Yanlin Zhang

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Yanlin Zhang is a Ph.D. candidate in Transportation Engineering and Computational Science and Engineering at the University of Illinois Urbana–Champaign. His research focuses on large-scale trajectory modeling, road-user behavior, and autonomous vehicle performance. He has contributed to several federally funded projects, developing data-driven pipelines for multimodal perception, traffic analysis, and safety evaluation.

Research Projects

TGSIM: Third Generation of SIMulation *Lead Graduate Research Assistant*
FHWA-funded trajectory dataset project
github.com/ylinzhang12/TGSIM-trajectory-pipeline

- Designed an end-to-end Python pipeline (PyTorch, OpenCV, NumPy, Pandas) for object detection, multi-object tracking, smoothing, and quality control on aerial video.
- Scaled the system to process 14+ hours of high-definition footage into over 11K vehicle-kilometers of high-fidelity trajectories for mixed-autonomy traffic analysis.
- Standardized data schema and documentation for public FHWA release, enabling reuse by external research groups and agencies.

AVA: Automated Vehicles for All *Perception & Data Analytics Lead*
USDOT-funded automated driving test program
github.com/ava-share

- Built a real-time multimodal perception stack in ROS (C++/Python), fusing LiDAR segmentation, radar tracking, and camera-based detection on a Dataspeed drive-by-wire platform.
- Developed offline pipelines to mine safety-critical interactions and surrounding-vehicle context from large-scale ROS bag logs.
- Collaborated with controls and safety teams to validate longitudinal control and perception performance in on-road ADS testing.

SER: Self-Enforcing Roadways *Lead Graduate Research Assistant*
Illinois DOT-funded safety design project

- Built a deep-learning-based image segmentation pipeline on Google Street View imagery to extract roadway and roadside features at scale.
- Linked visual roadway features to crash severity using multinomial logit and causal-inference frameworks to quantify safety impacts of "self-enforcing" designs.
- Prototyped AI tools for automated identification of self-enforcing features to support future design libraries and pilot deployments.

ENACT: Energy-Aware Connected and Automated Transport *Perception Team Lead*
Collaboration with Argonne National Laboratory

- Developed radar–camera–LiDAR fusion modules with Kalman filtering for robust forward-vehicle detection in energy-focused CAV experiments.
- Integrated perception outputs with vehicle control to evaluate how different driving strategies and perception settings affect real-world energy consumption.
- Co-authored publications on perception-enabled, energy-aware CAV operation using data from controlled on-road experiments.

Education

2021 – 2026 (Expected) **Ph.D. in Transportation Engineering and Computational Science and Engineering**, University of Illinois Urbana–Champaign
Thesis: Characterization and Modeling of Behavioral Dynamics in Mixed Vehicular Traffic

2020 – 2021 **M.Sc. in Transportation Systems Analysis and Planning**, Northwestern University

2016 – 2020 **B.Eng. in Traffic Engineering (Highest Honors)**, Tongji University

Publications

Note: "α–β" means alphabetical author ordering.

Peer-reviewed publications

J1. **Zhang, Yanlin**, Alireza Talebpour, Hani S Mahmassani, and Samer H Hamdar (2025). "Investigation of Discretionary Lane-Changing Decisions: Insights From the Third Generation Simulation (TGSIM) Dataset". In: *Transportation Research Record*, p. 03611981251318329

J2. **Zhang, Yanlin** and Alireza Talebpour (2024). "Characterizing human–automated vehicle interactions: An investigation into car-following behavior". In: *Transportation research record* 2678.5, pp. 812–826

J3. Nachuan Li, Hani S Mahmassani, **Zhang, Yanlin**, Alireza Talebpour, and Samer Hamdar (2025). "Close Look into the Spatial-Temporal Distribution of Speed, Lane Changes, and Heavy Vehicles in a Congested Freeway Weaving Section". In: *Transportation Research Record* 2679.2, pp. 862–878

J4. (α–β) Rami Ammourah, Pedram Beigi, Bingyi Fan, Samer H Hamdar, John Hourdos, Chun-Chien Hsiao, Rachel James, Mohammdreza Khajeh-Hosseini, Hani S Mahmassani, Dana Monzer, Tina Radvand, Alireza Talebpour, Mahdi Yousefi, and **Zhang, Yanlin** (2025). "Introduction to the third generation simulation dataset: Data collection and trajectory extraction". In: *Transportation Research Record* 2679.1, pp. 1768–1784

J5. Alireza Talebpour, **Zhang, Yanlin**, Tina Radvand, and Mahdi Yousefi (2024). "Advancing Self-Enforcing Streets Phase 1: The Relationship between Roadway Environment and Crash Severity". In

Under review

U1. **Zhang, Yanlin**, Sungyong Chung, Nachuan Li, Dana Monzer, Hani S Mahmassani, Samer H Hamdar, and Alireza Talebpour (2025). "Can the Waymo Open Motion Dataset Support Realistic Behavioral Modeling? A Validation Study with Naturalistic Trajectories". In: *arXiv preprint arXiv:2509.03515*

Skills

Programming & Tools	Python, C, C++, ROS, R, MATLAB, Git, Linux/Unix, Docker, LaTeX
Machine Learning	PyTorch, TensorFlow, Keras, scikit-learn, Hugging Face, OpenCV
Data Science	Time-series analysis, causal inference, Bayesian methods
Communication	Academic writing, teaching/mentoring, and technical presentations