

Yihan Zhang: Discovering spikes in random matrices using approximate message passing

In modern statistics, random matrices of large dimensions often arise with a low-dimensional planted structure. Such structure may originate from an informative component that has small effective dimensions such as sparsity, rank, etc. It is of statisticians' interest to extract such components from large noisy matrices. To this end, understanding the spectral properties of spiked random matrices arising from various models becomes crucial. In this talk, I will present a novel proof technique using the approximate message passing theory that allows us to systematically characterize some spectral properties such as the location of outlier eigenvalues and the overlap between principal components and unknown parameters. The power of this approach will be demonstrated in the context of generalized linear models with general Gaussian design for which there exists no off-the-shelf random matrix theory results for the matrices of interest.

Based on joint work in preparation with Hong Chang Ji, Marco Mondelli and Ramji Venkataramanan.