

JIAHENG XIAO

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RESEARCH INTEREST

- Deep learning modeling and prediction for urban transportation systems.
- Multi-agent trajectory prediction in traffic flow and autonomous mobility.
- Probabilistic and cognitive-inspired inference for dynamic behavior modeling.
- AI-enabled traffic state estimation and control strategies.

EDUCATION

Jilin University

M.S. of Transportation Information Engineering and Control | Average Score: 82/100

Sep 2021 - Jul 2024

Core courses: **Basis of Modern Statistics(94)**, **Traffic Control Theory(93)**, **Fundamental of Algebra(86)**, Image Processing and Pattern Recognition, Traffic Information Engineering

Jilin University

Bachelor of Automobile Application Engineering

Sep 2016 - Jul 2020

Core courses: **Advanced Mathematics(83)**, Automobile Application Engineering(83), Fundamentals of C Programming(86), Fundamentals of Automotive Control Technology

PUBLICATIONS

J. Xiao(First author), Z. Li, Y. Sun(2026). DPIU-Net: Dynamic Pedestrian Intention Understanding Through Cognitive Decision-Making. **IEEE TNNLS**, DOI:10.1109/TNNLS.2026.3665567.

- Developed novel MI-based probabilistic model to infer dynamic intent under real-world multi-agent interactions.
- Proposed uncertainty-aware framework to improve prediction reliability in safety-critical scenarios.

J. Xiao, Z. Qu, Z. Li(2024). Pedestrian Trajectory Prediction and Vehicle Safety Warning Methods in Autonomous Driving. **Master's thesis**, Jilin University..

RESEARCH EXPERIENCES

Hypergraph-Guided Social Interaction Modeling with State Space Models

Sept 2025 – Present

Jimei University | *Project Lead*

Xiamen, China

- Analyzed the limitations of fully connected interaction modeling in the Transformer for pedestrian trajectory prediction, and found out that it is difficult to explicitly depict the social relationships within the group.
- Combined hypergraphs with the State Space Model (SSM), first perform high-order modeling and sorting of the social relationships between the target individual and its neighbors, and then conduct temporal modeling of the sorted interaction sequences.
- Currently in the stage of model development and manuscript preparation.

Probabilistic Pedestrian Movement Intention Understanding

Nov 2021 - Aug 2024

Jilin University | Jilin Province S&T Program | *Project Lead*

Changchun, China

- Combining **deep learning** and the **human cognitive decision-making mechanism**, developed a method for understanding pedestrian movement intentions that couples pedestrian movement sequences with scenarios.
- Introduced a **Bayesian Optimization layer** to quantify epistemic uncertainty in intent inference, significantly improving robustness in long-tail scenarios.
- Achieved best ADE/FDE on the SDD(8.29/12.12)/ETH-UCY(0.18/0.32), validating that explicit **intention modeling** significantly reduces error of trajectory distributions compared to purely reactive baselines.

Pedestrian Trajectory Prediction and Vehicle Safety Warning Methods in Autonomous Driving

Jilin University | Master's Dissertation | *Project Lead*

Dec 2021 – May 2024

Changchun, China

- Collaborated on multi-class object detection using **ROS2** and **SLAM**, including **spatiotemporal calibration** of **multi-sensor data**(cameras/LiDAR); used **potential field** for human-vehicle conflict resolution.
- Modeled **pedestrian-vehicle collision risk** utilizing KDE and Bayesian probability; characterized risk into risk field for safe navigation decisions.
- Achieved superior accuracy over baseline methods on trajectory benchmark datasets; improved success rate of avoiding collisions under **dynamic campus environment** and **SUMO**.

Dynamic Assessment Model of Road Risk

Jilin University | Collaborative project between MPS and Huawei| *Key Contributor*

Jan 2022 – Jul 2022

Changchun, China

- Collaborated to develop a dynamic assessment model for road operation risks based on historical accident data and real-time road information.
- Designed risk scoring & monitoring logic deployed in real-world traffic management systems, addressing challenges in data sparsity and resource-constrained inference.
- The model has been officially adopted and implemented by the National Public Security Department of China.

PATENTS

Z. Li, **J. Xiao**, P. Tao, H. Zhao(2023). An Instance-Based Trajectory Prediction Method Considering Pedestrian Motion Intentions, China Patent No. CN117392514A.

Z. Li, H. Zhao, **J. Xiao**, P. Tao(2023). A method for predicting pedestrian crossing intentions based on multiple self-attention mechanisms, China Patent No. CN117765568A.

SKILLS

Deep Learning: Probabilistic modeling/ attention mechanisms/ Bayesian optimization/ large-scale model training.

Traffic engineering: Traffic flow modeling and prediction, Large-scale spatiotemporal data analysis for urban mobility, Probabilistic inference in interactive traffic environments

Optimization/Control: Bayesian optimization/ nonlinear optimization/ scenario evaluation.

Robotics/Vehicle Perception: Trajectory prediction/ risk assessment/ **multi-modal sensor fusion/ ROS/SLAM**.

Programming Languages: Python/ **PyTorch**/ Hugging Face/ MATLAB/C++ / C/ Java

English: Fluent (Capable of academic writing and presentation).

MISCELLANEOUS EXPERIENCE

A+ grade certified, Explored the progress on smart transportation in Singapore with Prof. Raymond Ong on National University of Singapore Academic Workshop 2022

National Second Prize, The 14th National Transportation Science and Technology Competition 2019

First Prize, Jilin University Transportation Science and Technology Innovation Competition. 2019

College Scholarship, Transportation College Of Jilin University 2018

REFERENCES

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