## Table of Contents

**Foreword** .............................................................................................................................................. xv

**Preface** ................................................................................................................................................ xix

**Acknowledgment** .............................................................................................................................. xxiii

### Section 1

#### Physical Layer

**Chapter 1**
Sensing Coverage and Connectivity in Cognitive Radio Sensor Networks................................. 1  
Ecehan Berk Pehlivanoğlu, Koç University, Turkey  
Mustafa Özger, Koç University, Turkey  
Özgür Barış Akan, Koç University, Turkey

**Chapter 2**
Radio Resource Management in Cognitive Radio Sensor Networks.............................................. 27  
Ayaz Ahmad, COMSATS Institute of Information Technology, Pakistan  
Sadiq Ahmad, COMSATS Institute of Information Technology, Pakistan

**Chapter 3**
Spectrum Sensing in Cognitive Radio Sensor Networks................................................................. 48  
Farooq Alam, COMSATS Institute of Information Technology 47040, Pakistan  
Zahooruddin, COMSATS Institute of Information Technology 47040, Pakistan  
Ayaz Ahmad, COMSATS Institute of Information Technology 47040, Pakistan  
Muhammad Iqbal, COMSATS Institute of Information Technology 47040, Pakistan

### Section 2

#### MAC Layer

**Chapter 4**
MAC Protocol for CRSN .................................................................................................................... 74  
Amna Jamal, National University of Singapore (NUS), Singapore  
Chen-Khong Tham, National University of Singapore (NUS), Singapore  
Wai-Choong Wong, National University of Singapore (NUS), Singapore
Chapter 5
S. Hashim Bukhari, COMSATS Institute of Information Technology, Pakistan
Mubashir Husain Rehmani, COMSATS Institute of Information Technology, Pakistan
Sajid Siraj, COMSATS Institute of Information Technology, Pakistan & University of Portsmouth, UK

Chapter 6
Dynamic and Smart Spectrum Access Technology.......................................................................................... 127
Jyoti Sekhar Banerjee, Bengal Institute of Technology, India
Arpita Chakraborty, Bengal Institute of Technology, India

Section 3
Network Layer

Chapter 7
Cognitive Radio Sensor Networks: Bridging the Gap for Network Communication............................... 160
Ejaz Ahmed, University of Malaya, Malaysia
Salman Ali, National University of Sciences and Technology, Pakistan
Adnan Akhunzada, University of Malaya, Malaysia
Ibrar Yaqoob, University of Malaya, Malaysia

Chapter 8
Network Layer for Cognitive Radio Sensor Networks.................................................................................. 196
Suleiman Zubair, University of Technology, Malaysia
Norsheila Fisal, University of Technology, Malaysia
Mohammed B. Abazeed, University of Technology, Malaysia
Zubair Khalid, University of Technology, Malaysia
Yahya O. Salihu, Kaduna Polytechnic, Nigeria
Bala A. Salihu, Federal University of Technology Minna, Nigeria
Hassan T. AbdulAzeez, Federal University of Technology Minna, Nigeria
Ahmad Suleiman, Federal University of Technology Minna, Nigeria

Section 4
Transport Layer

Chapter 9
Transport Layer for Cognitive Radio Sensor Networks.................................................................................. 231
Yasir Saleem, Sunway University, Malaysia
Farrukh Salim, NED University of Engineering and Technology, Pakistan
Section 5
Applications

Chapter 10
Applications of Independent Component Analysis in Cognitive Radio Sensor Networks........... 259
Zahooruddin, COMSATS Institute of Information Technology 47040, Pakistan
Ayaz Ahmad, COMSATS Institute of Information Technology 47040, Pakistan
Muhammad Iqbal, COMSATS Institute of Information Technology 47040, Pakistan
Farooq Alam, COMSATS Institute of Information Technology 47040, Pakistan
Sadiq Ahmad, COMSATS Institute of Information Technology 47040, Pakistan

Chapter 11
Integration of Cognitive Radio Sensor Networks and Cloud Computing: A Recent Trend .......... 288
Yasir Saleem, Sunway University, Malaysia
Farrukh Salim, NED University of Engineering and Technology, Pakistan
Mubashir Husain Rehmani, COMSATS Institute of Information Technology, Pakistan

Compilation of References ........................................................................................................ 313
About the Contributors ............................................................................................................ 344
Index ....................................................................................................................................... 351