IEEE Design&Test

Call for Contributions to Special Issue on

Event-triggered Circuits and Systems for Sparse Information Processing

Aim and Scope

Event-triggered systems are gaining importance because of data abundance. While a lot of data provides better knowledge and context for systems to actuate or trigger at the right moments, the amount of useful information that characterizes an *event-of-interest* is typically sparse. Intelligence is key to effectively extract this information from the vast amounts of data that are being sensed, transmitted, and stored. This Special Issue targets circuits, systems, and architectures that help us exploit intelligence to extract sparse information contained in data. The SIU will cover (see topics of interest) inventive information-theoretic approaches to enable energy-efficient circuits and systems, as well as integration of these approaches with physical layer hardware using advances in machine-learning, neuromorphic computing, sparse-sampling, and hardware-friendly stochastic/machine-learning approaches.

The dramatic growth in silicon-enabled devices with projections of multi-trillion resource-constrained mobile devices in the future are giving rise to deeply interconnected systems that anticipate, adapt, and control, while being autonomous and dependable. Yet these systems find themselves unsettled in important ways. Transmitting large amounts of raw data, for example, is inefficient, clogs the network, and requires charging batteries frequently for sensor nodes (e.g., unassisted ground sensors). The problems of high-dimensional data transmission across the network and low-energy consumption can be resolved through *event-triggered* circuits and systems capable of autonomously maintaining required performance with high energy-efficiency. *Event-triggered* designs minimize run-time power consumption leveraging the context (e.g., recent events or power consumption/energy) for the specific dataset (e.g., biophysiological markers or communication spectrum). The systems also reduce energy by trading compression as a dynamic knob (against sampling frequency and computation) related to the input context. In recent years, machine/deep learning algorithms have unprecedentedly improved the accuracy of practical recognition and classification tasks, some even surpassing human-level performance. In alignment with this trend, integration of mixed-signal integrated circuits with stochastic event-driven computing can enable a new generation of computers that can be applied to a wide range of applications ranging from next-generation of communication receivers to data processing for internet-of-things.

In this context, this SI on event-triggered circuits and systems seeks research works including (but not limited to) feature-extracting radio front-ends, non-uniform-sampling, multiply-accumulate (MAC) operations, stochastic methods that consider energy- and cost-efficiency as parameters. The above challenges require a highly cross-disciplinary collective effort, as they lie at the intersection of circuits and systems, statistical signal processing, solid-state circuits, CAD, architectures, machine learning, signal processing (e.g., computer vision, audio), applied information-theory and the related communities. Accordingly, the authors of this special issue will be invited to submit their paper contributions on the

following and other topics related to energy-quality scalable systems: The aim is to offer readers a clear perspective of the rich landscape of both academic and industrial endeavor in event-triggered circuits, systems and architectures from application of information-theoretic concepts to design and implementation. The special issue will not only showcase the state-of-the-art but also articulate the innovations and advances for universal adoption of such technologies in applications such as emerging sensor networks, neurocomputing, mixed/virtual reality, wearable/implantable biomedical body sensor networks, next-generation communication (5G/Beyond-5G), wireless communication networks, GHz/THz computing, and hardware security.

Topics of interests include but not limited to:

- Non-Nyquist sampling
- Adaptive analog-to-information converters
- Statistical signal processing
- Deep learning with adaptive sensing
- Quantized compressive sensing
- Distributed sensing and inferencing
- On sensor, in-memory, and in-network data processing
- Sensing, modeling, storage and transfer of sparse data
- Asynchronous circuits (*e.g.,* neuromorphic processors, continuous-time digital signal processing, sparse sensor data processors)
- Spiking neural networks and neuromorphic computing
- Approximate computing with single and multi-class classifiers

Schedule

- Submission Deadline: Feb. 25th, 2019
- Notification First Round: April 8th, 2019
- Submission of Revision: May 8th, 2019
- Final Notification: June 8th, 2019
- Final Papers Due: June 22nd, 2019

Guest Editors

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