Replica Method and Sample Covariance Matrices

Taro Nagao

Graduate School of Mathematics, Nagoya University, Chikusa-ku, Nagoya 464-8602, Japan

Eigenvalue distribution of the random matrix (sample covariance matrix) of the form $A^T A$, where A is a rectangular matrix and A^T is the transpose of A is analyzed by the replica method in statistical mechanics. Approximation schemes are developed to extend the analysis to sparse random matrices.