Optimal thresholding of singular values and eigenvalues

Abstract:

It is common practice in multivariate and matrix-valued data analysis to reduce dimensionality by performing a Singular Value Decomposition or Principal Component Analysis, and keeping only \( r \) singular values or principal components, the rest being presumably associated with noise. However, the literature does not propose a disciplined criterion to determine \( r \); most practitioners still look for the "elbow in the Scree Plot", a 50-years-old heuristic performed by eye. I'll review a line of work which develops a systematic approach to eigenvalue and singular value thresholding. This approach assumes that the signal is low-rank and that the noise is rotationally invariant. Recent results derive optimal thresholds in the presence of quite general noise distributions.

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