Zexuan **Jia**

Ph.D. Student · Mobility Systems Control (MSC) Laboratory
200 D.W. Brooks Drive, Athens, GA 30602
zexuan.jia@uga.edu

Education

University of Georgia — *Athens, Georgia*
Ph.D. Student in Mechanical Engineering — *Aug. 2025 - Present*

Southern University of Science and Technology — *Shenzhen, Guangdong*
B.S. in Computer Science and Engineering — *Sep. 2020 - Jul. 2025*

Publication

Optimizing Autonomous Driving Datasets for Detection with Smaller Data Sizes and Equivalent Effectiveness — *IEEE T-ETCI 2026 (JCR-Q1)*
Zexuan Jia, Gongjin Lan — *Accepted, Sep. 2026*

Joint Prediction of Virtual Leader from Future Occupancy and Queueing Theory in Automated Vehicles — *IEEE MECC 2026*
Zexuan Jia, Yunli Shao — *Accepted, Aug. 2026*

LLM-based and Game-Theoretic Traffic Trajectory Generation for Autonomous Driving — *IEEE CCAI 2025*
Zexuan Jia, Huayu Xu — *Published, Aug. 2025*

Projects

Traffic-State Reconstruction and Prediction under Partial Observability using Hybrid AI Learning and Traffic Flow Models — *MSC Lab, UGA*
Deep learning, prediction, motion planning — *Aug. 2025 - Present*

- Develop a hybrid traffic-state reconstruction and prediction framework integrating deep learning with traffic flow modeling
- Design AI models to reconstruct short-term traffic occupancy and flow from partial observations in urban signalized environments
- Incorporate traffic flow dynamics to extend prediction accuracy to corridor-level horizons and capture underlying traffic evolution beyond observed data

A 3D Digital Twin Framework for Closed-Loop Simulation and Control of Autonomous Vehicles (Sponsored by DOE through ORNL) — *MSC Lab, UGA*
Deep learning, Simulation, 3D digital twin, closed-loop evaluation — *Aug. 2025 - Present*

- Develop a multi-resolution digital twin integrating SUMO and CARLA for closed-loop simulation of traffic, control, vehicle dynamics, and hardware-in-the-loop
- Propose a five-layer (L0–L4) fidelity framework to quantify the sim-to-real gap across geometry, sensor signals, perception, and behavior, with predictive-validity analysis and gap-budget attribution to trace error sources
- Build a ROS-free annotation toolkit for real-world multi-sensor logs (six cameras, 3D LiDAR) that aligns LiDAR-keyed frames and auto-seeds 3D bounding boxes, reducing manual labeling to box refinement

CDASim Upgrade to Support Cooperative Driving Automation Research (Sponsored by DOT through Leidos) — *MSC Lab, UGA*
Simulation, CARLA, SUMO, ROS2 — *Sep. 2025 - Feb. 2026*

- Develop core components of a distributed co-simulation framework integrating CARLA–CARMA–SUMO–ROS2 for unified traffic, vehicle, sensing, and control stacks
- Conduct component-level and system-level testing to enable scenario-based validation of cooperative driving automation (CDA) in simulation

LLM-Driven Traffic Trajectory Generation with Game-Theoretic Modeling

Waseda University, SUSTech

LLM, Traffic generation — *Jan. 2025 - Aug. 2025*

- Developed game-theoretic traffic trajectory generation methods to model interactive multi-agent behaviors such as yielding, competition, and negotiation in dynamic traffic environments
- Established a validation pipeline using downstream perception and motion prediction tasks to assess the realism and utility of generated trajectories

Closed-Loop Data-Efficient Perception under Sensing Uncertainty in Autonomous Driving

ISUS Lab, SUSTech

Deep Learning, 3D Perception, Data Closed-Loop — *Dec. 2023 - Aug. 2024*

- Investigated data-efficient training strategies for 2D and 3D perception models in autonomous driving under limited and heterogeneous sensing conditions
- Developed a dataset optimization framework that quantifies scene complexity, instance quality, and sensing uncertainty for structured data selection
- Reduced dataset size by 76.4% across four open-source datasets while preserving 99.2% of model performance, demonstrating efficient data utilization

Honors & Awards

2026	**Frist Prize**, Automated Vehicle Trajectory Modeling Challenge (IEEE ITSS AV)	*Award*
2025	**The Best Graduate Thesis Awards**, Southern University of Science and Technology	*Award*
2025	**Highest Honors in Computer Science and Engineering**, Southern University of Science and Technology	*Honor*
2025	**Best Oral Presentation**, 2025 IEEE International Conference on Computer Communication and Artificial Intelligence (CCAI)	*Award*

Service

2026 **Reviewer**, Transportation Research Board Annual Meeting & Transportation Research Record

2026 **Reviewer**, International Journal of Information Technology & Decision Making

Skills

Programming: Python, C++, C, Java

Deep Learning: PyTorch, Open3D, OpenPCDet, OpenCV, MMDetection3D

Simulation Robotics CARLA, AlpaSim, SUMO, ROS/ROS2, Unreal Engine 4, Unity3D

Systems Tools ARM/x86 Linux, Docker, Singularity, Slurm