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Fadi Al-Turjman
Editor

Smart Cities Performability, Cognition, & Security

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Editor
Fadi Al-Turjman
Department of Computer Engineering
Antalya Bilim University
Antalya, Turkey

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To my wonderful family.

"You cannot connect the dots looking forward; you can only connect them looking backwards. So you have to trust that the dots will somehow connect in your future."

—Steve Jobs

Preface

We are living in an era where smart and cognitive solutions are becoming a global platform for the computation and interaction between humans as well as the machines while performing several critical tasks.

Performability, cognition, and security have been considered as a complementary package toward realizing the emerging smart cities paradigm. From this perspective, it is essential to understand the role of these three significant components which will provide a comprehensive vision for the worldwide smart city project in the near future.

No doubt that introducing such a new paradigm can come up with potential challenges in significant levels, especially in terms of the overall system performance, cognition, and security. It is also essential to consider the emerging intelligent applications for better lifestyle and more optimized solutions in our daily life.

The objective of this book is to overview existing smart cities applications while focusing on performability, cognition, and security issues. The main focus is on the smart design aspects that can help in realizing such paradigm in an efficient and secured way. The artificial intelligent (AI) techniques as well as new emerging technologies such as the Internet of Things (IoT) and the Smart-Cloud accompanied with critical evaluation metrics, constraints, and open research issues are included for discussion. This conceptual book, which is unique in the field, will assist researchers and professionals working in the area to better assess the proposed smart cities paradigms which have already started to appear in our societies.

Hope you enjoy it.

Fadi Al-Turjman

Contents

1 An Effective Design for Polar Codes over Multipath Fading Channels 1
Jehad M. Hamamreh

2 LearningCity: Knowledge Generation for Smart Cities 17
Dimitrios Amaxilatis, Georgios Mylonas, Evangelos Theodoridis, Luis Diez, and Katerina Deligiannidou

3 Deep Reinforcement Learning Paradigm for Dense Wireless Networks in Smart Cities 43
Rashid Ali, Yousaf Bin Zikria, Byung-Seo Kim, and Sung Won Kim

4 Energy Demand Forecasting Using Deep Learning 71
Bahrudin Hrnjica and Ali Danandeh Mehr

5 Context-Aware Location Recommendations for Smart Cities 105
Akanksha Pal and Abhishek Singh Rathore

6 Fractional Derivatives for Edge Detection: Application to Road Obstacles 115
Roy Abi Zeid Daou, Fabio El Samarani, Charles Yaacoub, and Xavier Moreau

7 Machine Learning Parameter Estimation in a Smart-City Paradigm for the Medical Field 139
M. Bhuvaneswari, G. Naveen Balaji, and F. Al-Turjman

8 Open Source Tools for Machine Learning with Big Data in Smart Cities 153
Umit Deniz Ulusar, Deniz Gul Ozcan, and Fadi Al-Turjman

9 Identity Verification Using Biometrics in Smart-Cities 169
D. R. Ambika, K. R. Radhika, and D. Seshachalam

10 Network Analysis of Dark Web Traffic Through the Geo-Location of South African IP Address Space 201
Craig Gokhale

11 LBCLCT: Location Based Cross Language Cipher Technique 221
Vishal Gupta, Rahul Johari, Kalpana Gupta, Riya Bhatia, and Samridhi Seth

Index 235

About the Editor

Fadi Al-Turjman is a professor at Antalya Bilim University, Turkey. He received his Ph.D. in computing science from Queen's University, Canada, in 2011. He is a leading authority in the areas of smart/cognitive, wireless, and mobile networks' architectures, protocols, deployments, and performance evaluation. His record spans over 200 publications in journals, conferences, patents, books, and book chapters, in addition to numerous keynotes and plenary talks at flagship venues. He has authored/edited more than 12 published books about cognition, security, and wireless sensor networks' deployments in smart environments with Taylor & Francis and Springer (top-tier publishers in the area). He is a recipient of several recognitions and best paper awards at top international conferences. He led a number of international symposia and workshops in flagship IEEE conferences. He is serving as the lead guest editor in several journals, including the *IET Wireless Sensor Systems* and *Sensors*, *MDPI Sensors*, and the Elsevier *Internet of Things*.

Chapter 3
Deep Reinforcement Learning Paradigm for Dense Wireless Networks in Smart Cities

Rashid Ali, Yousaf Bin Zikria, Byung-Seo Kim, and Sung Won Kim

3.1 Introduction

3.1.1 Motivation

Future dense wireless local area networks (WLANs) are attracting significant devotion from researchers and industrial communities. IEEE working groups are expected to launch an amendment to the IEEE 802.11 (WLAN) standard by the end of 2019 [1]. The upcoming amendment, covering the IEEE 802.11ax high-efficiency WLAN (HEW), will deal with ultradense and diverse user environments for smart cities, such as sports stadiums, train stations, and shopping malls. One inspiring service is the promise of astonishingly high throughput to support extensively advanced technologies for fifth generation (5G) communications and Internet of Things (IoT). HEW is anticipated to infer the various and interesting features of both the learners' environment of a HEW device as well as device behavior in order to spontaneously control the optimal media access control (MAC) layer resource allocation (MAC-RA) [2] system parameters.

In real WLANs, the devices proficiently and dynamically manage WLAN resources, such as the MAC layer carrier sense multiple access with collision avoidance (CSMA/CA) mechanism to improve users' quality of experience (QoE)

R. Ali · Y. B. Zikria · S. W. Kim (✉)
Department of Information and Communication Engineering, Yeungnam University, Gyeongsan, South Korea
e-mail: rashid@yu.ac.kr; yousafbinzikria@ynu.ac.kr; swon@yu.ac.kr

B.-S. Kim
Department of Software and Communications Engineering, Hongik University, Seoul, South Korea
e-mail: jsnbs@hongik.ac.kr

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