

# Special Interest Groups (SIG) on sensing, communications, caching, and computing (C<sup>3</sup>) in cognitive networks

Prof. Li Wang

Email: [liwang@bupt.edu.cn](mailto:liwang@bupt.edu.cn)

Beijing University of Posts and Telecommunications



北京郵電大學

BEIJING UNIVERSITY OF POSTS AND TELECOMMUNICATIONS

# Outline

---

- 1 Overview
- 2 Members of Our SIG
- 3 Finished Activities
- 4 Plan

**Special Interest Groups (SIG)**  
on Social Behavior Driven  
Cognitive Radio Networks



**Special Interest Groups (SIG)**  
on sensing, communications,  
caching, and computing (C<sup>3</sup>)  
in cognitive networks

# SIG: Social Behavior Driven Cognitive Radio Networks

## ➤ Scope and Objectives

- Interplay between Social science and Wireless Communications
  - Mobility and Social behaviors of mobile users trigger more applications
- Exploit social behaviors and improve spectrum utilization to provide more flexibility in networking

## ➤ Critical technical problems

- How to sense and understand social behaviours and diverse applications characteristics?
- How to formulate and utilize human-device interactions to boost communication performance?
- How to facilitate the benefits of considering social behaviours and application characteristics from multi-dimensional resources, e.g., caching and computing?

**Goal:** Provide a platform for exploiting social science into cognitive radio networks by exploring and providing more new dimensions.

**New goal:** sensing, communications, caching, and computing (C<sup>3</sup>) in cognitive networks.

# Emergency Services and Challenges

## □ Emergency disaster scenarios:

- Natural catastrophes: Earthquake, flood, etc.
- Others: Urban fire in mega-city, etc.

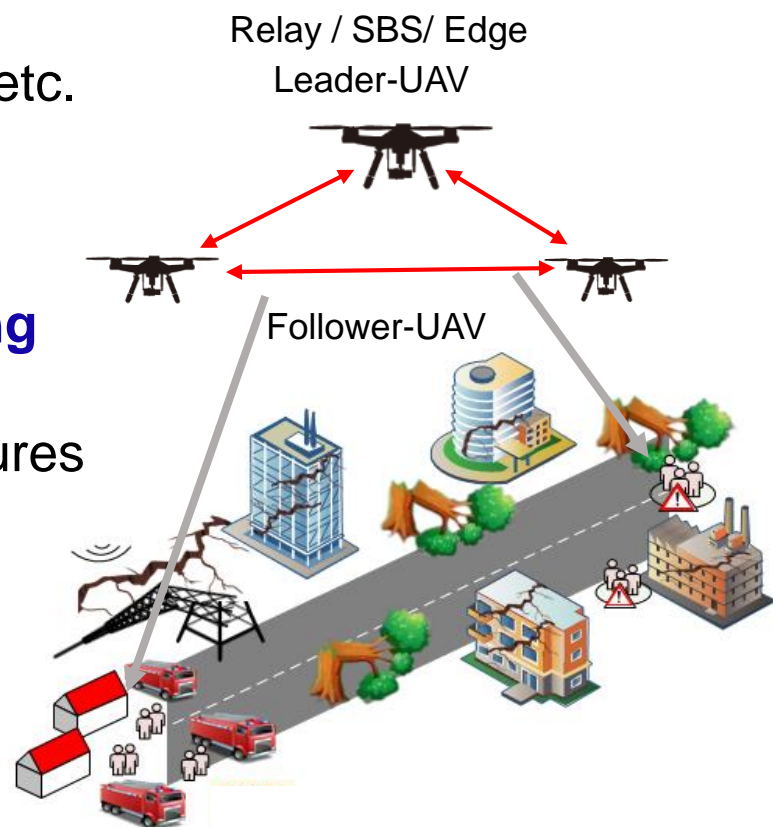
## □ Typical services and applications:

### • Mission cognition & timely decision-making

- Object recognition
  - the severity of damage to infrastructures
  - level of danger to rescuer/victims
  - humans and animals in distress
- High-definition mapping
- Emergency live surveillance

## □ Critical challenges:

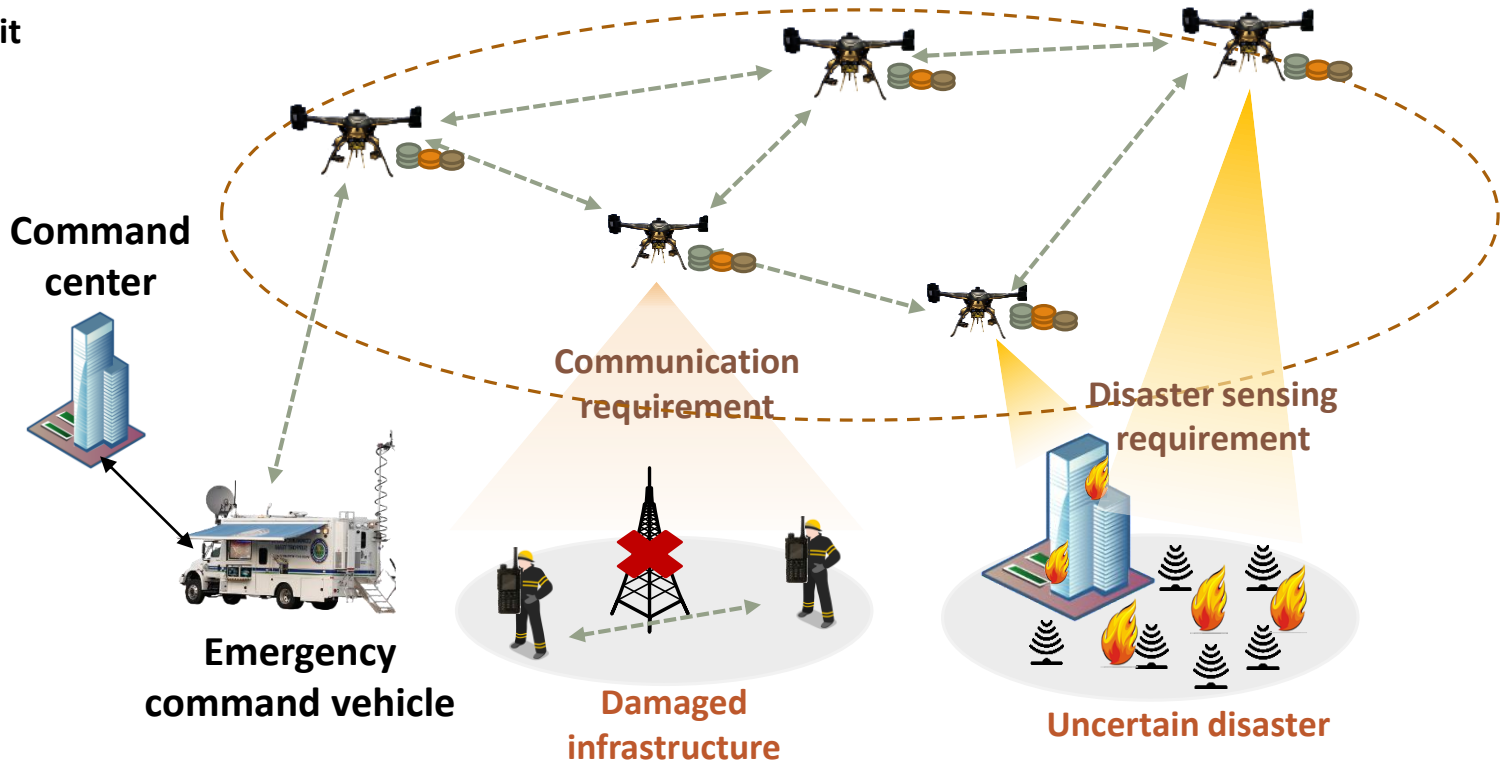
- Diversified service needs: URLLC, eMBB, and mMTC
- Limitation of end devices: Storage space, computing capability, and battery
- Dynamic network topology and changing wireless environment



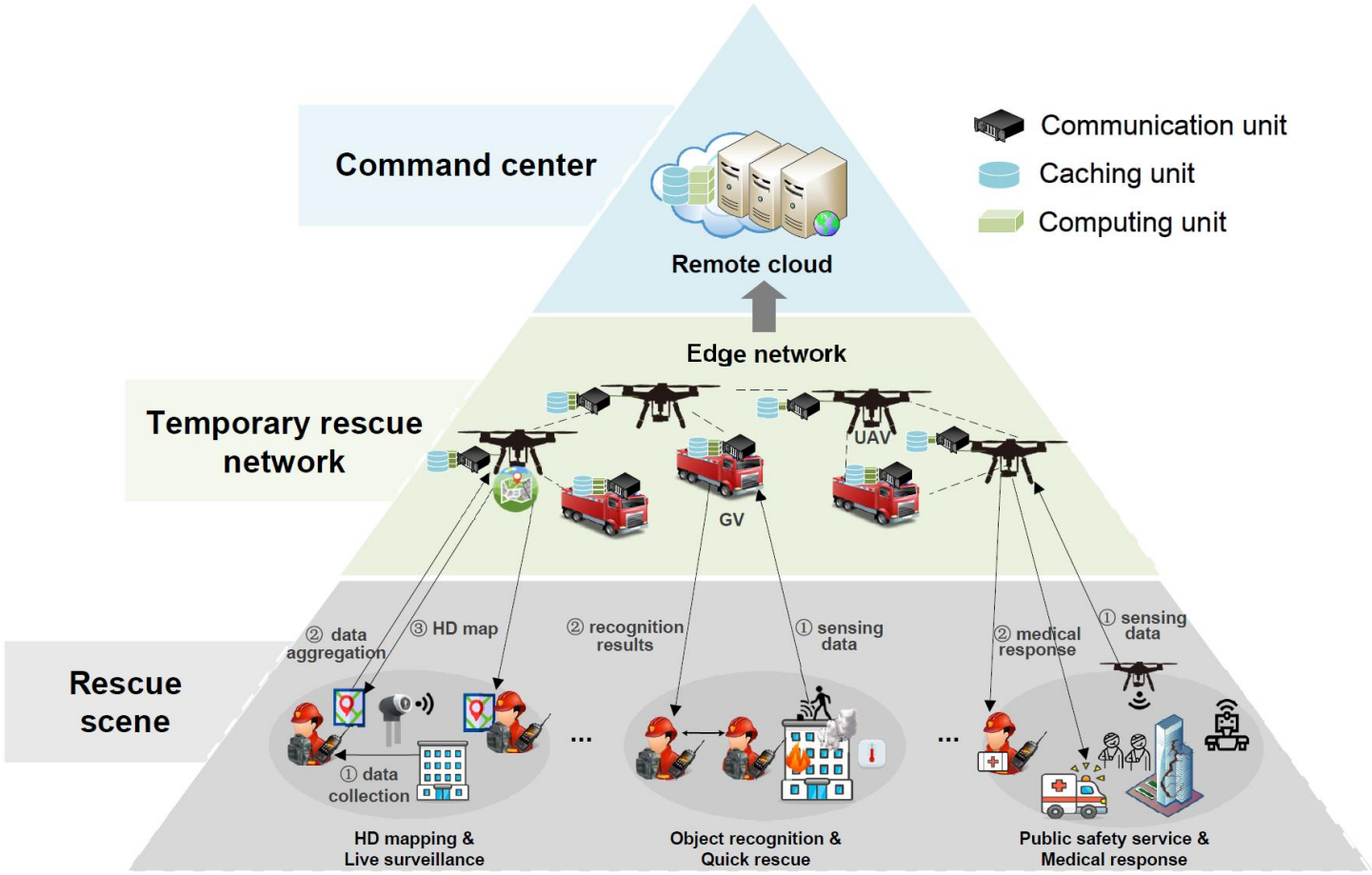
# Emergency Communications and Networks

Provide the efficient sensing and rescue assistance under limit 3C resources

- Communication unit
- Computing unit
- Caching unit

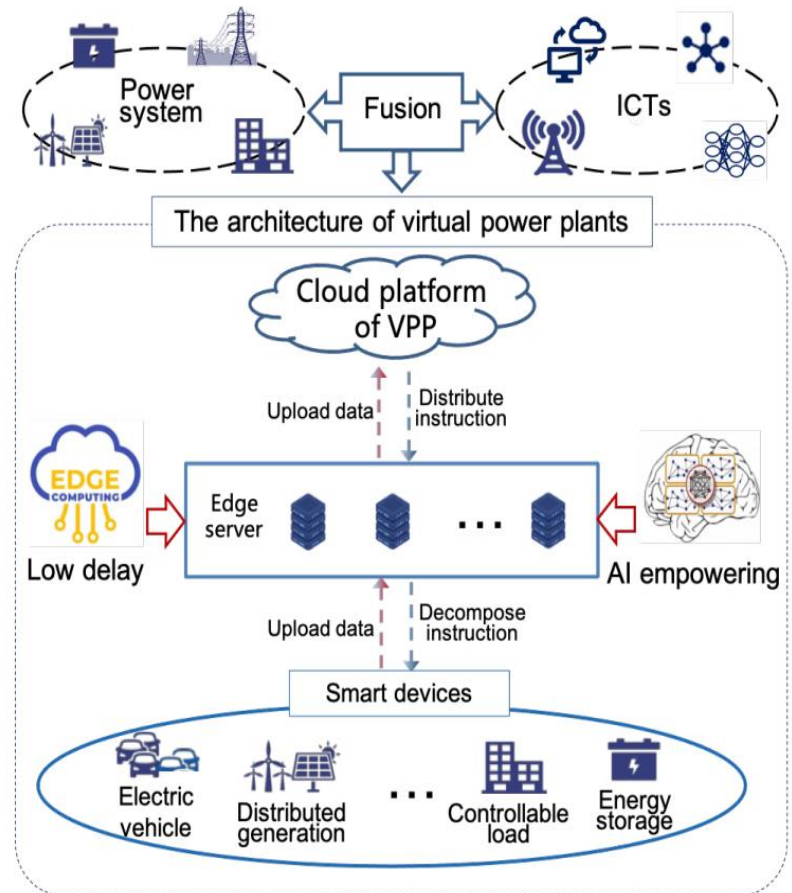
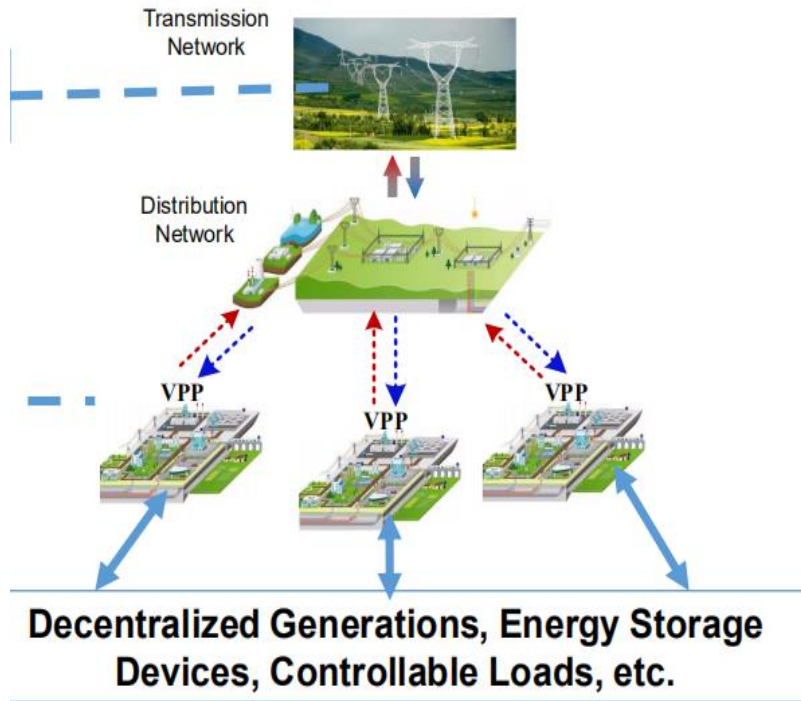


# Mission Cognitive Wireless Emergency Network



• L. Wang, J. Zhang, J. Chuan, R. Ma, and A. Fei, "Edge Intelligence for Mission Cognitive Wireless Emergency Networks," *IEEE Wireless Communications*, vol.27, no.4, pp.103-109, August. 2020.

# Another case: Virtual Power Plant



**Virtual power plant (VPP)** can aggregate the capacity of distributed resources through the fusion of power system and Information Communication Technologies



# Outline

---

- 1 Overview
- 2 **Members of Our SIG**
- 3 Finished Activities
- 4 Plan

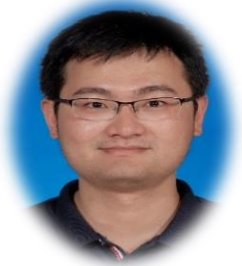
# Members of SIG

## ➤ Chair:

- Dr. Li Wang, Professor, [liwang@bupt.edu.cn](mailto:liwang@bupt.edu.cn)
- Beijing University of Posts and Telecommunications (BUPT), China



## ➤ Vice-Chair



- Yongpeng Wu  
Shanghai Jiaotong University,  
China  
[yongpeng.wu@sjtu.edu.cn](mailto:yongpeng.wu@sjtu.edu.cn)

- Giuseppe Araniti  
University Mediterranea of  
Reggio Calabria, Italy  
[araniti@unirc.it](mailto:araniti@unirc.it)



- Trung Q. Duong(PhD Sep. 2012)  
Queen's Uni. Belfast, UK  
[trung.q.duong@gmail.com](mailto:trung.q.duong@gmail.com)

- Bo Bai  
Future Network Theory Lab,  
2012 Labs, Huawei Technologies  
Co., Ltd., HongKong  
[ee.bobbai@gmail.com](mailto:ee.bobbai@gmail.com) ;  
[baibo8@huawei.com](mailto:baibo8@huawei.com)



# Senior Advisors



## Prof. Lajos Hanzo, University of Southampton (Communications)

- IEEE fellow and IEE/IET fellow;
- Fellow of the [Royal Academy](#) of Engineering (FREng);
- A Governor of the IEEE VTS as well as of ComSoc;
- The Editor-in-Chief of the [IEEE Press](#);
- An IEEE Distinguished Lecturer of both the [Communications Society](#) and the [Vehicular Society](#) .
- The Honorary Doctorate “Doctor Honoris Causa”.
- The Doctor of Sciences (DSc) degree



## Prof. Jie Wu, Temple University (Networking)

- IEEE fellow
- Director, International Affairs, College of Science and Technology (CST)
- Director, Center of Networked Computing, CST
- Laura H. Carnell Professor, Department of Computer and Information Sciences (CIS)
- A CCF Distinguished Speaker
- China Computer Federation (CCF) Overseas Outstanding Achievement Award



## Prof. Zhu Han, University of Houston (Artificial Intelligence)

- IEEE fellow
- IEEE Distinguished Lecturer
- An NSF Career Award in 2010,
- The Fred W. Ellersick Prize of the IEEE Communication Society in 2011
- The EURASIP Best Paper Award for the Journal on Advances in Signal Processing in 2015
- IEEE Leonard G. Abraham Prize in the field of Communications Systems (best paper award in IEEE JSAC) in 2016, and several best paper awards in IEEE conferences

# Founding Members

- Tommy Svensson, Chalmers University of Technology, [tommy.svensson@chalmers.se](mailto:tommy.svensson@chalmers.se)
- Maurizio Murrone, University of Cagliari, Italy, [m.murrone@ieee.org](mailto:m.murrone@ieee.org)
- Lei Chen, Georgia Southern University, USA, [lchen@georgiasouthern.edu](mailto:lchen@georgiasouthern.edu)
- Alessandro Raschella, Liverpool John Moores University, Italy, [ale.raschella@gmail.com](mailto:ale.raschella@gmail.com)
- Qingzhong Liu, Sam Houston State University, USA, [liuqzsc@gmail.com](mailto:liuqzsc@gmail.com)
- Antonino Orsino, Ericsson Research, Finland, [antonino.orsino@ericsson.com](mailto:antonino.orsino@ericsson.com)
- Guoru Ding, Southeast University, China, [dr.guoru.ding@ieee.org](mailto:dr.guoru.ding@ieee.org)
- Xiaojun Ruan, California State University, USA, [xiaojun.ruan@csueastbay.edu](mailto:xiaojun.ruan@csueastbay.edu)
- Qing Yang, University of North Texas, USA, [Qing.yang@unt.edu](mailto:Qing.yang@unt.edu)
- Massimo Condoluci, King' s College London, UK, [massimo.condoluci@kcl.ac.uk](mailto:massimo.condoluci@kcl.ac.uk)
- Zhonghong Ou, Beijing University of Posts and Telecommunications, China, [zhonghong.ou@bupt.edu.cn](mailto:zhonghong.ou@bupt.edu.cn)
- Kamel Tourki, Huawei, France, [kamel.tourki@gmail.com](mailto:kamel.tourki@gmail.com)
- Yuen, Singapore University of Technology and Design (SUTD), Singapore, [yuenchau@sutd.edu.sg](mailto:yuenchau@sutd.edu.sg)
- JakoChaub Hoydis, Nokia-Bell-Labs, France, [jakob.hoydis@nokia-bell-labs.com](mailto:jakob.hoydis@nokia-bell-labs.com)
- Symeon Chatzinotas, University of Luxembourg, Luxembourg, [Symeon.Chatzinotas@uni.lu](mailto:Symeon.Chatzinotas@uni.lu)
- Miaomiao Dong, City University of Hong Kong, [mmdong2-c@my.cityu.edu.hk](mailto:mmdong2-c@my.cityu.edu.hk)
- Tianyang Bai, Qualcomm Corporate R&D, USA, [tianyangbai@gmail.com](mailto:tianyangbai@gmail.com)
- Yan Zhang, University of Oslo, Norway, [yanzhang@ieee.org](mailto:yanzhang@ieee.org)
- Qihui Wu, Nanjing University of Aeronautics and Astronautics, China, [wuqihui2014@sina.com](mailto:wuqihui2014@sina.com)
- A. Nallanathan, Queen' s Mary University of London, UK, [arumugam.nallanathan@kcl.ac.uk](mailto:arumugam.nallanathan@kcl.ac.uk)
- Octavia Dobre, Memorial University, Canada, [odobre@MUN.CA](mailto:odobre@MUN.CA)
- Daniel Benevides da Costa, Federal University of Ceará, Brazil, [danielbcosta@ieee.org](mailto:danielbcosta@ieee.org)
- Marco Di Renzo, CNRS - CentraleSupélec - Univ Paris-Sud, France, [marco.di.renzo@gmail.com](mailto:marco.di.renzo@gmail.com)
- Himal A. Suraweera, University of Peradeniya, Sri Lanka, [himal@ee.pdn.ac.lk](mailto:himal@ee.pdn.ac.lk)
- Nghi H. Tran, University of Akron, USA, [nghi.tran@uakron.edu](mailto:nghi.tran@uakron.edu)
- Phee Lep Yeoh, University of Sydney, Australia, [phee.yeoh@sydney.edu.au](mailto:phee.yeoh@sydney.edu.au)
- Jinhong Yuan, University of New South Wales, Australia, [jinhong@ee.unsw.edu.au](mailto:jinhong@ee.unsw.edu.au)
- David López-Pérez, Bell Labs Alcatel-Lucent, Ireland, [david.lopez-perez@nokia-bell-labs.com](mailto:david.lopez-perez@nokia-bell-labs.com)
- George C. Alexandropoulos, Huawei Technologies France, [alexandg@ieee.org](mailto:alexandg@ieee.org)
- Kyeongjin Kim, Mitsubishi Electric Research Laboratories, USA, [kkim@merl.com](mailto:kkim@merl.com)
- George K. Karagiannidis, Aristotle University of Thessaloniki, Greece, [geokarag@auth.gr](mailto:geokarag@auth.gr)
- Le-Nam Tran, University College Dublin, Ireland, [nam.tran@ucd.ie](mailto:nam.tran@ucd.ie)



Academic



Industries



# Outline

---

- 1 Overview
- 2 Members of Our SIG
- 3 **Finished Activities**
- 4 Plan

# Finished Activities

## Finished Activities: 23 items

IEEE Access (2016.11)

IEEE SPAWC (2017.07)

IEEE JSAC (2017.08)

International School on 5G Systems (2017.10)

IEEE Communications Magazine (2017.12)

IEEE BTS Young Professionals 2018 (2018.04)

IEEE Access (2017.10)

IEEE INFOCOM 2018 Workshop (2018.04)

IET Communications (2018.01)

EUROPEAN WIRELESS 2018 (2018.05)

IEEE Access (2018.01)

IEEE HotICN 2018 (2018.08)

MONET Journal (2018.10)

IEEE/CIC ICC 2018 (2018.08)

IEEE Access (2018.12)

IEEE GLOBECOM 2018 (2018.12)

IEEE JSAC (2018.12)

IEEE INFOCOM 2019 (2019.04)

IEEE Access (2019.03)

IEEE ICC Workshop 2019 (2019.05)

MONET Journal (2019.05)

IEEE Wireless Communications (2019.10)

IEEE JSTSP (2020.01)

**13 Special Issues**

**10 Workshops**

### ➤ IEEE JSAC:

- **Special Issue Series** on “Network Softwarization & Enablers”

### ➤ Guest Editors

Dr. Adlen Ksentini, Eurecom, France

Prof. Akihiro Nakao, The University of Tokyo, Japan

Prof. Alex Galis, University College London, UK

Dr. Antonio Manzalini, Telecom Italia, Italy

Dr. Bo Bai, Huawei Technologies, Hong Kong

Dr. Dutta Ashutosh, AT&T, USA

Dr. Ejaz Ahmed, National Institute of Standards and Technology, USA

Dr. Hideki Tode, Osaka Prefecture University, Japan

Dr. Husain Rehmani, Waterford Institute of Technology (WIT), Ireland

Dr. Javid Taheri, University of Karlstad, Sweden

Dr. Kashif Mahmood, Telenor, Norway

Dr. Konstantinos Samdanis, Huawei, Germany

Vice Chair



Prof. Martin Casado, Stanford University, USA

Dr. Miloud Bagaa, Aalto University, Finland

Prof. Min Chen, Huazhong University of Science and Technology, China

Dr. Mohammad Aazam, Carnegie Mellon University, Qatar

Prof. Nidal Nasser, Alfaisal University, Saudi Arabia

Dr. Ori Rottenstreich, Princeton University, USA

Prof. Robert Ricci, University of Utah, USA

Dr. Shahid Mumtaz, Instituto de Telecomunicações, Portugal

Dr. Teruyuki Hasegawa, KDDI, Japan

Prof. Toktam Mahmoudi, Kings College London, UK

Prof. Wei Wang, Electronic Engineering Zhejiang University, P.R. China

Dr. Zarrar Yousaf, NEC Europe Laboratories, Germany

# IEEE Wireless Communications

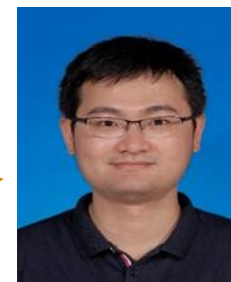
## Safeguarding 5G-and-Beyond Networks with Physical Layer Security

➤ **IEEE Wireless Communications:**

- **Special Issue** on “Safeguarding 5G-and-Beyond Networks with Physical Layer Security”

➤ **Guest Editors**

- Nan Yang, Australian National University, Australia
- Yongpeng Wu , Shanghai Jiao Tong University, China
- Trung Q. Duong , Queen’s University Belfast, United Kingdom
- Robert Schober, Friedrich-Alexander University Erlangen-Nrnberg, Germany
- A. Lee Swindlehurst, University of California, USA





### IEEE JOURNAL OF SELECTED TOPICS IN SIGNAL PROCESSING

#### JSTSP Volume 14 Issue 1

#### Introduction to the Issue on Perception-Driven 360° Video Processing

##### ➤ Guest Editors

- ✓ Mai Xu, Beihang University, Beijing, China
- ✓ Ali Borji, University of Central Florida Orlando, Orlando, USA
- ✓ Ce Zhu, University of Electronic Science and Technology of China, Chengdu, China
- ✓ Edward Delp, Purdue University, West Lafayette, USA
- ✓ Patrick Le Callet, Ecole Polytechnique l'Universit de Nantes, Nantes, France



Lead Guest Editor

# Outline

---

- 1 Overview
- 2 Members of Our SIG
- 3 Finished Activities
- 4 **Plan**

# Schedule for Our SIG

## ➤ Workshops

- GLOBECOM 2022, ICC 2022, WCNC 2022, etc.

## ➤ Special Issues

- IEEE JSAC, Trans. on Communications, Trans. on Wireless Communications, Trans. on Mobile Computing, Trans. on Vehicular Technology, Trans. On Networking, Communication Mag., Wireless Communications, IEEE Access, etc.
  - The **first SI** on IEEE Access before **June. of 2022**;
  - **Two SIs** on IEEE Transactions on Cognitive Communications and Networks, IEEE Wireless Communications, or IEEE JSAC before **Dec. 2022**, and at the **beginning of 2023**, respectively.

## ➤ Organizing regular meetings

- During special sessions at related conferences (INFOCOM, ICC, GLOBECOM, etc.), on the personal web pages of the SIG organizers
- Through an email distribution list of potential members.

## ➤ Invited talks

- The possible candidates are Professors listed as follows
  - Prof. Xiang-Gen Xia at University of Delaware;
  - Prof. Chengshan Xiao at Lehigh University;
  - Prof Erik G. Larsson at Linkoping University;
  - Prof. Robert Schober at Erlangen University;
  - Prof. Zhi Ding at UC Davis.

## SIG on Sensing, Communications, Caching, and Computing (C<sup>3</sup>) in Cognitive Networks

### Scope and Objectives

In the last two decades, cognitive radios have emerged as an efficient way to improve spectrum utilization and provide more flexibility in networking. A significant change in cognitive radio networks (CRNs) recently is putting social behaviour in the loop. Many social behaviours can be sensed and even predicted by the machine learning and artificial intelligence (AI) based smart applications. In this context, the social behaviour is a new driven force for better performance in CRNs. In addition, emerging smart applications can strongly affect social behaviour, which will be a new driven force for proposing new applications in CRNs as well. In this social behaviour driven CRNs, critical technical problems should be solved to realize the potential benefits, e.g., how to efficiently formulate and utilize human-device interactions to boost communication performance since the device holder are supposed to be mobile regularly, and how to facilitate the benefits of considering social behaviours and application characteristics from utilizing the devices' capability of caching and computing. Another major challenge is how to sense and understand social behaviours and application characteristics. In this SIG group, we provide a platform on the development of social behaviour driven CRNs to exploit and explore new dimensions.

### Chair

Dr. Li Wang, BUPT, China

### Vice-chairs

Dr. Giuseppe Araniti, University Mediterranea of Reggio Calabria, Italy

Dr. Bo Bai, Huawei Technologies Co., Ltd., HongKong

Dr. Trung Q. Duong, Queen's Uni. Belfast, UK

Dr. Yongpeng Wu, Shanghai Jiaotong University, China

*Thank you !  
Welcome!*