

# Minghao Mou

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## 📖 Education

Purdue University

West Lafayette, IN

*Electrical Engineering Ph.D.* (3.91/4 GPA)

**Coursework:** Game Theory, Randomized Algorithm, Optimization, Generative Models, Stochastic Processes

The Chinese University of Hong Kong, Shenzhen

Shenzhen, China

*Applied Mathematics B.S. (First Class)* (3.80/4 GPA)

**Coursework:** Stochastic Simulation, Data Structure & Algorithm, Probability Theory

## 👛 Experience

Purdue University

West Lafayette, IN

*Continuous-time Flow-based Models as Soft Ellipsoid Method;*

May 2026–Present

- Connected continuous-time flow-based models (e.g., diffusion models, normalizing flows, flow-matching based models) to ellipsoid method from optimization theory.
- Established theoretical results on the probabilistic invariance of soft ellipsoids, and volume reduction.
- Provided diagnostics on the quality generated samples based on the connection to ellipsoid method.

*Strategic Congestion Manipulation by Monopolistic Storage Operators in Power Networks;*

Feb 2026–Present

- Modeled a multi-agent strategic system and analyzed how capacity, network constraints, and positions affect equilibrium prices and welfare using real-world-inspired market structure.
- Reformulated the problem as an MPEC/MIQP and derived continuity conditions for market outcomes with respect to key parameters.

*Solving Parametric Variational Inequalities via Flow Matching;*

July 2025–Present

- Developed a Python/PyTorch-based learning prototype for parametric variational inequalities and benchmarked it on large-scale synthetic and game-theoretic problems.
- Proved guarantees on solution quality and feasibility for large-scale decision problems.

*Braess' Paradox in Coupled Power and Transportation Systems [ArXiv];*

Dec 2023–Dec 2025

- Formulated coupled network models and analyzed equilibrium behavior under multiple operating scenarios.
- Developed optimization methods to test hypotheses and evaluate intervention strategies.

*Nexus Cognizant Pricing [pdf];*

Aug 2023–Dec 2023

- Built bi-level models and analyzed cross-network externalities under market incentives using structured datasets.

The Chinese University of Hong Kong, Shenzhen

Shenzhen, China

*Research Assistant;* Advisor: Dr. Shuang Li

Sep 2022–May 2023

- Proposed a model to infer latent processes and predict future occurrences by Logic Point Processes.
- Enhanced model's understanding of actions and intentions using logical rules as prior knowledge.

*Teaching Assistant - MAT4010: Functional Analysis*

Sep 2022–May 2023

*Teaching Assistant - MAT4220: Partial Differential Equations*

Sep 2022–May 2023

- Supported students in proof-based mathematics by clarifying abstract concepts, solution strategies, and rigorous mathematical reasoning.

## 🔧 Skills

**Programming & Data Tools:** Python (NumPy, SciPy, pandas, PyTorch), SQL, MATLAB, Linux

**Statistics & Optimization:** Statistical analysis, stochastic modeling, optimization, game theory

**Machine Learning:** Predictive modeling, neural networks, flow matching, probabilistic modeling

**Research & Communication:** Literature review, hypothesis-driven research, presentations,  $\text{\LaTeX}$ , Git

## 📄 Publication

Minghao Mou, Zaiwei Chen, Junjie Qin. "Solving Parametric Variational Inequalities via Flow Matching." Submitted to NeurIPS 2026.

Minghao Mou, and Junjie Qin. "Braess' Paradoxes in Coupled Power and Transportation Systems." ArXiv Preprint.

Minghao Mou, Sean Qian, and Junjie Qin. "Nexus Cognizant Pricing of Workplace Electric Vehicle Charging." 2024 American Control Conference (ACC). IEEE, 2024.