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Guest editorial: Special issue on selected papers from IEEE BioCAS 2018

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Guest Editorial

Special Issue on Selected Papers From IEEE BioCAS 2018

THIS special issue of the IEEE TRANSACTIONS ON BIOMEDICAL CIRCUITS AND SYSTEMS presents a selection of high quality research papers from the 2018 IEEE Biomedical Circuits and Systems Conference (BioCAS 2018) in Cleveland, OH, USA, from October 17-19, 2018. Similar to previous years, BioCAS 2018 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 medical devices and healthcare systems. The BioCAS conference serves as a premier international forum for these activities.

BioCAS 2018 received a total of 270 submissions from around the world, with 51.1% from North America, 26.3% from Asia/Pacific, 20.4% from Europe, 1.1% from South America, and 1.1% from Africa. A total of 58 Review Committee Members (RCMs) coordinated the peer review of all submitted papers. A total of 1,117 reviews were received, with an average of over 4 reviews per paper. A total of 182 submissions were accepted into the program, resulting in an acceptance rate of ~67%. The Editors of this special issue considered the top 30 papers that were presented at the conference according to the technical review scores, and invited 20 to submit extended version and possible inclusion in the special issue. After communication with the authors and several rounds of peer reviewing process, we are here presenting the 8 accepted papers which represent the state of the art in the field as presented at BioCAS 2018. These papers cover a number of topics, but we would broadly put them into three categories: physiological signal processing techniques with clinical applications, wearable and implantable technologies, and neurotechnology as follows

1. *Physiological Signal Processing Techniques with Clinical Applications:* Neuromorphic computing for real-time processing of electromyography (EMG) signals, as well as use of deep learning to develop patient-specific epileptic seizure prediction technique from electroencephalography (EEG) signals:

- a) *Discrimination of EMG Signals Using a Neuromorphic Implementation of a Spiking Neural Network*, by E. Donati *et al.*
- b) *Efficient Epileptic Seizure Prediction based on Deep Learning*, by H. Daoud *et al.*

2. *Wearable and Implantable Technologies:* Compact electronic devices designed for wearable and/or implantable applications, as well as sensor interface circuit and system designs that can be applied to wearable scenarios:

- a) *Coherent UWB Radar-on-chip for In-body Measurement of Cardiovascular Dynamics*, by C. Lauteslager *et al.*
- b) *An Injectable System for Subcutaneous Photoplethysmography, Accelerometry, and Thermometry in Animals*, by J. Reynolds *et al.*
- c) *A Standalone Intraoral Tongue-Controlled Computer Interface for People with Tetraplegia*, by F. Kong *et al.*

3. *Neurotechnology:* Design of communication solutions used for brain computer interfaces, including backscatter data link and human body communication, as well as ultrasound neuromodulation implementation solutions:

- a) *A Comprehensive Study of Ultrasound Transducer Characteristics in Microscopic Ultrasound Neuromodulation*, by H. S. Gougheri *et al.*
- b) *A 25 Mbps, 12.4 pJ/bit Backscatter Data Uplink for the NeuroDisc Brain Computer Interface*, by R. Rosenthal *et al.*
- c) *An Improved Update Rate CDR for Interference Robust Broadband Human Body Communication Receiver*, by S. Maity *et al.*

The guest editors would like to thank the BioCAS 2018 Technical Program Committee (TPC) members for selecting high-quality papers as well as helping us in the initial phase of paper selection for inclusion in this special issue. Special thanks go to our colleagues who participated in the review process. 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.

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Laleh Najafizadeh (S'02–M'10–SM'17) received her B.Sc. degree from Isfahan University of Technology, Isfahan, Iran, her M.Sc. degree from the University of Alberta, Edmonton, AB, Canada, and her Ph.D. degree from the Georgia Institute of Technology, Atlanta, Georgia, USA, all in Electrical Engineering. From 2003 to 2004, she was with the iCORE Wireless Communications Laboratory at the University of Alberta, and from 2010 to 2012 she was a postdoctoral fellow at the National Institutes of Health (NIH), MD, USA. She is currently an Associate Professor in the Department of Electrical and Computer Engineering, at Rutgers University, Piscataway, NJ. Dr. Najafizadeh has co-authored two book chapters and more than 100 peer-reviewed papers in premier journals and conference proceedings. Her research has been supported by several agencies including the National Science Foundation (NSF), Defense Advanced Research Projects Agency (DARPA), and industry sponsors. She is the recipient of Texas Instruments Leadership Fellowship, Delta Kappa Gamma World Fellowship, and competitive scholarships from the Alberta Ingenuity Fund, and the Alberta Informatics Circle of Research Excellence. Together with her students she received the best student paper award

(Runner-Up) from the 2014 IEEE ISCAS.



Milin Zhang (S'06–M'11–SM'17) received the B.S. and M.S. degrees in electronic engineering from Tsinghua University, Beijing, China, in 2004 and 2006, respectively, and the Ph.D. degree from the Electronic and Computer Engineering Department, The Hong Kong University of Science and Technology (HKUST), Hong Kong. She was a Post-Doctoral Researcher with the University of Pennsylvania. In 2016, she joined the Department of Electronic Engineering, Tsinghua University, as an Assistant Professor. Her research interests include designing traditional and various nontraditional imaging sensors, such as polarization imaging sensors and focal-plane compressive acquisition image sensors. She is also interested in analog and mixed-signal circuit designs oriented for various applications. Dr. Zhang has been serving as a Technology Program Committee Member of the IEEE Asian Solid-State Circuits Conference (A-SSCC) since 2019, the IEEE Custom Integrated Circuits Conference (CICC) since 2018, and the IEEE ISSCC SRP Committee. She received the Best Paper Award of the BioCAS Track of the 2014 International Symposium on Circuits and Systems (ISCAS) and the Best Paper Award (first

place) of the 2015 Biomedical Circuits and Systems Conference (BioCAS).



Konstantin Nikolic (M'11) received the Dipl.Eng. and Masters degrees in applied physics from Belgrade University, Belgrade, Serbia, and the Ph.D. degree in physics from Imperial College London, London, UK (1994). Currently, he is an Associate Professor – Research (Senior Research Fellow) and Principal Investigator in the Institute of Biomedical Engineering and Department of Electrical and Electronic Engineering, Imperial College London. Previously he was an Assistant Professor and then Associate Professor in the Faculty of Electrical Engineering, University of Belgrade, Serbia. He leads a Bio-modeling group, which develops methods and computational tools for understanding, modelling and simulating various biological and physiological processes and their applications in bio-inspired electronic systems and diagnostics. He also leads the research programme which is developing a closed loop system for bimodal neural recording and neuro-stimulation. He has more than 100 scientific publications and is a co-author of several widely used university textbooks sold in almost 10,000 copies. He is an Associate Editor for the IEEE TRANSACTIONS ON BIOMEDICAL CIRCUITS AND SYSTEMS and a Member of the IEEE CAS Technical Committee and the Royal Society Neural Interfaces Steering Group.