THE UNIVERSITY OF CHICAGO

Department of Statistics
DISSERTATION PROPOSAL PRESENTATION

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Statistical Sparsity in Detection and Large Scale Testing Problems

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ABSTRACT

The proposed thesis concerns sparsity-related boundaries arising in detection and large scale testing problems. In the first part, we discuss a global null testing problem for a sequence of Gaussian observations against a sparse alternative. We extend the classical Ingster--Donoho--Jin detection boundary to the setting of the high dimensional changepoint detection problem, in which each row of the observed matrix is a sequence of Gaussian variables. In the second part, we discuss a large scale testing problem, where the goal is to identify the set of non-null signals among a sequence of Gaussian observations with unknown means. The problem is recast as testing a uniformly drawn hypothesis, which implicitly defines a frequentist analogue of the local false discovery rate (local fdr). Building on this definition, we derive a critical radius at which the local fdr of an interval-null hypothesis becomes identifiable within a collection of sparse signal-plus-noise models. To conclude, we briefly draw a connection between testing a global null against a sparse alternative, and distinguishing whether or not a single sparse mean arose from a signal distribution with a polynomial tail.