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RSEARCH INTERESTS

AI for Transport Planning, Sustainable Urban Mobility, Public Transit, Travel Behavior, Urban Science

EDUCATION

- Doctor of Philosophy, **Massachusetts Institute of Technology (MIT)** 2013-2018
- Master of Applied Science, **University of British Columbia (UBC)** 2011-2013
- Bachelor of Engineering, **Tongji University** 2007-2011

PROFESSIONAL EXPERIENCE

- Assistant Professor at **The University of Hong Kong (HKU)** 2020-Present
- Senior Data Scientist at **Via Transportation, Inc.** 2018-2020

OTHER ACADEMIC POSITIONS

- Programme Director, HKU MSc in Urban Design and Transport (MScUDT) 2024-Present
- Chief Examiner, HKU MA in Transport Policy and Planning (MATPP) 2022-Present
- Chairperson of Transport Policy Committee, HKU Institute of Transport Studies 2023-Present
- Editorial Board Member, *Transactions in Urban Data, Science, and Technology* 2022-Present

PROFESSIONAL AFFILIATIONS

- Fellow, Hong Kong Society for Transportation Studies 2022-Present
- Member, HKU Musketeers Foundation Institute of Data Science 2022-Present
- Fellow, HKU Urban Systems Institute 2023-Present

TEACHING EXPERIENCE

- URBA6002 Urban Big Data Analytics (HKU) 2021-Present
- URBA6004 Spatial Mobilities Analytics (HKU) 2021-Present
- URBP6157/GEOG7003 Transport Economics (HKU) 2022-Present
- URBA6402 Smart Planning and Design Studio (HKU) 2022-Present
- URBS2005 Research Methods in Urban Studies (HKU) 2021-2022

RESEARCH GRANTS

Total amount of external grants (as PI or Co-PI) received is over HK$6m.

External Grants

[1] PI. "Computational Design of Zero-Emission Zones for Urban Freight". *Hong Kong Research Grants Council (RGC) - General Research Fund (GRF) (17210325)*, HK$827,561, 01/2026-12/2028.

[2] PI. "Smart Mega Events: A Cross-city Comparative Analysis of Event Portfolios and Public Perceptions Using Online Data and Large Language Models". *Public Policy Research Funding Scheme (PPRFS) (2025.A8.170.25C)*, HK$592,250, 11/2025-10/2026.

[3] PI. "Leveraging Large Language Models for Road Trip Itinerary Recommendation in the Greater Bay Area". *Contract Research - Highyun InfoTech Limited*, HK$950,000, 04/2025-03/2026.

[4] PI. "Generalizable Deep Learning across Cities and Modes for Human Mobility Prediction". *National Natural Science Foundation of China (NSFC) Young Scientists Fund (42201502)*, CNY300,000. 01/2023-12/2025.
[5] Co-PI. "e-TranStar 2.0: i-Core-enabled Smart Just-in-Time MiC Transportation Planning". *Public Sector Trial Scheme (PSTS)- Innovation and Technology Fund (ITT/004/24LP)*, HK$3.73m. 05/2024-04/2026.

Internal Grants

[6] PI. "Leveraging Causal and Generative AI for Human-centric Urban Street Design". *HKU Lasting Impact Fund – Young Scholar Scheme (010104001)*, HK$800,000. 12/2024-11/2028.
[7] PI. "Modeling the co-evolution of urban metro networks and land use systems". *HKU Seed Fund for PI Research – Basic Research (109001117)*, HK$77,533. 06/2024-06/2026.
[8] PI. "Enhancing Multimodal Public Transit System Resilience using Network Science and AI". *HKU Seed Fund for PI Research – Basic Research (109000301)*, HK$107,000. 06/2023-06/2025.
[9] PI. "Quantifying the Impact of Street Network Structure on Urban Congestion: A Multi-City Study". *HKU Seed Fund for Basic Research (104006646)*, HK$95,500. 06/2022-06/2024.
[10] PI. "A Simulation-based Analytical Framework for the Design of an Integrated Autonomous Vehicle and Public Transit System and Evaluation of its Impact on Urban Form". *HKU Seed Funding for Strategic Interdisciplinary Research Scheme (102010057)*, HK$1m. 06/2021-06/2024.
[11] PI. "Urban Embedding: Learning Spatial Representation from Urban Mobility Flows". *HKU Seed Fund for Basic Research for New Staff (104006019)*, HK$138,780. 03/2021-02/2023.

PUBLICATIONS

(* corresponding author; underlined names indicate supervised students or research assistants)

Journal Papers

[1] Zhao, L., Shen, S. and **Zhao, Z.*** (2025). Large-scale electric bus network transition planning via deep reinforcement learning. *Transportation Research Part D: Transport and Environment*, 146, 104899.
[2] Ding, F., Tang, Y., Wang, Y. and **Zhao, Z.*** (2025). Unraveling the network effects in station ridership growth patterns under metro network expansion. *Journal of Transport Geography*, 125, 104205.
[3] Tang, Y., He, J. and **Zhao, Z.*** (2025). Activity-aware human mobility prediction with hierarchical graph attention recurrent network. *IEEE Transactions on Intelligent Transportation Systems*, 26(2), 1604-1616.
[4] Zhang, Q., Ma, Z.*, Ling, Y., Qin, Z., Zhang, P. and **Zhao, Z.** (2025). Causal graph discovery for urban bus operation delays: A case in Stockholm. *Transportation Research Record*, early access.
[5] Hu, Y., Zhao, M. and **Zhao, Z.*** (2024). Uncovering heterogeneous effects of link-level street environment on e-bike and e-scooter usage. *Transportation Research Part D: Transport and Environment*, 136, 104477.
[6] Fu, T., Li, X.*, Wang, J., Zhang L., Gong, H., **Zhao, Z.** and Sobhani, A. (2024). Trajectory prediction and risk assessment in car-following scenarios using a noise-enhanced generative adversarial network. *IEEE Transactions on Intelligent Transportation Systems*, 25(2), 20970 - 20984.
[7] Liang, Y., **Zhao, Z.*** and Webster, C. (2024). Generating sparse origin-destination flows on shared mobility networks using probabilistic graph neural networks. *Sustainable Cities and Society*, 105777.
[8] Liang, Y., Liu, Y., Wang, X. and **Zhao, Z.*** (2024). Exploring large language models for human mobility prediction under public events. *Computer, Environment and Urban Systems*, 112, 102153.
[9] Hu, Y., Chen, L. and **Zhao, Z.*** (2024). How does street environment affect pedestrian crash risks? A link-level analysis using street view image-based pedestrian exposure measurement. *Accident Analysis and Prevention*, 205, 107682.

[10] Yang, H., Jiang, J.*, **Zhao, Z.**, Pan, R. and Tao, S. (2024). STVANet: A spatio-temporal visual attention framework with large kernel attention mechanism for citywide traffic dynamics prediction. *Expert Systems with Applications*, 254, 124466.

[11] Huang, G., **Zhao, Z.*** and Yeh, A.G.O. (2024). How shareable is your trip? A path-based analysis of ridesplitting trip shareability. *Computer, Environment and Urban Systems*, 110, 102120.

[12] Lin, Y., Xu, Y.*, **Zhao, Z.**, Tu, W., Park, S. and Li, Q. (2024). Assessing effects of pandemic-related policies on individual public transit travel patterns: A Bayesian online changepoint detection based framework. *Transportation Research Part A: Policy and Practice*, 181, 104003.

[13] Liang, Y., **Zhao, Z.***, Ding, F., Tang, Y. and He, Z. (2024). Time-dependent trip generation for bike sharing planning: A multi-task memory-augmented graph neural network. *Information Fusion*, 106, 102294.

[14] Ding, F., Chen, S., and **Zhao, Z.*** (2024). Incorporating walking into ride-hailing: The potential benefits of flexible pick-up and drop-off. *Transportation Research Part D: Transport and Environment*, 127, 104064.

[15] Zhao, L., Shen, S. and **Zhao, Z.*** (2024). Planning decentralized battery-swapping recharging facilities for e-bike sharing systems. *Sustainable Cities and Society*, 101, 105118. (***HKU Foundation Publication Award for Research Postgraduate Students, 2024***)

[16] Liang, Y., Huang, G. and **Zhao, Z.*** (2024). Cross-mode knowledge adaptation for bike sharing demand prediction using adversarial graph neural networks. *IEEE Transactions on Intelligent Transportation Systems*, 25 (5), 3642-3653.

[17] Liang, Y., **Zhao, Z.*** and Zhang, X. (2024). Modeling taxi cruising time based on multi-source data: A case study in Shanghai. *Transportation*, 51, 761–790.

[18] Zhou, J.*, Zhou, M., Zhou, J. and **Zhao, Z.** (2023). Adapting node-place model to predict and monitor COVID-19 footprints and transmission risks. *Communications in Transportation Research*, 3, 100110.

[19] Huang, G., Liang, Y. and **Zhao, Z.*** (2023). Understanding market competition between transportation network companies using big data. *Transportation Research Part A: Policy and Practice*, 178, 103861.

[20] Huang, G., Lian, T., Yeh, A.G.O. and **Zhao, Z.*** (2023). To share or not to share? Revealing determinants of individuals' willingness to share rides through a big data approach. *Transportation Research Part C: Emerging Technologies*, 157, 104372.

[21] Liang, Y., Ding, F., Huang, G. and **Zhao, Z.*** (2023). Deep trip generation with graph neural networks for bike sharing system expansion. *Transportation Research Part C: Emerging Technologies*, 154, 104241.

[22] Jiang, F., Ma, J.*, Webster, C.J., Chiaradia, A.J.F., Zhou, Y., **Zhao, Z.** and Zhang, X. (2023). Generative urban design: A systematic review on problem formulation, design generation, and decision-making. *Progress in Planning*, 100795.

[23] Lin, Y., Xu, Y.*, **Zhao, Z.**, Park, S., Su, S. and Ren, M. (2023). Understanding changing public transit travel patterns of urban visitors during COVID-19: A multi-stage study. *Travel Behaviour and Society*, 100587.

[24] **Zhao, Z.*** and Liang, Y. (2023). A deep inverse reinforcement learning approach to route choice modeling with context-dependent rewards. *Transportation Research Part C: Emerging Technologies*, 149, 104079.

[25] Zhou, M., Zhou, J.*, Zhou, J., Lei, S. and **Zhao, Z.** (2023). Introducing social contacts into the node-place model: A case study of Hong Kong. *Journal of Transport Geography*, 107, 103532.

[26] **Zhao, Z.***, Koutsopoulos, H. N. and Zhao, J. (2022). Identifying hidden visits from sparse call detail record data. *Transactions in Urban Data, Science, and Technology*, 1(3-4), 121-141.

[27] Liang, Y., **Zhao, Z.*** and Sun, L. (2022). Memory-augmented dynamic graph convolutional networks for traffic data imputation with diverse missing patterns. *Transportation Research Part C: Emerging Technologies*, 143, 103826. (***HKU Foundation Publication Award for Research Postgraduate Students, 2023***)

[28] Liang, Y., Huang, G. and **Zhao, Z.*** (2022). Joint demand prediction for multimodal systems: A multi-task multi-relational spatiotemporal graph neural network approach. *Transportation Research Part C: Emerging Technologies*, 140, 103731.

[29] Bi, W., Lu, W.*, **Zhao, Z.** and Webster, C. (2022). Combinatorial optimization of construction waste collection and transportation: A case study of Hong Kong. *Resources, Conservation & Recycling*, 179, 106043.

[30] Li, J. and **Zhao, Z.*** (2022). Impact of COVID-19 travel-restriction policies on road traffic accident patterns with emphasis on cyclists: A case study of New York City. *Accident Analysis & Prevention*, 167, 106586.

[31] Liang, Y. and **Zhao, Z.*** (2022). NetTraj: A network-based vehicle trajectory prediction model based on directional representation and spatiotemporal attention mechanisms. *IEEE Transactions on Intelligent Transportation Systems*, 23 (9), 14470-14481.

[32] Mo, B., **Zhao, Z.***, Koutsopoulos, H.N. and Zhao, J. (2022). Individual mobility prediction in mass transit systems using smart card data: An interpretable activity-based hidden Markov approach. *IEEE Transactions on Intelligent Transportation Systems*, 23 (8), 12014-12026.

[33] **Zhao, Z.***, Koutsopoulos, H.N. and Zhao, J. (2020). Discovering latent activity patterns from transit smart card data: A spatiotemporal topic model. *Transportation Research Part C: Emerging Technologies*, 116, 102627.

[34] **Zhao, Z.** and Zhao, J.* (2020). Car pride and its behavioral implication: An exploration in Shanghai. *Transportation*, 47(2), 793-810.

[35] **Zhao, Z.**, Koutsopoulos, H.N. and Zhao, J.* (2018). Detecting pattern changes in individual travel behavior: A Bayesian approach. *Transportation Research Part B: Methodological*, 112, 73-88.

[36] **Zhao, Z.**, Koutsopoulos, H.N. and Zhao, J.* (2018). Individual mobility prediction using transit smart card data. *Transportation Research Part C: Emerging Technologies*, 89, 19-34.

[37] Goulet-Langlois, G**.,** Koutsopoulos, H.N., **Zhao, Z.** and Zhao, J.* (2018). Measuring regularity in individual travel patterns. *IEEE Transactions on Intelligent Transportation Systems*, 19 (5), 1583-1592.

[38] Zhao, J.*, Frumin, M., Wilson, N. H. and **Zhao, Z.** (2013). Unified estimator for excess journey time under heterogeneous passenger incidence behavior using smartcard data. *Transportation Research Part C: Emerging Technologies*, 34, 70-88.

[39] Frumin, M., Zhao, J.*, Wilson, N. H. and **Zhao, Z.** (2013). Automatic data for applied railway management: Case study on the London Overground. *Transportation Research Record: Journal of the Transportation Research Board*, 2353, 47-56.

[40] **Zhao, Z.**, Zhao, J.* and Shen, Q. (2013). Has transportation demand of Shanghai, China, passed its peak growth? *Transportation Research Record: Journal of the Transportation Research Board*, 2394, 85-92.

Conference Papers

[1] Wang, X., **Zhao, Z.***, Zhao, L., Wu, L. (2025). Just-in-time deliveries: Managing uncertain target arrival times with adaptive routing. *2025 IEEE 28th International Conference on Intelligent Transportation Systems (ITSC)*, accepted.

[2] Li, T., **Zhao, Z.*** and Liu, X. (2025). Adaptive fusion of decomposed traffic components: A heterogenized spatio-temporal attention for traffic forecasting. *2025 IEEE 28th International Conference on Intelligent Transportation Systems (ITSC)*, accepted.

[3] Tang, Y., Qu, A., Wang, Z., Zhuang, D., Wu, Z., Ma, W., Wang, S., Zheng, Y., **Zhao, Z.** and Zhao, J.* (2025). Sparkle: Mastering basic spatial capabilities in vision language models elicits generalization to spatial reasoning. *IJCAI 2025 The First Workshop on Multimodal Knowledge and Language Modeling (MKLM'25)*, Montreal, Canada. (***MKLM'25 Best Paper Award***)

[4] Tang, Y., Wang, Z., Qu, A., Yan, Y., Hou, K., Zhuang, D., Guo, X., Zhao, J., **Zhao, Z.** and Ma, W.* (2024). ItiNera: Integrating spatial optimization with large language models for open-domain urban

itinerary planning. *The 2024 Conference on Empirical Methods in Natural Language Processing* (*EMNLP'24*), Miami FL, USA.

[5] Ding, F., Liang, Y., Wang, Y., Tang, Y., Zhou, Y., and **Zhao, Z.*** (2024). A graph deep learning model for station ridership prediction in expanding metro networks. *The 2nd ACM SIGSPATIAL International Workshop on Advances in Urban-AI (UrbanAI'24)*, Atlanta, GA, USA.

[6] Tang, Y., Wang, Z., Qu, A., Yan, Y., Hou, K., Zhuang, D., Guo, X., Zhao, J., **Zhao, Z.** and Ma, W.* (2024). Synergizing spatial optimization with large language models for open-domain urban itinerary planning. *The 13th ACM SIGKDD International Workshop on Urban Computing (UrbComp'24)*, Barcelona, Spain. (***UrbComp'24 Best Paper Award***)

[7] Liang, Y., Ding, F., Tang, Y. and **Zhao, Z.*** (2023). Time-aware trip generation for bike sharing system planning. *The 12th ACM SIGKDD International Workshop on Urban Computing (UrbComp'23)*, Long Beach, CA, USA.

[8] Liang, Y., Huang, G. and **Zhao, Z.*** (2022). Bike sharing demand prediction based on knowledge sharing across modes: A graph-based deep learning approach. *2022 IEEE 25th International Conference on Intelligent Transportation Systems (ITSC)*, 857-862.

[9] **Zhao, Z.***, Koutsopoulos, H.N. and Zhao, J. (2018). Discovering latent activity patterns from human mobility. *The 7th ACM SIGKDD International Workshop on Urban Computing (UrbComp'18)*, London, UK.

[10] **Zhao, Z.**, Koutsopoulos, H. N. and Zhao, J.* (2018). Detecting changes in individual travel behavior patterns. *Transportation Research Board 97th Annual Meeting*, Washington, DC.

[11] **Zhao, Z.**, Koutsopoulos, H. N. and Zhao, J.* (2017). Mobility as a language: Predicting individual mobility in public transportation using n-gram models. *Transportation Research Board 96th Annual Meeting*, Washington, DC.

[12] **Zhao, Z.**, Zhao, J.* and Koutsopoulos, H. N. (2016). Individual-level trip detection using sparse call detail record data based on supervised statistical learning. *Transportation Research Board 95th Annual Meeting*, Washington, DC.

[13] **Zhao, Z.** and Zhao, J.* (2015). Car pride: Psychological structure and behavioral implications. *Transportation Research Board 94th Annual Meeting*, Washington, DC.

[14] **Zhao, Z.**, Chua G. and Zhao, J.* (2012). Evolution of trip chaining patterns in London from 1991 to 2010. *Innovations in Travel Modelling Conference*, Tampa, FL.

[15] Kang, L.*, Lin, B., **Zhao, Z.** and Jin, L. (2010). The traffic control system at urban intersections during the phase transitions based on VII. *2010 International Conference on Computer Application and System Modeling (ICCASM 2010)*, Taiyuan, China.

Book Chapters

[1] **Zhao, Z.**, Koutsopoulos, H. N. and Zhao, J. (2020). Chapter 7 – Uncovering Spatiotemporal Structures from Transit Smart Card Data for Individual Mobility Modeling. In Antoniou, C., Efthymiou, D. and Chaniotakis, E. (eds.), *Demand for Emerging Transportation Systems: Modeling Adoption, Satisfaction, and Mobility Patterns*. Elsevier, 123-149.

INVITED TALKS

[1] Disentangling metro passenger travel delays under extreme weather events: An analytical framework. *Special Session on Smart Urban Mobility at the 4th International Conference in Urban Informatics (ICUI)*, Hong Kong, China, August 2025.

[2] Large-scale electric bus network transition planning via deep reinforcement learning. *Special Session on Urban Planning AI at the 19th International Association for China Planning (IACP) Conference*, Xiamen, China, July 2025.

[3] Combining AI and Network Science for Transportation Network Planning Presentation. *2024 INFORMS Annual Meeting*, Seattle WA, October 2024.

[4] Large language models for human mobility analytics. *Transport for London AI Journal Club*, online, August 2024.
[5] Data-driven travel demand forecasting for transportation system planning using deep learning. *The 6th Bridging Transportation Researchers (BTR) Online Conference (BTR6)*, online, August 2024.
[6] AI-driven travel demand modeling for smart transport planning. *Massachusetts Institute of Technology*, Cambridge MA, November 2023.
[7] AI and machine learning for urban planning and design. *Executive Course in Urban Analytics for Lands Department, HKSAR Government*, Hong Kong, August 2023.
[8] AI for transport planning. *HKU-PKU Joint Summer School in Urban Science*, Shenzhen, July 2023.
[9] AI-driven travel demand modeling for smart transport planning. *KTH Royal Institute of Technology*, online, March 2023.
[10] Urban transport networks and trajectory data mining. *Peking University-HKU Sustainable Development and Smart Cities in the Greater Bay Area*, online, November 2021.
[11] Trajectory data mining for smart urban mobility. *University of Michigan-Shanghai Jiaotong University Joint Institute*, online, June 2021.
[12] Transportation big data and data mining for cities. *Seminar-Workshop Series in Urban Analytics for Lands Department, HKSAR Government*, Hong Kong, December 2020.
[13] Uncovering behavior dynamics in human mobility using transit smart card data. *Hong Kong Polytechnic University*, online, September 2020.

HONORS & AWARDS

- HKU Li Ka Shing Prize (as supervisor), 2025
- MKLM'25 Best Paper Award, 2025
- UrbanComp'24 Best Paper Award, 2024
- HKU Overseas Fellowship Award, 2023
- HKU Foundation Publication Award for Research Postgraduate Students (as supervisor), 2023-2024
- Second Prize, The 6th Chengyuan Cup - Planning Decision Support Model Design Contest (as supervisor), 2022
- Fellow, Meeting of Minds@HKU Forum for Outstanding Young Scholars, 2019
- Mitacs-Accelerate Internship Award, 2012
- Tongji University Outstanding Graduate Award, 2011
- Second Prize, Competition of Transport Science and Technology of Tongji University, 2010
- Scholarships for Excellent Academic Performance, 2008-2010

SELECTED SERVICES

- Organizing committee member for International Symposium for Transport Network Resilience, 2023 (INSTR2023)
- Organizer for University of Glasgow-HKU Symposium on Urban Analytics, 2021
- Reviewer for leading academic journals in transportation, urban planning and geography, including
  - *Transportation Research Part A/B/C/D/E*
  - *IEEE Transactions on Intelligent Transportation Systems*
  - *Sustainable Cities and Society*
  - *Computer, Environment and Urban Systems*
  - *Journal of Planning Education and Research*
  - *International Journal of Geographical Information Science*
  - *Journal of Transport Geography*
  - *Travel Behaviour and Society*
  - *IEEE Transactions on Mobile Computing*
  - *GIScience & Remote Sensing*

- *Transport Policy*
- *Transportation*
- *Accident Analysis and Prevention*
- *Journal of Public Transportation*
- *Journal of Transport and Health*
- *PLOS ONE*

RESEARCH POSTGRADUATE STUDENTS

Current Students

- Lingyun Zhong, PhD Student 2025-Present
- Yamin Wang, PhD Student 2025-Present
- Tianhao Li, PhD Student 2024-Present
- Xiaohan Wang, PhD Student 2023-Present
- Luyun Zhao, PhD Student 2023-Present
- Fangyi Ding, PhD Student 2022-Present

Past Graduates

- Yijia Hu, PhD; Currently Postdoc Fellow at The University of Hong Kong 2021-2025
- Yuebing Liang, PhD; Currently Assistant Professor at Tsinghua University 2020-2024
- Yihong Tang, MPhil; Currently PhD student at McGill University 2022-2024