

# Conference Abstract

2018 IEEE International Conference on Information  
Communication and Signal Processing  
*ICSP 2018*

September 28-30, 2018

Singapore

Venue: Nanyang Executive Centre, Singapore  
Address: 60 Nanyang View, Singapore 639673

Published by



Supported by



國立中央大學  
資訊工程學系



OHIO  
UNIVERSITY

## **Welcome Letter**

Dear Participants,

Welcome to the 2018 IEEE International Conference on Information Communication and Signal Processing (ICSP 2018) which will be held in Singapore on September 28-30, 2018. The conference's theme is "Information Communication and Signal Processing".

ICSP 2018 provides a platform to disseminate the information on the most recent and relevant sustainable innovations, theories and practices in information communication and signal processing to all branches of academia and industry. ICSP 2018 is aimed at providing an excellent platform for academicians, researchers, students, professionals, engineers, and scientists from academia and industry to share their research findings and building an academic research network for further collaborative research in their respective areas. Parallel sessions and workshops in several fields of information, communication and signal processing will be hosted over the period of three days of the conference.

I wish to take this opportunity to express my heartfelt appreciation to Conference Advisory Committee, Prof. Alex Kot Chichung from Nanyang Technological University in Singapore, Conference Co-chairs, Prof. Xudong Jiang from Nanyang Technological University in Singapore, Prof. Kezhi Mao from Nanyang Technological University in Singapore. I also express my heartfelt appreciation to the Conference Program Chairs, Prof. Mehmet Celenk from Ohio University in USA and Prof. Kuo-Chin Fan from National Central University in Taiwan. I would like to express my gratitude and appreciation to the Conference Technical Committee for their great contributions to the paper review process and Conference Organizing Committee for their efforts to organizing this conference. Many thanks to the reviewers for their excellent works to maintain the academic quality and scholarship. Without all of your efforts, the conference will not be possible to be held.

Finally, I would like to thank the conference keynote speakers and participants for coming to Singapore to share their knowledge with the rest of the participants. I hope these keynote speeches will be proved to be intellectually stimulating to all participants.

Hope you will enjoy the conference, the food, the hospitality, and the beautiful and charming environment in Singapore!

**Conference Chair**

**Prof. Maode Ma, Nanyang Technological University, Singapore**

# **Instructions for Presentation**

## **Oral Presentation Tips**

**Time:** a maximum of 15 minutes in total, including speaking time and discussion. Please make sure your presentation is well timed. Please keep in mind that the program is full and that the speaker after you would like their allocated time available to them.

You can use USB flash drive (memory stick), make sure you scanned viruses in your own computer. Each speaker is required to meet her / his session chair in the corresponding session room 10 minutes before the session starts and copy the slide file (PPT or PDF) to the computer.

It is suggested that you email a copy of your presentation to your personal email box as a backup. If for some reason the files cannot be accessed from your flash drive, you will be able to download them to the computer from your email.

Please note that session room will be equipped with a LCD projector, screen, point device, microphone, and a laptop with general presentation software such as Microsoft Power Point and Adobe Reader. Please make sure that your files are compatible and readable with our operation system by using commonly used fronts and symbols. If you plan to use your own computer, please try the connection and make sure it works before your presentation.

**Movies:** If your Power Point files contain movies please make sure that they are well formatted and connected to the main files.

## **Poster Presentations Tips**

Maximum poster size is 36 inches wide by 48 inches high (3ft.x4ft.)

Posters are required to be condensed and attractive. The characters should be large enough so that they are visible from 1 meter apart.

Please note that during your poster session, the author should stay by your poster paper to explain and discuss your paper with visiting delegates.

### **Contact:**

**ICSP 2018: Ms. Rachel Cao**

**Email: [icspconference@163.com](mailto:icspconference@163.com)**

**Tel: +86-13880104217**

# **Table of Contents**

<b>Welcome Letter</b>	2
<b>Instructions for Presentation</b>	3
<b>Agenda Overview</b>	5
<b>Nanyang Executive Centre Map</b>	7
<b>Introduction of Speakers</b>	8
<b>Oral Presentation Sessions</b>	
Session 1: Digital Communication and Information System	13
Session 2: Image Processing Technology and Application	19
<b>Note</b>	26

## Agenda Overview

Friday, September 28, 2018		
10:00-17:00	Conference Check in and Materials Collection	Entrance of NEC
Saturday, September 29, 2018		
Opening Ceremony		
9:00-9:05	Prof. Maode Ma Nanyang Technological University, Singapore	Small Lecture Room 6
Keynote & Plenary Speeches		
9:05-9:45	<b>Speech I</b> Prof. Alex Kot Chichung IEEE Fellow and IES Fellow Nanyang Technological University, Singapore <i>Speech Title: Fake or Real?</i>	Small Lecture Room 6
9:45-10:25	<b>Speech II</b> Prof. Mehmet Celenk Ohio University, USA <i>Speech Title: Auotonomus Vehicle Guidance in Heavily Shaded Road Conditions</i>	
10:25-11:00	<b>Coffee Break &amp; Group Photo</b>	Corridor (Level 3)
11:00-11:40	<b>Speech III</b> Prof. Mao Kezhi Nanyang Technological University, Singapore <i>Speech Title: Situation Awareness Based on Automated Analytics of Online News</i>	Small Lecture Room 6

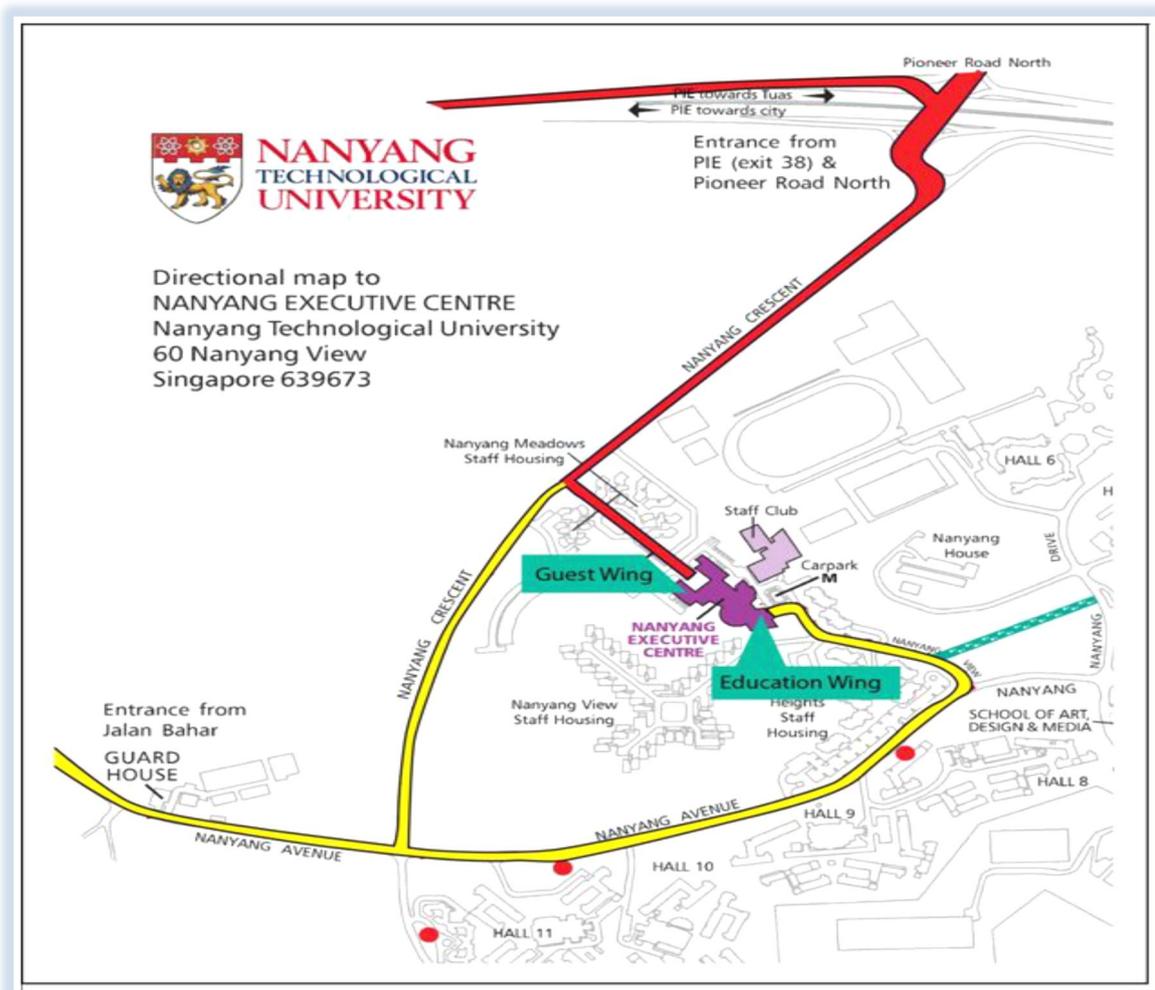
## 2018 Singapore Conference

11:40-12:20	<b>Speech IV</b> Prof. Xudong Jiang Nanyang Technological University, Singapore <i>Speech Title: Iterative Truncated Arithmetic Mean Filter and Its Properties</i>	
12:20-14:00	<b>Lunch</b>	Function Hall 2 (Level 4)
<b>Oral Presentation Sessions</b>		
14:00-15:30	<b>Session 1 (Part A): Digital Communication and Information System</b> SP002 SP004 SP011 SP012 SP033 SP036	Small Lecture Room 6
14:00-15:30	<b>Session 2 (Part A): Image Processing Technology and Application</b> SP013 SP016 SP017 SP020 SP021 SP022	Seminar Room 2
15:30-15:45	<b>Coffee Break</b>	Corridor (Level 3)
15:45-17:15	<b>Session 1 (Part B): Digital Communication and Information System</b> SP039 SP045 SP046 SP1009 SP1010 SP025	Small Lecture Room 6
15:45-17:30	<b>Session 2 (Part B): Image Processing Technology and Application</b> SP026 SP028 SP031-A SP040 SP041 SP043 SP044	Seminar Room 2
18:00-20:00	<b>Dinner</b>	Function Hall 2 (Level 4)
<b>Sunday, September 30, 2018</b>		
<b>One Day Tour in Singapore</b>		

## Nanyang Executive Centre Map

### General Information:

- Registration Desk: Entrance of NEC
- Coffee Break: Corridor at NEC, Level 3
- Lecture Hall: Small Lecture Room 6, Level 3 & Seminar Room 2, Level 2
- Lunch and Dinner: Function Hall 2 at NEC, Level 4



More Details about the Venue via:

<http://www.ntu.edu.sg/ias/upcomingevents/Pages/Vnue%20-%20Nanyang%20Executive%20Centre.aspx>

# Introduction of Speakers

## Speaker I



**Prof. Alex Kot Chichung, IEEE Fellow and IES Fellow**

**Nanyang Technological University, Singapore**

**Speech Title:** Fake or Real?

**Abstract:** With the fast proliferation of digital cameras and other image acquisition devices due to the advancement in digital photography technology, photos from the public may have good news values for making journalist reports. However, one big challenge is how to authenticate the photo contents from the public, which may come from unreliable sources. A large variety of forensics works have been proposed to address various forensic challenges based on different types of tell-tale signs. This talk introduces several techniques for: (1) Accurate detection of image demosaicing regularity as a general type of image forensics features. (2) Identification of various common image source models including digital still cameras, RAW conversion tools and the low-end mobile cameras; (3) Universal detection of a wide range of common image tampering. (4) Tampering detection for blur images. (5) EXIF file tampering or content manipulations, (6) Tempering detection with blur images, and (7) Prevention of the image recapturing threat in spoofing, especially in face spoofing. These techniques help expose common image forgeries, especially those easy-to-make forgeries, which can be hardly seen directly by human eyes. The common theme behind these forensics techniques is through statistical detection of some intrinsic image regularity or tampering anomalies.

**Biography:** Prof. Kot has been with the Nanyang Technological University (NTU), Singapore since 1991. He headed the Division of Information Engineering at the School of Electrical and Electronic Engineering (EEE) for eight years. The Division's focuses are on signal processing for image, video, speech and audio. He was the Vice Dean Research and Associate Chair (Research) for the School of EEE for three years, overseeing the research activities for the School with over 200 faculty members. He is currently Professor and the Associate Dean (Graduate Studies) for the College of Engineering (COE) and Director of ROSE Lab [Rapid(Rich) Object SEarch Lab) with Peking University, Tencent and Inspur]. He has published extensively with over 200 technical papers in the areas of signal processing for communication, biometrics recognition, data-hiding, authentication and image forensics for digital media. He has two USA and one Singapore patents granted.

Prof. Kot served as Associate Editor for the IEEE Transactions on Signal Processing from 2000 to 2003, IEEE Transactions on Multimedia from 2008 to now, IEEE Transactions on Circuits and Systems for Video Technology from 2000 to 2005; IEEE Transactions on Circuits and Systems Part II from 2004 to 2006; IEEE Transactions on Circuits and Systems Part I from 2005 to 2007, IEEE Transactions on Image Processing, the Signal Processing Magazine, IEEE Signal Processing Letters, and the Senior Editorial Board of IEEE Journal of Special Topics in Signal Processing. He also served as Guest Editor

## *2018 Singapore Conference*

---

for the Special Issues for the IEEE Transactions on CSVT and JASP. He was a member of the IEEE Transactions on Multimedia Steering Committee and a member of the IEEE SPS Image and Multi-dimensional DSP and IEEE SPS Information, Forensics and Security Technical Committees. Currently, he is in, the Editorial Board member for the EURASIP Journal of Advanced Signal Processing, and the IEEE Transactions on Information Forensics and Security.

He is a member of the IEEE CAS Visual Signal Processing and Communication Technical Committees. He has served the IEEE in various capacities such as the General Co-Chair for the 2004 IEEE International Conference on Image Processing (ICIP) and area/track chairs for several IEEE flagship conferences. He also served as the IEEE Signal Processing Society Distinguished Lecturer Program Coordinator and the Chapters Chair for IEEE Signal Processing Chapters worldwide. He received the Best Teacher of The Year Award at NTU, the Microsoft MSRA Award and as a co-author for the ICPR2008 Best Biometrics Student Paper Award in Florida, USA, the IWDW2010 Best Paper Award in Seoul, Korea and the ISCAS2010 Finalist for the Best Student Paper Award in Paris, France, the IEEE WIFS Best Student Paper Silver Award, the IEEE ICCT 2011 Best Paper Award and the ICECC 2012 Best Paper Award. He was elected as the IEEE CAS Distinguished Lecturer in 2005. He is now a Vice President in the Signal Processing Society, an IEEE Signal Processing Society Distinguished Lecturer, a Fellow of the Academy of Engineering, Singapore, a Fellow of IEEE and a Fellow of IES.

### Speaker II



**Prof. Mehmet Celenk, Ohio University, USA**

**Speech Title:** Auotonomus Vehicle Guidance in Heavily Shaded Road Conditions

**Abstract:** The aim of this paper is to investigate a novel method for detection of road lane markers in conjunction with the determination of positioning of the self-driving vehicle relative to lane markers and road boundaries during travel in inclement weather conditions continues to be of paramount importance. This research considers the detection performance and associated parameters using experimental data that demonstrates the accurate results during various conditions. This work presents an investigation and associated results where road land boundary markers are detected in conjunction with the ability decipher the horizon when the front view of the vehicle's path is degraded. Degradation of driving scenes can be attributed to such weather conditions as heavy rain, fog, or snow. The detection of lane markers and road boundaries is especially important for roads that exhibit severe curves, aggressive uphill slopes and downhill valleys, We present a model to predict deviations from reference distances associated with roads with such design constraints. To address self-driving objectives a method is proposed based on the Least Mean Square (LMS) optimization and the orthogonality principle. The paper also presents a design methodology of the concepts to address autonomous operation of passenger vehicles with some promising experimental results. Error curves are computed and presented for the actual verses predicted lane markers by integrating salient features of the Principal Component Analysis (PCA) and Gradient Specturm Matching (GSM) methods. Multi IR-sensory based fusion is selected as a test bed for the development of an embedded system for autonomous convoy guidance.

**Biography:** Mehmet Celenk received a Ph.D. degree from Stevens Institute of Technology in EECS in 1983, where he was the Robert Crook Stanley Graduate Fellow in 1985. He served on the Turkish Army in 1984-85 as a lieutenant and joined OU in 1985, where he is currently a Professor of the School of EECS. He has published 300 articles, received a \$600,000 hypercube processor grant, participated in a \$450,000 Tubitak Autonomous Vehicle Design and Development grant, and secured \$120,000 in funds for visiting scholars' R&D projects. He has directed 35 M.S./Ph.D. theses/dissertations in the School of EECS. He received the distinguished service award from the Signal School in Ankara in 1984 for his R&D work and launching the Communications Journal. He was the recipient of the 1988 Fritz & Dolores Russ Research Award of the Russ College of ENT of OU, and awarded the OU Avionics Academic Challenge Faculty Fellowship in 1988-92. He has been an active reviewer for numerous professional societies (e.g., IEEE, IEE, IET, SPIE, IS&T, IAPR), journals/transactions, publishers, and funding agencies (e.g., NSF, NYSTAR 2002-07). He has been an associate editor of the IEEE Trans. on SMCA (currently SMC: Systems) since 2005 and of the Electronic Letters of the IET since 2015, and the recipient of the Best Associate Award of the IEEE SMC Society in 2010. He has served on the editorial board of the J. Recent Patents on Signal Proc. since 2008, on the Editorial Board of J. of Biometrics and its Applications since 2014, and on TCM of numerous international conferences. He is a member of IEEE, Eta Kappa Nu, and former member of SPIE, IS&T, ACM, ASEE, OE. He was awarded Certificate of Appreciation by SPIE's Electronic Imaging J. and Optical Engineering for his review services in 2012-13.

### Speaker III

**Prof. Mao Kezhi, Nanyang Technological University, Singapore**



**Speech Title:** Situation Awareness Based on Automated Analytics of Online News

**Abstract:** Perceiving the environment, understanding the situation and projecting the future status is the so called “situation awareness”. Situation awareness requires systematic gathering, fusion and analysis of information from various sources. News agencies, big and small, have tens of thousands of journalists around the world, who publish their first-hand information of incidents online at the first time. Nowadays, online news serves as a major source of information.

In this talk, we will introduce an online news text analytics-based automated situation awareness system. This system is able to detect unusual or unexpected incidents happening in the region or other parts of the world in real time or close to real time. Examples of such incidents are terrorism attack, infectious disease breakout, earthquake, tsunami, volcanic eruption, flooding, and typhoon etc. This system could help understand the situations, predict the future developments and assess the impacts in order to prevent or mitigate the potential negative impacts.

**Biography:** Dr. Mao Kezhi obtained his BEng, MEng and PhD from Jinan University, Northeastern University, and University of Sheffield in 1989, 1992 and 1998 respectively. He worked as a Lecturer at Northeastern University from 1992 to 1995. He joined School of Electrical and Electronic Engineering, Nanyang Technological University, Singapore in 1998, where he is now a tenured Associate Professor. Dr. Mao has over 20 years of research experience in artificial intelligence, machine learning, big data, image processing, natural language processing, and information fusion. He has published over one hundred research papers in referred international journals and conferences. He has edited 3 books published by Springer.

Besides academic research, Dr. Mao is also active in development and consulting. He has successfully developed and delivered several intelligent systems and software tools to government agencies, hospitals and industries.

Dr. Mao Kezhi serves on Editorial Board of Computational Intelligence and Neuroscience. He has served as Keynote Speaker/Programme Chair/Organizing Committee Member for multiple international conferences. In addition, he has served as a reviewer for multiple international journals.

### Speaker IV

**Prof. Xudong Jiang, Nanyang Technological University, Singapore**



**Speech Title:** Iterative Truncated Arithmetic Mean Filter and Its Properties

**Abstract:** The arithmetic mean and the order statistical median are two fundamental operations in image processing. They have their own merits and limitations in noise attenuation and image structure preservation. Comparing with the arithmetic operation, data sorting required by the median-based filters is a complex process and is intractable for multivariate data. This talk explores the relation between the two very often used fundamental statistics, namely, the arithmetic mean and the order statistical median. It unveils some simple statistics of a finite data set as the upper bounds of the deviation of the median from the mean. It is desirable to develop a filter having the merits of both the types of filters. The proposed Iterative Truncated arithmetic Mean filter, ITM filter, circumvents the data-sorting process but outputs a result approaching the median. Proper termination of the proposed ITM algorithm enables the filters to own merits of the both mean and median filters and, hence, to outperform both the filters in many image processing applications.

**Biography:** Prof. Xudong Jiang received the B.Sc. and M.Sc. degree from the University of Electronic Science and Technology of China, and received the Ph.D. degree from Helmut Schmidt University Hamburg, Germany. From 1986 to 1993, he worked as Lecturer at UESTC where he received two Science and Technology Awards from the Ministry for Electronic Industry of China. He was a recipient of the German Konrad-Adenauer Foundation young scientist scholarship. From 1993 to 1997, he was with Helmut Schmidt University Hamburg, Germany as scientific assistant. From 1998 to 2004, He worked with the Institute for Infocomm Research, A\*Star, Singapore, as Senior Research Fellow, Lead Scientist and appointed as the Head of Biometrics Laboratory where he developed an software that achieved the fastest and the second most accurate fingerprint verification in the International Fingerprint Verification Competition (FVC2000). He joined Nanyang Technological University, Singapore as a faculty member in 2003 and served as the Director of the Centre for Information Security from 2005 to 2011. Currently, Dr Jiang is a tenured Association Professor in Nanyang Technological University. Dr Jiang has published over 120 research papers, including 20 papers in top IEEE journals: TPAMI, TIP, TSP and SPM, which are well-cited on Web of Science. He is also an inventor of 7 patents (3 US patents). Dr Jiang is a senior member of IEEE, elected voting member of IFS technical committee of IEEE Signal Processing Society, Associate editor of IEEE Signal Processing Letters and IET Biometrics. He has been serving as General Chair, Technical Program Committee Chair, Keynote Speaker and Session Chair of multiple international conferences. His research interest includes pattern recognition, computer vision, machine learning, image analysis, signal processing, machine learning and biometrics.

Oral Presentation Sessions

Tips:

Please arrive at conference room 15 minutes earlier, in case some authors are not able to make the presentation on time.

There will be a session group photo part at the end of each session.

The best presentation will be chosen after each session and the certificate will be awarded by the chair. Good Luck!

Session 1: Digital Communication and Information System—12 presentations

Chair: TBA

Time: 14:00-17:15

Venue: Small Lecture Room 6, Level 3

Part A: 14:00-15:30

<p><b>SP002</b> <b>14:00-14:15</b></p>	<p>UAV Detection Using Continuous Wave Radar Cang Liang, <b>Ning Cao</b>, Xiaokai Lu and Youjie Ye Hohai University, China</p> <p><b>Abstract</b>-In this paper we use a continuous wave radar to detect unmanned aerial vehicles (UAVs). The proposed method can be divided into two stages: suspected targets extraction and trajectories obtaining. In the first stage, we use a Double-GMM-Iteration method, in which two Gaussian mixture model background subtractors are applied to remove the background and obtain suspected UAV targets. In the second stage, we combine multi-frame information to obtain the suspected target trajectories through an improved track-before-detect (TBD) method. Finally, trajectories longer than the threshold are determined as UAVs, and their relevant parameters are calculated. Experiments show that our method can effectively label the trajectories of UAVs, and the probability of false alarm is also low.</p>
<p><b>SP004</b> <b>14:15-14:30</b></p>	<p>NFV Orchestration and Rapid Migration Based on Elastic Virtual Network and Container Technology <b>Jian Zou</b>, Wei, Li, Jingyu Wang, Qi Qi and Haifeng Sun Beijing University of Posts and Telecommunications, China</p> <p><b>Abstract</b>-Telcos and cloud service providers are keen to exploit virtual network functions (VNF) because it has the potential to reduce reliance on expensive proprietary networking gear and increase network elasticity. In this paper, we propose a NFV Orchestration and Rapid Migration (NORM) architecture and system to realize a complete virtual network layout through the SDN and NFV. Through the port and MAC address mapping, NORM can complete the physical nodes accessing the Virtual Networks (VNs), while deploying related VNFs through Docker. At the same time, we set up a white list function to reserve a place</p>

for the hosts to be accessed in advance to facilitate quick access from the host. Through a combination of multiple methods, NORM can support resource customization, automated deployment, and migration flexibility. We designed a complete SDN network through experiments and evaluated the relevant performance. The experimental results verified that the use of Docker compared to the VM improved three to four times in performance.

Novel Computational-Index as a Representative Feature for Non-Intrusive Load Monitoring

Kushan Choksi and **Sachin Kumar Jain**

Indian Institute of Information Technology, Design & Manufacturing Jabalpur, India

**SP011**  
**14:30-14:45**

**Abstract-**This paper presents the development of novel extraction feature used for load disaggregation from aggregated demand profile. Non-intrusive load monitoring tackles the issue of appliances identification inside a residential building. New extraction features used for load identification are based on power, V-I mutual locus and wave-shape features for specific appliances which offers better or generally comparable results in comparison to popular methods. A novel dynamic computational index is developed to achieve a robust feature extraction using V-I mutual locus. Power patterns are used for identification of multi-state devices. Specific screening and classification of extraction features are so developed to get better load disaggregation and lesser computational time. Multi-label classifications approach has been used for the same. The methodology is compared based on precision, classification accuracy, and robustness using experimental data.

A Load-Aware Dynamic TDMA Protocol for Terahertz Wireless NanoSensor Networks

Juan Xu, Yakun Zhao, Rong Zhang and **Jiali Kan**

Tongji University, China

**SP012**  
**14:45-15:00**

**Abstract-**Wireless NanoSensor Networks (WNSNs) is a new type of networks which combines nanotechnology and sensor networks, having promising applications in the biomedical, industrial, environmental and military fields. Due to the peculiarities of WNSNs, such as molecular absorption noise in the Terahertz channel and the limited capacities of nano-nodes, novel Medium Access Control (MAC) protocols are needed to regulate access to the channel and coordinate transmission orders among nano-nodes. In this paper, a load-aware dynamic TDMA (LAD-TDMA) protocol is proposed. This protocol is built on a novel pulsed-based communication scheme called TS-OOK and avoids symbol collisions to achieve high energy efficiency. LAD-TDMA adopts a dynamic TDMA-based time slot allocation mechanism according to the current number and corresponding traffic of source nodes, the transmission peculiarities of Terahertz channel. The

performance of the protocol is evaluated and analyzed in terms of energy consumption, average end-to-end delay and average throughput, by using the NS3 simulation platform. Results show that LAD-TDMA is energy efficient and advantageous in average end-to-end delay and average throughput, which is proved to be suitable to support node-intensive and load-unbalanced WSNs, by considering the properties of Terahertz band, energy limitation of nano-devices and nano-nodes' traffic.

Secure Data Transmission Using Video Steganography and Twisted Exchange Algorithm

**Hnin Lai Nyo**, Aye Su Hlaing and Tin Win Maw  
University of Technology, Myanmar

**SP033**  
**15:00-15:15**

**Abstract**-Privacy has always a growing impact on the modern applications and the growth in term of technology. The demand for the highest privacy must be guaranteed in the field of technical, commercial and legal regulations whenever sensitive information is stored, processed, or communicated in any form. Thus new technologies are also created new ways to gather private information. In this system, to transmit data securely and to improve robustness, imperceptibility and payload capacity, combination of steganography and cryptography techniques are used. The referable values of secret image is embedded in the video file with the use of Arnold scrambling technique, discrete wavelet transformation and least significant bit. The secret key generated referable values of image is embedded behind the audio file. Before embedding of secret key, it is encrypted by a new proposed encryption algorithm, Twisted Exchange algorithm. Therefore, in this paper, for the security strength of proposed algorithm, it is analyzed whether its generated key stream is random, unpredictable and consistent or not by using National Institute of Standards and Technology (NIST) statistical test tool and compare the results with other standard pseudorandom number generators.

IoT Botnet Detection Approach Based on PSI Graph and DGCNN Classifier

**Huy-Trung Nguyen**, Quoc-Dung Ngo and Van-Hoang Le  
Graduate University of Science and Technology, VietNam Academy of Science and Technology, Viet Nam

**SP036**  
**15:15-15:30**

**Abstract**-Internet of Things (IoT) devices are increasingly deployed in different domain and for different purposes. The increasing presence in a broad range of applications, their computing and processing capabilities make them a valuable attack target for IoT botnet malware. Recent years, machine learning has been served as a useful resource for researchers in malware detection. However, the feature extraction is always a heavy manually task relying on domain knowledge while malware may evolve fast in real world. In order to deal with this problem, convolutional neural networks (CNN) based IoT malware detection, which can

## 2018 Singapore Conference

detect malware without extracting pre-selected features is a promising solution. In this paper, we propose a novel approach for Linux IoT botnet detection based on the combination of PSI graph and CNN classifier. 10033 ELF files including 4002 IoT botnet samples and 6031 benign files were used for the experiment. The evaluation result shows that PSI graph CNN classifier achieves an accuracy of 92% and a F-measure of 94%.

15:30-15:45

Coffee Break

Part B: 15:45-17:15

Adaptive Resource Management for Co-located MIMO Radar in Multi-Target Tracking

**Yang Su** and Ting Cheng

University of Electronic Science and Technology of China, China

SP039  
15:45-16:00

**Abstract**-Compared with conventional phased array radar, co-located MIMO radar can effectively control transmitting beam width by means of sub-array division, providing greater flexibility in system resource management. To realize the effective resource management for the co-located MIMO radar in multi-target tracking, the resource management optimization model is proposed, where four working parameters can be controlled, including sub-array number, sampling period, transmitting waveform energy and working mode. The objective function integrates the average time and energy resource consumption of the system, and constraints are used to ensure that targets can be effectively detected. When solving the optimization problem, consider fully the influence of sub-array number on the other working parameters, the originally four-dimensional optimization problem is decomposed into several three-dimensional optimization problems, and finally the adaptive resource management algorithm for the co-located MIMO radar is obtained. The simulation results demonstrate that the proposed algorithm can control the working parameters of the co-located MIMO radar effectively. Furthermore, with the proposed adaptive resource management algorithm the average resource consumption of the co-located MIMO radar can be reduced effectively.

SP045  
16:00-16:15

Secure OFDM Based on Coupled Linear Congruential Generator and Its FPGA Prototype

**Rakesh Palisetty**, Amit Kumar Panda and Kailash Chandra Ray

Indian Institute of Technology Patna, India

**Abstract**-Orthogonal frequency division multiplexing (OFDM) is a promising technology for 4G, 5G and IoT applications. In OFDM, physical layer security is an important aspect due to increased data traffic, and number of users. But most of the security features are performed in the medium access control (MAC) layer and the transmissions at physical layer are highly susceptible to the eavesdropping. Scrambler associated with OFDM scheme is only used for avoiding long sequence

## 2018 Singapore Conference

of ones or zeros in the input data by employing linear feedback shift register (LFSR). In this paper, LFSR is replaced with secured pseudorandom bit generator (PRBG) i.e., coupled linear congruential generator (CLCG) in the scrambler/descrambler module that adds security features in the physical layer and performs scrambling as well. All the NIST tests are performed that demonstrates CLCG is better than LFSR in terms of randomness and security. Therefore, an efficient hardware architectural design and implementation methodology of the proposed scheme i.e., CLCG based secure OFDM for an application of 802.11a is demonstrated in this paper. The baseband transceiver modules of CLCG based secure OFDM along with AWGN channel are prototyped on commercially available virtex xc5vlx110t-1 FPGA device. The bit error rate (BER) and peak to average power ratio (PAPR) performance of the proposed scheme are also studied.

Design and FPGA Prototype of 1024-bit Blum-Blum-Shub PRBG Architecture  
**Amit Kumar Panda** and Kailash Chandra Ray  
Indian Institute of Technology Patna, India

**SP046**  
**16:15-16:30**

**Abstract-**The necessity of hardware security for internet-of-things applications demands a low hardware area, high speed and secure pseudorandom bit generator (PRBG). Amongst various PRBGs, Blum-Blum-Shub (BBS) is the proven cryptographically secure PRBG because of its large prime factorize problem. The efficient implementation of BBS method relies on the large integer modular multiplication which makes it computationally expensive. Montgomery algorithm is a very efficient solution to perform the modular multiplication which replaces the critical trial division with series of shift and additions. However, the clock latency and critical path delay are increased with increase of modular size. Therefore, in this paper, a modified radix-2 iterative Montgomery modular multiplier is used for efficient hardware implementation of 1024-bit BBS generator. It replaces two two-operand adders with one three-operand adder. Carry-save adder is the commonly used technique for three-operand addition which experiences high critical path delay. Hence, the critical path delay is further reduced by employing a fast parallel prefix Han-Carlson adder for three-operand addition in the proposed architecture. The proposed architecture is designed using Verilog HDL and prototyped on the Virtex5 FPGA device. The physical implementation results report that the proposed 1024-bit BBS architecture can work at a maximum frequency of 71.2 MHz with overall latency improvement of 93.87%.

**SP1009**  
**16:30-16:45**

A Secure and Efficient Vertical Handover Authentication Scheme for 5G HetNets  
**Alican Ozhelvaci** and Maode Ma  
Nanyang Technological University, Singapore

**Abstract-**5G is a new paradigm that brings new technologies to overcome the challenges of the next-generation wireless mobile network. Also, 5G is expected to

## 2018 Singapore Conference

supply fastest, most reliable network access to support huge data traffic and massively connected nodes with low latency and high throughput. There are different new technologies that are emerging to tackle requirements of the future wireless mobile network, such as Network Function Virtualization (NFV), Software Defined Networking (SDN) and cloud computing. The heterogeneous environment of 5G will cause frequent handoff in small cells where users join and leave frequently. Therefore, in this paper, the focus is on secure and seamless handover mechanism to supply strong, quick and mutual authentication. And, a careful attention is needed to security challenges, therefore, potential pitfalls can be avoided. It is begun by explaining emerging technologies for the 5G mobile network. Then, the architecture of SDN is briefly described. Finally, this article presents a fast and efficient vertical handover authentication for next-generation wireless mobile communication - 5G – based on SDN architecture.

Optimal Relay Node Placement for Connectivity Recovery in Underwater Acoustic Sensor Networks

**Lingfeng Liu**, Maode Ma, Chunfeng Liu and Yantai Shu  
Tianjin University, China

**SP1010**  
**16:45-17:00**

**Abstract**-Due to the harsh surroundings, a underwater acoustic sensor network (UASN) may suffer large scale damage where many nodes fail simultaneously causing the network to get partitioned into multiple disjoint segments. In this work, we studied the crucial issue to reestablish the network connectivity with the least number of relay nodes which is NP-hard in general. To solve the problem efficiently, this paper proposes a novel heuristic scheme for UASNs which works based on a 3 dimensional (3D) architecture. The proposed scheme consists of two algorithms, named as Alternative Tree Construction and Fermat-point Selection (ATCFS) as a whole. Extensive simulation experiments demonstrate that the proposed scheme offers a simple yet attractive solution to the problem.

A Single Input Model for Sequential Processing of Speech Separation

Motohiro Ichikawa, Naoto Sasaoka and **Isao Nakanishi**  
Tottori University, Japan

**SP025**  
**17:00-17:15**

**Abstract**-Speech separation based on auditory scene analysis (ASA) has been widely studied. A computational ASA (CASA) model, in which a mixed signal is sequentially decomposed into frequency signals, has been also proposed. Four feature types of ASA are extracted from the decomposed frequency signals, and the decomposed frequency signals are regrouped by examining the characteristics of the extracted features. Finally separated speeches are obtained. In this study, the CASA model is improved and pieced out, and the separation performance is examined via a computer simulation.

**Session 2: Image Processing Technology and Application—13 presentations**

**Chair: Prof. Xueying Zhang, Taiyuan University of Technology, China**

**Time: 14:00-17:30**

**Venue: Seminar Room 2, Level 2**

**Part A: 14:00-15:30**

Text Detection in Natural Scene Images with Text Line Construction

**Zihao Liu**, Qiwei Shen and Chun Wang

Beijing University of Posts and Telecommunications, China

**SP013**

**14:00-14:15**

**Abstract**-This paper implements a new text region recognition algorithm that can accurately localize image text regions in natural image with complex background. The method is mainly based on the anchor mechanism of the faster R-CNN, taking into account the special features of the text area relative to other object detect tasks, so as to convert the text area detection task in the image into a general object detection task for the small area text. In this way, we can detect the text proposal directly in the convolutional feature map of the neural network, and it can simultaneously predict the text/non-text score of the proposal and the coordinates of each proposal in the image. Then we propose a text line construction algorithm that can combine the text regions into complete text line blocks, thus greatly improving the accuracy and reliability of our text detection model. Our text detector also works accurately in multi-scale and multi-lingual text detection tasks. It achieves 0.86 F-measure and 0.78 F-measure on the ICDAR 2011 and ICDAR 2013 benchmarks, which also confirms the accuracy of our model.

Real-time Complexity Control for High Efficiency Video Coding

**Jiunn-Tsair Fang**, Yu-Liang Tu, Li-Ping Yu and Pao-Chi Chang

Ming Chuan University, Taiwan

**SP016**

**14:15-14:30**

**Abstract**-The current video coding standard, High Efficiency Video Coding (HEVC), provides quad-tree structures of the coding unit (CU) to achieve high coding efficiency. Compared with previous standards, the HEVC encoder increases much computational complexity to levels inappropriate for applications of power-constrained devices. This work thus proposes a real-time complexity control scheme to control each frame complexity if the complexity of encoded frames is counted and its accumulated value is over the threshold. To further improve the coding efficiency, a fast CU depth decision algorithm is proposed. Experimental results show that a two-level of complexity control scheme was designed. In addition, the loss of the average BD-PSNR was about 0.23 dB and 0.27 dB as the target complexity was set to 80% and 60% of the unconstrained complexity, respectively.

An Improved CamShift Algorithm Based on FAST-SIFT Feature Detection Matching  
**Xuzhang Xiao**, Jing Wang, Qiwei Shen and Yulong Wang  
Beijing University of Posts and Telecommunications, China

**SP017**  
**14:30-14:45**

**Abstract**-The tracking accuracy of the traditional CamShift moving target tracking algorithm will drastically reduce when the target is occluded or the color between the target and background is similar, moreover, there may even be serious problems with missing target. To solve the problem, this paper proposes an improved algorithm based on FAST-SIFT feature detection matching. The algorithm firstly needs to manually select the tracking target as the target template, and then compares the target search window obtained by the traditional CamShift algorithm with the target template for color histogram comparison. If the Bhattacharyya coefficient between the target candidate area and the target template is greater than the detection threshold, the target tracking fails. Then, the FAST-SIFT feature detection matching algorithm is used to match the previously obtained target template with the current frame image, which re-determines the position information of the lost target. Therefore, the target can be further tracked by the traditional CamShift algorithm. Simulation experiments show that the improved algorithm can still guarantee a good tracking effect in a relatively complicated background environment.

Classification of Negative Emotion Speech Intensity Based on Similarity Algorithm  
Ying Sun, **Xueying Zhang**, Jianghe Ma and Ziheng Zhang  
Taiyuan University of Technology, China

**SP020**  
**14:45-15:00**

**Abstract**-The emotional speech recognition is mainly aimed at the division of the basic discrete emotions, and the researches concerning the strength boundaries of each emotion speech are relatively rare. Given this situation and based on the emotional intensity theory proposed by Plutchik, the paper tries to adopt the similarity algorithm to classify the negative emotion. By adoption of the neutral emotions and three negative emotions (anger, fear and sadness) from EMO-DB and CASIA emotional speech database and by using the distance similarity algorithm and K-means clustering algorithm, the emotional speech samples are calculated. On this basis, the grades of the three negative emotions can be divided. At the same time, the divided results above verified by the support vector machine in the experiment. The experimental results show that the basic negative emotions divided by the similarity algorithm obtain a better recognition results. Compared with the distance similarity algorithm, the K-means clustering similarity algorithm is smoother for all kinds of emotion recognition results, and the result is better. In addition, the classification of emotion intensity based on clustering similarity algorithm has broad application prospects in diagnosing the grades of disease of mental disorders such as depression.

Speaker Localization with Smoothing Generalized Cross Correlation Based on Naive Bayes Classifier

**Lixia Huang**, Suisui Zhang, Danfei Zan, Xueying Zhang and Fenglian Li  
Taiyuan University of Technology, China

**SP021**  
**15:00-15:15**

**Abstract**-Conventional approaches to acoustic source localization simply based on the received microphone signals, are often vulnerable to adverse acoustic conditions, such as low signal-to-noise ratio (SNR) or high reverberation. But, approaches based on Pattern Recognition and Machine Learning Technology can increase accuracy to locate source in adverse acoustic environment. The advantage of the algorithm is that it requires no calibration of microphone arrays. And Naive Bayes Classifier is simple, fast, and has a small error rate. This paper proposed an improved localization algorithm based on classification of cross-correlation functions (GCC) . The weighted cross power spectrum of GCC is smoothed by a smooth filter to formed smooth generalized cross-correlation (SGCC) . Then, the classifier model is obtained in each location and form the feature vector. Finally, acoustic source location is estimated by Naive-Bayes classifier. We also proposed in this study the source localization system that based on merely two microphones to input sound signals, combined with improved and optimal methods proposed above. Real-data experiments have demonstrated that algorithm with SGCC has higher localization accuracy than with GCC by 20% in the proposed system at least. The system has good ability to acoustic source localization.

Robust Adaptive Filtering under Least q-Gaussian Kernel Mean p-Power Error Criterion

**Xifeng Li**, Libiao Peng, Dongjie Bi and Yongle Xie  
University of Electronic Science and Technology of China, China

**SP022**  
**15:15-15:30**

**Abstract**-Owing to their superior approximation capability, kernel adaptive filters (KAFs) have been widely applied to the nonlinear systems modeling. Traditional KAFs are generally developed under the mean square error (MSE) criterion. However, the MSE criterion merely performs well under the Gaussian assumption. For non-Gaussian situations, an information theoretic measure called correntropy has been proposed and applied in robust adaptive filtering, which uses the Gaussian kernel as the default kernel. Of course, Gaussian kernel is not always the optimal choice. To enhance the approximation capability of KAFs, The q-Gaussian kernel is derived from the q-Gaussian distribution which arises from the maximization of the Tsallis entropy under appropriate constraints. With a proper shape parameter q, the q-Gaussian kernel can get better performance than the Gaussian kernel. In this paper, the least q-Gaussian kernel mean q-power error (LQKMP) criterion is proposed with the help of correntropy and the q-Gaussian kernel. Furthermore, a recursive KAF algorithm, named as recursive least q-Gaussian kernel mean p-power (RQKMP), is derived under the LQKMP criterion

## 2018 Singapore Conference

for robust learning in noisy environment. This new proposed algorithm reveals superior performance against large outliers. Simulations about time series prediction are utilized to demonstrate the effectiveness of the proposed algorithm.

15:30-15:45

Coffee Break

Part B: 15:45-17:30

A Highly Secure Digital Image Steganography Technique Using Chaotic Logistic Map and Support Image

**Md Anwar Hussain** and Popi Bora

North Eastern Regional Institute of Science and Technology, India

SP026  
15:45-16:00

**Abstract**-A widely applied technique to transmit secret information, hiding in a cover image is Least Significant Bit (LSB) image steganography. Various stega-analysis algorithms are available to detect the amount of hidden data in such cover image. Nonlinear chaotic map functions which are highly complex in behaviour with unpredictable time evolution are used for designing security algorithms. In this paper we report a highly secure steganography technique using chaotic map and a support image to hide secret information in a grayscale cover image. The secret information is encrypted before hiding and the support image is pre-processed to defy stega-analysis. Our technique applies three prong security to secret information by using a very robust random sequence for encryption, a support grayscale image, and pre-processing of the support image.

Semantic-based Web Page Clustering System Using Enhanced Agglomerative Algorithm

**Ei Ei Moe**, Hnin Hnin Htun and Aye Mon Yi

University of Technology, Myanmar

SP028  
16:00-16:15

**Abstract**-Web page clustering is an important role for providing intuitive navigation and browsing mechanism. This clustering process provides a structure for organizing large bodies of text for efficient browsing and searching. Because of the polysemous and synonyms problems, keyword-based web page clustering system can eliminate the performance of browsing mechanism. So, this system proposes as the semantic based web page clustering system. For semantic analysis, word sense disambiguation (WSD) process is used to get the best senses to be used as features in the clustering process. By using semantic features in each web page, this system clusters each web page. For clustering, this system uses the enhanced Agglomerative hierarchical clustering algorithm which can produce each cluster according to the user desired cluster number. Furthermore, this algorithm can allow the user to view cluster content as the hierarchical level. Finally, the proposed system points out the semantic that is effective for web page clustering.

## 2018 Singapore Conference

<p><b>SP031-A</b> <b>16:15-16:30</b></p>	<p>Wavelet-based Feature Extraction for the Classification of Gene Expression Data <b>Alex Gonzaga</b> University of the Philippines Manila, Philippines</p> <p><b>Abstract</b>-We propose a wavelet-based classification method of gene expression data on lung cancer based on wavelet transform and logistic regression. We obtain the maximal overlap discrete wavelet transform of each case standardized over genes and preselected by a variance filter criterion. The preselected genes are then arranged in decreasing order of statistical significance of their coefficients in a logistic regression model. Their wavelet coefficients are considered as features to obtain a classification model using logistic regression with a binary response: normal or cancer. Results through cross-validation show that the wavelet-based logistic regression model has better predictive accuracy than both logistic regression and discriminant analysis. Top performing models were those that used Daubechies 2 and Daubechies 6 wavelets. The simplicity of logistic regression affords ease in the assessment of relative contributions of genes to the odds of having lung cancer.</p>
<p><b>SP040</b> <b>16:30-16:45</b></p>	<p>Vehicle Type Classification Based on Acoustic Signals Using Denoised MFCC <b>Lwin Nyein Thu, Aung Win and Htet Ne Oo</b> University of Technology, Myanmar</p> <p><b>Abstract</b>-The ever increasing number of vehicles currently appeared with the road traffic congestion sequentially to claim the development of systems which are designed to increase the level of safety, effectiveness and environmental protection. Some approaches can be applied to the systems of vehicle type classification by using continuous signals such as sounds, heat, vibrations, images, videos, and magnetic field. In this research work, a novel MFCC approach is proposed with a deep learning algorithm for the development of the vehicle type classification system based on acoustic signals. The proposed system is used the Denoised MFCC that has been organized into the addition of Double-Density Dual-Tree Complex Discrete Wavelet Transform (DD-DWT) to Mel-Frequency Cepstral Coefficient (MFCC) as the feature extraction method and one of the deep learning algorithms: Convolutional Neural Network (ConvNet or CNN) for the classification of the vehicle sounds. The system is able to objectively recognize the type of vehicles such as bus, car, motorcycle and truck passing on the highway road.</p>
<p><b>SP041</b> <b>16:45-17:00</b></p>	<p>Ayeyarwady River Regions Detection and Extraction System from Google Earth Imagery <b>Ei Moh Moh Aung and Thuzar Tint</b> University of Technology, Myanmar</p>

**Abstract**-Nowadays environmental changes have frequently occurred all over the world. Among these changes, river changes are also important to be monitored. The accurate river region detection is the primary important step in river change detection. There is a lot of analysis in river regions detection and extraction based on Landsat and Synthetic Aperture Radar (SAR) images, but there are a few approaches for Google Earth RGB images which do not contain multispectral bands. Thus, this paper is proposed to detect and extract the river regions including both river and sandbank using Google earth RGB images. In this paper, the river regions and sandbank regions are firstly segmented using heuristic rules based on Sobel and thresholding methods. And then, HSV histogram features, color auto-correlogram features, color moments features, Gabor wavelet features and wavelet transform features are extracted from the segmented regions. The multi-class Support Vector Machine (SVM) is applied to categorize the river regions, sandbank regions, and others based on the derived features. According to the testing result, the proposed system obtained 94% overall accuracy for river regions detection.

Unsupervised Lbp Histogram Selection for Color Texture Classification via Sparse Representation

**Vinh Truong Hoang**

Ho Chi Minh City Open University, Viet Nam

**SP043**  
**17:00-17:15**

**Abstract**-In recent years, LBP and its variants have led to significant progress in applying texture methods to different applications. However, this operator tends to produce high dimensional feature vectors, especially when the number of considered neighboring pixels increases or when it is applied to color images. Various approaches are proposed to obtain more discriminative, robust LBP-features with reduced feature dimensionality. LBP histogram selection is a method to reduce the number of histogram to characterize color image. In this paper, we propose to construct sparse similarity matrix by an unsupervised way for LBP histogram selection.

A New Tag Recombinant Approach Based on Apriori Algorithm

Jiangli Jiao, **Xueying Zhang**, Fenglian Li and Yan Wang

Taiyuan University of Technology, China

**SP044**  
**17:15-17:30**

**Abstract**-In the recommender system, users often label multiple same tags on the interesting items which other users have labeled. It can cause that many same tags are often repeatedly labeled, resulting in the tag redundancy situation on the user-item-tag data set. In this paper, a tag recombinant approach based on Apriori algorithm is proposed for reducing the tag redundancy situation. The approach first utilized the Apriori algorithm to preprocess the original tag data for searching the frequent itemsets of tags, and then recombined the new tags to form a new

## *2018 Singapore Conference*

data set. The experimental results demonstrated that based on the proposed approach, the newly formed data set significantly reduced the number of the tuples, and at the same time the relationship among the user, item and tag can be reflected more clearly.

*Dinner  
Time*

**18:00-20:00**





