Compressive Sensing Techniques for Low-Power Sensor Design

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BIO
Nan Sun is Temple Foundation Endowed Associate Professor in the Department of Electrical and Computer Engineering at the University of Texas at Austin. He received the B.S. degree from Tsinghua University, Beijing, China in 2006, where he ranked top and graduated with the highest honor. He received the Ph.D. degree from Harvard University in 2010. Dr. Sun received the NSF Career Award in 2013. He serves on the Technical Program Committee of the IEEE Custom Integrated Circuits Conference and the IEEE Asian Solid-State Circuit Conference. He is an Associate Editor of the IEEE Transactions on Circuits and Systems – I: Regular Papers, and a Guest Editor of the IEEE Journal of Solid-State Circuits. He also serves as IEEE Circuits-and-Systems Society Distinguished Lecturer from 2019 to 2020.

ABSTRACT
Conventional sensor front-end designs all follow the Nyquist theorem that the data acquisition rate must be at least twice the signal bandwidth. Nevertheless, it is not an efficient way to capture a sparse signal, for its information rate can be much lower than suggested by its bandwidth. In fact, many natural signals are sparse including audio, image, and biological signals. Compressive sensing (CS) is a technique that takes advantage of the natural signal’s sparsity and allows the signal to be precisely captured with far fewer measurements than the Nyquist rate. Thus, it opens up a new door to reduce the sensor power. This talk discusses the opportunities and challenges in applying CS techniques to sensor front-end design. Focus will be given on how to develop a hardware-efficient circuit realization for CS. We will cover both single- and multi-channel CS architectures for audio and imager applications.