CONFERENCE ABSTRACT

2019 8th International Conference on Computing and Pattern Recognition (ICCPR 2019)

October 23-25, 2019

Grand Gongda Jianguo Hotel, Beijing, China

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Introduction

Welcome to 2019 8th International Conference on Computing and Pattern Recognition (ICCPR 2019) which is organized by Beijing University of Technology and Biology and Bioinformatics (BBS) under Hong Kong Chemical, Biological & Environmental Engineering Society (CBEES), co-organized by Tiangong University and Hebei University of Technology. The objective of ICCPR 2019 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 Computing and Pattern Recognition.

Papers will be published in the following proceedings:
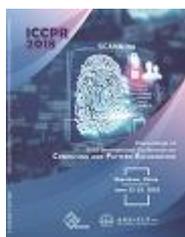
ACM Conference Proceedings (ISBN: 978-1-4503-6471-3): archived in ACM Digital Library, indexed by EI Compendex and SCOPUS, and submitted to be reviewed by Thomson Reuters Conference Proceedings Citation Index (ISI Web of Science).

Some selected refereed papers describing the state-of the-art topics will be considered for publication in the following journal:

International Journal of Machine Learning and Computing (IJMLC) (ISSN: 2010-3700), which will be indexed by Scopus, EI (INSPEC, IET), Google Scholar, Crossref, ProQuest, Electronic Journals Library, and DOAJ.

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

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Assist. Prof. Chuang Zhu, Beijing University of Posts and Telecommunications, China
Prof. Cai Chengtao, Harbin Engineering University, China

Program at-a-Glance

Day 1 October 23, 2019 (Wednesday)	10:00-17:00	**Arrival Registration** Venue: Hotel Lobby (1st Floor)
	16:00-18:00	**Committee Meeting**
Day 2 October 24, 2019 (Thursday)	**Arrival Registration 09:00-18:00** Venue: Lobby of Function Room (3rd Floor)	
	Morning Conference Venue: Function Room (多功能厅, 3rd Floor)	
	09:00-09:10	**Opening Remarks** Prof. Kebin Jia, Beijing University of Technology, China
	09:10-09:50	**Keynote Speech I** Prof. Kenji Suzuki Tokyo Institute of Technology, Japan Topic: "Deep Learning in Medical Image Processing, Pattern Recognition, and Diagnosis"
	09:50-10:30	**Keynote Speech II** Prof. David Zhang Chinese University of Hong Kong (Shenzhen), China Topic: "Facial Multi-Characteristics and Applications"
	10:30-10:55 Coffee Break & Group Photo	
	10:55-11:35	**Keynote Speech III** Prof. Alexander Suvoror Institute of Experimental Medicine, St. Petersburg, Russia Topic: "Personified Microbial Therapy; Reasons behind the Approach"
	11:35-11:55	**Invited Speech I** Prof. Ran He Institute of Automation of Chinese Academy of Sciences, China Topic: "Variational Image Analysis under Limited Computational Resource"
	11:55-12:15	**Invited Speech II** Assoc. Prof. Qingzheng Xu National University of Defense Technology, China Topic: "Opposition-Based Learning and its Application in Evolutionary Computing"

Day 2 October 24, 2019 (Thursday)	15-13:20 Lunch (Restaurant)		
	Afternoon Conference		
	13:20-15:50	**Session 1 Hibiscus Room （芙蓉厅, 3rd Floor）**	Topic: "Feature Extraction and Image Segmentation" 10 presentations
		Session 2 Peony Room （牡丹厅, 3rd Floor）	Topic: "Pattern Recognition and Image Classification" 10 presentations
		Session 3 Rose Room （玫瑰厅, 3rd Floor）	Topic: "Medical Image Processing and Medical Testing" 10 presentations
		Session 4 Jasmine Room （茉莉厅, 3rd Floor）	Topic: "Data Analysis and Soft Computing" 10 presentations
	15:50-16:00 Coffee Break		
	16:00-18:30	**Session 5 Hibiscus Room （芙蓉厅, 3rd Floor）**	Topic: "Target Detection" 9 presentations
		Session 6 Peony Room （牡丹厅, 3rd Floor）	Topic: "Image Analysis and Signal Processing" 10 presentations
		Session 7 Rose Room （玫瑰厅, 3rd Floor）	Topic: "Molecular Biology and Biomedicine" 10 presentations
		Session 8 Jasmine Room （茉莉厅, 3rd Floor）	Topic: "Computer Information Technology and Application" 10 presentations
	18:30-20:30 Dinner (Restaurant)		
Day 3 October 25, 2019 (Friday)	**Morning Conference** Venue: Peony Room (牡丹厅, 3rd Floor)		
	09:00-09:05	**Opening Remarks** Prof. Kebin Jia, Beijing University of Technology, China	
	09:05-09:45	**Keynote Speech IV** Prof. Yuan-Ting Zhang City University of Hong Kong, Hong Kong Topic: "Cardiovascular Health Engineering: from Wearable MINDS to MISSION'2024"	

Day 3 October 25, 2019 (Friday)	09:45-10:25	**Keynote Speech V** Prof. Tun-Wen Pai National Taipei University of Technology, Taiwan Topic: "Integration of Mining Disease Trajectory Patterns and Whole Exome Sequencing Analysis for Biomarker Panel Construction"
	10:25-11:20	**Poster Session**
	11:30-12:30	**Academic Visit**

Tips: Please arrive at the Conference Room 10 minutes before the session begins to upload PPT into the laptop; submit the poster to the staff when signing in.

Presentation Instruction

Instruction for Oral Presentation

Devices Provided by the Conference Organizer:

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

Materials Provided by the Presenters:

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

Duration of each Presentation (Tentatively):

Keynote Speech: about **35** Minutes of Presentation and **5** Minutes of Question and Answer
Invited Speech: about **15** Minutes of Presentation and **5** Minutes of Question and Answer
Oral Presentation: about **12** Minutes of Presentation and **3** Minutes of Question and Answer

Instruction for Poster Presentation

Materials Provided by the Conference Organizer:

The place to put poster

Materials Provided by the Presenters:

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

Best Presentation Award

One Best Oral or Poster Presentation will be selected from each session, and the Certificate for Best Presentation will be awarded at the end of each session on Oct. 24 and Oct. 25, 2019.

Dress Code

Please wear formal clothes or national representative of clothing.

Disclaimer

Along with your registration, you will receive your name badge, which must be worn when attending all conference sessions and activities. Participants without a badge will not be allowed to enter the conference venue. Please do not lend your name badge to the persons who are not involved in the conference and do not bring the irrelevant persons into the conference venue.

The conference organizers cannot accept liability for personal injuries, or for loss or damage of property belonging to conference participants, either during, or as a result of the conference. Please check the validity of your own insurance.

Keynote Speaker Introduction

Keynote Speaker I

Prof. Kenji Suzuki
Tokyo Institute of Technology, Japan

Kenji Suzuki, Ph.D. (by Published Work; Nagoya University) worked at Hitachi Medical Corporation, Japan, Aichi Prefectural University, Japan, as a faculty member, and in Department of Radiology, University of Chicago, as Assistant Professor. In 2014, he joined Medical Imaging Research Center at Illinois Institute of Technology, as Associate Professor (Tenured). In 2017, he was jointly appointed in World Research Hub Initiative at Tokyo Institute of Technology, Japan, as Specially Appointed Professor. He published more than 330 papers (including 110 peer-reviewed journal papers). He has been actively studying deep learning in medical imaging in the past 25 years. His papers were cited more than 14,000 times, and his h-index is 47. He published 11 books and 22 book chapters, and edited 13 journal special issues. He was awarded/co-awarded more than 25 grants as PI including NIH R01 and ACS. He served as the Editor of a number of leading international journals, including Pattern Recognition. He served as a referee for 91 international journals such as Nature Communications (IF: 12.4), an organizer of 62 international conferences, and a program committee member of 170 international conferences. He received 26 awards, including Springer-Nature EANM Most Cited Journal Paper Award 2016.

Topic: "Deep Learning in Medical Image Processing, Pattern Recognition, and Diagnosis"

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 computer vision, pattern recognition, and imaging fields, because "learning from examples or data" is crucial to handling a large amount of data ("big data") coming from informatics and imaging 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. I invented ones of the earliest deep-learning models for image processing, semantic segmentation, object enhancement, and classification of patterns in medical imaging.

I have been actively studying on deep learning in medical imaging in the past 23 years. In this talk, AI-aided diagnosis and smart medical imaging with deep learning are introduced, including 1) computer-aided diagnosis for lung cancer in CT, 2) distinction between benign and malignant lung nodules in CT, 3) polyp detection and classification in CT colonography, 4) separation of bones from soft tissue in chest radiographs, and 5) radiation dose reduction in CT and mammography.

Keynote Speaker II

Prof. David Zhang
Chinese University of Hong Kong (Shenzhen), China
IEEE and IAPR Fellow

David Zhang graduated in Computer Science from Peking University. He received his MSc in 1982 and his PhD in 1985 in both Computer Science from the Harbin Institute of Technology (HIT), respectively. From 1986 to 1988 he was a Postdoctoral Fellow at Tsinghua University and then an Associate Professor at the Academia Sinica, Beijing. In 1994 he received his second PhD in Electrical and Computer Engineering from the University of Waterloo, Ontario, Canada. He has been a Chair Professor at the Hong Kong Polytechnic University where he is the Founding Director of Biometrics Research Centre (UGC/CRC) Organized by the Hong Kong SAR Government since 2005. Currently he is Presidential Chair Professor in Chinese University of Hong Kong (Shenzhen). He also serves as Visiting Chair Professor in Tsinghua University and HIT, and Adjunct Professor in Shanghai Jiao Tong University, Peking University, National University of Defense Technology and the University of Waterloo. He is both Founder and Editor-in-Chief, International Journal of Image & Graphics (IJIG) (http://www.worldscinet.com/ijig/ijig.shtml) and Springer International Series on Biometrics (KISB)(http://www.springer.com/series/6191); Organizer, the first International Conference on Biometrics Authentication (ICBA); and Associate Editor of more than ten international journals including IEEE Transactions and so on. Over past 30 years, he have been working on pattern recognition, image processing and biometrics, where many research results have been awarded and some created directions, including palmprint recognition, computerized TCM and facial beauty analysis, are famous in the world. So far, he has published over 20 monographs, 400 international journal papers and 40 patents from USA/Japan/HK/China. He has been continuously listed as a Highly Cited Researchers in Engineering by Clarivate Analytics (formerly known as Thomson Reuters) in 2014, 2015, 2016, 2017 and 2018, respectively(http://highlycited.com). He is also ranted about 80 with H-Index 103 at Top 1000 Scientists for international Computer Science and Electronics(http://www.guide2research.com/scientists). Professor Zhang is a Croucher Senior Research Fellow, Distinguished Speaker of the IEEE Computer Society, and a Fellow of both IEEE and IAPR.

Topic: "Facial Multi-Characteristics and Applications"

Abstract—The human face plays an important role in our social life, from which we can extract many forms of information, such as identity, gender, race, age, emotions, health, personality, attractiveness, etc. Faces with multi-characteristics have long been a source of interest to psychologists and other scientists in a wide range of disciplines. This presentation is based on our research, which describes the four types of typical features extracted from a face. Some related features extracted from a face, including facial unique features for individual identity, statistical common features for beauty analysis, changed color features for facial diagnosis and changed geometry features for expression recognition are provided. Experimental results under different applications have shown the superiority of these facial multi-characteristics.

Keynote Speaker III

Prof. Alexander Suvoror
Institute of Experimental Medicine, St. Petersburg, Russia

Alexander Suvoror focus on the study of microbiological molecular biology, genetic and diversity of microbial communities, medicine for human rehabilitation, and the development of probiotics and some vaccine. The honors are listed below: President stipend for advanced scientists, Honorable diploma from the Scientific committee of Russian Duma, First prize of the Presidium of Russian Medical Academy for achievements in Medical science, Stipend for advanced scientists of Russia, one of the 100 best inventions of Russia, and so on. More than 180 papers and 7 monographs were published. 21 patents were granted. Prof. Alexander Suvoror also serves as the Director of the Department of Fundamental medicine and medical technologies of Saint-Petersburg State University, the Senior Researcher/General Manager of Russian Avena Technology Co.,Ltd., the chairman of the 18th International Conference on Intestinal Biology, the consultant on WHO streptococcal disease, the member of European Society for Clinical Microbiology and Infectious Diseases(ESCMI) and the Bureau of the International Society for Microbial Ecology(SOMED), and the director of the St. Petersburg Microbiology Society.

Topic: *"Personified Microbial Therapy; Reasons behind the Approach"*

Abstract—Microbiota is an important and seriously unexplored inhabitant of any human organism. Recently it was discovered that the human health condition significantly depends on microbiota which might be changed after taking drugs including antibiotics. Disturbed microbiota – dysbiosis is a common cause of many human diseases including heart diseases, cancer, neurodegenerative diseases and many others. Taking probiotic microorganisms as a mean for the dysbiosis treatment seems logical approach for improving of the health condition. However, in many cases probiotics are not working in favor of the patients. The key for the problem lies in innate immune system and personal adaptation for the indigenous microbiota. We suggest using indigenous bacterial strains (autoprobiotics) as an alternative of the traditional probiotic therapy. For this approach individual bacterial strains are selected out of each individual and after microbiological and genetic testing applied as a cure for the mammals with dysbiosis. Examples of autoprobiotic testing on experimental animal models and in clinical studies are discussed.

Keynote Speaker IV

Prof. Yuan-Ting Zhang
City University of Hong Kong, Hong Kong

Yuan-Ting Zhang is currently the Chair Professor of Biomedical Engineering at City University of Hong Kong. He was the Sensing System Architect in Health Technology at Apple Inc., California, USA in 2015. He was the founding Director of the Key Lab for Health Informatics of Chinese Academy Sciences (2007-2018). Professor Zhang dedicated his service to the Chinese University of Hong Kong from 1994 to 2015 in the Department of Electronic Engineering, where he served as the first Head of the Division of Biomedical Engineering and the founding Director of the Joint Research Center for Biomedical Engineering. Prof. Zhang was the Editor-in-Chief for IEEE Transactions on Information Technology in Biomedicine. He served as Vice Preside of IEEE EMBS, Technical Program Chair of EMBC'98, and Conference Chair of EMBC'05.Prof. Zhang is currently the Editor-in-Chief for IEEE Reviews in Biomedical Engineering, Chair of 2018 Gordon Research Conference on Advanced Health Informatics, Chair of the Working Group for the development of IEEE 1708 Standard on Wearable Cuffless Blood Pressure Measuring Devices, and Chair of 2016-2018 IEEE Award Committee in Biomedical Engineering. Prof. Zhang's research interests include cardiovascular health informatics, unobtrusive sensing and wearable devices, neural muscular modeling and pHealth technologies. He was selected on the 2014, 2015, 2016 and 2017 lists of China's Most Cited Researchers by Elsevier. He won a number of international awards including IEEE-EMBS best journal paper awards, IEEE-EMBS Outstanding Service Award, IEEE-SA 2014 Emerging Technology Award. Prof. Zhang is elected to be IAMBE Fellow, IEEE Fellow and AIMBE Fellow for his contributions to the development of wearable and m-Health technologies.

Topic: "Cardiovascular Health Engineering: from Wearable MINDS to MISSION'2024"

Abstract—This talk will present firstly some perspectives on the miniaturization, intelligence, network, digitization, and standardization (MINDS) design of wearable and flexible devices with the application for the unobtrusive, cuffless measurements of arterial blood pressure. Secondly, using the atherosclerotic plaque assessment as an example, the talk will attempt to illustrate how to integrate the wearable sensing with other technologies across multiple scales in the biological hierarchy from molecular, cell, organ to system for the early prediction of acute cardiovascular diseases. A multi-Centre clinical trial on Myocardial Infarction & Stroke

Screening Of Nations (MISSION) will also be presented. Finally, the talk will cover some challenges in moving wearable and flexible systems towards a more holistically convergence approach to future healthcare, which principles are characterized by the P8 Health that is Predictive, Personalized, Preventive, Precise, Pervasive, Participatory, Preemptive, and Patient-centered.

Keynote Speaker V

Prof. Tun-Wen Pai
National Taipei University of Technology, Taiwan

Dr. Pai received his Ph.D. degree in electrical and computer engineering from Duke University, Durham, NC, USA. He joined the Telecommunication Laboratories governed by the Ministry of Transportation and Communications of Taiwan, where he served as an associate researcher and a project leader to develop kernel technologies in intelligent official document analysis and Chinese optical character recognition systems. After three years in governmental research laboratories, he switched to academic fields as an associated professor. He was a faculty member in Department of Computer Science and Engineering, National Taiwan Ocean University where he served as the Department Chairman from 2002 to 2004. He works currently as a full professor at National Taipei University of Technology and served as the Director of Bioinformatics and Medical Informatics Research Center, Taipei, Taiwan. Dr. Pai has received several teaching and research awards from National Taiwan Ocean University and he served as general chairs and regular program committees for several international conferences in the areas of bioinformatics, machine learning, and data engineering, and he also served as a chief guest editor of several special issues from the journal of Biomed Research International. Dr. Pai is member of ACM and IEEE SMC societies.

Topic: "Integration of Mining Disease Trajectory Patterns and Whole Exome Sequencing Analysis for Biomarker Panel Construction"

Abstract—The main objective of this talk is to describe a new approach of designing a testing panel kit for preterm birth detection through disease trajectory pattern search and genetic analysis of whole exome sequencing techniques. The designed panel kit is able to detect high-risk preterm delivery in order to prevent infant deaths and to reduce required subsequent medical resources. We have initially surveyed a set of biomarkers by collecting current genetic information associated with preterm birth such as dbPTB, GEO, and OMIM datasets. Incorporating these published biomarkers and our discovered disease trajectory/comorbidity of preterm births from Taiwanese governmental medical records, genetic mutations were validated by clinical samples. The project is yet undergoing and cooperating with biotech companies to develop an efficient and practical testing panel kit for high-risk of preterm birth, especially focusing on oriental women. The novel and specific biomarkers are discovered

mainly based on our developed data mining algorithms for identifying disease trajectory patterns and whole-exome sequenced data from Asian women. Through cooperating with medical doctors and industrial companies, the effectiveness of designing a testing panel kits could be achieved and validated by sufficient clinical samples, and high-risk preterm delivery could be early detected and prevented.

Invited Speaker Introduction

Invited Speaker I

Prof. Ran He
Institute of Automation of Chinese Academy of Sciences, China

Ran He is a Professor at the National Laboratory of Pattern Recognition (NLPR), Institute of Automation of Chinese Academy of Sciences, Beijing, China. He received the B.E. degree in Computer Science from Dalian University of Technology, the M.S. degree in Computer Science from Dalian University of Technology, and Ph.D. degree in Pattern Recognition and Intelligent Systems from Institute of Automation, Chinese Academy of Sciences in 2001, 2004 and 2009, respectively. His research interests focus on information theoretic learning, pattern recognition, and computer vision. He has published over 140 journal and conference papers in these fields, and has widely published at highly ranked international journals, such as IEEE TPAMI, TIP, TIFS, IJCV, PR, and leading international conferences, such as ICCV, CVPR, NIPS, IJCAI, AAAI. He is currently serving as an associate editor of Elsevier Neurocomputing and IET Image Processing, and served as area chair and senior program member of several conferences. His research was supported by NSFC for Excellent Young Scientist Programme, and Beijing Natural Science Funds for Distinguished Young Scholars.

Topic: "Variational Image Analysis under Limited Computational Resource"

Abstract—Image data tend to be high-dimensional and large-scale. When given infinite computational resource, machine learning algorithms can generate exact results (prohibitively expensive). Variational approximation methods arise from the use of a finite amount of processor time. These methods are often built on top of standard function approximators. In this talk, we introduce a group of variational inference and learning algorithms that scale to high-dimensional and large-scale image datasets. First, we address the linear approximation to learn robust and compact local features of image data, named ordinal measures. Second, we address the quadratic approximation of a family of loss functions that widely used in image analysis. Accordingly, a half-quadratic optimization framework is proposed for modeling sparsity, low-rank recovery and noise. Third, we introduce an Introspective Variational Autoencoders to approximate the posterior distribution, then we can generate high-resolution images from the learnt distribution, paving a way for analysis via synthesis.

Invited Speaker II

Assoc. Prof. Qingzheng Xu
National University of Defense Technology, China

Qingzheng Xu is an Associate Professor with the College of Information and Communication, National University of Defense Technology, Xi'an, China. He received the B.S. degree in information engineering from the PLA University of Science and Technology, Nanjing, China, in 2002, and the Ph.D. degree in control theory and engineering from the Xi'an University of Technology, Xi'an, China, in 2011. He was a visiting scholar at the School of Computer Science and Engineering, Nanyang Technological University, Singapore, from May 2018 to May 2019. He is a senior member of China Computer Federation. His main research interests are opposition-based learning, nature-inspired computation and combinatorial optimization. He has published over 50 technical papers in international journals or conference proceedings.

Topic: *"Opposition-Based Learning and its Application in Evolutionary Computing"*

Abstract—An opposition concept is both familiar and mysterious at the same time to ordinary mortals like us. However, due to the lack of an accepted mathematical or computational model, until recently it has not been explicitly investigated to any great length in the fields outside of philosophy and logic. The basic concept of Opposition-Based Learning (OBL) was originally introduced by Tizhoosh in 2005. In a very short period of time, it has been utilized in different evolutionary computing areas. This speech covers basic concepts, theoretical foundation, combinations with intelligent algorithms, and typical application fields. A number of challenges that can be undertaken to help move the field forward are also discussed.

Session 1

Afternoon, October 24, 2019 (Thursday)
Time: 13:20-15:50
Venue: Hibiscus Room (芙蓉厅, 3rd Floor)
Topic: "Feature Extraction and Image Segmentation"
Session Chair: to be added

J0068 Session 1 Presentation 1 (13:20-13:35)	A Semi-automatic Technique for Fetus Segmentation in 3D Ultrasound Exams Francisco Motta, Jan Hurtado, Daniel Radetic and **Alberto Raposo** Pontifical Catholic University of Rio de Janeiro, Brazil *Abstract*—Ultrasound exams have an important role in obstetrics due to its low cost, low risk, and real-time capabilities. The advent of three-dimensional ultrasonography has made possible the use of the fetal volume as a biometric measurement to monitor its development. The quantication of the fetal volume requires a previous process of segmentation, which consists of the labeling of the sites that belong to the object of interest in a digital image. There is not; however, a standard methodology for fetal volumetry, and most studies rely on manual segmentations. The segmentation of ultrasound images is particularly challenging due to the presence of artifacts as the speckle noise and acoustic shadows, and the fact that the contrast between regions of interest is commonly low. In this study, we have developed and tested a semiautomatic method of fetal segmentation in 3D ultrasound exams. Due to the diculties as mentioned above, proper ultrasound segmentation methods need to make use of expected characteristics of the specic segmented structures. This thought has guided the development of our methodology that, through a sequence of simple steps, achieved good quantitative results in the segmentation task.
J0003 Session 1 Presentation 2 (13:35-13:50)	Automatic Three-dimensional Liver Vessel Segmentation in CT Images Using an Improved Vesselness Enhancement Filter Based Fuzzy Connectedness Method **Rui Zhang**, Zhuhuang Zhou and Shuicai Wu Beijing University of Technology, China *Abstract*—Three-dimensional (3D) segmentation of liver vessel is critical in computed tomography (CT) based liver tumor treatment planning and

	navigation. An improved fuzzy connectedness (FC) method was proposed for automatic liver vessel segmentation in CT volumetric images in this work. We incorporated the vessel-enhanced image (i.e., vesselness image) into the fuzzy affinity function of FC, rather than the intensity image which was used by traditional FC. An improved vesselness filter was proposed by incorporating adaptive sigmoid filtering and a background-suppressing item. The fuzzy scene of FC was automatically initialized by using the Otsu segmentation algorithm and one seed selected adaptively instead of multiple seeds required in the traditional FC. The improved FC method was evaluated on 40 cases of clinical CT volumetric images. The experimental results showed that the proposed liver vessel segmentation strategy could achieve higher segmentation performance than traditional algorithms. The average accuracy, sensitivity, specificity and dice of the improved FC method were (96.4 ± 1.1)%, (73.7 ± 7.6)%, (97.4 ± 1.3)% and (67.3 ± 5.7)% in 3Dircadb dataset, while were (96.8 ± 0.6)%, (89.1 ± 6.8)%, (97.6 ± 1.1).and (71.4 ± 7.6) in Sliver07 dataset. We concluded that the proposed improved FC method may be used as a new method for automatic 3D liver vessel segmentation in CT images.
J0035 Session 1 Presentation 3 (13:50-14:05)	Accurate Semantic Segmentation in Remote Sensing Image **Shuqi Wang**, Chuang Zhang, and Ming Wu Beijing University of Posts and Telecommunications, China *Abstract*—Thanks to recent development in CNNs and deep learning, solid improvements have been made in semantic segmentation, however, most of the previous works in semantic segmentation are for automatic driving and do not fully taken into account the specific difficulties that exist in high resolution remote sensing imagery. One of such difficulties is that objects are small, crowded and intra-class scale difference in remote sensing imagery. To tackle with this challenging task, we have proposed a novel architecture which adopts encoder-decoder structure, multi-scale dilated convolution with spatial attention and separable convolution (Global Attention Pyramid) and channel attention decoder (Attention Decoder). The proposed Global Attention Pyramid module solves these problems by enlarging receptive field without reducing resolution of feature maps and pixel-level attention. And the proposed Attention Decoder module solves these problems by providing global context to select category localization details. We tested our network on two satellite imagery datasets and acquired remarkably good results for both datasets especially for small objects. And our new network improves the performance from 0.6341 to 0.6510 in DEEPGLOBE road extraction dataset.
J0039 Session 1 Presentation 4	A Selective Multi-feature Tracker based on Confidence **Yichen Ma**, Sheng Fang and Zhe Li Shandong University Of Science And Technology, China *Abstract*—In order to improve the tracking speed of trackers with

(14:05-14:20)	multi-feature fusion mechanism, and the tracking accuracy of trackers with boundary effects caused by circular shift, a confidence-based tracker which explores the selective multi-feature fusion mechanism is proposed in this paper. Firstly, a novel confidence degree is designed, which is used to evaluate the reliability of the predicted position of the HOG feature. Secondly, a selective multi-feature fusion mechanism based on confidence degree is proposed to improve tracking speed of trackers with multi-feature fusion mechanism. To reduce the boundary effects, the thought of background-aware based on HOG feature is employed, and it was extended to the color histogram feature. To prove the effectiveness of our tracker, we test our tracker on public datasets. The experimental results demonstrate that our tracker can improve performance in tracking accuracy and speed of tracker in the above challenges and the performance on the public datasets is better than several state-of-the-art trackers.
J0060 Session 1 Presentation 5 (14:20-14:35)	A Fast and Accurate Purification Method of Image Feature Point Pairs Using Structural Consistency Constraints **Bo Zhai**, Ling Liu, Shu Xian, Jin Zheng and Hui-Biao Hu China Academy of Launch Vehicle Technology, China *Abstract*—Feature-based matching of images is a key method in pattern recognition, but due to noise, out-of-focus, similar texture, et. al., mismatched feature point pairs are usually generated, and easily result in the incorrect final results. Based on the linear transformation of image scenes, this paper proposes a fast and accurate purification method of matched feature point pairs using the structural consistency of the constructed matching Delaunay triangulations. The structural consistency is expressed and quantified from two aspects: distribution correspondence of the corresponding adjacent vertexes, and the similarity of the corresponding triangular units. By taking the two aspects as restraints, the mismatches are screened out and removed dynamically, which can improve the matching foundation and give better support for the further processing for images and targets. Representative images with different imaging platforms and environments are chosen for experimentation. Results show that compared with the existing classical methods, the proposed method has high accuracy, good robustness and fast computational speed for removing the mismatched feature point pairs.
J0063 Session 1 Presentation 6 (14:35-14:50)	CHD: Consecutive Horizontal Dropout for Human Gait Feature Extraction Chengtao Cai, **Yueyuan Zhou** and Yanming Wang Harbin Engineering University, China *Abstract*—Despite gait recognition and person re-identification researches have made a lot of progress, the accuracy of identification is not high enough in some specific situations, for example, people carrying bags or changing coats. In order to alleviate above situations, we propose a simple but effective Consecutive Horizontal Dropout (CHD) method apply on

	human feature extraction in deep learning network to avoid overfitting. Within the CHD, we intensify the robust of deep learning network for cross-view gait recognition and person re-identification. The experiments illustrate that the rank-1 accuracy on cross-view gait recognition task has been increased about 10% from 68.0% to 78.201% and 8% from 83.545% to 91.364% in person re-identification task in wearing coat or jacket condition. In addition, 100% accuracy of NM condition was first obtained with CHD. On the benchmarks of CASIC-B, above accuracies are state-of-the-arts.
J0073 Session 1 Presentation 7 (14:50-15:05)	Development of Deep-learning Segmentation for Breast Cancer in MR Images based on Neural Network Convolution **Yuchen Wang**, Ze Jin, Yukiko Tokuda, Yasuto Naoi, Noriyuki Tomiyama and Kenji Suzuki Tokyo Institute of Technology, Japan *Abstract*—In this study, we proposed a deep-learning-based semantic segmentation of breast tumors in diagnostic breast MRI, which had been planned with chemotherapy treatment, for extracting imaging biomarkers in radiomics/radiogenomics studies. Deep-learning neural network convolution (NNC) that employs patched-based neural network regression in a convolutional manner were employed to output a map of the likelihood of being a tumor. We trained our NNC with three dynamic contrast-enhanced MR images as input: pre-contrast, early-phase, and a subtraction image between the two. Corresponding "teaching" images were obtained from "gold-standard" tumor regions that were manually segmented by an experienced radiologist. To evaluate the performance, we compared our method with non-deep-learning region-growing and watershed segmentation algorithms on 118 MRI studies in 4-fold cross-validation. Average Dice coefficients of our NNC, the region-growing, and watershed segmentation algorithms were 0.724, 0.643, and 0.540, respectively. The performance of our NNC was superior to that of the conventional methods with statistical significance. Thus, our NNC semantic segmentation would be a valuable tool for providing accurate tumor segmentation in extracting imaging biomarkers in radiomics/radiogenomics studies.
J0089 Session 1 Presentation 8 (15:05-15:20)	Improving Histopathological Image Segmentation and Classification Using Graph Convolution Network **Haili Ye**, Da-Han Wang, Jianmin Li, Shunzhi Zhu and Chenyan Zhu Xiamen University of Technology, China *Abstract*—In this paper, we present a system for segmentation and classification of breast cancer ROI images by integrating the idea of hierarchical processing of segmentation and classification tasks. The system is composed of a segmentation module and a GCN module, where the GCN module is designed to improve the performance of the classification result. The segmentation module is used to obtain the segmentation masks of the image patches of the ROI image, which are spliced to generate the

	segmentation result of the ROI image. The GCN module is used to capture the spatial and semantic dependencies among image patches of the ROI image, by constructing the graph using the segmentation masks of the image patches. Based on the learned features by the GCN module, the classification result of the ROI image can be obtained. Experimental results on the grand challenge on BreAst Cancer Histology images (BACH) 2018 dataset [17] show that, the proposed segmentation and classification method outperforms the winner of BACH 2018 significantly, which demonstrates the effectiveness of the proposed method.
J0093 Session 1 Presentation 9 (15:20-15:35)	Automatic Classification of Ice Sheet Subsurface Targets in Radar Sounder Data based on the capsule Network Yiheng Cai, **Jie Ma**, ShaoBin Hu and Hui Li Beijing University of Technology, China *Abstract*—Exhaustive investigations of the ice sheet subsurface can be carried out by analyzing the information contained in the huge archives of radar grams acquired by dedicated radar sounder (RS) instruments. In particularly, an automatic segmentation technique enables a fast and objective extraction of ice subsurface target properties on wide areas. Here, an approach which automatically segment radar image at the pixel level using capsule Network was proposed. Our work expands the use of capsule networks to the task of extraction of ice subsurface target in the literature. In this paper, we adopts three kinds of network frameworks for the task of extraction of ice subsurface target. We also discuss the performance of squashing function on the segmentation result. Experimental results on MCoRDS datasets confirm the performanceiveness of our methods.
J0055 Session 1 Presentation 10 (15:35-15:50)	Credit Card Fraud Detection based on CSat-related AdaBoost **Yue Yang**, Chenyuan Liu and Ningning Liu University of International Business and Economics, China *Abstract*—In the field of Financial Technology, machine learning provides important support for decision-making through the effective use of data. Credit card fraud detection technology is a good example, but it still faces two challenges: the unbalanced data sets and cost-sensitive characteristics. In this paper, we proposed an enhanced CSat (Customer Satisfaction)-related AdaBoost. Based on the traditional AdaBoost, we consider the expected loss of the impact of customer satisfaction and re-adjust the weight of different categories in the cost adjustment function of the basic classifier. Considering the serious consequences of fraud transactions, we also implemented a metric related to the Total Profit of Classification (TPC) to evaluate performance. The results show that the CSat-related AdaBoost performed better in F1-score and AUC score compared to the traditional AdaBoost and some mainstream models, the reliability and interpretability of TPC as an evaluation metric is also demonstrated in our paper.

Session 2

Afternoon, October 24, 2019 (Thursday)
Time: 13:20-15:50
Venue: Peony Room (牡丹厅, 3rd Floor)
Topic: "Pattern Recognition and Image Classification"
Session Chair: Assoc. Prof. Da-Han Wang

J0005 Session 2 Presentation 1 (13:20-13:35)	Acoustic Scene Classification by Enhanced High-frequency Weak Signal Characteristic Spectrum **Wenjie Hao**, Lasheng Zhao and Qiang Zhang Dalian University, China *Abstract*—In the acoustic scene classification task, the method of using mel-spectrogram to express the acoustic scene information is widely applied. However, mel-spectrogram has defects and it ignores important information about some acoustic scenes. The paper improves the mel-spectrogram and its generation algorithm. Including: I. For the sensitivity of the acoustic scene to high-frequency acoustic signals, the paper changes the filter design method of Mel Frequency Cepstrum Coefficient (MFCC). This method preserves more high frequency information by applying the equal-height triangular filter banks and increasing the number of the filters. II. Based on the previous step, an enhancement algorithm is proposed for the problem of the lack of high-frequency weak signals in the characteristic spectrum. The algorithm performs nonlinear mapping on the mel-spectrogram, which makes the transformed high-frequency weak signal feature information more obvious. The algorithm is verified by DCASE 2018 acoustic scene classification dataset and LITIS ROUEN dataset. The experimental results demonstrate the effectiveness of the proposed algorithm.
J0007 Session 2 Presentation 2 (13:35-13:50)	Chinese Calligraphy: Character Style Recognition based on Full-page Document **Yuanbo Wen** and Juan Alberto Sigüenza Autonomous University of Madrid, Spain *Abstract*—Chinese Calligraphy have many different styles. Usually beginners will focus on one style and learn it. However, beginners cannot accurately determine the type of Chinese calligraphy. Especial for the western foreigner. Therefore, it has important significance that using a computer to assist in collecting the calligraphy samples and do the correct

	classification. In addition, it can help some non-speak Chinese library in the classification and identification with some books. It also improves the efficiency that librarian work for some classification with Chinese Calligraphy books. In our research, we have proposed a new method for dealing with Chinese Calligraphy style recognition. The method is based on using the whole page of the document. We use Convolutional Neural Network (CNN) technique and two datasets of different quality for the experiments, then analyses the results. In those experiments, we made some improvements to the CNN structure with dropout layer. The experimental results show that the full-page documents recognition method proposed can achieve high accuracy with the support of CNN technology, and can effectively identify the five different styles of Chinese calligraphy. Compared with the traditional analysis methods with segmentation, our experimental results show that the method based on the full-page document is feasible, avoiding the cumbersome font segmentation problem. This is more efficient and more accurate.
J0028 Session 2 Presentation 3 (13:50-14:05)	Application of Differential Evolution Algorithm in Equivalent System Fitting **Tian Hongfeng**, Xue Yuan and Yang Zixin Air Force Engineering University, China *Abstract*—The equivalent system method is one of the important methods to evaluate the flight quality of an aircraft. The least squares method and the maximum likelihood method are widely used in the equivalent system fitting, but the initial value selection based on the least squares method is more complicated, the precision of the maximum likelihood method is lower, and the differential evolution algorithm can Avoid the complicated problem of initial value selection, and the differential evolution algorithm also has higher optimization ability. The differential evolution algorithm is applied to the equivalent system of a certain aircraft's transverse navigation system, and compared with the results of least squares method and maximum likelihood method. The results show that the differential evolution algorithm is applied to the equivalent system identification. Good results, and strong ability to find in the equivalent calculation.
J0030 Session 2 Presentation 4 (14:05-14:20)	A Graph-enhanced Convolution Network with Attention Gate for Skeleton Based Action Recognition **Kai Yang**, Xiaolu Ding and Xiaolu Ding China Mobile Research Institute, China *Abstract*—Action recognition based on skeleton data is a challenging field which attracted much attention in computer vision. Previous research mostly leverage the joints level graph to represent spatial features. In this paper, we propose a novel graph-enhanced convolution network with attention gate (GECN-AG) which uses both joints level graph and distilled body-part level graph to extract fine-grained and coarse-grained spatial features.

	Considering simultaneously use of the velocity and position features may improve the ability to focus on critical temporal frames, we propose a novel attention module for temporal feature extraction. Furthermore, a regularized cross-entropy loss is designed to optimize the training process. Our approach achieves competitive performance on two widely-used benchmark datasets.
J0042 Session 2 Presentation 5 (14:20-14:35)	Using Noisy Word-level Labels to Train a Phoneme Recognizer based on Neural Networks by Expectation Maximization **Chen Li**, Bo Zhang, Shan Huang and Zhenhuan Liu Nankai University, China *Abstract*—The Connectionist Temporal Classification (CTC) technique can be used to train a neural-network based speech recognizer. When the technique is used to train a phoneme recognizer, it is required that training data should be annotated with phoneme-level labels. This is not feasible if large speech databases are used. One approach to make use of such speech data is to convert the word-level transcriptions into phoneme-level labels, followed by a CTC training. The problem of this approach is that the converted pho-nemelevel labels may mismatch the audio content of the speech data. This paper uses a probabilistic model to describe the probability of observing the noisy phoneme-level labels given an utterance. The model consists of a neural network which predicts the probability of any phoneme sequence, and another so-called mismatch model to describe the probability of disturbing a phoneme sequence to another. Based on the Expectation-Maximization (EM) framework, we propose a training algorithm which can simultaneously learn parameters of the neural-network and the mismatch model. Effectiveness of our method is verified by comparing recognition performance of our method with a conventional training method on TIMIT corpus.
J0076 Session 2 Presentation 6 (14:35-14:50)	Simplified VGG Based Super Resolution Restoration for Face Recognition **Mengmeng Wang**, Suyu Wang and Peiling Kong Beijing University of Technology, China *Abstract*—The resolution level of face images is one of the key factors affecting the performance of face recognition algorithms.Face recognition under low resolution conditions has always been a challenging research topic in related fields.Using super-resolution restoration technology to improve the spatial resolution of the face to be recognized and reconstruct its high-resolution information is an effective way to improve the performance of the algorithm.However, the traditional image super-resolution restoration algorithm generally has problems such as high computational complexity and difficulty in training, which restricts its application in the actual face recognition system.Therefore, this paper proposes a l ow-resolution face image super-resolution restoration algorithm based on simplified VGG network.Firstly, based on the

	degradation process of low-resolution face images, a set of face image samples corresponding to high and low resolution based on prior knowledge is constructed, and a streamlined 6-layer VGG network is designed to learn between high and low resolution images. The mapping relationship is finally achieved by deconvolution amplification to achieve the super-resolution restoration process of the image.The common LFW and ORL data sets are used to test and analyze the super-resolution restoration effect of the algorithm and its impact on the face recognition algorithm. The experimental results show that the proposed algorithm is superior to the classical SRCNN algorithm in super-resolution performance.When applied to the face recognition algorithm based on Lenet-5, its recognition performance is significantly improved.
J0085 Session 2 Presentation 7 (14:50-15:05)	StaticSLAM : A Dynamic Object-free Accurate SLAM System **Haibin Du**, Jianming Wang and Yukuan Sun Tiangong University, China *Abstract*—Localization and mapping in the real scene where movable objects exist is a challenging task, however, most SLAM approaches generally assume that the scene is static. This assumption leads to building a map with movable objects, causing the localization to fail. We propose MODS, a movable object discrimination strategy which generates a knowledge base containing different attributes of an object, classify the object according to various attributes in the knowledge base, and take different measures for different categories. By using MODS, lidar data can be used in a selective manner to avoid data redundancy and reduce the probability of localization failure. We implement a complete SLAM system based on MODS, verify the influence of movable objects on SLAM with KITTI dataset, and also estimate our SLAM system. The qualitative experimental results show that our SLAM system can effectively eliminate the influence of movable objects on mapping and localization. Moreover, the quantitative experiment results show that the time required for localization was reduced by 16.0% on average compared with the state-of-the-art, while the loop-closure can still be correctly detected.
J0065 Session 2 Presentation 8 (15:05-15:20)	Face Quality Assessment via Semi-Supervised Learning **Xuan Zhao**, Yali Li and Shengjin Wang Tsinghua University, China *Abstract*—Face quality assessment, used for selecting a "good" subset from face images captured over multiple frames in uncontrolled conditions, plays a significant role in video-based face recognition. By removing the poor quality images, it can not only improve recognition performance but also reduce the computation cost. This paper proposes an end-to-end face quality assessment algorithm based on a semi-supervised learning framework. The contributions of the proposed method are threefold. (i) Making use of unlabeled data from target domain to fine-tune a neural network by a

	strategy of automatically updating labels. (ii) Combining prior knowledge with feature learning by using a set of characteristics as binary constraints. (iii) Proposing a light neural network model for training and predicting. Experiments demonstrate that our model can get much higher accuracy in face quality assessment task than the models trained with the same amount of labeled faces, meanwhile the complexity is lower. Experimental results also show that our method can improve the performance of face recognition by face selection.
J1010 Session 2 Presentation 9 (15:20-15:35)	Automatic Recognition of Sound Direction in the Median Plane of Human Ears **Siqing Han** and Delong Xu The High School Affiliated to Renmin University of China, China *Abstract*—The human ear orientates the sound source in the horizontal direction base on the binaural effect, while the orientation of human ear in median plane angle is based on auricle effect. This paper is based on a research device, which measures the sounds from sound sources at different angles in the median plane. Through acquisition of sound data at intervals of $5°$ between $0°$ and $180°$ in the median plane, the spectrum envelope of the sound is extracted to form data samples. The separability of data samples is studied by using three kinds of Minkowski distances. A convolutional neural network is constructed to carry out the research of automatic recognition the median plane angle of the sound source. The research proved that by using Convolution Neural Network (CNN), we can precisely orientate the direction in the median plane with a higher precision.
J0014 Session 2 Presentation 10 (15:35-15:50)	Projection Mapping Content Design Formula **Qinglian Guo** Kanazawa Institute of Technology, Japan *Abstract*—By analyzing a large number of related videos on YouTube and accumulating practical experience, the authors have concluded an original composition formula for creating projection mapping contents from three shapes: a primary shape modeling a building's real structure; a secondary adding virtual structures to emphasize the stereoscopic effect of the space; and an ornamental shape to show active objects that may move around in the space. The paper gives explains about the composition formula, introduces originally designed content, and describes notes on using the composition formula.

Session 3

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

Afternoon, October 24, 2019 (Thursday)
Time: 13:20-15:50
Venue: Rose Room (玫瑰厅, 3rd Floor)
Topic: "Medical Image Processing and Medical Testing"
Session Chair: Assoc. Prof. Xiaomin Zhao

J0015 Session 3 Presentation 1 (13:20-13:35)	Se-denseNet: Attention-based Network for Detecting Pathological Images of Metastatic Breast Cancer **Yang Duan**, Lingling Sun and Yaqi Wang Hangzhou Dianzi University, China *Abstract*—Clinically, the doctor judges the degree of tumor infiltration, and identifies whether it is metastasized by observing the histopathological section of the patient, and conducts targeted treatment for patients accordingly. Pathologists must be highly focused on the diagnostic process, but it is still prone to missed diagnosis. This paper presents a complete diagnostic system for the classification of pathological images of metastatic breast cancer, which can automatically identify metastatic breast cancer cells. In this paper, we use convolutional neural networks to extract images intensively and add attention mechanisms to score and re-learn the features to ensure that the effective features of metastatic cancer can be learned quickly and effectively. Furthermore, the generalization performance of the system is improved by using super-resolution to supplement image details. Eventually, the area under the corresponding curve (AUC) for a single model was 0.993, and the auc score on the kaggle test set was 0.001 higher than when the super-resolution treatment was not used. A final score of 0.975 was achieved on the KAGGLE Histopathologic Cancer Detection competition test set. This method can be used to assist doctors in examining pathological sections, and make the diagnosis results relatively objective.
J0051 Session 3 Presentation 2 (13:35-13:50)	Exploiting Generalized Matched Filter for Efficient and Effective P300 Detection in Speller Paradigm **Hongma Liu**, Yali Li and Shengjin Wang Tsinghua University, China *Abstract*—Brain computer interface (BCI) is aimed to produce a direct way for people to communicate with computer. P300 speller interprets brain signals so that people can spell a word without body movement. However, the conventional classification methods are time-consuming and not

	practical for application. In this paper, we propose a method that tackles the problem through a generalized matched filter. This work is distinguished by two key contributions. First, we investigate statistical signal processing and its feasibility in our task. A model based on hypothesis testing is built and we derive a generalized matched filter (GMF) which is a simple linear function of the signal due to the Gaussian noise assumption. Second, feature selection is introduced according to the estimated covariance matrix, which improves the performance and enhances the computing efficiency simultaneously. Experimental results have demonstrated the great effectiveness of our methods. We improve the performance significantly by 30.5%, 14% at 5, 15 epochs over the original GMF model on BCI competition III dataset II. Moreover, the results are also competitive and much more efficient in applications compared with state-of-the-art methods. Our algorithms need no time for training and cost only 0.016s per character for testing.
J0079 Session 3 Presentation 3 (13:50-14:05)	Face Frontalization with Inpainting Method **Kaiyu Guo** and Juyong Zhang University of Science and Technology of China, China *Abstract*—Problems caused by large profile views are always holdback for face recognition and face reconstruction, such as texture missing problem. In this paper, we propose a method to generate frontal faces from faces of different poses in the wild. Different from previous works for face frontalization which only use GANs or only render a rotated 3D face model to an image, we combine face reconstruction and generative adversarial model, which can preserve the shape information from 3D space and refine the texture through learned distribution from GAN. The task of our GAN is to inpaint the incomplete frontal images which are rendered from the reconstructed 3D model. As the results show, our inpainting method has a better performance than the Poisson editing method on face verification.
J1013 Session 3 Presentation 4 (14:05-14:20)	Effects of Image Augmentation and Dual-layer Transfer Machine Learning Architecture on Tumor Classification Cheng Chen, Christine Chen, Xuesong Mei, **Chaoyang Chen**, Guoxin Ni and Stephen Lemos Wayne State University, USA *Abstract*—Breast tumor (BT) is the second most common health problem for women. The mortality of metastatic malignant tumor is higher than other types of cancer. Traditional diagnosis method can be very labor-intensive and time-consuming with risk of making wrong diagnosis. Computer vision and imaging processing techniques using machine learning (ML) methods are emerging to aide clinical diagnosis. Some machine learning methods have yielded an accuracy of 85% using single-layer classifier. In this study, InceptionV3, a transfer machine learning tool was used for image processing with enhancement technologies and the classification of breast tumor

	histopathological types using a two-layer classifier. Results showed that image augmentation with dual-layer transfer machine learning algorithms yielded an accuracy of 95.6% in identification of breast tumor pathologic types, which is higher than previously reported methods in literature. Different image preprocessing methods, dataset preparing methods, and classifier architectures were also studied to define the optimal algorithm. Results showed that multiple layers processing algorithms using color image instead of black and white images yielded a better accuracy in histopathological type classification.
J2013 Session 3 Presentation 5 (14:20-14:35)	The Long-term Depression of Brain Activity Induced by Electrical Stimulation of Cerebral Cortex **Long Liu**, Jiacheng Zhang, Kedi Xu and Shuming Ye Zhejiang University, China *Abstract*—Electrical stimulation has been widely used for neural modulation. By adjusting proper parameters, electrical stimulation could induce stable inhibition effects on targeted neurons, suggesting a potential cure for interrupting epileptic seizures. It is widely studied that the inhibition effect of electrical stimulation depends on stimulation parameters. Thus, it is important to figure out spatiotemporal inhibition effects induced by parametric changes. In this paper, multi-channel recording electrode array was applied to monitor electrophysiological changes induced by electrical stimulation simultaneously. The stimulation was delivered into rodent somatosensory cortex and neural activities were recorded around the stimulation site. Multi-channel spike firing changes were acquired with different stimulation parameters and inhibition durations were calculated accordingly. Our results showed long-term depression of neural activity lasted about 1 to 3.5 seconds which, in accordance with other studies, highly depended on parameter changes of current amplitude. The spatial responses comparison showed that within a certain range of amplitude (below 200 μA), the inhibition impact induced by electrical stimulation was focal. On the other hand, frequency modulation showed a clear frequency selectivity at about 100 Hz. These results provide some evidences on parameter selection for application of seizure treatment with electrical stimulation.
J0086 Session 3 Presentation 6 (14:35-14:50)	Multi-View Human Action Recognition by Cell Summary Descriptor and Decision Fusion **Ying Zhao**, Yao Lu and Shunzhou Wang Beijing Union University, China *Abstract*—Multi-view human action recognition (MVHAR) is essential for many applications including smart video surveillance in shopping malls, airports, railway stations and other public places, as well as the ambient assisted living systems. Currently, a lot of methods realized MVHAR by constructing high dimensional features or by complex calculation process, which causes the recognition speed difficult to meet the needs of real-time

	application system. To address the problem, a CS descriptor is constructed for each frame by dividing each frame into several cells and further dividing each cell into several radial bins and then extracting spatiotemporal features from each radial bin. Then a video is represented by a sequence of dimension-reduced CD descriptors. The CS descriptor is not only discriminative but also low computational cost. A probabilistic classifier is learned for each view of each action category, and then action classification is carried out independently in each view. A probability estimation based decision fusion algorithm is proposed to make a final decision. Experimental results on the two publically available multi-view human action datasets MuHAVi-MAS-14 and IXMAS show that the proposed approach is superior to state-of-the-art methods in recognition accuracy and moreover, the approach is so computationally efficient that it is appropriate for real-time applications.
J2019 Session 3 Presentation 7 (14:50-15:05)	Determination of Computationally Efficient Multi-pool Model Fitting Approach for Pulsed Chemical Exchange Saturation Transfer MRI Lee Sze Foo, Wun he Yap and **Yee Kai Tee** Universiti Tunku Abdul Rahman, Malaysia *Abstract*—Chemical exchange saturation transfer (CEST) magnetic resonance imaging (MRI) is an emerging imaging technique that detects lowly-concentrated labile protons which can have many potential clinical applications. Multi-pool model fitting is a CEST quantification technique that is able to quantify the pure CEST effect of the individual labile proton pools for a more accurate analysis. However, multi-pool model fitting suffers from long computational times which makes it impractical for clinical use. There are two approaches with which multi-pool model fitting may be performed. This study aimed to determine the more efficient approach for the multi-pool model fitting for pulsed CEST MRI. Simulated CEST data using published model parameters were applied to assess the computational efficiency of the different approaches. Both approaches were able to produce equal accuracy but one of them was twice more computationally efficient than the other. However, further work is required to further improve the speed of multi-pool model fitting of pulsed CEST for potential future clinical applications.
J2023 Session 3 Presentation 8 (15:05-15:20)	A Novel Seizure Diagnostic Model based on Generalized Hurst Exponent and Extremely Randomized Trees **Chuan Hu**, Xin Xu, Guixia Kang, Dongli Wei, Beibei Hou and Zhifeng Liu Beijing University of Posts and Telecommunications, China *Abstract*—The automatic detection of epileptic EEG signals is of great significance for the clinical diagnosis and treatment of epilepsy. The purpose of this study is to establish a high-accuracy, implementable and low-complexity diagnostic model for distinguishing healthy, interictal and epileptic EEG. In our model, the significant features of epileptic EEG are

	extracted by the multifractal analysis approach based on Generalized Hurst exponent combining with Hurst exponent, fluctuation index, mean and standard deviation. Furthermore, the ensemble classifier method based on extremely randomized trees (ERT) is to be explored for classification. It is turn out that the ERT is an effective classifier by comparing with random forest and support vector machine. A satisfactory and comparable result has been observed using our diagnostic model with the average accuracies of 99.25% and 99.33% and specificities of 99.63% and 99.67% validated by 10-fold cross and Standard 50-50 methods, respectively.
J2029 Session 3 Presentation 9 (15:20-15:35)	Brain Tumor Screening using Adaptive Gamma Correction and Deep Learning **Zheng Huang**, Guoli Song and Yiwen Zhao Shenyang Institute of Automation, Chinese Academy of Sciences, China *Abstract*—Generally, the brain tumor is regarded as one of the most dangerous diseases. It is always too late to detect the brain tumors, as the tumors at the early stage are always ignored. In fact, the traditional manual diagnosis process is inefficient. The radiologists have to accomplish a great amount of reading work per day, which can result in weariness and thus lead to misdiagnosis. To liberate radiologists from endless work, a brain tumor screening system based on adaptive gamma correction and deep learning is proposed. The brain images are labeled with "non-tumor" and "tumors", and the radiologists just needs to deal with the brain images labeled with "tumors", which can significantly reduce the workload of the radiologists. Firstly, sufficient contrast enhanced T1-weighted brain images are collected. Further, background removal based on iterative threshold and a novel adaptive gamma correction (NAGC) are implemented to generate brain images with similar overall intensity. Finally, data augmentation technologies are applied to enlarge the training set, and convolutional neural network (CNN) is adopted to train the classifier. The results indicate that the accuracy of the proposed system can reach 95.13%.
J3010 Session 3 Presentation 10 (15:35-15:50)	Analysis of the Method for Determining Changes in the Airways from the Spirometric Curve Evolution **Adam G. Polak**, Dariusz Wysoczański and Janusz Mroczka Wrocław University of Science nd Technology, Poland *Abstract*—The severity of chronic respiratory diseases is evaluated performing spirometry, and particularly the forced expiration maneuvers before and after bronchodilation or challenge tests. However, no method has yet been proposed for the quantitative assessment of changes in airway mechanics following such tests. Just recently, a reduced model for forced expiration with 6 free parameters was derived and used to estimate the parameters by fitting it to a spirometric curve. The aim of this work was to perform comprehensive research on the method for quantifying the changes in airway mechanics by fitting the above model to two spirometric curves,

representing the states of the respiratory system before and after bronchodilation or bronchoconstriction. To this end, a set of pairs of spirometric curves were generated from randomly drawn parameters, and 2,400 of them were used for testing purposes. The proposed method for spirometric data analysis consisted of two stages: the estimation of 6 parameters from the pre-test data using the inverse neural network and the Levenberg-Marquardt (LM) algorithm, and then the estimation of 2 parameters describing airway properties from the post-test curve with the LM procedure. The results show that this approach allows the quantification of changes in the airway mechanics with the accuracy of about 6-7 % of the parameter ranges. These outcomes encourage further analysis of the method using more reliable spirometric data.

Session 4

Afternoon, October 24, 2019 (Thursday)
Time: 13:20-15:50
Venue: Jasmine Room (茉莉厅, 3rd Floor)
Topic: "Data Analysis and Soft Computing"
Session Chair: To be Added

J0018 Session 4 Presentation 1 (13:20-13:35)	Clustering Data Stream with Rough Set **Renxia Wan** and Yanyan Li North Minzu University, China *Abstract*—In this paper, the upper and lower approximations of rough set are introduced to describe the micro-cluster feature in the procedure of clustering uncertain data stream. The proposed algorithm employs presents the micro-cluster timestamp with the time decay and uses agglomerative clustering method to emerge new cluster in the buffer of outliers. Experimental results show that the proposed algorithm can generate natural clusters and outperforms the existing method in term of accuracy.
J0024 Session 4 Presentation 2 (13:35-13:50)	An Effective Personalised Ranking Model Via User Information Under the GAN Framework **Heng Zheng**, Sen Zhang, Xiaoli Su, Zhenyue Gao, and Wendong Xiao University of Science and Technology Beijing, China *Abstract*—Recently, as the most popular deep network model, generative adversarial networks (GAN) has achieved excellent performance in many domians. Some pioneer researchers use GAN for personalized recommendation, such as IRGAN and CFGAN. However, we find two limitations about them: these models do not used auxiliary information to alleviate data sparsity problem and do not employed powerful components as basic model. This paper proposes an effective GAN-based personalised ranking model, named as PRGAN that leverages both user behavior information (such as user-item interaction or other implicit feedback) and user demographic information to enhance the recommendation accuracy. Because of data sparsity, we employ extended version of factorization machine i.e. deepFM as the generator. DeepFM not only can be effectively trained in the case of sparse data, but also can learn high-dimensional features. Compared with traditional FM, deepFM utilize user information more effectively to generate accurate user expressions. Furthermore, we employ Bayesian personalized ranking (BPR) as our discriminator. After a

	minimax iteration game, PRGAN finally generates a high-quality ranking list of items according to user performance. Extensive experiments on two real-world datasets show our model significantly outperforms the state-of-the-art ranking methods and GAN-based model.
J0038 Session 4 Presentation 3 (13:50-14:05)	Alternating Minimization Differential Privacy Protection Algorithm for the Novel Dual-Mode Learning Tasks Model **Kaili Zhang**, Haibin Zhang and Pengfei Zhao Beijing University of Technology, China *Abstract*—Privacy-preserving machine learning algorithms are crucial for the increasingly common setting of analyzing personal data, such as medical, financial records. Through these algorithms, two categories of tasks can be completed: data publishing and data analysis. However, there is a lack of a generalized framework and effective algorithms for solving the combination of those two tasks, which leads to the cumbersome procedures for the identical data set, as well as the waste of computation time. To solve the above problem, firstly, an empirical risk minimization (ERM) model was established for dual-mode learning tasks in this study. Secondly, an alternating minimization differential privacy protection algorithm (AMDPPA) was designed to solve this dual-mode ERM model. Meanwhile, through the theoretical analyses, we proved that the proposed AMDPPA can achieve both privacy protection data classification and data publishing, namely, the released privacy-protected data can not be used to accomplish additional classification tasks for subsequent users. Furthermore, numerical analysis was performed based on real-world data sets. The results show the algorithm's effectiveness in making a trade-off between privacy and learning performance.
J0040 Session 4 Presentation 4 (14:05-14:20)	Velocity-Driven Particle Swarm Optimization **Wei Li**, Yaochi Fan, and Qiaoyong Jiang and Qingzheng Xu Xi'an University of Technology, China *Abstract*—Particle swarm optimization (PSO) is an efficient nature-inspired optimization algorithm, which has been widely applied in many engineering fields. The performance of particle swarm optimization (PSO) has been significantly influenced by velocity update strategy. Traditionally, each particle updates its velocity based on its historical best experience and the global best experience, which may make the swarm lose its diversity and lead to premature convergence. To strengthen the performance of PSO, this paper proposes an improved PSO with the velocity-driven strategy (VD-PSO). In VD-PSO algorithm, the particles whose velocities are driven by better velocities focus on exploitation. The historical velocities, such as better velocities, may effectively characterize the landscape information of the optimization problems. In addition, the particles focus on exploration through information exchange amongst velocities. To verify the effectiveness of the proposed algorithm, experiments are conducted with

	CEC2014 test problems. The experimental results demonstrate the effectiveness of the proposed algorithm for solving the global optimization problems.
J0043 Session 4 Presentation 5 (14:20-14:35)	Intrusion Detection Using Convolutional Recurrent Neural Network **Tongtong Su**, Huazhi Sun and Sheng Wang Tianjin Normal University, China *Abstract*—There are two main problems in the current abnormal network traffic monitoring methods: feature dependence and low accuracy. To solve these problems, we propose a novel deep learning model OCL based on network traffic in this paper. Our OCL model consists of one-dimensional convolutional neural network and long short-term memory. Convolutional neural network is first used to extract features from the image representation of original network traffics. Secondly, LSTM is used to combine the extracted features over time from the obtained features via convolutional and pooling operation. Finally, the output of the LSTM model is fed to fully connection network for classification. End-to-end representation learning is adopted to automatically learn the key features of network traffics. This can describe the network traffic behavior better and improve the ability of anomaly detection effectively. To verify the effectiveness of OCL model, it is comprehensively evaluated on the NSL-KDD dataset and get the best results. Experimental results show that the OCL model achieves high accuracy, which has better performance than other detection methods.
J0052 Session 4 Presentation 6 (14:35-14:50)	Application of Model Compression and Acceleration Algorithms in Complex Task Model **Zhaohui Lv**, Yuanyan Xie, Yang Yang, Yu Guo and Zhenqiang Mi University of Science & Technology, China *Abstract*—Nowadays, the rapid development of artificial intelligence has brought great progress to computer vision (CV) technology. As the number of layers in the neural network model continues to deepen, the accuracy of the model is constantly improving, but the computational complexity of the model becomes larger and larger, and the model needs to be trained on GPU or even TPU. The huge amount of computation limits the many techniques of deep learning that can only be moved to the cloud and cannot be applied on mobile devices. In order to alleviate this problem, many scholars have proposed a variety of model compression and acceleration algorithms, model pruning is one of the classic algorithms. As a common model compression and acceleration algorithms, model pruning can reduce network complexity and computation effectively. However, the pruning algorithm generally has a long training time, and the accuracy of the model decreases too fast when the complex task is pruned. In view of this, this paper proposes two improved schemes, which can effectively alleviate the problem that the accuracy of model degradation is too fast, and greatly shorten the training time. When experimenting on a complex task such as

	the image caption model, the accuracy of the model can remain unchanged basically when the computational complexity of the model is reduced by half.
J0066 Session 4 Presentation 7 (14:50-15:05)	The Impact of Online Word-of-Mouth on Movie Box Office based on Fine-Grained Sentiment Analysis **Guangyu Zhao**, Donglin Li and Ningning Liu University of International Business and Economics, China *Abstract*—With the development of movie media websites, online WOM (word-of-mouth) has become an important reference for people to choose movies. This article aims to study the impact of online WOM on the movie box office market. To tackle this problem we collected 48 movie data released in 2018 as independent variables, including the movie score, the average score of the content of comments, etc. Which are used as independent variables, and the movie box office as the dependent variable to establish the model. Specifically, the fine-grained sentiment analysis is performed on the content of the comment. The results show that the average rating of comments and the positive and negative proportions of movie scores have a significant positive correlation effect on the box office of a movie. And they also highlight the importance of online user-generated reviews to the audience's decision-making.
J0075 Session 4 Presentation 8 (15:05-15:20)	Understanding the Structure of Streaming Documents based on Neural Network **Yutong Jiang**, Ning Li and Yingai Tian Beijing Information Science and Technology University, China *Abstract*—Document structure understanding can obtain the structural information of long-form documents, which plays a key role in the automatic layout of document formats. In the main document format, the structure of streaming documents is difficult to understand, and the current recognition effect is not ideal. According to the characteristics of streaming documents, neural network has obvious advantages for sequence labeling problems, and then a neural network based streaming document structure identification method is proposed. First, the format features, content features and semantic features are extracted, and deep and cross network model is introduced to apply the feature intersections in an automated manner. Secondly, using Long- and short-term memory(LSTM) neural network to construct the recognition model can identify eighteen types of logical labels and document structures more accurately. Finally, using the migration learning method, the structure identification of reports and other types of documents is initially realized. Experiments show that the recognition model proposed in this paper has better document structure recognition ability than other machine learning-based models or methods, and the effect is better than the current best products.

J0083 Session 4 Presentation 9 (15:20-15:35)	Few-Shot Knowledge Reasoning Method based on Attention Mechanism **Haocheng Xie**, Aiping Li and Yan Jia National University of Defense Technology, China *Abstract*—As a core issue of knowledge graph research, knowledge graph reasoning and complementation technology have always been a hot topic of current research. Existing knowledge graph reasoning techniques usually requires a large amount of training for each relationship, and training each relationship requires a large number of training samples. Inspired by meta-learning [1], this paper combines the idea of meta-learning [1] with the attention mechanism [5] to be applied to knowledge reasoning. On the one hand, it greatly reduces the number of samples required for each relationship training, and also reduces the scale of the problem, and the accuracy is higher than the model without the attention mechanism; On the other hand, the extensibility of knowledge has been greatly improved. After the model training is expected to be completed, when dealing with the newly added relationship, there is no need to retrain the model.
J1009 Session 4 Presentation 10 (15:35-15:50)	Neural Network Hyperparameter Tuning based on Improved Genetic Algorithm Wei Xiang and **You Zhining** Jimei University, China *Abstract*—In this paper, based on the structural characteristics of neural networks, a series of improvements have been made to traditional genetic algorithms. The algorithm is used to optimize a series of hyper-parameters in the fully connected neural network, and to find the near-global optimal combination of hyper-parameters. In the case of using MNIST data set and 20 rounds of model training, the algorithm is used to optimize the fully connected neural network. Experiments show that when the population evolves to 30 generations, the accuracy of the model can reach 98.81%, which is higher than 98.4% of the official sample model. This shows that the algorithm has played a certain role in the super-parameter optimization of the neural network.

15:50-16:00	Coffee Break

Session 5

Afternoon, October 24, 2019 (Thursday)
Time: 16:00-18:15
Venue: Hibiscus Room (芙蓉厅, 3rd Floor)
Topic: "Target Detection"
Session Chair: to be added

J0004 Session 5 Presentation 1 (16:00-16:15)	Classification of Short Single-lead ECG Recordings for Atrial Fibrillation Detection Using Decision Tree Ensemble **Minggang Shao**, Zhuhuang Zhou and Shuicai Wu Beijing University of Technology, China *Abstract*—Objectives: In this paper, a new atrial fibrillation (AF) detection method was proposed to classify the ECG recordings into one of four classes: Normal rhythm, AF, Other rhythm, and Noisy recordings. Methods: The proposed method comprised preprocessing, feature extraction, and classification. In preprocessing, R-peaks were detected, and RR intervals were extracted. In feature extraction, 30 multi-level features were extracted, including AF features (n = 4), morphology features (n = 20), RR interval features (n = 2), and features of similarity index between beats (n = 4). In classification, an AdaBoosted decision tree ensemble was trained with these features for classifying ECG recordings into the four classes. The ensemble model was trained with 100-fold cross-validation on the training dataset (n = 8528) provided by the 2017 PhysioNet/Computing in Cardiology (CinC) Challenge. Results: The trained classifier was tested by the Challenge on the unavailable test dataset (n = 3658); the official F1 scores for 'Normal', 'AF', 'Other' were 0.91, 0.82, and 0.73, respectively, and the overall F1 score was 0.82 (ranking equal 5th with eight other algorithms in the 2017 PhysioNet/CinC Challenge). Significance: The proposed algorithm may be used as a new method for AF detection.
J0034 Session 5 Presentation 2 (16:15-16:30)	Fabric Defects Detection based on Multi-sources Features Fusion Zhoufeng Liu, **Shanliang Liu**, Yan Dong, Zhiyong He and Chunlei Li Zhongyuan University of Technology, China *Abstract*—For fabric object inspection, the traditional approaches (e.g., Low rank approximation and sparse representation) have achieved the excellent accuracy in some certain texture fabric, whereas some methods based on convolutional neural network have the advantage of higher efficiency and prime accuracy with various texture fabric. To furthermore improve the

detection accuracy, in this paper, we propose a novel defect model based on transform learning. In the process of model training, both the multiple layer features of the image and the useful information of the source model are fused to meliorate the availability. Additionally, a novel training model called Multiple Sources Features Fusion (MSFF) is presented, which solve the situation of limited negative samples are available and demand to obtain fleet and precise quantification automatically for fabric image assessment. In this paper, we address this question quantitatively by comparing the performances of MSFF detection based on feature transfer network and Object Detection Network (ODN). And our proposed method improves Average Precision (AP) by more 5.9% relative to other result on TILDA—achieving an AP of 93.9%, and achieving an AP of 98.8% on ZYFD datasets, and false positive rate (FP) of 0.2%. Experimental results demonstrate the good performance in the defect detection for patterned fabric and more complex warp-knitted fabric.

J0026 Session 5 Presentation 3 (16:30-16:45)	Object Detection based on Feature Scale Fusion and Feature Scale Enhancement **Jing Wang**, Ping Gong and Ziyuan Liu Beijing University of Posts and Telecommunications, China *Abstract*—Currently, object detection is widely used to deal with the image analysis problem, which is the most important task in computer version. As the high image resolution leads to high computational cost and the low image resolution leads to low accuracy, the key bottleneck of CNN based object detection is the image resolution selection. In this work, we solve the problem of obtaining powerful object detection effect with feature scale fusion and feature scale enhancement. The proposed module can achieve significant accuracy by applying Feature Scale Fusion Module (FSFM) and Feature Scale Enhancement Module (FSEM) to the feature extraction layer of Faster R-CNN. In this case, the enhanced feature map become the input of RPN layer and ROI layer of Faster R-CNN. The accuracy gain of the propose module is verified via the Pascal VOC and MSCOCO datasets, which is proved to obtain significant improvements over the most advanced detection models.
J0059 Session 5 Presentation 4 (16:45-17:00)	Real-time Fabric Defect Detection based on Lightweight Convolutional Neural Network Zhoufeng Liu, **Jian Cui**, Chunlei Li, Shumin Ding and Qingwei Xu Zhongyuan University of Technology, China *Abstract*—Fabric defect detection is an important link for quality control in a textile factory. Deep convolutional neural network (CNN) has made great progress in the field of target detection, and has proven applicable in fabric defect detection. However, the improvement of detection performance of CNN network mainly depends on complex network structure. This comes the drawbacks of significant increase in computational costs and storage

	services, which seriously hinders the usages of CNN on resource-limited environments, such as smart industrial cameras and other embedded devices. In this paper, a lightweight CNN model is designed for fabric defect detection, and denoted as DefectNet. It is based on a streamlined architecture that uses depthwise separable convolutions instead of standard convolutions to build a lightweight neural network architecture, and significantly reduce the computational complexity of the model. The multi-scale feature extraction method is used to improve the detection ability of the model for fabric defects of various sizes. Experimental results demonstrate that the proposed scheme has higher detection accuracy and faster detection speed on the basis of fewer network parameters, which can provide real-time fabric defects detection on the embedded devices.
J0032 Session 5 Presentation 5 (17:00-17:15)	Efficient Edge Detection based on Multi-scale Gabor Filters **Wang Miaomiao**, Gu Meihua and ZhangXiaodan Xi'an Polytechnic University, China *Abstract*—Spatially scaled edges are ubiquitous in natural images. Therefore, to better detect edge with different scales, we propose an edge detection algorithm based on multi-scale Gabor filters. First, the imaginary parts of the Gabor filters (IPGFs) with five scales and eight directions are constructed. Second, the input image is filtered by IPGFs to extract edge features.Then, dimensionality reduction is performed by using pca. Finally, image fusion and double threshold method are used to preserve the edge continuity. Furthermore, we test our method on widely used images. The proposed detector is compared with other detectors. The experiment results illustrate that the algorithm can detect more image details while ensuring the accuracy of detection.
J0027 Session 5 Presentation 6 (17:15-17:30)	Object Detection based on Feature Scale Fusion and Feature Scale Enhancement **Jing Wang**, Ping Gong and Ziyuan Liu Beijing University of Posts and Telecommunications, China *Abstract*—Currently, object detection is widely used to deal with the image analysis problem, which is the most important task in computer version. As the high image resolution leads to high computational cost and the low image resolution leads to low accuracy, the key bottleneck of CNN based object detection is the image resolution selection. In this work, we solve the problem of obtaining powerful object detection effect with feature scale fusion and feature scale enhancement. The proposed module can achieve significant accuracy by applying Feature Scale Fusion Module (FSFM) and Feature Scale Enhancement Module (FSEM) to the feature extraction layer of Faster R-CNN. In this case, the enhanced feature map become the input of RPN layer and ROI layer of Faster R-CNN. The accuracy gain of the propose module is verified via the Pascal VOC and MSCOCO datasets, which is proved to obtain significant improvements over the most advanced

	detection models.
J0061 Session 5 Presentation 7 (17:30-17:45)	Fabric Defect Detection Using Fully Convolutional Network with Attention Mechanism Zhoufeng Liu, **Jinjin Wang,** Chunlei Li, Bicao Li and Ruimin Yang Zhongyuan University of Technology, China *Abstract*—Because of the complex and diverse fabric image texture and defects, the traditional fabric defect detection algorithm has poor detection results and low efficiency. Visual saliency model can outstand the defect region from the complex background. However, the previous saliency detection models typically utilize hand-crafted image features to generate the saliency map, and it can only be used for some kinds of fabric type. In this paper, a deep saliency model generated by fully convolutional network with attention mechanism is proposed for fabric defect detection. First, the proposed model extracts multi-level and multi-scale features using Fully Convolutional Networks (FCN), this will improve the characterization ability for fabric texture. Then, the attention mechanism module is incorporated into the backbone network, thus the different feature map is assigned different weight, this further improves the effectiveness of the feature extraction. Finally, multi-level saliency maps are generated after deconvolution, and then fused by a series of short connection structures to better detect the salient region. Experiment results demonstrate that the proposed approach can accurately locate the defect region comparing with the state-of-art methods. Meantime, defect detection ability of the network model can be improved without significantly increasing the amount of calculation and parameters.
J0074 Session 5 Presentation 8 (17:45-18:00)	Cancer Metastasis Detection Through Multiple Spatial Context Network **Wutong Zhang**, Chuang Zhu, Jun Liu, Ying Wang and Mulan Jin Beijing University of Posts and Telecommunications, China *Abstract*—Breast cancer is one of the leading causes of death by cancer in women, and it often requires accurate detection of metastasis in lymph nodes through Whole-slide Images (WSIs). At present, there are many algorithms of cancer metastasis detection based on CNN, which are generally patch-level models, aiming for increasing the sensitivity, speed, and consistency of metastasis detection. However, most of these algorithms use patch as an independent individual to train, which leads to the neglect of much important spatial context information in WSI. In this paper, we propose a multiple spatial context network (MSC-Net) which considers the spatial correlations between neighboring patches through fusing the spatial information probability maps obtained from the two novel networks we propose, the self-surround spatial context stacked network (SSC-Net) and the center-surround spatial context shared network (CSC-Net). The SSC-Net is a deep mining of continuous information between patches, while CSC-Net strengthens the influence of the neighborhood information to the central

	patch. Furthermore, for saving memory overhead and reducing computational complexity, we propose a framework which can quickly scan the WSI through the mechanism of the patch feature sharing. We demonstrate evaluations on the camelyon16 dataset and compare with the state-of-the-art trackers. Our method provides a superior result.
J0084 Session 5 Presentation 9 (18:00-18:15)	Yarn-dyed Fabric Defect Detection based on Multi-resolution Global and Local Saliency **Han Shixing**, Li Pengfei and Zhang Guangyao Xi'an Polytechnic University, China *Abstract*—In order to detect the defection of yarn-dyed fabric, a method of integrating the global and local saliency maps of multi-resolution is proposed. Multi-scale images were obtained by haar wavelet transform, and different resolutions of images were calculated global comprehensive saliency. Then GBVS algorithm was used to calculate local saliency of fabric images. The global and local saliency maps were weighted and fused to obtain comprehensive saliency images. Finally, image segmentation and morphological operations were carried out to detect the defect areas. Experimental analysed that the detection success rate of different types of texture patterns under five different kinds of defects. The experimental results showed that the detection success rate is 93.5%, so the detection rate is fast which has a certain feasibility for industrial production.

Session 6

Afternoon, October 24, 2019 (Thursday)
Time: 16:00-18:30
Venue: Peony Room (牡丹厅, **3ʳᵈ Floor**)
Topic: "Image Analysis and Signal Processing"
Session Chair: Assoc. Prof. Adam G. Polak

J0009 Session 6 Presentation 1 (16:00-16:15)	Combination of FFST and SR: A New Multi-focus Image Fusion Strategy **Bingzhe Wei**, Xiangchu Feng, Weiwei Wang and Ruiqiang He Xidian University, China *Abstract*—A novel multi-focus image fusion strategy based on the combination of fast finite shearlet transform (FFST) and sparse representation (SR) is proposed. As a novel multi-scale geometry analysis tool, FFST has many good properties, such as lower computing complexity and multi-directional high-pass bands. To take advantage of these properties, the SR-based fusion rule for low-pass bands and the regional contrast fusion rule for high-pass bands are introduced. Experiments show that the proposed method has remarkable superiorities and can obtain better fusion results in both visual quality and objective assessments.
J2034 Session 6 Presentation 2 (16:15-16:30)	Multi-modal Image Fusion based Anatomical Shape Model for Low-contrast Anterior Visual Pathway and Medial Rectus Muscle Segmentation in CT Images **Guoyu Hu**, Jianjun Zhu, Yining Hu, Jie Yu, Ping Liang and Jian Yang Beijing Institute of Technology, China *Abstract*—Segmentation of the anterior visual pathway (AVP, including optic nerve, optic chiasma, and optic tract) and the medial rectus muscle (MRM) in computed tomography (CT) images is indispensable in the treatment planning of skull base tumors. However, the optic tract and the optic chiasma are difficult to visualize because of weak CT imaging on soft tissue. In this paper, we propose a multi-modal image fusion-based segmentation approach for low-contrast AVP and MRM in CT images. First, a statistical shape model is constructed from the magnetic resonance (MR) images in which the optic tract and the optic chiasma are imaged clearly. Second, a deformation field is calculated by fusing the target CT image and the reference MR image and applied to the statistical shape as the initial segmentation result. Third, a multi-feature constrained surface of the AVP and the MRM is generated from the CT image. After fitting the initial

	segmentation result to the surface, the structures, including the optic tract and the optic chiasma that are invisible in CT images, can also be segmented. The proposed method is demonstrated on the clinical data of human head with respect to the Dice value and mean distance. The mean Dice and the mean distance between the segmentation results and the ground truth are 0.66 and 0.58, respectively.
J0054 Session 6 Presentation 3 (16:30-16:45)	Image Super-resolution and Deblurring Using Generative Adversarial Network Bianli Du, Xiaokang Ren, **Saijian Chen**, Jie Ren and Danling Cao Tianjin Normal University, China *Abstract*—Image super-resolution and deblurring are two highly ill-posed problems that are usually dealt separately. However, real-world images are often low-resolution and have complex blurring. This paper focuses on ordinary natural scene images and reconstructs clear high-resolution images directly from blurred low-resolution inputs. Firstly, we propose a model based on generative adversarial network to jointly process image super-resolution and non-uniform motion deblurring. Secondly, we decouple this joint problem into feature extraction module, super-resolution reconstruction module and deblurring module. The modules promote each other and reconstruct clearer high-resolution images. Finally, we use bilinear interpolation followed by a convolutional layer to achieve upsampling instead of using the common deconvolution layer, which effectively suppresses checkerboard artifacts. The experimental results show that the proposed method is efficient and can perform better than the existing advanced algorithms in both quantitative and qualitative performance.
J0056 Session 6 Presentation 4 (16:45-17:00)	Combining Attentional CNN and GRU Networks for Ocean Current Prediction based on HF Radar Observations **Nathachai Thongniran**, Kulsawasd Jitkajornwanich, Siam Lawawirojwong, Panu Srestasathiern and Peerapon Vateekul Chulalongkorn University, Thailand *Abstract*—Lately, CNN-GRU demonstrates the ability of deep learning techniques on ocean surface current prediction. Improvement of the current prediction model creates positive impact on variety of marine activities, such as search-and-rescue, disaster monitoring and power forecasting. Deep learning techniques was successfully deployed to improve model performance in many areas due to their ability to handle enormous amounts of information in a variety of inputs and their huge growth in recent years. Latest ocean current prediction employed a combination of two mature techniques, which are Convolutional Neural Network (CNN) and Gated Recurrent Unit (GRU), to capture spatial and temporal characteristics of its nature. However, there is still room for improvement due to many modern techniques that still have not been employed, and domain knowledge in oceanic, such as lunar illumination, is not taken into account to improve

	prediction performance. This paper introduces the ocean surface prediction model that employs soft attention mechanism, transfer learning, and incorporation of domain knowledge inputs which are month number, lunar effect, and hour number. An experimental dataset from 2014 to 2016, provided by GISTDA, is collected by using high frequency (HF) radar stations located along the coastal Gulf of Thailand. The experiment compares an existing CNN-GRU and our proposed model. The result shows an improvement of the prediction model in terms of RMSE by 1.983%, and 3.635% on U and V components.
J0064 Session 6 Presentation 5 (17:00-17:15)	An Acoustic Model of Civil Aviation's Radiotelephony Communication **Yuanqing Liu**, Xiaojing Guo, Haigang Zhang and Jinfeng Yang Civil Aviation University of China, China *Abstract*—Civil Aviation's Radiotelephony Communication (CARC) in China involves Chinese and English. Due to the particular grammatical structure and pronunciation of CARC, the universal cross-lingual acoustic model isn't applicable. For the purpose of achieving the Chinese-English speech recognition of CARC, this paper proposes a cross-lingual acoustic model using a shared-hidden-layer Convolution Depth Neural Network (CDNN) with hidden Markov model. It introduces the Convolution Neural Network (CNN) to overcome the diversity of speech signals. In order to shorten the training and decoding time, the Low Frame Rate (LFR) is added in the feature extraction stage. The experimental results show that the acoustic model based on CDNN is better applied to the domain of CARC. The introduction of CNN can further improve recognition performance. Adding the LFR effectively reduces the training time and the word error rate.
J1016 Session 6 Presentation 6 (17:15-17:30)	A Multi-model Object Tracking Algorithm based on Texture and Color Features Xuwen Li, **Wendong Xue**, LiJuan Shi and Qiang Wu Beijing University of Technology, China *Abstract*—Mean Shift is widely concerned because of its advantages like fast convergence, real-time performance and simple procedure. However, the tracking performance of the traditional Mean Shift algorithm is obviously interfered when the background has the similar color as the target or the illumination changes. Besides, the tracking is easy to defeat in the case of target occlusion and loss of important frames. Therefore, this paper proposes two improvements based on the traditional Mean Shift tracking algorithm. First, the HLBP texture feature and color feature are employed to describe the target feature in order to improve the robustness of the tracking algorithm. Second, multiple models are taken into account to provide more abundant choices for the tracking process which can improve the tacking performance. The result of experiments show that our algorithm is more robust under the case of object occlusion and posture change, and gets better

	performance in accuracy when the background color and target color are similar or the illumination changes.
J0071 Session 6 Presentation 7 (17:30-17:45)	A Multi-scale Wavelet CNN for Scanning Electron Microscopy Nerve Image Super Resolution **Pan Zhao**, Zhongwen Gao, Hua Han and Guoqing Li Harbin University of Science and Technology, China *Abstract*—Efficient acquisition of high-resolution SEM nerve images is an important part of brain science research. Because of the characteristics of SEM nerve image, the SR images obtained by current methods are too smooth and lack detailed information. We first analyze the multi-scale wavelet coefficients of SEM nerve images and find that when decomposed to the third scale, there is almost no structural information at high frequencies and the horizontal components are more obvious than the vertical ones. Based on these characteristics, an end-to-end full convolution neural network based on multi-scale wavelet is proposed. Firstly, the main structure of the network is constructed, which is divided into two modules: encoding and decoding. Then, the actual output of the network is changed to the prediction of multi-scale wavelet coefficients, and the final SR image is obtained by inverse transformation. Finally, multi-objective form is used to set hyper-parameters based on the wavelet characteristics of SEM nerve image. In terms of loss function, two-stage losses (gray-level loss and multi-scale wavelet coefficients loss) are used to emphasize the overall texture and the high-frequency details respectively. In addition, the inverse transformation can replace the deconvolution to reduce some network parameters. In the experiment, the relationship between SR effect and wavelet scale is analyzed. With the increase of wavelet scale, the performance of the model is not linearly enhanced, and the optimal wavelet scale and upscaling factor of the model are determined. Experiments show that, compared with other state-of-the-art methods, our method is more prominent and more realistic in the restoration of nerve structure texture.
J0092 Session 6 Presentation 8 (17:45-18:00)	Multiple Sound Sources Localization by Using Statistical Source Component Equalization **Shang Gao**, Maoshen Jia, Yuxuan Wu, Yitian Jia, Mingchen Wei Beijing University of Technology, China *Abstract*—Multiple sound sources localization is a hot topic in audio signal processing as it can provide effective information for parameter coding and reconstruction of sound scenes. In this paper, a multiple sound sources localization method is proposed by using statistical source component equalization. Based on single source zone (SSZ) detection, the proposed method aims to settle the localization accuracy degradation problem caused by the missed detection of statistically weak source (SWS) which is inevitable in the sound scene where more than five sound sources occur simultaneously. Since SWSs only have little DOA estimations compared

with other sound sources called statistically dominant source (SDS), they are difficult to be found in the histogram of DOA estimations. A statistical source component equalization algorithm is designed to remove the components of SDSs and reserve the components of SWSs at the same time, which can make the SWSs obvious enough to be found through post-processing. The objective evaluation reveals that the proposed method can always obtain a comparable or better localization results than traditional SSZ-based method.

J0072 Session 6 Presentation 9 (18:00-18:15)	Automatic Detection of 3D Steel Structures in As-built Point Clouds **Rogério Pinheiro de Souza**, Paulo Ivson Netto Santos, Cesar A. Sierra Franco and Alberto Barbosa Raposo Pontifical Catholic University of Rio de Janeiro, Brazil *Abstract*—The use of Building Information Modeling (BIM) is a growing reality in the civil industry. Its key information is the 3D geometric model of the building. With the need to apply such methodology to existing buildings, researchers have focused on how to automatically generate 3D geometric information from point clouds provided by laser scanning sensors. Most of this research has focused on the recognition of either planar (e.g., walls) or cylindrical (e.g., piping) structures. Few works have dealt with the detection of structural steel elements, due to its particular shape, and only recently focused on detecting their dimensions. However, in these approaches the point cloud of each structural element was manually separated from the point cloud of the entire building. This creates a challenge since the manual segmentation of a point cloud is a long and subjective process. In this paper, we propose a novel method that automatically detects structural steel elements in a 3D point cloud of existing buildings, without the need for previous segmentation. The proposed technique combines a slice approach with image processing and a machine learning strategy. Performance results show the effectiveness of our approach to detect the desired elements with more than 94% of precision. These results open new possibilities to create automated pipelines to generate accurate 3D BIM models.
J2036 Session 6 Presentation 10 (18:15-18:30)	The Effect of Smoothing Filter on CNN based AD Classification **Baiwen Zhang**, Jingxuan Wang, Lan Lin and Huicai Wu Beijing University of Technology, China *Abstract*—Gaussian smoothing (GS) is a spatial low pass filtering method widely used in neuroimaging preprocessing. Full width at half maximum (FWHM) is a common parameter when the imaging data convolved with GS kernel. The convolutional neural networks (CNNs) can be considered as the feature extractor, which is implemented by applying a series of different filters. However, the influence of kernel size of GS for feature extraction remains unclear. In this study, we describe an automatic AD classification algorithm that is built on a pre-trained CNN model, AlexNet for feature extraction and support vector machine (SVM) for classification. The

algorithm was trained and tested using the structural Magnetic Resonance Imaging (sMRI) data from Alzheimer's Disease Neuroimaging Initiative (ADNI). The data used in this study include 191 Alzheimer's disease (AD) patients and 103 normal control (NC) subjects. We evaluate the influence of FWHM on classification performance. When FWHM is 0mm, the classification accuracy obtained the highest value for AD and NC, which reached 91.5%, 92.4%, 89.0% for conv3, conv4 and conv5 of AlexNet respectively. The classification accuracy at each layer is relatively low when FWHM is 8mm. The result suggests that the higher smooth value may have a negative effect on feature extraction of CNNs during AD classification.

Session 7

Afternoon, October 24, 2019 (Thursday)
Time: 16:00-18:30
Venue: Rose Room (玫瑰厅, 3rd Floor)
Topic: "Molecular Biology and Biomedicine"
Session Chair: Prof. Qinglian Guo

J2005 Session 7 Presentation 1 (16:00-16:15)	Discovering New Inhibitor to Diminish Integrase and LEDGF/p75 Relation using an *in silico* Approach **Umesh Panwar** and Sanjeev Kumar Singh Alagappa University, India *Abstract*—Since the century begins, viruses have remained a global health concern. The causative agent for Acquired Immune Deficiency Syndrome (AIDS) is an HIV-1 virus, infects vital cells of the human immune system. Owing to a Lack of effective medicine against Human immunodeficiency virus (HIV) cost millions of lives. Proof of olden research reveals the chromatin tethering function of LEDGF/p75 is hijacked by integrase to settle viral integration. Thus, the relation of LEDGF/p75 with HIV-1 integrase has drawn interest in the development of future therapeutics to combat latent viral infection. Herein, we applied an in silico platform of E-pharmacophore based virtual screening with implementation of molecular docking, ADME, free binding energy and dynamics simulation strategies to develop a potent inhibitor to diminish the protein-protein interaction between integrase and LEDGF/p75. It results that the identified molecule with acceptable pharmacological properties and higher binding affinity is able to inhibit the IN-LEDGF/p75 relation. We anticipate the identified molecule may be future therapeutic agents to cure a HIV infection to increase individual life span.
J2014 Session 7 Presentation 2 (16:15-16:30)	Genome-wide Association of APOE and FOXO3A for Human Longevity: A Systematic Review **Birga Anteneh Mengesha** and Huang Jian University of Electronics Science and Technology, China *Abstract*—The use of systems biology and bioinformatics to deal with the complexity inherent in aging research has played a major role. Genome-wide association studies (GWAS) is a means of detecting longevity-associated with genetic variants. The numbers of genetic variants found to associate with longevity and the most convincing human longevity genes today are APOE and FOXO3A which have frequently been associated

	with longevity. We conducted a systematic review to identify studies that contain the relevant data. Odds ratios (OR) and 95% confidence interval (CI) and P<0.05 for significant tests were used to figure out the genomic association between the genes and human longevity. There are a positive association of rs2802288 (OR = 1.08, 95% CI = 0.93-1.25, p = 0.03) and rs2764264 (OR = 1.25, 95% CI = 0.90-1.73, P = 0.01) between FOXO3A polymorphisms and human longevity on pooled analysis, specifically with male longevity but there is no association with rs13220810 polymorphism (OR = 0.96, 95% CI = 0.80-1.16, P = 0.31). Rs7412 polymorphism of APOE indicates a significant association which was more likely with human longevity (OR = 1.30, 95% CI = 0.50-2.83, P = 0.01) and rs429358 polymorphism of APOE was less likely to occurred for longevity with a negative significant association (OR = 0.50, 95% CI = 0.37-0.67, P = 0.01). It was confirmed that there are an association between FOXO3A and APOE with human longevity on polymorphisms. Further genotyping should be done to verify more potential markers or polymorphisms related to human longevity.
J2015 Session 7 Presentation 3 (16:30-16:45)	Cell Printing by a Hybrid Pneumatic-electrohydrodynamic Method Chen Xi, **Wang Yiwei**, Bao Weijie, Wang Can, Wang Zhihai and Gui Jingang Beijing University of Technology, China *Abstract*—Sample deposition based on micro-droplet ejection has broad application prospects in the field of biomedicine. For biological cell printing, a hybrid pneumatic-electrohydrodynamic (HPEHD) micro-droplet ejection system is built in the laboratory. Strong electric field is established by applying a high voltage between the nozzle and a collector electrode. A solenoid valve is opened temporarily; high pressure gas enters the liquid storage chamber, and produces pressure pulse, which extrudes the liquid slightly from the nozzle. The liquid is further deformed in the electric field into a cone shape (Taylor cone), and then the end of the Taylor cone breaks to form a micro-droplet. The ejection process is studied using machine-vision and image processing. With Sodium Alginate (1.0%) containing human peripheral blood mononuclear cells (PBMC) as bioink, single droplet per ejection is realized, and the droplet size is reduced by 50% due to the presence of the electric field. Through flow cytometry and microscopic photos, the effect of ejection process on the short-term viability of cells is shown to be negligible, suggesting HPEHD ejection a potential technology option for cell printing.
J0091 Session 7 Presentation 4 (16:45-17:00)	Learning Global-to-Local Constraint Network for Face Alignment **Ziyang Chen** and Congcong Zhu Beijing University of Posts and Telecommunication, China *Abstract*—In this paper, we propose a global-to-local constraint network (GLCN) to improve the robustness of face alignment. Especially in the

challenging cases when faces undergo large variations including severe poses and occlusions. Unlike conventional cascade regression which based on average faces to conduct regressing, which does not take full advantage of face information. Our GLCN learns a custom shape for every input images through global information. Then local adjustments will be applied for these initializations for robust feature representation. To achieve this goal, we design a local constraint network, which models the global-to-local constraint mechanism. We employ an hourglass network to learn global feature representation, and typically incorporates with five subnets to optimize facial landmarks. To further reinforce the alignment performance, we integrate our designed model in the paradigm of RNN network. Experimental results demonstrate the robustness of our GLCN versus many challenging cases especially.

J2017 Session 7 Presentation 5 (17:00-17:15)	Metabolic Pathway Membership Inference using an Ontology-based Similarity Approach Imam Cartealy and **Li Liao** University of Delaware, USA *Abstract*—Determining whether a protein belongs to a metabolic pathway is an important annotation task, can provide context to the basic functional annotation, and aid reconstruction of incomplete pathways. In this work, we develop a method for pathway membership inference based gene ontology (GO) similarity between a query protein and proteins that are known to members of a given pathway. By comparing with various existing measures of GO term semantic similarity, we develop an effective and efficient way to take into account of both information content of individual GO terms and the whole GO hierarchy. We test the classifier using 10-fold cross validation for all metabolic pathways reported in KEGG database and demonstrate that our method outperforms with statistical significance in comparison to a suite of existing semantic similarity measures, as evaluated using ROC score. And our method outperforms other methods in running time by multiple orders of magnitude for long pathways.
J2021 Session 7 Presentation 6 (17:15-17:30)	Enriched DNA Strands Classification using CGR Images and Convolutional Neural Network **Sarah Safoury** and Walid Hussein The British University in Egypt, Egypt *Abstract*—Bioinformatics is the biological study which applies programming techniques for more understanding and analysis of living objects such as the study of genome structure. The genome structure could be represented in the form of an image. Chaos Game Representation (CGR) is the practice of converting the DNA sequence (i.e., genomes) into images, where each image is a graphical appearance for an individual DNA strand's signature. CGR is a method of converting a long one-dimensional DNA sequence into a graphical form. This method provides a visual image of a

	DNA sequence different from the traditional manual linear arrangement of nucleotides polymerase chain reaction. In the recent years, CGR was introduced to automatically classify genomes not only by archival references but also through its unique signature.
	In this paper, a novel CGR classification approach is developed combining the advances of image processing and pattern recognition approaches. The approach starts by declaring the genome and using the CGR technique to map it to the graphical interface (i.e., 16x16 signature images). Then, an image processing procedure is prepared to handle complex geometric shapes, analyze structured and visualized genome sequences and fractal point the included nucleotides of these images. Finally, the convolutional neural network was designed and well-trained by those signatures to classify each genome tested.
J2022 Session 7 Presentation 7 (17:30-17:45)	Circular RNA CircEZH2 Suppresses TGEV-induced Opening of mPTP via circEZH2/miR-22/HK2 Axis and circEZH2/miR-22/IL-6/NF-κB Axis in IPEC-J2 **Xiaomin Zhao**, Xuelian Ma and Dewen Tong Northwest A&F University, China *Abstract*—To investigate the effect of non-coding RNAs (ncRNAs) on inflammation and mitochondrial damage of porcine intestinal epthelial cell (IPEC), caused by transmissible gastroenteritis coronavirus (TGEV), the profiles of mRNAs, miRNAs, and circRNAs of intestinal porcine epithelial cell-jejunum 2 (IPEC-J2) cell line during TGEV infection were analyzed. Based on bioinfomatic analysis, we tested the interation relationship between circEZH2 and miR-22, identified the targets of miR-22, measured the roles of circEZH2 in mitochondrial permeability transition pore (mPTP) opening induced by TGEV infection. We found that circular RNA circEZH2 could directly attach miR-22 and supressed TGEV-induced opening of mPTP. Hexokinase 2 (HK2) and interleukin 6 (IL-6) were identified as the targets of miR-22. HK2 inhibited TGEV-induced mPTP opening, while no effect on NF-κB pathway. IL-6 reduced TGEV-induced mPTP opening and enhanced nuclear factor kappa-light-chain-enhancer of activated B cells (NF-κB). Activation of NF-κB decreased TGEV-induced mPTP opening. The data indicated that TGEV-induced mPTP opening was regulated via two pathways: circEZH2/miR-22/HK2 axis and circEZH2/miR-22/IL-6/NF-κB axis.
J2027 Session 7 Presentation 8 (17:45-18:00)	Mesoporous Silicon Nanocarriers with Dieckol Interlayer for Selectively Controlled Drug Release and Mitochondria-targeting Specificity **Vy Anh Tran**, Vo Van Giau, Seong Soo A. An, Thu Thao Vo Thi and Sang Wha Lee Gachon University, South Korea *Abstract*—A smart drug delivery system (DDS) is one of the most promising

	therapeutic strategies for effective cancer therapy. Importantly, DDS should possess not only high therapeutic efficacy but also be harmless and degradable in vivo, the capability of controlled drug release, target area without developing drug-resistant cancer cells. We developed multifunctional mesoporous silicon NPs (or FMPSi-based NPs) as smart drug delivery system (DDS) possessing both fluorescent imaging and stimuli (pH, NIR light)-responsiveness of drug release. GO-coated NPs (so-called FMPSi-Cis@GO) exhibited the fast drug release at low pH 5.5, whereas Di/GO-coated NPs (FMPSi-Cis@Di@GO) exhibited more consistent drug release irrespective of pH changes. Furthermore, FMPSi-Cis@Di@GO exhibited excellent chemo-photothermal therapeutic effects. FMPSi-Cis@Di@GO@DQA exhibited higher fluorescence intensity in isolated mitochondria of cancer cells as compared to FMPSi-Cis@GO@DQA, indicating more effective delivery of the former Di-interlayered NPs into the mitochondria. Among as-prepared NPs, FMPSi-Cis@Di@GO@DQA exhibited the most enhanced cancer cell killing efficiency probably due to the synergistic effects of Di interlayer on the decrease of cellular ATP production and mitochondrial membrane damaging. Our multifunctional mesoporous silicon NPs demonstrated the controlled drug delivery, excellent chemo-photothermal therapeutic effects, and mitochondria targeting specificity, as drug vehicle platform for the smart delivery of specific mitochondria-acting drugs.
J2038 Session 7 Presentation 9 (18:00-18:15)	Integrated Bioinformatics Platform for Large-scale Data Analysis **Henry Yang** National University of Singapore, Singapore *Abstract*—Bioinformatics has become an important part of many areas of biology and an essential tool to interpret and understand various large-scale genomic/proteomic datasets. Many high-throughput technologies, such as next-generation sequencing, microarray, mass spec, and high-throughput screening, are now available for biologists to perform large-scale profiling of cellular events for extracting relevant biological insights. As each type of data generated by these technologies describes biological events from different angles/aspects and alone can only provide information on a biological system from a limited viewpoint, integrated viewpoints from different disparate datasets are often required to better understand the complex biological regulatory mechanisms. In this presentation, a novel modular integration platform will be discussed which contains two steps: 1) individual data analysis portal and 2) modular data integration portal. Given a biological question, we can integrate different data at different stages module-wise to better answer the question asked. Several examples with the application of this platform will be highlighted, including growth/transcriptional factors, alternative splicing, RNA editing and lncRNA expression during hematopoiesis, leukemia or stem cell development.

J3009 Session 7 Presentation 10 (18:15-18:30)	Non-specific Effect (NSEs) of Supernatant L20B Culture Cell after OPV Exposure against *Shigella flexneri* Adhesion to Mice Enterocyte **Enny Suswati**, Fedik Abdul Rantam and Eddy Bagus Wasito Universitas Airlangga, Indonesia *Abstract*—**Introduction** Besides protect against specific microorganisms, vaccines can induce heterologous or non-specific effects (NSE). As the global polio eradication initiative prepared to cease use of oral polio vaccine (OPV) in 2020, there is increasing interest in the understanding of oral vaccination provides non-specific immunity to other infections so the consequence of this transition can be adequately planned for and mitigated.**Method** This research was laboratory experimental research using Randomized Post Test Only Control Group design to prove the difference in adhesion of *Shigella flexneri* on Balb/c mice enterocytes after variety concentration administration of supernatant L20B Culture cell after OPV exposure. Supernatant concentrations of 0%, 12.5%, 25%, 50%, 100% each was coated to enterocytes Balb/c mice, then infected with *Shigella flexneri*. After six hours incubation at 37 ℃, a small volume of the mixture was made for Gram staining and examined microscopically under high power field. *Shigella flexneri* adhere to 100 enterocytes were counted and analyzed using correlation test and Anova. **Resul**t here were statistically difference in adhesion between 0% and 25%, 50% and 100%; 12.5% and 50% and 100%; 25% and 50% and 100%; 50% and 100%. There was a strong correlation between supernatant concentration and Shigella flexneri adhesion index in Balb/c mice enterocyte.**Conclusion** There were index differences of adhesion *S flexneri* on Balb/c mice enterocyte after giving L20B cell culture supernatant after OPV exposure which was meaningful differences between 0% with 25%, 50%, and 100%. There was strong correlation between supernatant concentration and Shigella flexneri adhesion index in Balb/c mice enterocyte

Session 8

Afternoon, October 24, 2019 (Thursday)
Time: 16:00-18:30
Venue: Jasmine Room (茉莉厅, 3rd Floor)
Topic: "Computer Information Technology and Application"
Session Chair: to be added

J0012 Session 8 Presentation 1 (16:00-16:15)	Research on Multi-UAVs Formation Flight Control based on Fuzzy PID Xiangwei Jiang, Boxin Zhao, **Boyang Zhang**, Xiaolong Chen and Xiongwei Wang Air Force Engineering University, China *Abstract*—Small Unmanned Aerial Vehicle (UAV for short) has advantages of low cost, light and flexible. But single UAV also has disadvantages of lack of sight distance, sole access to information, limited airborne computing resources, etc. In order to overcome those weaknesses, UAV is undergoing a change for formation cluster. Moreover, UAV formation control is a key technology to ensure effective cooperative formation flight of UAV. [1] Therefore the paper studied the fuzzy PID controller for formation control of mini quad-rotor UAV through MATLAB simulation and contrast with the typical PID controller.
J0044 Session 8 Presentation 2 (16:15-16:30)	An Analysis on Python Programming Language Demand and its Recent Trend in Bangladesh **Aaquib Javed**, Monika Zaman, M. Monir Uddin and Tasnova Nusrat North South University, Bangladesh *Abstract*—In today's world, we have a lot of programming languages. Which can realize our needs, but the important issue is, how to teach programming language in a very effective way to freshmen. Well, in that case, python can be a suitable language for both learning and real-world programming. It is a high-level, object-oriented programming language created by Guido Van Rossum was released in 1991. After python released day by day, it has become one of the most famous and demanding programming languages all over the world. In this paper will introduce and discuss python programming characteristics / features, organized syntax, and its powerful tools which help to solve many tasks also it is very close to simple math thinking. We tried to find out the recent trend/demand for python programming language in Bangladesh by operated a survey under faculty member from various universities, freelancer programmers and

	students from engineering studies. Also, make some simple comparison between python and other languages. From there we have figure out the most demanding features, characteristics of python language and the types of programming language supported by python. Python is now the most demanded and fastest-growing language which is founded by the support of researches done over many articles of various magazines and popular websites.
J0048 Session 8 Presentation 3 (16:30-16:45)	MultiGraph Attention Network for analyzing Company Relations **Natraj Raman**, Grace Bang and Azadeh Nematzadeh S&P Global, UK *Abstract*—When analyzing companies in financial markets, it is essential to identify those companies that share similar characteristics in order to assess their relative strengths and weaknesses. This challenging task requires representing the rich set of information associated with companies and the complex interrelations between them in a form that is amenable to pattern recognition. We present here a new deep representation learning method that encodes the network graph of companies in a low-dimensional embedding space, preserving its topological structure. Our solution employs a number of neural attention mechanisms that adaptively aggregate information over company node neighborhoods in a multi-dimensional edge setting. The learned company embeddings are transferable and can be fine-tuned for a wide range of analytical tasks. We demonstrate improvement over state-of-the-art solutions and illustrate the efficacy of our method for financial analysis tasks such as industry classification, peer group identification, credit rating anomaly detection and visualization of company relations.
J0049 Session 8 Presentation 4 (16:45-17:00)	Remaining Useful Life Prediction of Cutting Tools based on Deep Adversarial Transfer Learning **Yingchao Liu**, Xiaofeng Hu and Jian Jin Shanghai Jiao Tong University, China *Abstract*—Condition-based maintenance and the prediction of the remaining useful life (RUL) of cutting tools are of crucial importance to reduce unexpected downtime and ensure quality. Our paper proposes a deep adversarial transfer learning based approach for RUL prediction of cutting tools. It mainly includes three parts: source domain pre-training, adversarial domain adaption and target domain prediction. Firstly, we pre-train a source long short-term memory (LSTM) network and a nonlinear regression model by using the labeled source cutting tool examples. Secondly, we perform adversarial domain adaption by learning a target LSTM model that minimize the distance between the source domain and target domain under their respective mapping, thus making it impossible for the discriminator to distinguish between the target and source cutting tools. Finally, the RUL of target cutting tools can be predicted. Our proposed

	method is applied to the data obtained the data obtained from a turbine factory's slotting cutter machining process. The result shows that the effectiveness and practicability of our proposed method.
J0077 Session 8 Presentation 5 (17:00-17:15)	Fire Detection Method based on Improved Deep Convolution Neural Network Yiheng Cai, **Yuanyuan Li**, Jiaqi Liu, Yajun Guo and Hui Li Beijing University of Technology, China *Abstract*—Computer vision-based fire detection methods have recently gained popularity as compared to traditional fire detection methods based on sensors. According to whether or not use hand-crafted features for fire detection, computer vision-based fire detection methods can be divided into two categories: hands-crafted based methods and deep learning based methods. However, because of the limited representation of hand-crafted features, the performance of hand-crafted based methods are limited by the illumination, quality and background scenes of fire images. Thus, in this study, we propose an improved deep convolution network, which uses the global average pooling layer instead of the full connected layer to fuse the acquired depth features and detect fire. Besides, to further improve the accuracy of fire detection, we construct multi-features input data to compensate for the insufficiency of experimental data. Because there is no common dataset for fire detection, we verify the effect of our proposed method on our collected dataset and get 89.9% accuracy for fire detection.
J0078 Session 8 Presentation 6 (17:15-17:30)	Construction of Knowledge Map of Continuous Fiber Reinforced Ceramic Matrix Composites Xiang Gao, **Wenjing Cui**, Leijiang Yao, Yajie Zhou and Guanhua Wang Northwestern Polytechnical University, China *Abstract*—The development of new materials is a complex process that requires a long development cycle. In order to shorten the research and development cycle and save the cost of new material research and development, the United States proposed the Materials Genome Initiative (MGI) in 2011, in which the development of data sharing and computing tools is critical to the success of MGI. We need to design suitable methods for knowledge organization and storage of ceramic matrix composite (CMC) in order to achieve data sharing, improve the existing status of collecting and integrating relevant data from relevant literature and high error rate by relying on manual methods. In this paper, we propose a data organization method based on a complete experimental data record for CMC. At the same time, we use knowledge maps to store data. On the one hand, data sharing is solved and a visual operation interface is provided. On the other hand, we lay a foundation for semantic search of material database.

J0088 Session 8 Presentation 7 (17:30-17:45)	House Rent Prediction based on Joint Model **Kun Zhang**, LingCong Shen and Ningning Liu University of International Business and Economics, China *Abstract*—With the development of the house leasing market, the house rents of several large cities in China have experienced rapid growth due to the increasing demand. In this paper, we focus on investigating various machine learning approaches to predict the house rent. Firstly, we not only have investigated different rent-related features including community condition, location, traffic and house condition, but also have employed various prediction models including XGBoost, LightGBM and CatBoost algorithms. Based on these, we proposed a joint model, which is a combination of above three models by linear weighting learned from least square method. Our best model ranks in top3% in the public Data Castle competition, which proves the joint model can effectively improve the accuracy and stability of the rent prediction compared to other prediction models.
J0094 Session 8 Presentation 8 (17:45-18:00)	Data Acquisition System of Weather Sounding Air Pressure Sensor **Wenjing Zhang**, Pengyu Liu and Kebin Jia Beijing University of Technology, China *Abstract*—Develop high-precision air pressure monitoring sensors for upper-air meteorological detection, break through cost control and adaptability to upper-air environment, and form products with independent intellectual property rights and stable and reliable quality. For its slow collection speed, need manual operation, can not be automatically collected. An automatic data acquisition system is designed for the new upper-air meteorological sensor. Because the sensor is controlled by two variables, pressure and temperature, a single variable method is adopted to measure the pressure characteristics at each temperature point. Each sensor number obtained first and create the corresponding data table, on the basis of setting the current temperature of constant temperature trough, and according to the requirements set step to determine the temperature characteristic points, after waiting for its stability, and according to the requirements set pressure feature points, judge stability after collecting data, the machine according to the communication protocol parsing, get the final accurate measuring data and deposited in the database. In order to test the effectiveness of the system, a serial port assistant is used for simulation. The results show that the acquisition system can automatically collect data of weather sounding sensor without manual operation. The acquisition speed is fast and the efficiency is high, which greatly reduces the manual operation. Therefore, it has strong operational significance and is worth popularizing.

J0069 Session 8 Presentation 9 (18:00-18:15)	The Highway Pavement State Detection Based on Residual Neural Network **Wu Zhe-cheng**, Liu Peng-yu and Jia Ke-bin Beijing University of Technology, China *Abstract*—The determined state of highway road surface is an important guarantee for reducing traffic accident. This paper firstly proposes an algorithm combining background subtraction and FCN semantic segmentation network to solve the problem of inaccurate segmentation of pavement region in traditional pavement state detection.It simplify the range of road area which is to be detected. Furthermore, in view of the low classification accuracy of the traditional pavement state classifier, this paper builds the pavement classification model Resnet-road based on the residual learning unit, and trains the pavement state classifier. Compared with the traditional pavement state classification algorithm, the accuracy of road surface classification method in this paper is increased by 4%-7%, which can be applied to actual inspection.
J1015 Session 8 Presentation 10 (18:15-18:30)	Software Design of Hardware-in-the-loop Simulation System based on RapidIO Xuwen Li, Jiashun Hu, **Xuegang Wu** and Qiang Wu Beijing University of Technology, China *Abstract*—At present, Rapid IO has been widely used in embedded platforms due to its high transmission efficiency and low transmission delay, making the software of the embedded platform a new speed. Windows system has the advantages of friendly interface, wide user base, easy maintenance and upgrade, etc., which has received extensive attention in the industry, but the real-time performance is poor and it is impossible to directly communicate with the embedded processor directly through Rapid IO, which makes it impossible to become a semi-physical simulation system. Therefore, the TSI721 driver development based on the RTX environment is designed. The internal structure of Rapid IO protocol, RTX real-time subsystem and Tsi721 switch chip is briefly described. Detailed description of the development framework and interface design of the Tsi721Pcie driver, the main process of RTX driver development. Experiments verify that PCIe and RTX drivers are stable, reliable, and capable of completing tasks in real time.
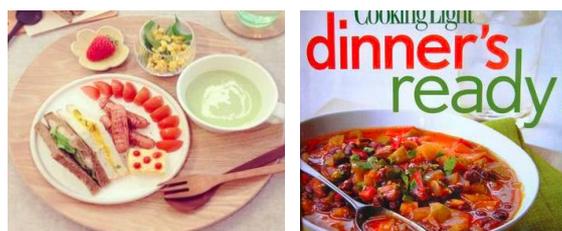
Dinner	
18:30-20:30	**Restaurant**

Poster Session

Morning, October 25, 2019 (Friday)
Time: 10:25-11:20
Venue: Peony Room (牡丹厅, 3rd Floor)

J2008 Poster 1	The Lateral Flow Trips based on the Binding of Upconversion Nanoparticles and Aptamers for Detection of Heavy Metal Ions in Water **Xu Rong**, Feng Ailing and Ding Jinzi Baoji University of Arts & Science, China *Abstract*—Intake of polluted water can cause many diseases, such as digestive disease, infections disease, lithiasis, etc. The effective detection of heavy metal ions which are one of the main pollutants in water, can reduce the incidence of diseases caused by polluted water. Conventional testing method of water sample often requires large instruments, professional operators and expensive test reagents, it's time-consuming and difficult to promote in resource-limited areas. Herein, we developed a simple lateral flow detection platform, which using aptamer functionalized upconversion nanoparticles (UCNPs) as probe for highly precise and sensitive analysis of heavy mental ions in water sample. By using $NaYF_4$:Yb,Er as chromogenic particle and competitive format, the concentration of heavy mental irons can be determined from the color intensity of the detection zone on the platform. Compared with antibody, UCNPs combined with aptamers can effectively improve the sensitivity and specificity of detection and reduce the cost. Cadmium ions are widely exist in polluted water and we use it as the detection target to verify the performance of detection platform. By making UCNPs-Aptamer conjugates, we have achieved testing range and detection limit of cadmium ions is 20-4000 nM and 12 nM. In addition, the lateral flow detection platform can detect different targets by changing different aptamer sequences. Therefore, the platform can provide a sensitivity, convenient and stable method for point of care detection of different targets in various fields especially in water sample detection.
J0019 Poster 2	The Research on Multi-angle Face Tracking based on Multi-feature Fusion and KCF **Mengnan Hu** and Yijie Wang Shandong Police College, China *Abstract*—A method for multi-angle face tracking based on multi-feature fusion and KCF algorithm is proposed in this paper. Firstly, Haar-like, MB-LBP and HOG features are combined to detect the face region, which is regarded as the initial tracking search window. Secondly, training, updating

	and adjusting search window size. Finally, if the tracking target is lost, face region is relocated through the multi-angle detection algorithm which can realize real-time and automatic tracking. To verify the effect, our method is compared with the traditional KCF algorithm. The results of simulation experiments show that, the method proposed can track multi-angle face of video sequences from video database in real time, the center distance error is 8.49, the overlap rate is 58.78%, and the tracking time is 55.41ms.
J3002 Poster 3	Graph Theory based Fragment Docking Approach for Ligand Binding Prediction **Sara Sarfaraz**, Iqra Munee and Haiyan Liu University of Science and Technology China, China *Abstract*— Although existing docking methods can perform efficiently on protein-ligand complexes with known structures, problem may arise when there is no crystal structure available for the receptor and one has to rely on modelled ones. This could be especially difficult for docking larger ligands. We describe a fragment-based docking method that is less sensitive to the accuracy of the receptor structures than common approaches. Our method consists of the following major steps: breaking the (large) ligand into rigid fragments, docking the fragments with Autodock into a modelled structure, performing graphic theory based alignment between docked fragment poses and the ligand, transforming the ligand into the pocket based on the maximum clique alignments and scoring the results. Benchmarking was performed on a number of CYP450-substrate complexes. Modelled structures of CYP450 proteins were used as targets. Results are compared with those obtained by docking the complete ligands into modelled structures with Autodock. It was found that our method successfully yielded native like binding poses for all ligand conformations, the minimum RMSD from the crystal structure ligand pose being 1.4 Å for one of the conformers compared to the minimum RMSD of 5.7 Å obtained using Autodock of complete ligand. The results indicate that this approach can be effectively applied for docking large ligands into modelled receptor structures.
J2009 Poster 4	Characteristics of Porous Hydrogel Contact Lens using Alginate with IPN Methods Chul-MinWoo, Na-Yang Ko, **Xinhai Wang**, Pil-Heon Lee and Hyun-Mee Lee Catholic University of Daegu, South Korea *Abstract*—The purpose of this study was to improve the antimicrobial activity and the properties of contact lenses by treating porous hydrogel contact lenses using foaming agents with alginic acid, a seaweed polysaccharide, by the IPN (Interpenetrating Polymer Network) method. In terms of the porous hydrogel contact lenses, ammonium carbonate (AC) and sodium carbonate (SC) were used as the foaming agents, and a 3% alginic acid solution, an initiator, and a crosslinker were used for the IPN

	solution. This study used semi-IPN and full-IPN methods and after performing IPN treatment on the porous hydrogel contact lenses, we evaluated their physical properties such as oxygen permeability and elasticity, in addition to antimicrobial activities and protein adhesion. The lens using the SC foaming agent showed improvements in physical properties such as oxygen permeability and water content, and the lens containing AC showed improvements in biological and chemical properties such as wettability, protein adsorption, and antimicrobial activities. The water content and transmittance were almost the same, but the oxygen permeability and wettability were improved by about 30%. Protein adsorption was reduced by up to 65% while properties such as antimicrobial activity showed significant improvement. Although porous hydrogel contact lenses are difficult to manage due to reduced elasticity, all of the samples treated with semi-IPN and full-IPN with alginic acid showed improved strength. In particular, the strength was further enhanced through full-IPN compared to semi-IPN. This study confirmed that introducing alginic acid to porous hydrogel contact lenses significantly improves the properties of the contact lenses.
J2033 Poster 5	Analysis of the Differences about Emotion Recognition between Male and Female based on Extracted Chaos Characteristic Nie Chun-yan, Fan Ru-jun, Xia Ying, Che Min-shi, **Yang Cheng-jin** and Ruan Xin-lei Electronic Information Institute of Changchun University, China *Abstract*—In this paper, the physiological signal instruments are used to extract chaos characteristics (Maximum Lyapunov index, Information entropy, Approximate entropy, Box dimension and Complexity) of multiple physiological signals (ECG, RSP, SC) under four different emotions (sadness, pleasure, anger and joy) from two volunteers (one male and one female).On this basis, the chaos characteristics are extracted to form the chaotic feature matrix, and to make recognition and classification of four kinds of emotion combining with C5.0 decision tree classifier. The results show that recognition rates are 93% for girls and 91% for boys respectively in emotion recognition based on chaotic theory, and the individual gender difference has little effect.
J2010 Poster 6	The Characteristics of Hydrogel Contact Lenses According to the IPN Time of Seaweed Polysaccharides Na Young Ko, Xinhai Wang, Hyo Jeong Park, **Juhyun Bae** and Hyun Mee Lee Catholic University of Daegu , South Korea *Abstract*—This study examined the characteristic changes of hydrogel contact lenses over IPN time in terms of creating interpenetrating polymer networks (IPN) using alginic acid and carrageenan, which are biocompatible polysaccharides. We used semi-IPN and full-IPN methods. The IPN time

was set to 1, 3, 7, 14, and 28 days, and measured the water content, oxygen permeability, contact angle, protein adsorption, and antimicrobial activity to evaluate the function of the contact lenses. The oxygen permeability and wettability of the samples using alginic acid were higher than those using carrageenan, and all physical properties were improved as the IPN time increased. The water content and oxygen permeability of semi-IPN were higher than that of full-IPN, and the contact angle of full-IPN was lower than that of semi-IPN. The full-IPN sample in alginic acid for 28 days showed the lowest protein adsorption of 3.574mg/g and alginic acid showed lower protein adsorption than carrageenan. This study confirmed that the physical properties were improved by adding seaweed polysaccharides to contact lenses and considers that these materials can be used to improve wettability and antimicrobial function.

J2037 Poster 7	A Software for the Lung Image Database Consortium and Image Database Resource Initiative **Jingxuan Wang**, Baiwen Zhang, Lan Lin, Xuetao Wu and Shuicai Wu Beijing University of Technology, China *Abstract*—With the development of big data to medical area, more and more researchers use authoritative public datasets for research. In the field of lung cancer research, Lung Image Database Consortium and Image Database Resource Initiative is the largest open lung image database in the world, which contains CT images stored in DICOM format and expert diagnostic information stored in XML format. However, data cannot be used directly and needs to be further processed.To solve this problem, a preprocessing software based on lung CT image data is designed. The software can realize the preprocessing of lung CT image, interprets the expert diagnosis information completely, and visualizes the expert annotation results. The lung CT image data preprocessing software has cross-platform portability, openness and sharing.
J2011 Poster 8	Comparison of Properties for Porous Hydrogel Contact Lens using Various Polymerization Methods Chul-MinWoo, Na-Yang Ko, Juhyun Bae, **Hyo-Jeong Kim** and Hyun-Mee Lee Catholic University of Daegu , South Korea *Abstract*—The purpose of this study is to compare the physical properties of contact lenses according to different polymerization methods such as the thermal polymerization, photopolymerization, and room temperature polymerization of porous hydrogel contact lenses. We used three types of polymerization methods to fabricate hydrogel contact lenses according to the use and type of bubble agent, and compared and analyzed physical properties such as oxygen permeability, transmittance, water content, refractive index, contact angle, and tensile strength, and biological and chemical properties such as protein adsorption and

	antimicrobial activity. In terms of fabricating the porous hydrogels, this study added ammonium carbonate, sodium carbonate, and water 30% each to 2-hydroxy ethyl methacrylate (HEMA), methacrylic acid (MAA), and styrene. Depending on the polymerization method, we used initiators including azobisisobutyronitrile (AIBN), 2-hydroxy-2-methyl propiophenone (2H2M), and ammonium persulfate (APS) and EGDMA as the crosslinker. Thermal polymerization was performed in a drying oven at 80°C for 1 hour and photopolymerization was conducted at 365 ㎚ for 600 seconds using a UV curing system. In addition, room temperature polymerization was performed in a chamber at 25°C for 1 hour to fabricate the contact lenses and films. Based on the Scanning Electron Microscope (SEM) and swelling rate, porous hydrogel contact lenses were produced by all three polymerization methods. The oxygen permeability, water content, and wettability were the highest in photopolymerization and the lowest in room temperature polymerization. The transmittance was almost the same regardless of the type of polymerization method. This study found pores in all of the samples using SEM measurement, and identified a large pore size and structure in the lens fabricated by room temperature polymerization by adding water. This study confirms that porous hydrogel contact lenses can be fabricated by photopolymerization and room temperature polymerization. We also discovered that photopolymerization helps to improve the physical properties of contact lenses.
J2030 Poster 9	Common Salivary Protein1 (CSP1) as a Potential Diabetes Biomarker **Linlin Zhang** and Sang Wook Oh Jeonbuk National University, South Korea *Abstract*—Saliva is a bodily fluid secreted by three pairs of major salivary glands and by many of minor salivary gland. The human common salivary protein 1(CSP1) is one of variety of molecules in saliva and its function remains to be determined. The saliva CSP1 levels of 26 DM patients and 12 normal adults were quantified by ELISA system. As a probe, the mAb-CSP1 was used for Western blotting of human saliva and immunohistochemistry of various human tissues. The study showed that the saliva CSP1 concentration of diabetes (DM) patients was much higher than of healthy controls. The salivary gland was the only tissue stained with mAb-CSP1 by immunohistochemistry among the various human tissues. Quantification of CSP1 concentration by ELISA showed that the median values of DM patients and healthy adults were 4.65 (3.36-6.90) μg/ml and 3.7 (2.86-5.02) μg/ml, respectively. Student t-test results indicated that there was a statistically significant difference between the two groups ($p<0.026$). Therefore, the significant difference of CSP1 levels between the two groups indicated that CSP1 is a potential biomarker for detection or screening of DM patients.
J2012	A Comparison of the Properties of Porous Hydrogel Contact Lenses

Poster 10	According to the Type of Ionic Natural Polysaccharide **Na-Yang Ko**, Hyo-Jeong Kim, Hyo-Jeong Park, Pil-Heon Lee and Hyun-Mee Lee Catholic University of Daegu , South Korea *Abstract*—The purpose of this study was to examine the effect on the physical and chemical properties of contact lenses according to the ionic character of natural polysaccharides by polymerizing contact lenses with biocompatibility and antimicrobial activity by bridging natural polysaccharides with porous hydrogels containing large amounts of water. We used natural polysaccharides such as alginic acid, chitosan, and agarose, and fabricated the porous hydrogels by using sodium carbonate as the foaming agent. Due to the influence of the porous hydrogel, the water content and oxygen permeability improved significantly compared to the general hydrogel. The addition of natural polysaccharides decreased the water content and oxygen permeability of chitosan and agarose, except for alginic acid, but improved the wettability and antimicrobial activity regardless of the type and ionic character of the natural polysaccharides. In terms of protein adsorption, the adsorption of BSA was low in hydrogels bridged with anionic alginate, and the adsorption of lysozyme was low in hydrogels bridged with cationic chitosan. The performance of the contact lenses was improved by bonding ionic natural polysaccharides to porous hydrogel contact lenses.
J2035 Poster 11	A Dynamic Model of Opioid Epidemic based on Cellular Automata and Principal Component Analysis **Yufeng Wang**, Lezhi Chen, Junyi He, Lingna Chen, Junxi Chen and Liangwei Jiang University of South China, China *Abstract*—The United States is currently experiencing an opioid epidemic. We applied a dynamic model to predict the pathway of opioid transmission. We classify 69 drugs from the NFLIS data into 12 categories and display the relation of the latitude and longitude of each county and the number of Drug Reports. We construct the dynamic model based on cellular automata and principal component analysis. Moreover, we take the socio-economic indicators into consideration and perform sensitivity analysis. The simulation results show that for Ohio and Pennsylvania the sharp increase will appear in 2019. We can observe that the opioid crisis of five states in 2019 will be more severely located in the border area between Kentucky and Ohio, and in the northwest of West Virginia and West Virginia. This dynamic model will provide references for the further study of opioid epidemic.
J1011 Poster 12	An Improved TrAdaBoost for Image Recognition of Unbalanced Plant Leaf Disease **Su Tingting**, Mu Shaomin, Dong Mengping, Sun Wenjie and Shi Aiju Shandong Agricultural University, China

	Abstract—Due to the impact of morbidity, region as well as subjective factors and so on, there are some differences in the number of each category in the plant leaf disease image dataset. When a dataset is unbalanced, the generalization ability of the model decreases. To improve classification accuracy, an improved TrAdaBoost is proposed. Firstly, the images in the datasets are processed called whitening to reduce input redundancy and decrease exposure, and then divided into training set and test set in a certain proportion. Secondly, in order to reduce the occurrence of negative transfer, c-means clustering is used to obtain the instances in the source domain with large similarity to the target domain. Thirdly, a balanced factor is introduced to balance the classification accuracy of minority class and majority class by adjusting the weights of instances in minority class according to the error rate in the target domain. Meanwhile the classifier in the traditional TrAdaBoost is replaced with support vector machine in order to further accommodate the image multi-classification task. To verify the effectiveness of the improved TrAdaBoost, experiments are carried out on different plant leaf disease image datasets. The experimental results show that, the proposed method is more effective in solving the problem of unbalanced datasets, compared with support vector machine, TrAdaBoost and other algorithms.
J0045 Poster 13	An Impulse Noise Removal Model Algorithm based on Logarithmic Image Prior **Chun Li**, Jian Li and Ze Luo Chinese Academy of Sciences, China *Abstract*—Logarithmic image prior constraint is a particularly effective and popular prior model in field-based image processing technology. This paper which focuses on the removal of impulse noise with logarithmic prior in image reconstruction. Impulse noise is often caused during image-data acquisition and transmission, there are many reasons for it. Therefore, removing the kind of noise is a very important and complex task in image reconstruction. Consequently, this paper proposes a new patch-based sparse optimization method with data-fidelity of L1. Theoretically, under reasonable assumptions, we give partial convergence analysis of the algorithm. Computationally, we use the split Bregman iterative method under the guarantee of convergence analysis and the weight of SVD decomposition, a complex problem is transformed into several simple sub-problems to solving; wherein, u-subproblem can be solved by (FFT); h, d-subproblems can be solved use shrinkage operator, respectively. In the intervening time, we also discuss how to choose the parameters. In the experimental aspects, we have done a lot of experiments and compared with other state-of-the-art methods. The experimental results show that the method is superior to other methods in terms of effectiveness.
J0062	A Self-adaptive Multi-objective Cross-entropy Method for Hybrid

Poster 14	Renewable Energy Systems Qun Niu, **Ming You** and Ziyuan Sun Shanghai University, China *Abstract*—A self-adaptive multi-objective cross-entropy method, namely SAMOCE, is proposed to optimize hybrid renewable energy systems (HRESs). A new adaptive smoothing strategy is proposed to improve the conventional cross-entropy method which involves excessive parameters. The strategy aims to remove some parameters in the method and it is further extended to multi-objective problems. To verify the performance of SAMOCE, four benchmark functions are tested. In comparison with other classic multi-objective algorithms, SAMOCE is shown to have better convergence and diversity. In addition, the SAMOCE is used to optimize a hybrid renewable energy system and produces the best results in comparison with MOPSO and NSGAII.
J0070 Poster 15	Data Repair Method based on Timeliness and Conditional Function Dependency Rules **Xifeng Kou**, Xuliang Duan, Xuchen Zhao and Yincheng Han Sichuan Agricultural University, China *Abstract*—As data explosion grows, data quality issues become more and more concerned. Data timeliness as an important data quality property plays a key role in data mining. In the absence of timestamps, based on chronological order Association rules can better repair data, while conditional function dependence is a semantic complement to function dependencies, and it is widely used in database consistency repair. The general algorithm framework for timeliness and consistency repair in data quality is studied. Firstly, the definition of state timeliness rules and the mining algorithm of conditional function dependence are clarified. Then, based on the state type timeliness rules, the data is missing and error repaired in the case of timestamp missing, and then the conditional function is used to repair the data consistency. Finally, the algorithm is performed. The implementation and verification of the algorithm-related parameters on the real data set, the test success rate is tested and verified. The repair results have higher success rate and significant effect, and have application value in timeliness and consistency repair.
J0090 Poster 16	OCR-friendly Image Synthesis using Generative Adversarial Networks **Raunak Hosangadi**, Darshan Adiga and Viveka Vyeth Datoin, India *Abstract*—With quality being a deciding factor in the accuracy of OCR predictions for a given source image, there comes the need of pre-processing methods to improve the quality of an image before undergoing this process. Towards that, we present a GAN-based method targeted at improving the quality of source image in the fields of image resolution, blur and noise. The

	model uses an encoder trained to generate latent image representations for a low-quality image, the representations corresponding to blur and noise types present in the image. These representations act as inputs to the constructed conditional GAN. Besides these labels, the generator takes a low-quality image as input and is trained to generate a high-quality image as represented by the target images. The discriminator makes use of a standard OCR score to measure the performance of the generator in order to achieve images that are more OCR-friendly than the given target image. The model uses perceptual losses for training to produce clear images and improve convergence. Improving of image resolution is made by the use of super-resolution by means of sub-pixel convolution. Finally, the paper describes a series of experiments run on the model, as well as the results to show improvements in OCR performance using a single mode; for images suffering a variety of distortions. The results are quantified based on multiple performance measures and the final analysis is presented.
J0067 Poster 17	A Multi-scale Network based on Attention Mechanism for Hyperspectral Image Classification **Luo Xin**, Shu Baiyi, Yu Haoyang, Wang Hongjie, Peng Shuaibo and Mu Jiong Sichuan Agricultural University, China *Abstract*—In recent years, with the theoretical progress of deep learning and the improvement of computational power, more and more deep learning based work has been proposed and achieved good results. However, due to its particularity, hyperspectral image (HSI) is difficult to directly apply the theory and experience of traditional deep learning. For HSI, we mainly face the following problems: effective use of spatial and spectral information, lack of annotated datasets and large spectral dimensions. These problems make it difficult to classify. Generally, in order to solve these problems, some pre-processing methods, such as PCA, and mutual information, will be taken, but this will lose some useful information. On the other hand, people usually consider spatial information on a joint-learning way (take a pixel-centric patch as input), but this approach may lead to some useless information being taken into account. Therefore, we apply the attention model to the HSI classification and reduce the dimension in a way that can be learned, we believe that this can also help the network to be more easily concentrated on similar pixels without being affected by abnormal pixels. In summary, we propose a new attention-based network called ABMN (attention based multiscale network), which is mainly composed of a dimension reduction block and a multi-scale spatial information extraction block. And excellent results are obtained on two popular hyperspectral image sets (Pavia University scene, Indian Pines), OA is 99.66% and 100% respectively.
J2007	Discrimination of Cardiac Arrhythmia using a Fusion Classifier with ECG Morphological Features

Poster 18	**Hui Yang** and Zhiqiang Wei Ocean University of China, China *Abstract*—Electrocardiogram (ECG) is the most common way to diagnose cardiac dysfunctions. Many methods for automatic heartbeats classification have been applied and reported in the literature. However, due to differences in the theory and the structure of the types of classifiers, achieving similar results from these classifiers given a common ECG features and datasets, cannot be expected. In this study, a new fusion classification algorithm consisting of diverse classifiers namely, K-nearest neighbors (KNN), neural networks (NN), Support Vector Machine (SVM), and decision tree, is proposed to increase the robustness of the classification algorithm. The proposed fusion classifier was applied to six types of ventricular and atrial complex － normal (N) heart beats, left bundled branch blocks (LBBB), right bundled branch blocks (RBBB), premature ventricular contractions (PVC), atrial premature beats (APB) and paced beats (PB) from the MIT-BIH Arrhythmia Database and obtained an overall accuracy of 95.99%. The accuracies for the classes N, LBBB, RBBB, PVC, APB, and PB are 97.35, 98.65, 98.40, 94.45, 72.25, and 99.85 respectively. Comparison with peer algorithms also proves a better performance in automatic heart arrhythmia classification technologies.
J3004 Poster 19	The Genomic and Transcriptomic Analysis of Stomach Cancer **Minyu Chen** Oregon Episcopal School, USA *Abstract*—The increasing number in cancer population necessitates the urgency for studying cancer. Cancer, the abnormal proliferation of cells arising from a particular organ and metastasizing to nearby areas, is a general category that contains more than 100 fatal diseases and is caused by alterations in oncogenes and tumor suppressor genes. This project adopted whole exome sequencing (DNA) data of 6 stomach cancer patients including 6 from tumor tissues and 3 from adjacent normal tissues. Genomic analysis of 6 stomach cancer patients revealed the number and frequency of mutated genes while transcriptomic analysis indicated the protein profiling of stomach cancer, which was performed by retrieving data from TCGA and TEGx database. For genomic analysis of common oncogene and tumor suppressor genes comparing the six patients' tumor tissue, the sequencing results identified 5 different types of mutations containing SNV (single nucleotide variation), MNV(multiple nucleotide variation), insertion, deletion and replacement. The common oncogene BCR was found in 5 of the 6 patients. In transcriptomic analysis of three patients' tumor gene subtract their normal gene, the shared mutated gene MUC3A was found significantly over-expressed in tumor tissues. Finally, the high p-value of the the survival curve of MUC3A expression and predicted patients' survival conditions indicated that there's no statistically-significant correlation

	between MUC3A's over-expressions and patients' survival.
J2024 Poster 20	Chickenpox and Quick Treatment, No Scars Left **Huynh Tan Hoi** FPT University, Vietnam *Abstract*—Chickenpox is a very common skin infection in the community and can occur at any age. So, a full understanding of the disease is indispensable knowledge to help prevent and take care of the best for ourselves and our loved ones. The paper is based on recent journals as well as the survey data of 100 respondents who are living in some different areas of Vietnam during December of 2018. This research paper has also pointed out some effective ways to help patients to improve their health as well as methods to remove scars.
J2031 Poster 21	Early Detection of Rice Blast (Pyricularia) at Seedling Stage based on Near-infrared Hyper-spectral Image **Yang Yan** and Wang Yu Nanning Normal University, China *Abstract*—Blast rice is a biological disaster in rice cultivation. Once it happens, it will reduce production at least up to 40-50%. In this study, the near-infrared hyper-spectral image was used to early detect blast rice at seedling stage. Samples were divided into two classes: infected samples and healthy samples. All of samples were imaged using Near-infrared hyper-spectral imaging system(900-1700nm). In order to detect disease, principal component analysis (PCA) was applied and linear discriminant analysis (LDA) model was built. The classification accuracy and precision of PCALDA model reach 0.92 and 0.862 on validation set. Meanwhile, five feature wavelengths (1188nm, 1339nm, 1377nm, 1432nm, 1614nm) were found and PCALDA classification model base on feature images was also built and discussed. The result showed it feasibility to early detect Rice Blast (Pyricularia) at seedling stage based on Near-infrared Hyper-Spectral Images in a quick and easy way.
J3007 Poster 22	Transcriptome Analysis of the Zn(II)2Cys6 Zinc Cluster-encoding Gene Family in *Aspergillus Oryzae* Tiantian Liang, Wenxu Xiao, Bin Zeng and **Bin He** Jiangxi Science & Technology Normal University, China *Abstract*—*Aspergillus oryzae* is an important fermentation microorganism, which is often subjected to some abiotic stress, such as salt. The Zn(II)2Cys6 zinc cluster-encoding gene family plays an important role in the response of abiotic stress. However, little is known about the members, structure and expression pattern of this gene family under salt stress in *A. oryzae*. In this study, ten Zn(II)2Cys6 gene family members were identified based on the transcriptome data of *A. oryzae*. Motif analysis showed that six motifs are contained in the Zn(II)2Cys6 gene family of *A. oryzae*, two of

	which are identified in all of the members. The different expression pattern under salt stress suggested that the mechanism of Zn(II)2Cys6 genes involved in salt regulation is complex and diversified, while the expression patterns of Zn(II)2Cys6 genes at different stages revealed that most of *AoZC* genes had a relatively high expression at logarithmic phase. The results of this study will lay a theoretical foundation for the functional identification of Zn(II)2Cys6 family members in *A. oryzae*.
J0080 Poster 23	Optimization of Recurrent Neural Networks on Natural Language Processing **Jingyu Huang** and Yunfei Feng University of Cambridge, UK *Abstract*—Recurrent neural networks (RNNs) are successful in various sequence modelling tasks, including natural language processing (NLP). However, parallelising the training process of RNNs proves to be difficult as computation at each timestep is dependent upon the output of the previous timestep. Many approaches have been taken to improve parallelisation of RNNs in recent years and achieved remarkable results. This paper investigate ways to further improve training speed and accuracy of RNNs in sentiment classification by combining methods of improving recurrent structure and recurrent units. Results show that not all combinations can result in an improvement, but rather significant improvements can be produced with the right arrangement of recurrent models.
J3008 Poster 24	Comparative Genome Analysis of *Aspergillus Oryzae* and *Aspergillus Flavus* Yijing Wang, Yayi Tu, **Bin He** and Bin Zeng Jiangxi Science & Technology Normal University, China *Abstract*—*Aspergillus oryzae* is widely used for the industrial production of traditional fermentation, while *Aspergillus flavus* can produce strong carcinogenic and teratogenic aflatoxin. However, they are very similar in morphology and difficult to be distinguished from each other. In this paper, the genome sequences of *A. oryzae* and *A. flavus* were downloaded from public database and compared from different aspects, including protease prediction, core genes and specific genes, gene clusters and so on. These results provide a theoretical basis for better identification and understanding the relationship of *A. oryzae* and *A. flavus*.
J2039 Poster 25	Improved Pathogen Recognition using Non-euclidean Distance Metrics and Weighted kNN **Mukunthan Tharmakulasingam**, Cihan Topal, Anil Fernando and Roberto La Ragione University of Surrey, UK *Abstract*—The timely identification of pathogens is vital in order to effectively control diseases and avoid antimicrobial resistance. Non-invasive

	point-of-care diagnostic tools are recently trending in identification of the pathogens and becoming a helpful tool especially for rural areas. Machine learning approaches have been widely applied on biological markers for predicting diseases and pathogens. However, there are few studies in the literature that have utilized volatile organic compounds (VOCs) as non-invasive biological markers to identify bacterial pathogens. Furthermore, there is no comprehensive study investigating the effect of different distance and similarity metrics for pathogen classification based on VOC data. In this study, we compared various non-Euclidean distance and similarity metrics with Euclidean metric to identify significantly contributing VOCs to predict pathogens. In addition, we also utilized backward feature elimination (BFE) method to accurately select the best set of features. The dataset we utilized for experiments was composed from the publications published between 1977 and 2016, and consisted of associations in between 703 VOCs and 11 pathogens. We performed extensive set of experiments with five different distance metrics in both uniform and weighted manner. Comprehensive experiments showed that it is possible to correctly predict pathogens by using 68 VOCs among 703 with 78.6% accuracy using k-nearest neighbour classifier and Sorensen distance metric.
J1001 Poster 26	Vehicle Ranging Warning System based on Trinocular Vision **Chao Xu** and Hualing Li North University of China, China *Abstract*—With the development of society and the advancement of science and technology, the living standards of the people are constantly improving, and the number of car ownership is increasing rapidly. Driving safety has become a crucial issue. In 2018, more than 60,000 people were killed or injured in traffic accidents in China. If the driver knows the danger in the early 1.0s, it can reduce the traffic accident by 90%. The driving safety problem in this paper is based on artificial intelligence theory and technology such as machine vision, feature point recognition, image processing, etc. It mainly studies the front vehicle detection method and safety early warning technology based on trinocular vision. Based on the SVM support vector machine algorithm, the vehicle's license plate multi-cardinal feature points and edge features are used to fuse the vehicle, and the image tracking based on the image pyramid optimization is used to track the vehicle. The study uses trinocular vision to increase visual coverage and more accurately calibrate the distance between the vehicles. According to the braking principle of the car and the calculation of the braking distance, the calculation method of the safety early warning model is obtained, and then the early warning system is realized.
J1017 Poster 27	Spherical Nanoparticle Parameter Measurement Method based on Mask R-CNN Segmentation and Edge Fitting Fang Zhang, **Qian Zhang**, Zhitao Xiao, Lei Geng, Jun Wu and Yanbei Liu

	Tianjin Polytechnic University, China *Abstract*—Nanoparticle size measurement and character description are important in Nano technology. In order to accurately measure the parameter of nanoparticles and evaluate the quality of nanomaterials, a spherical nanoparticle size measurement method based on Mask R-CNN segmentation and edge fitting is proposed according to the image captured by transmission electron microscopy. Firstly, according to the characteristics of the agglomerated adhesion particles in the nanoparticle image, the Mask R-CNN network is selected to segment the nanoparticle image. Secondly, based on the particle segmentation results, the nanoparticle boundary is fitted with a circle, and an edge correction scheme is proposed for the incomplete nanoparticles. Finally, the particle size and shape parameters of the particles are measured based on the fitting results. The experimental results verify the effectiveness of the proposed method.
J0002 Poster 28	A Reparameterized Construction in L2-norm Weight Decay for Rectifier Neural Networks **DejianZhong** and Jie Lin University of Electronic Science and Technology of China, China *Abstract*—In this paper, we investigate regularization method to construct better rectifier neural networks for the classification tasks from two aspects. First we propose a novel regularization method for effective training of rectifier neural networks by reparameterizing each connection weight in convolution layers into a product of two vectors and using the L2-norm penalty to constrain those two vectors rather than the connection weight. Second, we derive a robust initialization for our reparameterization method by taking the rectifier nonlinearities into account to help learn well regularized networks. This new method has been evaluated on the CIFAR-10 and CIFAR-100 datasets and demonstrated improved performance relative to the traditional L2-norm weight decay approach.
J1014 Poster 29	Detection of Pulmonary Nodules based on Reception and Faster R-CNN Zhitao Xiao, **Bowen Liu**, Lei Geng, Jun Wu and Yanbei Liu Tianjin Polytechnic University, China *Abstract*—Because most lung cancer originates from the canceration of lung nodules, it is very important to accurately locate lung nodules. The difficulty of lung nodule detection lies in the interference of other organs in lung CT images, the similarity of blood vessel cross sections and lung nodule cross sections in lung parenchyma, and the different size and edge shape of lung nodule. To solve these problems, this paper proposes a lung nodule detection algorithm based on the combination of Reception and Faster R-CNN, in which the Reception module is used to extract features, then the Faster R-CNN structure is used to classify and regress suspected lung nodule regions, and the residual network and the Inception structure are combined

	to form the Reception module. It is because the residual network can effectively alleviate the Vanishing gradient problem caused by the increase of network layers. The Inception structure can connect different convolution layers in parallel to enhance the utilization rate of internal resources. The experimental results show that the accuracy rate of this network is 92.8%, which is better than the existing methods.
J2016 Poster 30	An Automated Animal Training Apparatus for Operant Conditioning Studies in Rodents **Rong-Chao Peng** and Wen-Rong Yan Guangdong Medical University, China *Abstract*—Animal behavioral experiments like operant conditionings are common techniques in the research of biomedical sciences. However, Manual operation of behavioral experiments is usually inaccurate, prone to mistakes and quite time-consuming. It cannot accomplish some complex experiments such as training animals to discriminate different sounds of different frequencies, triggering data acquisition equipment to record electrophysiological signals immediately after an acoustic/optical stimulus. Here, we designed and implemented an automatic apparatus for animal behavior studies, which is competent to perform different kinds of complex stimulus-reward experiments by software settings. The apparatus is consisted of a microcontroller and several peripheral components. Programmable procedures are controlled by the microcontroller for training or testing of rodents, in no need of human intervention. Parameters such as the color, duration and timing of light stimuli, or the frequency, duration and patterns of sound are adjustable by software. Using this apparatus, we conducted experiments and verified that rats had the ability to discriminate sound stimuli with different duration or different cycles. This apparatus worked automatically, stably and reliably, with less manual operation and higher efficiency. It would also be a useful tool for other studies such as learning and memory experiments.
J0006 Poster 31	Bipolar Disorder Classification based on Multimodal Recordings Siming Cao, Kaijie Zhao, Lejun Yu, Penghao Rao, Xiaocui Yu, Yongkang Xiao, Huanqing Yan and **Jun He** Beijing Normal University, China *Abstract*—Automatic bipolar disorder classification is a challenging task. In this paper, we mainly focus on BD classification from acoustic, visual, and textual modalities. We highlight three aspects of our methods: 1) besides the baseline features, we explore and fuse some hand-crafted and deep learned features from all available modalities including acoustic, visual, and textual modalities. It should be noted that we extracted the textual modality by using the voice translation tool according to the acoustic modality; 2) Considering the fact that each video is given only one video-level label, while each frame of the video is unlabeled, we use the unsupervised

	Convolutional Auto-Encoder (CAE) and used it for feature extraction. 3) Due to the dataset is too small to train Convolutional Neural Network (CNN), so we decide to pre-train the CNN on other emotion datasets. The experimental results show that our model outperforms the baseline system. The final unweighted average recall (UAR) we gained is 93.12%.
J2025 Poster 32	Research Progress of CDT **Gao Yuting**, Shen Shutong and Deng Sanhong Nanjing University, China *Abstract*—With the high mortality rate for the cases of malignant tumors, the discovery and early treatment of cancer is critical to improving the 5-year survival rate of cancer. The biggest challenge in control and prevention is how to detect tumors as early as possible, so that the most effective means can be used for treatment. With the help of the WOS database, researchers found that liquid biopsy, genetic material/protein expression and computer imaging play an important role in cancer detection. Through analysis of the history and current status of cancer detection technology development, this paper also aims to provide guidance for the clinical practice of current cancer screening and provide inspiration for future technological development.
J0008 Poster 33	Facial Emotion and Action Unit Recognition based on Bayesian Network **Jun He**, Xiaocui Yu, Lejun Yu and Bo Sun Beijing Normal University, China *Abstract*—Understanding human facial expressions is one of the key steps to achieving human-computer interaction. In this paper, we report on advances we have made in building a Bayesian network (BN) for facial expressions recognition based on the CK+ datasets. One of the motivating factors for using a BN is that it can simulate the process of generation and cognition of facial expressions and action units (AUs) realistically. The constructed BN comprises five layers; besides commonly-used expressions, AUs, and feature layers, brain cognition and facial muscles layers are firstly proposed and innovatively designed for the recognition of facial expressions. Further, via deep analysis, we firstly select the most proper facial landmark points, and then fuse their displacement feature and texture features as low-level features. The results of experiments indicate that the two layer we proposed and the discriminative low-level feature we selected are effective to improve the recognition rate. It also indicates the combination of human brain mechanisms and computer statistical learning is successful.
J0011 Poster 34	3D MR Image Segmentation Algorithm based on Supervoxel and Kernel FCM Algorithm **Zhang Shuo**, Lu Yinan and Liu Xiaoni Jilin University, China

	Abstract—Image segmentation is the basis of medical image processing. The proposed method can segment 3D volume data by supervoxel and kernel FCM algorithm. Firstly, the extended SLIC method is used to divide the 3D image into supervoxels. Then the supervoxels are described by statistical feature and segmented by kernel FCM algorithm. The experimental results on a publically available brain MR dataset show the effectiveness and superior performance of the proposed method.
J0010 Poster 35	Cross-Culture Continuous Emotion Recognition with Multimodal Features **Jun He**, Penghao Rao, Siming Cao, Bo Sun, Lejun Yu, Huanqing Yan and Yongkang Xiao Beijing Normal University, China *Abstract*—Automatic emotion recognition is a challenging task that can make great impact on improving natural human-computer interactions. In this paper, we present our automatic prediction of dimensional emotional state for Cross-cultural Emotion Sub-Challenge (AVEC 2018), which uses multi-features and fusion across visual, audio and text modalities. Single-feature predictions are modeled at first with support vector regression (SVR). The multimodal fusion of these modalities is then performed with a multiple linear regression model. Besides the baseline features, we extract one-gram and two-gram features from text, and some types of convolutional neural networks (CNNs) feature from video. Our multimodal fusion reached CCC=0.599 on the development set for arousal, 0.617 for valence and 0.289 for likability.
J0017 Poster 36	Offline Text-independent Writer Identification using Different Levels of Features **Dongli Wang** The Third Research Institute of the Ministry of Public Security, China *Abstract*—The effective extraction of feature information in handwriting identification has been the focus of researchers, especially the completion of a robust handwriting identification method is still an urgent technical problem. In this paper, we will combine two different levels of features: local directional chain-code feature (LDCF) and global improved texture feature (GITF). According to the advantages of each of these two features, it is applied to different matching processes. In the first stage, the LDCF is extracted and then roughly matched to obtain a handwriting image candidate sample set. The next stage is to refine the candidate sample set using the GITF. The experimental results evaluated on the database containing 203 writers of address images demonstrate the effectiveness of our method.
J0016 Poster 37	Class Attendance Checking System based on Deep Learning and Global Optimization Qingmei Cheng, Bojie Rong, Bo Sun and **Jun He** Beijing Normal University, China

Abstract—This paper proposes a class attendance checking system based on deep learning approach. Because classrooms are non-constrained environments and each student often has only one sample photo in the learning management system, traditional methods are difficult to achieve good results. Considering the deep learning methods' excellent performance in complex scenes, we build a class attendance checking system using deep learning methods. First, the Faster-RCNN model is used for face detection. Then, we track the detected faces and extract the features of the face images through a CNN model. After calculating the distance between the detected face features and the sample face features, a global optimization method is used to accomplish the recognition of all face tracks at the same time. This paper begins with an introduction to the application background, and reviews the related works in the field of face-recognition-based attendance checking in the classroom. Then, this paper introduces our system architecture and the methodology used in each section. Finally, we test the system on real class surveillance videos. The results demonstrate the validity of our system architecture and the methods we used.

J0025 Poster 38	Twitter User Geolocation Based on Heterogeneous Network and Label Propagation

Hechan Tian, Yaqiong Qiao and Yimin Liu
State Key Laboratory of Mathematical Engineering and Advanced Computing, China

Abstract—Twitter user geolocation is applied into various applications, such as local messages recommendation and event location recognition. Existing methods do not usually utilize the potential positional correlation between heterogeneous information, resulting in low user geolocation accuracy. Therefore, this paper proposes a user geolocation method based on heterogeneous network and label propagation. First, a heterogeneous network is built based on heterogeneous information mined from user tweets. Then, by analyzing the factors that impact the efficiency and accuracy of label propagation, redundant nodes and edges in the initialized heterogeneous network are removed. Finally, the locations of unlabeled users are geolocated through label propagation in the simplified heterogeneous network. Experiments on the publicly available Twitter benchmark dataset show that proposed method accurately locate 57% of users within 161 km of their locations, a significant improvement over several existing methods.

J0023 Poster 39	Prediction of Short-Term Precipitation in Qinghai Lake Based on BiLSTM-Attention Method

Zhenye Wang, Chengxu Ye and Yuchao Wang
Qinghai Normal University, China

Abstract—The short-term precipitation forecast plays a crucial role in production and life. The prediction accuracy and stability of the traditional

	model have a large room for improvement. In order to improve this problem, this paper attempts to establish a precipitation prediction method based on deep learning. A short-term precipitation prediction model for Qinghai Lake combined with a bidirectional long-term memory network and attention mechanism. Based on historical precipitation over the past month, average water pressure and average temperature, forecasts are made for precipitation over the next 48 hours. The experimental results show that the prediction model is superior to the traditional prediction method in terms of prediction accuracy, convergence speed and root mean square error and average absolute error, which can effectively improve the accuracy and stability of the short-term precipitation prediction model in local areas.
J0033 Poster 40	Pre-Trained BERT-GRU Model for Relation Extraction **Rongli Yi** and Wenxin Hu East China Normal University, China *Abstract*—Existing works on entity relation extraction are based on neural networks and achieve state-of-the art performance by leveraging extra lexical and syntactic features from external NLP pre-processing tools. Feature based methods are hard to be generalized in new language, and the pre-processing procedure may lead to additional error. To overcome this problem, we propose BERT-GRU(Bidirectional Encoder Representations from Transformer with Bidirectional Gated Recurrent Unit), which exploits pre-trained deep language representations to obtain the latent linguistic information for relation extraction and without using any high-level linguistic resources extracted by NLP tools. We conduct our experiment on GPU environment which can enhance the training procedure, results on SemEval-2010 task 8 show that our model outperforms existing methods without any external features.
J0053 Poster 41	Cscore: A Novel No-Reference Evaluation Metric for Generated Images **Yunye Zhang**, Zhiqiang Zhang, Wenxin Yu and Ning Jiang South West University of Science and Technology, China *Abstract*—The development of deep learning advances the field of image processing. In recent years, lots of methods have made out- standing achievements in the domain of text-to-image synthesis, like Generative Adversarial Networks (GANs). Until now, although some evaluation metrics has been proposed to measure the performance of GANs in text-to-image synthesis, the quality of these evaluation metrics has always been controversial. At present, there is no widely used evaluation metric to judge the quality of generated image. In this paper, a novel No-Reference image quality evaluation metric is proposed, which can be used to get a score for each generated image produced by deep learning without referring to the real image. This evaluation metric can provide a new way to verify the quality of complex networks by judging the quality of generated images retroactively.

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J0022 Poster 42	Gastric Polyps Detection by Improved Faster R-CNN **Ruilin Wang**, Wei Zhang, Wenbo Nie and Yao Yu University of Science & Technology Beijing, China *Abstract*—This paper presents the research results of detecting gastric polyps with deep learning object detection method in gastroscopic images. In this work, we use an improved Faster R-CNN network to detect the gastric polyps. We use the ROI align operation to replace ROI pooling operation, use the GIoU loss to replace the original smooth L1 loss and use the soft-NMS to replace the traditional NMS in the Faster R-CNN network. The ROI align operation can solve the problem of misalignment. This GIoU loss can take the IoU between the predicted value and the ground truth value into account to the greatest extent and improve the detection performance. This GIoU loss in the detection network will effectively improve the accuracy of the box regression. The soft-NMS can reduce the deletion of bounding boxes by mistake in the post processing stage. The Faster R-CNN network not only achieves good results in general image detection, but also in gastric polyps image detection. The improved Faster R-CNN can further improve the detection performance in the gastric polyps. Compared to the other polyps detection methods, precision, recall rate and F1 score of our network has been achieved higher values. The final detection results about precision, recall rate and F1-score of our work is 78.96%, 76.07%, 77.49%. In gastric polyps detection, this method can be of great help to doctors and patients.

Conference Venue

Grand Gongda Jianguo Hotel (北京工大建国饭店)
Website: http://www.gongda-jianguo.cn/
Tel.: 010-59102045/010-59102046; Fax:+86-10-59102055
Addr.: 100 Pingle yuan Street, Chaoyang, 100124 Beijing, China (北京市朝阳区平乐园100
号北京工业大学南门西侧)

Grand Gongda Jianguo Hotel is located a 12-minute drive from China World Trade Center and Guomao Commercial Area. The stylish hotel offers a health club, free parking and free internet. Spacious guest rooms at Grand Gongda Jianguo are fully air conditioned and feature a modern interior. Each well-furnished room has an electric teakettle, ironing facilities and a flat-screen TV with cable channels. Hotel Grand Gongda Jianguo has a well-equipped fitness center. Laundry and dry cleaning services are offered. The hotel has a tour desk to assist guests with travel arrangements and ticketing. Fu Yuan Cafe serves a wide variety of international and Asian dishes. Japanese and Chinese food can be tasted at Wan Shi Chuan Japanese Restaurant and Tainan Fu Cheng Chinese Restaurant respectively. Grand Gongda Jianguo Hotel is a 10-minute drive from the Antique Market. It is 27 miles from Beijing Capital Airport and will take around 40-50 minutes by taxi.

Tips:
1. As the registration fee does not cover accommodation, it is suggested that an early reservation should be done. 注册费不含食宿费，建议您尽早自行预订酒店！
2. The hotel offers group price for participants of ICCPR 2019. You can call the Hotel Reservation Tel. : 01059102045 or 01059102046 to book the room. Please mention the

conference name-"ICCPR 2019" to the hotel staff. The price for Single Bed with one breakfast is 500RMB/per night; The price for Twin Beds with two breakfast is 600RMB/per night. ICCPR 2019 参会人员入住北京工大建国饭店可享受团购价；您可通过预订热线：01059102045 或者 01059102046 告知酒店工作人员"例如：我是 ICCPR 2019 参会人员"进行预订；大床房含单早价格：500 人民币每晚；标间含双早价格：600 人民币每晚。

3. The group price is available before October 10, 2019. After October 10, 2019, you should book the hotel with the normal price and we cannot guarantee there are rooms available. 团购价只适用于 2019 年 10 月 10 日以前的预订；2019 年 10 月 10 日以后的预订，只能按照正常价格预订并且酒店不能保证有空房。

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Note

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