

YE HAN

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RESEARCH INTERESTS

My research lies at the intersection of **intelligent vehicles**, **smart transportation**, and **multi-agent artificial intelligence**, with a primary focus on **multi-vehicle cooperative decision-making** within stochastic mixed traffic environments. I am dedicated to exploring the deep integration of multi-agent reinforcement learning, advanced planning algorithms, and foundational AI theories to develop highly robust and computationally efficient cooperative decision-making frameworks for Connected and Automated Vehicles. My long-term vision is to expand the scientific boundaries of “multi-agent decision-making” to foster the emergence of swarm intelligence, thereby driving the development of future transportation systems characterized by high efficiency, safety, and orderly collaboration.

Specifically, my current contributions and research interests unfold as follows:

- **Cooperative Decision-Making Mechanisms for CAVs (Core Domain):** Investigating the complex interactions and game-theoretic mechanisms among multiple vehicles within stochastic traffic flows. By constructing efficient multi-agent cooperative decision-making models, I aim to foster the emergence of advanced collaborative behaviors, thereby fundamentally optimizing both the safety of microscopic maneuvers and the efficiency of macroscopic transportation networks.
- **Theory-Driven Multi-Agent Decision Algorithms (Core Methodology):** Innovating foundational AI algorithms from the bottom up to address the highly dynamic nature of intelligent transportation systems. I focus on modeling complex multi-agent interaction and constructing scalable, computationally efficient decision architectures that empower real-time cooperative autonomous driving. I am particularly interested in integrating *game theory* and *information theory* with DL to unlock advanced strategic reasoning in multi-agent systems.
- **Deployment-Aware Algorithm Design (Practical Applicability):** Incorporating real-world physical and social constraints into theoretical frameworks and algorithm design. To bridge the gap between my models and real-world deployment, my future research aims to account for the social compatibility of heterogeneous traffic, complex vehicle dynamics, and the integration with existing autonomous driving stacks. This ensures the developed cooperative algorithms are fundamentally primed for eventual real-world implementation.

EDUCATION

- **Tongji University** Sept. 2019 – Jul. 2026
Ph. D. in Vehicle Engineering, College of Automotive and Energy Engineering Shanghai, China
 - Thesis: Multi-Vehicle Collaborative Decision-Making in Stochastic Mixed Traffic Segments: Optimal Benchmark and Real-Time Solution,  [1-Page Summary](#)
 - Supervisor: Prof. Lijun Zhang
- **Beijing Institute of Technology** Sept. 2015 - Jun. 2019
B. Eng. in Vehicle Engineering, School of Mechanical Engineering Beijing, China
 - Rank: 3/66 (Top 5%), Graduate of Outstanding Engineer Program, Ministry of Education of China

RESEARCH EXPERIENCE

- **Multi-Vehicle Collaborative Decision-Making in Stochastic Mixed Traffic Segments** Jan. 2023 - Dec. 2025
Ph.D. Research Shanghai, China
 - Architected a Topology-Enhanced MARL framework utilizing Locality-Sensitive Hashing to significantly improve task completion and traffic efficiency in stochastic mixed traffic segments.
 - Developed a Parallel Update MCTS algorithm, enhancing search depth under constrained computational budgets.
 - Formulated HDR reward shaping method to resolve reward sparsity in high-frequency decision-making.
 - Designed a ViT-based interactive state representation network for spatio-temporal feature extraction.
 - Led the construction of a scaled-down vehicle experimental platform and validate the proposed algorithms.
 - Work resulted in [J.1][J.2][J.3][J.4][C.1][C.2], manuscripts [J.2-4] in submission.
- **Modular Distributed Vehicles System Design and Control [NSFC Major Program]** Jun. 2023 - Jan. 2024
Sub-Project Student Lead & Core Researcher Shanghai, China
 - Spearheaded the technical background research and formulated the overarching methodology for Sub-Project 3, focusing on multi-layer feature fusion fault diagnosis and self-reconfiguring active fault-tolerant control methods for complex vehicular systems.

- Coordinated extensive cross-institutional collaborations with Tsinghua University and Beijing Institute of Technology, resolving the theoretical integration bottlenecks between flexible modular chassis design, self-organizing control, and fault-tolerant mechanisms.
- **Electric Vehicle Drive System NVH Analysis and Optimization [JMEV ** Sept. 2021 - Aug. 2023
Lead Graduate Researcher & Project Manager Nanchang, China
 - Co-authored the 1-million-RMB grant proposal and coordinated the full-lifecycle execution of the project, from theoretical formulation to validation and project conclusion.
 - Executed comprehensive structural and system-level optimizations, meeting the strict response target.
- **High-Speed Electric Drive System NVH Modeling and Optimization [SAIC Motor ** Sept. 2019 - Aug. 2021
Lead Graduate Researcher & Project Manager Shanghai, China
 - Coordinated a joint industry-academia research initiative, developing complex coupled mathematical models for high-speed reducers that integrated time-varying dynamics.
 - Engineered a 6-DOF powertrain mount system dynamic model, applying genetic algorithms to optimize mount stiffness, damping, and spatial coordinates, to maximize the system's degree of decoupling and minimize vibration transmissibility.

PUBLICATIONS AND PATENTS

C=CONFERENCE, J=JOURNAL, P=PATENT, -S=IN SUBMISSION

- [J.1] Ye Han, Lijun Zhang, Dejian Meng, Zhuang Zhang, Xingyu Hu, Songyu Weng. **A value based parallel update MCTS method for multi-agent cooperative decision making of connected and automated vehicles.** *IEEE Transactions on Intelligent Transportation Systems*, 2025.
- [J.2-S] Ye Han, Lijun Zhang, Dejian Meng, Zhuang Zhang. **Topology enhanced MARL for multi-agent cooperative decision-making of CAVs.** *preprint*, 2026.
- [J.3-S] Ye Han, Lijun Zhang, Dejian Meng, Zhuang Zhang. **Hybrid differential reward: Combining temporal difference and action gradients for efficient optimizing in cooperative driving** . *preprint*, 2026.
- [J.4-S] Ye Han, Lijun Zhang, Dejian Meng, Zhuang Zhang. **Policy Optimality Measurement for Multi-Vehicle Decision-Making: From Extrinsic Indicators to Intrinsic Quality.** *preprint*, 2026.
- [C.1] Ye Han, Lijun Zhang, Dejian Meng, Xingyu Hu, Yixia Lu. **SPformer: A transformer based DRL decision making method for connected automated vehicles.** *IEEE 27th International Conference on Intelligent Transportation Systems*, 2024.
- [C.2] Ye Han, Lijun Zhang, Dejian Meng, Zhuang Zhang. **A Differentiated Reward Method for Reinforcement Learning based Multi-Vehicle Cooperative Decision-Making Algorithms.** *Proceedings of the 32nd China-SAE Congress: Selected Papers*, 2025.
- [J.5] Zhehui Zhu, Dejian Meng, Ye Han, Siqi Chen, Lijun Zhang. **Hybrid reinforcement learning-model predictive control framework for full-band (0–500 Hz) vibro-acoustic optimization in active suspension systems.** *Expert Systems with Applications*, 2026.
- [J.6] Zhuang Zhang, Lijun Zhang, Dejian Meng, Wei Tian, Ye Han, Kaikun Pei, Jun Yan. **A Geometry and Semantics-Based Progressive Generation Approach for Traffic Sign Adversarial Patches.** *Automotive Innovation*, 2026.
- [J.7] Xingyu Hu, Lijun Zhang, Dejian Meng, Ye Han[†], Lisha Yuan. **Gitsr: Graph interaction transformer-based scene representation for multi vehicle collaborative decision-making.** *International Journal of Automotive Technology*, 2024. ([†] Corresponding Author)
- [C.3] Songyu Weng, Xingyu Hu, Ye Han, Lijun Zhang. **Spatial-Temporal Graph Hybrid Network Reinforcement Learning for Decision-Making of Connected and Autonomous Vehicles.** *2025 International Conference on Electronic Information, Computer and Aerospace Remote Sensing*.
- [C.4] Xingyu Hu, Lijun Zhang, Dejian Meng, Ye Han, Songyu Weng, Shuolong Xu. **LLMCTS: Large Language Model Prior Guided MCTS for Autonomous Vehicle Decision-Making.** *2025 International Symposium on Intelligent Robotics and Systems*.
- [C.5] Zhuang Zhang, Lijun Zhang, Dejian Meng, Wei Tian, Ye Han, Kaikun Pei. **Defending Against Adversarial Examples with Adaptive Quantization Table-Guided Image Compression.** *International Conference on Advances in Construction Machinery and Vehicle Engineering*, 2024.
- [C.6] Zhuang Zhang, Lijun Zhang, Dejian Meng, Wei Tian, Ye Han, Kaikun Pei, Zhou You. **Generating Adversarial Examples for Pedestrian Detectors in Dynamic Driving Scenarios.** *International Conference on Advances in Construction Machinery and Vehicle Engineering*, 2024.
- [P.1] Dejian Meng, Ye Han, Lijun Zhang, Luying Huang. **A target detection method based on monocular vision and millimeter-wave radar fusion.** China National Intellectual Property Administration, Patent No. CN112215306A. Grant Date: 2023-03-31.
- [P.2] Dejian Meng, Luying Huang, Lijun Zhang, Ye Han. **A motion blur target detection method based on vehicle motion and data augmentation.** China National Intellectual Property Administration, Patent No. CN112435190A. Publication Date: 2021-03-02.

ACADEMIC PRESENTATIONS

- **Oral: A Differentiated Reward Method for RL based MVDM Algorithms** Oct. 2025
32nd China-SAE Congress Chongqing, China
 - Presented orally at one of China's premier automotive engineering conferences
 - Corresponding publication: [C.2]
- **Oral: SPformer: A Transformer based DRL Decision Making Method for CAVs** Sept. 2024
IEEE 27th International Conference on Intelligent Transportation Systems Edmonton, Canada (Online)
 - Video presentation with poster
 - Corresponding publication: [C.1]

TEACHING AND MENTORING EXPERIENCE

- **Teaching Assistant, Vehicle Dynamics** Fall, 2022
Tongji University, School of Automotive Studies Shanghai, China
 - Facilitated course instruction, graded assignments and examinations, and hosted weekly office hours for an undergraduate cohort of 30+ students.
 - Delivered tutorial sessions on core curriculum topics, including longitudinal and lateral dynamics, and so on.
- **Research Mentor, Intelligent Vehicle Control & Vehicle Dynamics** 2020 - Present
Tongji University, Supervised by Prof. Lijun Zhang and Prof. Dejian Meng Shanghai, China
 - **Mentorship Scope:** Directly supervised the research progress of 1 Ph.D. candidate (X. Hu), 6 Master's (S. Weng et al.), and 5 Undergraduate students across intelligent decision-making and vehicle dynamics domains.
 - **Responsibilities:** Defined research project scopes, provided weekly technical guidance (including algorithmic formulation and experiments), reviewed manuscripts/theses, and oversaw hardware experimental designs.
 - **Mentorship Outcomes:** Mentorship directly resulted in successful student thesis defenses and co-authored publications in journals and conferences.

RESEARCH GRANTS AND FUNDINGS

- **SAIC Science and Technology Development Funding (2212), ¥2,000,000.00** Jun. 2022 – present
 - Role: Grant Proposal Co-Author & Early-Stage Coordinator.
 - Led the technical background research and co-authored the grant proposal, specifically formulating the technical methodology and preliminary foundations. Successfully delivered the project proposal presentation to the industrial partner.
 - Organized and coordinated the student research team during the project's initiation phase.
- **Nanchang Automotive Institute Forward-Looking Project, ¥1,000,000.00** Sept. 2021 – Mar. 2024
 - Role: Lead Graduate Researcher & Project Manager (Proposal to Completion).
 - Co-authored the grant proposal and led full-lifecycle execution including NVH optimization, prototype validation, and final reporting. See **Research Experience** for details.
- **SAIC Science and Technology Development Funding (1903), ¥500,000.00** Sept. 2019 – Aug. 2021
 - Role: Lead Graduate Researcher & Project Manager (Proposal to Completion).
 - Assisted in aligning industrial requirements with research objectives during the proposal phase; led gear dynamics modeling and mount optimization during execution. See **Research Experience** for details.
- **National Key R&D Program of China (2016YFB0100901), ¥15,000,000.00** Sept. 2019 – Dec. 2020
 - Role: Researcher. Sub-project: Full-State Parameter Estimation, Complex Environment Perception, and Multi-Source Information Fusion for Intelligent Electric Vehicles.
 - Developed environment perception and multi-source information fusion algorithms; conducted simulation validation; published a patent [P.1]; contributed to the sub-project final report.

HONORS AND AWARDS

- **Finalist (Top 6), ITSC 2026 Ph.D. Thesis Competition, IEEE ITSC 2026 (YP & WIE)** Aug. 2026
- **SAECE Outstanding Paper Award, China Society of Automotive Engineers** Oct. 2025
- **Huate Scholarship, Shanghai Huate Automobile Parts Co., Ltd.** Mar. 2021
- **Outstanding Doctoral Student Scholarship, Tongji University** Mar. 2020

PROFESSIONAL MEMBERSHIPS

- **Journal & Conference Reviewer**

- Expert Systems with Applications (ESWA), IEEE Transactions on Intelligent Transportation Systems (T-ITS)
- IEEE Intelligent Transportation Systems Conference (ITSC), IEEE Intelligent Vehicles Symposium (IV)

- **Professional Memberships**

- IEEE Member, IEEE ITSS Member, IEEE Young Professionals
- Chinese Society of Automotive Engineers (CSAE) Member

SKILLS

Programming Languages: Python (Proficient), MATLAB (Proficient), C/C++ (Familiar)

Deep Learning: PyTorch

Robotics & Simulation: ROS/ROS2, SUMO

Developer Tools & Typesetting: Git, Linux, L^AT_EX

ADDITIONAL INFORMATION

Languages: Chinese, Native. **English,** Fluent, **German,** Basic

Interests: Tennis, Photography

REFERENCES

1. **Lijun Zhang**

Professor and Chair of the College Council,
College of Automotive and Energy Engineering, Tongji University
Email: tjedu_zhanglijun@tongji.edu.cn
Relationship: Ph. D. Supervisor

2. **Xiaoguang Yang**

Professor and Director of the Intelligent Transportation Systems Research Center
College of Transportation Engineering, Tongji University
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Relationship: Mentor, Collaborator

3. **Nan Li**

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Relationship: Mentor, Collaborator