Department of Data Science

香港城市大學
City University of Hong Kong

End-to-End Learning and Optimization of Transportation Network Equilibrium

Date: 5 December 2024 (Thursday)

Time: 9:30am - 10:30am

Seminar Link: https://cityu.zoom.us/j/87195998631

ABSTRACT

Traditional game-theoretical models for analyzing and managing traveler interactions on transportation networks—developed over half a century ago—are constrained by oversimplified behavioral assumptions and require extensive, costly calibration, restricting their predictive accuracy and practical applicability. This talk explores an "end-to-end" framework that leverages breakthroughs in machine learning and crowd-sourced data to transform game-theoretical modeling and management of transportation networks. By parameterizing unknown payoff functions with neural networks and embedding them in an implicit layer to enforce equilibrium conditions, this framework directly discovers optimal player models in routing games from multi-source empirical data. This end-to-end learning approach is expressive and flexible: it can replicate any "well-proposed" equilibrium state when parametrized with sufficiently large neural networks. Building on this end-to-end learning, this framework develops a certified auto-differentiation-accelerated algorithm for distributionally robust, bi-level transportation network design under contextual uncertainty. This "end-to-end" framework shifts game-theoretical transportation analysis from traditional model-based approach to an AI-driven paradigm, paving the way for a "modeling as a service" future.

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DS SEMINAR

Ms. Zhichen LIU

GUEST SPEAKER'S PROFILE

Zhichen LIU is a Ph.D. candidate in Civil Engineering (Next Generation Transportation Track) at the University of Michigan, with a dual Master's in Industrial and Operations Engineering.

Her research interest focuses on bringing together data-driven optimization, machine learning, and game theory to address operation research challenges, particularly within transportation and mobility systems. She is a Rackham Predoctoral Fellow, recognized for her research and community contributions.

All are welcome