CONFERENCE PROGRAM

2020 9th International Conference on Bioinformatics and Biomedical Science (ICBBS 2020)

&

2020 International Conference on Bio-Signal and Image Processing (ICBSIP 2020)

October 16-18, 2020

Organized by

Published and Indexed by

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Conference Introduction

2020 9th International Conference on Bioinformatics and Biomedical Science (ICBBS 2020) will be held online in conjuction with 2020 International Conference on Bio-Signal and Image Processing (ICBSIP 2020) during October 16-18, 2020.

ICBBS conference series is held annually. Previously, it has been successfully held in Beijing, Shenzhen, Bangkok, Kuala Lumpur, Copenhagen, Bali and Singapore. The aim of the ICBBS 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 Bioinformatics and Biomedical Science and related fields. This conference provides opportunities for the delegates to exchange new ideas and application experiences face to face, to establish business or research relations and to find global partners for future collaboration.

Papers will be published in the following proceeding or journal:

All accepted papers fulfilling requirements on quality will be published in **ACM International Conference Proceedings (ISBN: 978-1-4503-8865-8),** and which will be archived in ACM Digital Library, indexed by EI Compendex and SCOPUS.
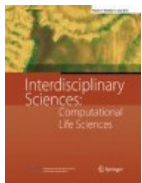
Some excellent papers will be recommended for reviewing of publication in **Interdisciplinary Sciences: Computational Life Sciences (ISSN: 1913-2751 (print version); ISSN: 1867-1462 (electronic version)** as a special issue, which can be indexed by SCIE, Journal CitationReports/Science Edition, PubMed/Medline, SCOPUS, EMBASE and so on.

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

Presentation Guideline

♦ Presentation Requirement

➢ At least one author should present for each abstract/full paper during the session.

♦ Time Zone

➢ The time shown in this program is **Greenwich Mean Time (GMT+08:00)–China Local Time**. Please set up your laptop time in advance.

♦ Equipment Needed

➢ A computer with an internet connection (wired connection recommended).
➢ USB plug-in headset with a microphone (recommended for optimal audio quality).
➢ Webcam (optional): built-in or USB plug-in.

♦ Environment Requirement

➢ Quiet Location.
➢ Stable Internet Connection.
➢ Proper lighting.

♦ Voice Control Rules during the Presentation

➢ The host will mute all participants while entering the meeting.
➢ The host will unmute the speakers' microphone when it is turn for his or her presentation.
➢ Q&A goes after each speaker, the participant can raise hand for questions, and the host will unmute the questioner.
➢ After Q&A, the host will mute all participants and welcome next speaker.

♦ Warm Tips for Oral Presentation

➢ Get your presentation PPT files prepared.
➢ Regular presentation is 15 minutes including 12 minutes of presentation and 3 minutes of Q&A.
➢ To effectively control the time and avoid some unexpected situations, it is suggested that you should record your presentation ahead of time, do the live oral presentation online or play the video while it's your turn for presentation.
  Step 1: Authors record a video introduction with their own image, speaking to the camera, introducing themselves: name, affiliation, brief description of scope of their work
  Step 2: Authors then switch to their slides and provide a voiceover describing images in each slide
  Step 3: Authors need to be able to upload these presentations to a location specified by YOU in advance. Send the video to the staff in advance.

Presentation Guideline

✚ Best Presentation Award

➢ One Best Presentation will be selected from each session, and the result will be announced at the end of the session.

✚ Conference Material

➢ All presented papers will be issued with soft copy of conference materials: Receipt, Participation and presentation certificate, etc.

✚ Notes

➢ Log in the meeting room 10 minutes ahead of the session.
➢ Learn the zoom skills.
➢ Please kindly keep your Paper ID in mind so that the staff can quickly locate your registration information.
➢ Your punctual arrival and active involvement in each session will be highly appreciated.
➢ The conference will be recorded; we will appreciate your proper behavior.

✚ Follow us

➢ Add the Wechat of CBEES-BBS for more detailed and updated conference news.

Scanning me:

ZOOM User Guideline

↳ Download the ZOOM:

- ➤ https://zoom.us/download
- ➤ https://www.zoom.com.cn/download

↳ Learn the ZOOM skills

- ➤ Please visit:
  https://support.zoom.us/hc/en-us/articles/201362033-Getting-Started-on-Windows-and-Mac

↳ How to use ZOOM:

- ➤ Sign up an account.
- ➤ Set the language.
- ➤ Test computer or device audio.
- ➤ Join a meeting: Join the meeting with "meeting ID" provided in the program, tap the name as "Paper ID-name", eg. " Y0007-Freya Shi", " O0007-Olia Lai" or "Lis-Freya Shi", then click "Join".
- ➤ Get familiar with the basic functions: Rename, Chat, Raise Hand, Start Video, Share the computer sound and Screen Share, etc.
  The most important function is Share Screen, because you will use it for your online presentation.

On Oct. 16, we will have test session. On that day, we will teach you how to use ZOOM and the functions mentioned above. If you don't know how to use, please do not worry. However, you must download ZOOM, then, you can join the conference.

Program-at-a-Glance

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Prof. Mohd Zaid Abdullah, Universiti Sains Malaysia, Malaysia</td><td rowspan="6">**667-7358-9540**</td></tr>
<tr><td>10:40-10:50</td><td>**Keynote Speaker I**
Prof. Masahiro Fujita, The University of Tokyo, Japan</td></tr>
<tr><td>10:50-11:00</td><td>**Keynote Speaker II**
Prof. Lihua Xie, Nanyang Technological University, Singapore</td></tr>
<tr><td>11:00-11:10</td><td>**Keynote Speaker III**
Dr. Takehito Ogata, Center for Technology Innovation – Controls, R&D Group, Hitachi, Ltd., Japan</td></tr>
<tr><td>11:10-11:20</td><td>**Keynote Speaker IV**
Prof. TSUI Kwok-Wing Stephen, The Chinese University of Hong Kong, Hong Kong</td></tr>
<tr><td>11:20-11:30</td><td>**Invited Speaker I**
Prof. Hirohide Haga, Doshisha University, Japan</td></tr>
<tr><td>11:30-13:30</td><td>Break</td><td></td></tr>
<tr><td>13:30-14:10</td><td>**Test Session 1-Topic: "Medical Imaging and Image Processing"**
Y2003, Y2004, Y2006, Y2007, O0018, Y2009, Y2010, O2002</td><td rowspan="5">**667-7358-9540**</td></tr>
<tr><td>14:10-14:40</td><td>**Test Session 2-Topic: "Bioinformatics and Computational Biology"**
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<tr><td>14:40-15:30</td><td>**Test Session 3-Topic: "Biomedical Signal and Image Processing"**
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<tr><td>15:30-16:30</td><td>**Test Session 4-Topic: "Electronic and Electrical Engineering"**
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<tr><td>16:30-17:00</td><td>**Test Session 5-Topic: "Medical Information System and Biomedicine"**
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Tips: Please log in the meeting room in the specific test session on time. Oral presentation test: 5 minutes/per paper.

Program-at-a-Glance

Date	Duration	Event	Meeting ID
Oct. 17 Saturday	8:50-9:00	Join in the Meeting Room	**667-7358-9540**
	9:00-9:10	**Opening Remarks** Prof. Mohd Zaid Bin Abdullah, Universiti Sains Malaysia,Malaysia	
	9:10-9:50	**Keynote Speech I** Prof. Masahiro Fujita, The University of Tokyo, Japan	
	9:50-10:30	**Keynote Speech II** Prof. Lihua Xie, Nanyang Technological University, Singapore	
	10:30-10:40	Break	
	10:40-11:20	**Keynote Speaker III** Dr. Takehito Ogata, Center for Technology Innovation – Controls, R&D Group, Hitachi, Ltd., Japan	
	11:20-12:00	**Keynote Speaker IV** Prof. TSUI Kwok-Wing Stephen, The Chinese University of Hong Kong, Hong Kong	
	12:00-13:30	Break	
	13:30-13:50	**Invited Speaker I** Prof. Hirohide Haga, Doshisha University, Japan	
	13:50-14:10	Break	
	14:10-16:10	**Session 1-Topic: "Medical Imaging and Image Processing"** Y2003, Y2004, Y2006, Y2007, O0018, Y2009, Y2010, O2002	
	16:10-16:30	Break	
	16:30-18:00	**Session 2-Topic: "Bioinformatics and Computational Biology"** O0006, O0012, Y3002, O0004, O0013, O0015	
	8:50-18:00	**Back up Room for Q&A**	**619-5238-1323**

Tips: Please log in the meeting room in the specific fomal session on time.

Program-at-a-Glance

Date	Duration	Event	Meeting ID
		Formal Session Schedule	
Oct. 18 Sunday	9:30-12:00	**Session 3-Topic: "Biomedical Signal and Image Processing"** Y2005, O2001, O0002, O0008, O0005, O0011, O0014, O1001, O0019, O0020	**667-7358-9540**
	12:00-13:15	Break	
	13:15-16:15	**Session 4-Topic: "Electronic and Electrical Engineering"** Y0014, Y0001, Y1001, Y0002, Y0005, Y0004, Y1002, Y0003, Y0007, Y0012, Y0013, Y0011	
	16:15-16:30	Break	
	16:30-18:00	**Session 5-Topic: "Medical Information System and Biomedicine"** Y0008, O0009, O1002, O1004, O0010, O1007	
	18:00-18:10	**Closing Ceremony** Prof. Wuqiang Yang, The University of Manchester, UK	
	9:30-18:00	**Back up Room for Q&A**	**619-5238-1323**

Tips: Please log in the meeting room in the specific fomal session on time.

Conference Chair

Prof. Mohd Zaid Bin Abdullah
Universiti Sains Malaysia, Malaysia

M. Z. Abdullah graduated from Universiti Sains Malaysia (USM) with a B. App. Sc. degree in Electronic in 1986 before joining Hitachi Semiconductor as a test engineer. In 1989, he commenced an M.Sc. in Instrument Design and Application at University of Manchester Institute of Science and Technology, UK. He remained in Manchester conducting research in Electrical Impedance Tomography at the same university, and received his Ph.D. degree in 1993. He joined USM in the same year. His research interests include microwave tomography, digital imaging, and ultra-wide band sensing. He has published numerous research articles in international journals and conference proceedings. One of his papers was awarded The Senior Moulton medal for the best article published by the Institute of Chemical Engineering in 2002. Presently he is director of the Collaborative Microelectronic Design Excellence Centre (CEDEC), Universiti Sains Malaysia.

Keynote Speaker I

Prof. Masahiro Fujita
The University of Tokyo, Japan

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

Speech Title: "Circuit-Compiler Co-Design for AI Systems"

Abstract—There have been significant researches on the new development of specialized circuits for efficient AI system processing such as neural electric circuits on one hand, and specialized parallel processing compilation on the others. So far they are somehow separately researched and developed. In this talk we try to establish a co-design and development methodology that can simultaneously optimize circuits as well as parallel processing on top of them. Taking examples in convolutional neural networks and self-attention mechanisms in transformers, we show that such co-design methodology can fully optimize the target AI systems, which is impossible through individual optimizations. The proposed design methodology can make it possible to develop highly efficient edge devices for AI sytems.

Keynote Speaker II

Presentation Time: 9:50-10:30, Oct 17, 2020 (GMT+8:00)
Meeting ID: 667-7358-9540

Prof. Lihua Xie, Fellow of IEEE and IFAC
Nanyang Technological University, Singapore

Lihua Xie received the Ph.D. degree in electrical engineering from the University of Newcastle, Australia, in 1992. He was a faculty with the Department of Automatic Control, Nanjing University of Science and Technology from 1986 to 1989. Since 1992, he has been with the School of Electrical and Electronic Engineering, Nanyang Technological University, Singapore, where he is currently a professor and the Director of the Delta-NTU Corporate Laboratory for Cyber-Physical Systems. He served as the Head of Division of Control and Instrumentation from July 2011 to June 2014. His research areas include robust control, networked control, compressive sensing, localization and unmanned systems. He has been listed as a highly cited researcher by Thomson Routers and Clarivate Analytics annually since 2014. He is currently an Editor-in-Chief of Unmanned Systems and Associate Editor of IEEE Transactions on Control of Network Systems. He has served as an Editor of IET Book Series on Control and Associate Editor of IEEE Transactions on Automatic Control, IEEE Transactions on Control Systems Technology, Automatica, IEEE Transactions on Circuits and Systems-II, etc. He was an IEEE Distinguished Lecturer (2011-2014) and an elected member of the Board of Governors of IEEE Control System Society (Jan. 2016- Dec. 2018). He is Fellow of IEEE, Fellow of IFAC, and Fellow of Academy of Engineering Singapore.

Speech Title: "Localization and Control in GPS Denied Environment"

Abstract—The capability of localization is of great importance for many applications such as Internet of Things and operation of unmanned systems. GPS has been widely used for positioning and navigation. However, in indoor environments and many outdoor environments such as urban canon and forest, GPS may not be available or unreliable. Hence, it has been a lot of interest in developing technologies and algorithms for localization in such environments. In this talk, we shall discuss some recent research on this topic. We shall discuss localization leveraging on various technologies including WiFi, UWB and vision. In particular, we shall introduce WiFi based indoor positioning and activity recognition as well as recently developed distance based cooperative localization including consensus based approach and graph optimization based approach, leveraging on UWB technologies. We shall also discuss an integrated visual-inertial-UWB system for mapping and localization with applications in logistics and structure inspection.

Keynote Speaker III

Dr. Takehito Ogata
Center for Technology Innovation – Controls,
R&D Group, Hitachi, Ltd., Japan

Dr. Takehito Ogata is a Senior Researcher and Unit Leader of the Transportation System Control Research Department, Center for Technology Innovation – Controls, R&D Group, Hitachi, Ltd. He has started his career in Hitachi since 2007, and he has been working on several projects for the development of Advanced Driver Assistance System, Autonomous Parking System and Autonomous Driving System. His main contribution in these projects included the development of the robust environment recognition system using vision-based sensors. He received his Ph.D. from Faculty of Engineering at Kyushu Institute of Technology. He was a visiting researcher at the Centre for Vision, Speech and Signal Processing, in the University of Surrey during 2005. His research theme in KIT was on vision-based human activity recognition. His current research interests include computer vision, sensor fusion and machine learning.

Speech Title: "Vision-based Environment Recognition for Smart Mobility"

Abstract—It is no doubt that the invention of automobiles has changed our lives more comfortable and convenient. However, it also has brought one of the serious social problems to solve - the traffic accidents. The Advanced Driver Assistance System (ADAS), or the Autonomous Driving (AD) system, is expected to reduce fatalities and injuries caused by traffic accidents by substituting or supporting drivers' role of sense, think and act. One of the essential issues to realize such system is how the system recognizes the surrounding environment. Vision based sensors such as cameras are widely used as front sensing cameras to prevent collision, or rear-view cameras to support drivers' sight while parking, because they are known as low-cost yet high-resolution sensors. However, in the same time, vision-based sensors are also known as difficult sensors to realize stable performance under various conditions. This talk will present some of our research & development results of vision-based environment recognition technologies regarding to AD/ADAS development.

Keynote Speaker IV

Prof. TSUI Kwok-Wing Stephen
The Chinese University of Hong Kong, Hong Kong

TSUI Kwok-Wing Stephen is currently a Professor in the School of Biomedical Sciences, the Head of Division of Genomics and Bioinformatics and the Director of Hong Kong Bioinformatics Centre in the Chinese University of Hong Kong (CUHK). In 1995, he received his PhD degree in Biochemistry at CUHK. He was then appointed as an Assistant Professor in the Biochemistry Department in 1997 and promoted to the professorship in 2004. He was also a former member of the International HapMap Consortium and worked on the single nucleotide polymorphisms of human chromosome 3p. During the SARS outbreak in 2003, his team was one of the earliest teams that cracked the complete genome of the SARS-coronavirus. Totally, he has published more than 220 scientific papers in international journals, including Nature, NEJM, Lancet, PNAS, Circulation, JACI and Genome Biology. His major research interests are next generation sequencing, bioinformatics, human genetic diseases and molecular microbiology.

Topic: "Genomic Study of Dust Mites Reveals Novel Allergens Involved in
Human Allergic Diseases"

Abstract—We generalize the classic Scheffe Theorem, that will be applied to normal vectors with covariance matrix $\delta^2 C$; known up to δ^2; independent from S; being S the product by δ^2 of a central chi-square. Namely, C may be not invertible. We obtain confidence ellipsoids and simultaneous confidence in-tervals, through duality. These confidence intervals will be used to "refine" F tests for fixed effects models. The asymptotic version of these results will be obtained using the continuous mapping theorem. Lastly we consider the case of the singular multinomial distribution.

Invited Speaker I

Prof. Hirohide Haga
Doshisha University, Japan

Hirohide Haga was born in 1954 in Kyoto, Japan. He received his B.Eng and M.Eng from Doshisha University in electrical engineering and Ph.D. in computer science from Kyoto University in 1978, 1980, and 1994 respectively. In 1980, he joined to Hitachi, Ltd., one of the leading computer companies in Japanese where he was a research staff of computer software. In 1994, he moved from Hitachi to Doshisha University. Currently he is a full professor of computer science at Faculty of Science and Engineering, Doshisha University. He held several visiting positions (visiting scholar, visiting professor, and invited professor) at Imperial College of Science and Technology, University of London (UK), University of Oulu (Finland), Cambridge University (UK), École Centrale de Lille (France), and CentraleSupélec (France). He is a member of IEEE, ACM, BCS (British Computer Society), and IEICE-J (Institute of Electronics, Information, and Communication Engineer-Japan). His research interests include Software Engineering, Multi-Agent System, highly secure and reliable database system (Blockchain technology), and Digital Art. He was honored as a Chartered IT Professional from BCS.

Title: Simulating Physical and Social Phenomenon by Agent-based Modeling (ABM)

Abstract—In this talk, I will provide some examples of simulating physical and social phenomenon by Agent-based Modeling and emphasize the advantages of it. With the progress of computer hardware and software, simulation becomes very popular in science and engineering. To simulate the target system, some equations which describe the target system with enough precision must be established. Then these equations, such as algebraic or differential equations, are solved analytically or numerically. However, when we want to simulate social phenomenon, it is virtually impossible to write these equations. Therefore, simulating the social phenomenon was hard or sometimes impossible. But now we have a new simulation method named Agent-based Simulation (ABM). In ABM, the target system is described by the set of agents, which are autonomous software entities, and environment (space). Agents can interact to each other and to environment. Each agent has its own rules for interaction. These rules only describe microscopic (local) action. However, these microscopic rules emerge the macro-level phenomenon in the target system. In ABM, no global equation is necessary, instead, local rules are necessary. Usually describing local rules is easier than describing global rules.

Detailed Program for Oral Session

Session 1: Medical Imaging and Image Processing

Time: 14:10-16:10, Oct. 17, 2020 (Saturday)

Greenwich Mean Time (GMT+08:00) – China Local Time

Meeting ID: 667-7358-9540

Session Chair: Prof. Haifeng Zhao, Anhui University, China

S1-1	Y2003 14:10-14:25	Automatic Classification of Respiratory Sounds Based on Convolutional Neural Network with Multi Images **Koki Minami**, Huimin Lu, Tohru Kamiya, Shingo Mabu and Shoji Kido Kyushu Institute of Technology, Japan *Abstract*—Auscultation of respiratory sounds is very important for screening the respiratory disease. However, there is no quantitative evaluation method for the diagnosis of respiratory sounds until now. It is necessary to develop a system to support the diagnosis of respiratory sounds. We describe an algorithm for the automatic classification of the respiratory sounds as containing crackles, containing wheeze, containing both, and normal. Our approach consists of two major components. Firstly, transformation of one-dimensional signals into two-dimensional time-frequency representation images which called spectrogram, scalogram, mel-spectrogram and formant map. Secondly, classification of transferred images using convolutional neural networks (CNN), and all images are input to CNN. In this paper, we apply our proposed method to respiratory sound data, and achieve sensitivity of 47.4%, specificity of 66.8%, average score of 57.1% and harmonic score of 55.3%.
S1-2	Y2004 14:25-14:40	Linear Reconstruction Techniques Applied to Scattering Media **Benjamin T. Cecchetto** and James Stewart Queen's University, Canada *Abstract*—The goal of reconstruction or tomographic techniques is to solve for material parameters from boundary information. Linear reconstruction techniques such as ART or SIRT are desirable because of their efficient performance. The derivation of these methods do not take into account scattering media, which is non-linear in nature. We present a summary of linear reconstruction techniques applied to scattering media. We also evaluate using photon distributions as a novel algebraic reconstruction technique matrix.We show the clear benefit of using the randomized reconstruction techniques with many passes over their non-randomized counterparts. We show a marginal improvement in all linear reconstruction techniques with a moderate amount of scattering. We also demonstrate the poor performance of the linear techniques with scattering media, even when using known photon distributions.
S1-3	Y2007 14:40-14:55	Monocular-based Drivable Area Segmentation by Fusing 3-D and Texture Information **Takehito Ogata** Center for Technology Innovation-Controls, R&D Group, Hitachi, Ltd., Hitachi, Japan. *Abstract*—In this paper, a monocular camera based drivable area segmentation algorithm is described. The feature-point based motion stereo algorithm is a well-known method to measure 3D environment by

		using Monocular-camera. However, one of the disadvantages of this algorithm is that it is not suitable to measure 3D information of the area around the traveling direction and non-texture area (e.g. road surface). It is important to know, 3D measurement of the traveling direction and road surface are critical for the driving assistance system. In this paper, we propose the unique drivable area segmentation algorithm. One of its uniqueness is that it combines 3D information of feature points calculated from motion stereo, and segmentation based on similarity of grid-based texture feature. We implement this algorithm in automotive embedded SoC and evaluate various situations.
S1-4	Y2006 14:55-15:10	Reconstruction of Heterogeneous Scattering Media Using Stochastic Search **Benjamin T. Cecchetto** and James Stewart Queen's University, Canada *Abstract*—A heterogeneous scattering medium has different material properties in different areas. For such a medium, we present an algorithm to reconstruct the interior materials frommeasurements of light at the boundary of themedium. The algorithm uses a novel hierarchical stochastic search over the space of materials to find an arrangement of inner materials that best matches the boundary conditions. The algorithm performs a combination of depth- and breadthfirst search, choosing random permutations of materials at each step. Validation is performed with a variety of difficult material combinations. We have shown the proposed algorithm is capable of reconstructing a variety of heterogeneous media over the full domain of Henyey-Greenstein materials if the materials are known a priori. We have also demonstrated the algorithm's capability to reconstruct the same materials without knowing the materials a priori.
S1-5	O0018 15:10-15:25	Improved Traumatic Brain Injury Classification Approach Based on Deep Learning **Chao Gan**, Dengdi Sun, Kangli Qin and Haifeng Zhao Anhui University, China *Abstract*—Despite medical imaging diagnosis has made significant progress,accurate imaging diagnosis of traumatic brain injury (TBI) still remains a challenging task because of the extremely complex and diverse brain images in TBI. Deep learning has been proved to be an effective way for boosting medical image analysis performance. However, the current research in this direction is limited by the lack of a comprehensive TBI image dataset. This work contributes a new CT image dataset suitable for the detection of TBI, which includes 226 (TBI/normal: 175/51) subjects, 6780 slices in a hospital with a CT scan of the head and their ground truth classifications for TBI detection purpose given by the experienced radiologist. With this dataset, we propose a novel imaging diagnosis model of TBI based on convolutional neural network (CNN) combined with recurrent neural network (RNN) and embedded squeeze-and-excitation (SE) module. Besides, we introduce transfer learning to avoid the problems of local optimization and data insufficiency.Experimental results show that our model achieves 95.9%

		accuracy on the classification task of predicting whether there is damage at the slice level, which is more accurate than other commonly used classification networks. We believe that our current work can help doctors make a further clinical diagnosis.
S1-6	O2002 15:25-15:40	Clustering Based Low Dose Cerebral Computed Tomography Perfusion Spatio-temporal Restoration **Fan Shengyu**, Bian Yueyan and Kang Yan Northeast University, China *Abstract*—CT perfusion (CTP) is a common scanning type for the diagnosis of acute stroke. Dynamic 4D data are obtained by scanning the same region of interest for time series volumetric acquisition. Usually, the scanning dose is low, which leads to serious image noise and the quality of follow-up hemodynamic parameter processing decreases. In order to solve this problem, this paper proposes a clustering based cerebral CTP data spatio-temporal restoration algorithm, CSFT, and carries out experiments on the generated digital phantom and clinical data, then the result was compared with the widely used mean filtering method, STV method and VBM4D method. For digital phantom, PSNR and SSIM, mean value and standard deviation of restored noise were compared with the ground truth of digital phantom, time density curve and hemodynamic parameter map are also compared respectively. The same comparison was made for clinical data, except that the PSNR and SSIM reference images were raw noise images instead of the ground truth. For digital phantom, The PSNR of CSFT algorithm reached 38.22, while the original noisy data was only 27.40, SSIM reached 0.8311, the noise mean was -0.033, very close to 0, the noise standard deviation was 2.047, only 19.47% of the standard deviation of artificially added noise. For clinical data, The PSNR of CSFT algorithm reached 45.58, SSIM reached 0.8835, the mean noise value was 0.0242, which was very close to 0, and the standard deviation of noise was 8.936. Experiments show that CSFT can effectively restore low-dose cerebral CTP data when CT perfusion data with serious low-dose noise.
S1-7	Y2009 15:40-15:55	Asymmetric Encode-Decode Network With Two Decoding Paths For Skin Lesion Segmentation **Kangli Qin**, Dd Sun, Sj Zhang and Hf Zhao Anhui University, China *Abstract*—Automated skin lesion segmentation is an important and challenging task. Due to the fact that the edges of melanomas are uneven and the color changes constantly, some may have image artifacts. Most of the existing segmentation methods are based on the encode-decode network, which often cannot effectively combine low-level simple features with high-level semantic features, thereby improving the final segmentation results. In this paper, we propose a novel encode-decode network with two asymmetric decoding paths, which can better fuse low-level and high-level features. In our architecture, multi-scale features can be captured through our proposed New Dense Atrous Convolution (NDAC) block, and the re-designed skip pathways can transmit more

		representative features from the encoder to the decoder. Experimental results conducted on ISBI 2017 Skin Lesion Challenge dataset show that our model outperforms other state-of-the-art deep learning-based methods.
S1-8	Y2010 15:55-16:10	Alzheimer's disease classification using capsule networks on structural MRI **Al-Farabi Z. Nagashbayev** and M. Fatih Demirci Nazarbayev University, Kazakhstan *Abstract*—Alzheimer's disease (AD) is the most prevalent cause of dementia among elderly people. This paper presents a deep learning model based on capsule networks for the classification of AD and Normal Control (NC) using MRI images taken from the ADNI dataset. Our framework introduces several modifications to the original capsule networks in order to significantly reduce the number of trainable parameters so that it can be implemented in computers with limited GPU while obtaining comparable results with the literature. According to the overall results of subject independent and subject dependent experiments, the proposed framework compares favorably with many existing approaches while having fewer parameters and/or using a smaller number of MRI images in AD and NC classes.

Break Time: 16:10-16:30

Detailed Program for Oral Session

Session 2: Bioinformatics and Computational Biology

Time: 16:30-18:00, Oct. 17, 2020 (Saturday)
Greenwich Mean Time (GMT+08:00) –China Local Time
Meeting ID: 667-7358-9540
Session Chair: Prof. Yinglei Song, Jiangsu University of Science and Technology, China

S2-1	O0006 16:30-16:45	Characteristics and Identification of *Agkistrodon acutus* Guenther Fingerprinting by RAPD with HPCE for Authentication Based on Bioinformatics **Tonghui Liu**, Xiangyu Meng and Mingcheng Li Jilin Vocational College Ind. &Tech., China *Abstract*—*Agkistrodon acutus* Guenther is a rare traditional Chinese medicine (TCM) herb. Traditional use of *Agkistrodon acutus* Guenther as a kind of medicine and health food has been widely documented in China. DNA fingerprinting technology is used to identify species at the molecular level. In the present study, we amplified the mitochondrial cytochrome b (Cyt b) of *Agkistrodona cutus* Guenther by random amplified DNA polymorphism (RAPD). Afterwards, the amplified products were detected by non-gel sieving capillary electrophoresis (NCE) with ultraviolet detection, and HPCE-RAPD fingerprinting of *Agkistrodona cutus* Guenther was established. Meanwhile, the factors affecting PCR amplification and capillary electrophoresis were optimized. Under the optimal conditions of 20 mmol/L NaH_2PO_4-Na_2HPO_4-2 mmol/L EDTA buffer solution [0.8% (W/V) HPMC, 15 mmol/L TBAP, pH 7.3], injection voltage -10 KV, separation voltage -8 KV, *Agkistrodona cutus* Guenther, counterfeits, and commercially available samples were analyzed. The obtained fingerprints were analyzed for similarity, and it was found that the fingerprint similarity of different *Agkistrodona cutus* Guenther samples was significantly different, which could be used for rapid identification of *Agkistrodona cutus* Guenther samples including various counterfeit. HPCE fingerprinting combined with RAPD technique has the advantages of a rich polymorphism, a high detection rate, simple technique and high efficiency, rapidity and sensitivity of capillary electrophoresis, which is suitable for the rapid identification of *Agkistrodona cutus* Guenther and its counterfeit products. Through further study, this assay proposed in this study can also be widely used for the rapid identification of other miscible TCM materials.
S2-2	O0012 16:45-17:00	Building Random Forest QSAR Models for Affinity Identification of 14-3-3 ζ with Optimized Parameters Ying Fan, Xiaojun Wang and **Chao Wang** Hong Kong Baptist University, China *Abstract*—14-3-3s present in multiple isoforms in human cells and mediate signal transduction by binding to phosphoserine-containing proteins. Previous studies demonstrate that the isoform 14-3-3 ζ acts as a key factor in promoting chemoresistance of cancer. Here, our work is

		devoted to developing the predictive models that can determine the binding affinity of phosphopeptide fragments against 14-3-3 ζ by the random forest approach. Based on the variable matrix built by the simple descriptors DPPS and statistical methods coupled with optimized hyperparameters, the robust models are obtained by a combinatorial peptide microarray dataset ($n = 385$ for N-terminal sublibrary, $n = 384$ for C-terminal sublibrary). For the test set, the R^2 and RMSE are 0.8532 and 0.4516 at the N-terminal sublibrary ($n = 96$) and are 0.7998 and 0.5929 at the C-terminal sublibrary ($n = 94$), respectively. We also find that the distinct physiochemical properties function on the 14-3-3 ζ interaction. Overall, our results demonstrate that the computational methods based on QSAR analysis can be used for building the predictive models on the binding affinity of phosphopeptide against 14-3-3 ζ and contribute to the further research on clinical research.
S2-3	Y3002 17:00-17:15	Review of Face Recognition Algorithms **Yifan Wei** Beijing Huijia Private School, China *Abstract*—Face detection is one of the most relevant applications of image processing and biometric systems. In this paper, we summarized the procedure of face recognition and some common methods, including the face recognition based on Hidden Markov Model, geometrical features, and template matching. Hidden Markov Model mainly helps to discover the statistic relationship between each state to help with the face recognition; geometric feature of face images provides the information of the different parts on faces to help the identification process; and the face recognition based on template matching uses templates of different face regions to help with the face matching process.
S2-4	O0004 17:15-17:30	m6ABRP: Predicting m^6A-YTHDF2 Binding Regions via Sequence-based Properties **Ze Liu**, Jinghui Xu, Xiuli Mao, Jianzhao Qi and Quanwu Li Northwest A&F University, China *Abstract*—m^6A plays important roles in cell differentiation and tissue development via selectively binding with the YTH-containing proteins. However, the mechanism of the selectively binding events is largely unknown. The precise prediction of m^6A-YTH binding regions across the transcriptome will be helpful to learn the molecular basis of m^6A selectively binding with the YTH-containing proteins. In this study, we developed a machine learning-based model, named m6ABRP, for predicting m^6A-YTHDF2 binding regions. Sequence-based features were extracted and five different algorithms, Support vector machine (SVM), RandomForest, ExtraTrees, GradientBoosting and AdaBoost, were implemented for model training. Among them, the SVM-based model received the best AUC of 0.920 on the training dataset using five-fold cross validation and received the best AUC of 0.910 on the independent test dataset. The results suggest that m6ABRP is a powerful tool for predicting m^6A-YTHDF2 binding regions.

Detailed Program for Oral Session

S2-5	O0013 17:30-17:45	SCNMLRR: Single Cell Clustering Based on Low-rank Non-negative Matrix Factorization **Xin Wei**, Yibo Zhuang, Xiaohui Wu and Guoli Ji Xiamen University, China *Abstract*—Single-cell RNA sequencing (scRNA-seq) aims at profiling single cells in a cell population by the sequencing of whole genome expression data. scRNA-seq data has high noise, high dimensionality, and high sparsity, challenging the identification of cell types for cells with high heterogeneity and diversity. Currently, there are many clustering algorithms for scRNA-seq data. Generally, majority of clustering algorithms group cells by similarity measures. In this study, we proposed a new method called SCNMLRR for similarity measurement, which is based on non-negative matrix factorization and low-rank representation. Using SCNMLRR with spectral clustering, we performed clustering on several scRNA-seq datasets and compared it with different clustering algorithms under different similarity measures. Results showed that SCNMLRR achieved higher performance in terms of various performance indicators.
S2-6	O0015 17:45-18:00	Screening Potential Biomarkers of Breast Cancer Based on Bioinformatics **Liu Wenjia**, Ying Nanjiao, Mo Qiusi and Zhu Lei *Abstract*—Breast cancer (BRCA) is a common cancer, and incidence is highest among women with cancer. This study chose gene expression profile of GSE65194, GSE42568, GSE7904 and GSE10810 from GEO databases aiming to screen potential biomarkers of breast cancer. Including 393 samples, 331 cancer samples and 62 normal samples. Differentially expressed genes (DEGs) from four groups between BRCA samples and normal samples were selected out, then 150 common DEGs were detected, including 37 upregulated genes and 113 downregulated genes. Next this study used Database for Annotation Visualization and Integrated Discovery (DAVID) performed Gene Ontology (GO) and Kyoto Encyclopedia of Gene and Genomes (KEGG) pathway analysis. Moreover, we selected 15 core genes with high connectivity, including CCNB1, CDC20, BUB1B, AURKA, CDK1 and RRM2. The Kaplan Meier plotter (KM plotter) analyzed these six core genes survival rate. Finally, this study analyzed that all six genes were significantly expressed in BRCA. In conclusion, the bioinformatics analysis demonstrated that the six core genes CCNB1, CDK1, BUB1B, CDC20, AURKA and RRM2 might promote the development of BRCA, that could became new biomarkers for diagnosis and medications of BRCA.

Detailed Program for Oral Session

Session 3: Biomedical Signal and Image Processing

Time: 9:30-12:00, Oct. 18, 2020 (Sunday)
Greenwich Mean Time (GMT+08:00) – China Local Time
Meeting ID: 667-7358-9540
Session Chair: Assoc. Prof. Henry Yang, National University of Singapore, Singapore

S3-1	Y2005 9:30-9:45	Signal-to-Noise Ratio Improvement Using Multiplexed Illumination with Scattering Media **Benjamin T. Cecchetto** and James Stewart Queen's University, Canada *Abstract*—Empirical measurement of the attenuation of a light ray (i.e. a laser beam) through a scattering medium is challenging because the radiance of the exiting light is near the noise floor of the detector. The SNR can be improved with multiplexed illumination, where several different rays are sent simultaneously resulting in much higher outgoing radiance. The contribution of an individual ray is determined by solving a linear system. We perform an experiment to determine the empirical improvement in SNR using multiplexed illumination in place of single-ray illumination. The experiment shows that the empirical improvement does not followthe predicted theoretical improvement.
S3-2	O2001 9:45-10:00	Temporal-Spatial-Frequency Feature Selection of Brain-Computer Interface Based on BQPSO **Li Wang**, Zhenxiong Yan and Yanjun Liu Guangzhou University, China *Abstract*—The electroencephalography (EEG) signals can be identified and translated into control commands by brain-computer interface (BCI) systems. To improve the recognition results of the EEG signals, a temporal-spatial-frequency feature selection model based on binary quantum particle swarm optimization (BQPSO) is proposed. The signals are firstly divided into six segments according to time, and then they are bandpass filtered into six different frequency ranges, respectively. Temporal-spatial-frequency features are extracted by common spatial pattern (CSP). After selecting by BQPSO, the optimized features are classified by extreme learning machine. Two different data sets are used to validate the proposed model, and their average classification results are 84.7% and 81.4%, respectively. Compared with other feature selection algorithms, our proposed model achieves the best results. Better classification results can be obtained by the appropriate feature selection algorithm.
S3-3	O0002 10:00-10:15	Hybrid Automated Brain Tumor Detection by Using FKM, KFCM Algorithm with Skull Stripping **Imran Javaid**, Shuai Zhang, Abd El Kader Isselmou, Isah Salim Ahmad, Souha Kamhi and Ummay Kulsum Hebei University of Technology, China

Abstract—Brain tumor detection from MRI images is a time consuming and precarious task due to irregular characteristics of tumor tissue image segmentation. In MR images permit convincing evidence and play a decisive part in diagnosing the different kinds of tumors. The segmentation recognition and extraction of tumor area from (MRI) magnetic resonance image are an initial interest. The clinical or radiologist specialists performed a time-consuming and tedious task but their precision relies on their experience. Therefore, the usage of computer-aided expertise becomes mandatory to overcome that limitation. A sophisticated fully automated tumor recognition system is proposed to have the maximum accuracy, specificity and sensitivity with a minimum error rate, computational time and competently extract tumor from MRI images. The current study emphases on tumor and edema segmentation that is built on kernel-based fuzzy C-means and skull stripping method. The clustering method amended by merging multiple kernels established on spatial information. Furthermore, once the acquired image is de-noised the automated brain tumor recognition algorithm stripped the outer boundaries of the irrelevant tissue and then the segmentation algorithm is applied to extract the tumor area precisely. For analysis and recording of the experimental result, hundred MRI images are used. The algorithm in the current study is compared and after the experimental result, the algorithms certify having the detection of brain tumor with accuracy i.e. 98.7%, specificity 90.0%, sensitivity 92.8% with minimum error rate 0.002% given by the improved algorithm KFCM while the minimum computation time i.e. 1.64 seconds achieved by Fuzzy K-means (FKM).

S3-4	O0008 10:15-10:30	Multi-scale Hierarchy Feature Fusion Generative Adversarial Network for Low-Dose CT Denoising **Ying bai**, Haifeng Zhao, Shaojie Zhang, Dong Nie and Zhenyu Tang Anhui University, China

Ying bai, Haifeng Zhao, Shaojie Zhang, Dong Nie and Zhenyu Tang
Anhui University, China

Abstract—Image noise is an inherent issue in low-dose CT (LDCT). Increasing radiation dose can alleviate this problem to some extent, but it also brings potential risks to the patients. Thus, LDCT denoising has raised increasing attention from researchers. Currently, many deep learning based LDCT denoising methods have been proposed with success, such as encoder-decoder. In this paper, we propose a novel multi-scale hierarchy feature fusion based encoder-decoder network within the GAN framework for LDCT denoising. Specifically, a four-stage multi-scale dilated blocks is introduced to integrate low-level features with high-level features. Comparing with the conventional skip connection, which ignores the semantic gap between low-level features and high-level features, the advantage of our method is the effective use of low-level information. In addition, residual learning is also adopted to boost the training of the network. Experimental results on public dataset have demonstrated the superiority of our method over the state-of-the-art methods under comparison in both visual quality and quantitative evaluation.

S3-5	O0005	Boundary-attention Loss Function in Neural Network for Pathological Lymph Nodes Segmentation based on PET/CT Images

Detailed Program for Oral Session

	10:30-10:45	**Guoping Xu**, Hanqiang Cao and Guoxing Jiang Huazhong University of Science and technology, China *Abstract*—Automated Lymph Node (LN) detection and segmentation are essential for cancer staging. Positron emission tomography (PET) and computed tomography (CT) imaging are routinely used to detect pathological LNs in clinical. Yet, it is still a difficult task for LN segmentation owing to its low contrast as well as surrounding soft tissues and the variation in nodal size and shape. Deep convolutional neural networks have been widely employed to segment objects in medical images, which choice cross-entropy as loss function. However, it did not consider the severe class imbalance between pathological LNs and the background. Keeping this in mind, we, firstly, present a novel boundary-aware cross-entropy (*BCE*) loss function, which could up-weight the boundary voxels of LNs. Moreover, we investigate the behavior of multiple loss functions for LNs segmentation, such as cross-entropy loss (*CE*), focal loss (*FL*), and generalized Dice loss (*GDL*). Lastly, we propose a novel strategy that combines *BCE*, *CE* and *FL* loss function with *GDL* respectively, which could exploit the class re-balancing properties of the *GDL* for imbalanced category labels between LNs and background. We find that combination of *BCE* loss function with *GDL* could alleviate the problem of imbalance of category labels. Four-fold cross validations have been done on 63 volumes containing 214 malignant lymph nodes shows that the combination of *BCE* loss function with *GDL* achieved the sensitivity 90% and 85%, and Dice 75% and 77% on SegNet and DeepLabv3+ architecture respectively.
S3-6	O0011 10:45-11:00	A Pipeline to Identify Novel 3' UTRs and Widespread Intergenic Transcription by Combination of Polyadenylation Sites and RNA-seq Data **Hongjuan Fu**, Yibo Zhuang, Xiaohui Wu and Guoli Ji Xiamen University, China *Abstract*—Recent genomic studies continue to uncover widespread occurrences of polyadenylation poly(A) sites in presumed intergenic regions, providing new opportunities to investigate the complex of 3' untranslated regions and intergenic transcription. Here we developed a pipeline to detect novel 3' UTRs, novel genes, and intergenic transcribed units by combining real and predicted poly(A) sites, archival ESTs, and RNA-seq data. Using data from *Medicago truncatula*, a model organism for legume biology, more than 3100 novel 3' UTRs were identified, including 1932 normal 3' UTRs averaging 1482 nt in length and 1261 distal 3' UTRs each with elongation $\geq$ 5000 nt. Up to 632 novel genes and 12,765 intergenic transcribed units in previously uncharacterized intergenic regions were discovered. These new 3' UTRs, novel genes, and intergenic transcribed units substantially extend the scope of plant transcriptome and should be incorporated into current *M. truncatula* genome annotation for more comprehensive genomic study, e.g., searching microRNA targets or other regulatory elements.

Detailed Program for Oral Session

S3-7	O0014 11:00-11:15	Brain Image Parcellation Using Fully Convolutional Network with Adaptively Selected Features from Brain Atlases **Xiao Zhang**, Haifeng Zhao, Zhenyu Tang and Shaojie Zhang Anhui University, China *Abstract*—Brain image parcellation is an important data processing step in neuroscience. Since multi-atlas based parcellation (MAP) uses prior information from brain atlases (i.e., manually labeled brain regions), it can provide accurate brain parcellation and has been widely adopted. Recently, some deep learning based brain image parcellation (DLP) methods using fully convolutional network (FCN) have been proposed. Compared with MAP, DLP has high computational efficiency, making it more applicable in practice. However, existing DLP methods either neglect or partially utilize brain atlases, making it difficult to get comparable parcellation accuracy as MAP. In this paper, we propose a new DLP method which is able to use brain atlases in an effective way. The network is based on FCN and non-local block based channel attention module (NL module). The input of our network is the target brain image to be parcellated as well as available brain atlases, and the parcellation result is produced through the FCN guided by the features of brain atlases selected by NL modules at different scales. In the experiments using two public MR brain image datasets (LPBA40 and NIREP-NA0), our method outperforms MAP and the state-of-the-art DLP methods due to the effective usage of brain atlases.
S3-8	O1001 11:15-11:30	Applications of Nanomaterials in Combined Antitumor Therapy **Sai Liu** Hubei University of Chinese Medicine, China *Abstract*—Cancer has historically been a significant problem in the world. Traditional clinical strategies for treating tumors including chemotherapy, radiation therapy, surgery. Currently, some novel anti-cancer therapeutics such as immunotherapy, photodynamic therapy (PDT), photothermal therapy (PTT) also exert a broad prospect. However, though they may inhibit tumors to some extent, due to the poor targeting ability, some of them show side effects and huge individual differences, so limited curative effect still renders the high mortality. Therefore, it was necessary to find some methods to overcome the treatment defects. In recent years, multi-mode combined anti-tumor therapy has shown potential to improve the therapeutic efficacy. But how to deliver drugs of different characteristics to desire sites efficiently and synchronously is an urgent problem. In this review, we discuss the applications of nanotechnology in some new combined anti-tumor therapies, including several new combined therapeutics, the advances of nanocarriers used in multimode combined antitumor therapeutics, and some prevalent nano-materials in combined strategies. Finally, we outline some future trends and limitations of nano-delivery of combined treatments.
S3-9	O0019 11:30-11:45	An Automatic Glioma Segmentation System Based on A Separable Attention U-Net (SAUNet) **Zhenyu Zhang**, Shouwei Gao and Zheng Huang

		Shanghai University, China *Abstract*—With the complicated structure of brains, glioma segmentation is a challenging task. To precisely segment gliomas, U-Net structure is adopted by most current methods. However, the computation complexity of U-Net based method is large. Therefore, a separable attention U-Net, which can reduce the computation complexity without decreasing the performance, is proposed in this paper. Firstly, data augmentation techniques are implemented to enlarge the database and thus avoid over-fitting; Moreover, the separable attention U-Net is constructed for glioma segmentation. The experimental results indicate that the dice similarity coefficient of the proposed separable attention U-Net can reach 0.879 with the parameter number of 4.29 M, which indicates that the proposed glioma segmentation method is of application significance. A single column document that allows authors to type their content into the pre-existing set of paragraph formatting styles applied to the sample placeholder text here. Throughout the document you will find further instructions on how to format your text.
S3-10	O0020 11:45-12:00	The Real Time EEG Phase Locked Feedback Control for Alpha Amplitude and Frequency Regulation: An OpenBCI Implementation **Xinyue Wang**, Shaohui Hou, Li Zhang, Linling Li, Zhen Liang, Zhiguo Zhang Gan Huang Shenzhen University, China *Abstract*—The neural oscillation in electroencephalogram (EEG) signals is highly related to people's psychological cognitive ability. In this work, an OpenBCI version of phase-locked feedback control system has been implemented for real time alpha wave regulation. As compared with the distributed system architecture on Brainamp, PC and Arduino in the previous work, the new proposed system has integrated all the modules for signal acquisition, phase estimation and applying stimulation on one chip. Hence, the delay for signal transmission can be effectively eliminated, which leads to a better accuracy for phase estimation in phase-locked feedback control. The results show the effective of the proposed system to alpha wave regulation.

Break Time: 12:00-13:15

Detailed Program for Oral Session

Session 4: Electronic and Electrical Engineering

Time: 13:15-16:15, Oct. 18, 2020 (Sunday)

Greenwich Mean Time (GMT+08:00) – China Local Time

Meeting ID: 667-7358-9540

Session Chair: Assoc. Prof. Rini Nur. Hasanah, Universitas Brawijaya, Indonesia

S4-1	Y0014 13:15-13:30	Automated Temporary Immersion System for Blueberry and Pineapple **Freedy Sotelo-Valer**, Walter Corvacho-Cárdenas and Hugo Gamarra-Chinchay Universidad Ricardo Palma, Peru *Abstract*—In this work, an automated temporary immersion system was implemented, where blueberry and pineapple were used as test crops, achieving an economic and simple handling system compared to the existing ones. After the corresponding tests, multiplication rates of the explants between 2 and 8 were obtained, reaching a number of sprouts above 100 units, demonstrating the efficiency of the system.
S4-2	Y0001 13:30-13:45	Application and Effect Analysis of Series Reactive Power Compensation in Low Voltage Distribution Network Yongjun Yu, Weifeng Xu, Jinqi Hong, Junmei Weng, Chongkai Cai, Hui Zhao and **Ziang Duanmu** Chongqing University, China *Abstract*—The load terminal voltage at the low voltage side of the distribution network will drop when the user load increases. Thereby affecting the normal operation of the electrical appliance. Currently, the treatment approach to the voltage deviation at the low voltage side of the distribution network is using the Parallel reactive power compensation technology. However, the compensation effect will decrease with the load increases. To solve the above problems, this paper proposes a method for applying series capacitor compensation to the low voltage side of the distribution network. Firstly, the principle of low voltage generation on the low-voltage side of the distribution network is derived. Then introduce the principle of series reactive power compensation method. And according to the actual parameters of the project, simulate the terminal voltage amplitudes and the line current under the different wire types and load rates. Finally, the improvement effect of series reactive power compensation on the low-voltage side power quality of distribution network is analyzed with simulation calculation. The results show that the proposed method has a good control effect on the power quality of the low-voltage side of the distribution network.

Detailed Program for Oral Session

S4-3	Y1001 13:45-14:00	Power System Equivalent Parameters Tracking with PSO Based Optimal Quadratic Form Method **Ganyun Lv**, Chenjie Chu and Yu Zhang Nanjing Institute of Technology, China *Abstract*—The Thevenin equivalent parameters seen at the point of common coupling (PCC) is an important parameter for power system planning and operation, voltage stability. This paper presents a novel algorithm of tracking the power system equivalent parameters online with PSO based optimal quadratic form method, using local measurements at PCC. The algorithm uses three coherent measurements at PCC for impedance estimation without requiring synchronized measurements, and a nonlinear algebraic equation is gotten with three point phasor data. In order to solve the nonlinear equations with good performance, the nonlinear algebraic equation is transformed to an optimal quadratic form then. Later, an optimal quadratic form method based on particle swarm optimization (PSO) is provided for estimating the parameters by constructing the objective function of PSO according to quadratic form. Later, online tracking of equivalent parameters is realized by dynamic PSO estimation method. Verification studies, including calculating of static and dynamic equivalent parameters of the power system, are provided to verify the algorithm with Matlab/Simlink. Moreover, noise condition and error of measurements are investigated. The proposed algorithm has some advantages of convergence, precision and simplicity.
S4-4	Y0002 14:00-14:15	The Detection Method and Test of Generator Imbalance Fault Fu Dong-Liang, **Li Jia-Tong**, Yu Jiong-Min, Shen Yu-Fei and Ye Fei Shanghai Marine Equipment Research Institute, China *Abstract*—Based on techniques of time-domain index feature extraction and principal component analysis (PCA), a method for unbalanced fault diagnosis is proposed in this paper. Five dimensionless factors corresponding to IMF are calculated after the original data is decomposed (EMD) by empirical mode, then the PCA is applied to the data vectors, which are processed by dimensionality reduction and residual space projection. At last, fault diagnosis test of balance loosening was carried out on the test bench of intelligent water supply system. Test results show that, the established PCA model is effective in judging unbalanced faults.
S4-5	Y0005 14:15-14:30	An Improved DC-Link Voltage Control Strategy of SAPF under Unbalanced Loads **Maoning Xu**, Li Peng and Xuefeng Wang Huazhong University of Science and Technology, China *Abstract*—The shunt active power filter (SAPF) based on three-leg voltage source converter is widely used to compensate the harmonic

		currents caused by nonlinear loads of grid. However, when the nonlinear loads are unbalanced, the grid currents compensated by SAPF are still unbalanced and distorted even an accurate current detection method is adopted. The reason is that when SAPF compensates the unbalanced loads of grid, the DC-link voltage will contain the second-order harmonic which has influence on the d-axis reference of SAPF's current control loop. Then the output of the SAPF will contain extra third-order harmonic and fundamental negative sequence currents, which make grid currents distorted and unbalanced. In this paper, in order to overcome the problem of poor filtering and dynamic performance by using traditional PI control for DC-link voltage, a MAF-PI controller which combines a moving average filter (MAF), a phase-lead compensator (PLC) and a PI control into DC-link voltage control loop is proposed. This strategy realizes the accurate harmonic currents compensation and excellent DC-link voltage dynamic response of SAPF for unbalanced loads. The effectiveness of the proposed strategy is verified through simulation results.
S4-6	Y0004 14:30-14:45	3D Optical Encryption System using Merging Reconstruction Method **Jaehoon Lee**, Myungjin Cho, Kotaro Inoue and Min-Chul Lee Kyushu Institute of Technology, Japan *Abstract*—In this paper, we propose a photon-counting double random phase encryption with merging reconstruction. Double random phase encryption (DRPE) is a simple and secure optical encryption technique using phase random masks. To enhance the security level, a three-dimensional photon counting technique has been applied to DRPE. However, we cannot recognize the original image information in a photon-limited scene. To solve this problem, we propose a merging reconstruction method, which can detect the photons using several reconstruction layers. Through this method, we can obtain a decrypted image of enhanced visual quality. This paper presents a simulation test for the proposed method.
S4-7	Y1002 14:45-15:00	Dealing with Intractability of Information System Subsystems Development Order via Control Flow Graph Reducibility **Robert Kudelić** and Kornelije Rabuzin University of Zagreb, Republic of Croatia *Abstract*—When Information System is developed a priority of subsystems evelopment needs to be set. This problem is a more general problem than a well known problem Feedback Arc Set, and is like that problem also computationally hard to solve. Therefore in this paper we have found that real-world instances of Information System can be represented as a Flow Graph, and some of them do admit reducibility. This is significant since for such special cases polynomial and optimal solutions for the Information System Subsystems Development Order problem are achievable. This fact

		was until now unknown, and it broadens the body of knowledge behind the problem of Information System Subsystems Development Order, and other connected computationally hard problems. Such scientific contribution also gives insight into how to cope with Information System development in terms of a problem instance at hand.
S4-8	Y0003 15:00-15:15	A Study on Real-Time Modification of the Refractive Index of A Surrounding Medium Using a Uniform Microsphere In Digital Holographic Microscopy **Hyun-Woo Kim**, Kotaro Inoue, Myungjin Cho and Min-Chul Lee Kyushu Institute of Technology, Japan *Abstract*—An accurate refractive index of the surrounding medium is required to measure the accurate depth of the specimen in digital holographic microscopy (DHM). Many researchers have reported a method that uses blood smear to avoid overlapping of red blood cells (RBCs). Moreover, they have applied the refractive index of the blood plasma. However, the blood smear is not blood plasma, so that it cannot obtain the accurate depth information. In addition, it is difficult to measure the refractive index of the surrounding medium in every experiment. To solve this problem, in this paper, we propose a new method to record a hologram using a sample of a mixture of blood and a uniform microsphere. We have already known the size of the microsphere in the experiment. Thus, we can modify the refractive index of the surrounding medium. Finally, we can measure the accurate depth information of the specimen using the modified refractive index of the surrounding medium. The proposed method can be used not only in RBCs but also in the study of cells or microbial.
S4-9	Y0007 15:15-15:30	The Application of Synchro Transmitter in the Material Distribution Angle Control of a Blast Furnace **Jyh-Ming Chang** and Ming-Yuan Cho National Kaohsiung University of Science and Technology, Taiwan *Abstract*—A material charging system is a critical process in a blast furnace. Raw materials are transported from the stock house to the top of furnace and distributed into the furnace. To put defined amounts of materials into the preset position, the control and detection of angular positions of flow control valves and the distributing chute on the top of the furnace is crucial. A synchro transmitter, used in combination with a synchro indicator, provides remote indication and control of the opening of valves, gates, dampers, and mobile equipment. In the proposed system, the synchro transmitter outputs a three-phase signal. The signal is finally transformed into a digital angular signal. By appropriate PLC control codes, the signal is a mapping of real mechanical angles or traveling length for operation and control. As a real application in a blast furnace, it is proved a robust, environment

		insensitive and stable solution of angle measurement and process control.
S4-10	Y0012 15:30-15:45	Research on EMC Tests of Intelligent Monitoring Devices for Metal-Oxide Surge Arresters **Yue Shen**, Xiaoyan Guo, Quan Sun and Yong Huang Xi'an High Voltage Apparatus Research Institute Co.,Ltd., China *Abstract*—According to the structure and working principle of metal-oxide surge arrester (OMA) intelligent monitoring device (IMD)，this paper analyses the electromagnetic environment of it and obtains the importance and necessity of studying electromagnetic compatibility(EMC) tests. As there is no testing standard basis for the IMD, in this paper the corresponding EMC test requirements, test parameters and test methods are given. Aiming at the problems of the IMD during the EMC tests, the practical anti-interference measures are given to ensure the reliability of the design at the end of the paper. By improving the EMC performance of IMD, the reliability of IMD in harsh high-voltage electromagnetic environment can be ensured. Beyond that, this paper also offers reference for establishing testing standards of the IMD.
S4-11	Y0013 15:45-16:00	Design and Implementation of an Automatic Coffee Dryer **Freedy Sotelo-Valer**, Luis Huamán-Sayán and Ernesto Mamani-Arroyo Universidad Ricardo Palma, Peru *Abstract*—A prototype drying system for coffee grains was developed using an oven with a feedback control system to accomplish this task. The coffee grains enter the system wet and are then subjected to a stable temperature of 45°C, thus achieving uniform drying. As this is an initial version, the container has been sized for 500grs and both the temperature and the drying time have been calculated to guarantee the quality of the drying.
S4-12	Y0011 16:00-16:15	Methodology for Analysis of Gm-C Filters based on Statistical, Fuzzy Logic and Machine Learning Approach **Malinka Ivanova** Technical University of Sofia, Bulgaria *Abstract*—In the paper a new approach for analysis of Gm-C filters is presented that is suitable for automation of some engineering tasks and integration in CAD tools. The proposed methodology includes data gathering through simulation and circuit mathematical description, utilization of statistical experimental design technique, fuzzy logic method and machine learning algorithm. It is verified through analysis of a low pass Gm-C second order Butterworth filter and creation of several models: high level behavioral VHDL-AMS model of Gm-C active filter, statistical and fuzzy logic based model of inference and machine learning analytical model.

Detailed Program for Oral Session

Session 5: Medical Information System and Biomedicine

Time: 16:30-18:00, Oct. 18, 2020 (Sunday)
Greenwich Mean Time (GMT+08:00) – China Local Time
Meeting ID: 667-7358-9540
Session Chair: Assoc. Prof. Md Shoaib Bhuiyan, Suzuka University of Medical Science, Japan

S5-1	Y0008 16:30-16:45	Remote Monitoring Applying IoT to Improve Control of Medication Adherence in Geriatric Patients with a complex Treatment Regimen, Lima-Peru Eduardo Chavez, Billy Sifuentes, **Ricardo Vidal**, Juan Grados, Santiago Rubiños and Abilio Cuzcano Universidad Nacional del Callao, Peru *Abstract*—Health care has changed profoundly thanks to the continuous improvement of electronic devices, recent rapid progress in wireless communications and microsystems has allowed the opportunity to automatically collect reliable patient data, yet communication about medication management through Transitions of care can be challenging, when older patients are treated for multiple health conditions in a nursing home. In this document, we propose an innovative architecture that employs Wireless Sensor Network (WSN) technologies with the NodeMCU which is an open source IoT (internet of things) platform and the Raspberry pi 3B+ that is used as an Mqtt server, for a smart pill dispenser, which will promote medication adherence, improve patient / user self-management; also assist in the efficient administration of therapies by reminding and registering medications for patients with a complex treatment regimen.
S5-2	O0009 16:45-17:00	Performance characterization of Binary Classifiers for Automatic Annotation of Aortic Valve Opening in Seismocardiogram Signals Deepak Rai, **Hiren Kumar Thakkar** and Shyam Singh Rajput Bennett University, India *Abstract*−The potential non-invasive modalities to estimate cardiac health parameters. Each SCG cycle contains specific SCG peaks that help identify specific cardiac mechanical events. The accurate and automatic annotation of SCG peaks has potential daily-life applications such as continuous cardiac health monitoring. However, it is challenging to automate the SCG annotation due to the morphological variations of SCG signals. In this paper, automatic annotation of the most important SCG peak called Aortic valve Opening (AO) is explored by formulating the AO annotation as a binary classification problem. Four binary classifiers such as Logistic Regression (LR), Support Vector Machine (SVM), Decision Tree (DT), and

		Gaussian Naive Bayes (GNB) are used for AO annotation and supported by empirical features such as "Amplitude" and "Time of Appearance". The performance comparison of these binary classifiers is carried out using 759 SCG signals acquired from the Physionet public repository "cebsdb". The classifiers are trained and comprehensively tested followed by 5-fold cross-validation. The experimental results show that DT and GNB consistently perform well on established seven performance metrics.
S5-3	O1002 17:00-17:15	Oral Beta-lactamase Protects the Gut Bifidobacterium/Lactobacillus from Beta-lactam Antibiotics-mediated Damage in SD Rats **Qijian Luo** and Yiqi Jin Shanghai United Cell Biotechnology Co., Ltd, China *Abstract*−Excreted antibiotics into intestine after parenteral administration may be unwanted and can disrupt the indigenous microbiota and cause some adverse clinical consequences. To mitigate this adverse effect, we developed BL, a recombinant beta-lactamase formulated into enteric-coated pellets, to degrade the excreted beta-lactam antibiotics. Herein, we reported its preclinical efficacy evaluation in rats, using ampicillin and cefotiam as model antibiotics. In one study, animals were assigned to receive oral vehicle or different dosage of BL(24~144μg/dose) three times around one intravenous dose of antibiotics, blood and intestinal samples were collected, and antibiotics concentration were determined. In the second study, animals received daily intraperitoneal antibiotics concurrently with vehicle or different dosage of BL(72~216μg/dose) 3 times per day , or no treatment, for three consecutive days, fecal samples were collected before and after the antibiotics treatment and cultured for bifidobacterium/lactobacillus counting. Herein we showed that orally administered BL significant decreased the antibiotics intestinal concentration with no noticeable influence to the serum concentration. Antibiotics' treatment induced a 5-6 order of magnitude decrease in bifidobacterium/lactobacillus count, and BL intervention could prevent gut from such damage and maintain the counts similar to the no treatment group. These preclinical studies demonstrated that BL could degrade the excreted beta-lactam antibiotics and protect against its damage to gut probiotic bacteria.
S5-4	O1004 17:15-17:30	Applications of Nano-drugs and Tumor Microenvironment Sensitive Nano-drug Delivery Systems **Anqi Da** Nanjing University of Chinese Medicine, China *Abstract*−Cancer therapy is an attractive research field in basic and clinical studies. Among them, nano-based antitumor drugs and delivery systems play increasingly crucial role in tumor

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		treatment, while they are still faced with complicated surrounding environments. Therefore, this review summarized the tumor micro-environments and some nano-based delivery systems including some FDA-approved nano-drugs for clinical use, in addition, the tumor microenvironment sensitive drug delivery systems are also illustrated.
S5-5	O0010 17:30-17:45	Two-stage Generative Adversarial Recovery Network for MR Brain Images Containing Tumors **Meng Kong**, Haifeng Zhao, Shaojie Zhang and Zhenyu Tang Anhui University, China *Abstract−*Brain image registration (BIR) plays an important role in neuroscience. However, for the registration of brain image containing tumors, the existence of tumor could cause great influence to BIR. One possible solution for getting rid of such influence is to recover the tumor brain image to "normal" appearance brain image (no tumor). Most of existing methods for tumor brain image recovery are based on low-rank, which is time consuming and low recovery quality. In this paper, we propose a novel deep-learning based method for tumor brain image recovery. Specifically, a two-stage generative adversarial network comprising a region recovery stage and an image recovery stage is presented. For the input tumor brain image, the region recovery stage first generates a recovered brain region image containing three different regions (i.e., the gray matter, the white matter and the cerebrospinal fluid). The recovered brain region image is used in the image recovery stage as priori information to get the final "normal" appearance brain image. Both stages are trained under the generative adversarial framework. The experimental results demonstrate that the registration accuracy of tumor brain images can be significantly enhanced by our network as compared to the state-of-the-art image recovery methods.
S5-6	O1007 17:45-18:00	Molecular Cloning, Expression and Characterization of a Novel L-lactate Dehydrogenase from *Aspergillus oryzae* Yijian Li, Yan Cao, **Bin He**, Xinping Liu, Mingqiang Ai and Yayi Tu Jiangxi Science & Technology Normal University, China *Abstract−*Lactic acid is the building block of poly-lactic acid (PLA), a biopolymer that could be set to replace petroleum-based plastics. To make lactic acid production cost-effective, the production process should be carried out at low pH, in low-nutrient media, and with a low-cost carbon source. *Aspergillus oryzae* is an important fermentation microorganism, which are versatile microbial cell factories able to naturally produce large amounts of organic acids. Neither a functional lactate dehydrogenase (LDH) nor lactate production by *A. oryzae* is reported. A novel L-lactate dehydrogenase from

Aspergillus oryzae (AoLDH) was cloned with 1107 bp in length and encoded a protein of 368 amino acids with a 6.27 isoelectric point. In silico analyses revealed that no signal peptide sequences and transmembrane domains were contained in AoLDH. Further, AoLDH displayed relatively narrow temperature adaptability and exhibited optimum temperature at 40°C, which was close to the growth environment. Also, the purified AoLDH exhibited the maximum activity at pH 8 while AoLDH deactivatd the enzymatic activity at pH 5. Moreover, the enzymatic activity of AoLDH was stimulated by Zn^{2+} and Ca^{2+}, but inhibited in the presence of Mg^{2+}, Mn^{2+} and Fe^{2+}. In addition, high concentrations of metal ions caused more obvious effects. These results provided a better understanding of L-lactate dehydrogenase from *Aspergillus oryzae*.

Closing Ceremony

Presentation Time: 18:00-18:10, Oct 18, 2020 (GMT+8:00)
Meeting ID: 667-7358-9540

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Prof. Wuqiang Yang is a Fellow of the IET (formerly IEE), Fellow of the Institute of Measurement and Control and Fellow of the IEEE. He was also an IEEE IMS Distinguished Lecturer (2010-2016) and JSPS Invitation Fellow (2016). Since 1991, he has been working with The University of Manchester (formerly UMIST) in the UK and became Professor of Electronic Instrumentation in the School of Electrical and Electronic Engineering in 2005. His main research interests include industrial tomography, especially electrical capacitance tomography (ECT), inverse problem and image reconstruction, instrumentation and multiphase flow measurement. He has published over 500 papers, is a referee for over 50 journals (including 6 IEEE journals), Associate Editor of IEEE Trans. on Instrumentation and Measurement, editorial board member of 6 other journals (including Meas. Sci. and Technol.), guest editor of many journal special issues and visiting professor at several other universities. His biography has been included in Who's Who in the World since 2002.