Stanford University
Department of Statistics

Departmental Seminar

*** Venue Change ***

4:30pm, Tuesday, October 1, 2019
McCullough Building (04-490) Room 115

Refreshments served at 4pm in Sequoia Lounge.

Speaker: David Donoho, *Stanford Statistics*

Title: Optimal Singular Value Thresholding in Correlated Noise

Abstract:

We consider the problem of recovering a low-rank signal matrix in the presence of a general, unknown additive noise; more specifically, noise where the eigenvalues of the sample covariance matrix have a general bulk distribution. We assume given an upper bound for the rank of the assumed orthogonally invariant signal, and develop a selector for hard thresholding of singular values, which adapts to the unknown correlation structure of the noise. Our selector asymptotically achieves the the lowest squared error loss achievable by *any* hard threshold selector *on the data at hand*, namely the square error achievable by an oracle with access to the (in principle unknowable) low-rank signal matrix. This selector generalizes to the correlated noise case the $4/\sqrt{3}$ threshold rule previously published for the case of white noise. Our approach develops stable and asymptotically unbiased empirical estimates of the noise bulk from signal+noise, and shows that these estimates can be used inside formulas deriving from work by Benaych–Georges and Rao–Nadakuditi.

This is assumed to be a mathematically sophisticated audience, so we'll spend more time on the arguments underlying the proofs, than we would if we were discussing such things to end-users.

This is joint work with Matan Gavish and Elad Romanov.