

Lecture Notes on Data Engineering  
and Communications Technologies 25

Leonard Barolli · Fang-Yie Leu  
Tomoya Enokido · Hsing-Chung Chen  
*Editors*

# Advances on Broadband and Wireless Computing, Communication and Applications

Proceedings of the 13th International  
Conference on Broadband and Wireless  
Computing, Communication and  
Applications (BWCCA-2018)

 Springer

# **Lecture Notes on Data Engineering and Communications Technologies**

Volume 25

## **Series editor**

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The aim of the book series is to present cutting edge engineering approaches to data technologies and communications. It will publish latest advances on the engineering task of building and deploying distributed, scalable and reliable data infrastructures and communication systems.

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# **Welcome Message of BWCCA-2018 International Conference Organizers**

Welcome to the 13th International Conference on Broadband and Wireless Computing, Communication and Applications (BWCCA-2018), which will be held in conjunction with the 13th 3PGCIC-2018 International Conference from October 27 to October 29, 2018, at Tunghai University, Taichung, Taiwan.

This international conference is a forum for sharing ideas and research work in the emerging areas of broadband and wireless computing. Information networking is going through a rapid evolution. Different kinds of networks with different characteristics are emerging, and they are integrating into heterogeneous networks. For these reasons, there are many interconnection problems which may occur at different levels of the hardware and software design of communicating entities and communication networks. These kinds of networks need to manage an increasing usage demand, provide support for a significant number of services, guarantee their QoS, and optimize the network resources.

The success of ALL-IP networking and wireless technology has changed the ways of living for the people around the world. The progress of electronic integration and wireless communications is going to pave the way to offer people the access to the wireless networks on the fly, based on which all electronic devices will be able to exchange the information with each other in a ubiquitous way whenever necessary.

The aim of this conference is to present the innovative research and technologies as well as developments related to broadband networking, and mobile and wireless communications. This edition BWCCA-2018 received 134 paper submissions, and based on review results, we accepted 35 papers (about 26% acceptance ratio) for presentation in the conference and publication in the Springer Lecture Notes on Data Engineering and Communication Technologies proceedings.

The organization of an international conference requires the support and help of many people. A lot of people have helped and worked hard to produce a successful BWCCA-2018 technical program and conference proceedings. First, we would like to thank all authors for submitting their papers, program committee members and reviewers who carried out the most difficult work by carefully evaluating the submitted papers.

This year in conjunction with BWCCA-2018, we have seven international workshops that complemented BWCCA-2018 program with contributions for specific topics. We would like to thank the workshop co-chairs and all workshop organizers for organizing these workshops.

We thank Kevin Bylykbashi, Donald Elmazi, Yi Liu, Miralda Cuka, and Kosuke Ozera, Fukuoka Institute of Technology (FIT), Japan, as Web administrator co-chairs and Dr. Makoto Ikeda, FIT, Japan, as finance chair for their excellent work.

We would like to express our gratitude to Prof. Makoto Takizawa, Hosei University, Japan; Mao-Jiun Wang, Tunghai University, Taiwan; and Jyh-Cheng Chen, National Chiao Tung University, Taiwan as honorary co-chairs of BWCCA-2018 for their support and help. We give special thanks to keynote speakers of BWCCA-2018 and local arrangement team of Tunghai University for making excellent local arrangement for the conference.

We hope you will enjoy the conference and have a great time in Tunghai, Taiwan.

Li-Chih Wang  
Fang-Yie Leu  
Leonard Barolli  
BWCCA-2018 General Co-chairs

Hsing-Chung Chen  
Tomoya Enokido  
Farookh Hussain  
BWCCA-2018 Program Committee Co-chairs

# Welcome Message from BWCCA-2018 Workshops Co-chairs

Welcome to the workshops of the 13th IEEE International Conference on Broadband and Wireless Computing, Communication and Applications (BWCCA-2018), which will be held in conjunction with the 13th 3PGCIC-2018 International Conference from October 27 to October 29, 2018, at Tunghai University, Taichung, Taiwan.

This year, seven workshops will be held in conjunction with BWCCA-2018 International Conference. The workshops are very important part of the main conference, and they cover specific topics related to next-generation networks, network traffic analysis, sensor technologies, smart environments, complex systems, wireless communication, mobile networks, and multimedia networking.

BWCCA-2018 workshops are listed in the following:

1. The 20th International Symposium on Multimedia Network Systems and Applications (MNSA-2018)
2. The 11th International Workshop on Next Generation of Wireless and Mobile Networks (NGWMN-2018)
3. The 9th International Workshop on Methods, Analysis and Protocols for Wireless Communication (MAPWC-2018)
4. The 9th International Workshop on Cloud, Wireless and e-Commerce Security (CWECS-2018)
5. The 7th International Workshop on Robot and Vehicle Interaction, Control, Communication and Cooperation (RVI3C-2018)
6. The 4th International Workshop on Advanced Techniques and Algorithms for Security and Privacy (ATASP-2018)
7. The 4th International Workshop on Large Scale Networks and Internet Computing (LSNIC-2018)

These workshops bring to the researchers conducting research on specific themes the opportunity to learn from this rich multidisciplinary experience.



The workshop chairs would like to thank the workshop organizers for their great efforts and hard work in proposing the workshop, selecting the papers, the interesting programs and for the arrangements of the workshop during the conference days.

We hope you enjoy the workshop's programs and proceedings.

Kun-Kin Tsai  
Elis Kulla  
Xiaofeng Chen  
BWCCA-2018 Workshops Co-chairs

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# **Welcome Message from MNSA-2018 International Symposium Co-chairs**

It is our great pleasure to welcome you to the 20th International Symposium on Multimedia Network Systems and Applications (MNSA-2018), which will be held in conjunction with the 13th International Conference on Broadband and Wireless Computing, Communication and Applications (BWCCA-2018) from October 27 to October 29, 2018, at Tunghai University, Taichung, Taiwan.

This international symposium is a forum for sharing ideas and research work in the emerging areas of multimedia networking and systems.

Networks of today are going through a rapid evolution, and the growing popularity of wired and wireless networks, multimedia network systems and applications is changing our daily life. In the last few years, we have observed an explosive growth of multimedia computing, communication, and applications. This revolution is transforming the way people live, work, and interact with each other and is impacting the way business, education, entertainment, and health care are operating. Presently, a lot of research on high-speed networks and multimedia communication is going on. The papers included in this symposium cover aspects of cloud computing, fog computing VANETs, multimedia applications, network protocols, distributed computing systems, and wireless networks.

Many people contributed to the success of MNSA-2018. First, we would like to thank the organizing committee of BWCCA-2018 International Conference for giving us the opportunity to organize the symposium. We would like to thank all authors for submitting their research work and for their participation. We are looking forward to meet them again in the forthcoming editions of the workshop.

We would like to express our appreciation to MNSA-2018 reviewers who carefully evaluated the submitted papers. Finally, we would like to thank the local arrangement chairs for the local arrangement of the workshop.

We hope you will enjoy the symposium and have a great time in Taichung, Taiwan.

Makoto Takizawa  
Leonard Barolli  
MNSA-2018 Symposium Organizers

Tomoya Enokido  
MNSA-2018 Program Co-chair

## **MNSA-2018 Organizing Committee**

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Muhammad Younas	Oxford Brookes University, UK
Fatos Xhafa	Technical University of Catalonia, Spain

# Welcome Message from NGWMN-2018 International Workshop Co-chairs

Welcome to the 11th International Workshop on Next Generation of Wireless and Mobile Networks (NGWMN-2018), which will be held in conjunction with the 13th International Conference on Broadband and Wireless Computing, Communication and Applications (BWCCA-2018) from October 27 to October 29, 2018, at Tunghai University, Taichung, Taiwan.

The aim of this workshop is to present the innovative researches, methods, and algorithms for wireless networks, sensor networks, and ubiquitous computing. The next generation of wireless and mobile networks is expected to allow a single mobile user to access heterogeneous wireless and mobile networks. Therefore, this workshop will provide a timely technical forum for the dissemination of new results in this exciting research area and is devoted to the architectures, protocols, resource management, mobility management, and scheduling in integrated wireless and mobile networks.

Many people have kindly helped us to prepare and organize the NGWMN-2018 workshop. First, we would like to thank the authors who submitted high-quality papers and reviewers who carefully evaluated the submitted papers. We would like to give our special thanks to general co-chairs of BWCCA-2018 for their strong encouragement and guidance to organize this workshop. We would like to thank all of the PC members for their serious review works in order to make successful organization of NGWMN-2018.

Finally, we would like to thank the local organizing committee of BWCCA-2018 for excellent arrangement.

We hope you will enjoy the conference and have a great time in Taichung, Taiwan.

Leonard Barolli  
Hsing-Chung Chen (Jack Chen)  
Kangbin Yim  
NGWMN-2018 Co-chairs

## NGWMN-2018 Co-chairs

Leonard Barolli	Fukuoka Institute of Technology, Japan
Hsing-Chung Chen (Jack Chen)	Asia University, Taiwan
Kangbin Yim	Soonchunhyang University, Korea

## NGWMN-2018 Organizing Committee

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Hsing-Chung Chen (Jack Chen)	Asia University, Taiwan
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National Formosa University, Yunlin County,  
Taiwan

Neng-Yih Shih

Asia University, Taiwan

Jyu-Wei Wang

Asia University, Taiwan



# Message from MAPWC-2018 International Workshop Organizers

Welcome to the 9th International Workshop on Methods, Analysis and Protocols for Wireless Communication (MAPWC-2018), which will be in conjunction with the 13th International Conference on Broadband and Wireless Computing, Communication and Applications (BWCCA-2018) from October 27 to October 29, 2018, at Tunghai University, Taichung, Taiwan.

Wireless communications are characterized by high bit-error rates and burst errors, which arise due to interference fading, shadowing, terminal mobility, and so on. Since the traditional design of the algorithms, methods, and protocols of the wired Internet did not take wireless networks into account, the performance over wireless networks is largely degraded. Especially, the multi-hop communication aggravates the problem of wireless communication even further. To solve these problems, there has been increased interest to propose and design new algorithms and methodologies for wireless communication.

The aim of this workshop is to present the innovative researches, methods, and numerical analysis for wireless communications and wireless networks. The workshop contains high-quality research papers, which were selected carefully by program committee members.

It is impossible to organize such a successful program without the help of many individuals. We would like to express our appreciation to the authors of the submitted papers and to the program committee members, who provided timely and significant review.

We hope all of you will enjoy MAPWC-2018 and find this a productive opportunity to exchange ideas with many researchers.

Leonard Barolli  
MAPWC-2018 Workshop Chair

Makoto Ikeda  
Hiroshi Maeda  
MAPWC-2018 Workshop PC Co-chairs

## **MAPWC-2018 Organizing Committee**

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Leonard Barolli

Fukuoka Institute of Technology, Japan

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Fukuoka Institute of Technology, Japan

# Message from CWECS-2018 International Workshop Organizers

Welcome to Barcelona, Spain, and the 9th International Workshop on Cloud, Wireless and e-Commerce Security (CWECS-2018), which is held in conjunction with the 13th International Conference on Broadband and Wireless Computing, Communication and Applications (BWCCA-2018) from October 27 to October 29, 2018, at Tunghai University, Taichung, Taiwan.

Computer network and communication have been a part of our everyday life. People use them to contact others almost anytime anywhere. However, hackers due to business benefits, enjoying their skill/professional achievement or some other reasons, very often attack, intrude, or penetrate our systems. This is the key reason why computer/network security has been one of the important issues in computer research. Many researchers have tried to do their best to develop system security techniques and the methods to protect a system. But system attacks still occur worldwide every day. In fact, current system security technology is far away from perfect and should be continuously improved.

This workshop aims to present the innovative researches, methods, and applications for cloud, wireless, and e-commerce security. Other network-related papers are also welcomed. The workshop contains high-quality research papers, which were selected carefully by program committee members.

It is impossible to organize such a successful program without the help of many individuals. We would like to express our appreciation to the authors of the submitted papers and to the program committee members, who provided timely and significant review.

We hope all of you will enjoy CWECS-2018 and find this a productive opportunity to exchange ideas with many researchers.

Fang-Yie Leu  
Aniello Castiglione  
Chu-Hsing Lin  
CWECS-2018 Workshop Co-chairs

Ilsun You  
Fuu-Cheng Jiang  
Yi-Li Huang  
CWECS-2018 Workshop PC Co-chairs

## **CWECS -2018 Organizing Committee**

### **Workshop Co-chairs**

Fang-Yie Leu	Tunghai University, Taiwan
Aniello Castiglione	University of Salerno, Italy
Chu-Hsing Lin	Tunghai University, Taiwan

### **Workshop PC Co-chairs**

Ilsun You	Soonchunhyang University, Korea
Fuu-Cheng Jiang	Tunghai University, Taiwan
Yi-Li Huang	Tunghai University, Taiwan

### **Program Committee Members**

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Shiuh-Jeng Wang	Central Police University, Taiwan
Ugo Fiore	University of Naples Federico II, Italy
Heru Susanto	The Indonesian Institute of Science, Indonesia

# Message from RVI3C-2018 International Workshop Organizers

Welcome to the 7th International Workshop on Robot and Vehicle Interaction, Control, Communication and Cooperation (RVI3C-2018), which will be held in conjunction with the 13th International Conference on Broadband and Wireless Computing, Communication and Applications (BWCCA-2018) from October 27 to October 29, 2018, at Tunghai University, Taichung, Taiwan.

Robots and vehicles are being steadily introduced into modern everyday life and are expected to play a key role in the near future. Typically, the robots are deployed in situations where it is too dangerous, expensive, tedious, and complex for humans to operate, while vehicles are used in the roads and highways. Although many of the real-life applications may only need a single robot or vehicle, a large number of them require the cooperation, coordination, and communication of a team of robots and vehicles to accomplish a certain task. The use of multiple robots and vehicles of overlapping capabilities offers a cost-effective and more robust solution. This redundancy in the robots and vehicles' capabilities makes the overall system more flexible and fault-tolerant.

This workshop focuses on the emerging field of robot and vehicles interaction, communication, and cooperation, bringing together research and application of methodology from robotics, vehicular ad hoc networks (VANETS), human factors, human-computer interaction, interaction design, cognitive psychology, education, and other fields to enable robots and vehicles to have more natural and more rewarding interactions, communication, and cooperation with humans throughout their spheres of functioning.

The design of an efficient collaborative framework that ensures the autonomy and the individual requirements of the involved robots and vehicles is a very challenging task. Developing operational multi-robot and multi-vehicle teams involves research on a number of topics such as fault-tolerant cooperative control, adaptive action selection, distributed control, robot and vehicle awareness of team member actions, improving efficiency through learning, inter-robot and