Title: Random matrix theory and the informational limit of eigen-analysis

Abstract: Motivated by the ubiquity of signal-plus-noise type models in high-dimensional statistical signal processing and machine learning, we consider the eigenvalues and eigenvectors of finite, low rank perturbations of large random matrices. Applications in mind are as diverse as radar, sonar, wireless communications, spectral clustering, bio-informatics and Gaussian mixture cluster analysis in machine learning. We provide an application-independent approach that brings into sharp focus a fundamental informational limit of high-dimensional eigen-analysis. Building on this success, we highlight the random matrix origin of this informational limit, the connection with "free" harmonic analysis and discuss how to exploit these insights to improve low-rank signal matrix denoising relative to the truncated SVD.

Bio: Raj is an Assistant Professor in the Department of EECS at the University of Michigan. He received his PhD in EECS from the MIT and Woods Hole Oceanographic Institution Joint Program. He received Young Investigator Awards from the Office of Naval Research and the Air Force Office of Scientific Research and a Best Young Author Award from the IEEE Signal Processing Society. His research involves developing, extending and applying random matrix theory to problems arising in signal processing, machine learning and other engineering applications.