

**Indiana University-Purdue University  
Indianapolis**  
**Department of Mathematical Sciences**

STATISTICS SEMINAR

12:15pm—1:15pm, Tuesday, April 24, 2018  
SL 137

**Speaker:** **Dr. Zuofeng Shang** (Assistant Professor)  
*Department of Mathematical Sciences, IUPUI*

**Title:** **Likelihood Ratio Test for Stochastic Block Models with  
Bounded Degrees**

**Abstract:**

A fundamental problem in network data analysis is to test whether a network contains statistical significant communities. We study this problem in the stochastic block model context by testing  $H_0$ : Erdos-Renyi model vs.  $H_1$ : stochastic block model. This problem serves as the foundation for many other problems including the testing-based methods for determining the number of communities and community detection. Existing work has been focusing on growing-degree regime while leaving the bounded-degree case untreated. Here, we propose a likelihood ratio type procedure based on regularization to test stochastic block models with bounded degrees. We derive the limiting distributions as power Poisson laws under both null and alternative hypotheses, based on which the limiting power of the test is carefully analyzed. The joint impact of signal-to-noise ratio and the number of communities on the asymptotic results is also unveiled. The proposed procedures are examined by both simulated and real-world network datasets. Our proofs depend on the contiguity theory for random regular graphs developed by Janson (1995).