition Letters. His current research works are supported by the Natural Science Foundation of China. He won the Best Paper Award of CIHW 2016 and the Candidate of Excellent Paper Award of IEEE IIHMSP 2014. Five of his published papers were selected as the Most Cited Articles of IEEE TCSVT (2013~2018), Signal Processing (Elsevier), Journal of Visual Communication and Image Representation (Elsevier), Displays (Elsevier), and Imaging Science Journal, respectively. He is the member of technical committee on Image Forensics and Security for China Society of Image and Graphics.

Keynote Speaker IV

Prof. Kenji Suzuki
Tokyo Institute of Technology, Japan

Kenji Suzuki, Ph.D. (by Published Work; Nagoya University) worked at Hitachi Medical Corp., Japan, Aichi Prefectural University, Japan, as a faculty member, and in Department of Radiology, University of Chicago, as Assistant Professor. In 2014, he joined Department of Electric and Computer Engineering and Medical Imaging Research Center, Illinois Institute of Technology, as Associate Professor (Tenured). In 2017, he was jointly appointed in World Research Hub Initiative (WRHI), Institute of Innovative Research (IIR), Tokyo Institute of Technology, Japan, as Specially Appointed Professor (equivalent to Visiting Professor). He published 330 papers, including 110 peer-reviewed papers in leading journals such as IEEE TPAMI (Impact Factor: 17.7), IEEE TIP (IF: 6.8), IEEE TSP (IF: 5.2), and IEEE TMI (IF: 6.1). He has been actively studying deep learning in medical imaging and computer-aided diagnosis in the past 25 years, especially his early deep learning model was proposed in 1994, deep learning for image processing in 2004, receptive fields in 2004, semantic segmentation in 2004, U-net model in 2006, end-to-end deep learning in 2009, and deep learning reconstruction in 2010. His papers were cited more than 13,000 times, and his h-index is 48. He is inventor on 30 patents (including ones of earliest deep-learning patents), which were licensed to several companies and commercialized via FDA approvals. He published 11 books and 22 book chapters, and edited 13 journal special issues. He was awarded a number of grants as PI including NIH R01, ACS, JST, and NEDO grants. He served as the Editor-in-Chief/Associate Editor or Guest Editor of a number of leading international journals, including Pattern Recognition (IF: 5.9) and Neurocomputing (IF: 4.0). He served as a referee for 114 international journals such as Science Translational Medicine (IF: 17.1) and Nature Communications (IF: 11.9), an organizer of 93 international conferences, and a program committee member of 98 international conferences. He gave 120 invited talks and keynote speeches at international conferences. He received 26 awards, including Springer-Nature EANM Most Cited Journal Paper Award 2016 and 2017 Albert Nelson Marquis Lifetime Achievement Award. His research was covered in 49 articles in newspapers, magazines and journals by press and media, including Lancet Respiratory Medicine (IF: 23.0).

Keynote Speaker V

Prof. Yan Li
University of Southern Queensland, Australia

Prof Yan Li received her PhD degree from the Flinders University of South Australia, Australia. She is currently a Professor in the School of Agricultural, Computational and Environmental Sciences at the University of Southern Queensland (USQ), Australia. Her research interests lie in the areas of Artificial Intelligence, Machine Learning, Big Data Technologies, Internet Technologies, and Signal/Image Processing etc. Prof Yan Li has published more than 170 publications, supervised dozens of PhD completions, and obtained more than 2 million research grants through international collaborations. Prof Yan Li is the leader of USQ Data Science Programs and the recipient of many research and teaching excellence awards, including 2012 Australia prestigious National Learning and Teaching Citation Award, 2008 Queensland Government Smart State-Smart Women Award, 2009 USQ Teaching Excellence Award, 2009 USQ Research Excellence Award, and 2015-2017 Research Publication Excellence Awards.   Prof Yan Li has served as an elected academic leader in many high-level university committees, such as USQ Academic Board Executive Committee and USQ Research Committee etc.

Keynote Speaker VI

Prof. Ma Maode
Nanyang Technological University in Singapore

Dr. Maode Ma received his BE degree in computer engineering from Tsinghua University in 1982, ME degree in computer engineering from Tianjin University in 1991 and Ph.D. degree in computer science from Hong Kong University of Science and Technology in 1999.

Dr. Ma is a tenured Associate Professor in the School of Electrical and Electronic Engineering at Nanyang Technological University in Singapore. He has extensive research interests including wireless networking, wireless network security and optical networking, etc. He has been a member of the technical program committee for more than 110 international conferences. He has been a technical track chair, tutorial chair, publication chair, and session chair for more than 50 international conferences. Dr. Ma has published more than 130 international academic research papers on wireless networks and optical networks. He currently serves as an Associate Editor for IEEE Communications Letters, an Editor for IEEE Communications Surveys and Tutorials, and an Associate Editor for International Journal of Wireless Communications and Mobile Computing, Journal of Network and Computer Applications, Security and Communication Networks, International Journal of Vehicular Technology, Journal of Computer Systems, Networks, and Communications, and International Journal of Computing & Information Technology.

Instructions for the Online Tool "ZOOM"

1. You can download the software "Zoom" from this URL:
http://www.zoom.us/

2. How to join online conference in Zoom
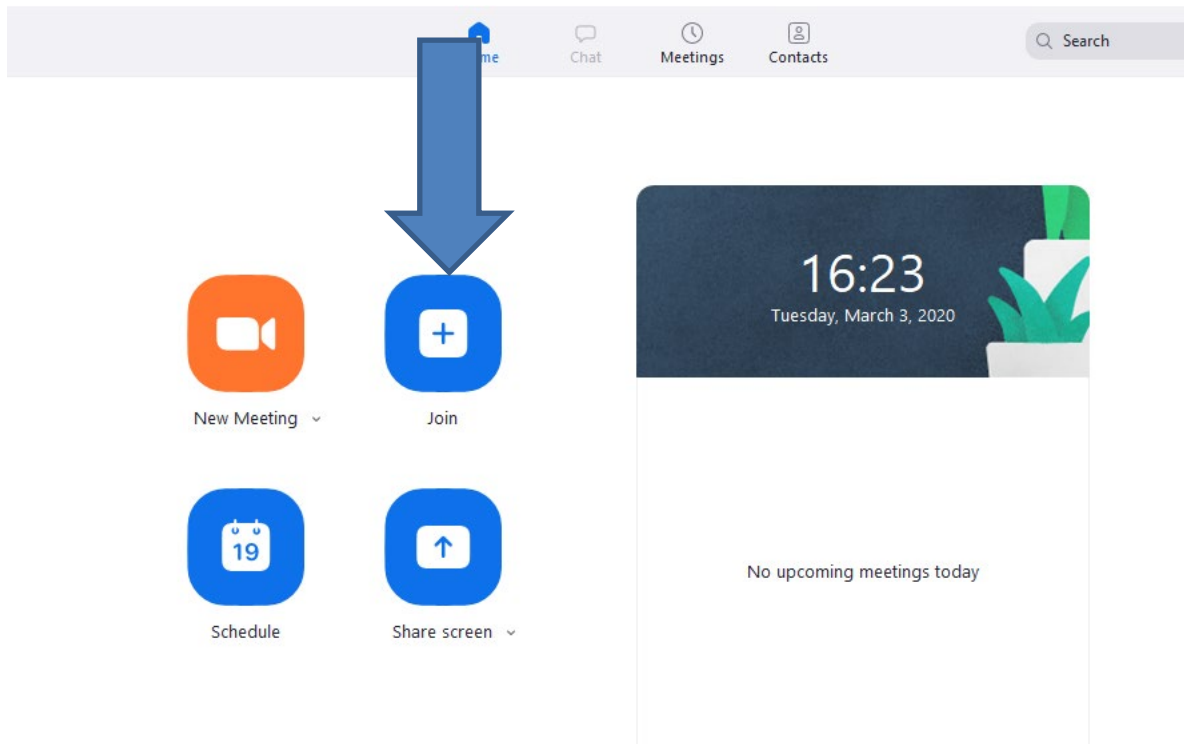
Please click **"join"**

3. Fill in the Conference ID
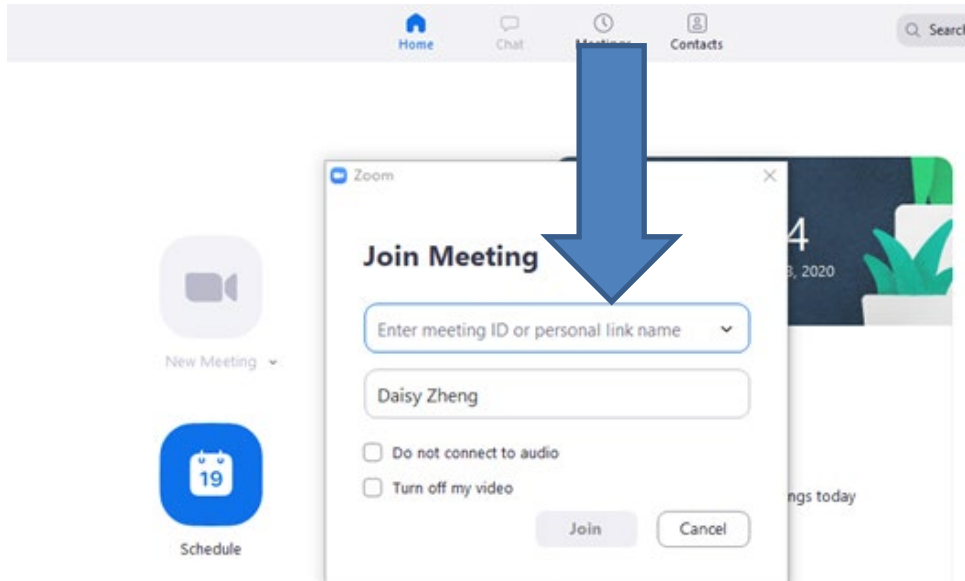
Please fill in the **Online-Meeting Room ID : 661 0917 2550**

and join the online conference

4. How to rename

Talking: Daisy Zheng

Meeting Topic: Daisy Zheng's Personal Meeting Room

Host: Daisy Zheng

Invitation URL: https://zoom.com.cn/j/4013264155

Copy URL

Participant ID: 15

Join Audio

Computer Audio Connected

Share Screen

Invite Others

Participants (1)

DZ Daisy Z... (Host, me) **Mute** **More >**

Participants (1)

DZ Daisy Z... (Host, me)

Rename

Add Profile Picture
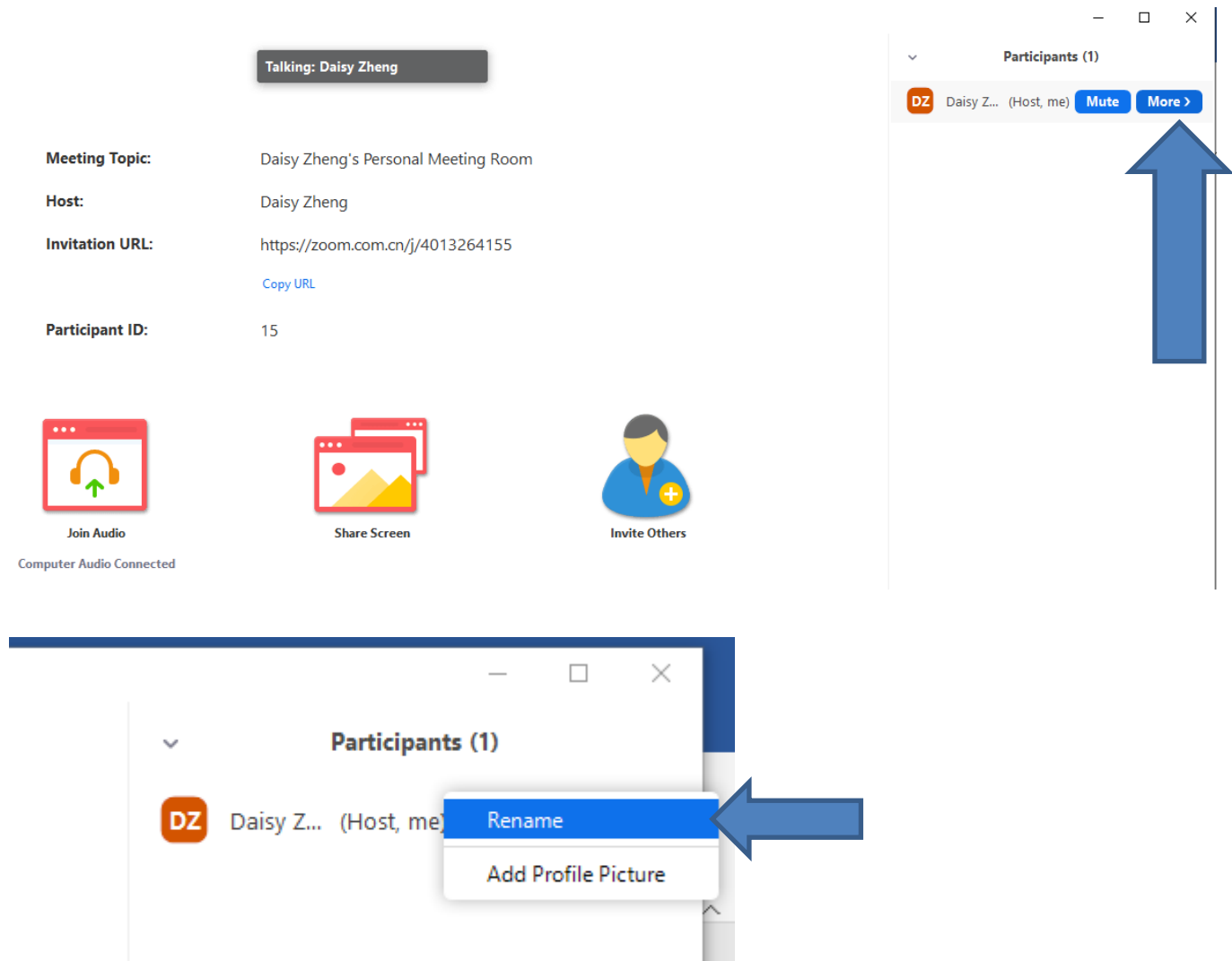
First, you can click "**More**"

Then, you can click **"rename".**

If you are **presenter**, your name need to be renamed as **your paper id + your name.**

If you are **listener,** your name need to be renamed as **listener + your name.**

5. How to Chat with Others in Zoom:

Talking:

Meeting Topic:	Daisy Zheng's Personal Meeting Room
Host:	Daisy Zheng
Invitation URL:	https://zoom.com.cn/j/4013264155
	Copy URL
Participant ID:	48

Join Audio
Computer Audio Connected

Share Screen

Invite Others

Zoom Group

To: Everyone ⌄

Type message here...

Mute   Start Video   Invite   Manage Participants   Share Screen   Chat   Record   **End Meeting**
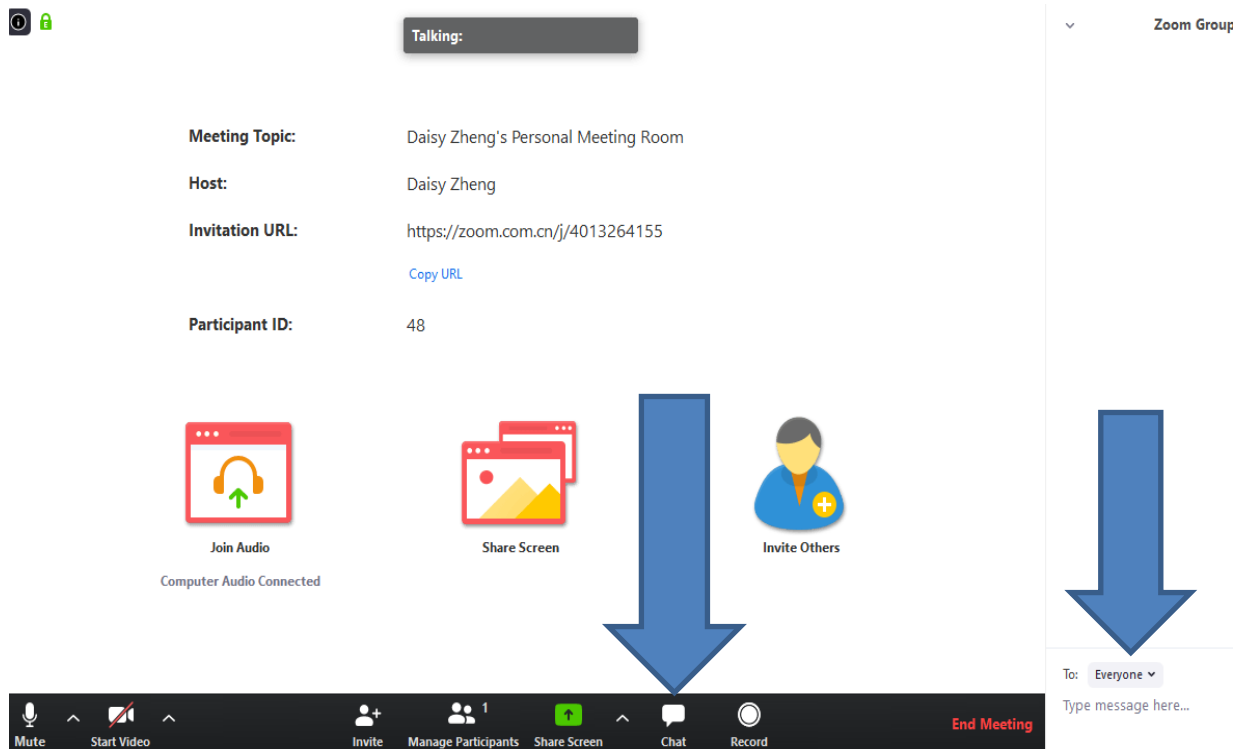
You can click "**Chat**" first.

Then, you can click "**everyone**" to choose who you want to talk with.

6. How to Use Raise Your Hands and Ask Questions in Zoom:
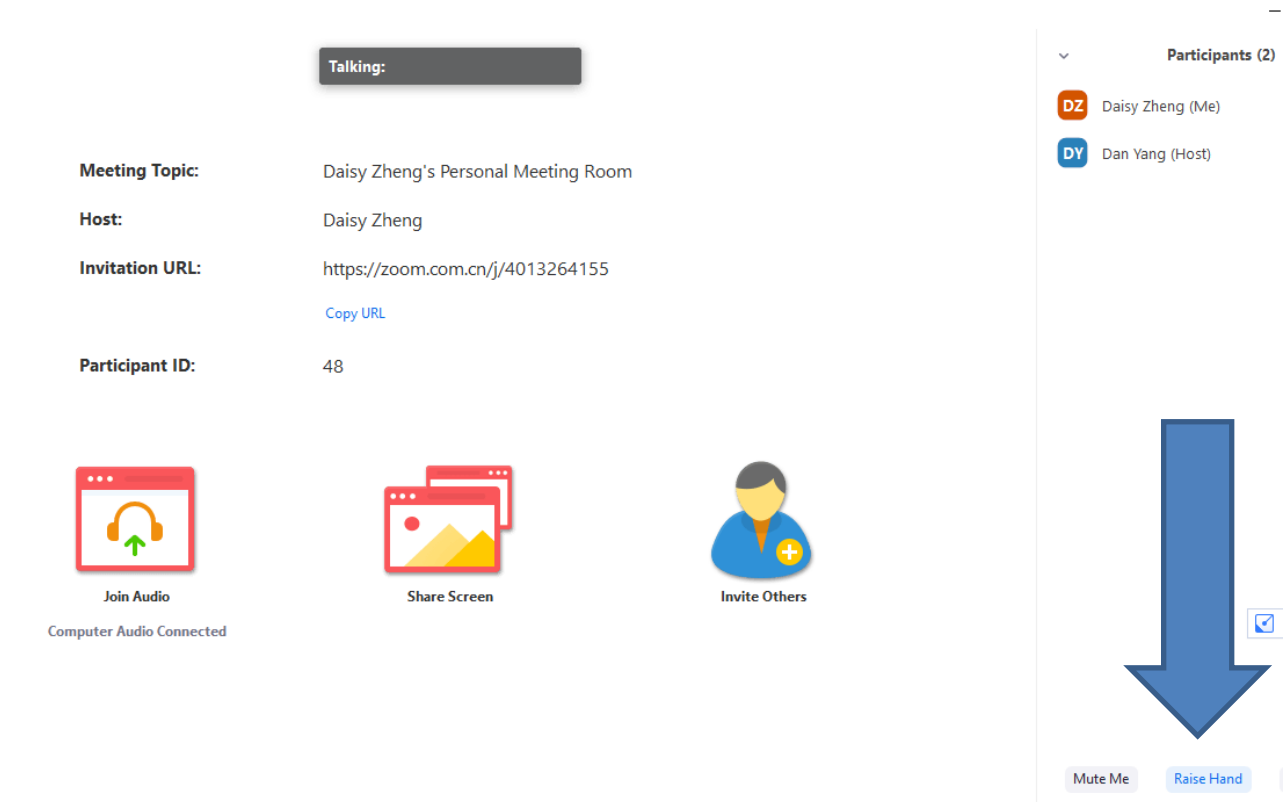
If you have any problems during the conference, you can click "**raise your hands**" or

use "**chat**" to communicate with the conference secretary and the conference secretary will

help you.

When you have questions about keynote speeches, you can also use "**raise your hands**"

function.

After the keynote speech, keynote speakers will answer your questions.

7. How to Share Your Screen
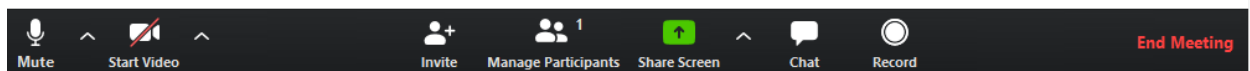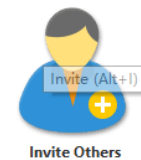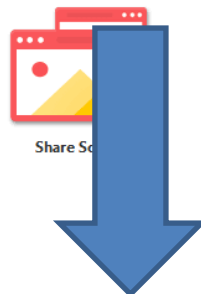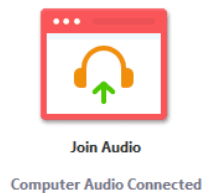
When you do your presentation, you need to share your screen.

You can click "**share screen**".

8. How to stop sharing your screen
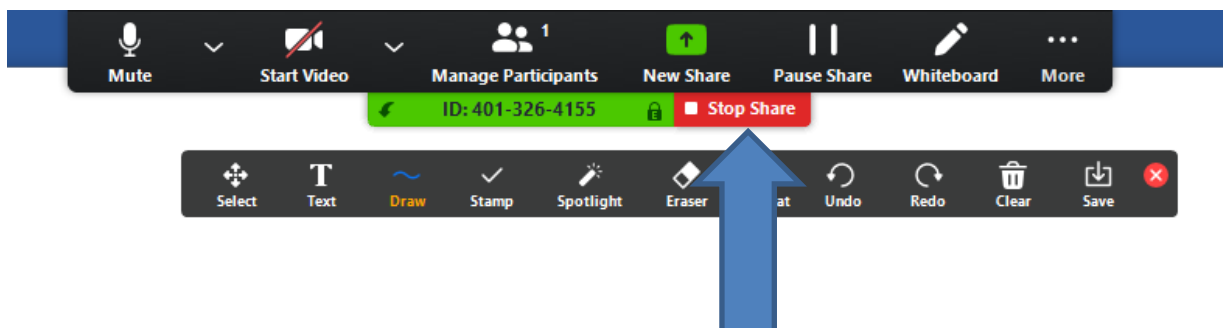
After your oral presentation, you can click "**stop share**".

Presentation Instructions

Instructions for Oral Presentations

Materials Provided by the Presenters:

PowerPoint or PDF Files

Duration of each Presentation (Tentatively):

Regular Oral Presentation: about **12 Minutes** of Presentation and **3 Minutes** of Question and Answer.

Best Presentation Award

One Best Presentation will be selected from each presentation session, and the Certificate for Best Presentation will be sent after the conference.

2020 2nd International Conference on Big-data Service and Intelligent Computation

Schedule for Conference

Tips: The time in the schedule is according to <u>local time in China.</u>

<u>*Online test is for testing the Internet connection and helping participants get familiar with software Zoom.</u>

<u>Please make sure that you will attend online test.</u>

Test Day: December 3, 2020 (Thursday) Room ID: 661 0917 2550		
Online Test		
Morning Test (9:30-11:50)	9:30-9:40	**Test for Prof. Chin-Chen Chang**
	9:40-9:50 (10:40-10:50 in Japan)	**Test for Prof. Chiharu Ishii**
	9:50-10:00	**Test for Prof. Chuan Qin**
	10:00-10:10 (11:00-11:10 in Japan)	**Test for Prof. Kenji Suzuki**
	10:10-10:20	**Test for Prof. Maode Ma**
	10:20-10:30	**Test for Prof. Jin Gou**
	10:30-10:40	**Test for Prof. Hui Tian**
	10:40-10:50 (13:40-13:50 in Australia)	**Test for Prof. Yan Li**
	10:50-11:50	**Test for Session 1**
Afternoon Test （13:10-17:30）	13:10- 14:10	**Test for Session 2**
	14:10- 15:10	**Test for Session 3**
	15:10-16:10	**Test for Session 4**
	16:10-17:10	**Test for Session 5**
	17:10-17:30	**Any questions about the test, please contact the staff at other time on December 3 before 17:30.**

December 4, 2020 (Friday) Room ID: 661 0917 2550		
Morning Session for Keynote Speeches and Session 1		
9:00- 11:40 KN Speeches (China Time)	**9:00- 9:10**	**Opening Remarks by Prof. Jin Gou and Prof. Hui Tian**
	9:10-9:50	**Keynote Speech I** **Title: Applying De-Clustering Concept to Information Hiding** **Prof. Chin-Chen Chang, Feng Chia University, Taiwan**
	9:50-10:30 (10:50-11:30 in Japan)	**Keynote Speech II** **Title: On Recent Developed Power Assist Suits** **Prof. Chiharu Ishii, Hosei University, Japan**
10:30-10:40		**Take a break**
10:40-12:10		**Session 1** (**AA5002, AA5003, AA5004, RV0003, AA0018, AA0019**)
Lunch time: 12:10- 13:30		
Afternoon Session: Keynote Speeches and Session 2		
13:30- 14:50 Keynote Speeches (China Time)	**13:30-14:10**	**Keynote Speech III** **Title: Tampering Detection and Content Recovery for Digital Images** **Prof. Chuan Qin, University of Shanghai for Science and Technology, China**
	14:10-14:50 (15:10-15:50 in Japan)	**Keynote Speech IV** **Title: Deep Learning for Medical Image Processing, Patten Recognition, and Diagnosis** **Prof. Kenji Suzuki, Tokyo Institute of Technology, Japan**
Break Time: 14:50- 15:00		
15:00- 16:45		**Session 2** (**RV0001, BS0006, BS0008-A, BS0010, AA5001, AA0020-A，AA5013**)

December 5, 2020 (Saturday) Room ID: 661 0917 2550		
Morning Session for Keynote Speeches and Session3		
9:00- 10:20 Keynote Speeches (China Time)	**9:00-9:40 (12:00-12:40 in Australia)**	**Keynote Speech V** **Title: Artificial Intelligence in Health and Brain Modelling** **Prof. Yan Li, University of Southern Queensland, Australia**
	9:40-10:20	**Keynote Speech VI** **Title: Secure Authentication for D2D Communications in 5G Wireless Networks** **Prof. Maode Ma, Nanyang Technological University, Singapore**
Break Time: 10:20- 10:30		
10:30-11:45	**Session 3** **(AA0015, AA0002, BS0013, AA0036, AA0034)**	
Lunch time: 11:45- 13:30		
Afternoon Session: Session 4 and Session 5		
13:30- 15:30	**Session 4** **(BS0003, BS0007, AA0007, AA0008, AA4001, BS0002, BS0016, AA0033)**	
Break Time: 15:30- 15:40		
15:40- 17:55	**Session 5** **(RV0002, BS0009-A, BS0014, AA0006, AA0025, AA0030, AA0032, AA0035, AA5012)**	

December 4, 2020 (Friday)　Morning Session

Room ID: 661 0917 2550

Opening Remarks (9:00-9:10)

Addressed by Chair Prof. Gou Jin and Prof. Hui Tian from Huaqiao University, China

Keynote Speech I (9:10-9:50)

Title: Applying De-Clustering Concept to Information Hiding

Prof. Chin-Chen Chang

Feng Chia University, Taiwan

Abstract—Reversible steganography allows an original image to be completely restored after the extraction of hidden data embedded in a cover image. In this talk, I will talk about a reversible scheme based on de clustering strategy for VQ compressed images. The declustering can be regarded as a preprocessing step to make the proposed steganographic method more efficient. Our experimental results show that the time required for the embedding process in the proposed method is few. In addition, the reversible steganography allows an original image to be completely restored after the extraction of hidden data embedded in a cover image. In this paper, we propose a reversible scheme for VQ-compressed images that is based on a declustering strategy and takes advantage of the local spatial characteristics of the image. The main advantages of our method are ease of implementation, low computational demands,and no requirement for auxiliary data.

Keynote Speech II (9:50-10:30 in China/10:50-11:30 in Japan)

Title: On Recent Developed Power Assist Suits

Prof. Chiharu Ishii
Department of Mechanical Engineering,
Faculty of Science and Engineering, Hosei University, Japan

Abstract—Recently, aging of society is progressing rapidly all over the world. Therefore, needs of nursing care for elderly people are increasing. In practice, however, 80% of caregivers have low back pain due to the nursing care such as transfer work. To help caregivers, many kinds of power assist suits have been developed. However, conventional power assist suits have the following problems. Those are heavy, expensive and hard to put on the suit. Therefore, by following advices from caregivers who are working in nursing home, we have developed a vest type power assist suit for the purpose of practical use in nursing care, which has characteristic that is lightweight, low cost and easy to put on and take off.

On the other hand, also in agriculture or the construction site, low back pain becomes a problem due to aging of the worker. Therefore, we developed an outdoor type power assist suit to ease the burden on the waist for work in a half sitting posture, which was termed "Aero Back". Aero Back is commercially available now.

In this talk, recent developed power assist suits in my Laboratory, such as leg part exoskeleton and arm part endoskeleton for rehabilitation, upper arm assist suit for upward work, and assist suit for walking support and lifting assistance, are discussed.

Take a Break: 10:30-10:40

Oral Presentation Abstracts

Session 1 (10:40-12:10)

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.

December 4, 2020 (Friday)

Room ID: 661 0917 2550

Session Chair: Prof. Chin-Cheng Chen, Jimei University, China

AA5002 (10:40-10:55 in China/21:40-21:55 in Canada)
Ship Detection in Satellite Optical Imagery
Benjamin Smith, Sean Chester and Yvonne Coady
University of Victoria, Canada

Abstract —Deep learning ship detection in satellite optical imagery suffers from false positive occurrences with clouds, landmasses, and man-made objects that interfere with correct classification of ships, typically limiting class accuracy scores 88% at best. In this work, we explore the tensions between customization strategies, class accuracy rates, training times, and costs in cloud based solutions. We demonstrate how a custom U-Net can achieve 92% class accuracy over a validation dataset, and 68% over a target dataset. We also compare a single node architecture with a parameter server variant whose workers act as a boosting mechanism. Trade-offs with extensions to this effort, such as a refining method of offline hard example mining, are also considered.

AA5003 (10:55-11:10 in China/11:55-12:10 in Japan)

Video Tampering Detection based on High-Frequency Features using Machine Learning

Hiroki Ueda[1], Hyunho Kang[2] and Keiichi Iwamura[1]

1: Tokyo University of Science, Japan

2: National Institute of Technology, Tokyo College, Japan

Abstract —In recent times, security cameras can be found installed in various places such as lobbies of buildings, urban areas, and drive recorders in automobiles. Similarly, smartphones and drive recorders have become a part of our everyday lives. However, in recent years, advances are being made in technology that enables images and videos to be edited easily. For example, editing software, such as Photoshop, After Effects, and Premiere Pro, allow anyone to edit videos and images easily. Thus, it is easy for people to take pictures or videos using smartphones or drive recorders and tamper with them. When an accident or crime occurs, videos or images from security cameras can serve as legal evidence for the genuineness of the background or object. Therefore, it is necessary to investigate the possibility of tampering with the video contents for malicious purposes. In this study, we propose a method for detecting video tampering based on high-frequency features using machine learning. Artifacts of tampered videos can be detected in consecutive frames through video forgery detection. In addition, although machine learning in this field is limited by its inability to acquire sufficient manipulated data, we demonstrate that this can be improved.

AA5004 (11:10-11:25 in China/12:10-12:25 in Japan)

Detecting Discrete Cosine Transform-Based Digital Watermarking Insertion Area Using Deep Learning

Sayoko Kakikura[1], Hyunho Kang[2], Naoto Kawamura[3] and Keiichi Iwamura[1]

1: Tokyo university of science, Japan

2: National institute of technology, Tokyo college, Japan

3: Kawamura techno lab., Japan

Abstract —Invisible digital watermarking, a technology for embedding information in digital content, is mainly used for copyright protection. In this paper, we proposed a method to identify images with invisible discrete cosine transform (DCT)-based watermarking and its vulnerability. Prior to watermarking, the images were normalized to 256 × 256 grayscale, and the network was generated through transfer learning; ResNet-18 was used to classify the input images as "watermarked" or "unwatermarked." According to our results, the accuracy of the network, when classifying images into both classes, was as high as 99.80%. Furthermore, the testing accuracy of a network designed to detect the embedding location of the watermark in the frequency domain was 97.97%. It should be noted that the networks were ineffective when the DCT block size of the input images differed from that of the images in the training set.

RV0003 (11:25-11:40)

Driver Hand Detection using Squeeze-and-Excitation YOLOv4 Network

Zhe Ma, Xiaohui Yang and Yingji Zhang

University of Jinan, China

Abstract — In this paper, we have proposed a driver hand detection method using YOLOv4 combined with Squeeze-and-Excitation (SE) module, which we called SE-YOLOv4. In our proposed SE-YOLOv4, we add the SE module to the CSPDarknet in the backbone of YOLOv4. The SE module optimizes the learning ability of YOLOv4, which improves the performance of driver hand detection. Furthermore, we have established a driver hand detection dataset. We evaluate the proposed hand detection method and compare it with some other network model, and experimental results show that the hand detection accuracy of our method was improved by 2%-4%.

AA0018 (11:40-11:55)

Video Object Detection Based on Deformable Convolution

Yanjun Liang and Zhiming Wang

University of Science and Technology Beijing, China

Abstract — Video object detection is one of the important research directions in the field of computer vision with applications in various domains, e.g. public security, traffic management, etc. Nevertheless, it is very challenging to extend the image-based object detection method to video object detection. In the existing methods, the feature information of multiple adjacent frames is aggregated into the current frame to improve the detection result. However, these methods only sample the information of adjacent frames on the sampling points obtained by prior knowledge or by calculating explicit motion references. Therefore, the feature information obtained by this sampling method is often insufficient. Furthermore, if the selected sampling points are inaccurate, the original feature information may be lost. In this paper, we use modulation-based deformable convolution for feature sampling, and the sampling positions and weight are generated through additional convolutional layers. This not only enriches the sampling information but also minimizes the intervention of prior knowledge. According to experiments on the Image VID dataset, the proposed method significantly improve detection accuracy compared with existing methods.

AA0019 (11:55-12:10 in China/12:55-13:10 in Korea)

Designing of Loss Function for 3D Pedestrian Detection using CenterNet

Chan Yong Kim, Doo Hee Lee, Hyo Jin Kim, Asif Aziz Memon, Ehtesham Iqbal and Kwang Nam Choi

Chung-Ang University, Korea

Abstract- Pedestrian detection has been a popular research topic in the last decade. In the past, anchor-based networks, for example, 1-stage and 2-stage detector, were famous for pedestrian detection. However, keypoint-based networks among anchor-free networks have been proposed recently and show high performance compared to anchor-based networks. CenterNet is a kind of keypoint-based network used for object detection. We modified the loss Function of CenterNet and proposed a weight function to train an object's height and width for 3D pedestrian detection. The evaluation of 3D pedestrian detection with the modified loss function is performed using the KITTI dataset's monocular images. The proposed loss function improves accuracy in the 3D pedestrian detection network compared to the original loss function.

Lunch: 12:10- 13:30

December 4, 2020 (Friday)   Afternoon Session

Room ID: 661 0917 2550

Keynote Speech III (13:30-14:10)

Title: Tampering Detection and Content Recovery for Digital Images

Prof. Chuan Qin

University of Shanghai for Science and Technology, China

Abstract— With the popularization of image acquisition equipment such as digital camera and smart phone and the rapid development of network technology, the use of digital images in daily work and life is very common. However, the potential attacker may tamper image contents through image editing software to achieve illegal purposes, such as creating false news, providing false evidence, and confusing the public. Hence, it is of urgent practical significance to protect the authenticity and integrity of digital images. This talk will first start with three types of techniques for image authentication, i.e., fragile watermarking, image hashing and passive forensics, and then will introduce the image tampering recovery methods with self-embedding fragile watermarking and perceptual hashing. At last, the future research directions will be discussed.

Keynote Speech IV (14:10-14:50 in China/15:10-15:50 in Japan)

Title: Deep Learning for Medical Image Processing, Patten Recognition, and Diagnosis

Prof. Kenji Suzuki

Tokyo Institute of Technology, Japan

Abstract— It is said that artificial intelligence (AI) driven by deep learning would make the 4th Industrial Revolution. Deep leaning becomes one of the most active areas of research in virtually any fields, because "learning from data" is essential in handling a large amount of data ("big data") coming from systems. Deep learning is a versatile, powerful framework that can acquire image-processing and analysis functions through training with image examples; and it is an end-to-end machine-learning model that enables a direct mapping from raw input data to desired outputs, eliminating the need for handcrafted features in conventional feature-based machine learning. Dr. Suzuki invented ones of the earliest deep-learning models for image processing, semantic segmentation, object enhancement, and classification of patterns in medical images. He has been actively studying on deep learning in medical imaging in the past 24 years. In his talk, medical image processing, pattern recognition, and AI-aided diagnosis with deep learning are introduced, including 1) computer-aided diagnosis for cancer in CT and x-ray images, 2) semantic segmentation of lesions and organs in medical images, 3) separation of bones from soft tissue in chest radiographs, and 4) radiation dose reduction by reducing noise and artifact in CT and mammography.

Take a Break: 14:50-15:00

Oral Presentation Abstracts

Session 2 (15:00-16:45)

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.

December 4, 2020 (Friday)

Room ID: 661 0917 2550

Session Chair: Prof. Kenji Suzuki, Tokyo Institute of Technology, Japan

RV0001 (15:00-15:15)
Ultra-Fast Mini License Plate Recognition System Based-on Vision Processing Unit
Junhui Wang[1], Shuangyin Ren[2], Jiezhong He[1], Xiaolan Ji[1] and Diqing Huang[1]
1: National University of Defense Technology, China
2: Academy of Military Science, China

Abstract —As more embedded environments need license plate recognition systems, how to recognize car plates with high speed/accuracy and low energy has become an important and challenging problem. In this paper, we propose a ultra-Fast miNi (FaNi) license plate recognition (LPR) system. The FaNi system are divided into one training sub-system and one inference sub-system. The former are used to get some offline features; then, the latter is deployed online to recognize license numbers with nearly real-time speed. The inference system is comprised of the vision processing unit (VPU) and the display unit. These two parts are both implemented with hardware logic. Experiments show that the FaNi system can obtain high accuracy and high speed with low resource cost.

BS0006 (15:15-15:30)

Feedback Knowledge Graph for Recommendation

Zhenyu Zang and Xiaohui Yang

University of Jinan, China

Abstract —Knowledge graph is wildly used in recommendation system to deal with the sparsity and lack of interactive information. The negative samples in most recommendation systems are obtained by negative sampling from the no interactive data. There are some false marks in negative sampling, and lack reasonable explanation. The real negative examples should exist in the user's interaction history, and user's preferences can be obtained from the feedback data (i.e.: ratings, reviews). In this paper, we use feedback data to find the negative samples, and propose a Feedback Knowledge Graph (FKG) which can give good explanation for the results. Specifically, the interactive data is divided into positive and negative samples by feedback information, and attention mechanism is introduced to aggregate information from different neighbors. Finally, we use a neural network to make interactive prediction of user items. Extensive experiments on two real-world datasets show that our model achieves good results.

BS0008-A (15:30-15:45)

Spherical Image Based SLIC Algorithm

Gang Wu

Beijing University of Technology, China

Abstract —Spherical images are usually projected to ERP(Equirectangular Projection) to facilitate the storage and subsequent processing. SLIC(Simple Linear Iterative Clustering) is the most commonly used superpixel segmentation algorithm for planar images, which can be applied directly to ERP images. However, the ERP suffers from non-uniformly distributed samples and inevitably creates discontinuous borders. Those problems will damage the spherical data's correlation and make superpixels inappropriately generated in some areas of the ERP image. In this paper, resampling for ERP images is first applied to generate spherical image elements nearly uniformly distributed on the sphere. Then we rearrange those spherical image elements to form a novel 2D representation of a spherical image without breaking their local correlations. Based on such a 2D representation, we integrate the geometrical relations of the spherical data into the SLIC algorithm and finally build a spherical image based SLIC algorithm. The experiments suggest that the proposed spherical image-based SLIC algorithm shows better objective quality than applying SLIC directly to ERP images. The generated superpixels also have closed-contours and present better similarity and consistency on the spherical surface without the effect of the variation of spherical regions.

BS0010 (15:45-16:00)

LSB Substitution Image Steganography Based on Randomized Pixel Selection and One-Time Pad Encryption

Manocher Alipour[1], Bobby Gerardo[2] and Ruji Medina[1]
1: Technological Institute of the Philippines Quezon City, Philippines
2: West Visayas State University, Philippines

Abstract —Digital communication is an inseparable part of almost every individual and involved community on the plant. Different algorithms use to secure the transmission media such as image and sound. Using steganography as essential tools to keep the integrity and confidentiality of data, it has become a norm in modern digital communication era. Four different images used in Experimental approach. The result shows the average Peak Signal-Noise Ratio with a value of 83.26753978, average Mean Square Error with value0.000310368, and average Structural Similarity Index with a value of 0.999997914. Furthermore, the histogram analysis of the cover image and steganography image has shown little difference. The outcome of experimental assessment demonstrates that the approach has high impressibility.

AA5001 (16:00-16:15 in China/17:00-17:15 in Japan)

Texture-based Screening of Genes Involved in Reproductive Aging in Caenorhabditis elegans

Momoko Imakubo[1], Koji Kyoda[2], Hiroya Itoga[2], Jun Takayama[3] and Shuichi Onami[4]
1: Kobe University, Japan
2: RIKEN Center for Biosystems Dynamics Research, Japan
3: RIKEN Quantitative Biology Center, Japan
4: RIKEN Center for Biosystems Dynamics Research, Japan

Abstract — Reproductive capacity declines with aging, thereby increasing errors in fertilization, chromosome segregation, and embryonic cleavage. Age-related changes in oocytes are found not only in function but also in appearance. We previously showed that the texture of the cytoplasm in Caenorhabditis elegans oocytes varies with their age. We quantitatively characterized this change through the image features of Mm Value (mean difference between the maximum and minimum intensities within each moving window) and Correlation (COR) of Gray-Level Co- Occurrence Matrix (GLCM). However, the genetic association with the changes in the cytoplasmic texture with aging has not been clarified. Genes that cause the similar texture changes with aging are candidate genes involved in the aging pathway. To examine whether gene knockdown can change the Mm Value or the COR as seen in the oocytes with aging, we analyzed the cytoplasmic texture in the early embryos in the Worm Developmental Dynamics Database, which stores differential interference contrast microscopy images in early C. elegans embryos with genes silenced by RNA-mediated interference. Of 316 target genes screened, we identified five genes whose knockdown decreased the Mm Value and one gene whose knockdown increased the COR. The five genes included genes that are involved in age-related function, such as chromosome segregation and mitochondrial function, and genes that is not known to be related to aging. One gene that increased the COR is also involved in chromosome segregation. Genes that changed Mm Value or COR could potentially be involved in reproductive aging.

AA0020-A (16:15-16:30 in China/17:15-17:30 in Japan)

Simplified Deep Learning Architecture for Text Recognition from Natural Scene

Deepak Rai and Tomoko Ozeki

Tokai University, Japan

Abstract- Recognizing texts from a natural scene is considered one of the most challenging problems in the field of computer vision. Existing methods treat text detection and recognition as two different tasks. For text detection, they generally use CNN based model with multiple stages and components. Moreover, for text recognition, a sequential prediction is conducted one by one on the top of text regions. However, this results in the degradation of the overall performance. The architecture of these models leads to heavy computation, making them impractical for real-world application scenarios. In this work, we have solved this problem by using a highly simplified pipeline. We have used a unified end-to-end trainable network for simultaneous detection and recognition. In the text detection branch, we have used the modified version of highly simplified EAST architecture based on FCN, which contains two sub-branches for text instance segmentation and instance-level bounding box regression. In the text recognition branch, text sequence information extracted using multiple CNN and bidirectional LSTM layers with CTC loss function. We used ResNet-50 as our base model. These technical improvements helped in removing many intermediate stages from our pipeline, making it very simple. We have experimented with ICDAR2015, COCO-Text, and MLT datasets.

AA5013 (16:30-16:45 in China/14:00-14:15 in India)

Prediction of lung and colon cancer through analysis of histopathological images by utilizing Pre-trained CNN models with visualization of class activation and saliency maps

Satvik Garg[1] and **Somya Garg**[2]

1: jaypee university of information technology, India

2: Deloitte Consulting LLP, India

Abstract-Colon and Lung cancer is one of the most perilous and dangerous ailments that individuals are en during over the world and has become a general medical problem. To lessen the risk of death, a legitimate and early finding is particularly required. In any case, it is a truly troublesome task that depends on the ex perience of histopathologists. If a histologist is under-prepared, at that point this may even hazard the life of a patient. As of late, deep learning has picked up energy and it is being valued in the analysis of Medical Imaging. This paper intends to utilize and alter the current Pre-trained CNN based model that can identify lung and colon cancer utilizing histopathological images with better augmentation techniques. In this pape r, eight distinctive Pre-trained CNN models, VGG16, NASNetMobile, InceptionV3, InceptionResNetV2, Res Net50, Xception, MobileNet, and DenseNet169 are trained on LC25000 dataset. The model's perfor mance is assessed on precision, recall, f1score, accuracy, and auroc score. The results exhibit that all eight models accomplished noteworthy results ranging from 96% to 100% accuracy. Subsequently, GradCAM an d SmoothGrad are also utilized to picture the attention images of Pre-trained CNN models classifying malig nant and benign images.

December 5, 2020 (Saturday)　Morning Session

Room ID: 661 0917 2550

Keynote Speech V (9:00-9:40 in China/12:00-12:40 in Australia)

Title: Artificial Intelligence in Health and Brain Modelling

Prof. Yan Li

University of Southern Queensland, Australia

Abstract— The rise of digital disruption and its related technologies has opened a wealth of opportunities and challenges. The availability of huge amounts of data and high speed computers is making artificial intelligence (AI) a mainstream technology.　AI is driving for improvements and innovations in all areas, which are changing the way we live, work and play. Understanding the role of AI (and machine learning) and their impacts on the future is critical. We are just beginning to grasp the potential of AI, automation, high speed communication, drones, big data and cloud computing.

Firstly, this talk will overview the current AI application trends and research directions in health and medical areas. AI is fast overtaking human tasks ranging from medical imaging to risk analysis and management, and to health diagnostics and healthcare. Secondly, I will showcase the performance of several advanced techniques based on brain networks, modelling, deep learning and brain big data analysis algorithms. Some of the technologies are being commercialised for detecting brain tumours and clots in cerebral arteries, and for analysing sleep patterns for sleep disorders.

Keynote Speech VI (9:40-10:20)

Title: Secure Authentication for D2D Communications in 5G Wireless Networks

Prof. Ma Maode

Nanyang Technological University in Singapore

Abstract—As a promising feature in 5G, device-to-device (D2D) communication is the technology allowing adjacent mobile devices to communicate directly without relaying the data over base stations. D2D technology can potentially increase the network capacity by offloading network traffic in a distributed manner. However, there are also new security challenges such as free-riding attack prevention, device anonymity protection and end-to-end data secrecy. Also, since there are many mobile devices which have limited computational resources in 5G cellular network, there is a need to develop a lightweight authentication protocol which addresses all these security requirements with low computational overhead. In this talk, a lightweight D2D authentication and key agreement protocol based on elliptic curve cryptography (ECC) will be presented. The proposed scheme makes use of the elliptic curve digital signature algorithm (ECDSA), elliptic curve Diffie-Hellman (ECDH) and authenticated encryption with associate data (AEAD) to provide mutual authentication, key agreement and secure data transmission for all 5G D2D devices. The scheme is computationally lightweight to be supported in any resource-constrained 5G devices with the ability to resist several active and passive protocol attacks including eavesdropping, replay attack, man-in-the-middle attack and free-riding attack. The security functionality of the proposal has been verified by Scyther tool to show its effectiveness. Finally, performance evaluation shows the scheme is efficient for both UEs and CN with rationally low computational costs.

Take a Break: 10:20-10:30

Oral Presentation Abstracts

Session 3 (10:30-11:45)

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.

December 5, 2020 (Saturday)

Room ID: 661 0917 2550

Session Chair: Prof. Ma Maode, Nanyang Technological University, Singapore

AA0015 (10:30-10:45 in China/22:30-22:45 in USA)

Towards Diagnosis of Carpal Tunnel Syndrome Using Machine Learning

Yuan Wei, Wei Zhang and Feng Gu
Department of Physical Therapy, College of Staten Island, USA

Abstract — Carpal Tunnel Syndrome (CTS) is the most common peripheral neuropathy affecting the hand function. Although the most complains from patients with CTS are fine motor control failures in daily manual activities, parameters of hand functional control have not been considered neither in current diagnostic nor evaluation process. In addition, CTS has been identified as an occupational disease. Over 50% of reported CTS cases are work related. However, early screening protocols of CTS at a preliminary stage are absent, and thus unable to prevent further complications, especially for high-risk populations who can advance their CTS stage on daily work basis. In the current protocol, we aim to identify important parameters of hand functional control that are indicative of CTS clinical occurrence and severity stages. Based on designed experiments during hand grasping, we performed machine learning classifiers to detect, filter and subtract important biomarkers or groups of biomarkers that dominantly classify the CTS hand and its severity. The identified biomarkers not only provide a high potential of a paradigm shift in CTS management, but also are able to shed light on hand functional evaluations associated with this neuropathy. In this paper, we adopt one of machine learning approaches, random forests, to the raw experimental hand function gripping data to identify the most important biomarkers for CTS. The experimental results show the effectiveness of the proposed work.

AA0002 (10:45-11:00 in China/11:45-12:00 in Japan)

How Do We Predict Stock Returns in the Cross-Section with Machine Learning?

Masaya Abe and Kei Nakagawa

Nomura Asset Management Co, Japan

Abstract —Stock return prediction is one of the most important themes for investors. Until now, there are many studies for the application of machine learning methods to predict stock returns in the cross-section. However, those studies focus only on differences in machine learning methods. This study investigates how the difference in problem settings such as problem definition and data preprocessing affects the performance of stock return prediction. Our results show that the performance varies depending on problem settings regardless of the prediction models. These findings indicate that not only the prediction models but also the problem settings are important for stock return prediction.

BS0013 (11:00-11:15 in China/8:30-8:45 in India)

Stock Volume Prediction Based on Polarity of Tweets, News, and Historical Data Using Deep Learning

Navaneeth Jawahar[1], Jeyaprakash Chelladurai[2], **Imayabharathi Sakthivel**[1] and Biju Bajracharya[3]

1: Disprz, India

2: East Stroudsburg University of Pennsylvania, USA

3: Ball State University, USA

Abstract —Deep Learning and Natural Language Processing are branches of modern technology that are fast being used to solve myriads of problems that inflict us in our daily life. A particular problem that has the potential to benefit greatly from the capabilities of data mining and machine learning is the issue of unpredictability in the stock market environment. What makes this a difficult problem is that stock volume movements are influenced by a variety of factors some of which are inherently quantifiable while others such as trader sentiments are not. The system proposed in this paper combines Fundamental and Technical trading philosophies in predicting stock volume movements, during day trading, based on historical stock performance data, financial news, and trader sentiments. Financial news articles, for a stipulated time period, are collected and filtered based on the companies mentioned in the articles. For this paper, we have chosen to filter and retain articles about companies belonging to SENSEX 50. For gauging trader sentiments with respect to the news about a company or the company in general, Twitter tweets are considered as a data source. Sentiment analysis is performed for the news and cumulated tweets for a company separately to arrive at two polarity scores that indicate the sentiments carried. Since recurrent neural networks have the ability to store additional states which can be used as a memory store in order to maintain and dismiss information based on data patterns, an LSTM (Long Short Term Memory Networks) model is developed to predict the stock volume movement based on the polarity scores of the news and tweets, and OHLC (Open, High, Low, Close) price values.

AA0036 (11:15-11:30 in China/22:15-22:30 in Canada)

Using Twitter Social Media for Depression Detection in the Canadian Population

Ruba Skaik and Diana Inkpen

University of Ottawa, Canada

Abstract-Depression is a serious public health problem, and an economic burden for the society. Therefore, identifying individuals with depression and providing the support for the people in need is a crucial step for a better environment. In this research, we explore the task of detecting signs of depression from tweets where people often express their feelings, thoughts, interests and opinions implicitly or explicitly. We utilize personal narratives collected through Twitter with depression self-report to build a model suitable for predicting depression ideation in a sample of Twitter users that is representative for the Canadian population. The labeled dataset contains 1,402 users, using classical machine learning techniques we achieved 0.961 F1-score using 10-fold cross validation. We used CLPsych dataset as a test dataset, and we reached 0.898 F1-score using deep learning models. We applied the trained model on a population sample and reported a non-contradicting result with depression statistics reported by Statistics Canada for 2015.

AA0034 (11:30-11:45 in China/9:00- 9:15 in India)

Multi-Core Aware Virtual Machine Placement for Cloud Data Cenetrs with Constraint Programming

S Nagadevi [1] and Kasmir Raja S.V [2]

1: SRM University, India

2: SRMIST, India

Abstract- Creation of a Virtual Machine (VM) in a suitable Physical Machine (PM) is the critical requirement of a Cloud Service Provider in cloud data center. Mapping the VM to an appropriate PM is called VM Placement . Many researchers have designed VMP algorithms [8-11] by considering the CPU capacity of a PM without considering the number of physical cores (pCPU) available in a PM and physical core capacity of a PM. However, in the real scenario, PM and VM consist of multiple physical cores. So, to place VM on PM, the CPU capacity of VM must be mapped to pCPU capacity of a PM. So, we have designed a VMP algorithm which will eradicate all the problems of core overload, less resource utilization, more number of host overloads and more number of VM migrations. In our proposed work, we have considered a multi-core aware VMP(MCA-VMP) by considering the core capacity of a VM and PM and obtained results that outperforms non-core aware VMP algorithms.

Lunch 11:45-13:30

December 5, 2020 (Saturday)　Afternoon Session

Oral Presentation Abstracts

Session 4 (13:30-15:30)

Room ID: 661 0917 2550

Session Chair: Prof. Chiharu Ishii, Hosei University, Japan

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.

BS0003(13:30-13:45)

Analysis the influence of Guilin tourism economic income on the per capita disposable income of urban residents based on GIS technology

Na Yang

Bowen College of Management Guilin University of Technology, China

Abstract —With the rapid development of computer technology, GIS technology has been widely used in the field of spatial geographic information, and the research on spatial analysis is becoming more and more important. This paper uses GIS and mathematical statistics to analyze Guilin's total tourism consumption and per capita disposable income of urban residents. Based on the analysis of the overall consumption data of Guilin tourism and the per capita disposable income of urban residents, this paper draws the following conclusions: 1) The main income of Guilin tourism economy comes from the southwest, which is one of the main reasons for the large gap between the per capita disposable income of urban residents in the southwest and the northeast. 2) The average annual growth value of Guilin's total tourism consumption and per capita disposable income of urban residents between 2012 and 2019 was 21.63 x 1010 yuan·a-1 and 2054.07 yuan·a-1. 3) The development of tourism in southwest Guilin has obviously affected the local economy, so that the per capita disposable income of urban residents has increased. 4) The tourism development in Northeast Guilin is lagging behind, and the economic income level is relatively low. There is a large gap in the per capita disposable income of urban residents in the southwest and northeast. The research results of this paper are intended to provide reference opinions for related researchers.

BS0007(13:45-14:00)

Research on the relationship between precision marketing and company development ability

Yuying Chen, Chenjun Fan, Ziyang Li and Lingxi Ren

Sichuan University, China

Abstract — In the current Internet marketing, many enterprises face the problem that they cannot find the key marketing points and waste huge advertising expenses, which is the result of the traditional advertising industry covering an excessive number of non-target users. Compared to the traditional marketing, precision marketing can help companies handle this problem to some extent through careful selection of target customers. Steam of literature has studied the big data on which precision marketing rely, including the acquisition of big data and the segmentation of user profiles, as well as tools and channels for precision marketing promotion. However, a well-designed precision marketing system has not been established, leading to uncertainty in suitability when companies employ precise marketing as a marketing tool. Though precision marketing is expected to improve marketing's economic benefits, companies lack quantitative indicators to show the relationship between precision marketing and benefits achieved. In this paper, we explore the relationship between precision marketing relying on big data and company's development ability. We find companies that invest more in marketing and whose industry is more competitive are more inclined to use precision marketing. We also find that precision marketing can help improve the company's development ability. Specifically, precision marketing has a positive impact on the company's return on net assets and the growth rate of total assets.

AA0007 (14:00-14:15 in China/15:00-15:15 in Japan)

Indoor Location Estimation Based on Inverse Fingerprints at Multiple Points in Time and Moving Distance

Yuto Oue, Takeshi Umezawa and Noritaka Osawa

Graduate School of Science and Engineering, Chiba University, Japan

Abstract- In indoor position estimation, it is generally difficult to estimate the coordinates accurately using indoor localization methods such as fingerprinting, triangulation and pedestrian dead reckoning alone. This is because each method has its own advantages and disadvantages due to differences in characteristics. Therefore, researches are being conducted to combine the methods to compensate for the disadvantages of each method and to estimate the position with a high accuracy. This paper proposes an indoor localization method that uses consolidated fingerprinting, which combines inverse fingerprinting and dead reckoning differently from conventional methods using combinations of them. The proposed method is based on inverse fingerprints at multiple time points and displacements or distances of movements between the time points. An experimental evaluation shows that the root mean square error of estimated positions is 0.42m for the proposed method and 1.09m for the inverse fingerprinting. The use of the proposed method reduces the error by about 61%.

AA0008 (14:15-14:30)

The Walking Robot Based on Mechanical Connecting-rod

Jian-Bing Zhang and Xiao-Ping Wang

School of Mechanical and Electrical Engineering and Automation, Nanhang Jincheng College, Nanjing, China

Abstract- In recent years, China's investment in space technology and natural environment has been increasing. In recent years, China's investment in space technology and natural environment has been increasing. First of all, it must be the bionic robot with strong adaptability to explore the surfaces of the moon, Mars and other planets under an uncertain environment. Compared with wheeled or tracked robot, the standpoints of the legged robot are discrete points, which can select optimal supporting spots on the ground, so the legged robot is better, especially the legged robot with eight legs. And the walking robot based on connecting-rod has been widely used because of its simple structure and strong load capacity. Secondly, due to the wide use of computer in society as well as the fast development of integrated circuit, SCM is playing a greater role. It has a lot of functions, can work steadily, and can be used conveniently but with small volume and low price so many of them are applied in the control systems, but more applications in the automatic control system, data acquisition, military products as well as appliances and other fields. And according to the specific hardware structure and the object, using the software makes it more perfect. In this paper, we designed a walking robot adopted the structure of connecting-rot, and take the SCM LM298 as the core of controlling. The robot takes its operation by using the integrated chips of encoding and decoding. This walking robot has realized many functions such as walking, turning back, left and right.

AA4001 (14:30-14:45)

Development of Robotic Quiz Games for Self-Regulated Learning of Primary School Children

Ting-Sheng Weng[1], Chien-Kuo Li[2] and Meng-Hui Hsu[3]

1. National Chiayi University, Taiwan
2. Shih Chien University
3. Kun Shan University, Taiwan

Abstract- The progressive development of information technology has provided multiple learning modes. The rich content and innovative applications available allow pupils to improve their skills through self-regulated learning (SRL), which has become an important education goal. Intelligent robots can be used in a wide range of applications, from programmed movements for learning activities, to the combination of artificial intelligence and sensor technology for human life and education. A robot's dynamic and interesting interface is more suitable for children's self-regulated learning. This study used a Zenbo robot as the development tool and Zenbo Scratch platform programming to develop an AI robot math quiz game for primary school students. Two elementary school math teachers, and a parent and a 5th grade primary school student were involved in the development of the game. This study used the parent's and student's continuous interaction with the robot to adjust the code and achieve the best human-computer interaction in robotic mathematics problem solving. Moreover, this study developed a companion robot for a math quiz game, which can be used for reviewing what has been learned in class. The robot can be used for self-regulated learning by young children to increase student learning outcome.

BS0002 (14: 45-15:00)

ICTA: Intelligent Computing Task Allocation for Efficient Deep Learning in Distributed Edge Computing System of IoT

Wei Qu, Xiaolu Ding, Kai Yang, Yuanyuan Bao and Wai Chen
China Mobile Research Institute, China

Abstract —As a critical part of distributed cross-device edge computing systems, computing task allocation is responsible to reasonably map the computation of DL tasks onto the set of available Internet-of-Things (IoT) devices, with the aim to achieve efficient execution of deep learning (DL) model inference/training. The complexity and uncertainty of task scheduling on diverse IoT edge devices, as well as the dynamic and resource-constrained edge computing environment, make it hard to obtain the best task allocation strategy in terms of the optimal matching between DL workloads and available resources. In order to maximize resource utilization and optimize task allocation, in this paper, we propose Intelligent Computing Task Allocation (ICTA), which is an automatic end-to-end optimizing model to allocate proper resources for each operator node in a computation graph by learning the long-term optimal resource management and task scheduling strategies. ICTA is capable of extracting features from resource graph and computation graph, respectively, by using graph convolutional network (GCN), and subsequently predicting the system performance of a given task allocation strategy through deep neural network (DNN) based on the extracted features. Finally, ICTA decides which device in the resource graph to place the operator node in the computation graph, based on the task allocation strategy corresponding to the best system performance. Moreover, being trained periodically in an end-to-end manner according to a continuous learning mechanism, GCN-based ICTA will become smarter while being used. Therefore ICTA facilitates the realization of intelligent distributed edge computing system and further contributes to smart edge applications and services.

BS0016 (15:00-15:15)

An Evolutionary Game Analysis on Patients' Value Creation Behavior in Online Healthcare Community

Xiang You, Gaoshan Wang and Ruixue Li
Shandong University of Finance and Economics, China

Abstract ——Online Healthcare Communities(OHCs) afford a convenient approach to obtaining healthcare information and services, and encourage users to engage in their own healthcare management activities. However, user loyalty and use frequency to OHCs is rather low. Therefore, to figure out how to promote the OHCs stickiness for patients and what factors are affecting patients' value creation activities, this research adopts evolutionary stability strategies and replicator dynamics of evolutionary game theory(EGT) to construct a game model concerning patients' value creation behavior. The results not only show that there are equilibrium strategies and evolution paths in the game model, it also reveals the outcomes of variable levels of collusion between patients in OHCs. We also find that influencing factors, such as perceived value, self-efficacy, healthcare knowledge return, costs of participation, are critical to the patients' value creation behavior in OHCs. Furthermore, our study contributes to existing game theories of individual behavior in online communities, and provides OHCs with guidelines that support them in effectively increase user stickiness to help community to maximize their value.

AA0033 (15:15-15:30 in China/16:15-16:30 in Japan)

Live Monitoring of Speech Quality of Public Addressing Network Speakers: A Preliminary Study

Elhard Kumalija and Yukikazu Nakamoto

Graduate School of Applied Informatics, University of Hyogo, Japan

Abstract- There is a growing number of installation of newtork speakers in public space like train stations, schools , and hospitals. These speakers are used for announcement and playing background music. Network performance can affect the quality of announcement speech heard from the network speaker. In this study a Deep neural network method is proposed for live monitoring of the quality of speaker output as perceived by public space occupants. Single end method for speech quality assesment was proposed because of the nature of application there is no reference speech to use for assesment. The network node (end point) of network speaker usually has low memory and computing resource. Therefore, compact deep neural network architecture and post-training quantization method were examined as deep neural network compression techniques for memory saving and compute acceleration. Using PESQ as the baseline for comparing the proposed model and ITU-T P.563, the estimated Mean opinion score pearson correlation coefficient was 0.710 and 0.40 respectivectively, while the mean squared error was 0.514 and 0.319 respectively. The proposed model performed better than P.563 ITU-T recommended model.

Take a Break: 15:30-15:40

Oral Presentation Abstracts

Session 5 (15:40-17:55)

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.

December 5, 2020 (Saturday)

Room ID: 661 0917 2550

RV0002 (15:40-15:55)

Driver's Gaze Zone Estimation Method: A Four-channel Convolutional Neural Network Model

Yingji Zhang, Xiaohui Yang and Zhe Ma

University of Jinan, China

Abstract —Driver's gaze has become an important indicator to analysis driving state. By estimating the gaze zone of drivers, we can further judge their fatigue state and even predict their driving intention in the next step. In this paper, we propose a four-channel gaze estimation model based on Convolutional Neural Network (CNN), which is used to estimate the gaze zones of the driver. In the proposed method, the images of the right eye, the left eye, the face, and the head are used as the input data of the multi-channel CNN. Then, the features of different channels are fused to estimate the gaze zone. Finally, we compared our method with several existing methods, and the experimental results show that the accuracy of our method is 96%.

BS0009-A (15:55-16:10)

Academic Performance Prediction with Multi-Source Behavioral Data via A 1C-LSTM Network

Xiaoyong Li, Yong Zhang and Huimin Cheng

Beijing University of Technology, China

Abstract —Academic Performance Prediction is an important research topic in educational data mining (EDM) and learning analytics (LA), since it can improve the teaching and learning process, especially for students who may fail the exams. Many researchers have studied the correlation between learning behavior or living behavior and academic performance using various methods, however, most of them mainly relies on the handcrafted features that needs rich expert knowledge and is time-consuming. This paper proposes a deep learning architecture for early predicting students' academic performance, in which it firstly combines one-dimensional convolutional neural network (1D-CNN) with long short-term memory network (LSTM) to automatically learn features from students' multiple sources behavioral data, and then concatenate these extracted features with students' demographic information for prediction. We evaluate our proposed method with the data produced by undergraduates from a university in Beijing, and compare with several classical classification algorithms from different aspects. The experimental results indicate that our proposed method outperforms the other alternatives.

BS0014 (16:10-16:25)

Alzheimer's Disease Classification Using structural MRI Based on Convolutional Neural Networks

Shuomei Chen[1], Jianxin Zhang[2], Xiaopeng Wei[3] and Qiang Zhang[3]

1: Dalian University, China

2: Dalian Minzu University, China

3: Dalian University of Technology, China

Abstract —Research on Alzheimer's Disease auxiliary diagnosis based on deep learning has been receiving more and more attention. However, in existing AD classification research based on T1-weighted structural Magnetic Resonance Imaging, the influence of different MRI scanning modes (i.e., 1.5T and 3T) of ADNI database is not well considered. In addition, there are few attempts to use the Voxel-Based Morphometry-Diffeomorphic Anatomical Registration Through Exponential Lie algebra method for data preprocessing in AD classification experiments. Therefore, the VBM-DARTEL method is used to preprocess the sMRI data. Then, based on different scanning methods, the preprocessed ADNI subsets are further divided according to three data partitioning methods (subject, MRI and visit-history), on which five representative convolutional neural networks are adopted for classification and evaluation. The experimental results demonstrate that the overall classification performance on both 1.5T and 3T datasets is visit-history>MRI>subject. Meanwhile, the best accuracy rates 95.87% and 97.15% are achieved by GoogLeNet on 1.5T and 3T datasets in visit-history level. In addition, preprocessing operation improves the accuracy rate of AD classification to a certain extent and the performance of the five CNN models is equivalent in preprocessed datasets, while there is obviously accuracy difference on none-preprocessed datasets.

AA0006 (16:25-16:40 in China/17:25-17:40 in Japan)

Resolving Lexical Ambiguity in English-Japanese Neural Machine Translation

Quang-Minh Do[1], **Kungan Zeng**[2] and Incheon Paik[2]

1: Eastgate Software Hoa Cuong Building, Vietnam

2: University of Aizu Fukushima, Japan

Abstract —Lexical ambiguity, i.e., the presence of two or more meanings for a single word, is an inherent and challenging problem for machine translation systems. Even though the use of recurrent neural networks (RNN) and attention mechanisms are expected to solve this problem, machine translation systems are not always able to correctly translate lexically ambiguous sentences. In this work, we attempt to resolve the problem of lexical ambiguity in English-Japanese neural machine translation systems by combining a pretrained Bidirectional Encoder Representations from Transformer (BERT) language model that can produce contextualized word embeddings and a Transformer translation model, which is a state-of-the-art architecture for the machine translation task. These two proposed architectures have been shown to be more effective in translating ambiguous sentences than a vanilla Transformer model and the Google Translate system. Furthermore, one of the proposed models, the TransformerBERT-WE, achieves a higher BLEU score compared to the vanilla Transformer model in terms of general translation, which is concrete proof that the use of contextualized word embeddings from BERT can not only solve the problem of lexical ambiguity, but also boosts the translation quality in general.

AA0025 (16:40-16:55 in China/9:40-9:55 in Germany)

A Systematic Review on Anomaly Detection for Cloud Computing Environments

Tanja Hagemann and Katerina Katsarou

Technische Universitat Berlin, Germany

Abstract — The detection of anomalies in data is a far-reaching field of research which also applies to the field of cloud computing in several different ways: from the detection of various types of intrusions to the detection of hardware failures, many publications address how far anomaly detection methods are able to meet the specific requirements of a cloud-based network. Since there is still no comprehensive overview of this constantly growing field of research, this literature review provides a systematic evaluation of 215 publications that can be considered as representative for the last ten years of this scientific development. Our analysis identifies three main methodological areas (machine learning, deep learning, statistical approaches) and summarizes how exactly the corresponding models are applied for the detection of anomalies. Furthermore, we clarify which concrete application areas are typically addressed by anomaly detection in the context of cloud computing environments and which related public datasets are often used for evaluations. Finally, we discuss the implications of the literature review and provide directions for future research.

AA0030 (16:55-17:10 in China/11:55-12:10 in Saudi Arabia)

Impact of data balancing strategies at training to predict credit risk

Suleiman Alsaif

Imam Abdulrahman Bin Faisal University, Saudi Arabia

Abstract- To protect the middle class from over-indebtedness, banking institutions need to implement a flexible analytic based evaluation method to improve the banking process of detecting customers who are likely to have difficulty in managing their debt. In this paper, we test and evaluate a large variety of data balancing methods on selected machine learning algorithms (MLAs) to overcome the effects of imbalanced data and show their impact at the training step to predict credit risk. Our objective is to deal with data unbalance in order to achieve the best predictions. We investigated the performance of these methods by different learners when classification models are trained using MLAs.

AA0032 (17:10-17:25)

Stream Classification Algorithm Based on Decision tree

Anqing Liu and Li Zhang

Northeastern University, China

Abstract- Due to the rise of many fields such as e-commerce platforms, a large number of stream data has emerged. The incomplete labeling problem and concept drift problem of these data pose a huge challenge to the existing stream data classification methods. In this respect, a dynamic stream data classification algorithm is proposed for the stream data. For the incomplete labeling problem, this method introduces a randomization and iterative strategy based on the VFDT algorithm to design an iterative integration algorithm, the algorithm uses the previous model classification result as the next model input, and implements the voting mechanism for new data classification. At the same time, the window mechanism is used to store data and calculate the data distribution characteristics in the window, then, combined with the calculated result and the predicted amount of data to adjust the size of the sliding window. Experiments show the superiority of the algorithm in classification accuracy.

AA0035 (17:25-17:40 in China/10:25- 10:40 in Ireland)

Effective Tuning of Regression Models using an Evolutionary Approach: A Case Study

Seamus Lankford

Adapt Centre, Dublin City University, Ireland

Abstract- Hyperparameters enable machine learning algorithms to be customized for speci_c datasets. Choosing the right hyperparameters is a challenge often faced by machine learning practitioners. With this re- search, tuning of hyperparameters for regression models was explored. Models predicting house prices in King County were created using a detailed suite of regression algorithms. Traditional approaches, and evo- lutionary algorithms, for improving model accuracy were evaluated. A variety of feature selection methods and hyperparameter tuning using grid search, random search and pipeline optimization were evaluated as part of the traditional approaches. Furthermore, evolutionary algorithms were applied to model optimization. In this paper, it is shown that an evolutionary approach, implemented with TPOT, achieves the highest accuracy for a regression model based on the King County dataset. Regarding metrics, combining the RMSE and R2 metrics is shown to be an e_ective means of determining model accuracy. Finally, greedy feature selection performed best when a variety of feature selection methods are compared.

AA5012 (17:40-17:55 in China/ 5:40-5:55 in USA)

CNN as a Feature Extractor In Gaze Recognition

Arun Gopal Govindaswamy, Jacob Furst, Daniela Raicu and Enid Montague

DePaul University, United States

Abstract- In this paper, we employ a Convolutional Neural Network (CNN) in predicting physician gaze. This paper focuses on two aspects – one comparison between hand-crafted features and CNN-based learned features, and two in investigating the impact of fully-connected layers in an end-to-end CNN model. The pre-trained CNN model based on VGG16 through transfer learning is used as a feature extractor and a K-Nearest Neighbor and a Random Forest (RF) algorithm were used as the classifier of physician gaze. The CNN-RF and CNN--K-NN models were compared with the traditional end-to-end CNN model and through a series of experiments and statistical tests of significance, we show that the power of CNN comes from the features extraction part and that the fully connected layers of the CNN have comparable performance to the random forest and the k-NN classifiers. We also show that the CNN-based learned features provide substantial distinguishable power in classifying physician gaze.

Note

Note