清華大學、交通大學
統計學研究所
專題演講

題　目：An Empirical Bayes Approach to Shrinkage Estimation on the Manifold of Symmetric Positive-Definite Matrices

主講人：Mr. Chun-Hao Yang

（University of Florida, Gainesville, FL, USA）

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視訊地點：清大綜合三館 834 室

Abstract

The James-Stein estimator is an estimator of the multivariate normal mean and dominates the maximum likelihood estimator (MLE) under squared error loss. The original work inspired great interest in developing shrinkage estimators for a variety of problems. Nonetheless, research on shrinkage estimation for manifold-valued data is scarce. In this paper, we propose shrinkage estimators for the parameters of the Log-Normal distribution defined on the manifold of N by N symmetric positive-definite matrices. For this manifold, we choose the Log-Euclidean metric as its Riemannian metric since it is easy to compute and is widely used in applications. By using the Log-Euclidean distance in the loss function, we derive a shrinkage estimator in an analytic form and show that it is asymptotically optimal within a large class of estimators including the MLE, which is the sample Fréchet mean of the data. We demonstrate the performance of the proposed shrinkage estimator via several simulated data experiments. Furthermore, we apply the shrinkage estimator to perform statistical inference in diffusion magnetic resonance imaging problems.

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