**Shixiao Liang**
Ph.D. Candidate
Department of Civil and Environmental Engineering, University of Wisconsin–Madison
Madison, WI — sliang85@wisc.edu — (608) 515-1070

## EDUCATION

**University of Wisconsin-Madison**, Madison, WI, US
**Ph.D.**, Civil and Environmental Engineering (Intelligent Transportation System) 2023.09 - Present
Supervisor: Prof. Xiaopeng Li, Prof. Xin Wang; GPA: 3.96/4

**M.S. - Research**, Civil and Environmental Engineering 2024.09 - Expected 2026.12

**M.S.**, Computer Science 2022.09 - 2024.08
GPA: 3.8/4

**M.A.**, Mathematics 2021.09 - 2023.06
GPA: 3.8/4
First year completed through the UW-Madison VISP/MA (3+1+1) Program during the fourth year of undergraduate study.

**Nankai University**, Tianjin, China 2018.09 - 2022.06
**B.S.**, Mathematics and Applied Mathematics
Thesis: Private Label Encroachment Strategy in E-commercial Supply Chain; Supervisor: Prof. Wei Hu
Honors: Excellent Student Leader Scholarship; Outstanding Social Service Scholarship

## RESEARCH INTERESTS

- **AI and Language Model for Intelligent Transportation Systems:** agentic multimodal reasoning, cooperative perception, and automated safety analysis using vision-language models and vehicle sensing data.
- **Telematics Data Analysis and Mining:** large-scale connected vehicle data processing, lane-level trajectory reconstruction, and risk modeling.
- **Physics-Informed and Interpretable AI:** physics-enhanced residual learning, interpretable trajectory prediction, and hybrid models combining physical laws with deep learning.

## PUBLICATIONS

1. Cao, B.*, **Liang, S.***, Zhou, H., Long, K., Li, H., Ma, C., & Li, X. (2026). **Semantic Graph-Augmented Agentic AI for Quality Control**. *International Conference on Transportation and Development 2026*, 35–47. https://doi.org/10.1061/9780784487013.004
2. **Liang, S.**, Ma, C., Long, K., Zhou, H., Liu, J., & Li, X. (2026). **Real-Time Traffic Crash Detection Platform Using Sparse Telematics Data from Connected Vehicles**. *IEEE Intelligent Vehicles Symposium (IV).*
3. **Liang, S.**, Ma, C., Li, P., Shi, H., Liu, J., Zhou, H., Long, K., Cao, B., & Li, X. (2026). **Real-Time Lane-Level Crash Detection on Freeways Using Sparse Telematics Data**. *Accident Analysis & Prevention.* Published online. https://www.sciencedirect.com/science/article/pii/S0001457526002162
4. Long, K., Shi, H., **Liang, S.**, & Li, X. (2026). **Physics Enhanced Residual Policy Learning (PERPL) for safety cruising in mixed traffic platooning under actuator and communication delay**. *Transportation Research Part C: Emerging Technologies.* Accepted for publication.
5. Li, Z., Zhang, P., **Liang, S.**, Zhou, H., Ma, C., Yao, H., Li, Q., & Li, X. (2025). **Benchmarking Tesla's Traffic Light and Stop Sign Control: Field Dataset and Behavior Insights**. *SSRN preprint.* https://doi.org/10.2139/ssrn.5734560
6. Li, H., Cao, B., Liang, Z., Li, W., Oh, J., Chen, Y., **Liang, S.**, Zhou, H., Ma, C., Liu, J., Li, Z., Zhang, P., Long, K., Liu, M., Jiang, J., Yu, C., Liu, S., Yu, H., & Li, X. (2025). **CATS-V2V: A Real-World Vehicle-to-Vehicle Cooperative Perception Dataset with Complex Adverse Traffic Scenarios**. arXiv:2511.11168. https://arxiv.org/abs/2511.11168
7. Fang, J., Guo, N., **Liang, S.**, & Xiang, Y. (2025). **Application of three-dimensional Rubik's cube scrambling and genetic information diffusion in multiple-color image encryption**. *Journal of Supercomputing*, 81, 982. https://doi.org/10.1007/s11227-025-07363-y
8. Hao R., **Liang S.**, Guan T., Zhou H., Wang X., Li X., Zhai Z. (2025). **Privacy-Preserving Sensor Location Problem for Traffic Flow Surveillance.** *Computer-Aided Civil and Infrastructure Engineering.* https://doi.org/10.1111/mice.13418
9. Qiu, J., Fu, S., Ou, J., Tang, K., Qu, X., **Liang S.**, Wang, X., & Ran, B. (2024). **Estimating link flow through link speed with sparse flow data sampling.** *Computer-Aided Civil and Infrastructure Engineering.* https://doi.org/10.1111/mice.13323
10. Fang, J., Zhao, K., **Liang, S.**, & Wang, J. (2024). **Image encryption algorithm based on a novel 2D logistic-sine-coupling chaos map and bit-level dynamic scrambling**. *Concurrency and Computation: Practice and*

*Experience*. https://doi.org/10.1002/cpe.8261

11. Zhou, H., Ma, K., **Liang, S.**, Li, X., & Qu, X. (2024). **ULTra-AV: A unified longitudinal trajectory dataset for automated vehicle**. *Scientific Data*. https://doi.org/10.1038/s41597-024-01968-x
12. Fu, S., Shi, H., **Liang, S.**, Wang, X., & Ran, B. (2024). **Analytical Optimized Traffic Flow Recovery for Large-scale Urban Transportation Network**. arXiv:2409.03906. https://arxiv.org/abs/2409.03906

[*] *Equal contribution.*

## UNDER REVIEW

1. Long, K., Ma, C., Zhou, H., **Liang, S.**, Chen, S., & Li, X. (2025). **Surrogate Safety Measures Prediction from Individual Vehicle Trajectories via Knowledge Distillation**. *Submitted to Accident Analysis & Prevention*.
2. Liu, J., Ma, C., Zhou, H., Tang, W., **Liang, S.**, Ding, H., Li, X., & Ran, B. (2025). **Spontaneous Risk-Aware Selective Cooperative Perception**. *Submitted to Transportation Research Part C: Emerging Technologies*.
3. Chen, W., Huang, H., Ma, K., Li, H., **Liang, S.**, Zhou, H., & Li, X. (2025). **Unveiling Uniform Shifted Power Law in Stochastic Human and Autonomous Driving Behavior**. *Submitted to Nature Human Behaviour*. arXiv:2511.00659. https://doi.org/10.48550/arXiv.2511.00659
4. **Liang, S.**, Chen, W., Long, K., Zhang, P., Ma, C., Li, X., & Ke, J. (2025). **Theory Foundation of Physics-Enhanced Residual Learning**. *Submitted to Transportation Science (Major Revision)*. arXiv:2509.00348. https://doi.org/10.48550/arXiv.2509.00348

## WORKING PAPERS

- Ma, C., **Liang, S.**, Li, Z., Zhou, H., Long, K., Cao, B., Li, H., & Li, X.[*]. **Selective Cooperative Perception via Agentic Dialogue and Blind Spot Reasoning with Vision-Language Models**.
  *Working paper*.

- Chen, W.[*], **Liang, S.**[*], Huang, H., & Li, X.[*]. **A generative model–powered distribution prediction framework for autonomous driving behavior**.
  *Working paper*.

[*] *Equal contribution.*

## TEACHING EXPERIENCE

**University of Wisconsin–Madison, Department of Mathematics** — Madison, WI
*Teaching Assistant* — 2025.08 – 2025.12
Instructor: Prof. Mariya Soskova
Course: *Math 221: Calculus and Analytic Geometry*

*Teaching Assistant* — 2025.06 – 2025.08
Instructor: Dr. Gevorg Mnatsakanyan
Course: *Math 632: Introduction to Stochastic Processes*

*Teaching Assistant* — 2024.08 – 2024.12
Instructor: Dr. Gevorg Mnatsakanyan
Course: *Math 320: Linear Algebra and Differential Equations*

**University of Wisconsin–Madison, Department of Industrial and Systems Engineering** — Madison, WI
*Guest Lecturer* — 2023.10 – 2023.12
Instructor: Prof. Xin Wang
Course: *ISyE 645: Engineering Models for Supply Chains*

**University of Wisconsin–Madison, Department of Mathematics** — Madison, WI
*Course Assistant* — 2022.09 – 2023.05
Instructor: Prof. Saverio Spagnolie
Course: *Math 514: Numerical Analysis*

## PRESENTATION

- **Telematics-Based Prediction of Winter Low-Friction Risk for Real-Time Warning**
  **Shixiao Liang**
  Accepted Presentation, ASCE2027 Experience [2027]

- **Semantic-Graph-Augmented Agentic AI for Quality Control**
  Cao, B.*, **Liang, S.***, Li, H., Long, K., Li, W., & Li, X.
  Conference Presentation, ASCE International Conference on Transportation & Development (ICTD 2026), Detroit, MI [Jun 2026]

- **Uniform Scaling Law in Stochastic Human and Autonomous Driving**
  Wang Chen, Heye Huang, Ke Ma, Hangyu Li, **Shixiao Liang**, Hang Zhou, Xiaopeng Li
  Poster Presentation, Transportation Research Board (TRB) Annual Meeting [Jan, 2026]

- **Selective Cooperative Perception via Blind Spot Reasoning and Agentic Dialogue with Vision-Language Models**
  Chengyuan Ma, **Shixiao Liang**, Zheng Li, Hang Zhou, Keke Long, Bofeng Cao, Hangyu Li, Xiaopeng Li
  Poster Presentation, Transportation Research Board (TRB) Annual Meeting [Jan, 2026]

- **Real-Time Lane-Level Crash Detection on Freeways Using Sparse Telematics Data**
  **Shixiao Liang**, Chengyuan Ma*, Pei Li, Haotian Shi, Jiaxi Liu, Xiaopeng Li
  Poster Presentation, Transportation Research Board (TRB) Annual Meeting [Jan, 2026]
  Poster Presentation, Research Bazaar, University of Wisconsin–Madison, Madison, WI [Mar 2026]
  Runner-up, CCAT Student Poster Competition, 2026 Global Symposium on Mobility Innovation [Apr 2026]

- **Benchmarking Tesla's Traffic Light and Stop Sign Control: Field Dataset and Behavior Insights**
  Zheng Li, Peng Zhang, **Shixiao Liang**, Hang Zhou, Chengyuan Ma, Qianwen Li, Handong Yao, Xiaopeng Li
  Poster Presentation, Transportation Research Board (TRB) Annual Meeting [Jan, 2026]

- **CATS-V2V: A Real-World Vehicle-to-Vehicle Cooperative Perception Dataset with Complex Adverse Traffic Scenarios**
  Hangyu Li, Bofeng Cao, Zhaohui Liang, Wuzhen Li, Chengyuan Ma, **Shixiao Liang**, Hang Zhou, Jiaxi Liu, Hongkai Yu, Xiaopeng Li
  Poster Presentation, Transportation Research Board (TRB) Annual Meeting [Jan, 2026]

- **ULTra-AV: A Unified Longitudinal Trajectory Dataset for Automated Vehicle**
  Zhou, H., Ma, K., **Shixiao Liang**, Li, X., & Qu, X.
  Poster Presentation, Transportation Research Board (TRB) Annual Meeting [Jan, 2025]

- **Electrifying the Fleet: A Comprehensive Review of Clean Energy Vehicle Candidates for Upgrades**
  **Shixiao Liang**, Xiaopeng Li
  Poster Presentation, Universities of Wisconsin Sustainability Summit [Sep, 2024]

## RESEARCH PROJECTS

**Evaluation of Vehicle Telematics and Infrastructure-based Connected Vehicle Data for Real-Time Safety and Mobility Application**
**Funding Agency:** Center for Connected and Automated Transportation (CCAT)
**Role:** system design, lane-level telemetry processing, crash detection algorithm development
**Project Period:** 2025.06 – 2026.06

**Pilot Use of Telematics for Traffic Safety Analysis**
**Funding Agency:** Wisconsin Department of Transportation (WisDOT)
**Role:** statewide telematics database construction (SQL), data cleaning, crash–trajectory alignment
**Project Period:** 2025.09 – 2026.09

**CPS: Small: NSF-DST: Turning "Tragedy of the Commons (ToC)" into "Emergent Cooperative Behavior (ECB)" for Automated Vehicles at Intersections with Meta-Learning**
**Funding Agency:** National Science Foundation (NSF)
**Role:** PERL model development, theoretical analysis, trajectory prediction
**Project Period:** 2024.01 – 2026.12

## PROFESSIONAL SERVICE

- **Reviewer**
  - Transportation Research Part E: Logistics and Transportation Review * 8
  - Asia-Pacific Conference on Transportation and the Environment (APTE) * 1
  - Transportation Research Board (TRB) Annual Meeting * 3

- Cleaner Logistics and Supply Chain * 9
- Journal of Urban Planning and Development * 13
- IEEE Intelligent Vehicles Symposium (IV) * 2
- IEEE Intelligent Transportation Systems Magazine * 1
- IEEE International Conference on Intelligent Transportation Systems (ITSC) * 1
- IEEE Intelligent Transportation Systems * 4

## ADDITIONAL INFORMATION

- **Languages:** English, Chinese
- **Programming:** Python, Julia, Matlab, SQL
- **Software:** Gurobi, JuMP, Pytorch, LaTeX