THE UNIVERSITY OF CHICAGO | DEPARTMENT OF STATISTICS

Statistics Colloquium

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"Core Shrinkage Covariance Estimation for Matrix-variate Data"

Monday October 13, 2025, at 11:30 AM
Jones 303, 5747 S. Ellis Avenue

Abstract

A separable covariance model for a random matrix provides a parsimonious description of the covariances among the rows and among the columns of the matrix, and permits likelihood-based inference with a very small sample size. However, in many applications the assumption of exact separability is unlikely to be met, and data analysis with a separable model may overlook or misrepresent important dependence patterns in the data. In this article, we propose a compromise between separable and unstructured covariance estimation. We show how the set of covariance matrices may be uniquely parametrized in terms of the set of separable covariance matrices and a complementary set of "core" covariance matrices, where the core of a separable covariance matrix is the identity matrix. This parametrization defines a Kronecker-core decomposition of a covariance matrix. By shrinking the core of the sample covariance matrix with an empirical Bayes procedure, we obtain an estimator that can adapt to the degree of separability of the population covariance matrix.

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