Guest EditorialSpecial Issue on Selected Papers from IEEE BioCAS 2017

Guest Editorial—Special Issue on Selected Papers From IEEE BioCAS 2017

Maurizio Martina, Fernando Corinto and Sandro Carrara

This special issue of the IEEE TRANSACTIONS ON BIOMEDICAL CIRCUITS AND SYSTEMS presents a selection of high quality research papers from the 2017 IEEE Biomedical Circuits and Systems Conference (BioCAS) in Torino, Italy, from October 19–21, 2017. As in previous years, BioCAS 2017 was jointly sponsored by the IEEE Circuits and Systems (CAS) Society and the IEEE Engineering in Medicine and Biology (EMB) Society. At the crossroads of medicine, life sciences, physical sciences and engineering, exciting interdisciplinary research and development activities are taking place that shape tomorrow's healthcare and well-being. The BioCAS conference serves as a premier international forum for these activities. BioCAS 2017 received a total of 306 papers from all over the world with a 9% increase compared to BioCAS 2016. The papers came from all over the world with a split of about 27% from Asia, 43% from Europe, 20% from North America, and the rest from other parts of the world. Out of these, only 207 top papers were accepted after a thorough review process, resulting in an acceptance rate of 68%. The papers in this special issue were selected out of the total of 207 accepted papers based on technical review scores from independent experts worldwide who reviewed these papers for the conference program. Multiple rounds of peer review in the TRANSACTIONS resulted in the following 13 papers for this special issue, which correspond indeed to the top-6% of the best presented at the conference. The papers cover several topics and can be combined in 4 broad categories. as per the follow:

1) *Biomedical Imaging and Signal Processing*: Novel imaging and signal processing approaches along with prototypes:
   a) *Towards Ultrasound Everywhere: A Portable 3D Digital Back-End Capable of Zone and Compound Imaging* by A. Ibrahim et al.
   b) *Real-Time Event-Driven Classification Technique for Early Detection and Prevention of Myocardial Infarction on Wearable Systems* by D. Sopic et al.
   c) *Adaptive Image Enhancement Based on Guide Image and Fraction-Power Transformation for Wireless Capsule Endoscopy* by M. Long et al.
2) *Bio-Inspired and Neuromorphic Circuits and Systems*: Microelectronic circuitry that emulates the function and structure of biological neural systems for a better understanding of the brain function and development of intelligent sensory and computational systems:
   a) *Analysis and Simulation of Capacitor-Less ReRAM-Based Stochastic Neurons for the in-Memory Spiking Neural Network* by J. Lin and J.-S. Yuan.
   b) *Parallel Distribution of an Inner Hair Cell and Auditory Nerve Model for Real-Time Application* by R. James et al.
   c) *A Mixed-Signal Structured AdEx Neuron for Accelerated Neuromorphic Cores* by S. A. Aamir et al.
3) *Biosensors and Imagers*: Combining nanotechnology, MEMS, integrated and programmable electronics to allow for innovative bio-sensing techniques and leading to new applications in clinical research and healthcare:
   a) *CMOS Luminescence Imager With Ambient Light Compensation and Lifetime to Frequency Conversion* by G. Fu and S. Sonkusale.
   b) *Heterogeneous Integration of CMOS Sensors and Fluidic Networks Using Wafer-Level Molding* by M. Lindsay et al.
   c) *An IoT Solution for Online Monitoring of Anesthetics in Human Serum Based on an Integrated Fluidic Bioelectronic System* by F. Stradolini et al.
4) *Implantable Electronics and Neural Implants*: Microelectronic circuits for acquiring, conditioning, and processing physiological signals as well as for data transmission and remote powering of implanted medical devices:
   a) *A High-Resolution Opto-Electrophysiology System With a Miniature Integrated Headstage* by A. E. Mendrela et al.
   b) *Implantable Wireless Intracranial Pressure Monitoring Based on Air Pressure Sensing* by H. Jiang et al.
   c) *Chip-Scale Coils for Millimeter-Sized Bio-Implants* by P. Feng et al.
   d) *End-to-End Design of Efficient Ultrasonic Power Links for Scaling towards Sub-Millimeter Implantable Receivers* by T. C. Chang et al.

The Guest Editors would like to thank the BioCAS 2017 Technical Program Committee members for soliciting and selecting high quality papers in the symposium and our colleagues that helped us in the review process of the selected papers. We also owe our deepest gratitude to Dr. Mohamad Sawan as the Editor-in- Chief of IEEE TRANSACTIONS ON BIOMEDICAL CIRCUITS AND SYSTEMS. We also wish to thank the IEEE support staff for their efforts in finalizing this special issue.

MAURIZIO MARTINA, *Guest Editor*
Politecnico di Torino, Italy.

FERNANDO CORINTO, *Guest Editor*
Politecnico di Torino, Italy.

SANDRO CARRARA, *Guest Editor*
École Polytechnique Fédérale de Lausanne, Switzerland.

Maurizio Martina (S'98-M'94-SM'15) received the M.S. and Ph.D. in electrical engineering from Politecnico di Torino, Italy, in 2000 and 2004, respectively. He is currently an Associate Professor of the VLSI-Lab group, Politecnico di Torino. His research interests include VLSI design and implementation of architectures for digital signal processing, video coding, communications, artificial intelligence, machine learning and event-based processing. He published 3 book chapters on VLSI architectures and digital circuits for wireless communications and error correcting codes. He has more than 100 scientific publications and is author of 2 patents. He is now an Associate Editor of IEEE Transactions on Circuits and Systems - I, Hindawi VLSI Design and Journal of Circuits, Systems and Computers. He has been Tutorials, Special Sessions, and Awards co-Chair of NGCAS 2017 and part of the organizing committee, demo co-Chair and treasurer of IEEE BioCAS 2017. Recently, he has been guest editor of two special issues of selected papers from NGCAS 2017 (JOLPE and Integration, the VLSI Journal). In 2012 he had been guest editor of a special issue on VLSI Circuits, Systems, and Architectures for Advanced Image and Video Compression Standards, (Hindawi VLSI Design). He is a member of the Circuits and Systems Society and reviewer for several journals and conferences of the CAS society. Currently, he is the counselor of the IEEE Student Branch at Politecnico di Torino and a professional member of IEEE-HKN. In 2013 he received the CLEANTECH award for the "Ecolumiere" project at Start Cup 2013, where the project was ranked 4th. The same year the "Ecolumiere" project won the National CLEANTECH award at PNI 2013, where the project was ranked 1st. He is co-founder of a startup, which has been awarded with the "Premio dei Premi per l'innovazione" by Prof. Stefania Giannini, head of the Italian Ministry of Education, Universities and Research in 2014.

Fernando Corinto (M'03–SM'10) received the master's degree in electronic engineering, the Ph.D. degree in electronics and communications engineering, and the European Doctorate from the Politecnico di Torino in 2001, 2005, and 2005, respectively. He is currently an Associate Professor of circuit theory with the Department of Electronics and Telecommunications, Politecnico di Torino. His research activities are mainly on nonlinear circuits and systems, locally coupled nonlinear/nanoscale networks, and memristor nanotechnology. Prof. Corinto was awarded the Marie Curie Fellowship in 2004. He has co-authored six book chapters and more than 130 international journal and conference papers. He is the Chair of the IEEE CAS Technical Committee on Cellular Nanoscale Networks and Array Computing and a member of the IEEE CAS TC Nonlinear Circuits and Systems. He serves as the Vice Chair of the IEEE North Italy CAS Chapter. He is the Vice Chair of the COST Action: Memristors-Devices, Models, Circuits, Systems and Applications. He was a DRESDEN Senior Fellow with the Technische Universitat Dresden in 2013 and 2017. He was an August-Wilhelm Scheer Visiting Professor with Technische Universitat Mfcnchen in 2016. He is also a member of the Institute for Advanced Study-Technische Universitat Munchen. He was an Associate Editor of the IEEE TRANSACTIONS ON CIRCUITS AND SYSTEMS—I: REGULAR PAPERS from 2014 to 2015. He has been on the Editorial Board and has been a Review Editor of the International Journal of Circuit Theory and Applications since 2015.

Sandro Carrara is an IEEE Fellow for his outstanding record of accomplishments in the field of design of nanoscale biological CMOS sensors. He is also the recipient of the IEEE Sensors Council Technical Achievement Award in 2016 for his leadership in the emerging area of co-design in Bio/Nano/CMOS interfaces. He is a faculty member (MER) at the EPFL in Lausanne (Switzerland). He is former professor of optical and electrical biosensors at the Department of Electrical Engineering and Biophysics (DIBE) of the University of Genoa (Italy) and former professor of nanobiotechnology at the University of Bologna (Italy). He holds a PhD in Biochemistry Biophysics from University of Padua (Italy), a Master degree in Physics from University of Genoa (Italy), and a diploma in Electronics from National Institute of Technology in Albenga (Italy). His scientific interests are on electrical phenomena of nano-bio-structured films, and include CMOS design of biochips based on proteins and DNA. Along his carrier, he published 7 books, one as author with Springer on Bio/CMOS interfaces and, more recently, a Handbook of Bioelectronics with Cambridge University Press. He has more than 250 scientific publications and is author of 13 patents. He is now Editor-in-Chief of the IEEE Sensors Journal, the largest journal among 180 IEEE publications; he is also founder and Editor-in-Chief of the journal BioNanoScience by Springer, and Associate Editor of IEEE Transactions on Biomedical Circuits and Systems. He is a member of the IEEE Sensors Council and his Executive Committee. He was a member of the Board of Governors (BoG) of the IEEE Circuits And Systems Society (CASS). He has been appointed as IEEE Sensors Council Distinguished Lecturer for the years 2017-2019, and CASS Distinguished Lecturer for the years 2013-2014. His work received several international recognitions as best-cited papers or best conference papers. He has been the General Chairman of the Conference IEEE BioCAS 2014, the premier worldwide international conference in the area of circuits and systems for biomedical applications.