Zhaoxiang Li

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Education

Massachusetts Institute of Technology (MIT) — **Cambridge, United States**
Ph.D. in Urban Studies and Planning — *Sep.2025-Present*
MIT Presidential Fellowship

Peking University — **Beijing, China**
Master of Science, Urban and Regional Planning — *Sep.2022-Jul.2025*

- **GPA:3.67/4.00**, Supervised by Prof. Pengjun Zhao
  National Scholarship for Graduate Students of China, 2024, **Rank 1/51**

Tongji University — **Shanghai, China**
BEng, Traffic Engineering — *Sep.2018-Jun.2022*

- **GPA:4.76/5.00**, which is equivalent to 92.61 on 100 basis
  National Scholarship for Undergraduate Students of China, 2020, **Rank 1/225**

Research Interests

My research interests lie at the intersection of **Urban Mobility & Travel Behavior**, **Emerging Mobility Systems**, **Sustainable Transportation**, and **Transportation Equity**:

(1) Urban Mobility and Travel Behavior: Leveraging transit data to understand the mobility patterns and behavioral dynamics of people and goods; exploring incentive mechanisms and intervention measures to promote more sustainable mobility.

(2) Emerging Mobility Systems: Assessing the environmental, economic, and social impacts of the application of CASE (Connected, Autonomous, Shared, Electric) mobility technologies using causal inference and machine learning methods.

(3) Green Transformations in Transportation: Focused on technological innovation, governance, and strategic planning techniques to achieve green transformations in transportation systems.

(4) Social and Spatial Justice: In relation to accessibility to essential services, transportation infrastructure, climate and environmental impacts of transportation systems among different communities and groups.

Publications

(* indicates the corresponding author; † indicates co-first authors.)

Referred publications

1. **Li, Z.,** Ma, X., Pan, R., Yang, C., & Yuan, Q*. (2025). Explaining the Spatial Dynamics and Identifying Potential Risks of Hazardous Materials Truck Movements. *Journal of Transport Geography*, *123*, 104125.
2. **Li, Z.**, Zhao, P.*, He, Z., & Xiao, Z. (2024). Non-linear Effects of CO_2 Emissions from Road Transport in Port Landside Area. *Transportation Research Part D: Transport and Environment*, *132*, 104264.
3. Zhao, P.*, **Li, Z.***, He, Z., Chen, Y., & Xiao, Z. (2025). Reducing the Road Freight Emissions through Integrated Strategy in the Port Cities. *Nature Communications, 16(1)*, 2563.
4. Zhao, P.*, **Li, Z.** , Xiao, Z., Jiang, S., He, Z., & Zhang, M. (2023). Spatiotemporal Characteristics and Driving Factors of CO_2 Emissions from Road Freight Transportation. *Transportation Research Part D: Transport and Environment*, *125*, 103983.
5. He, Z., Zhao, P.*, Xiao, Z., Huang, X., **Li, Z.**, & Kang, T. (2024). Exploring the Distance Decay in Port Hinterlands under Port Regionalization Using Truck GPS Data. *Transportation Research Part E: Logistics and*

Transportation Review, *181*, 103390.

6. He, Z., Zhao, P.*, Zhang, S., **Li, Z.**, Huang, G., Zhang, C., & Niu, Y. (2024). Analyzing Foreland Dynamics in China's Port Clusters under Global Major Events (2019–2022) by AIS Trajectory Data. *Ocean & Coastal Management*, *255*, 107269.
7. He, Z., Zhao, P. *, Huang, G., **Li, Z.**, Huang, Z., Niu, Y., & Zhang, C. (2025). Unrevealing the adaptivity of container shipping network during disruption events by AIS trajectory data. *Ocean & Coastal Management, 270*, 107862.

Forthcoming publications

1. Zhao, P.*, **Li, Z.**, Kan, C., Zheng, Y., Wang, Y., Hou, Y., Jiang, S., & Liu, Q.*. (2025). Environmental Injustice and Transition Pathways of Heavy-Duty Truck Transport in China. *Communications Earth & Environment*. (Under review)
2. Wang, Y., Yin, H, & **Li, Z.***. (2025). Multiscale spatiotemporal heterogeneity analysis of bike-sharing system's self-loop phenomenon. *Transportation Research Part A: Policy and Practice*. (Under review)
3. Wang, S., Zheng, Y.*, Chen, J., **Li, Z.**, Ji, Y., & Du, Y. (2025). Adaptive Energy Scheduling Strategy for Port Logistics Systems: A Dual-Consolidation Continual Reinforcement Learning Approach. *Applied Energy*. (Under review)

Academic Conferences

The 24th COTA International Conference of Transportation Professionals (Summer 2024) **Shenzhen, China**

The 15th International Conference on Applied Energy (Fall 2023) **Matsue & Tokyo, Japan**

The 14th Workshop on Computational Transportation Science (Fall 2023) **Shanghai, China**

The 28th Conference on Atmospheric Environment Science and Technology of China (Winter 2022) **Beijing, China**

Research Experience

JTL Urban Mobility Lab at MIT **MA, United States**

Project 1: Employment Impacts of Landmark Federal Economic Stimulus Legislation *Jul.2025-Present*

- Collected and constructed datasets on Biden-era federal legislation (IIJA and IRA) and U.S. labor market outcomes through large-scale data crawling and integration.
- Applied a causal inference framework integrating deep generative models to identify the employment impacts of major infrastructure and climate policies.

Key Laboratory of Earth Surface System and Human-Earth Relations **Shenzhen, China**
Ministry of Natural Resources of China, Peking University

Project 1: Carbon Footprint and Environmental Impacts of Urban Transportation Systems *(Shenzhen Science and Technology Program, Grant No. JCYJ20220818100810024,* ***$2,074,430****), Participant Sep.2022-Jul.2025*

- Constructed high resolution CO_2 and air pollutants (NO_x, PM) emission inventories of road transportation in China based on 51 billion GPS trajectory signals of heavy-duty trucks, utilizing COPERT model.
- Identified spatiotemporal patterns and drivers of CO_2 emission from road transportation using geospatial (MGWR) and machine learning (XGBoost + ALE) approaches.
- Established a mesoscale road traffic simulation model to simulate the impact of road network changes on traffic flow, and its subsequent effects on road transportation emissions reduction.
- Developed a scenario-based approach to assess the integrated effects of truck fleet electrification and road network development on deep decarbonization and air pollution emissions reduction in the Greater Bay Area

(GBA) of China by 2035, under both the BAU scenario and the net-zero emission electricity grids scenario.

- Evaluated the causal effects of urban land use mix on road freight transport emissions in Chinese cities using a causal machine learning framework (Double Machine Learning).

Project 2: Building Capacity for the Future City in Developing Countries (PEAK) *(UKRI's Global Challenge Research Fund, Grant No.ES/P011055/1,* ***$9,146,875****), Participant* *Sep.2022-Jul.2025*

- Extracted human travel origin-destination (OD) data from 35 billion mobile signalling records during the 2019-2023 period and analysed the mobility patterns in China before and after the COVID-19 epidemic.
- Proposed the Pollution-Benefit Matching Index (PBMI) to quantify the social inequalities of economic benefits and pollution burdens (NO_x, PM) from road freight transport activities in China at a 1 km grid scale.
- Evaluated the impacts of traffic restriction policies on pollutant emissions from road transportation and analyzed the resulting inequalities using DID analysis.
- Assessed the potential of policy interventions (e.g., pollution taxes, electrification, land use mix) to promote environmental justice, using a simulation-based approach.

Project 3: Mechanism and Simulation of Sea-land Resources Flow via Big Data *(National Natural Science Foundation of China, Grant No.42130402,* ***$401,056****), Participant* *Sep.2022-Jul.2023*

- Devised a data-driven algorithm to extract liner shipping networks and voyage information via 4.5 billion AIS (Automatic Identification System) data.
- Employed the complex network approach to demarcate the foreland structures of China's port clusters.
- Estimated the distance decay effect of freight flows in port-hinterland relationship (between the Shenzhen Port and primary freight facilities) by adopting the gravity model.
- Investigated the allocation of freight facilities related to the Shenzhen Port using the DBSCAN algorithm.

Key Laboratory of Road and Traffic Engineering **Shanghai, China**
Ministry of Education of China, Tongji University

Project 1: Federated Learning-based Personalized Vehicle Operation Risk Identification Algorithms *(National Innovation Training Project, Grant No.202010247139,* ***$2,800****),* ***Principal Investigator*** *Jan.2020-May.2021*

- Constructed a CNN-LSTM model to identify risk driving events from vehicle forward video data.
- Developed a federated learning (FL) framework to collect data from multiple vehicles and transmit model training parameters with privacy preservation.
- Adopted a Domain Adaptation method within the FL framework to adjust the feature distribution of input data from different users, removing the differences in sample distribution.

Project 2: Travel Decision-making Mechanism and Control Method for Urban Heavy-duty Trucks *(National Natural Science Foundation of China, Grant No.52302394,* ***$41,488****), Participant* *Apr.2021-Jun.2022*

- Proposed a data-driven approach (a dual-constraint PELT algorithm) for extracting stops and trips from GPS data, determined dwell time thresholds of HazMat truck stops.
- Developed a spatial clustering algorithm to identify stopping hotspots for HazMat transportation.
- Analysed the mobility patterns of HazMat trucks based on the truncated power-law distribution.
- Modified the risk assessment method of the US DOT to calculate the potential risks of HazMat transportation.

Selected Honors and Awards

Membership: American Society Civil Engineering (ASCE) 2021-Present

MIT Presidential Fellowship 2025

Merit Student Pacesetter Award, Peking University (**Rank 1/51**) 2024

National Scholarship (Awarded by Ministry of Education of China, **Rank 1/225**) 2024

Outstanding Graduate of Shanghai (Awarded by Shanghai Education Commission, **Rank 1/225**) 2022

Xiangcheng High-Tech Talent Scholarship, Tongji University (**Rank 2/225**) 2021

First Prize of the 16th National Competition of Transport Science and Technology (Awarded by Ministry of Transport of China, **Rank 1/1130**) 2021

5th in 2021 American Society Civil Engineering Mid-Pacific Student Conference Transportation Contest 2021

National Scholarship (Awarded by Ministry of Education of China, **Rank 1/225**) 2020

Outstanding Student Award, Tongji University (**Top 1%** of all undergraduate students at TJU) 2019-2022

Research Skills

- **Programming**: Python, C++, SQL, MATLAB, STATA, ArcGIS, QGIS, TransCAD, PTV Visum/Vissim, EPA MOVES, COPERT.
- **Deep Learning Framework**: Pytorch, TensorFlow, Scikit-learn.
- **Analytical Skills**: Machine Learning, Computer Vision, Reinforcement Learning, GIS & Spatial Data Analysis, Traffic Simulation, Transportation Energy & Emission Modeling, Econometrics, Causal Inference, Discrete Choice Modeling, Web Scrapping.
- **Language**: English (IELTS: 7.0), Chinese Mandarin (Native).