



THE UNIVERSITY OF  
**CHICAGO**

Department of Statistics

DISSERTATION PROPOSAL

---

Sen Na

Department of Statistics  
The University of Chicago

Scalability and Robustness: Dynamic Programming and  
Semiparametric Modeling

FRIDAY, November 22, 2019, at 5:00 PM  
Jones 303, 5747 S. Ellis Avenue

### ABSTRACT

Within the broad area of large-scale optimization and robust estimation, I primarily focused on two themes: nonlinear dynamic programming and high-dimensional semiparametric modeling. Nonlinear dynamic system appears widely in real engineering problems such as power grid and supply chain, and machine learning problems such as reinforcement learning. Semiparametric model aims to analyze data such that detected signals are robust to certain model misspecification. I will present a brief overview of my work on both themes. Particularly, my work on dynamic programming builds on sensitivity analysis, a fundamental concept in control theory, and aims to establish thorough theoretical (convergence) guarantees for fast, online model predictive control algorithm. On the statistical side, my work on semiparametric models generalizes classical analysis from Gaussian distribution to semiparametric exponential family distribution, and from low dimension to high dimension. Statistical rates of convergence of some proposed estimators are also presented.