

# **2018 IEEE 23rd International Workshop on Computer Aided Modeling and Design of Communication Links and Networks (CAMAD 2018)**

**Barcelona, Spain  
17-19 September 2018**



**IEEE Catalog Number: CFP18CAM-POD  
ISBN: 978-1-5386-6152-9**

**Copyright © 2018 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:	CFP18CAM-POD
ISBN (Print-On-Demand):	978-1-5386-6152-9
ISBN (Online):	978-1-5386-6151-2
ISSN:	2378-4865

**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](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

CURRAN ASSOCIATES INC.  
**proceedings**  
.com

# 2018 IEEE 23rd International Workshop on Computer Aided Modeling and Design of Communication Links and Networks (CAMAD)

## Heterogeneous Networks

<i>Bringing LTE to Unlicensed Spectrum: Technical Solutions and Deployment Considerations</i>	
Bolin Chen (University of Sheffield, United Kingdom (Great Britain)), Zheng Chen (Linköping University, Sweden), Nikolaos Pappas (Linköping University, Sweden), Di Yuan (Linköping University, Sweden), Jie Zhang (University of Sheffield, Dept. of Electronic and Electrical Engineering, United Kingdom (Great Britain))	1
<i>Indoor Multiple-User MIMO Channel Measurement and Characterization</i>	
Jiliang Zhang (Lanzhou University, P.R. China), Yang Wang (Harbin Institute of Technology, P.R. China), Liqin Ding (Harbin Institute of Technology, P.R. China), Xiaoli Chu (University of Sheffield, United Kingdom (Great Britain)), Jie Zhang (University of Sheffield, Dept. of Electronic and Electrical Engineering, United Kingdom (Great Britain))	8
<i>Managing Interference in D2D Networks via Clustering and Topological Awareness</i>	
Salam Doumiati (American University of Beirut, Lebanon), Hassan A. Artail (American University of Beirut, Lebanon), Mohamad Assaad (CentraleSupélec, France)	13
<i>Guaranteed Bit Rate Traffic Prioritisation and Isolation in Multi-tenant Radio Access Networks</i>	
Irene Vilà Muñoz (Universitat Politècnica de Catalunya (UPC), Spain), Oriol Sallent (Universitat Politècnica de Catalunya, Spain), Anna Umbert (University Politècnica of Catalunya, Spain), Jordi Pérez-Romero (Universitat Politècnica de Catalunya (UPC), Spain)	20
<i>A System for Optimizing Small-Cell Deployment in 2-Tier HetNets</i>	
Dorothy Abonyi (The University of Sheffield, United Kingdom (Great Britain)), Jonathan Michael Rigelsford (The University of Sheffield, United Kingdom (Great Britain))	26
<i>Improving the Spectral Efficiency in Dense Heterogeneous Networks Using D2D-Assisted eICIC</i>	
Mohamed A Elshatshat (University of Crete & Foundation for Research and Technology, Greece), Stefanos Papadakis (FORTH-ICS, Greece), Vangelis Angelakis (Linköping University, Sweden)	32

## PHY and Communication Protocols

<i>Understanding the Impact of Line-of-Sight in the Ergodic Spectral Efficiency of Cellular Networks</i>	
Celia Garcia Corrales (Universidad de Malaga, Spain), Francisco J. Martin-Vega (University of Málaga & IEEE Student Member, Spain), Francisco Javier Lopez-Martinez (Universidad de Malaga, Spain), Francisco J. Cañete (Universidad de Málaga, Spain), Jose Francisco Paris (University of Málaga, Spain)	38
<i>5G New Radio Numerologies and their Impact on the End-To-End Latency</i>	
Natale Patriciello (Centre Tecnològic de Telecomunicacions de Catalunya (CTTC), Spain), Sandra Lagen (Centre Tecnològic de Telecomunicacions de Catalunya (CTTC), Spain), Lorenza Giupponi (Centre Tecnològic de Telecomunicacions de Catalunya (CTTC), Spain), Biljana Bojovic (Centre Tecnològic de Telecomunicacions de Catalunya (CTTC), Spain)	44
<i>Antenna Selection Symbol-Level Precoding for Low Complexity Large-Scale Antenna Array Systems</i>	
Stavros Domouchtsidis (University of Luxembourg, Luxembourg), Christos G. Tsinos (University of Luxembourg, Luxembourg), Symeon Chatzinotas (University of Luxembourg, Luxembourg), Björn Ottersten (University of Luxembourg, Luxembourg)	50
<i>Binary Reed-Solomon Coding Based Distributed Storage Scheme in Information-Centric Fog Networks</i>	
Ye Shu (Shanghai Jiao Tong University, P.R. China), Mianxiong Dong (Muroran Institute of Technology, Japan), Kaoru Ota (Muroran Institute of Technology, Japan), Jun Wu (Shanghai Jiao Tong University, P.R. China), Siyi Liao (Shanghai Jiao Tong University, P.R. China)	56
<i>BitSurfing: Wireless Communications with Outsourced Symbol Generation</i>	
Ageliki Tsioliaridou (Foundation for Research and Technology, FORTH, Greece), Christos Liaskos (Institute of Computer Science, Foundation of Research and Technology, Hellas, Greece), Sotiris Ioannidis (Foundation for Research and Technology - Hellas, Greece)	61
<i>Regulating the Block Loss Ratio of the Licklider Transmission Protocol</i>	
Ricardo Lent (University of Houston, USA)	68

## Data Analytics

<i>Toward Intelligent Detection Modelling for Adversarial Samples in Convolutional Neural Networks</i>	
Zhuobiao Qiao (Shanghai Jiao Tong University, P.R. China), Mianxiong Dong (Muroran Institute of Technology, Japan), Kaoru Ota (Muroran Institute of Technology, Japan), Jun Wu (Shanghai Jiao Tong University, P.R. China)	74
<i>Deep Reinforcement Learning based Smart Mitigation of DDoS Flooding in Software-Defined Networks</i>	
Yandong Liu (Shanghai Jiao Tong University, P.R. China), Mianxiong Dong (Muroran Institute of Technology, Japan), Kaoru Ota (Muroran Institute of Technology, Japan), Jianhua Li (Shanghai Jiao Tong University, P.R. China), Jun Wu (Shanghai Jiao Tong University, P.R. China)	80
<i>In-memory Spatial-Aware Framework for Processing Proximity-Alike Queries in Big Spatial Data</i>	
Isam Mashhour Al Jawarneh (University of Bologna & CIRI ICT, Italy), Paolo Bellavista (University of Bologna, Italy), Antonio Corradi (University of Bologna & CIRI ICT, Italy), Luca Foschini (University of Bologna, Italy), Rebecca Montanari (University of Bologna, Italy), Andrea Zanotti (University of Bologna, Italy)	86
<i>Catching free-riders: in-network adblock detection with machine learning techniques</i>	
Daniele Moro (Politecnico di Milano, Italy), Filippo Benati (Politecnico di Milano, Italy), Michele Mangili (ErnieApp Ltd, Ireland), Antonio Capone (Politecnico di Milano, Italy)	92
<i>A Smart Unstaffed Retail Shop Based on Artificial Intelligence and IoT</i>	
Lizheng Liu (Fudan University, P.R. China), Bo Zhou (Fudan University, P.R. China), Zhuo Zou (Fudan University & KTH Royal Institute of Technology, Sweden), Shih-Ching Yeh (Fudan University, P.R. China), Lirong Zheng (Fudan University, P.R. China)	98

*Fiber-Wireless Fronthaul/Backhaul Network Architectures for 5G*

George Lyberopoulos (COSMOTE Mobile Telecommunications S.A., Greece), Elina Theodoropoulou (COSMOTE Mobile Telecommunications S.A., Greece), Ioanna Mesogiti (COSMOTE Mobile Telecommunications S.A., Greece), Konstantinos G. Filis (Cosmote Mobile Communications SA, Greece), Athina Ropodi (Incelligent, Greece), Konstantinos Tsagkaris (Incelligent, Greece), Panagiotis Demestichas (Incelligent, Greece), Nikos Pleros (Aristotle University of Thessaloniki, Greece), George Kalfas (Aristotle University of Thessaloniki & Technical University of Catalonia, Greece), Christos Vagionas (Aristotle University of Thessaloniki, Greece) ..... 102

*Optical and wireless network convergence in 5G systems - an experimental approach*

Paulo Marques (Instituto de Telecomunicações, Portugal), Valerio Frasca (Intel Deutschland GmbH, Germany), Carlos Filipe Moreira e Silva (Federal University of Ceará, Brazil), Emanuel Sena (Universidade Federal do Ceará, Brazil), Raphael Braga (Universidade Federal do Ceará, Brazil), Joao F. N. Pinheiro (Federal University of Ceara, Brazil), Carlos A. Astudillo (State University of Campinas, Brazil), Tiago Andrade (State University of Campinas, Brazil), Eduardo S. Gama (Universidade Federal da Paraíba, Brazil), Luiz F. Bittencourt (University of Campinas, Brazil), Leandro Aparecido Villas (UNICAMP, Brazil), Edmundo Madeira (State University of Campinas, Brazil), Nelson L. S. da Fonseca (State University of Campinas, Brazil), Cristiano Bonato Both (Federal University of Health Sciences of Porto Alegre, Brazil), Gabriel Lando (Universidade Federal do Rio Grande do Sul, Brazil), Felipe Queiroz (Universidade Federal do Espírito Santo, Brazil), Matias Schimuneck (University of Rio Grande do Sul, Brazil), Juliano Araujo Wickboldt (Federal University of Rio Grande do Sul, Brazil), Ana Trevisan (Universidade Federal do Rio Grande do Sul, Brazil), Rafael de Jesus Martins (Federal University of Rio Grande do Sul, Brazil), Alexandre do Carmo (Instituto Federal do Espírito Santo, Brazil), Raquel F Vassallo (Federal University of Espírito Santo, Brazil), Rodolfo Picoreti (Federal University of Espírito Santo, Brazil), Roberta Gomes (UFES, Brazil), Cristina Dominicini (Universidade Federal do Espírito Santo, Brazil), Víctor García (Federal University of Espírito Santo, Brazil), Rafael Silva Guimaraes (Federal Institute of Espírito Santo - Campus Cachoeiro de Itapemirim, Brazil), Rodolfo S Villaca (Federal University of Espírito Santo (UFES), Brazil), Magnos Martinello (Federal University of Espírito Santo, Brazil), Moises R. N. Ribeiro (Federal University of Espírito Santo, Brazil), Daniel Fernandes Macedo (Universidade Federal de Minas Gerais, Brazil), Vinicius F. Silva (Universidade Federal de Minas Gerais, Brazil), Julio Cesar Guimaraes (Universidade Federal de Minas Gerais, Brazil), Carlos Colman Meixner (University of Bristol, United Kingdom (Great Britain)), Reza Nejabat (University of Bristol, United Kingdom (Great Britain)), Dimitra Simeonidou (University of Bristol, United Kingdom (Great Britain)), Yi Zhang (Trinity College Dublin, Ireland), Frank Slyne (Connect Research Centre - Trinity College Dublin, Ireland), Pedro Alvarez (CTVR, Trinity College, Ireland), Diarmuid Collins (Trinity College Dublin, Ireland), Marco Ruffini (CONNECT, Trinity College Dublin, Ireland), Luiz DaSilva (Trinity College & Trinity College Dublin, Ireland), Johann M. Marquez-Barja (University of Antwerpen - imec & IDLab Research Group - imec, Belgium) ..... 107

*Analysing Interface Bonding in 5G WLANs*

Michael Dilmore (University of Bristol, United Kingdom (Great Britain)) ..... 112

*The Fronthaul Infrastructure of 5G Mobile Networks*

Simon Rommel (Eindhoven University of Technology, The Netherlands), Thiago R Raddo (Eindhoven University of Technology, The Netherlands, The Netherlands), Idelfonso Tafur Monroy (Eindhoven University of Technology, The Netherlands) ..... 117

*Medium-transparent Dynamic Bandwidth Allocation for 5G Fiber Wireless Dense Fronthaul Networks*

Agapi Mesodiakaki (Aristotle University of Thessaloniki (AUTH), Greece), Pavlos Maniotis (Aristotle University of Thessaloniki, Greece), Christos Vagionas (Aristotle University of Thessaloniki, Greece), Marios Gatzianas (Centre for Research and Technology Hellas, Greece), Eftychia Datsika (IQUADRAT Informatica S. L., Spain), Elli Kartsaki (IQUADRAT, Spain), John S Vardakas (IQUADRAT Informatica S. L. Barcelona, Spain), George Kalfas (Aristotle University of Thessaloniki & Technical University of Catalonia, Greece) ..... 123

*Network Services SLAs over 5G Infrastructure Converging Disaggregated Network and Compute Resources*

Ioanna Mesogiti (COSMOTE Mobile Telecommunications S.A., Greece), George Lyberopoulos (COSMOTE Mobile Telecommunications S.A., Greece), Elina Theodoropoulou (COSMOTE Mobile Telecommunications S.A., Greece), Konstantinos G. Filis (Cosmote Mobile Communications SA, Greece), Anna Tzanakaki (University of Bristol, United Kingdom (Great Britain)), Rafael Canto Palancar (Telefonica, Spain), Nicolás Serrano (Telefónica I+D, Spain), Daniel Camps (i2CAT, Spain), Jesús Gutiérrez (IHP, Germany) ..... 129

## Smart IoT and M2M

*Scalable and Flexible IoT data analytics: when Machine Learning meets SDN and Virtualization*

Jordi Serra (CTTC, Spain), Luis Sanabria-Russo (CTTC - Centre Tecnològic de Telecomunicacions de Catalunya, Spain), David Pubill (CTTC, Spain), Christos Verikoukis (CTTC & UB, Spain) ..... 134

*The Interoperability of Things*

George Hatzivasilis (FORTH-ICS, Greece), Ioannis Askoxylakis (FORTH-ICS, Greece), George Alexandris (Bournemouth University, United Kingdom (Great Britain)), Darco Anicic (Siemens, USA), Arne Bröring (Siemens AG, Germany), Vivek Kulkarni (Siemens AG, Germany), Konstantinos Fysarakis (Sphynx Technology Solutions AG, Switzerland), George Spanoudakis (Sphynx Technology Solutions AG, Switzerland) ..... 140

*Towards a Security, Privacy, Dependability, Interoperability Framework for the Internet of Things*

Othonas Soultatos (City University London, United Kingdom (Great Britain), Greece), George Spanoudakis (City University London, United Kingdom (Great Britain)), Konstantinos Fysarakis (Sphynx Technology Solutions AG, Switzerland), Ioannis Askoxylakis (FORTH-ICS, Greece), George Alexandris (Bournemouth University, United Kingdom (Great Britain)), Andreas Miaoudakis (FORTH-ICS, Greece), Nikolaos E. Petroulakis (Foundation for Research and Technology - Hellas, Greece) ..... 147

*Key challenges for developing a Socially Assistive Robotic (SAR) solution for the health sector*

Keven Kearney (Engineering Ingegneria Informatica SpA, Italy), Federica Saccà (Engineering Ingegneria Informatica SpA, Italy), Domenico Presenza (Engineering Ingegneria Informatica, Italy), Philip Wright (Engineering Ingegneria Informatica, Italy) ..... 153

*Comparison of M2M traffic models against real world data sets*

Marco Sansoni (University of Padova, Italy), Giuseppe Ravagnani (University of Padova, Italy), Daniel Zucchetto (University of Padova, Italy), Chiara Pielli (University of Padova, Italy), Andrea Zanella (University of Padova, Italy), Kashif Mahmood (Telenor, Norway) ..... 160

*Harvesting artificial light indoors to power perpetually a Wireless Sensor Network node*

David Pubill (CTTC, Spain), Jordi Serra (CTTC, Spain), Christos Verikoukis (CTTC & UB, Spain) ..... 166

## User-centric Networking

<i>Software Defined Selective Traffic Offloading (SDSTO)</i>	
Mukhald Salih (Brunel University, United Kingdom (Great Britain)), John Cosmas (Brunel University, United Kingdom (Great Britain)), Nawar Jawad (Brunel University, United Kingdom (Great Britain)) .....	172
<i>Assessing QoE-driven management policies for VoIP and Video Streaming service provisioning</i>	
Daniele Ciabrone (WEST Aquila, Italy), Stefano Tennina (WEST Aquila & University of L'Aquila, Italy), Mattia Boschi (WEST Aquila srl, Italy), Dimitris Tsolkas (University of Athens, Greece), Luigi Pomante (Università degli Studi dell'Aquila, Italy) .....	179
<i>Multi-Agent RL based User-Centric Spectrum Allocation Scheme in D2D enabled Hetnets</i>	
Kamran Zia (National University of Sciences and Technology, Pakistan), Nauman Javed (National University of Sciences and Technology, Pakistan), Muhammad Nadeem Sial (King's College London, United Kingdom (Great Britain)), Sohail Ahmed (Air University, Pakistan), Farrukh Pervez (National University of Sciences and Technology Islamabad, Pakistan) .....	185
<i>5G Performance Testing of Mobile Chatbot Applications</i>	
Vaios Koumaras (INFOLYSIS P. C., Greece), Andreas Foteas (INFOLYSIS P. C., Greece), Angeliki Papaioannou (INFOLYSIS P. C., Greece), Marianna Kapari (INFOLYSIS P. C., Greece), Christos Sakkas (INFOLYSIS P. C., Greece), Harilaos Koumaras (NCSR Demokritos, Greece) .....	191
<i>5GENESIS: The Genesis of a flexible 5G Facility</i>	
Harilaos Koumaras (NCSR Demokritos, Greece), Dimitris Tsolkas (Fogus Innovations & Services, Greece, Greece), Georgios Gardikis (Space Hellas S.A., Greece), Pedro Merino (University of Malaga, Spain), Valerio Frasca (Intel Deutschland Gmbh, Germany), Dionysia Triantafyllou (University of Surrey, United Kingdom (Great Britain)), Marc Emmelmann (Fraunhofer FOKUS, Germany), Vaios Koumaras (INFOLYSIS P. C., Greece), Maria Garcia Osma (Telefonica, Spain), Daniele Munaretto (Athonet, Italy), Eneko Atxutegi (Nemergent Solutions SL, Spain, Spain), Jara Suárez de Puga (Universitat Politècnica de València, Spain), Ozgu Alay (Simula Metropolitan Center for Digital Engineering, Norway), Anna Brunstrom (Karlstad University, Sweden), Anne-Marie C. Bosneag (Ericsson Ireland Research Centre, Ireland) .....	197
<i>TRIANGLE: a Platform to Validate 5G KPIs in End to End scenarios</i>	
Almudena Diaz Zayas (University of Malaga, Spain), Andrea F. Cattoni (Keysight Technologies, Denmark), Carlos Cárdenas Angelat (DEKRA, Spain), Oscar Castañeda (DEKRA, Spain), Janie Baños Polglase (DEKRA, Spain), Pedro Merino (University of Malaga, Spain), Michael Dieudonné (Keysight Technologies, Belgium) .....	203

## MEC/Caching

<i>Phileas: A Simulation-based Approach for the Evaluation of Value-based Fog Services</i>	
Filippo Poltronieri (University of Ferrara, Italy), Cesare Stefanelli (University of Ferrara, Italy), Niranjani Suri (US Army Research Laboratory (ARL) & Florida Institute for Human & Machine Cognition (IHMC), USA), Mauro Tortonesi (University of Ferrara, Italy) .....	210
<i>Optimized Cloudlet management in Edge Computing environment</i>	
Efthymios Oikonomou (University of Piraeus, Greece), Angelos Rouskas (University of Piraeus, Greece) .....	216
<i>Supporting the Development of Next-generation Fog Services</i>	
Carlo Giannelli (University of Ferrara, Italy), Filippo Poltronieri (University of Ferrara, Italy), Cesare Stefanelli (University of Ferrara, Italy), Mauro Tortonesi (University of Ferrara, Italy) .....	222
<i>Comparing Web Cache Implementations for Fast Updates Based on LRU, LFU and Score Based Strategies</i>	
Gerhard Hasslinger (Deutsche Telekom, Germany), Konstantinos Ntougias (Athens Information Technology, Greece), Frank Hasslinger (TUDa, Germany), Oliver Hohlfeld (RWTH Aachen University, Germany) .....	228
<i>The Deterministic Network Calculus Analysis: Reliability Insights and Performance Improvements</i>	
Alexander Scheffler (TU Kaiserslautern, Germany), Markus Fögen (TU Kaiserslautern, Germany), Steffen Bondorf (NTNU Trondheim, Norway) .....	235
<i>DRIVE: Discovery seRvice for fully-Integrated 5G enVironmEnt in the IoT</i>	
Paolo Bellavista (University of Bologna, Italy), Luca Foschini (University of Bologna, Italy), Domenico Scotece (University of Bologna, Italy), Kyriaki Karypidou (Alexander TEI of Thessaloniki, Greece), Periklis Chatzimisios (Alexander TEI of Thessaloniki and Bournemouth University, Greece) .....	241

## IoT and Data-driven circular economy

<i>Blockchains as Enablers for Auditing Cooperative Circular Economy Networks</i>	
George Alexandris (Bournemouth University, United Kingdom (Great Britain)), Sofia Alexaki (Ecole des Ponts Business School, France), Vasilios Katos (Bournemouth University, United Kingdom (Great Britain)), George Hatzivasilis (FORTH-ICS, Greece) .....	247
<i>Blockchain-based Electronic Patient Records for Regulated Circular Healthcare Jurisdictions</i>	
Sofia Alexaki (Ecole des Ponts Business School, France), George Alexandris (Bournemouth University, United Kingdom (Great Britain)), Vasilios Katos (Bournemouth University, United Kingdom (Great Britain)), Nikolaos E. Petroulakis (Foundation for Research and Technology - Hellas, Greece) .....	254
<i>Towards a Circular Economy via Intelligent Metamaterials</i>	
Christos Liaskos (Institute of Computer Science, Foundation of Research and Technology, Hellas, Greece), Ageliki Tsioliariidou (Foundation for Research and Technology, FORTH, Greece), Sotiris Ioannidis (Foundation for Research and Technology - Hellas, Greece) .....	260
<i>Empowering Human-Computer Interaction in Securing Smartphone Sensing</i>	
Zachary Rauen (Clarkson University, USA), Fazel Anjomshoa (Clarkson University, USA), Burak Kantarci (University of Ottawa, Canada) .....	266
<i>Energy-aware Placement For IoT-Service Function Chain</i>	
Riad Kouah (USTHB, Algeria & LaBRI Lab, France), Abdelhamid Alleg (CNRS-LaBRI UMR 5800, University Bordeaux, Bordeaux-INP, France), Abir Laraba (Université Toulouse III, France), Toufik Ahmed (CNRS-LaBRI UMR 5800, University Bordeaux, Bordeaux-INP, France) .....	272
<i>Connecting NS-3 with Cooja</i>	
Afonso Oliveira (Inesc-ID/Instituto Superior Técnico/Universidade de Lisboa, Portugal), Teresa Vazão (Inesc-ID/Instituto Superior Técnico, Portugal) .....	279

## 5G and beyond networks I

<i>On the Efficiency Evaluation of a Novel Scheme Based on Daubechies Wavelet for Watermarking in 5G</i> Tamara Alshayeh (University of Nicosia, Cyprus), Constandinos X. Mavromoustakis (University of Nicosia, Cyprus), Jordi Mongay Batalla (Warsaw University of Technology & National Institute of Telecommunications, Poland), George Mastorakis (Technological Educational Institute of Crete, Greece), Evangelos K. Markakis (Technological Educational Institute of Crete, Greece), Evangelos Pallis (Technological Educational Institute of Crete, Greece) .....	285
<i>On the performance of SIP-based next generation emergency services</i> Eleftherios Sigioltzakis (Athens Metropolitan College, Greece), Ilias Politis (Athens Metropolitan College, Greece) .....	291
<i>Uncertainty management for wearable IoT wristband sensors using Laplacian-based Matrix Completion</i> Stavros Nousias (University of Patras, Greece), Christos Tselios (University of Patras & Citrix Inc., Greece), Dimitris Bitzas (University of Patras, Greece), Aris S. Lalos (University of Patras, Greece), Konstantinos Moustakas (University of Patras, Greece), Ioannis Chatzigiannakis (Sapienza University of Rome, Italy) .....	297
<i>Edge Caching Architecture for Media Delivery over P2P Networks</i> Yannis Nikoloudakis (University of the Aegean, Greece), Harry Skianis (University of the Aegean, Greece), Ilias Politis (University of Patras & Hellenic Open University, Greece), Constandinos X. Mavromoustakis (University of Nicosia, Cyprus), Evangelos K. Markakis (Technological Educational Institute of Crete, Greece), George Alexiou (Technological Educational Institute of Crete, Greece), Stavroula Bourazani (Technological Educational Institute of Crete, Greece), George Mastorakis (Technological Educational Institute of Crete, Greece), Evangelos Pallis (Technological Educational Institute of Crete, Greece) .....	303
<i>Considering CoMP for efficient cooperation among heterogeneous small cells in 5G networks</i> Panagiotis Georgakopoulos (University of Patras, Greece), Ilias Politis (University of Patras & Hellenic Open University, Greece), Stavros Kotsopoulos (University of Patras, Greece) .....	308
<i>High Quality Mobile XR: Requirements and Feasibility</i> Christer Qvarfordt (Huawei Technologies Sweden AB, Sweden), Henrik Lundqvist (Huawei Technologies, Sweden), Georgios P. Koudouridis (Huawei Technologies R&D Center Sweden, Sweden) .....	314

## Smart Grid

<i>Why Use RF Energy Harvesting in Smart Grids</i> Fernando Moreno Cruz (Infineon Technologies AG & University of Granada, Germany), Antonio Escobar (Infineon Technologies AG, Germany) .....	320
<i>Frequency Estimation for Grid-connected Converters under Time-varying Harmonics and Inter-harmonics</i> Eder B Kapisch (Universidade Federal de Juiz de Fora, Brazil), Jorge Duarte (Eindhoven University of Technology, The Netherlands), Carlos Duque (UFJF, Brazil), Gabriel Tibola (Eindhoven University of Technology, The Netherlands) .....	326
<i>PV cell characteristic extraction to verify power transfer efficiency in indoor harvesting system</i> Luca Perilli (University of Bologna, Italy), Matteo Pizzotti (University of Bologna, Italy), Luca Perugini (University of Bologna, Italy), Eleonora Franchi (University of Bologna, Italy), Roberto Canegallo (ST Microelectronics, Italy) .....	332
<i>Plug and Play DC-DC Converters for Smart DC Nanogrids with Advanced Control Ancillary Services</i> Guangyuan Liu (University of Padova, Italy), Paolo Mattavelli (University of Padova, Italy), Aram Khodamoradi (University of Padova, Italy), Tommaso Caldognetto (University of Padova, Italy), Paolo Magnone (University of Padova, Italy) .....	338
<i>A CMOS RF-Powered Tag with Sensing and Localization Capabilities</i> Cinzia Tamburini (University of Bologna, Italy), Matteo Pizzotti (University of Bologna, Italy), Federico Alimenti (University of Perugia, Italy), Marco Virili (University of Perugia, Italy), Michele Dini (University of Bologna, Italy), Marco Crescentini (University of Bologna, Italy), Paolo Mezzanotte (University of Perugia, Italy), Luca Roselli (University of Perugia, Italy), Marco Tartagni (University of Bologna, Italy), Aldo Romani (University of Bologna, Italy) .....	344

## Network Architectures and Protocols

<i>A New Joint Scheduling Scheme for GBR and non-GBR Services in 5G RAN</i> Salvatore Riolo (University of Catania, Italy), Daniela Panno (University of Catania, Italy) .....	349
<i>Coaxial Networks for 5G Fronthaul</i> Diogo Acatauassu (UFPA, Brazil), Marx Miranda de Freitas (Federal University of Pará & Electromagnetism Laboratory Applied (LEA), Brazil), Joao Weyl Costa (Universidade Federal do Pará - UFPA, Brazil), Eduardo Medeiros (Lund University, Sweden), Igor Almeida (Ericsson, Brazil), Andre Mendes Cavalcante (Ericsson & Ericsson Research, Brazil) .....	355
<i>End-to-End Simulation of Integrated Access and Backhaul at mmWaves</i> Michele Polese (University of Padova, Italy), Marco Giordani (University of Padova, Italy), Arnab Roy (InterDigital Communications, USA), Sanjay Goyal (InterDigital Communications, USA), Douglas Castor (InterDigital, USA), Michele Zorzi (University of Padova, Italy) .....	361
<i>An Efficient Mode Selection for improving Resource Utilization in Sidelink V2X Cellular Networks</i> Haider Albonda, JrAlbonda (Spain, Spain), Jordi Pérez-Romero (Universitat Politècnica de Catalunya (UPC), Spain) .....	368
<i>Automatic Roaming Consortium Discovery and Routing for Large-Scale Wireless LAN Roaming Systems</i> Kazunari Irie (Tohoku University, Japan), Hideaki Goto (Tohoku University, Japan) .....	374
<i>A QoE monitoring solution for LTE-Advanced Pro networks</i> Elisavet Grigoriou (University of Cagliari, Italy), Theocharis Saoulidis (Alexander Technological Educational Institute of Thessaloniki, Greece), Luigi Atzori (University of Cagliari, Italy), Virginia Pilloni (University of Cagliari, Italy), Periklis Chatzimisios (Alexander TEI of Thessaloniki and Bournemouth University, Greece) .....	380

## 5G and beyond networks II

<i>5GC+: an Experimental Proof of a Programmable Mobile Core for 5G</i>	
Umberto Fattore (NEC Laboratories Europe GmbH, Germany), Fabio Giust (Athonet S. r. l., Italy), Marco Liebsch (NEC Europe Ltd, Germany) .....	386
<i>Application and Network VNF migration in a MEC-enabled 5G Architecture</i>	
Ioannis Sarrigiannis (Iquadrat Informatica S. L., Spain), Elli Kartsakli (IQUADRAT, Spain), Kostas Ramantas (Iquadrat Informatica, Greece), Angelos Antonopoulos (Telecommunications Technological Centre of Catalonia (CTTC), Spain), Christos Verikoukis (CTTC & UB, Spain) .....	392
<i>On the Performance of Covariance Shaping in Massive MIMO Systems</i>	
Placido Mursia (Eurecom, France), Italo Atzeni (EURECOM, France), David Gesbert (Eurecom Institute, France), Laura Cottatellucci (University of Erlangen-Nuremberg, Germany) .....	398
<i>NB-IoT: A Candidate Technology for Massive IoT in the 5G Era</i>	
Subin Narayanan (National and Kapodistrian University of Athens, Greece), Dimitris Tsolkas (University of Athens, Greece), Nikos Passas (University of Athens, Greece), Lazaros Merakos (University of Athens, Greece) .....	404
<i>Dynamic Programming Based Content Placement Strategy for 5G and Beyond Cellular Networks</i>	
Tadege Mihretu Ayenew (National and Kapodistrian University of Athens, Greece), Dionysis Xenakis (University of Athens, Greece), Nikos Passas (University of Athens, Greece), Lazaros Merakos (University of Athens, Greece) .....	410
<i>Monitoring and Analytics for the Optimisation of Cloud Enabled Small Cells</i>	
Jordi Pérez-Romero (Universitat Politècnica de Catalunya (UPC), Spain), Vincenzo Riccobene (Intel, Ireland), Florian Schmidt (NEC Laboratories Europe, Germany), Oriol Sallent (Universitat Politècnica de Catalunya, Spain), Elisa Jimeno (ATOS, Spain), Javier Fernandez Hidalgo (I2CAT, Spain), Adam Flizikowski (IS-Wireless, Spain), Ioannis Giannoulakis (NCSR Demokritos, Greece), Emmanouil Kafetzakis (Orion Innovations P. C., Greece) .....	416