Special Interest Groups（SIG）
on sensing, communications, caching, and computing (C^3) in cognitive networks

Prof. Li Wang
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Prof. Yongpeng Wu
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Outline

1 **Overview**

2 Members of Our SIG

3 Finished Activities

4 Plan

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 mulit-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^3) 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

Relay / SBS/ Edge
Leader-UAV

Follower-UAV

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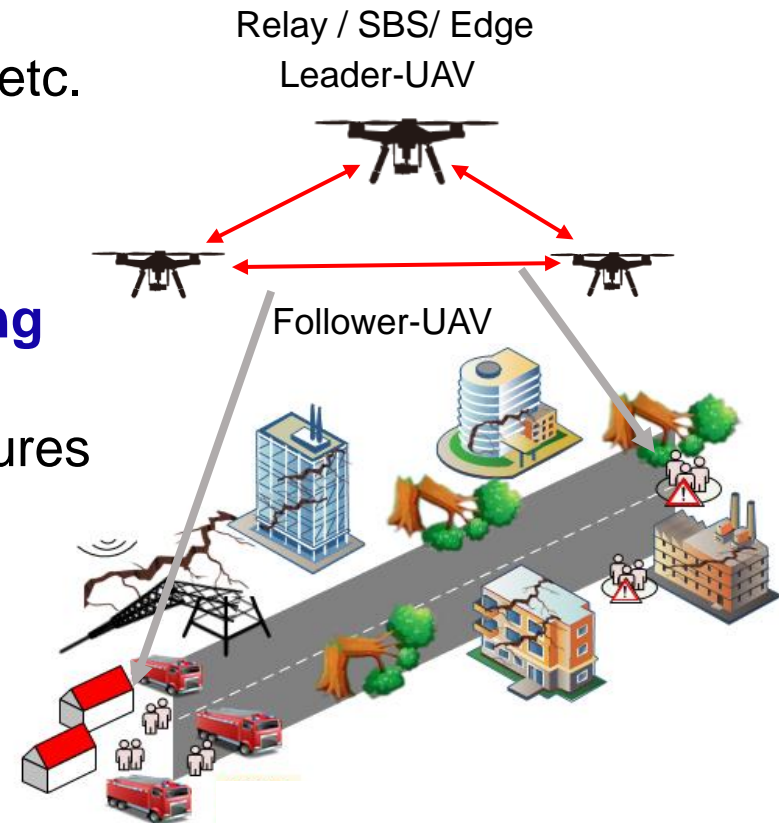
Mission Cognitive Wireless Emergency Network
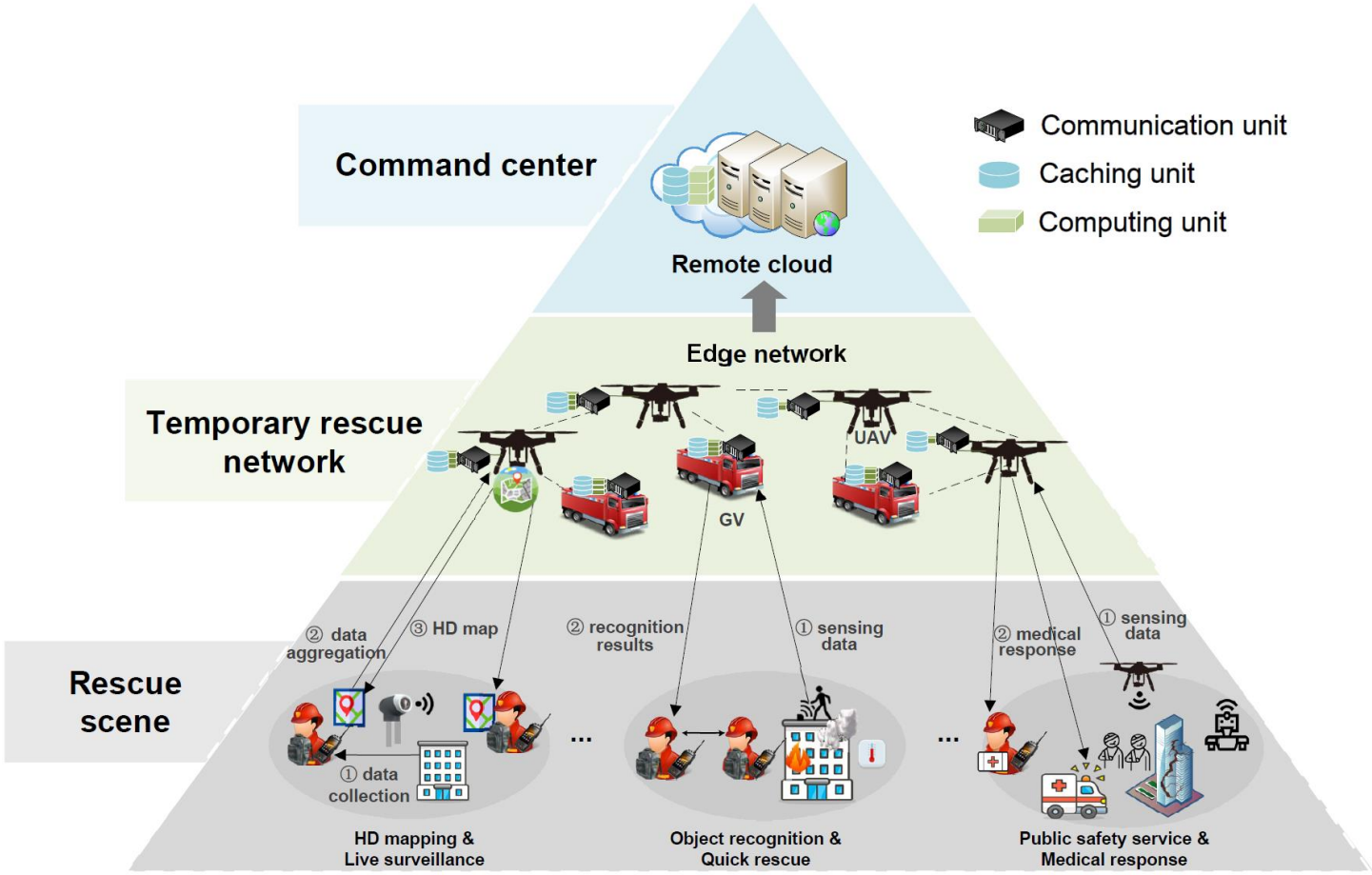
- L. Wang, J. Zhang, J. Chuan, R. Ma, and A. Fei, "Edge Intelligence for Mission Cognitive Wireless Emergency Networks," *IEEE Wireless Communications*, vol.27, no.4, pp.103-109, August. 2020.

IEEE Technical Committee on Cognitive Networks (TCCN)

Another case：Virtual Power Plant
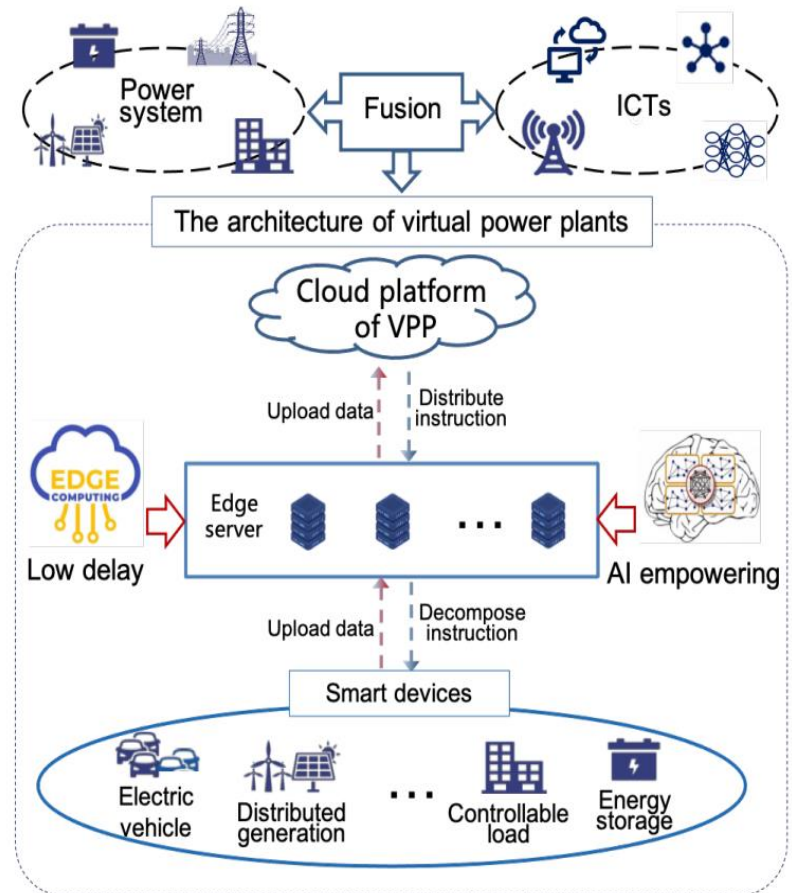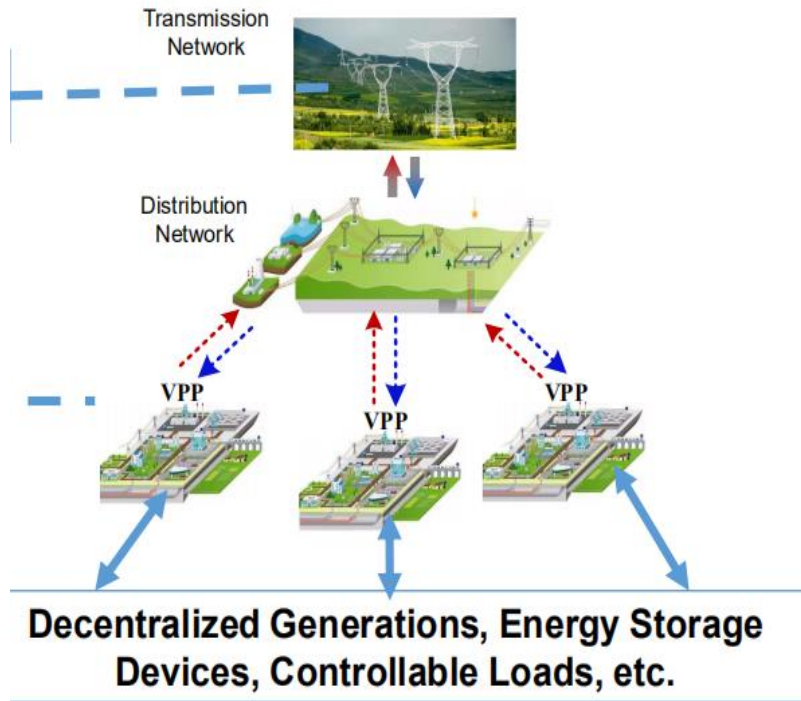
Virtual power plant (VPP) can aggregate the capacity of distributed resources through the fusion of power system and Information Communication Technologies

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Members of SIG

- ➢ **Chair**:
  - Dr. Li Wang, Professor, 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

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- Trung Q. Duong(PhD Sep. 2012)
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  trung.q.duong@gmail.com

- Bo Bai
  Future Network Theory Lab, 2012 Labs, Huawei Technologies Co., Ltd., HongKong
  ee.bobbai@gmail.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 Honaris 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
- Maurizio Murroni, University of Cagliari, Italy, m.murroni@ieee.org
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- Jinhong Yuan, University of New South Wales, Australia, jinhong@ee.unsw.edu.au
- David López-Pérez, Bell Labs Alcatel-Lucent, Ireland, david.lopez-perez@nokia-bell-labs.com
- 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
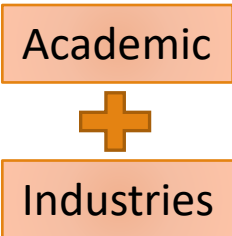
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Finished Activities

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 ICCC 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
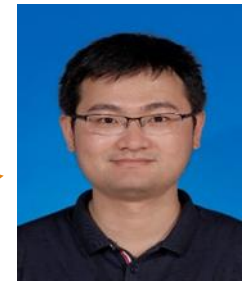
IEEE Network

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 Jyvaskyla, 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

Finished activities
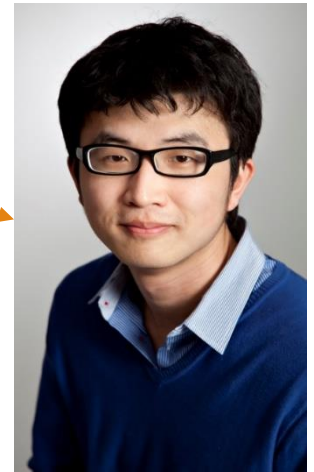
➢ **IEEE JSAC:**
- **Special Issue Series** on "Network Softwarization & Enablers"

➢ **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

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

Vice Chair

Finished activities

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

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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.

Schedule activities

IEEE Journal of Selected Topics in Signal Processing
Call for Papers
Signal Processing for XR Communications and Systems

Manuscript submission:	Jan. 31, 2023
First notification:	Mar. 31, 2023
Revised manuscript:	May 31, 2023
Second notification:	Jul. 15, 2023
Final manuscript submission:	Aug. 31, 2023
Publication date:	Nov. 1, 2023

Guest Editors:

Yongpeng Wu (Lead)	Shanghai Jiao Tong University
Erik G. Larsson	Linköping University
Jing Li	Alibaba Group,
Angel Lozano	Universitat Pompeu Fabra
Luce Morin	National Institute of Applied Sciences,
Mai Xu	Beihang University,
Chengshan Xiao	Lehigh University
Wei Yang	Qualcomm

Lead Guest Editor

SIG on Sensing, Communications, Caching, and Computing (C^3) 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!