Statistics Seminar

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Manifold learning for dynamic functional brain connectivities: modeling and detecting change points

Abstract:
In neuroscience, functional connectivity describes the connectivity between brain regions that share functional properties. It is often characterized by a time series of covariance matrices between functional measurements of distributed neuron areas. An effective statistical model for functional connectivity and its changes over time is critical for better understanding brain functions and neurological diseases. To this end, we propose a matrix-log mean model with an additive heterogeneous noise for modeling random symmetric positive definite matrices that lie in a Riemannian manifold. We introduce the heterogeneous error terms to capture the curved nature of the nonlinear manifold. A scan statistic is then developed for the purpose of multiple change point detection. Theoretically, we establish the sure coverage property. Simulation studies and an application to the Human Connectome Project lend further support to the proposed methodology.

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