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.