Guest Editorial
Special Issue on Smart City-Networks

IN RECENT years, there has been a growing interest in sustainable and smart cities. Increasingly, cities need more efficient water, transportation, and energy systems to address various challenges, including a growing population, environmental and economic sustainability, and resiliency to natural disasters and unpredictable events. Advanced technologies for data collection, information processing, and decision-making are being developed, accompanied by advances in technologies for mitigating greenhouse gas emissions reduction such as renewables, electric vehicles (EVs), space heating, and industrial processes; altogether, these form the foundation for smart city networks and provide the focus for this special issue.

Typical examples of smart city networks are electrical distribution grids characterized by different nodes and/or clusters of microgrids, and transportation networks in which links represent roads and nodes represent crossings. Often, these networks are interconnected and interacting, examples of which are charging stations for EVs that couple power and transportation networks. District heating and electricity networks are often coupled, as are water distribution and district heating. In most of these networks, a common theme is an increasing shift toward solutions consisting of automation, digitalization, and networking through the Internet of Things (IoT), thereby underscoring the need for developing tools for collecting, monitoring, and processing large amounts of data, analyzing and synthesizing real-time control algorithms, and carrying out studies that are scalable and are capable of handling emergencies.

This special issue describes several new advances in the study of smart city networks, both from an application and methodological point of view. Most papers include a real case study to illustrate the impact on a city network. From an application point of view, the articles included are mostly related to transportation and energy networks, often integrated with information and communication technologies (ICT) networks and/or coupled through EVs. The following topics span transportation networks:

1) traffic networks with platoons of vehicles;
2) estimation of demands in transportation networks;
3) car-sharing systems;
4) smart parking lots;
5) optimal routing of vehicles.

Power and energy networks are represented by the following topics:

1) management of EVs within an electrical network;
2) security assessment of power systems;
3) optimal management of energy communities and sustainable districts with coupled electrical and thermal (district heating) networks;
4) optimal management of smart grids and microgrids;
5) optimal control of power supply facilities;
6) urban smart lighting.

Examples of ICT networks that are considered in the above applications span blockchain technology, platforms for management of city networks, and alleviation mechanisms for addressing congestion in urban roads by active and strategic management of messages to entice drivers to take socially beneficial routes.

From a methodological point of view, the articles propose, for the most part, decentralized, distributed, and hierarchical architectures. The following is a sample of approaches proposed in these articles:

1) a novel form of continuous-time primal–dual gradient dynamics and a real-time control method for the charging coordination of EVs in smart city networks;
2) a bilevel optimization problem transformed into a Quadratic Constraint Quadratic Program and solved through a feasible direction algorithm;
3) a new distributed optimization algorithm for integrated smart city networks, which ensures privacy of information exchange is characterized by a fast solution based on the Nesterov's algorithm;
4) a novel noncooperative control mechanism for optimally regulating the operation of power distribution networks (DNs) equipped with traditional loads, distributed generation, and active users;
5) a feedback control approach for solving optimal power flow problems in power DNs based on a projected gradient scheme, where the cost is given by the sum of functions of local power injections;
6) a two-stage distributed control strategy;
7) a multiagent deep reinforcement learning combined with a quantum machine learning approach to lead to a cooperative control strategy for smart grids and microgrids;
8) distributed state estimation for power systems together with a blockchain-based communication platform.

We would like to take this opportunity to thank all of the authors for their submissions and contributions. We would also like to thank many individuals who helped review the papers in a timely and professional manner and provided many excellent suggestions. The Editorial Assistant, Arij Barakat, provided valuable assistance. Last, but not least, we are grateful to the Editor-in-Chief, Jeff Shamma, for providing us with this great

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opportunity to put together this special issue and for his help in the final evaluation of papers.

MICHELA ROBBA, *Guest Editor*
Department of Informatics, Bioengineering
Robotics and Systems Engineering
University of Genoa, 16126 Genoa, Italy

GIULIO FERRO, *Guest Editor*
Department of Informatics, Bioengineering
Robotics and Systems Engineering
University of Genoa, 16126 Genoa, Italy

RONG SU, *Guest Editor*
School of Electrical and Electronic Engineering
Nanyang Technological University
Singapore 639798

CHRISTOS G. CASSANDRAS, *Guest Editor*
Division of Systems Engineering and the
Center for Information and Systems Engineering
Boston University, Boston, MA 02215 USA

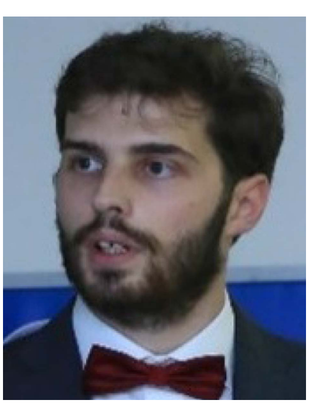
KARL H. JOHANSSON, *Guest Editor*
School of Electrical Engineering and Computer Science
KTH Royal Institute of Technology
114 28 Stockholm, Sweden

ANURADHA M. ANNASWAMY, *Guest Editor*
Department of Mechanical Engineering
Massachusetts Institute of Technology
Cambridge, MA 02141 USA

Michela Robba (Member, IEEE) received the degree in environmental engineering and the Ph.D. degree in electronic and computer engineering from the University of Genova, Genova, Italy, in 2000 and 2004, respectively.

She is currently an Associate Professor of Systems Engineering with the University of Genoa. She is the author of more than 130 publications in international journals, books, and proceedings of international conferences. Her research interests include optimization and control of smart grids, renewable energy resources, and natural resources management.

Prof. Robba is a member of the scientific board of the Italian Energy Cluster and Liguria Region Innovation Pole on Energy, Environment and Sustainable Development. Since 2019, she has been an Associate Editor for IEEE TRANSACTIONS ON AUTOMATION SCIENCE AND ENGINEERING, and since 2018, of *Energies* and *Journal of Control Science and Engineering*. She has joined several international programme committees at conferences in the field of control and optimization. She is a Lecturer for the courses “Simulation of energy and environmental systems,” “Models and methods for energy engineering,” and “Methods and models for logistics” with the Polytechnic School, University of Genova.



Giulio Ferro (Member, IEEE) received the B.S. degree in industrial engineering, the M.S. degree in power systems engineering, and the Ph.D. degree in systems engineering from the University of Genoa, Genoa, Italy, in 2014, 2016, and 2020, respectively.

He is currently an Assistant Professor with the University of Genoa. He was a Visiting Student with AAC Lab, MIT, Cambridge, MA, USA. His research interests include optimization and management of microgrids, distribution networks, and distributed optimization.

Rong Su (Senior Member, IEEE) received the Bachelor of Engineering degree in automatic control from the University of Science and Technology of China, Hefei, China, in 1997, and the Master of Applied Science and Ph.D. degrees in systems and control from the University of Toronto, Toronto, ON, Canada, in 2000 and 2004, respectively.

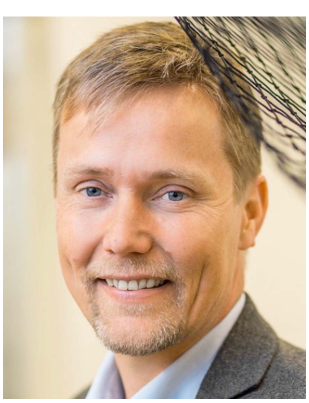
He was with the University of Waterloo, Waterloo, ON, Canada, and Technical University of Eindhoven, Eindhoven, The Netherlands, before he joined Nanyang Technological University, Singapore, in 2010. He has more than 230 journal and conference publications, one monograph, and 12 granted/filed patents on the topics of his research interests, which include multiagent systems, discrete-event system theory, model-based fault diagnosis, cybersecurity analysis and synthesis, control and optimization of complex networks with applications in flexible manufacturing, intelligent transportation, and green buildings.

Dr. Su is an Associate Editor for *Automatica* (IFAC), *Journal of Discrete Event Dynamic Systems: Theory and Applications*, and *Journal of Control and Decision*. He was the Chair of the Technical Committee on Smart Cities in the IEEE Control Systems Society in 2016–2019, and is currently a co-Chair of IEEE Robotics and Automation Society Technical Committee on Automation in Logistics. He is the recipient of the 2021 Hsue-shen Tsien Paper Award from *IEEE/CAA Journal of Automatica Sinica*, and an IEEE Distinguished Lecturer for IEEE Robotics and Automation Society.

Christos G. Cassandras (Life Fellow, IEEE) received the B.S. degree in engineering and applied science from Yale University, New Haven, CT, USA, in 1977, the M.S.E.E. degree in electrical engineering from Stanford University, Stanford, CA, USA, in 1978, and the S.B. and Ph.D. degrees in applied mathematics from Harvard University, Cambridge, MA, USA, in 1979 and 1982, respectively.

He is a Distinguished Professor of Engineering with Boston University, Boston, MA, USA. He is the Head of the Division of Systems Engineering, a Professor of Electrical and Computer Engineering, and a co-founder of Boston University's Center for Information and Systems Engineering (CISE). He has collaborated with MathWorks, Inc. in the development of the discrete event and hybrid system simulator SimEvents. He specializes in the areas of discrete event and hybrid systems, cooperative control, stochastic optimization, and computer simulation, with applications to computer and sensor networks, manufacturing systems, and transportation systems. He has authored or coauthored more than 500 refereed papers in these areas and six books.

Prof. Cassandras was the Editor-in-Chief of IEEE TRANSACTIONS ON AUTOMATIC CONTROL from 1998 to 2009 and is currently an Editor of *Automatica*. He was the 2012 President of the IEEE Control Systems Society and has been a plenary/keynote speaker at numerous international conferences, most recently, the 20th IFAC World Congress in 2017. He is the recipient of several awards, including the 2011 IEEE Control Systems Technology Award, the Distinguished Member Award of the IEEE Control Systems Society in 2006, the 1999 Harold Chestnut Prize (IFAC Best Control Engineering Textbook), 2011 and 2014 prizes for the IBM/IEEE Smarter Planet Challenge competition, and the 2014 Engineering Distinguished Scholar Award at Boston University. He is also a Fellow of the IFAC.



Karl H. Johansson (Fellow, IEEE) received the M.Sc. degree in electrical engineering and the Ph.D. degree in automatic control from Lund University, Lund, Sweden, in 1992 and 1997, respectively.

He is currently a Professor with the School of Electrical Engineering and Computer Science, KTH Royal Institute of Technology, Stockholm, Sweden, and the Director of Digital Futures. He has held visiting positions with UC Berkeley, USA; Caltech, USA; NTU, Singapore; HKUST Institute of Advanced Studies, Hong Kong; and NTNU, Norway. His research interests include networked control systems and cyberphysical systems with applications in transportation, energy, and automation networks.

Dr. Johansson is the President of the European Control Association and a member of the IFAC Council, and has served on the IEEE Control Systems Society Board of Governors and the Swedish Scientific Council for Natural Sciences and Engineering Sciences. He is a recipient of several best paper awards and other distinctions from IEEE, IFAC, and ACM. He has been awarded the Swedish Research Council Distinguished Professor, Wallenberg Scholar with the Knut and Alice Wallenberg Foundation, Future Research Leader Award from the Swedish Foundation for Strategic Research, the triennial IFAC Young Author Prize, and IEEE Control Systems Society Distinguished Lecturer. He is a Fellow of the Royal Swedish Academy of Engineering Sciences.

Anuradha M. Annaswamy (Life Fellow, IEEE) received the undergraduate degree from the Indian Institute of Science Karnataka, India and the M.S. and Ph.D. degrees from Yale University, New Haven, CT, USA.

He is a Founder and the Director of the Active-Adaptive Control Laboratory, Department of Mechanical Engineering, MIT, Cambridge, MA, USA. She is the author of a graduate textbook on adaptive control, co-editor of two vision documents on smart grids as well as two editions of the Impact of Control Technology report, a coauthor of a 2021 National Academy of Sciences, Engineering, and Medicine (NASEM) Committee report on the Future of Electric Power in the United States, and a member of another NASEM study on the role of net-metering in the evolving electricity system. She has been a Faculty Lead in the Electric Power Systems workstream with the MIT Future Energy Systems Center since 2021. Her research interests include adaptive control theory and its applications to aerospace, automotive, propulsion, and energy systems as well as cyberphysical systems, such as smart grids, smart cities, and smart infrastructures.

Ms. Annaswamy is a recipient of best paper awards (Axelby; CSM), as well as Distinguished Member and Distinguished Lecturer awards from the IEEE Control Systems Society (CSS) and a Presidential Young Investigator award from NSF. She is a Fellow of the International Federation of Automatic Control. She is the recipient of the Distinguished Alumni award from the Indian Institute of Science for 2021. She was the President of CSS in 2020.