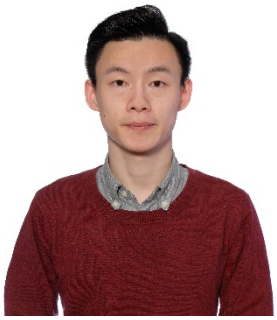
PhD Oral Defense

Date: **27 May 2021 (Thursday)** **Time:** **2:30pm**

Thesis Title

A deeper understanding of human mobility and its consequent pluralism via modeling and optimization



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Abstract

This thesis spans three aspects corresponding to commuting, which is arguably the most stable and regular human mobility pattern. Firstly, an attractiveness-based mobility model is proposed to model the physical process behind the commuting behavior, empowered by a trip competition mechanism (TCM). This model conquers two unresolved fundamental issues identified from existing mobility models, so as to enable the estimation of commuting flows in all spatial ranges and quantification of regional attractiveness. Then, combining the TCM concept with machine learning, an advanced commuting network reconstruction method is further developed to achieve high-precision flow estimation. It models the competition relationship in TCM by constructing a geographic competition graph (GCG). A novel design of graph neural network called distance-tiered graph neural network (DtGNN) is then proposed to achieve node embedding in GCG for high-precision commuting flow prediction. The effectiveness and efficiency of the two proposed models are verified by extensive experiments on real-world data, comparing with state-of-the-art mobility models. Lastly, a new naming game called multi-language naming game (MLNG), defining a multi-language context and simulating the communication and consensus processes in mobility-consequent pluralistic societies, is proposed. Interesting results are found via extensive analytical simulations.