

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

STATISTICS SEMINAR

12:15pm—1:15pm, Tuesday, January 14, 2019
LD 265

Speaker: **Ruiqi Liu**
Department of Mathematical Sciences, IUPUI

Title: **Deep Instrument Variables Estimator**

Abstract:

The endogeneity issue is fundamentally essential in statistics and econometrics, as many empirical applications may suffer from the omission of explanatory variables, measurement error and simultaneous causality. We propose a two-stage estimator based on deep neural network (Deep Instrument Variables Estimator) to overcome endogeneity in the linear instrument variables model. A critical drawback of existing methods is that when the number of instruments is large, one has to sacrifice the statistical efficiency for avoiding curse of dimensionality, or impose structural assumptions and explicitly rely on the specified structures to obtain an efficient estimator. We impose a latent structural assumption on the reduced form equation, which is more general and includes most of the popular statistical and econometric models. Based on deep neural network, we prove that our estimator can effectively capture the intrinsic structures of the reduced form equation without knowing the prior information of the structure. Under mild conditions, we show that the proposed estimator is root-n consistent and semiparametric efficient. Simulation studies on synthetic data confirm the validity of our theoretical results. We also apply the proposed method to a real-world dataset to study the relationship between vehicle sales and price.