

MODELING LARGE-SCALE PEDESTRIAN NETWORKS: FROM TRAFFIC ASSIGNMENT TO MACHINE LEARNING APPROACHES

Speaker

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Abstract

Understanding and modeling pedestrian networks in urban areas is crucial for effective infrastructure planning and sustainable transportation systems. This talk explores advanced methodologies for modeling large-scale pedestrian networks, synthesizing insights from user equilibrium pedestrian traffic assignment (UE-pTAP), dynamic pedestrian traffic assignment (DPTA), and machine learning approaches. We discuss a macroscopic UE-pTAP framework that addresses scalability issues by integrating pedestrian volume-delay functions (pVDFs) and stochastic walking travel times. Furthermore, we introduce a simulation-based DPTA model that incorporates bidirectional pedestrian streams, utilizing a dynamic user equilibrium (DUE) and link transmission model (LTM) to capture the unique microscopic characteristics of pedestrian flows. Additionally, we present empirical findings on pedestrian route choice preferences, emphasizing the impact of built environment factors such as navigational attributes, gradients, crossings, and Points of Interest (POIs). Leveraging mobile phone and crowdsourced data, we also examine the scalability of machine learning models for estimating walking and cycling volumes across super large networks, highlighting challenges in model training and inference. These insights enable data-driven optimization of pedestrian infrastructure, prioritizing investments to encourage walking and enhance urban mobility. This comprehensive approach offers valuable guidance for transportation modelers, policymakers, and urban planners in developing robust, scalable models for pedestrian network analysis

Biography

Dr. Saberi is an Associate Professor in the School of Civil and Environmental Engineering at the University of New South Wales (UNSW), Sydney, Australia. He holds a PhD degree in Transportation Systems Analysis and Planning from Northwestern University, USA. He is leading the CityX research lab as part of the Research Centre for Integrated Transport Innovation (rCITI) which focuses on scientific understanding of cities through modelling, simulation, data analytics, and visualisation. His research interests and experience cover a range of transportation engineering areas including traffic flow theory & characteristics, large-scale transportation network modelling, complex networks, active transportation, and urban data analytics & visualisation. Dr Saberi is also a co-founder of footpath.ai, a UNSW spinout, that scales and automates mapping of the walking infrastructure with GeoAI and computer vision.



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