Signal Processing Advances for 5G

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Abstract

The 5th generation (5G) networks not only aim to provide ubiquitous wireless connectivity with high data rates, low latency, large capacity, and enhanced customer experience, but also commit to fulfilling Internet of things (IoT) with reliable and secure services at low costs. To this end, 5G networks rely on seamless operations of distinctive technologies such as cognitive radio (CR), millimeter-wave communications, and heterogeneous network architecture, which deal with very wide radio spectrum, extremely high frequency bands, massive multiple-input multiple-output (MIMO), a huge number of devices, massive connectivity, context-aware computing, and so on. All these issues signify signal and data processing in regimes of exceedingly large volume, size and dimension, which render traditional communication and signal processing techniques inefficient or inapplicable. In this talk, we present our recent work on the theory and algorithms of sparse signal processing and compressive sensing, with emphasis on structure-based compressive covariance sensing beyond sparsity, and high-dimensional super-resolution gridless compressive sensing. We illustrate how these signal processing advances can effectively solve key sensing and estimation problems in wideband cognitive radios and millimeter-wave communications with massive MIMO. Our work exploits the underlying low-dimensional geometric structures of the signals and data of interest, which offer useful tools for energy-efficient sensing and inference from high-dimensional signals, large-scale networks and big-volume data. Such tools find broad applications in environmental monitoring, smart cities, imaging, healthcare, and more.

Biography

Dr. Zhi Tian has been a Professor in the Electrical and Computer Engineering Department of George Mason University since 2015. Previously she was on the faculty of Michigan Technological University for 14 years, and served a 3-year term as a Program Director in the Division of Electrical, Communications and Cyber Systems (ECCS) at the National Science Foundation (NSF). Her general research interests lie in the areas of signal processing, statistical inference, and applications in wireless communications and information networks. She is a Fellow of the IEEE, and has been actively involved in various IEEE activities in both the Signal Processing and Communications Societies. She is Chair of the IEEE Signal Processing Society (SPS) Big Data Special Interest Group (BigData SIG), and was an elected member of the IEEE SPS Signal Processing for Communications and Networking Technical Committee (SPCOM TC). She was General Chair of the IEEE Global Conference on Signal and Information Processing (GlobalSIP) in 2016. She was an IEEE Distinguished Lecturer from 2013 to 2017, and served as Associate Editor for both the IEEE Transactions on Wireless Communications and the IEEE Transactions on Signal Processing.