

Editorial

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Editor-in-Chief

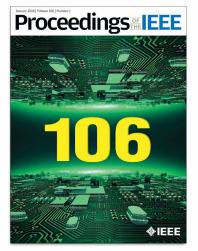
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Managing Editor

Every once in a while, a new technology, an old problem, and a big idea turn into an innovation.

—Dean Kamen

The year 2018 is almost here! We are excited to announce the wide range of topics we will be covering next year. As always, we will continue to cover the key technological developments in electrical and computer engineering, as well as computer science, through our many special issues and papers. Edited and authored by leading experts from around the world, our issues and papers hope to provide insight into areas outside your research expertise and



help you broaden your knowledge. We also hope that in addition to helping you keep on top of technological developments, they will inspire you to innovate and contribute to the progress in your own areas of research. A particular method or implementation from one area could very well provide a solution in another!

As per the 2016 Journal Citation Reports, the Proceedings of the IEEE was ranked in the top five journals in electrical engineering by Impact Factor and Article Influence Score—this is a testament to the journal's continued high impact and influence.

Before going into detail about the special issue topics, we would like to share some other developments for the journal.

I. NEW WEBSITE

The new website for the Proceedings of the IEEE was launched in March 2017 and can be found at: http://proceedingsoftheieee.ieee.org. The website offers readers a comprehensive overview of the journal. It highlights articles from the previous three issues and provides an insight into topics for upcoming issues. The site also posts abstracts of feature articles chosen by the editors, as well as links to the journal's most downloaded articles in recent months. Instructions for editors and authors on how to prepare and submit proposals for special issues and articles are also available. Additionally, the website provides some insight into how the journal has documented and influenced the major developments in technology, for more than a century, and how it continues to be a leading journal in electrical engineering. We urge you to visit the website if you have not already done so. Feedback about the website is always welcome and can be sent to proceedings@ieee.org.

II. WEBINARS

In 2016, we offered two free online forums to complement our special issue content. In 2017, we reestablished this initiative as the Proceedings OF THE IEEE Webinar Series. Webinars on the topics of additive manufacturing for RF components, technologies for brain research, and emerging 3-D imaging and display technologies were held in May, June, and October, respectively. The recorded versions of the webinars can still be accessed from our webpage. We plan to offer such webinars again in 2018, and are currently investigating suitable topics for the same.

III. UPCOMING SPECIAL **ISSUES**

Now let us take a closer look at what we have planned for Volume 106 in 2018.

During 2018, we will be publishing a total of ten special issues on a diverse range of topics with practical, fully referenced articles that will be of interest for researchers in electrical and computer engineering, and computer science.

A. Small Satellites

Guest Editors: Steven Gao, University of Kent, U.K.; Martin N. Sweeting, Surrey Satellite Technology Ltd., U.K; Shinichi Nakasuka, University of Tokyo, Japan; S. Pete Worden, Breakthrough Prize, USA; Silvio Ernesto Barbin, University of Sao Paulo, Brazil.

This special issue will cover recent developments in small satellites, which have undergone rapid development during the past three decades, and found wide applications in education, earth observation, wireless communications, and space science missions. The papers will cover different aspects of small satellites, spanning topics from a comprehensive review of small satellites development, to advanced technologies for propulsion, energy storage, antennas, attitude and orbit control, onboard processing, radar technologies, robotics and autonomous systems, deployable technologies, and debris measurement technology. The final part will include examples of small satellite development and applications for remote sensing and earth observation missions.

B. Safe and Secure Cyber-**Physical Systems**

Guest Editors: Marilyn Georgia Tech, USA; Dimitrios Serpanos, QCRI/University of Patras, Greece.

Safety has been a traditional concern of physical system designers. The introduction of computing elements to create cyber-physical systems (CPSs) has opened up a vast new range of potential problems that do not always show up on the radar of traditional system designers. Many of these problems are security oriented and reflect the threat posed by organized, deliberate attacks. Many other problems that affect reliability are due to the presence of bugs and software misdesign.

This special issue will offer a comprehensive view of cyber-physical safety and security. The proposed contributions will capture the set of emerging approaches to CPS safety and security such as design-time versus runtime approaches, formal methods in architecture and software design, attack surface analysis and mitigation, and security and safety in long-lived systems. In order to guarantee that CPSs can be integrated as a reliable system, the issue will cover technologies, methods, tools, and architectures that provide security and safety overall.

C. From High-Level Specification to High-**Performance Code**

Guest Editors: José M. F. Moura, Carnegie Mellon University, USA; David A. Padua, University of Illinois at Urbana-Champaign, USA; Jack Dongarra, University of Tennessee Knoxville, USA; Franz Franchetti, Carnegie Mellon University, USA.

Computer architectures and systems are becoming more and more powerful, and increasingly more complex at the same time. In the era of multicore, manycore, accelerator processors, it is exceedingly hard to extract the promised performance, especially at a reasonable energy budget. To avoid a serious underutilization of computer systems, because of potentially inefficient programming, the last ten years have seen a flurry of activity to automate the design and generation of highly efficient implementations for these multicore and manycore architectures, and to translate high-level descriptions of programs into high performance and power efficiency.

This special issue will cover recent advances on program translation, software synthesis, and automatic performance tuning in the context of compilers and library generators, performance engineering, program generation, domain-specific languages, and hardware synthesis. It will cover the range of machines from the smallscale (mobile/cell phone) level to the largest supercomputer installations and show that the underlying problems and techniques are remarkably similar.

D. Foundations and Trends in **Localization Technologies**

Guest Editors: Moe Z. Win, Massachusetts Institute of Technology, USA; R. Michael Buehrer, Virginia Tech, USA; George Chrisikos, Qualcomm Inc., USA; Andrea Conti, University of Ferrara, Italy; H. Vincent Poor, Princeton University, USA.

Real-time location awareness is essential for current and future wireless applications, particularly for 5G, Wi-Fi, and sensor networks. Reliable localization and navigation is a critical component for a diverse set of applications including smart cities, logistics, security tracking, medical services, search and rescue operations, automotive safety, and military systems. The coming years will see the emergence of location awareness in challenging environments with submeter accuracy and minimal infrastructure requirements.

This special issue will cover the foundations and trends of localization and navigation technologies, with an emphasis on foundations and applications as well as experimentation and applications.

E. Machine Ethics: The Design and Governance of Ethical AI and Autonomous Systems

Guest Editors: Alan Winfield, University of the West of England (UWE), U.K.; Katina Michael, University of Wollongong, Australia; Jeremy Pitt, Imperial College London, U.K.; Vanessa Evers, University of Twente, The Netherlands.

This special issue primarily focuses on machine ethics, which is the question of how autonomous systems can be imbued with ethical values. Ethical autonomous systems are needed because, inevitably, near future systems are moral agents; consider driverless cars, or medical diagnosis AIs, both of which will need to make choices with ethical consequences. Papers in this issue will deal with both implicit ethical agents, that is machines designed to avoid unethical outcomes, and explicit ethical agents, that is machines which either explicitly encode or learn ethics and determine actions based on those ethics. Some papers will also explore the educational, societal, and regulatory implications of machine ethics, including the issue of ethical governance.

F. Design Automation for Cyber-Physical Systems

Guest Editors: Alberto Sangiovanni Vincentelli, University of California, Berkeley, USA; Shiyan Hu, Michigan Technological University, USA; Xin Li, Carnegie Mellon University, USA; Qi Zhu, University of California, Riverside, USA; Charles Alpert, Cadence Design Systems, USA.

Cyber-physical systems (CPSs), such as autonomous and semiautonomous vehicles, industrial robots, and medical devices, promise immense economic and societal benefits. The design and operation of CPSs, however, faces tremendous challenges from the fast increase of system scale and complexity; the close interaction with dynamic physical environment and human activities; the adoption of multicore and distributed architectural platforms; and the stringent and diverse requirements on performance, safety, security, fault tolerance, extensibility, and energy consumption.

Papers in this special issue will focus on challenges and present promising solutions in modeling, simulation, synthesis, validation, and verification of CPSs. They will demonstrate the importance of design automation techniques in a variety of application domains, such as automotive and transportation systems, avionics, buildings, grid, and medical devices.

G. Smart Cities

Guest Editors: Gilles Betis, IEEE Smart Cities Initiatives, France; Christos G. Cassandras, Boston University, USA; Carlo Alberto Nucci, University of Bologna—DEI, Italy.

In the coming years, cities worldwide will need to make some drastic changes to their infrastructure as they need to provide an increasing number of services to the ever increasing urban population to meet overarching goals such as sustainability, safe environment, quality of life, and energy saving, to name a few. Several technologies, which are today labeled with the ubiquitous word "smart," need to be successfully employed for the development of suitable modeling tools and smart solutions of such sociotechnical systems. In this complex and challenging picture, people living in the city or using its facilities can be labeled as "smart" as well, in that they own portable smart devices communicating with existing information and communication technology networks, which are instrumental to the accomplishment of such a goal.

This special issue will cover recent advances in the area of smart cities with a focus on the following topics: smart/sustainable energy systems (including smart grids); infrastructures and technologies; mobility/transportation; data collection and management; smart buildings; and social factors, citizen involvement, and collaborative economy.

H. Applications of Graph Theory

Guest Editors: Tulay Adali, University of Maryland, Baltimore County, USA; Antonio Ortega, University of Southern California, USA.

Graph-theoretical methods, those that rely on a graphical representation, are being increasingly used in many areas of research. Graphs are mathematical abstractions that can be used to represent networks of various types: physical (e.g., the Internet or electrical networks), biological (e.g., brain networks), or social (e.g., online social networks). Furthermore, graphs can provide tools for a flexible representation for data sets in which data points have "irregular" positions with respect to each other. Common examples of this include data sets acquired by a sensor network, where uniform sensor placement may not be possible, or machine learning data sets, where training samples are not uniformly distributed in feature space. In some instances, a graphical representation arises as a natural way to describe the problem, while in other areas, e.g., image processing, they are being used to develop powerful, content-dependent alternatives to conventional processing tools.

Given the activity across various disciplines, both in terms of theory and applications, the aim of this special issue is to provide an overview of the recent results and advances in graphtheoretical methods across a broad spectrum of areas where their use has proven fruitful. While doing so, it will provide a platform for exchange of ideas across these different areas, and also present a comprehensive overview to the readers.

I. Rethinking PCA for Modern Data Sets: Theory, Algorithms, and Applications

Guest Editors: Namrata Vaswani, Iowa State University, USA; Yuejie Chi, Ohio State University, USA; Thierry Bouwmans, Universit de La Rochelle, France.

In today's big and messy data age, there is a lot of data everywhere around us. Before processing any big data set, the first step is to perform dimension reduction and noise/outlier removal. The most popular way to do this is via principal component analysis (PCA). A popular approach to simultaneously remove noise or outliers is via solving the robust PCA problem. PCA is often the first step in various types of exploratory data analysis, predictive modeling, classification, and clustering problems. It finds applications in biomedical imaging, computer vision, process fault detection, recommendation systems' design, and many more domains. Classical PCA, without constraints, and for clean data, is a solved problem. On the other hand, robust PCA, which refers to the problem of PCA in the presence of outliers, is a much harder problem and one for which provably correct solutions have started appearing only recently. The same is true for PCA with missing data (and the related low rank matrix completion problem) as well as for sparse PCA, which refers to the PCA problem when the principal components are assumed to be sparse. In fact, even

the classical PCA problem with speed or memory constraints is not a solved problem.

These issues have become practically important for modern data sets for several reasons and, while PCA is a problem that has been studied for over a century, these issues have started becoming important only in the last decade or less. This special issue will highlight the state of the art in this area of research.

J. Silicon Photonics

Guest Editors: Christopher Doerr, Acacia Communications, USA; Roel Baets, Ghent University, Belgium.

Silicon photonics is the integration of optical waveguides, filters, modulators, receivers, splitters, and related functions on a silicon die. The primary applications are in fiber-optic communication and optical sensors. This special issue will give a historical background, a tutorial, and state-ofthe-art progress in industry and academia in this new field. The issue will clearly identify what has been successful commercially, what has not been, and what technologies are the most promising for the future.

IV. REGULAR PAPERS

During 2018, we will continue to publish invited and contributed papers in the journal. We are pleased to bring to you tutorial and survey papers, which

will provide insight into a broad range of areas and applications.

V. CONCLUSION

We hope that you find our lineup of special issues to be as exciting as we do. Going into our 106th year, we will continue to enhance our offerings with new features while maintaining the impact and influence of the journal. Last but not least, you can reach us via e-mail at proceedings@ieee.org or via our social media pages on Facebook and LinkedIn. We look forward to hearing from you, our readers, and welcome you to participate actively in our new endeavors.