

Lecture Notes of the Institute for Computer Sciences, Social Informatics and Telecommunications Engineering

211

Editorial Board

Ozgur Akan

Middle East Technical University, Ankara, Turkey

Paolo Bellavista

University of Bologna, Bologna, Italy

Jiannong Cao

Hong Kong Polytechnic University, Hong Kong, Hong Kong

Geoffrey Coulson

Lancaster University, Lancaster, UK

Falko Dressler

University of Erlangen, Erlangen, Germany

Domenico Ferrari

Università Cattolica Piacenza, Piacenza, Italy

Mario Gerla

UCLA, Los Angeles, USA

Hisashi Kobayashi

Princeton University, Princeton, USA

Sergio Palazzo

University of Catania, Catania, Italy

Sartaj Sahni

University of Florida, Florida, USA

Xuemin Sherman Shen

University of Waterloo, Waterloo, Canada

Mircea Stan

University of Virginia, Charlottesville, USA

Jia Xiaohua

City University of Hong Kong, Kowloon, Hong Kong

Albert Y. Zomaya

University of Sydney, Sydney, Australia

More information about this series at <http://www.springer.com/series/8197>

Keping Long · Victor C. M. Leung
Haijun Zhang · Zhiyong Feng
Yonghui Li · Zhongshan Zhang (Eds.)

5G for Future Wireless Networks

First International Conference, 5GWN 2017
Beijing, China, April 21–23, 2017
Proceedings

Editors

Keping Long
University of Science and Technology
Beijing
China

Victor C. M. Leung
The University of British Columbia
Vancouver, BC
Canada

Haijun Zhang
University of Science and Technology
Beijing
China

Zhiyong Feng
Beijing University of Posts
and Telecommunications
Beijing
China

Yonghui Li
Centre of Excellence in Telecommunications
The University of Sydney
Maze Crescent
Australia

Zhongshan Zhang
University of Science and Technology
Beijing
China

ISSN 1867-8211 ISSN 1867-822X (electronic)
Lecture Notes of the Institute for Computer Sciences, Social Informatics
and Telecommunications Engineering
ISBN 978-3-319-72822-3 ISBN 978-3-319-72823-0 (eBook)
<https://doi.org/10.1007/978-3-319-72823-0>

Library of Congress Control Number: 2017962877

© ICST Institute for Computer Sciences, Social Informatics and Telecommunications Engineering 2018

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, express or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Printed on acid-free paper

This Springer imprint is published by Springer Nature
The registered company is Springer International Publishing AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Preface

The EAI International Conference on 5G for Future Wireless Networks (5GWN) is a comprehensive conference that focuses on 5G wireless networks. The main objective of 5GWN 2017, the first conference in the series, was to address and deliberate on the latest technical status and recent trends in the research and application of 5G technologies.

5GWN 2017 provided an opportunity for scientists, engineers, industrialists, scholars, and other professionals from all over the world to interact and exchange new ideas and research outcomes in related fields and to pursue possibilities for future collaboration. The conference is also aimed at gathering research contributions from the field of 5G wireless networks that address the major opportunities and challenges in applying 5G technologies to the understanding and designing of modern network systems, with an emphasis on both new analytical techniques and novel application scenarios.

The proceedings contain 64 papers that were selected from a total of 135 papers submitted to the conference. In the proceedings, readers can gather cutting-edge knowledge about the future 5G wireless networks. Each paper was presented, orally or as a poster, in the frame of the new analytical techniques and novel application scenarios, with topics on 5G networks including: non-orthogonal multiple access techniques; cognitive radio; channel modeling; D2D; performance analysis; cloud/CRAN-based 5G Networks; small cells; game theory; software-defined networks; heterogeneous networks; 5G ultra dense networks; self-organizing networks; network function virtualization; backhaul/fronthaul; resource allocation; big data; vehicular networks; massive MIMO; IoT; energy harvesting; radio resource management; caching; unlicensed spectrum (LTE-U); network slicing; full duplex techniques; and MmWave techniques.

We would like to express our grateful thanks to the conference program chairs and committee members, and all the reviewers for their great professionalism and efforts in reviewing the submitted papers. We also thank all the participants and sponsors for their valuable contributions to and support of 5GWN 2017.

14th December 2017

Keping Long
Victor C. M. Leung
Haijun Zhang
Zhiyong Feng
Yonghui Li
Zhongshan Zhang

Organization

Steering Committee

Steering Committee Chair

Imrich Chlamtac CREATE-NET, Italy

Steering Committee

Victor C. M. Leung The University of British Columbia, Canada
Haijun Zhang The University of British Columbia, Canada

Organizing Committee

General Chairs

Keping Long University of Science and Technology Beijing, China
Victor C. M. Leung The University of British Columbia, Canada
Haijun Zhang University of Science and Technology Beijing, China

Technical Program Committee Chairs

Zhiyong Feng Beijing University of Posts and Telecommunications,
China
Yonghui Li The University of Sydney, Australia
Zhongshan Zhang University of Science and Technology Beijing, China

Symposium Chairs

PHY and Massive MIMO Symposium

Feifei Gao Tsinghua University, China
Gang Wu UESTC, China
Chengwen Xing BIT, China
Kai Niu BUPT, China

Wireless Access Technology and Heterogeneous Networks Symposium

Linyang Song Peking University, China
Tianyu Wang University of California-Davis, USA
Chen Xu North China Electric Power University, China

5G Networks Symposium

Xiang Cheng Peking University, China
Chuan Huang UESTC, China
Xiaotian Zhou Shandong University, China

Communications Software, Services and SDN Symposium

Liang Zhou	Nanjing University of Posts and Telecommunications, China
Joel Rodrigues	University of Beira Interior, Portugal
Han Hu	Nanyang Technological University, Singapore

Future Trends and Emerging Technologies Symposium

Yongle Wu	Beijing University of Posts and Telecommunications, China
Shaoyong Zheng	Sun Yat-Sen University, China
Wenhua Chen	Tsinghua University, China

Workshops Chairs

Zhengguo Sheng	University of Sussex, UK
Lexi Xu	China Unicom, China

Publicity and Social Media Chair

Chunsheng Zhu	UBC, Canada
---------------	-------------

Sponsorship and Exhibits Chair

Renchao Xie	Beijing University of Posts and Telecommunications, China
-------------	--

Publications Chair

Chao Xu	Xidian University, China
---------	--------------------------

Tutorials Chair

Chunxiao Jiang	Tsinghua University, China
----------------	----------------------------

Local Chairs

Yu Qiu	BUCT, China
Yanliang Chen	BUCT, China

Web Chair

Baobao Wang	BUCT, China
-------------	-------------

Conference Manager

Lenka Oravska	EAI - European Alliance for Innovation
---------------	--

Technical Program Committee

Alagan Anpalagan	Ryerson University, Canada
Mehdi Bennis	University of Oulu, Finland
Shengrong Bu	The University of Glasgow, UK
Wei Chen	Beijing Jiaotong University, China
Xianfu Chen	VTT Technical Research Centre of Finland, Finland
Zhiyong Chen	Shanghai Jiaotong University, China
Xiaoli Chu	University of Sheffield, UK
Lingjie Duan	Singapore University of Technology and Design
Lisheng Fan	Guangzhou University, China
Luoyi Fu	Shanghai Jiaotong University, China
Lin Gao	Chinese University of Hong Kong, SAR China
Fengkui Gong	Xidian University, China
Weisi Guo	University of Warwick, UK
Chunlong He	Shenzhen University, China
Mingyi Hong	Iowa State University, USA
Ekram Hossian	University of Manitoba, Canada
Wen Ji	Chinese Academy of Sciences, China
Chunxiao Jiang	Tsinghua University, China
Long Le	University of Quebec, Canada
Yuan Luo	Chinese University of Hong Kong, SAR China
Dusit Niyato	Nanyang Technological University, Singapore
Miao Pan	University of Houston, USA
Anibal Sanjab	Virginia Tech, USA
Omid Semiari	Virginia Tech, USA
Derrick Wing Kwan Ng	University of New South Wales, Australia
Wei Wang	University of Zhejiang, China
Yong Xiao	University of Houston, USA
Renchao Xie	Beijing University of Posts and Telecommunications, China
Chungang Yang	Xidian University, Xi'an, China
Guanding Yu	University of Zhejiang, China
Daqiang Zhang	Tongji University, China
Guopeng Zhang	China University of Mining and Technology, China
Tiankui Zhang	BUPT, China
Wensheng Zhang	Shandong University, China
Yan Zhang	Simula Research Laboratory, Norway
Yanru Zhang	University of Houston, USA

Contents

28 GHz MIMO Channel Characteristics Analysis for 5G Communication Systems	1
<i>Suiyan Geng, Ningning Fan, Rui Zhang, and Xiongwen Zhao</i>	
A Caching Strategy Based on User Interest in Content-Centric Network	8
<i>Yuehua Huo, Yanyu Sun, Yu Zhang, Donglin Cui, Weiqiang Fan, and Yinlong Liu</i>	
Node Localization Based on Multiple Radio Transmission Power Levels for Wireless Sensor Networks	19
<i>Yikang Xing, Wei Huangfu, Xiaoming Dai, and Xiaoyan Hu</i>	
End-to-End Transmission Performance Optimization Based Routing Selection Algorithm for Software Defined Networking.	28
<i>Guixiang Jiang, Rong Chai, and Haipeng Li</i>	
Research on Video Services with QoE Perception Over Future Wireless Networks	38
<i>Qinghua Zhu, Jinglu Zhang, Gongsheng Zhu, and Xiaokui Chen</i>	
Tree-LSTM Guided Attention Pooling of DCNN for Semantic Sentence Modeling	52
<i>Liu Chen, Guangping Zeng, Qingchuan Zhang, and Xingyu Chen</i>	
Multi-base Station Energy Cooperation Based on Nash Q-Learning Algorithm	60
<i>Yabo Lv, Baogang Li, Wei Zhao, Dandan Guo, and Yuanbin Yao</i>	
Crowdfunding Assisted Cellular System Analysis and Application	69
<i>Mingqiang Yuan, Xinzhou Cheng, Tao Zhang, Yongfeng Wang, Lexi Xu, Chen Cheng, Haina Ye, and Weiwei Chen</i>	
SWAT Hydrological Model and Big Data Techniques	79
<i>Xi Guo, Biao Wang, Wei Xiong, and Shisheng Jin</i>	
A Survey on Security Issues in Big Data of Ubiquitous Network	89
<i>Yuehua Huo, Yanyu Sun, Weiqiang Fan, Xinzhou Cheng, Dong Li, and Yinlong Liu</i>	
Telecom Big Data Based User Analysis and Application in Telecom Industry	99
<i>Guanglu Shao, Weiwei Chen, Xinzhou Cheng, Lexi Xu, Tao Zhang, and Chen Cheng</i>	

Coverage Optimization in Self-organizing Small Cells	110
<i>Yu Chen, Wei Li, Xiuqing Yang, Yi Hu, and Qinghua Zhu</i>	
Expectation Maximization for Multipath Detection in Wideband Signals	120
<i>Salem Salem and Mohamed El-Tarhuni</i>	
Dynamic Resource Orchestration of Service Function Chaining in Network Function Virtualizations	132
<i>Bangchao Yu, Wei Zheng, Xiangming Wen, Zhaoming Lu, Luhan Wang, and Lu Ma</i>	
Support Recovery for Multiband Spectrum Sensing Based on Modulated Wideband Converter with SwSOMP Algorithm	146
<i>Zhuhua Hu, Yong Bai, Yaochi Zhao, and Yiran Zhang</i>	
Traffic Scheduling Algorithms for OFDM Based Radio Systems.	160
<i>Liang Li, Yirong Wang, Hao Zhang, Zhaoyan Qu, Siyuan Zhang, Yu Zhang, and Xiongwen Zhao</i>	
Coverage Performance in Cognitive Radio Networks with Self-sustained Secondary Transmitters	170
<i>Xiaoshi Song, Xiangbo Meng, Yuting Geng, Ning Ye, and Jun Liu</i>	
A Novel Algorithm of UAV-Mounted Base Station Placement and Frequency Allocation.	182
<i>Xu Shen, Zhiqing Wei, and Zhiyong Feng</i>	
Throughput Analysis for Full-Duplex Based Device-to-Device Communications	194
<i>Yajun Shang, Xuehan Meng, Xiaomeng Chai, Tong Liu, and Zhongshan Zhang</i>	
Joint Mode Selection and Resource Allocation in Underlying D2D Communication.	206
<i>Wei Zhang, Wanbing He, Dan Wu, and Yueming Cai</i>	
PAPR Reduction with Amplitude Clipping and Subband Filter in Filtered-OFDM System	220
<i>Changsen Nie and Yong Bai</i>	
Throughput Maximization for Two-Hop Decode-and-Forward Relay Channels with Non-ideal Circuit Power	228
<i>Hengjing Liang, Xiaojie Wen, Chuan Huang, Zhi Chen, and Shaoqian Li</i>	
Big Data-Driven Vehicle Mobility Analysis and Design for 5G	238
<i>Ruoxi Sun, Kai Zhang, and Yong Ren</i>	

Complexity Analysis of Massive MIMO Signal Detection Algorithms Based on Factor Graph	246
<i>Zhichao Yao, Chao Dong, Kai Niu, and Zhiqiang He</i>	
Per-Antenna Maximum Likelihood Detector for Massive MIMO.	257
<i>Senjie Zhang, Zhiqiang He, and Baoyu Tian</i>	
Joint User-Association and Resource-Allocation in Virtualized C-RAN	265
<i>Xiaohong Zhang, Yong Li, and Mugen Peng</i>	
Adaptive Resource Allocation for Device-to-Device Aided Cellular Systems	276
<i>Xianxian Wang, Shaobo Lv, Xiaoyu Liang, Tong Liu, Hongwen Cheng, and Zhongshan Zhang</i>	
A Utility-Based Resource Allocation in Virtualized Cloud Radio Access Network.	288
<i>Linna Chen, Chunjing Hu, Yong Li, and Wenbo Wang</i>	
Iterative Receiver with Gaussian and Mean-Field Approximation in Massive MIMO Systems	300
<i>Sheng Wu, Linling Kuang, Xincong Lin, and Baosheng Sun</i>	
Research and Application of Summer High Temperature Prediction Model Based on CART Algorithm	317
<i>Yujie Guan, Wei Wang, Fengchang Xue, and Shoudong Liu</i>	
Research on Peak-to-Average Power Ratio Reduction for FBMC-Based 5G Transmission.	327
<i>Wenwan You, Junqi Guo, Ke Shan, and Rongfang Bie</i>	
A Machine Learning Based Engine Error Detection Method.	338
<i>Xinsong Cheng, Liang Zhao, Na Lin, Changqing Gong, and Ruiqing Wang</i>	
Beamforming Design for Physical Layer Security and Energy Efficiency Based on Base Station Cooperation	347
<i>Wei Zhao, Hao Zhang, Hui Bao, and Baogang Li</i>	
A Survey on Big Data Analytics Technologies	359
<i>Fei Su, Zhenya Wang, Shan Yang, Ke Li, Xin Lu, Yang Wu, and Yi Peng</i>	
Classification of Medical Consultation Text Using Mobile Agent System Based on Naïve Bayes Classifier.	371
<i>Xingyu Chen, Guangping Zeng, Qingchuan Zhang, Liu Chen, and Zhuolin Wang</i>	

Low-Complexity MMSE Signal Detection Based on the AOR Iterative Algorithm for Uplink Massive MIMO Systems	385
<i>Zhenyu Zhang, Yuanyuan Dong, Zhongshan Zhang, Xiyuan Wang, Xiaoming Dai, Linglong Dai, and Haijun Zhang</i>	
Outage Performance for IDF Relaying Mobile Cooperative Networks	395
<i>Lingwei Xu, Jingjing Wang, Yun Liu, Jie Yang, Wei Shi, and T. Aaron Gulliver</i>	
AES and SNOW 3G are Feasible Choices for a 5G Phone from Energy Perspective	403
<i>Mohsin Khan and Valtteri Niemi</i>	
LR-RZF Pre-coding for Massive MIMO Systems Based on Truncated Polynomial Expansion	413
<i>Chi Zhang, Zhengquan Li, Yaoyao Sun, Lianfeng Shen, and Xinxin Ni</i>	
A Geographic Packet Forwarding Approach in 3D Mobile Ad Hoc Networks	420
<i>Xiaolin Gao, Guiting Zhong, Jian Yan, and Jianhua Lu</i>	
Probabilistic Caching in Wireless Device to Device Networks with Contention Based Multimedia Delivery.	429
<i>Xiaoshi Song, Yuting Geng, Xiangbo Meng, Ning Ye, Jun Liu, and Weimin Lei</i>	
Eigenvalue and Capacity Analysis Based on Measurement of Massive MIMO System at 3.5 GHz.	445
<i>Ruijie Xu, Jianhua Zhang, and Jie Xi</i>	
Power Allocation for Downlink of Non-orthogonal Multiple Access System via Genetic Algorithm	459
<i>Xinli Ma, Juan Wu, Zhenyu Zhang, Zhongshan Zhang, Xiyuan Wang, Xiaomeng Chai, Linglong Dai, and Xiaoming Dai</i>	
Research on the Interference and Coexistence of CBTC in 1.8 GHz Band . . .	471
<i>Ruichen Xu, Xiao Peng, Xiaobo Wang, Ji Fang, and Bo Yuan</i>	
Joint C-V-BLAST and DS-NOMA for Massive MIMO	484
<i>Khawla A. Alnajjar and Mohamed El-Tarhuni</i>	
Low-Complexity Equalization of Continuous Phase Modulation Using Message Passing.	493
<i>Jian Zhang, Zuyao Ni, Sheng Wu, and Linling Kuang</i>	
Range-Difference Based Resource Allocation Scheme for D2D-Aided Heterogeneous Networks	506
<i>Shaobo Lv, Xianxian Wang, Hongwen Cheng, and Zhongshan Zhang</i>	

LTE-WLAN Integrated Virtualization Network Architecture	517
<i>Fenglin Dai, Qixun Zhang, Yuhang Sun, and Mengyuan Liu</i>	
A Phase Difference Based Cooperative Spectrum Sensing Scheme for Cognitive Radio Network	529
<i>Zheng Xie, Sai Huang, Yifan Zhang, and Zhiyong Feng</i>	
Power Allocation for NOMA System via Dual Sub-gradient Descent.	544
<i>Juan Wu, Xinli Ma, Zhenyu Zhang, Zhongshan Zhang, Xiyuan Wang, Xiaomeng Chai, Linglong Dai, and Xiaoming Dai</i>	
A Differential QAM Scheme for Uplink Massive MIMO Systems.	556
<i>Peng Zhang, Shuaishuai Guo, and Haixia Zhang</i>	
REFF: RELiable and Fast Forwarding in Vehicular Ad-hoc Network	568
<i>Daxin Tian, Ziyi Dai, Kunxian Zheng, Jianshan Zhou, Xuting Duan, Peng Guo, Hui Rong, Wenyang Wang, and Haijun Zhang</i>	
A Novel Intrusion Detection System Based on Advanced Naive Bayesian Classification	581
<i>Yunpeng Wang, Yuzhou Li, Daxin Tian, Congyu Wang, Wenyang Wang, Rong Hui, Peng Guo, and Haijun Zhang</i>	
Power Allocation in One-Way Untrusted AF Relay System with Friendly Jamming	589
<i>Ronghua Luo, Chao Meng, Guobing Hu, and Hua Shi</i>	
A Vehicular Positioning Enhancement with Connected Vehicle Assistance Using Extended Kalman Filtering	597
<i>Daxin Tian, Wenhao Liu, Xuting Duan, Hui Rong, Peng Guo, Wenyang Wang, and Haijun Zhang</i>	
A Multi-queue Aggregation Framework for M2M Traffic in LTE-A and Beyond Networks	609
<i>Wen Feng, Hongjia Li, Ding Tang, Liming Wang, and Zhen Xu</i>	
Millimeter Wave Mobile Network with Full-Duplex Mode.	622
<i>Baiqing Zong, Xiaohong Zhang, Jianli Wang, Xiaotong Li, and Zhiyong Zhao</i>	
Modeling and Simulation on Cooperative Movement of Vehicle Group Based on the Behavior of Fish	630
<i>Daxin Tian, Lu Kang, Kunxian Zheng, Xuting Duan, Hui Rong, Peng Guo, Wenyang Wang, and Haijun Zhang</i>	

Propagation Characteristics in Indoor Scenario with Different Transmitter Locations at 3.5 and 6 GHz	640
<i>Xinzhuang Zhang, Yawei Yu, Lei Tian, Yu Han, Yu Zhang, and Jianhua Zhang</i>	
Social-Aware Data Caching Mechanism in D2D-Enabled Cellular Networks	650
<i>Miao Liu, Jun Li, Tingting Liu, and Youjia Chen</i>	
Two-Tier Matching Game Design for Wireless Caching in Pico-Cell Networks	663
<i>Guowei Shi, Jun Li, Haijun Zhang, Feng Shu, and Tingting Liu</i>	
A Resource Allocation Scheme Based on Genetic Algorithm for D2D Communications Underlying Multi-channel Cellular Networks	675
<i>Ying Sun, Xijun Yan, Xujie Li, Yan Gu, and Chenming Li</i>	
Comparison of Isotropic and 3D Beamforming LTE Systems Using Simulation	685
<i>Cheng Xu and John Cosmas</i>	
Author Index	695