

Title: MIMO Transceiver Designs and Optimization: Beyond Beamforming and Perfect Channel Information

Abstract:

As is well known, multiuser MIMO transceiver design and optimization techniques play a significant role in enhancing system throughput and efficiency in modern communications. This talk will describe the speaker's fundamental endeavors on two key topics. The first topic considers physical-layer MISO multicasting, or common information broadcast to multiple users. In this context one usually adopts beamforming, optimized via a method called semidefinite relaxation (SDR). We do this rethinking: can we obtain better designs by altering the physical-layer transceiver architecture itself? We will introduce a novel transceiver strategy called stochastic beamforming (SBF)—which adopts a random-in-time beamforming strategy—that can outperform SDR-based beamforming and reveals new insights. The second topic considers robust unicast MISO beamforming under imperfect channel information. Such designs can be very challenging even from a mathematical optimization viewpoint. We will review or rediscover several popularized techniques that are established under the SDR framework. If time permits, some recent theoretical breakthrough will be described.

Title: Hyperspectral Unmixing in Remote Sensing: Learn the Wisdom There and Go Beyond (Machine Learning Included)

Abstract:

Hyperspectral unmixing (HU) is one of the most prominent research topics in hyperspectral imaging in remote sensing. HU aims at identifying the underlying materials and their corresponding compositions in the scene, using the high spectral degrees of freedom of hyperspectral images. Early HU research is based on smart intuitions from remote sensing, and recent involvements from other fields—such as signal processing, optimization and machine learning—have substantially enriched HU techniques. In this talk we will look at what are the key insights of HU from a signal processing perspective, how such insights lead to a unique branch of theory and methods for structured matrix factorization, and why HU has strong connections to problems from other areas such as machine learning, data analytics, computer vision and biomedical imaging. If time permits, we will also have a quick tour on hyperspectral super-resolution, an emerging and fundamentally intriguing topic in which HU also plays a role.

Bio:

Wing-Kin (Ken) Ma is an Associate Professor with the Department of Electronic Engineering, The Chinese University of Hong Kong. His research interests are in signal processing, optimization and communications, with recent activities focused on structured matrix factorization and applications, and MIMO transceiver designs and interference management. Dr. Ma is active in the Signal Processing Society. He served as editors of several journals, e.g., Senior Area Editor of IEEE Transactions on Signal Processing, Lead Guest Editor of a special issue in IEEE Signal Processing Magazine, to name a few. He was a member of the Signal Processing Theory and Methods (SPTM) Technical Committee, and he is currently a member of the Signal Processing for Communications and Networking (SPCOM) Technical Committee. He received Research Excellence Award 2013–2014 by CUHK, the 2015 IEEE Signal Processing Magazine Best Paper Award, and the 2016 IEEE Signal Processing Letters Best Paper Award. His students received ICASSP Best Student Paper Awards in 2011 and 2014. He is an IEEE Fellow. He is currently an IEEE SPS Distinguished Lecturer.