Selected Papers from the Tenth ITU Kaleidoscope Academic Conference


Mostafa Hashem Sherif


Kai Jakobs


Christoph Dosch


Alessia Magliarditi

This special section consists of updated articles that were originally presented at the 10th International Telecommunication Union's (ITU's) Kaleidoscope Academic Conference. The conference took place in Santa Fe, Argentina, 26–28 November, 2018, with the theme of "Machine Learning for a 5G Future," with the technical co-sponsorship of IEEE and the IEEE Communications Society. There were about 250 attendees from 18 countries and over 75 remote participants. The proceedings are available on the ITU website at https://www.itu.int/pub/T-PROC-KALEI-2018, and from the IEEE Xplore Digital Library. Pictorial highlights from the conference are available at https://www.flickr.com/photos/itupictures/sets/72157704797092705.

The ITU Kaleidoscope series of academic conferences started in 2008 to provide an interdisciplinary forum on the information and communication technologies (ICTs) that could be relevant to future telecommunication standards. Participants include researchers, academics, students, engineers, policymakers, and regulators as well as futurists from universities, industry, and research institutions. The subject of the next conference, for example, will be on ICT for Health and will be hosted by the Georgia Institute of Technology, in Atlanta, Georgia, United States, 4–6 December, 2019.

The first article in this selection won the first prize in the best paper category. The title is "Automation of 5G Network Slice Control Function with Machine Learning," and it is authored by Ved Kafle, Pedro Martinez-Julia, and Takaya Miyazawa from the National Institute of Information and Communications Technology, Japan. The article reviews the work carried in the Telecommunication Standardization Sector of ITU (ITU-T) that relates to the fifth generation (5G) wireless networks, particularly slicing (i.e., creation of virtual networks) within the wireline part of the end-to-end network. These slices are used for the automatic allocation of virtualized resources to achieve the quality of service (QoS) that a given category of services for the Internet of Things (IoT) would require. The tutorial covers planning and design, construction and deployment, and operations support, including dynamic resource allocation and adjustment, policy adaptation, mobility management, monitoring, fault management, and network security. Simulation results illustrate how machine learning (using lasso regression) can help forecast the demand for network resources.

The title of the second article is "QoE Enhancement in Next Generation Wireless Ecosystems: A Machine Learning Approach" by Eva Ibarrola, Mark Davis, Camille Voisin, Ciara Close, and Leire Cristobo. This article is a joint academia–industry contribution from the University of the Basque Country (UPV/EHU), Spain, Technological University Dublin, Ireland, and OptiWi-fi Ltd., Ireland. The authors review the standardization activities in the ITU-T related to a new QoS framework suitable for the next generation wireless ecosystem that will comprise heterogeneous technologies operating in diverse scenarios. In such an environment, ensuring that the QoS is met will be a major challenge facing network operators and service providers because many of the factors will be beyond their control. To address this situation, ITU-T is working on new recommendations related to QoS and users' quality of experience for the 5G era. The authors propose a methodology for global QoS management within the new QoS framework that uses supervised and unsupervised machine learning techniques to identify the relevant key quality indicators and to detect anomalies in network performance. The article presents a case study to validate the model in real-world deployment scenarios.

The final selection, "Using Deep Reinforcement Learning for Application Relocation in Multi-Access Edge Computing," is a joint contribution from two Italian universities. The authors are Fabrizio De Vita, Giovanni Nardini, Antonio Virdis, Dario Bruneo, Antonio Puliafito, and Giovanni Stea. They demonstrate how multi-access edge computing (MEC) can reduce latency, improve resource utilization, and leverage context and radio awareness. In particular, they show that reinforcement learning can be used to relocate applications in MEC scenarios by learning during the system evolution. Their simulations demonstrate the feasibility of this approach and highlight its benefits for future investigations.

In closing, the Editors would like to express their gratitude to the reviewers listed below in alphabetical order for their assistance in making the selections and for their generous advice to the prospective authors.

Bellavista, Paolo — University of Bologna, Italy
Dao, Nhu-Ngoc — Chung-Ang University, Seoul, Korea
Fei, Zesong — Beijing Institute of Technology, China
He, Ying — Carleton University, Ottawa, Ontario, Canada
Jian, Chunxiao — Tsinghua University, Beijing, China
Khan, Naimul — Ryerson University, Toronto, Ontario, Canada
Liang, Chengchao — Carleton University, Ottawa, Ontario, Canada
Mastorakis, Spyridon — University of California, Los Angeles, USA
Pérez-Romero, Jordi — Universitat Politecnica de Catalunya, Barcelona, Spain

Sallent, Oriol — Universitat Politecnica de Catalunya, Barcelona, Spain
Samdanis, Konstantinos — Huawei Europe, Düsseldorf, Germany
Velasco, Luis — Universitat Politecnica de Catalunya, Barcelona, Spain
Wang, Ying — Beijing University of Posts and Telecommunications, China
Zhao, Zhifeng — Zhejiang University, Hangzhou, China

Biographies

Mostafa Hashem Sherif (ms5285@att.com) retired from AT&T in 2017. He has a Ph.D. from the University of California, Los Angeles and an M.S. in the management of technology from Stevens Institute of Technology, New Jersey, and is a certified project manager of the Project Management Institute (PMI). Among the books he authored are *Protocols for Secure Electronic Commerce* (CRC Press, 3rd ed., 2016), *Paiements électroniques sécurisés* (Presses polytechniques et universitaires romandes, 2006), and *Managing Projects in Telecommunication Services* (Wiley, 2006).

Kai Jakobs (kai.jakobs@comsys.rwth-aachen.de) joined RWTH Aachen University's Computer Science Department in 1985. He holds a Ph.D. in computer science from the University of Edinburgh and is a Certified Standards Professional. His research interests focus on ICT standards and the underlying standardization process. Over time, he has (co)-authored/edited 20+ books and published 200+ papers. He is Vice President of the European Academy for Standardisation (EURAS) and founder/Editor-in-Chief of the *International Journal on Standardization Research*.

Christoph Dosch is a senior expert in terrestrial, cable, and satellite broadcasting. He graduated from Technical University Munich in 1976. In 2014, he retired as general manager, Collaborative Research, with the IRT (www.irt.de) but has continued working with this institute as liaison officer to ITU. He is Vice Chairman of the ITU Study Group on Broadcasting Service and especially active in spectrum management, multimedia applications, and access services for people with special needs.

Alessia Magliarditi is the ITU-T Academia Coordinator in the Telecommunication Standardization Policy Department of the ITU Telecommunication Standardization Bureau (TSB). She leads the TSB Academia team and coordinates various ITU academic initiatives, including the ITU Kaleidoscope academic conferences, as the main ITU interface with universities and research institutions. She also acts as Executive Editor-in-Chief of the scholarly, professional, digital *ITU Journal: ICT Discoveries*, which publishes original research on ICT technical developments and their policy and regulatory, economic, social, and legal dimensions. She holds an M.A. in social sciences from the University "La Sapienza" of Rome, and an M.A in international relations and diplomatic studies from "LUMSA" University of Rome.