2019 UK/China Emerging Technologies (UCET 2019)

Glasgow, United Kingdom 21 – 22 August 2019



IEEE Catalog Number: ISBN: CFP19U35-POD 978-1-7281-2798-9

Copyright © 2019 by the Institute of Electrical and Electronics Engineers, Inc. All Rights Reserved

Copyright and Reprint Permissions: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

*** This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.

IEEE Catalog Number:	CFP19U35-POD
ISBN (Print-On-Demand):	978-1-7281-2798-9
ISBN (Online):	978-1-7281-2797-2

Additional Copies of This Publication Are Available From:

Curran Associates, Inc 57 Morehouse Lane Red Hook, NY 12571 USA Phone: (845) 758-0400 Fax: (845) 758-2633 E-mail: curran@proceedings.com Web: www.proceedings.com



Program 2019 UK/ China Emerging Technologies (UCET) UAV, Drone and Vehicle Communication

UAV Aided Data Dissemination for Multi-hop Backhauling in RAN	
Xiaovan Shi (University of Edinburgh, United Kingdom (Great Britain)), John Thompson (University of Edinburgh, United Kingdom (Great Britain)), Majid Safari (University of Edinburgh, United Kingdom (Great Britain)), Shenjie Huang (the Uinviersity of Edinburgh, United Kingdom (Great Britain)), Rong Ke Liu (Beihang University, P.R. China)	1
A Study on Beamforming for Coverage of Emergency Areas from UAVs	
Luca Reggiani (Politecnico di Milano, Italy), Stefano Bolis (Politecnico di Milano, Italy), Davide Scazzoli (Politecnico di Milano, Italy), Maurizio Magarini (Politecnico di Milano, Italy), Mahtab Alam (Tallinn University of Technology, Estonia)	5
VANET Group Sizing for GFDM Relaying in Realistic Vehicular Networks	
Scott Stainton (Newcastle University, United Kingdom (Great Britain)), Martin Johnston (Newcastle University, United Kingdom (Great Britain)), S S Dlay (Newcastle University, United Kingdom (Great Britain))	
A Blockchain-based Secure Internet of Vehicles Management Framework	
Md Abdur Rahman (University of Prince Mugrin, Saudi Arabia), Md Mamunur Rashid (King's College London, United Kingdom (Great Britain)), Stuart Barnes (King's College London, United Kingdom (Great Britain)), Syed Maruf Abdullah (Smart City Research Laboratory, Saudi Arabia)	11
UWB-RTK Positioning System Based on TDOA	
Peng Zhao (University of Electronic Science and Technology of China, P.R. China), Xiaozhang Zhu (University of Electronic Science and Technology of China, P.R. China), Ling He (University of Electronic Science and Technology of China, P.R. China), Ziyan Yang (University of Electronic Science and Technology of China, P.R. China), Siming Zuo (University of Glasgow, United Kingdom (Great Britain)), Zhiqin Zhao (UESTC, P.R. China)	15
The Selected Samples Effect on the Projection Matrix to Estimate the Direction of Arrival	
Mohammed Al-Sadoon (Richmond Road, Bradford, BD7 1DP, United Kingdom (Great Britain) & University of Bradford, Iraq), Raed A Abd-Alhameed (University of Bradford, United Kingdom (Great Britain)), Basman Al-Nedawe (Middle Technical University & MTU, Iraq), Mohammed Bin Melha (Saudi Air Navigation Services, Saudi Arabia)	19
UAV-assisted Cluster-head Selection Mechanism for Wireless Sensor Network Applications	
Syed Kamran Haider (Hohai University, P.R. China), Muhammad Ali Jamshed (University of Surrey, United Kingdom (Great Britain)), Aimin Jiang (Hohai University, P.R. China), Haris Bin Pervaiz (Lancaster University, United Kingdom (Great Britain)), Qiang Ni (Lancaster University, United Kingdom (Great Britain))	
Position Paper: Prototyping Autonomous Vehicles Applications with Heterogeneous Multi-FPGA Systems	
Tarek Elouaret (ETIS Laboratory, France), Stephane Zuckerman (University of Cergy Pontoise, France), Lounis Kessal (ETIS-ENSEA, France), Yoan Espada (ETIS Laboratory, France), Nicolas Cuperlier (ETIS Laboratory, France), Guillaume Bresson (VEDECOM Institute, France), Fethi Ben Ouezdou (Vedecom Institute, France), Olivier Romain (University of Cergy-Pontoise, Cameroon)	
Clustering Algorithm in Vehicular Ad-hoc Networks: A Brief Summary	
Kang Tan (University of Glasgow, P.R. China), Duncan Bremner (University of Glasgow, United Kingdom (Great Britain)), Julien Le Kernec (University of Glasgow, United Kingdom (Great Britain)), Muhammad Ali Imran (University of Glasgow, United Kingdom (Great Britain))	
A Vision-Based Amateur Drone Detection Algorithm for Public Safety Applications	
Kainat Abbasi (University of Engineering and Technology, Pakistan), Ayesha Batool (University of Engineering and Technology, Pakistan), Fawad Fawad (University of Engineering and Technology, Pakistan), Muhammad Asghar (University of Engineering and Technology, Pakistan), Ayesha Saeed (University of Engineering and Technology, Pakistan), Muhammad Khan (University of Engineering and Technology, Pakistan), Masood Ur-Rehman (University of Glasgow, United Kingdom (Great Britain))	

Modelling, Performance and Theory of Communication

Pairwise Error Probability of Non-Orthogonal Multiple Access with I/Q Imbalance	
Lina Bariah (Khalifa University, United Arab Emirates), Bassant Selim (École de Téchnologie Supérieure, Canada), Lina Mohjazi (Khalifa University, United Arab Emirates), Paschalis C. Sofotasios (Khalifa University & Tampere University, Finland), Sami Muhaidat (Khalifa University, United Arab Emirates), Walaa Hamouda (Concordia	
University, Canada)	
An Free of Iteration Array-Error Estimation Method for Multi-Channel SAR Systems	
Lun Ma (Chang an University, United Kingdom (Great Britain))	
Trace-Driven Simulation for LoRaWAN 868 MHz Propagation in an Urban Scenario	
Eugen Harinda (Glasgow Caledonian University, United Kingdom (Great Britain)), Hadi Larijani (Glasgow Caledonian University, United Kingdom (Great Britain)), Ryan Gibson (Glasgow Caledonian University, United Kingdom (Great Britain))	51
Design and Simulation of an S Band Frequency Synthesizer for Satellite Communication Systems	
Irid Sidi Mohammed Hadj (University of Tlemcen, Algeria), Samir Kameche (University of Tlemcen, Algeria)	
Coded OFDM in PLC Channels with SαS Distribution Impulsive Noise Using MRC Detector	
Shirui Zhang (Newcastle University, United Kingdom (Great Britain)), Charalampos C. Tsimenidis (Newcastle University, United Kingdom (Great Britain)), Huan Cao (Newcastle Uniersity, United Kingdom (Great Britain)), Said Boussakta (Newcastle University, United Kingdom (Great Britain))	60
Coverage Analysis for Indoor-Outdoor Coexistence for Millimetre-Wave Communication	
Aysenur Turkmen (University of Glasgow, United Kingdom (Great Britain)), Michael Mollel (The Nelson Mandela African Institution of Science and Technology and Glasgow University, United Kingdom (Great Britain)), Metin Ozturk (University of Glasgow, United Kingdom (Great Britain)), Yao Sun (University of Electronic Science and Technology of China, P.R. China), Lei Zhang (University of Glasgow, United Kingdom (Great Britain)), Rami Ghannam (University of Glasgow, United Kingdom (Great Britain)), Muhammad Ali Imran (University of Glasgow, United Kingdom (Great Britain))	64
Communication and Control Co-Design Using MIMO Wireless Network	
Abdulrahman Saeed Al Ayidh (University of Glasgow, United Kingdom (Great Britain)), Joao Nadas (University of Glasgow, United Kingdom (Great Britain)), Rami Ghannam (University of Glasgow, United Kingdom (Great Britain)), Guodong Zhao (University of Glasgow, United Kingdom (Great Britain)), Muhammad Ali Imran (University of Glasgow, United Kingdom (Great Britain)), Muhammad Ali Imran (University of Glasgow, United Kingdom (Great Britain)), Muhammad Ali Imran (University of Glasgow, United Kingdom (Great Britain))	
Use of Expert System in Requirements Engineering Process A Systematic Literature Review	
Bushra Haq (BUITEMS, Pakistan), Muhammad Nadeem (BUITEMS, United Kinqdom (Great Britain)), Kamran Ali (Middlesex University & Global University Systems (GUS), United Kinqdom (Great Britain)), Imran Ali (BUITEMS, Pakistan), Masood Ur Rehman (University of Glasgow, United Kingdom (Great Britain))	

Beamforming and antenna design

Hardware Constraints in Compressive Sensing Based Antenna Array	
Muhammad Ali Babar Abbasi (Queen's University Belfast & The Institute of Electronics, Communications and Information Technology (ECIT), United Kingdom (Great Britain)), Vincent Fusco (Queen's University Belfast, United Kingdom (Great Britain))	
Design of an LCP-based Antenna Array for 5G/B5G Wearable Applications	
Muhammad Saeed (University of Bedfordshire, United Kingdom (Great Britain)), Masood Ur-Rehman (University of Glasgow, United Kingdom (Great Britain))	
Remote Condition Monitoring: A Prototype Based on Pycom Development Board FiPy and Pysense	
Andr 'ea Voisin-Grall (Aix-Marseille Université, France, United Kingdom (Great Britain)), Obabiolorunkosi Malaolu (University of the West of Scotland, United Kingdom (Great Britain)), Yingbo Zhu (University of the West of Scotland, United Kingdom (Great Britain)), Tanveer Ahmed (University of the West of Scotland, United Kingdom (Great Britain)), Shahriar A Al-Ahmed (University of the West of Scotland, United Kingdom (Great Britain)), Muhammad Zeeshan Shakir (University of the West of Scotland, United Kingdom (Great Britain))	
Experimental Investigation of Empty Substrate Integrated Waveguide-Fed MMW Patch Antenna for 5G Applications	
Zia Ullah Khan (Queen Mary University of London, United Kingdom (Great Britain)), Akram Alomainy (Queen Mary University of London, United Kingdom (Great Britain)), Tian Hong Loh (UK, National Physical Laboratory, United Kingdom (Great Britain))	
A Dual Band Dual Sense Circularly Polarised Single Feed Microstrip Patch Antenna	
Sandip Ghosal (Indian Institute of Technology, India), Raed Shubair (Massachusetts Institute of Technology (MIT), USA)	

Implementation of Highly Accurate Test-Bed for Practical Evaluation of Wired and Wireless Internet Based Smart Grid Communications	
Mehdi Zeinali (The University of Edinburgh, United Kingdom (Great Britain)), John Thompson (University of Edinburgh, United Kingdom (Great Britain))	
Single-Point-Fed Broadband CP Antenna with Enhanced Axial Ratio	
Ismail Mabrouk (Al Ain University of Science and Technology, United Arab Emirates), Qammer H Abbasi (University of Glasgow, United Kingdom (Great Britain)), Akram Alomainy (Queen Mary University of London, United Kingdom (Great Britain)), Ubaid Ullah (Al Ain University of Science and Technology, United Arab Emirates)	103
Demonstration of a Smart Villa Energy Monitoring Platform in Qatar	
Islam Safak Bayram (Hamad Bin Khalifa University and Qatar Environment and Energy Research Institute & University of Strathclyde, Qatar), Olivier Van Cutsem (Ecole Polytechnique Federale de Lausanne, Switzerland), Johann Bigler (ThinkEE, Switzerland), Jean-Charles Fosse (ThinkEE, Switzerland), Maher Kayal (Swiss Federal Institute of Technology, Lausanne, Switzerland)	
Beam Steerable Antenna Development for Wireless Health Monitoring	200
Muhammad S Rabbani (University of Birmingham, United Kingdom (Great Britain)), Alexandros Feresidis (University of Birmingham, United Kingdom (Great Britain))	110
Wearable UHF RFID Tag Antenna Design Using Hilbert Fractal Structure	
Abubakar Sharif (University of Electronic Science and Technology China, P.R. China), Jun Ouyang (University of Electronic Science and Technology of China, P.R. China), Hassan Tariq Tariq Chattha (Islamic University of Madinah, Madinah, Saudi Arabi, Saudi Arabia & Islamic University in Madinah, Pakistan), Muhammad Ali Imran (University of Glasgow, United Kingdom (Great Britain)), Qammer H Abbasi (University of Glasgow, United Kingdom (Great	
Britain))	112
Channel Impulse Response-based Physical Layer Authentication in a Diffusion-based Molecular Communication System	
Sidra Zafar (Lahore College, Pakistan), Wagas Aman (Information Technology University, Lahore, Pakistan), Muhammad Mahboob Ur Rahman (Information Technology University, Pakistan), Akram Alomainy (Queen Mary University of London, United Kingdom (Great Britain)), Qammer H Abbasi (University of Glasgow, United Kingdom	
(Great Britain))	115

Machine Learning, Deep Learning and Artificial Intelligence

Human Action Recognition Using GLAC Features on Multi-view Binary Coded Images	
Mohammad Farhad Bulbul (Jashore University of Science and Technology, Bangladesh), Syed Md. Galib (Ja University of Science and Technology, Bangladesh), Hazrat Ali (COMSATS University Islamabad, Abbottaba	
Campus, Pakistan)	
Reinforcement Learning Method for Beam Management in Millimeter-Wave Networks	
Ruiyu Wang (University of Glasgow, United Kingdom (Great Britain)), Oluwakayode Onireti (University of Gl United Kingdom (Great Britain)), Lei Zhang (University of Glasgow, United Kingdom (Great Britain)), Muhan Imran (University of Glasgow, United Kingdom (Great Britain)), Guangmei Ren (Huawei Technologies Co., Lt China), Jing Qiu (Huawei Technologies Co., P.R. China), Tingjian Tian (Huawei Technologies Co., Ltd, P.R. Ch	nmad Ali td, P.R.
Deep Learning for Signal Detection in Non-Orthogonal Multiple Access Wireless Systems	
Narengerile Narengerile (University of Edinburgh, United Kingdom (Great Britain)), John Thompson (Univer Edinburgh, United Kingdom (Great Britain))	rsity of 125
Deep Leaning Based Ensemble Convolutional Neural Network Solution for Distributed Denial of Service Detection	วท
Shahzeb Haider (Bahaudin Zakariya University, Pakistan), Adnan Akhunzada (Comsats University, Pakistan), Ahmed (Comsats University, Islamabad, Pakistan), Mohsin Raza (Middlesex University, United Kingdom (Gro Britain))	
Texture Classification Using a Hybrid Deep and Handcrafted Features	
Fawad Fawad (University of Engineering and Technology, Pakistan), Muhammad Asghar (University of Engi and Technology, Pakistan), Avesha Saeed (University of Engineering and Technology, Pakistan), Muhamma (University of Engineering and Technology, Pakistan), Muhammad Zahid (University of Engineering and Technology, Taxila, Pakistan), Masood Ur-Rehman (University of Glasgow, United Kingdom (Great Britain))	d Khan
A Survey on Deep Learning for the Routing Layer of Computer Network	
Fengling Jiang (Hefei Normal University, P.R. China), Kia Dashtipour (University of Stirling, United Kingdom Britain)), Amir Hussain (Edinburgh Napier University, United Kingdom (Great Britain))	
A New Discriminative Feature Learning for Person Re-Identification Using Additive Angular Margin Softmax Los	55
Jie Su (Sichuan University, United Kingdom (Great Britain)), Xiaohao He (Sichuan University, P.R. China), Linl (Sichuan University, P.R. China), Yanmei Yu (Sichuan University, P.R. China), Shengyu Xu (Sichuan University China), Yonghong Peng (University of Sunderland, United Kingdom (Great Britain))	, P.R.
china, ronghong rong (onwersity of sundenand, onited kingdom (oreat britain))	

Spectrum Cost Optimization for Cognitive Radio Transmission over TV White Spaces Using Artificial Neural Networks Metin Ozturk (University of Glasgow, United Kingdom (Great Britain)), Attai Ibrahim Abubakar (University of Glasgow, United Kingdom (Great Britain)), Naveed UI Hassan (Lahore University of Management Sciences, Pakistan), Sajiad Hussain (University of Glasgow, United Kingdom (Great Britain)), Muhammad Ali Imran (University of Glasgow, United Kingdom (Great Britain)), Chau Yuen (Singapore University of Technology and Design, Singapore) __________145

Biomedical, health and sensing

Monitoring Body Motions Related to Huntington Disease by Exploiting the 5G Paradigm	
Daniyal Haider (University of Cerqy Pontoise, France), Julien Le Kernec (University of Glasgow, United Kingdom (Great Britain)), Olivier Romain (University of Cergy-Pontoise, Cameroon), Muhammad Umer Faroog (Federation University, Australia), Syed Shah (Institute of Business and Managment Sciences, Pakistan), Zunaira Qadus (Foundation Medical College(FUMC), Pakistan)	
ECG-based Affective Computing for Difficulty Level Prediction in Intelligent Tutoring Systems	
Fehaid Algahtani (University of the West of Scotland, United Kingdom (Great Britain)), Stamos Katsigiannis (University of the West of Scotland, United Kingdom (Great Britain)), Naeem Ramzan (University of the West of Scotland, United Kingdom (Great Britain), United Kingdom (Great Britain))	153
Wearable Peripheral Neuropathy Detection System Based on Surface Electromyography	
Kainat Yousaf (Lahore University of Management Sciences, Pakistan), Hamna Athar (Lahore University of Management Sciences, Pakistan), Wala Saadeh (Lahore University of Management Sciences, Pakistan)	157
Wearable ECG Measurement System for Detection of Cardiac Arrhythmia	
Arish Adil (Lahore University of Management Sciences, Pakistan), Hassan Abid (Lahore University of Management Sciences, Pakistan), Nadir Najib (Lahore University of Management Sciences, Pakistan), Usama Jillani (Lahore University of Management Sciences, Pakistan), Wala Saadeh (Lahore University of Management Sciences, Pakistan) Muhammad Awais Bin Altaf (Lahore University of Management Sciences, Pakistan)	
Air Quality Monitoring Using Portable Multi-Sensory Module for Neurological Disease Prevention	
Rami Ghannam (University of Glasgow, United Kingdom (Great Britain)), Hadi Heidari (University of Glasgow, United Kingdom (Great Britain)), Yanjun Chen (University of Glasgow, United Kingdom (Great Britain))	
The Design of a Customised Portable BCI Headset for Home Based Neurorehabilitation	
Nina Petric-Gray (University of Glasgow & Glasgow School of Art, United Kingdom (Great Britain)), Craig Whittet (Glasgow School of Art, United Kingdom (Great Britain)), Tiejun Liu (University of Electronic Science and Technology, United Kingdom (Great Britain)), Aleksandra Vuckovic (University of Glasgow, United Kingdom (Great Britain))	
Wearable Resistive-based Gesture-Sensing Interface Bracelet	
Yujia Chen (University of Electronic Science and Technology of China, P.R. China), Xiangpeng Liang (University of Glasgow, United Kingdom (Great Britain)), Maher Assaad (Ajman University, United Arab Emirates), Hadi Heidari (University of Glasgow, United Kingdom (Great Britain))	
Design and Implementation of a 3D Printed Sensory Ball for Wireless Water Flow Monitoring	
Hadi Heidari (University of Glasgow, United Kingdom (Great Britain)), Rami Ghannam (University of Glasgow, United Kingdom (Great Britain)), Yi Zhang (University of Glasgow & University of Elevtronic Science and Technology of China, P.R. China), Manousos Valyrakis (University of Glasgow, United Kingdom (Great Britain))	
Visual Hand Tracking on Depth Image Using 2-D Matched Filter	
Hadi Heidari (University of Glasgow, United Kingdom (Great Britain)), Xiangpeng Liang (University of Glasgow, United Kingdom (Great Britain)), Yongdian Sun (University of Glasgow, United Kingdom (Great Britain)), Mukammad Ali Imran (University of Glasgow, United Kingdom (Great Britain))	
Muhammad Ali Imran (University of Glasgow, United Kingdom (Great Britain)) A Miniaturized Wide Band Implantable Antenna for Biomedical Application	
Zubair Bashir (University of Engineering and Technology, Pakistan), Muhammad Zahid (University of Engineering	
and Technology, Taxila, Pakistan), Naeem Abbas (University of Engineering and Technology, Pakistan), Muhammad Yousaf (University of Engineering and Technology (UET), Taxila, Pakistan), Sultan Shoaib (Wrexham Glyndwr University & HITEC University Taxila, United Kingdom (Great Britain)), Muhammad Asghar (University of Engineering and Technology, Pakistan), Yasar Amin (UET Taxila, Pakistan)	
Adversarial Machine Learning Attack on Modulation Classification	
Muhammad Usama (Information Technology University, Pakistan), Muhammad Asim (Information Technology	
University, Pakistan), Junaid Qadir (Information Technology University (ITU), Punjab, Lahore, Pakistan), Ala Al- Fuqaha (Hamad Bin Khalifa University, Qatar), Muhammad Ali Imran (University of Glasgow, United Kingdom (Grea	
Britain))	

Adversarial ML Attack on Self Organizing Cellular Networks	
Muhammad Usama (Information Technology University, Pakistan), Junaid Qadir (Information Technology University (ITU), Punjab, Lahore, Pakistan), Muhammad Ali Imran (University of Glasgow, United Kingdom (Great Britain)),	
Salah-ud-din Farooq (Information Technology University (ITU), Pakistan)	190
Intrusion Detection Through Leaky Wave Cable in Conjunction with Channel State Information	
Syed Aziz Shah (School of International Education, P.R. China), Syed Shah (Institute of Business and Managment Sciences, Pakistan), Syed Shah (College of Electrical and Mechanical Engineering, Pakistan)	195

Security of Communication Systems

Intrusion Detection Using Swarm Intelligence	
Ayyaz-ul-Haq Qureshi (Glasqow Caledonian University, United Kinqdom (Great Britain)), Hadi Larijani (Glasqow Caledonian University, United Kinqdom (Great Britain)), Abbas Javed (Glasqow Caledonian University, United Kinqdom (Great Britain)), Nhamoinesu Mtetwa (Glasqow Caledonian University, United Kinqdom (Great Britain)), Jawad Ahmad (Edinburgh Napier University, United Kinqdom (Great Britain))	
Non-intrusive Electricity Sub-metering in Selected Households in Qatar	199
Islam Safak Bayram (Hamad Bin Khalifa University and Qatar Environment and Energy Research Institute & University of Strathclyde, Qatar)	204
An Effective Android Ransomware Detection Utilizing Multi-Factor Feature Filtration and Recurrent Neural Network	
Iram Bibi (Comsats University, Islamabad, Pakistan), Adnan Akhunzada (Comsats University, Pakistan), Jahanzaib Malik (Comsats University, Islamabad, Pakistan), Ghufran Ahmed (Comsats University, Islamabad, Pakistan), Mohsin Raza (Middlesex University, United Kingdom (Great Britain))	208
Frozen Bit Selection Scheme for Polar Coding Combined with Physical Layer Security	
Huan Cao (Newcastle Uniersity, United Kingdom (Great Britain)), Martin Johnston (Newcastle University, United Kingdom (Great Britain)), Stephane Y. Le Goff (University of Newcastle upon Tyne, United Kingdom (Great Britain))	212
Awareness of Kill Switch Application Among Mobile Phone Users	
Kamran Ali (Middlesex University & Global University Systems (GUS), United Kingdom (Great Britain)), Bushra Qayyum (University of Chester, United Kingdom (Great Britain)), Bushra Naeem (BUITEMS, Pakistan), Dhaii Al- Qahtani (BUITEMS, Saudi Arabia), Mohsin Raza (Middlesex University, United Kingdom (Great Britain))	216
A Partial Light-weight Image Encryption Scheme	
Jawad Ahmad (Edinburgh Napier University, United Kingdom (Great Britain)), Ahsen Tahir (University of Engineering and Technology Lahore, Pakistan), Muazzam A Khan (NUST School of Electrical Engineering and Computer Science, Pakistan), Fadia Khan (Wah Engineering College, Pakistan), Jan Sher Khan (University of Gaziantep Turkey, Turkey), Zeeshan Habib (Hitech uni, Pakistan)	221
Radio Spectrum Occupancy Measurement from 30MHz to 1030MHz in Pakistan	
Mohammad Daniyal Zulfiqar (University of Washington, USA), Khalid Ismail (Lahore University of Management Sciences, Pakistan), Naveed UI Hassan (Lahore University of Management Sciences, Pakistan), Sajjad Hussain (University of Glasgow, United Kingdom (Great Britain)), Meng Zhang (Southeast University, P.R. China)	224
The Need for Real Time and Robust Sensing of Infrastructure Risk Due to Extreme Hydrologic Events	
Manousos Valyrakis (University of Glasgow, United Kingdom (Great Britain)), Eftychia Koursari (AMEY Consulting, United Kingdom (Great Britain)), Stuart Wallace (AMEY Consulting, United Kingdom (Great Britain)), Panagiotis Michalis (University of Glasgow, United Kingdom (Great Britain))	229
Infrastructure Scour Risk Assessment Using Instrumented Particles	
Manousos Valyrakis (University of Glasgow, United Kingdom (Great Britain)), Cameron Houston (University of Glasgow, United Kingdom (Great Britain)), David Muir (University of Glasgow, United Kingdom (Great Britain))	232