

**MICHIGAN STATE UNIVERSITY**  
Department of Statistics and Probability

## **COLLOQUIUM**

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### **Concentration of Maxima: Fundamental Limits of Exact Support Recovery in High Dimensions**

**Tuesday, October 15, 2019**  
**10:20 AM - 11:10 AM**  
**Refreshments 10:00 AM**  
**C405 Wells Hall**

#### **Abstract**

We study the estimation of the support (set of non-zero components) of a high-dimensional signal observed with additive and dependent noise. With the usual parameterization of the size of the support set and the signal magnitude, we characterize a phase-transition phenomenon akin to the Ingster's signal detection boundary. We show that when the signal is above the so-called strong classification boundary, thresholding estimators achieve asymptotically perfect support recovery. This is so under arbitrary error dependence assumptions, provided that the marginal error distribution has rapidly varying tails. Conversely, under mild dependence conditions on the noise, we show that no thresholding estimators can achieve perfect support recovery if the signal is below the boundary. For log-concave error densities, the thresholding estimators are shown to be optimal and hence the strong classification boundary is universal, in this setting.

The proofs exploit a concentration of maxima phenomenon, known as relative stability. We obtain a complete characterization of the relative stability phenomenon for dependent Gaussian noise via Slepian, Sudakov-Fernique bounds and Ramsey theory.

(This is joint work with Zheng Gao.)

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