## Lecture Notes of the Institute for Computer Sciences, Social Informatics and Telecommunications Engineering 264

#### 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 Kobavashi Princeton University, Princeton, USA Sergio Palazzo University of Catania, Catania, Italy Sartai 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

Jiann-Liang Chen · Ai-Chun Pang Der-Jiunn Deng · Chun-Cheng Lin (Eds.)

# Wireless Internet

11th EAI International Conference, WiCON 2018 Taipei, Taiwan, October 15–16, 2018 Proceedings



*Editors* Jiann-Liang Chen National Taiwan University of Science and Technology (NTUST) Taipei, Taiwan

Ai-Chun Pang National Taiwan Normal University Taipei, Taiwan Der-Jiunn Deng Department of Industrial Engineering and Management National Changhua University of Education Changhua, Taiwan

Chun-Cheng Lin Department of Industrial Engineering and Management National Chiao Tung University Hsinchu, Taiwan

ISSN 1867-8211 ISSN 1867-822X (electronic) Lecture Notes of the Institute for Computer Sciences, Social Informatics and Telecommunications Engineering ISBN 978-3-030-06157-9 ISBN 978-3-030-06158-6 (eBook) https://doi.org/10.1007/978-3-030-06158-6

Library of Congress Control Number: 2018964698

© ICST Institute for Computer Sciences, Social Informatics and Telecommunications Engineering 2019 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.

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

#### Preface

We are delighted to introduce the proceedings of the 11th edition of the 2018 European Alliance for Innovation (EAI) International Conference on Wireless Internets (WiCON). This year, it took place at Howard International House Hotel, Taipei, Taiwan, during October 15–16, 2018. This conference provides an opportunity to connect with researchers, developers, and practitioners from around the world so as to discuss recent findings in the area of the emerging wireless Internet and networks.

The technical program of WiCON 2018 consisted of 36 full papers in oral presentation sessions at the main conference tracks. These technical papers cover a broad range of topics in wireless sensor, vehicular ad hoc networks, security, blockchain, and deep learning. Aside from the high-quality technical paper presentations, the technical program also featured three keynote speeches. The first keynote speech was entitled "IoT Applications on Campus: The IoT talk Approach," by Dr. Yi-Bing Lin from National Chiao Tung. The second keynote speech was entitled "IP-Based Data Communications with Space: Protocols and Mobility Management," by Dr. Mohammed Atiquzzaman from the University of Oklahoma. The third keynote speech was entitled "Towards Connectivity and Intelligence for Future IoT," by Dr. Tony Q. S. Quek from Singapore University of Technology and Design. We were excited to invite these three outstanding international researchers to share their vision on future research and development of wireless Internet technologies.

Coordination with the steering chair, Imrich Chlamtac, and general co-chairs, Prof. Jiann-Liang Chen and Prof. Ai-Chun Pang, was essential for the success of the conference. We sincerely appreciate their constant support and guidance. It was also a great pleasure to work with such an excellent Organizing Committee team and we thank them for their hard work in organizing and supporting the conference. In particular, we thank the Technical Program Committee, led by our TPC co-chairs, Prof. Der-Jiunn Deng and Prof. Chun-Cheng Lin, who completed the peer-review process of the technical papers and compiled a high-quality technical program. We are also grateful to the conference manager, Dominika Belisova, for her support and to all the authors who submitted their papers to the WiCON 2018 conference.

We strongly believe that the WiCON conference provides a good forum for all researchers, developers, and practitioners to discuss all science and technology aspects that are relevant to wireless Internet. We also expect that future WiCON conferences will be as successful and stimulating as indicated by the contributions presented in this volume.

November 2018

Jiann-Liang Chen Ai-Chun Pang Der-Jiunn Deng Chun-Cheng Lin

## Organization

#### **Steering Committee**

#### **Steering Committee Chair** Imrich Chlamtac Create-Net, Bruno Kessler Professor, University of Trento, Italy **Organizing Committee General Co-chairs** Jiann-Liang Chen National Taiwan University of Science and Technology, Taiwan Ai-Chun Pang National Taiwan University, Taiwan **Technical Program Committee Co-chairs** National Changhua University of Education, Taiwan Der-Jiunn Deng Chun-Cheng Lin National Chiao Tung University, Taiwan Web Chair Chien-Liang Chen Aletheia University, Taiwan **Publicity and Social Media Chair** Yong-Li Hu CITI, Academia Sinica, Taiwan **Workshops Chair** Chih-Heng Ke National Quemoy University, China **Publications Chair** Tseng-Yi Chen Yuan Ze University, Taiwan Local Chair Shin-Ming Cheng National Taiwan University of Science and Technology, Taiwan **Conference Manager** Dominika Belisova EAI - European Alliance for Innovation

## Contents

#### Wireless Network

Improving Uplink Resource Batch Utilization in LTE	
Licensed-Assisted Access.	3
Comparative Study of Two Signal-to-Noise Ratio Calculation Methods in LTE Downlink Simulations	14
Fractional Backoff Algorithm for the Next Generation WLAN Xuewei Cai, Bo Li, Mao Yang, Zhongjiang Yan, Bo Yang, Yi Jin, and Xiaobo Li	24
A60 GHz UWB-MIMO Antenna with Defected Ground for WPAN Applications Syrine Lahmadi and Jamel Bel Hadj Tahar	32
Research and Performance Evaluation of Spatial Reuse Technology for Next Generation WLAN	41
CRJT: Channel Reservation Based Joint Transmission MAC Protocol for the Next Generation WLAN Peng Tan, Ding Wang, Mao Yang, Zhongjiang Yan, and Bo Li	52
Artificial Intelligence	
Deep Learning for Smartphone-Based Human Activity Recognition Using Multi-sensor Fusion	65
An Efficient MapReduce-Based Apriori-Like Algorithm for Mining Frequent Itemsets from Big Data Ching-Ming Chao, Po-Zung Chen, Shih-Yang Yang, and Cheng-Hung Yen	76
Using Long-Short-Term Memory Based Convolutional Neural Networks for Network Intrusion Detection <i>Chia-Ming Hsu, He-Yen Hsieh, Setya Widyawan Prakosa,</i> <i>Muhammad Zulfan Azhari, and Jenq-Shiou Leu</i>	86

Intrusion Detection for WiFi Network: A Deep Learning Approach Shaoqian Wang, Bo Li, Mao Yang, and Zhongjiang Yan	95
Audio Event Detection Using Wireless Sensor Networks Based	
on Deep Learning	105
Security	
A Robust Remote Authentication Scheme for M-Commerce Environments Shih-Yang Yang, Jian-Wen Peng, Wen-Bing Horng, and Ching-Ming Chao	119
MIH-Based eNB Selection for Untrusted Networks Fang-Yie Leu, Kun-Lin Tsai, and Rui-Ting Hung	129
Using Instant Messaging for Collaboration: A Study of the Relationships Among Organizational Trust, Justice, and Spirituality	141
Application and Challenges of Blockchain Technology to Big Data-Based Credit Reference in China <i>Cheng-yong Liu and Cheng Chen</i>	148
A Trust Evaluation Gateway for Distributed Blockchain IoT Network <i>Hsing-Chung Chen</i>	156
Personal Data and Identifiers: Some Issues Regarding General Data Protection Regulations	163

#### **Internet of Things**

173
183
193

Contents	X
Contento	711

Container-Based Virtualization for Real-Time Data Streaming Processing	
on the Edge Computing Architecture	203
Endah Kristiani, Chao-Tung Yang, Yuan-Ting Wang, Chin-Yin Huang,	
and Po-Cheng Ko	

#### **Location-Based Services**

An Efficient Mobile AR Navigation System Using Polygon Approximation	
Based Data Acquisition Ching-Sheng Wang and Wei-Tsung Su	215
Location-Based Hotel Recommendation System Chien-Liang Chen, Ching-Sheng Wang, and Ding-Jung Chiang	225
Developing a Beacon-Based Location System Using Bluetooth Low Energy Location Fingerprinting for Smart Home Device Management <i>Chih-Kun Ke, Wang-Chi Ho, and Ke-Cheng Lu</i>	235
Financial Applications	
Applying Information Quantity Analysis to Sold Price of Real Estate Huan-Siang Luo and Kou-Hsiu Tesng	247
Factors Influencing Online Group Buying in Taiwan: An Empirical Study Based on the TPB Framework Chih-Ching Hung, Nai-Chang Cheng, Shang-En Yu, and Hong-Tsu Young	254
Empirical Analysis on Price-volume Relation in the Stock Market of Shanghai and Shenzhen	263
Heterogeneous Goods, Strategic Investment, and First Mover Advantages: Real Options Theory and Empirical Study Shih Yung Wei, Xiu-Wen Ye, Cheng-yong Liu, and Chih-Chun Hou	277
Analysis on Excess Return and Risk of Individual Stock—The Case Study of China	295

### Vehicular Ad Hoc Network

A Load Statistics-Based Frequency-Hopping Multiple Access Protocol	
with QoS Guarantee	309
Yinuo Qin, Bo Li, Zhongjiang Yan, Mao Yang, and Changtian Peng	

XII	Contents	
-----	----------	--

Developing a Context-Aware POI Network of Adaptive Vehicular Traffic	
Routing for Urban Logistics	319
Chih-Kun Ke, Szu-Cheng Lai, and Li-Te Huang	
Efficient 3D Placement of Drone Base Stations with Frequency Planning	329
Le Xu and Yuliang Tang	
GLCV: A Routing Scheme Based on Geographic Link Connectivity	
Management for Urban Vehicular Environments	339
Zhiping Lin, Wenting Zeng, Weihong Xu, and Yuliang Tang	
Services and Applications	
An Investigation of Alliance Portfolio Diversity Impact	
on Firm Performance	353
Chih-Ching Hung, Shang-En Yu, Nai-Chang Cheng, Chun-Hsien Wang,	
Wen-Hsin Chiang, and Hong-Tsu Young	
Research on the Related Issues About the Service of Mutual Legal	
Assistance Documents Through Electronic Delivery	367
Pei-Fen Tsai	
Mathematical Demonstration of Astronomical	
and Geographical Knowledge	375
Wen-Chi Chen, Jin-De Chang, Wen-Hong Chiu, Chang Lung Log, Ilui Pu Chi, and Bai Fan Tagi	
Cheng-Lung Lee, Hui-Ru Chi, and Pei-Fen Tsai	
Practical Internet Usage for Cultural Appropriation Development	387
Ku-Yun Chen	
Applying Information Quantity Analysis to the Ecological	
Conservation Development.	393
Huan-Siang Luo and Yee-Chaur Lee	
Author Index	401