

Dingyi Zhuang

Research Interests

Urban Computing

- Spatiotemporal data mining
- Uncertainty quantification
- Trustworthy AI
- Foundation models and generative AI

Intelligent transportation systems

- Public transit systems
- Travel demand modeling
- Data-driven transportation policy analysis
- Equity and accessibility in urban mobility

Education

2021 – Now **Massachusetts Institute of Technology**

- Ph.D. in Transportation
- Advisors: Jinhua Zhao
- Thesis proposal: Quantifying Uncertainty: Advancing Robustness, Reliability, and Fairness in AI-Driven Transportation Demand Modeling
- Committee Members: Jinhua Zhao, Haris N. Koutsopoulos, Shenhao Wang, Cathy Wu, Michael Batty
- GPA: **5.0/5.0**

2019 – 2021 **McGill University**

- Master (Thesis) in Civil Engineering
- Advisor: Lijun Sun
- GPA: **3.8/4.0**
- Thesis: Spatial Aggregation and Temporal Convolution Graph Neural Network for Kriging

2015 – 2019 **Shanghai Jiao Tong University**

- Bachelor of Science in Engineering (Tsien Hsue-Shen Class)
- Advisor: Jiangang Jin
- GPA: **3.6/4.0**; Ranking: **3/8**
- Graduate with Outstanding Honor (Top 5%)

Work & Research Experience

Jun 2024–
Aug 2024 **Morgan Stanley Services Group, Inc.**
Machine Learning Research Associate Intern
Advisor: Majid Behbahani

- Oct 2023– **Singapore-MIT Alliance for Research and Technology (SMART)** [↗](#)
 Now Research Assistant
 Advisor: Jinhua Zhao; Shenhao Wang; Alex 'Sandy' Pentland
 Working project: The Mens, Manus and Machina - How AI Empowers People, Institutions and the City in Singapore (M3S)
- Sep 2021– **MIT Transit Lab** [↗](#)
 Now Research Assistant
 Advisor: Jinhua Zhao; Shenhao Wang
 Partner agencies:
 ○ Chicago Transit Authority (CTA), rail incident data analysis
 ○ Department of Energy (DoE), travel demand prediction
- Aug 2020– **Mitacs Accelerate with ExPretio** [↗](#)
 Jun 2021 Research Intern
- Jul 2018– **Civil and Environmental Engineering, National University of Singapore**
 Sep 2018 Research Assistant
 Advisor: Lee Der-Horng
- Mar 2017– **Chuntsung Program, Shanghai Jiao Tong Univ.** [↗](#)
 Jun 2018 Research Assistant
 Advisor: Jiangang Jin

Journal Publications

395 Google scholar citations; h-index 10; i10-index 11.

- [7] 2024 **Uncertainty-aware probabilistic graph neural networks for road-level traffic crash prediction** [↗](#) .
 Xiaowei Gao, Xinke Jiang, James Haworth, [Dingyi Zhuang](#), Shenhao Wang, Huanfa Chen, Stephen Law
Accident Analysis and Prevention
- [6] 2024 **Uncertainty Quantification of Spatiotemporal Travel Demand with Probabilistic Graph Neural Networks.**
 Qingyi Wang, Shenhao Wang, [Dingyi Zhuang](#), Haris Koutsopoulos, Jinhua Zhao
IEEE Transactions on Intelligent Transportation Systems
- [5] 2023 **Fairness-enhancing deep learning for ride-hailing demand prediction** [↗](#) .
 Yunhan Zheng, Qingyi Wang, [Dingyi Zhuang](#), Shenhao Wang, Jinhua Zhao
IEEE Open Journal of Intelligent Transportation Systems
- [4] 2022 **A Universal Framework of Spatiotemporal Bias Block for Long-Term Traffic Forecasting** [↗](#) .
 Fuqiang Liu, Jiawei Wang, Jingbo Tian, [Dingyi Zhuang](#), Luis Miranda-Moreno, Lijun Sun
IEEE Transactions on Intelligent Transportation Systems
- [3] 2021 **Low-Rank Hankel Tensor Completion for Traffic Speed Estimation** [↗](#) .
 Xudong Wang, Yuankai Wu, [Dingyi Zhuang](#), Lijun Sun
IEEE Transactions on Intelligent Transportation Systems
- [2] 2020 **From compound word to metropolitan station: Semantic similarity analysis using smart card data** [↗](#) .
[Dingyi Zhuang](#), Siyu Hao, Lee Der-Horng, Jiangang Jin
Transportation Research Part C: Emerging Technologies, Volume 114, May 2020, Pages 322-337
- [1] 2019 **Understanding the bike sharing travel demand and cycle lane network: the case of Shanghai** [↗](#) .
[Dingyi Zhuang](#), Jiangang Jin, Yifan Shen, Wei Jiang
International Journal of Sustainable Transportation, 2019: 1-13

Conference Proceedings

CS + AI

- [6] 2024 **ItiNera: Integrating Spatial Optimization with Large Language Models for Open-domain Urban Itinerary Planning** .
Yihong Tang, Zhaokai Wang, Ao Qu, Yihao Yan, Kebing Hou, Dingyi Zhuang, Xiaotong Guo, Jinhua Zhao, Zhan Zhao, Wei Ma
The 2024 Conference on Empirical Methods in Natural Language Processing (EMNLP 2024), The 13th International Workshop on Urban Computing (Urbcomp 2024) **Best Paper Award**
- [5] 2023 **SAUC: Sparsity-Aware Uncertainty Calibration for Spatiotemporal Prediction with Graph Neural Networks** [↗](#).
Dingyi Zhuang, Yuheng Bu, Guang Wang, Shenhao Wang, Jinhua Zhao
32nd ACM SIGSPATIAL, NeurIPS 2024 TGL Workshop **Best Paper Candidate**
- [4] 2023 **Performance benchmarking and scalability of LPSim: a multi-GPU traffic simulation approach.**
Xuan Jiang, Dingyi Zhuang, Shangqing Cao, Junzhe Cao, Yuhan Tang, Vishwanath Bulusu, Raja Sengupta, Jinhua Zhao
IEEE Transactions on Intelligent Vehicles, Digital Twin and Parallel Intelligence, 2023
- [3] 2023 **Uncertainty Quantification via Spatial-Temporal Tweedie Model for Zero-inflated and Long-tail Travel Demand Prediction** [↗](#).
Xinke Jiang, Dingyi Zhuang, Xianghui Zhang, Hao Chen, Jiayuan Luo, Xiaowei Gao
32nd ACM International Conference on Information and Knowledge Management (CIKM-2023)
- [2] 2022 **Uncertainty Quantification of Sparse Trip Demand Prediction with Spatial-Temporal Graph Neural Networks** [↗](#).
Dingyi Zhuang, Shenhao Wang, Haris N. Koutsopoulos, Jinhua Zhao
28th ACM SIGKDD Conference on Knowledge Discovery & Data Mining (KDD-2022, oral pre.)
- [1] 2020 **Inductive graph neural networks for spatiotemporal kriging** [↗](#).
Yuankai Wu, Dingyi Zhuang, Lijun Sun
The Thirty-Fifth AAAI Conference on Artificial Intelligence (AAAI-21, oral pre.) **100+ citations**
- Transportation**
- [8] 2024 **Mitigating Spatial Disparity in Urban Prediction Using Residual-Aware Spatiotemporal Graph Neural Networks: A Chicago Case Study** .
Dingyi Zhuang, Hanyong Xu, Xiaotong Guo, Yunhan Zheng, Jinhua Zhao
Transportation Research Board, 2025
- [7] 2024 **Virtual Nodes Improve Long-term Traffic Prediction.**
Xiaoyang Cao, Dingyi Zhuang, Shenhao Wang, Jinhua Zhao
Transportation Research Board, 2025
- [6] 2024 **Large language models for travel behavior prediction.**
Baichuan Mo, Hanyong Xu, Dingyi Zhuang, Ruoyun Ma, Xiaotong Guo, Jinhua Zhao
TRC-30, 2024
- [5] 2023 **ST-GIN: An Uncertainty Quantification Approach in Traffic Data Imputation with Spatio-temporal Graph Attention and Bidirectional Recurrent United Neural Networks** [↗](#).
Zepu Wang, Dingyi Zhuang, Yankai Li, Jinhua Zhao, Peng Sun
IEEE International Conference on Intelligent Transportation Systems (ITSC-2023)
- [4] 2023 **Uncertainty Quantification in Road-level Traffic Risk Prediction by Spatial-Temporal Zero-Inflated Negative Binomial Graph Neural Network(STZINB-GNN)** [↗](#).
Xiaowei Gao, James Haworth, Dingyi Zhuang, Huanfa Chen, Xinke Jiang
12th International Conference on Geographic Information Science (GIScience-2023)
- [3] 2022 **The Braess Paradox in Dynamic Traffic** [↗](#) .
Dingyi Zhuang, Yuzhu Huang, Vindula Jayawardana, Jinhua Zhao, Dajiang Suo, Cathy Wu
25th IEEE International Conference on Intelligent Transportation Systems

- [2] 2020 **A Pseudo-3D Convolutional Neural Network based Framework for Short-term Mixed Passenger Flow Prediction in Large-scale Public Transit.**
Siyu Hao, Dingyi Zhuang, De Zhao, Lee Der-Hong
Transportation Research Board 2020
- [1] 2018 **An empirical study on cycle lane network using bike sharing data: the case of Shanghai.**
Dingyi Zhuang, Jiangang Jin, Yifan Shen, Wei Jiang
2018 International Conference on Transportation and Space-time Economics (oral pre.)

Submitted for Publication

All manuscripts are available upon reasonable requests

- 2024 **Sparkle: Mastering Basic Spatial Capabilities in Vision Language Models Elicits Generalization to Composite Spatial Reasoning.**
Yihong Tang, Ao Qu, Zhaokai Wang, [Dingyi Zhuang](#), Zhaofeng Wu, Wei Ma, Shenhao Wang, Yunhan Zheng, Zhan Zhao, Jinhua Zhao
Submitted to ICLR 2025
- 2024 **GETS: Ensemble Temperature Scaling for Calibration in Graph Neural Networks.**
[Dingyi Zhuang](#), Chonghe Jiang, Yunhan Zheng, Shenhao Wang, Jinhua Zhao
Submitted to ICLR 2025
- 2024 **Reliable Imputation of Incomplete Crash Data for Predicting Driver Injury Severity.**
Xiaowei Gao; Xinke Jiang; [Dingyi Zhuang](#); James Haworth; Shenhao Wang; Ilya Ilyanko
Submitted to Accident Analysis and Prevention
- 2024 **Timeseries Suppliers Allocation Risk Optimization via Deep Black Litterman Model.**
Jiayuan Luo, Wentao Zhang, Yuchen Fang, Xiaowei Gao, [Dingyi Zhuang](#), Hao Chen, Xinke Jiang
Submitted to AAAI 2025
- 2024 **UQGNN: Uncertainty Quantification of Heterogeneous Graph Neural Networks for Multimodal Urban Mobility Prediction.**
Dahai Yu, [Dingyi Zhuang](#), Yuheng Bu, Shenhao Wang, Guang Wang
Submitted to KDD 2025
- 2023 **Fairness-Enhancing Vehicle Rebalancing in the Ride-hailing System.**
Xiaotong Guo, Hanyong Xu, Yunhan Zheng, [Dingyi Zhuang](#), Jinhua Zhao
Working paper, submitting to TR-Part A
- 2023 **Advancing Transportation Mode Share Analysis with Built Environment: Deep Hybrid Models with Urban Road Network.**
[Dingyi Zhuang](#), Qingyi Wang, Yunhan Zheng, Xiaotong Guo, Shenhao Wang, Haris N. Koutsopoulos, Jinhua Zhao
Submitted to Transportation

Mentorship

Graduate Students

- 2024 Yifeng Liu, Master Student at MIT [↗](#)
- 2024 Chonghe Jiang, M.Phil Student at the Chinese University of Hong Kong [↗](#)
- 2024 Yihong Tang, Master Student at the University of Hong Kong [↗](#)
Now: Ph.D. at McGill University
- 2023 Zepu Wang, Master Student at the University of Pennsylvania [↗](#)
Now: Ph.D. at University of Washington

Undergraduate Students

- 2024 Xiaoyang Cao, Tsinghua University
- 2023 Xiaoyu Yan, Zhejiang University [↗](#)
Now: Ph.D. at Northwestern University

2023 Peisen Li, Tsinghua University [↗](#)
Now: Ph.D. at the University of Michigan

Teaching

Spring 2024 Teaching Assistant of 1.041/1.200 Transportation Foundation and Methodology [↗](#)
Spring 2023 Teaching Assistant of 1.041/1.200 Transportation Foundation and Methodology [↗](#)

Invited Talks & Guest Lectures

Oct 2024 **Quantifying Uncertainty: Advancing Robustness, Reliability, and Fairness in AI-Driven Transportation Demand Modeling**
INFORMS 2024

Jun 2024 **Uncertainty Quantification on Sparse Spatiotemporal Data Prediction**
Machine Learning Seminar, Morgan Stanley

Oct 2023 **Modeling Multi-perspective Nature of Urban Dynamics**
Allen Turing Insitute

Oct 2023 **Modeling Multi-perspective Nature of Urban Dynamics**
The Space Time Lab, University College London

Oct 2023 **Sparsity-Aware Uncertainty Calibration for Spatiotemporal Prediction with Graph Neural Networks**
The Bartlett Centre for Advanced Spatial Analysis, University College London

July 2023 **Uncertainty Quantification of Sparse Trip Demand Prediction**
Lyft

July 2023 **Deep Hybrid Model with Urban Road Network for Travel Demand Analysis**
Transit Data Section at World Conference on Transportation Research 2023

May 2023 **Deep Hybrid Model with Urban Road Network**
MIT Mobility Initiative Forum

Apr 2023 **Uncertainty Quantification of Sparse Trip Demand Prediction**
Urban Artificial Intelligence Laboratory, University of Florida

Feb 2023 **Deep Hybrid Model with Urban Road Network for Travel Demand Analysis**
CEE Research Days, MIT Media Lab

Oct 2022 **Uncertainty Quantification of Sparse Trip Demand Prediction**
College of Computer Science, Sichuan University

Honors & Awards

2024 **Best Paper Award, KDD 2024 Urban Computing Workshop**

2020 **CIRRELT Excellence Scholarships (Master's), CIRRELT**

2019 & 2021 **Graduate Excellence Fellowship, McGill University**

2019 **Hsue-shen Tsien Class, Shanghai Jiao Tong University**
Top 5%, Honor Program in School of Mechanical Engineering

2017 **Chungtsung Scholarship, Hui-Chun Chin and Tsung-Dao Lee Chinese Undergraduate Research Endowment**
Top 10% in selected excellent research students in Shanghai Jiao Tong University

2017 **Chinese Big Data Innovation Application and Modeling Contest** [↗](#)
First Prize (1/135)

2016 & 2017 **Eleme Scholarship, Shanghai Jiao Tong University**

2017 **2017 Mathematical Contest in Modeling**
Honorable Mention

2016 **Excellent Student, Shanghai Jiao Tong University**

Top 5%

2015 **Freshmen Scholarship, Shanghai Jiao Tong University**

Academic Service

Journal Referees IEEE Transactions on Neural Networks and Learning Systems • IEEE Transactions on Intelligent Transportation Systems • Transportation Research Part C • Journal of Computational and Graphical Statistics • Journal of Cleaner Production • Neurocomputing

Conference Referees Transportation Research Board Annual Meeting (TRB) • IEEE Conference on Intelligent Transportation (IEEE ITSC) • International Conference on Learning Representations (ICLR)

Position of Responsibility

Jun 2024 **2nd International Workshop on Socially Interactive Autonomous Mobility (SIAM)** [↗](#)
Program Committee

Jan 2024 **Mens, Manus and Machina (M3S) MIT-Singapore AI symposium** [↗](#)
Organizer

Oct 2015– **Center of Quality Development, Shanghai Jiao Tong University**

Sep 2017 Vice president