On Dimensionality of Mean Structure from a Single Data Matrix

Xuming He
Department of Statistics
University of Illinois at Urbana-Champaign

Abstract. We consider inference from data matrices that have low dimensional mean structures. In educational testing and in probe-level microarray data, estimation and inference are often made from a single data matrix believed to have a uni-dimensional mean structure. In this talk, we focus on probe-level microarray data to examine the adequacy of a uni-dimensional summary for characterizing the data matrix of each probe-set. To do so, we propose a low-rank matrix model, and develop a useful framework for testing the adequacy of uni-dimensionality against targeted alternatives. We analyze the asymptotic properties of the proposed test statistics as the number of rows (or columns) of the data matrix tends to infinity, and use Monte Carlo simulations to assess their small sample performance. Applications of the proposed tests to GeneChip data show that evidence against a uni-dimensional model is often indicative of practically relevant features of a probe-set. The talk is based on joint work with Xingdong Feng, currently a postdoctoral fellow at the National Institute of Statistics Sciences.