2019 International Conference on Image, Video and Signal Processing

(IVSP 2019)

February 25-28, 2019

Shanghai, China

The Pullman Shanghai Jing An

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IVSP 2019

http://ivsp.net/

Conference Venue

The Pullman Shanghai Jing An

Add: 330 Meiyuan Road, Jingan District, 200070, SHANGHAI, CHINA


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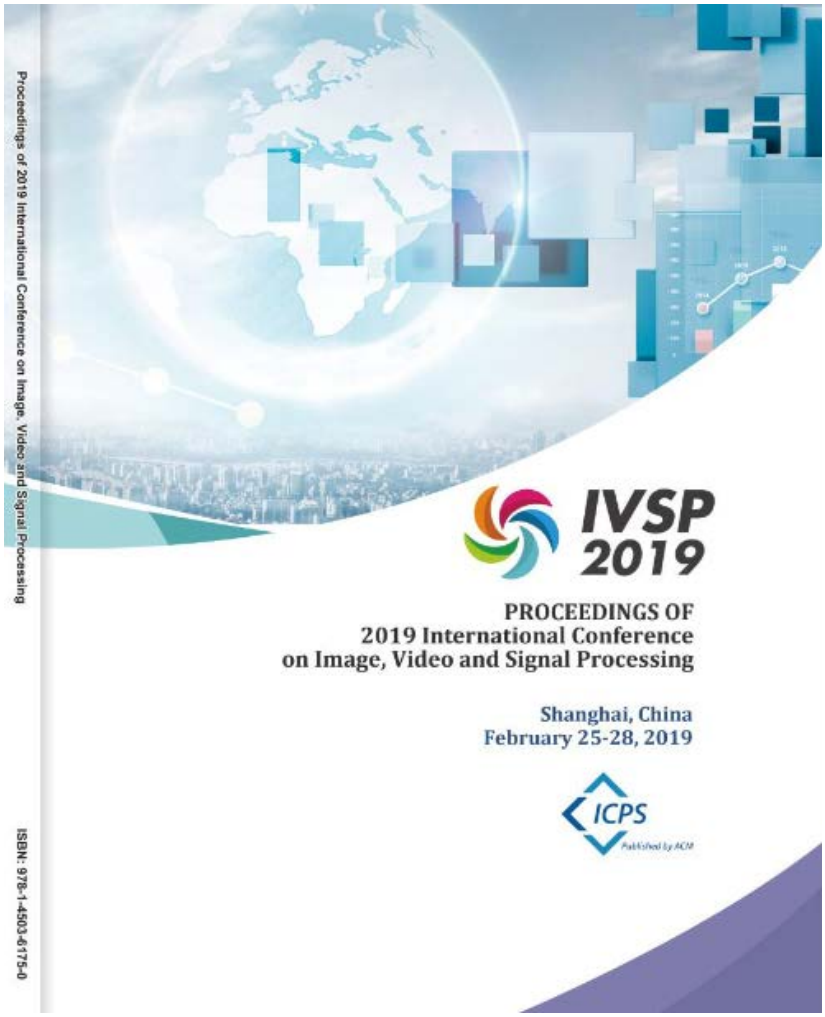
Session 3 *Image and signal processing*

Poster Session

Conference Introductions

Welcome to 2019 IVSP Shanghai conference. This conference is meant for researchers from academia, industries and research & development organizations all over the globe interested in the areas of video, image and signal processing, multimedia and computer graphics. It will put special emphasis on the participations of PhD students, Postdoctoral fellows and other young researchers from all over the world. It would be beneficial to bring together a group of experts from diverse fields to discuss recent progress and to share ideas on open questions. The conference will feature world-class keynote speakers in the main areas.

Papers will be published in the following proceeding:



International Conference Proceedings Series by ACM (ISBN: 978-1-4503-6175-0), which will be archived in the ACM Digital Library, and indexed by Ei Compendex, Scopus and submitted to be reviewed by Thomson Reuters Conference Proceedings Citation Index (ISI Web of Science).

Conference website and email：http://ivsp.net/ and ivsp@acm-sg.org

Presentation Instructions

Instructions for Oral Presentations

Devices Provided by the Conference Organizer:

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

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):

Regular Oral Presentation: about 15 Minutes of Presentation and 5 Minutes of Question and Answer

Instructions for Poster Presentation

Materials Provided by the Conference Organizer:

The place to put poster

Materials Provided by the Presenters:

Home-made Posters
Maximum poster size is A1
Load Capacity: Holds up to 0.5 kg

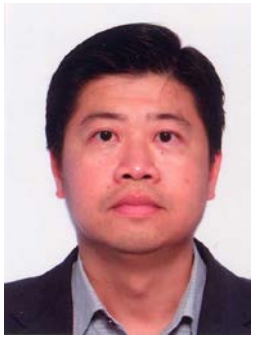
Best Presentation Award

One Best Presentation will be selected from each presentation session, and the Certificate for Best Presentation will be awarded at the end of each session on December 22th, 2018.

Dress code

Please wear formal clothes or national representative of clothing.

Keynote Speakers Introductions



Keynote Speaker I

Prof. Kenneth K. M. Lam
The Hong Kong Polytechnic University, Hong Kong

Prof. Kin-Man Lam received his Associateship in Electronic Engineering from the Hong Kong Polytechnic University in 1986. He won the S.L. Poa Education Foundation Scholarship for overseas studies and was awarded an M.Sc. degree in communication engineering from the Department of Electrical Engineering, Imperial College of Science, Technology and Medicine, England, in 1987. In August 1993, he undertook a Ph.D. degree program in the Department of Electrical Engineering at the University of Sydney, Australia. He completed his Ph.D. studies in August 1996.

From 1990 to 1993, Prof. Lam was a lecturer at the Department of Electronic Engineering of The Hong Kong Polytechnic University. He joined the Department of Electronic and Information Engineering, The Hong Kong Polytechnic University again as an Assistant Professor in October 1996. He became an Associate Professor in 1999, and is now a Professor. He was actively involved in professional activities. He has been a member of the organizing committee or program committee of many international conferences. In particular, he was a General Chair of the 2012 IEEE International Conference on Signal Processing, Communications, & Computing (ICSPCC 2012), the APSIPA ASC 2015, and the 2017 International Conference on Multimedia and Expo, all which were held in Hong Kong. Prof. Lam was the Chairman of the IEEE Hong Kong Chapter of Signal Processing between 2006 and 2008. He was an Associate Editor of IEEE Trans. on Image Processing from 2009 to 2014. He received an Honorable Mention of the Annual Pattern Recognition Society Award for an outstanding contribution to the Pattern Recognition Journal in 2004. In 2008, he also received the Best Paper Award at the International Conference on Neural Networks and Signal Processing.

Prof. Lam was the Director-Student Services and the Director-Membership Services of the IEEE Signal Processing Society between 2012 and 2014, and between 2015 and 2017, respectively. He was an Associate Editor of IEEE Trans. on Image Processing between 2009 and 2014, and an Area Editor of the IEEE Signal Processing Magazine between 2015 and 2017. Currently, he is the VP-Publications of the Asia-Pacific Signal and Information Processing Association (APSIPA). Prof. Lam serves as an Associate Editor of Digital Signal Processing, APSIPA Trans. on Signal and Information Processing, and EURASIP International Journal on Image and Video Processing. He is also an Editor of HKIE Transactions. His current research interests include human face recognition, image and video processing, and computer vision.

【Topic： Current and Future Research on Low-Resolution Face Recognition】

ABSTRACT: A lot of research on face recognition has been conducted over the past two decades or more. Various face recognition methods have been proposed, but investigations are still underway to tackle different problems and challenges for face recognition. The existing algorithms can only solve some of the problems, and their performances degrade in real-world applications. In this speech, we will first discuss the performances of face recognition techniques on face images at different resolutions. Then, we will focus on the issues and methods for low-resolution face recognition. For low-resolution face recognition, we will present different approaches, from machine-learning to deep-learning based methods.

Keynote Speaker II

Prof. Yulin Wang
Wuhan University, China

Prof. Yulin Wang is a full professor and PhD supervisor in International School of Software, Wuhan University, China. He got PhD degree in 2005 in Queen Mary, University of London, UK. Before that, he has worked in high-tech industry for more than ten years. He has involved many key projects, and hold 8 patents. He got his master and bachelor degree in 1990 and 1987 respectively from Xi-Dian University, and Huazhong University of Science and Technology(HUST), both in China. His research interests include digital rights management, digital watermarking, multimedia and network security, and signal processing. In recently 10 years, Prof. Wang has published as first author 3 books, 40 conference papers and 45 journal papers, including in IEEE Transactions and IEE proceedings and Elsevier Journals. Prof. Wang served as editor-in-chief for International Journal of Advances in Multimedia in 2010. He served as reviewer for many journals, including IEEE Transactions on Image Processing, IEEE Signal Processing Letters, Elsevier Journal of Information Sciences. He served as reviewer for many research funds, including National High Technology Research and Development Program of China ('863' project). Prof. Wang was the external PhD adviser of Dublin City University, Ireland during 2008-2010. He was the keynote speakers in many international conferences. He bas been listed in Marcus 'who's who in the world' since 2008.

【Topic：Image Authentication and Tamper Localization】

ABSTRACT: Image authentication can be used in many fields, including e-government, e-commerce, national security, news pictures, court evidence, medical image, engineering design, and so on. Since some content-preserving manipulations, such as JPEG compression, contrast enhancement, and brightness adjustment, are often acceptable—or even desired—in practical application, an authentication method needs to be able to distinguish them from malicious tampering, such as removal, addition, and modification of objects. Therefore, the traditional hash-based authentication is not suitable for the application. As for the semi-fragile watermarking technique, it meets the requirements of the above application at the expense of severely damaging image fidelity. In this talk, we propose a hybrid authentication technique based on what we call fragile hash value. The technique can blindly detect and localize malicious tampering, while maintaining reasonable tolerance to conventional content-preserving manipulations. The hash value is derived from the relative difference between each pair of the selected DCT AC coefficient in a central block and its counterpart which is estimated by the DC values of the center block and its adjacent blocks. In order to maintain the relative difference relationship when the image undergoes legitimate processing, we make a pre-compensation for the AC coefficients. Experimental results show that our technique is superior to semi-fragile techniques, especially in image fidelity, tolerance range of legitimate processing, and/or the ability to detect and localize the tampered area. Due to its low computational cost, our algorithm can be used in real-time image or video frame authentication. In addition, this kind of proposed techniques can be extended to use other characteristic data, such as high-level moment, statistical data of image, and so on.

Keynote Speaker III

Prof. Kiyoshi Hoshino
Tsukuba University, Japan

Prof. Kiyoshi Hoshino received two doctor's degrees; one in Medical Science in 1993, and the other in Engineering in 1996, from the University of Tokyo respectively. From 1993 to 1995, he was an assistant professor at Tokyo Medical and Dental University School of Medicine. From 1995 to 2002, he was an associate professor at University of the Ryukyus. From 2002, he was an associate professor at the Biological Cybernetics Lab of University of Tsukuba. He is now a professor. From 1998 to 2001, he was jointly appointed as a senior researcher of the PRESTO "Information and Human Activity" project of the Japan Science and Technology Agency (JST). From 2002 to 2005, he was a project leader of a SORST project of JST. His research interests include biomedical measurement and modelling, medical engineering, motion capture, computer vision, and humanoid robot design.

【Topic：Measurement of line-of-sight and eye rotation using a small camera installed roughly next to the eye 】

ABSTRACT: The speaker would like to introduce an innovative method, which enables the user to measure both “line of sight” and “eye rotation” using a small camera installed roughly next to the eye by a single imaging technique. Even at night or in such a bright environment of light that the evening sun streams into horizontally, our proposed system works robustly and stably.

Here, the first feature “line of sight” movement is horizontal eye movement, which is closely related to the target and degree of human interest. However, it is known as a negative aspect of line-of-sight movement that abnormal eye movement is likely to occur in persons with schizophrenia, dementia, sick-house syndrome or drug addiction. The second “eye rotation” feature is regarded as rotational movement around the z axis of the eye. It is known that the feature may be caused due to physical deconditions including dizziness, car-sickness, visually-induced motion sickness and nausea.

Making full use of the advantage of our system that enables the user to measure both the features of line-of-sight and eye rotation with only one measurement unit based on the same measurement principle, for example, athletes participating in sporting competitions may improve their performance. Persons who are poorer at sports tend to frequently move their line-of-sight using the conventional ones. But experiments using our system show that involuntary and inappropriate rotational eye movement also occurs simultaneously.

Invited Speaker

Prof. Hongtao Lu
Shanghai Jiao Tong University, China

Hongtao Lu is now a professor in the department of computer science and engineering, Shanghai Jiao Tong University, China. His research interests include machine learning, deep learning, pattern recognition and computer vision. He had authored or co-authored more than 100 papers in journals and premier conferences. His paper had gotten more than 3000 citations, and he is among the Elsevier most cited scholar in computer science in China from 2014-2018.

【Topic： Generative methods in Computer Vision】

ABSTRACT: Generative methods have recently achieved great successes in computer vision. In this talk I will introduce briefly two basic generative models: generative adversarial networks (GAN) and variational auto-encoder (VAE), and then I will present our two recent works on this topic. The first is “Stylized Adversarial AutoEncoder for Image Generation”, which splits the latent variable into two components: style feature and content feature, and then generated stylized images from combination of these features. The second is “An Adversarial Approach to Hard Triplet Generation” which generates hard examples for image retrieval.

Schedule for Conference

Day 1	**February 25, 2019 (Monday)** 10:00~17:00 **Venue: Lobby (The first floor)** Participants Onsite Registration & Conference Materials Collection
Day 2	**February 26, 2019 (Tuesday)** 8:55~18:30 Arrival Registration, Keynote Speech, Conference Presentation
	Morning Conference **Venue: Diamond Room (The sixth floor) (莹白厅)**
	Opening Remarks 8:55~9:00 Prof. Yulin Wang Wuhan University, China
	Keynote Speech I 9:00~9:40 **Title: "Current and Future Research on Low-Resolution Face Recognition"** Prof. Kenneth K. M. Lam, The Hong Kong Polytechnic University, Hong Kong
	Keynote Speech II 9:40~10:20 **Title: "Image Authentication and Tamper Localization"** Prof. Yulin Wang, Wuhan University, China
	Coffee Break & Group Photo Taking 10:20~10:50
	Keynote Speech III 10:50~11:30 **Title: "Measurement of line-of-sight and eye rotation using a small camera installed roughly next to the eye"** Prof. Kiyoshi Hoshino, Tsukuba University, Japan
	Invited Speech I 11:30~12:00 **Title: "Generative methods in Computer Vision"** Prof. Hongtao Lu, Shanghai Jiao Tong University, China
	Lunch 12:00~13:00 **Venue: Venu（The first floor） (泛路)**
	Afternoon Conference **Venue: Diamond Room (The sixth floor) (莹白厅)**
	Session 1:13:00~14:15 **Venue: Diamond Room (莹白厅)** Topic: "Target Detection and Pattern Recognition"

Day 2	Session Chair: Prof. Yulin Wang
	Coffee Break 15:15~14:30
	Session 2: 14:30~16:30 **Venue: Diamond Room (莹白厅)** Topic: "Computer vision and visualization" Session Chair: Prof. Kiyoshi Hoshino
	Coffee Break 16:30~16:45
	Session 3: 16:45~18:30 **Venue: Diamond Room (莹白厅)** Topic: "Image and signal processing" Session Chair: Prof. Kenneth K. M. Lam
	Poster Session 10:20~10:50 **Venue: Executive Lounge** Session Chair: Prof. Yulin Wang
	Dinner 18:30-19:30 **Venue: Lobby (The first floor)**
Day 3	**February 27, 2019 (Wednesday)** 9:00~12:00 **Academic Visit** （East China Normal University）
Day 4	**February 28, 2019 (Thursday)** 9:00~17:00 **One Day Tour**

Tips: Please arrive at the conference to upload or copy PPT into the laptop room 10 minutes before the session begins.

**** If you need to use your own computer, please confirm that the connecting line matches the computer before the start of your session .(Especially for the different types of Macbook)**

Note:

(1) It is recommended to be familiar with all the meeting rooms in the registration day, including the room where you will make your oral presentation.

(2) The organizer doesn't provide accommodation, and we suggest you make an early reservation.

(3) One Best Presentation will be selected from each presentation session, and the Certificate for Best Presentation will be awarded at the end of each session on February 26, 2019.

(4) One day tour does not include attractions tickets.

(5) We will take the group photo for all the attendees. Hope everyone can attend on time.



Oral Presentation Abstracts

Session 1

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

Afternoon, February 26, 2019 (Tuesday)

Time: 13:00~14:15

Venue: Diamond Room (莹白厅)

Topic: "Target detection and pattern recognition"

Session Chair: Prof. Yulin Wang

IP0025 Presentation 1 (13:00~13:15)

A Fast and Efficient Local Outlier Detection in Data Streams

Xing Yang[1], Wenli Zhou[1], Nanfei Shu[2], Hao Zhang[2]
1, Beijing University of Posts and Telecommunications, China; 2, Technology Research Institute, Aisino Corporation, China

Abstract— Outlier detection in data streams is used in many applications, such as network flow monitoring, stock trading fluctuation detection and network intrusion detection [1]. These applications require that the algorithms finish outlier detection effectively in a limited amount of time and memory space. Local Outlier Factor (LOF) is a fundamental density-based outlier detection algorithm [2], it determines whether an object is an outlier by calculating LOF score of each observer. There are many LOF-based algorithms that have achieved excellent results with respect to outlier detection in data streams, while most of existing LOF-based algorithms have problems with excessive computation. In this paper, we propose a fast outlier detection algorithm in data streams, the algorithm effectively reduces the LOF calculation of the whole data by Z-score pruning. The algorithm consists of three phases. Firstly, generate the prediction data through the generator. Secondly, judge whether the observation object is a potential outlier by the Z-score of the residual from the origin value and the prediction value. Finally, calculate the LOF of the observation object in the current time window according to the judgment result of the previous step. It is proved by experiments that our algorithm effectively reduces the detection time consumption through Z-score pruning under the condition of ensuring the detection accuracy.

Session 1

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

Afternoon, February 26, 2019 (Tuesday)

Time: 13:00~14:15

Venue: Diamond Room (莹白厅)

Topic: "Target detection and pattern recognition"

Session Chair: Prof. Yulin Wang

IP0016 Presentation 2 (13:15~13:30)

Few-shot Learning for Ear Recognition

Jie Zhang, Wen Yu, Xudong Yang, Fang Deng
Beijing University of Posts and Telecommunications, China

Abstract— Ear recognition is a popular field of research within the biometric community. It plays an important part in automatic recognition systems. The ability to capture image of the ear from a distance and perform identity recognition makes ear recognition technology an attractive choice for security application as well as other related applications. However, datasets of ear images are still limited in size, while in other biometric modal communities, like face recognition, they possess large datasets and the most of them are collected in uncontrolled condition. As a result, deep learning technology still cannot yield satisfactory result in ear recognition area. In this paper, we tackle ear recognition problem by using few-shot learning based methods. We explore different methods towards model training with limited amounts of training data and show that by using them, with the help of data augmentation, the model can be flexible and can quickly adapt to new identity to perform fast recognition. The result of our work is the first few-shot learning based work to ear recognition. With our work we are able to significantly improve the accuracy of 23% on a regular dataset, and even 21% on a challenging dataset that is collected from the web, which is comparable with state-of-the-art in ear recognition area.

Session 1

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

Afternoon, February 26, 2019 (Tuesday)

Time: 13:00~14:15

Venue: Diamond Room (莹白厅)

Topic: "Target detection and pattern recognition"

Session Chair: Prof. Yulin Wang

IP0017 Presentation 3 (13:30~13:45)

A Framework of Sequence Chunking for Human Activity Recognition Using Wearables

Weijia Zhang, Guoli Wang, Le Qin, Wei Zhong, Xuemei Guo
Sun Yat-Sen University, China

Abstract— Human activity recognition (HAR) is the main research area in ubiquitous computing, and most of existing approaches are based on the frameworks of sliding window segmentation and dense labeling. However, existing frameworks have some problems. For example, sliding window segmentation will cause the problem of label inconsistency, and dense labeling cannot model relationship between activities explicitly. In our paper, we propose a new framework to deal with the problems caused by these frameworks, in which HAR is treated as a sequence chunking problem and divided into the subtasks of segmentation and labeling. The purpose of the segmentation is to segment a raw sequence into different chunks that represent the corresponding activities respectively, and labeling is used to predict the corresponding label for each chunk based on segmentation results. We propose an encoder-decoder model based on convolutional neural networks to implement the proposed framework. The encoder segments a sequence to chunks based on BIO labels, and the decoder treats a chunk as a basic unit to predict the corresponding label. We conduct experiments and show that the proposed model achieves the state-of-the-art performance on both Opportunity and Hand Gesture datasets.

Session 1

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

Afternoon, February 26, 2019 (Tuesday)

Time: 13:00~14:15

Venue: Diamond Room (莹白厅)

Topic: "Target detection and pattern recognition"

Session Chair: Prof. Yulin Wang

IP0028 Presentation 4 (13:45~14:00)

Video-based face recognition based on deep convolutional neural network

Yilong Zhai, Dongzhi He
Beijing University of Technology, China

Abstract—With the rise of artificial intelligence in recent years, the field of object recognition is making rapid progress. Face recognition is a major subarea of object recognition which has already played a significant role in our life. However, despite the extensive study on the field of face recognition, video-based face recognition is still a tough area which needs further research. In this paper, we propose a model based on deep convolutional network for video-based face recognition. Our model split video images into two sets, a set of key frames and the other set is made up with non-keys, for different tasks to lower the computational complexity of the model. Besides, we introduce spatial pyramid pooling and center loss to our method for classification task. Our method presented in this paper reached an accuracy of 96.06% on YouTube Faces dataset. The results indicate our approach possesses high precision as well as a strong real-time performance.

Session 1

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

Afternoon, February 26, 2019 (Tuesday)

Time: 13:00~14:15

Venue: Diamond Room (莹白厅)

Topic: "Target detection and pattern recognition"

IP0032 Presentation 5 (14:00~14:15)

Learning of Complicate Facial Expression Categories

Xinmin Zhang, Yingdong Ma
Inner Mongolia University, China

Abstract— Facial expression recognition is a challenging task due to some external (such as data bias) and intrinsic (such as properties of expressions) factors. In this work, we propose a network selection method which selects network combination automatically from a set of candidate networks. The candidate networks include multiple shallow and deep CNNs to explore their complementary representation capabilities. To further improve performance of complicate expressions, we introduce an iterative training methods to tackle the over-fitting problem caused by small number of samples in complicate categories. In this method, complicate expression categories are identified according to their recognition accuracies firstly. A CNN network-based classifier is then trained iteratively by gradually updating training samples that belong to these complicate expression categories. The proposed method was verified on FER-2013 and RAF-DB databases. Experiments demonstrate that our method has significantly improved the recognition accuracy of complicate categories and, therefore, outperforms state-of-the-art expression recognition methods.

Coffee Break	14:15-14:30

Session 2

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

Afternoon, February 26, 2019 (Tuesday)

Time: 14:30~16:30

Venue: Diamond Room (莹白厅)

Topic: "Computer vision and visualization"

Session Chair: Prof. Kiyoshi Hoshino

IP0012 Presentation 6 (14:30~14:45)

Spatial Temporal Balanced Generative Adversarial AutoEncoder for Anomaly Detection

Zheng Lei, Fang Deng, Xudong Yang

Beijing University of Posts and Telecommunications, China

Abstract— For video anomaly detection, anomalies are usually detected based on the dissimilarity between testing samples and training samples. However, existing methods model the normal pattern in an unbalanced way with incomplete spatial or temporal information. In this paper, we propose a framework to better combine spatial and temporal information to model the input normal pattern. We cascade two AutoEncoders: one is trained to learn spatial features and the other trained to learn temporal features. We stack the output of spatial network with input to feed the temporal information network. An optical flow door is added to the temporal information network for better prediction. Anomaly is detected by the difference between a prediction of future frame and its ground truth. Experiments on two datasets validate the effectiveness of our method.

Session 2

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

Afternoon, February 26, 2019 (Tuesday)

Time: 14:30~16:30

Venue: Diamond Room (莹白厅)

Topic: "Computer vision and visualization"

Session Chair: Prof. Kiyoshi Hoshino

IP3002 Presentation 7 (14:45~15:00)

Detection Algorithm of Aluminum Surface Defects Using Machine Vision

Yang Wu, Jie Liu, Yaqin Zhang, Lianshuang Yu, Jingchun Wu
School of Mechano-Electronic Engineering, Wuxi Taihu University Wuxi, China

Abstract— With the growth of global economic and the widespread use of aluminum profile, the consumption of the global aluminum profile increases year by year. In this paper, we proposed a novel detection algorithm of aluminum surface defects using machine vision. Firstly, the aluminum images are acquired and analyzed sequentially, then a number of image processing strategies were used to detect various surface defects. The main contribution is a new area partition method, which can automatically assign texture and no-texture regions with texture information. The proposed method is proven able to detect defects on aluminum profile surfaces, such as cracks, pits, rust or scratches, rapidly and precisely. Robustness and effectiveness in the practical aluminum casting process are improved by using the proposed system.

Session 2

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

Afternoon, February 26, 2019 (Tuesday)

Time: 14:30~16:30

Venue: Diamond Room (莹白厅)

Topic: "Computer vision and visualization"

Session Chair: Prof. Kiyoshi Hoshino

IP0006 Presentation 8 (15:00~15:15)

Study on the Extraction Method for the Contrast Feature of Ship Wake Images Based on Human Visual Characteristics

Liying Wang [1], Mingrong Chen [1], Liang-An Jin [2], Zhi-Jiang Yuan [2] , Hua Rong [1]
1, Dalian Naval Academy, Department of Information System, China;
2 Dalian Naval Academy, Department of Navigation, China

Abstract— Since how to evaluate the ship wake image's quality quantitatively and effectively, and achieve the purpose of the extraction of ship wake's optical signal characteristics rapidly, is an important base task for the ship optics-wakes elimination technology now. The method about quality evaluation of ship wake images is studied in this paper based on the contrast model. According to the characteristics of the obvious contrast between wake area and seawater background area in ship wake images, this paper uses the contrast parameter as the index of wake image quality evaluation, and also as the characterization of the strength of ship wake's optical signal characteristic. In order to evaluate the actual quality of ship wake images, the weighting factors on wake area and seawater background area are introduced in this paper for combination evaluation when the basic contrast calculation model is improving. The improved model can fully consider the human visual characteristics and combine the subjective and objective evaluation methods organically. An experiment about the extraction of contrast feature is also carried out in this paper using the developed experiment device, which especially for the maritime feature extraction experiment. The results of this paper show that the contrast parameters can not only reflect the subjective visual perception of the human eye on the wake images' actual quality, but also better reflect the application essence of the wake image processing. And the contrast parameters can describe the intensity's changing rules of ship wake's optical signal characteristics reliably and quantitatively.

Session 2

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Afternoon, February 26, 2019 (Tuesday)

Time: 14:30~16:30

Venue: Diamond Room (莹白厅)

Topic: "Computer vision and visualization"

Session Chair: Prof. Kiyoshi Hoshino

IP0024 Presentation 9 (15:15~15:30)

Learning Autonomous Exploration and Mapping with Semantic Vision

Sören Schwertfeger, Xiangyang Zhi, Xuming He
ShanghaiTech University, China

Abstract— We address the problem of autonomous exploration and mapping for a mobile robot using visual inputs. Exploration and mapping is a well-known and key problem in robotics, the goal of which is to enable a robot to explore a new environment autonomously and create a map for future usage. Different to classical methods, we propose a learning-based approach this work based on semantic interpretation of visual scenes. Our method is based on a deep network consisting of three modules: semantic segmentation network, mapping using camera geometry and exploration action network. All modules are differentiable, so the whole pipeline is trained end-to-end based on actor-critic framework. Our network makes action decision step by step and generates the free space map simultaneously. To our best knowledge, this is the first algorithm that formulate exploration and mapping into learning framework. We validate our approach in simulated real world environments and demonstrate performance gains over competitive baseline approaches.

Session 2

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Afternoon, February 26, 2019 (Tuesday)

Time: 14:30~16:30

Venue: Diamond Room (莹白厅)

Topic: "Computer vision and visualization"

Session Chair: Prof. Kiyoshi Hoshino

IP0031 Presentation 10 (15:30~15:45)

Unsupervised Reinforcement Learning For Video Summarization Reward Function

Lei Wang, Yaping Zhu, Jinfei Zhou
Communication University Of China, China

Abstract— We propose a new reward function based on Deep Summarization Network (DSN),which is used to synthesize short video summaries to facilitate large-scale browsing of video.The DSN uses the video summarization as a process of sequential decision making, predicting the probability for each video frame to indicate the likelihood that the video frame is selected, and then selecting the frame based on the probability distribution to form video summaries.By designing a new DSN reward function, the rewards for representative and diversity rewards are higher, and a large number of experiments are performed on the two benchmark datasets, demonstrating that our summary network is significantly better than existing unsupervised video summaries.

Session 2

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

Afternoon, February 26, 2019 (Tuesday)

Time: 14:30~16:30

Venue: Diamond Room (莹白厅)

Topic: "Computer vision and visualization"

Session Chair: Prof. Kiyoshi Hoshino

IP0015 Presentation 11 (15:45~16:00)

Fast Inter Prediction Mode Decision for HEVC Using Random Forest

Zhuge Yan, Siu-Yeung Cho, Sherif Welsen
University of Nottingham Ningbo, China

Abstract— In this paper, we extracted specific image features that represent CU texture, incorporate a machine learning technique, namely random forest, in HEVC intra prediction mode selection, to improve the performance of intra coding of HEVC. Compared with similar algorithms, our method extracts very specific features of image texture changes in terms of angle. Therefore our method can achieve very high prediction accuracy. Having similar reduction in complexity, the proposed algorithm can gain higher video quality compared with similar algorithms.

Session 2

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

Afternoon, February 26, 2019 (Tuesday)

Time: 14:30~16:30

Venue: Diamond Room (莹白厅)

Topic: "Computer vision and visualization"

Session Chair: Prof. Kiyoshi Hoshino

IP0018 Presentation 12 (16:00~16:15)

Hot Spot Processing System On-Board Based on Multi-spectral Remote Sensing Images

Shuwei Hou, Baolong Guo, Quan Jing
1, Xidian University, China 2, Beijing Institute of Spacecraft System Engineering, China

Abstract— Multi-spectral remote sensing has become a general trend in remote sensing technology. The increasing number of spectral bands on one hand leads to higher data rates and data volumes, bringing unbearable pressure to the data transmission channel. On the other hand, users are often only interested in special information they are interested in, and not in the whole data mass. Concerning these two tendencies, a hot spot processing system on-board is proposed in this paper. Focusing on the water thermal pollution monitoring with high temperature anomaly, the proposed system consists of two stage processes, water temperature anomaly detection followed by downlink information generation. Experimental results reveal that the proposed system not only can greatly reduce the pressure of data transmission channel, improve the usability of the downlink data, but also can meet the emergency response requirements of high temperature events.

Session 2

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

Afternoon, February 26, 2019 (Tuesday)

Time: 14:30~16:30

Venue: Diamond Room (莹白厅)

Topic: "Computer vision and visualization"

Session Chair: Prof. Kiyoshi Hoshino

IP2002 Presentation 13 (16:15~16:30)

Image Caption Based on Visual Attention Mechanism

Jinfei Zhou[1], Yaping Zhu[1], Hong Pan[2]

1. School of Information and Communication Engineering, Communication University of China, China
2. School of Automation, Southeast University, Nanjing, China

Abstract— The generic neural encoder-decoder framework for image captioning typically uses a convolution neural network to extract the image features and then uses a recurrent neural network to generate a sentence describing this image. The residual attention network is a model that achieves good results in image classification task, which is proved that this network is better than the classical convolution neural network in the ability of feature extraction. In this paper, we propose a combination of the residual attention network and the classical convolution to extract image spatial features, and then input this image spatial features to our visual attention module. At last, we use the decoder which consists of two long short-term memory(Two-LSTM) to generate a sentence describing the image. Our design scheme validates the results of BLEU-N in the MSCOCO dataset.

Coffee Break	16:30-16:45

Session 3

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

Afternoon, February 26, 2019 (Tuesday)

Time: 16:45~18:30

Venue: Diamond Room (莹白厅)

Topic: "Image and signal processing"

Session Chair: Prof. Kenneth K. M. Lam

IP0004 Presentation 14 (16:45~17:00)

Analytical and Performance Evaluation of Chaotic Sequences under Effect of Gaussian Mixture Noise

Hany Mansour
Military Technical College, Egypt

Abstract— Generally, the communication receivers are designed to receive the Gaussian noise signals, consequently its performance degrade if the noise changed to be non-Gaussian. One of the most popular non-Gaussian noises is the Gaussian Mixture (GM) distribution, which is used to model the underwater channel, due to its universal approximation properties. On the other hand, Spread Spectrum (SS) has many applications in underwater communication; consequently it was necessary to analyze it under effect of GM noise. Actually, there were a little researches investigate and present an analytical analysis of the spread spectrum error probability in the underwater channel with the GM noise. In this paper, the chaotic sequence code is applied and verified as a spreading code for the SS system in underwater acoustic channel with GM noise. The error performance is presented and derived analytically with and without the spreading process. The results show that applying the chaotic sequence significantly improves the performance in the underwater acoustic channel with the Gaussian mixture noise

Session 3

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

Afternoon, February 26, 2019 (Tuesday)

Time: 16:45~18:30

Venue: Diamond Room (莹白厅)

Topic: "Image and signal processing"

Session Chair: Prof. Kenneth K. M. Lam

IP0014-A Presentation 15 (17:00~17:15)

Diagnosis of Periodontally Affected Teeth Using Dental X-ray Images Based on Convolutional Neural Network

Jia-Wei Lin[1], Ming-Chin Chen[2], Pei-Hsuan Yang[2], Chia-Hung Yeh[3,4], Ro-Min Weng[2]
1, Department of Dentistry, National Yang-Ming University, Taipei, Taiwan; 2, Department of Electrical Engineering, National Dong Hwa University, Hualien, Taiwan; 3. Department of Electrical Engineering, National Taiwan Normal University, Taipei, Taiwan; 4. Department of Electrical Engineering, National Sun Yat-sen University, Kaohsiung, Taiwan

Abstract—Purpose: Deep learning of dental radiographs has emerged as a powerful and efficient method for periodontal diseases detection. By applying convolutional neural network, a system was established for detection and diagnosis of periodontally affected teeth in dental radiographs.

Methods: The number of dental radiographs of the dataset was augmented to 1920 images with the rotated and flipped images of the original ones, then the dataset was divided into the training dataset (n=1780) and the testing dataset (n=140). Every image was segmented from either periapical or panoramic radiographs. After resized to 300×300 pixels, all images were used as the inputs of a convolutional neural network (CNN) including convolutional layer, pooling layer, dropout layer and fully connected layer to detect the periodontally affected teeth.

Results: The outcome of deep learning showed that the detection accuracy, sensitivity, and specificity of periodontally affected teeth were 82.14%, 71.43%, and 92.86%, respectively. The area under the receiver-operating characteristic curve (AUC) was 0.869. The results demonstrated that the proposed technique using CNN provided good prediction.

Conclusion: Our study showed that a diagnostic tool using deep learning for dental periodontal disease has the advantage of efficient analysis and diagnosis from dental X-ray images. With its convenience and precision, this system can be significantly beneficial to dental clinicians.

Session 3

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

Afternoon, February 26, 2019 (Tuesday)

Time: 16:45~18:30

Venue: Diamond Room (莹白厅)

Topic: "Image and signal processing"

Session Chair: Prof. Kenneth K. M. Lam

IP0021 Presentation 16 (17:15~17:30)

The Convolution Neural Network with Transformed Exponential Linear Unit(TELU) activation function for Image Classification

Edna Too, Li Yujian, Sam Njuki, Peter Yamak, Zhang Ting
Beijing University of Technology, China

Abstract— Activation functions play an important role in deep learning and its choice has a significant effect on the training and performance of a model. In this study, a new variant of Exponential Linear Unit (ELU) activation called Transformed Exponential Linear Unit (TELU) is proposed. An empirical evaluation is done to determine the effectiveness of the new activation function using state-of-the-art deep learning architectures. From the experiments, TELU activation function tends to work better than the conventional activations functions on deep models across a number of benchmarking datasets. TELU achieves superior classification accuracy on Cifar-10, SVHN and Caltech-101 dataset on state-of-the-art deep learning models. Additionally, it shows superior AUROC, MCC, and F1-score on the STL-10 dataset. This proves that TELU can be successfully applied in deep learning for image classification.

Session 3

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

Afternoon, February 26, 2019 (Tuesday)

Time: 16:45~18:30

Venue: Diamond Room (莹白厅)

Topic: "Image and signal processing"

Session Chair: Prof. Kenneth K. M. Lam

IP0023 Presentation 17 (17:30~17:45)

Background Calibration Algorithm for 3-stage Pipelined-SAR ADCs

Peng Dong, Yang Zhang and Fengyi Mei
School of Electronics and Information Engineering, Tongji University, China

Abstract— This paper presents a digital background calibration algorithm for the inter-stage gain error of the pipelined-SAR ADC. The background calibration estimates dynamic inter-stage gain variation by an update equation based on LMS algorithm. Gain errors are then corrected by the reconstruction logic. In addition, the residue saturation in pipeline ADC has been analyzed and solved. Simulation results are presented for a 13b 3-stage pipelined-SAR ADC. Without calibration, ADC's dynamic performance SNDR is 46dB and SFDR is 58dB. After the calibration, SNDR is increased to 70dB and SFDR is increased to 77dB.

Session 3

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

Afternoon, February 26, 2019 (Tuesday)

Time: 16:45~18:30

Venue: Diamond Room (莹白厅)

Topic: "Image and signal processing"

Session Chair: Prof. Kenneth K. M. Lam

IP0007 Presentation 18 (17:45~18:00)

Research on the Evaluation Method of Smoke Jamming Effect

Liying Wang, Songtao Liu, Mingrong Chen
Department of Information System, Dalian Naval Academy, Dalian, Liaoning, China

Abstract— Smoke is one of the important jamming methods for infrared imaging terminal guidance weapon, but how to evaluate the jamming effect of smoke is not well solved. Based on the whole process of infrared imaging guidance system, this paper viewed the jamming effect as the evaluation of the search stage and the tracking stage. Aiming at the evaluation of searching stage, the probability model of infrared imaging target detection is designed, and the evaluation criterion and method of the jamming effect of the smoke are given. In view of the evaluation of tracking stage, a total of three evaluation methods are designed, which are the contrast characteristics, correlation characteristics and fractal characteristics. The evaluation criterion and method of the jamming effect of smoke on photoelectric imaging tracking system are given, and finally the jamming effect evaluation software is designed and developed. The simulation results show that the evaluation method of smoke jamming effect for infrared imaging detection and tracking system is effective.

Session 3

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

Afternoon, February 26, 2019 (Tuesday)

Time: 16:45~18:30

Venue: Diamond Room (莹白厅)

Topic: "Image and signal processing"

Session Chair: Prof. Kenneth K. M. Lam

IP0029 Presentation 19 (18:00~18:15)

Research on Neural Network Based Digital Signal Demodulation

Tian Wu, Tao Luo, Jianfeng Li
Beijing University of Posts and Telecommunications, China

Abstract— In this paper we presented a neural network based method to demodulate digital signals. After training with different modulation schemes, the receiver can perform demodulation without changing receiver hardware by loading certain parameters based on the modulation scheme. We designed three neural network models with different architecture and simulate FSK, PSK, QAM demodulation over AWGN and Raleigh-faded channels. The results show that the neural network model can equal or even exceed the performance of the conventional demodulation method (matched filter or correlation-based demodulation). With this kind of receiver, we can intelligently process multiple types of signals without increasing hardware cost and volumetric.

Session 3

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

Afternoon, February 26, 2019 (Tuesday)

Time: 16:45~18:30

Venue: Diamond Room (莹白厅)

Topic: "Image and signal processing"

Session Chair: Prof. Kenneth K. M. Lam

IP0027 Presentation 20 (18:15~18:30)

Distributed Arithmetic Coding for Memory Sources

Mingwei Qi, Junwei Zhou, Yanchao Yang, Shengwu Xiong
School of Computer Science and Technology, Wuhan University of Technology, China

Abstract— Slepian-Wolf problem regards the compression of multiple correlated information sources that do not communicate with each other. In real applications, the information sources such as video sequences usually are memory where they are interdependent between symbols. Existing researches mainly consider the memoryless sources and employ channel coding to solve the Slepian-Wolf problem. In this paper, we use distributed arithmetic coding instead of channel coding to solve the Slepian-Wolf problem, benefiting the advantages of source coding in memory sources by eliminating redundancy between symbols. Simulation results indicate that the proposed scheme shows better performance compared to the existing schemes when applying on memory sources.

Dinner Time	18:30-19:30

POSTER Presentation Abstracts

Poster 1

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

Morning, February 26, 2019 (Tuesday)

Time: 10:20~10:50

Venue: Diamond Room (莹白厅)

Session Chair: Prof. Yulin Wang

IP0022 Presentation 1 (10:20~10:50)
Research on Urinary Micro-particles Image Eigenvalue Extraction and Analysis Method

Xian-Hua Zheng [1], Xiao-Mou Zhou [2], Ming-Jie Zheng [3]
1, Yangtze Normal University, China;
2, China University of Mining & Technology, China;
3, Research Laboratory Sanko Air Conditioning Co., LTD, Japan

Abstract— In order to obtain the feature of urinary micro-particles image, a method was proposed from shape and structure and region aspects in this paper. The shape and structure features were extracted according to the chain code method. Moreover, the region features were extracted by the invariant moments. Based on the binary segmentation of microscopy image, the red cell (RC), white cell (WC), cast, epithelial cell (EC) and crystal feature calculation of urinary micro-particles image are tested. The data tables are provided in detail to verify the accuracy and feasibility of the proposed method. The data mining of the tested micro-particles feature would be important to identify and classify the type of urinary micro-particles.

Poster 2

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

Morning, February 26, 2019 (Tuesday)

Time: 10:20~10:50

Venue: Diamond Room (莹白厅)

Session Chair: Prof. Yulin Wang

IP0030 Presentation 2 (10:20~10:50)

An Application of Object Detection Based on YOLOv3 in Traffic Scene

Sujin Luo, Chenyu Xu, Hongxin Li
Lanzhou University, China

Abstract— With the progress of scientific-technology, automatic equipment has become a prevailing trend in our society. Especially in transportation, unmanned vehicle system is a significant research project that can greatly benefit us. In traffic scene, to achieve high detection accuracy in real-time, a robust algorithm is needed. In this paper, we present a detection method based on YOLOv3 which preprocess the data set before training. We divide the original images into equal parts with k-fold cross validation. Each time when we train the model, we choose one part as testing set and remaining parts as training set to make full use of our data. The experiment results show that our method performs better than YOLOv3 in the case of class-imbalance. We also propose a new network structure, Dense-YOLOv3 which replaces some residual modules with dense modules. Through this method, overfitting is effectively alleviated.

Poster 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.

Morning, February 26, 2019 (Tuesday)

Time: 10:20~10:50

Venue: Diamond Room (莹白厅)

Session Chair: Prof. Yulin Wang

IP3003 Presentation 3 (10:20~10:50)

Subject Independent Facial Expression Recognition: Cross-Connection and Spatial Pyramid Pooling Convolutional Neural Network

Leilei Li[1,2], Yue Yuan[1,2], Mi Li[1,2], , Hongpei Xu[1,2], Shengfu Lu[1,2]

1. Department of Automation, Faculty of Information Technology, Beijing University of Technology, China
2. The Beijing International Collaboration Base on Brain Informatics and Wisdom Services, China

Abstract— Facial expression recognition is still a problem at present, especially in the case of individual independence. On the one hand, due to the influence of morphological changes, ethnic differences and other factors, the expression of individual expressions varies greatly. On the other hand, there is currently no publicly available large-scale dataset that can support deep neural networks. To this end, this paper proposes cross-connection and spatial pyramid pooling convolutional neural network. The model not only uses spatial pyramid pooling for high-level feature enhancement, but also combines cross-connection and spatial pyramid pooling to extract important low-level features. Finally the different levels of features are connected to improve the generalization performance of the model. We validate our approach in four widely used public expression datasets (CK+, JAFFE, MMI, NimStim). Compared to other facial expression recognition methods, our proposed method achieves comparable or superior results. In the case of subject independence, the model achieved a good result with 97.41% accuracy on the CK+ dataset.

Academic Visit

Shanghai Key Laboratory of Multidimensional Information Processing

February 27, 2019 (Wednesday) 9:00~17:00

上海市多维度信息处理重点实验室
Shanghai Key Laboratory of Multidimensional Information Processing

Shanghai Key Laboratory of Multidimensional Information Processing, based on related research of school of information science and technology, East China Normal University, is established through research condensation and resource integration. It aims to meet the major needs of the country and the needs of Shanghai's economic and social development. It targets the frontier scientific issues in the field of multi-dimensional information processing, and carrys out original innovation, exploratory, cutting-edge and systematic research. The project construction was approved by Shanghai Science and Technology Commission in September 2014.

The laboratory aims to lead the multi-dimensional information processing scientific exploration of the frontier of information science and technology in the future, and solve multi-dimensional, high-precision and intelligent problems. The basic research of theory and method research is carried out on multi-dimensional information acquisition and devices, multi-dimensional information analysis theory and methods as well as pattern analysis theory and knowledge. With sensor technology as the core, combined with advanced functional material manufacturing technology, circuits and systems, the basic theories and common problems in multi-dimensional information acquisition are studied. All the researches are with high precision as the goal and spatial information processing as the basis. The researches are based on multi-dimensional data, and they combines high-precision positioning theory, methods, techniques and their applications. Laboratory is studying the unified modeling, pattern analysis and knowledge base automation construction of multi-dimensional heterogeneous data.

Participants

Note:

- Session photo will be taken at the end of each session.
- The certificate for listeners can be collected at the registration counter.
- To show respect to other authors, especially to encourage the student authors, we strongly suggest you attend the whole session

 **Participant 1** **Yeong Hwa Kim** Chung-Ang University, South Korea	 **Participant 2** **Sungwook Yu** Chung-Ang University, South Korea
 **Participant 3** **Wiem Boorhzar** Shanghai Jiao Tong University, China	 **Participant 4** **Zheng wei Li** SMEE, Shanghai, China
 **Participant 5** **JiaQi Wu** Shanghai University of International Business and Economics, China	 **Participant 6** **Zhaohui Sun** Shanghai Jiao Tong University, China
 **Participant 7** **Zhe Wang** Shanghai Jiao Tong University, China	 **Participant 8** **Taichuan Yang** Shanghai Jiao Tong University, China
 **Participant 9** **Kai Zhu** Shanghai Jiao Tong University, China	 **Participant 10** **Fan Zhou** Shanghai Jiao Tong University, China

One Day Visit

February 28, 2019 (Thursday) 9:00~17:30

(Tip: The following places are for references,
and the final schedule should be adjusted to the actual notice.)

(9:00am) Assemble (The Pullman Shanghai Jing An)
(9:00-12:30pm) Morning Visit
(12:30p.m-5:30p.m) Afternoon Visit

1. Visit Shippo Old Street

Shippo Old Street is located in the center of Minghang District of Shanghai, only 18 kilometers from the downtown area. Shippo Ancient Town can satisfy your curiosity about ancient water townships without the bother of either long distance of the rush of crowds.

As the only ancient town forming part of greater Shanghai, with a history spanning over one thousand years, Qibao is more than just a living fossil of ancient Chinese conurbation and urban planning. The town was built in Northern Song Dynasty(960-1126) and grew into a prosperous business center during Ming(1368-1644) and Qing Dynasties(1644-1911). Qibao is the Chinese for " seven treasures" and there are two popular theories about its derivation. The more reliable one says that the name originates from the Qibao Temple, famed for its good reputation. It was that which contributed to the growth of business and culture of the previously unknown town.

2. Visit Power Station of Art

Established on Oct. 1st, 2012, the Power Station of Art (PSA) is the first state-run museum dedicated to contemporary art in mainland China. It is also home to the Shanghai Biennale.

Standing tall by Shanghai's mother river, the Huangpu River, PSA now occupies an area of 42-thousand square meters. With an internal height of 27 meters, the museum now houses exhibition sections that add up to 15-thousand square meters, and its 165-meter chimney, being an independent exhibition space, has also become an integral part of Shanghai's world-famous skyline.

Renovated from the former Nanshi Power Plant, PSA was once the Pavilion of Future during the 2010 Shanghai World Expo. The museum has not only witnessed the city's vast changes from the industry age to the IT era, but also provided a rich source of inspirations for artists with its simple yet straightforward architectural styles.

And as Shanghai's generator for its new urban culture, PSA regards non-stopping innovation and progress as the key to its long-term vitality. The museum has been striving to provide an open platform for the public to learn and appreciate contemporary art, break the barrier between life and art, and promote cooperation and knowledge generation between different schools of art and culture.

3. Visit Yu Garden

Yuyuan Garden is a famous classical garden located in Anren Jie, Shanghai. The garden was finished in 1577 by a government officer of the Ming Dynasty (1368-1644) named Pan Yunduan. Yu in Chinese means pleasing and satisfying, and this garden was specially built for Pan's parents as a place for them to enjoy a tranquil and happy time in their old age.

In the 400 years of its existence, Yuyuan Garden had undergone many changes. During the late Ming Dynasty, it became very dilapidated with the decline of Pan's family. In 1760, some rich merchants bought Yuyuan Garden and spent more than 20 years reconstructing the buildings. During the Opium War of the 19th century, Yuyuan Garden was severely damaged. The Yuyuan Garden you see today is the result of a five year restoration project which began in 1956. The garden was open to the public in September, 1961. Yuyuan Garden occupies an area of 20,000 square meters (about five acres). However, the small size is not a representative of the attractions of the garden. The pavilions, halls, rockeries, ponds and cloisters all have unique characteristics. There are six main scenic areas in the garden: Sansui Hall, Wanhua Chamber, Dianchun Hall, Huijing Hall, Yuhua Hall and the Inner Garden. Each area features several scenic spots within its borders.

4. Visit The Bund

The bund, located on the huangpu river in the huangpu district of Shanghai, is a historical and cultural block of China.Since 1844, the area of the bund has been divided into the British concession, which is a true reflection of Shanghai's ten-mile western concession and also the starting point of the old Shanghai concession area and the whole modern city of Shanghai. The total length of the bund is 1.5km, starting from yan 'an east road in the south to waibai ferry bridge on the suzhou river in the north, huangpu river in the east and the old Shanghai financial and foreign trade institutions in the west. There are 52 classical revival buildings of different styles on the bund, which is known as the bund international architecture exhibition group. It is one of the important historical relics and representative buildings in modern China and one of the landmarks of Shanghai.

Shanghai Oriental Pearl TV Tower (Chinese: 东方明珠电视塔), with a height of 468 meters high is the 4th highest in Asia and the 6th highest tower in the world. Construction commenced on July 30th, 1991 and was completed on October 1st, 1994. It faces the Bund across the Huangpu River. Built with eleven steel spheres in various sizes hanging from the blue sky to the green grassland, the body of the tower creates an admirable image, which is described in an ancient Chinese verse as: large and small pearls dropping on a plate of jade. **(****We can see the Shanghai Oriental Pearl TV Tower on the bund street. You can choose to hang out at the bund or take our bus back to the hotel)**

Note

Note