

# Dingyi Zhuang

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## 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

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## Education

### 2021 – Now Massachusetts Institute of Technology

- Ph.D. in Transportation
- Expected graduation: Summer 2026
- 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%)

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## Work Experience

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

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## Journal Publications

**489 Google scholar citations; h-index 12; i10-index 13.**




- [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*
- [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*

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## Conference Proceedings

**CS + AI**

- [9] 2025 **GETS: Ensemble Temperature Scaling for Calibration in Graph Neural Networks.**  
Dingyi Zhuang, Chonghe Jiang, Yunhan Zheng, Shenhao Wang, Jinhua Zhao  
*International Conference on Learning Representations (ICLR) 2025*, *Spotlight*
- [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  
*World Wide Web Conference, 2025*  
*Transportation Research Board, 2025*
- [7] 2025 **Timeseries Suppliers Allocation Risk Optimization via Deep Black Litterman Model.**  
Jiayuan Luo, Wentao Zhang, Yuchen Fang, Xiaowei Gao, Dingyi Zhuang, 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, Kebin 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
- [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-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)

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Submitted for Publication

All manuscripts are available upon reasonable requests

- 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.**  
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

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## 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 [↗](#)

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## 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

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## 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–  
Sep 2017 **Center of Quality Development, Shanghai Jiao Tong University**  
Vice president