77 Massachusetts Ave
Cambridge, MA 02139, United States
📞 (+1) 617-803-4153
✉ dingyi@mit.edu
🏠 https://zhuangdingyi.github.io/
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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
- Expected graduation: Summer 2026
- Advisors: Jinhua Zhao
- Thesis proposal: Quantifying Uncertainty: Advancing Sparsity-aware, 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 Experience

Jun 2025–
Aug 2025 **Bosch Center for Artificial Intelligence**
Research Intern
Advisor: Xiaoqi Wang

Jun 2024–	**Morgan Stanley Services Group, Inc.**
Aug 2024	Machine Learning Research Associate Intern
	Advisor: Majid Behbahani
Sep 2021–	**Chicago Transit Authority**
May 2022	Research Intern

Journal Publications

586 Google scholar citations; h-index 14; i10-index 16.

[8] 2025 **Reliable Imputation of Incomplete Crash Data for Predicting Driver injury Severity** � .
Xiaowei Gao, Xinke Jiang, <u>Dingyi Zhuang</u>, James Haworth, Shenhao Wang, Ilya Ilyanko, Huanfa Chen
Accident Analysis and Prevention

[7] 2024 **Uncertainty-aware probabilistic graph neural networks for road-level traffic crash prediction** � .
Xiaowei Gao, Xinke Jiang, James Haworth, <u>Dingyi Zhuang</u>, 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, <u>Dingyi Zhuang</u>, 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, <u>Dingyi Zhuang</u>, 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, <u>Dingyi Zhuang</u>, 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, <u>Dingyi Zhuang</u>, Lijun Sun
IEEE Transactions on Intelligent Transportation Systems

[2] 2020 **From compound word to metropolitan station: Semantic similarity analysis using smart card data** �.
<u>Dingyi Zhuang</u>, Siyu Hao, Lee Der-Horng, Jiangang Jin
Transportation Research Part C: Emerging Technologies

[1] 2019 **Understanding the bike sharing travel demand and cycle lane network: the case of Shanghai** �.
<u>Dingyi Zhuang</u>, Jiangang Jin, Yifan Shen, Wei Jiang
International Journal of Sustainable Transportation

Conference Proceedings

CS + AI

[9] 2025 **GETS: Ensemble Temperature Scaling for Calibration in Graph Neural Networks**.
<u>Dingyi Zhuang</u>, Chonghe Jiang, Yunhan Zheng, Shenhao Wang, Jinhua Zhao
International Conference on Learning Representations (ICLR) 2025, Spoitlight

[8] 2024 **Mitigating Spatial Disparity in Urban Prediction Using Residual-Aware Spatiotemporal Graph Neural Networks: A Chicago Case Study** .
<u>Dingyi Zhuang</u>, Hanyong Xu, Xiaotong Guo, Yunhan Zheng, Jinhua Zhao
World Wide Web Conference, 2025; Best Paper Award at WebST Workshop
Transportation Research Board, 2025

[7] 2025 **Timeseries Suppliers Allocation Risk Optimization via Deep Black Litterman Model**.
Jiayuan Luo, Wentao Zhang, Yuchen Fang, Xiaowei Gao, <u>Dingyi Zhuang</u>, Hao Chen, Xinke Jiang
The Association for the Advancement of Artificial Intelligence (AAAI) 2025, Oral presentation

[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, <u>Dingyi Zhuang</u>, 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** ↗.
<u>Dingyi Zhuang</u>, 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, <u>Dingyi Zhuang</u>, 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, <u>Dingyi Zhuang</u>, 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** ↗.
<u>Dingyi Zhuang</u>, 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, <u>Dingyi Zhuang</u>, Lijun Sun
*The Thirty-Fifth AAAI Conference on Artificial Intelligence (AAAI-21, **oral pre.**) 100+ citations*

Transportation

[7] 2024 **Virtual Nodes Improve Long-term Traffic Prediction**.
Xiaoyang Cao, <u>Dingyi Zhuang</u>, Shenhao Wang, Jinhua Zhao
Transportation Research Board, 2025

[6] 2024 **Large language models for travel behavior prediction**.
Baichuan Mo, Hanyong Xu, <u>Dingyi Zhuang</u>, 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, <u>Dingyi Zhuang</u>, 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, <u>Dingyi Zhuang</u>, Huanfa Chen, Xinke Jiang
12th International Conference on Geographic Information Science (GIScience-2023)

[3] 2022 **The Braess Paradox in Dynamic Traffic** ↗ .
<u>Dingyi Zhuang</u>, 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, <u>Dingyi Zhuang</u>, De Zhao, Lee Der-Horng
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 presentation)

Submitted for Publication

All manuscripts are available upon reasonable requests

2025 **Generative Urban Design: A Stepwise Approach Integrating Human Expertise with Diffusion Models**.
Mingyi He, Yuebing Liang, Yunhan Zheng, Qingyi Wang, Dingyi Zhuang, Shenhao Wang, Jinhua Zhao
Submitted to ACSP 2025

2025 **From Fixed to Learnable: Adaptive Kernel Parameters for GNN-Based Spatiotemporal Modeling**.
Zhongyue Zhang, Dingyi Zhuang, Yuankai Wu
Submitted to ICML 2025

2025 **Addressing Imbalances in Heterogeneous Semi-Bipartite Graphs for Effective Anti-Money Laundering**.
Dingyi Zhuang, Majid Behbahani, Zhanhong Cheng, Shenhao Wang, Yuheng Bu, Guang Wang, Yuriy Nevmyvaka
Submitted to KDD 2025

2025 **Uncertainty-aware Spatiotemporal Graph Neural Networks for Reliable User-level Electricity Load Forecasting**.
Dahai Yu, Rongchao Xu, Lin Jiang, Tian Tang, Dingyi Zhuang, Zhanhong Cheng, Yuheng Bu, Shenhao Wang, Guang Wang
Submitted to KDD 2025

2025 **Consumption Complexity as a Driver of Urban Economic Development**.
Yunhan Zheng, Yuebing Liang, Donghang Li, Dingyi Zhuang, Shenhao Wang, Jinhua Zhao
Submitted to Nature Cities

2025 **Dynamic Autoregressive Tensor Factorization for Pattern Discovery of Spatiotemporal Systems**.
Xinyu Chen, Dingyi Zhuang, HanQin Cai, Shenhao Wang, Jinhua Zhao
Submitted to The IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI), major reviewed.

2025 **Impacts of Subway Line Extension on Economic Vitality and Social Cohesion: A DMLDID Approach** .
Xinyi Huang, Yunhan Zheng, Dingyi Zhuang, Jinhua Zhao
Submitted to Communication in Transportation Research

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 Computer Vision and Pattern Recognition Conference (CVPR) 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 **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 VLDB 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**.
<u>Dingyi Zhuang</u>, Qingyi Wang, Yunhan Zheng, Xiaotong Guo, Shenhao Wang, Haris N. Koutsopoulos, Jinhua Zhao
Submmited 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 ⤤
Now: Ph.D. at MIT

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 ⤤
Now: Ph.D. at MIT

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

2025	**UPS PhD Fellowship, MIT**
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 • IEEE Internet of Things Journal • IET Intelligent Transport Systems • Journal of Computational and Graphical Statistics.
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– Sep 2017	**Center of Quality Development, Shanghai Jiao Tong University**
	Vice president