

Special Interest Groups (SIG) on sensing, communications, caching, and computing (C³) in cognitive networks

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Outline



Overview



Members of Our SIG



Finished Activities

Overview of this SIG

➤ 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 (C³) in cognitive networks.

Emergency Management: Services and Challenges

□ Emergency disaster scenarios:

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

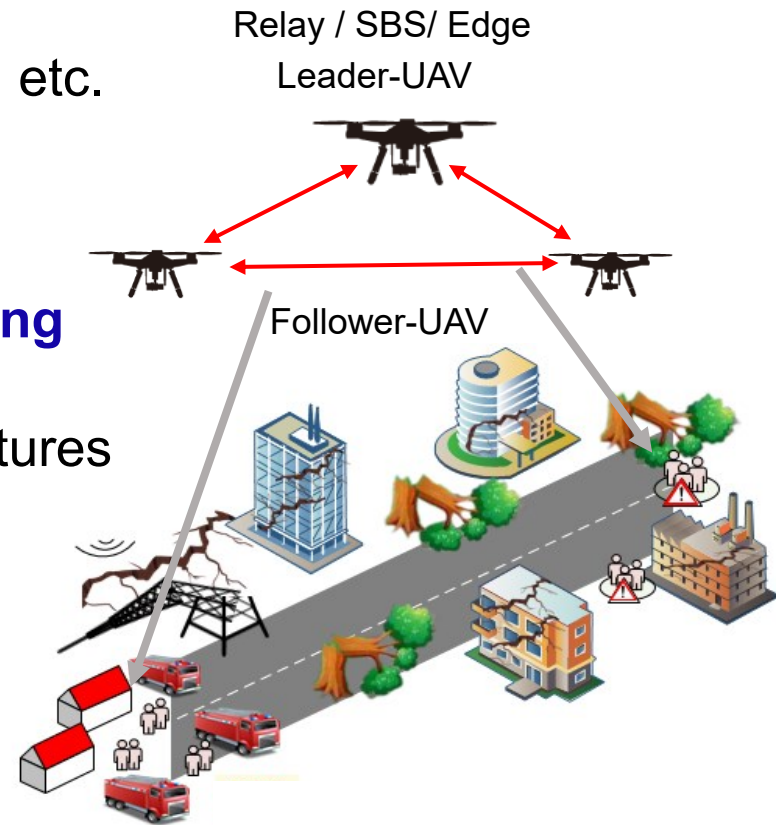
□ Typical services and applications:

• Mission cognition & timely decision-making

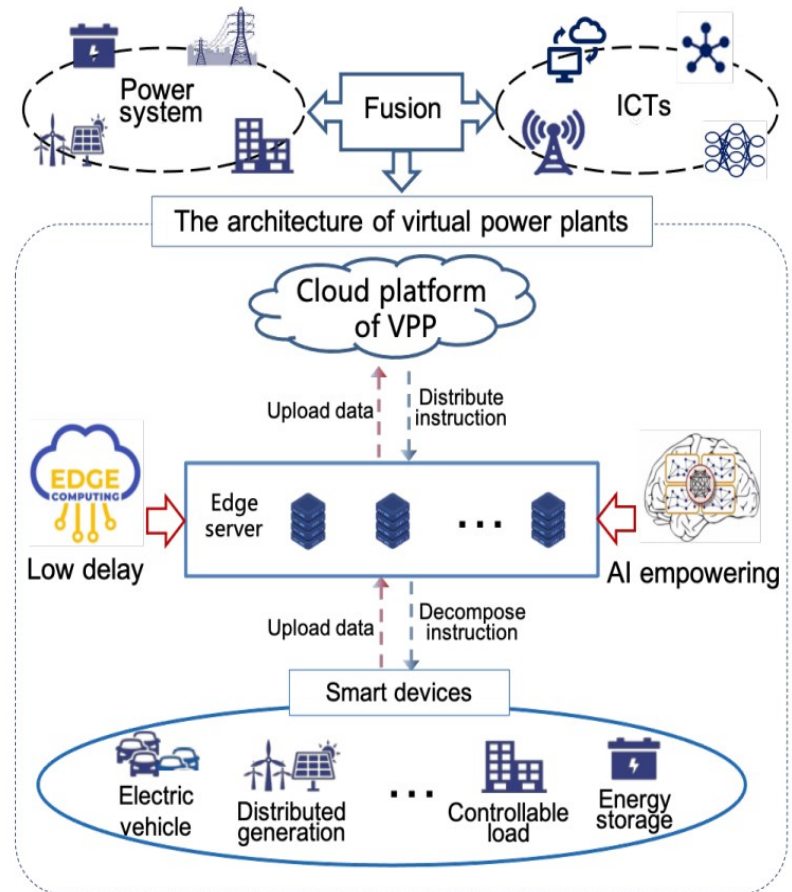
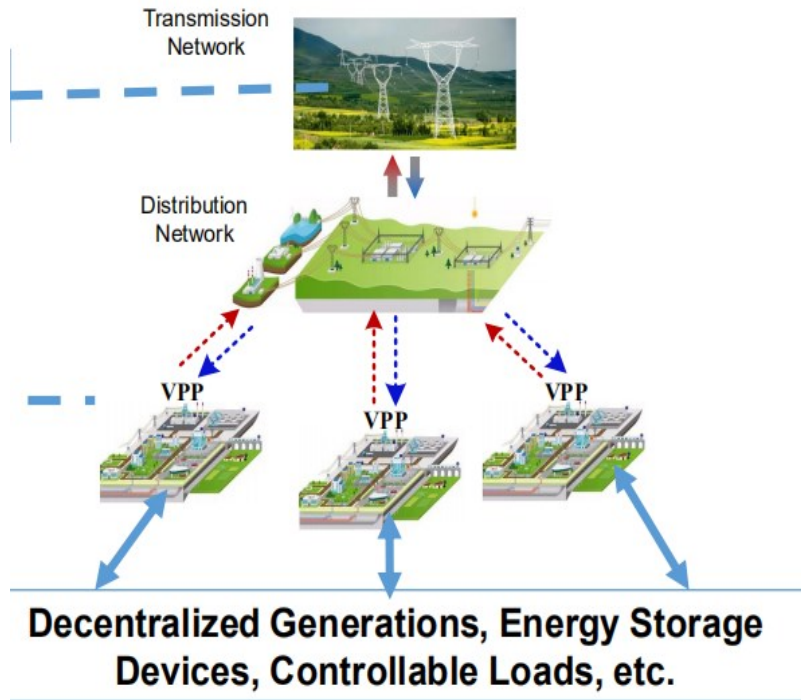
- Object recognition
 - the severity of damage to infrastructures
 - level of danger to rescuer/victims
 - humans and animals in distress
- High-definition mapping
- Emergency live surveillance

□ 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



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

Members of SIG

➤ Chair:

- Prof. Li Wang, liwang@bupt.edu.cn
- Beijing University of Posts and Telecommunications (BUPT), China



➤ Vice-Chair



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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
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- George C. Alexandropoulos, Huawei Technologies France, alexandg@ieee.org
- Kyeongjin Kim, Mitsubishi Electric Research Laboratories, USA, kkim@merl.com
- George K. Karagiannidis, Aristotle University of Thessaloniki, Greece, geokarag@auth.gr
- Le-Nam Tran, University College Dublin, Ireland, nam.tran@ucd.ie



Academic



Industries



Outline



Overview



Members of Our SIG



Activities

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 Wireless Communications

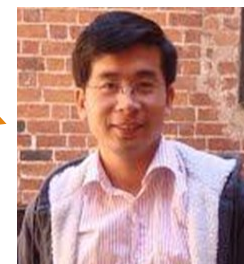
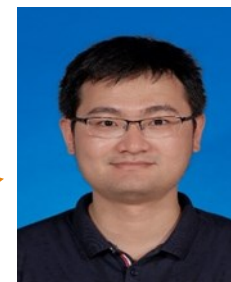
Safeguarding 5G-and-Beyond Networks with Physical Layer Security

➤ 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 Network

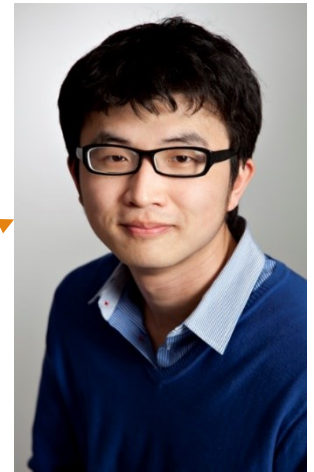
6G Non-Terrestrial Networks for Intelligent IoT Services

➤ **IEEE Network:**

- **Special Issue** on “6G Non-Terrestrial Networks for Intelligent IoT Services”

➤ **Guest Editors**

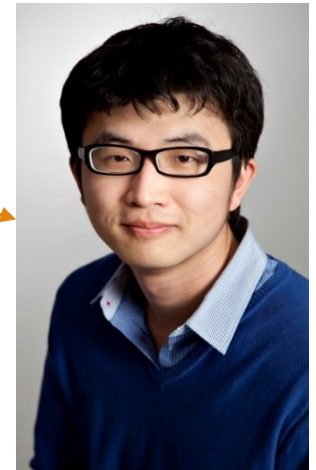
- Min Jia, Harbin Institute of Technology in Harbin, China
- Hsiao-Hwa Chen, National Cheng Kung University, Taiwan
- Zheng Chang, University of Jyväskylä, Finland
- Ning Zhang, University of Windsor, Canada
- Zhibin Wu, CETC Potevio Science & Technology Co., Ltd, China



IEEE Transactions on Cognitive Communications and Networking

Symbiotic Communication: When Backscatter Communications Meet Cognitive Radio in the Era of IoT

- IEEE Transactions on Cognitive Communications and Networking:
 - **Special Issue** on “Symbiotic Communication: When Backscatter Communications Meet Cognitive Radio in the Era of IoT”
- Guest Editors
 - Zheng Chang, University of Jyväskylä, Finland
 - Ying-Chang Liang, UESTC, China
 - Dusit Niyato, Nanyang Technological University, Singapore
 - Linda Jiang Xie, University of North Carolina at Charlotte, USA
 - Nguyen Huynh, Edinburgh Napier University, UK



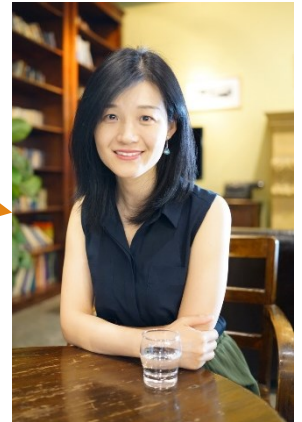
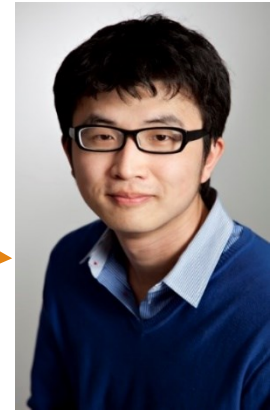
Ongoing activities

➤ IEEE Internet of Things Journal

- **Special Issue** on “Edge AI Models for Social Internet of Things”

➤ Guest Editors

- Zheng Chang, University of Electronic Science and Technology of China,
- Ryosuke Shibasaki, University of Tokyo, Japan
- Li Wang, Beijing University of Posts and Telecommunications, China
- Zhu Han, University of Houston, U.S.
- Giuseppe Araniti, University Mediterranea of Reggio Calabria, Italy
- Nguyen Huynh, Edinburgh Napier University, UK



SIG on Sensing, Communications, Caching, and Computing (C³) 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!*