ZHIHAO LIN

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EDUCATION

University of Glasgow (UofG) *Feb. 2023-Jun. 2026*
Ph.D. in Autonomous Systems & Connectivity
Supervisor: Dr. Jianglin Lan
Research Interests: Structure RL, Multi-Agent Decision Making, and Perception-Integrated Autonomy.

LAMIH UMR CNRS 8201, Université Polytechnique Hauts-de-France *Oct. 2025-Nov. 2025*
Visiting Research Student, Control Department
Host Supervisor: Dr. Anh-Tu Nguyen

Jilin University (JLU) *Sep. 2019-Jul. 2022*
M.S. in Circuits and Systems

Liaocheng University (LCU) *Sep. 2014-Jul. 2018*
B.S. in Electronic Information Engineering

HONORS AND AWARDS

Doctoral Scholarship, China Scholarship Council (CSC) *2023-2026*
Research Mobility Fund, University of Glasgow *Apr. 2025*
Editor's Choice Award, "Enhanced Visual SLAM for Collision-Free Driving with Lightweight Autonomous Cars", *Sensors* Journal *Apr. 2025*
Academic Scholarship, Jilin University *2020-2021*

PUBLICATIONS

Google Scholar: h-index 11, 500+ citations (as of May. 2026)

Published Papers

[1] **Zhihao Lin**, "Beyond Distributions: Geometric Action Control for Continuous Reinforcement Learning," in *Proceedings of the 14th International Conference on Learning Representations (ICLR)*, Accepted, 2026.

[2] **Zhihao Lin**, "Action Manifold Smoothing: A Lipschitz Pathway Perspective on High-Dimensional Reinforcement Learning," in *Proceedings of the 43th International Conference on Machine Learning (ICML)*, Accepted, 2026.

[3] **Zhihao Lin**, Lin Wu, Zhen Tian, Alessio Lomuscio, and Jianglin Lan, "Scalable and Safe Multi-Agent Coordination with Reconstructed Level-k Monte Carlo Tree Search," in *International Conference on Autonomous Agents and Multi-Agent Systems (AAMAS)*, Accepted, 2026.

[4] **Zhihao Lin**, Jianglin Lan, Shuo Liu, Zhen Tian, Dezong Zhao, and Chongfeng Wei, " Hierarchical Multi-Agent MCTS for Safety-Critical Coordination in Mixed-Autonomy Roundabouts," *IEEE Transactions on Vehicular Technology (TVT)*, Apr. 2026, Accepted.

[5] **Zhihao Lin**, Jianglin Lan, Anh-Tu Nguyen, and David Flynn, "Contingency-Aware Spatiotemporal Optimization for Safe Autonomous Vehicle Trajectory Planning," *IEEE Transactions on Intelligent Transportation Systems (TITS)*, vol. 26, no. 11, pp. 18 487–18 499, 2025.

[6] **Zhihao Lin**, Zhen Tian, Xianxian Zhao, Hanyang Zhuang, Ming Yang, and Jianglin Lan, "Dynamic Risk-Aware Trajectory Planning for Autonomous Vehicles: A Two-Stage Optimization with Space-Time Graphs," *IEEE Transactions on Vehicular Technology (TVT)*, Apr. 2026, Accepted.

[7] **Zhihao Lin**, Jianglin Lan, and Xianxian Zhao, "KAN-LSTM Enhanced Multi-Agent Advantage Actor-Critic Reinforcement Learning for Autonomous Ramp Merging," *IEEE Transactions on Vehicular Technology (TVT)*, vol. 75, no. 1, pp. 198–210, 2026.

[8] **Zhihao Lin**, Zhen Tian, Jianglin Lan, Dezong Zhao, and Chongfeng Wei, "Uncertainty-Aware Roundabout Navigation: A Switched Decision Framework Integrating Stackelberg Games and Dynamic Potential Fields," *IEEE Transactions on Vehicular Technology (TVT)*, 2025, Early Access.

[9] **Zhihao Lin**, Jianglin Lan, Christos Anagnostopoulos, Zhen Tian, and David Flynn, "Safety-Critical Multi-Agent MCTS for Mixed Traffic Coordination at Unsignalized Intersections," *IEEE Transactions on Intelligent Transportation Systems (TITS)*, vol. 26, no. 11, pp. 18 992–19 006, 2025.

[10] **Zhihao Lin**, Zhen Tian, Jianglin Lan, Qi Zhang, Ziyang Ye, Hanyang Zhuang, and Xianxian Zhao, "A Conflicts-Free, Speed-Lossless KAN-Based Reinforcement Learning Decision System for Interactive Driving in Roundabouts," *IEEE Transactions on Intelligent Transportation Systems (TITS)*, vol. 26, no. 10, pp. 16 377–16 390, 2025.

[11] **Zhihao Lin**, Qi Zhang, Zhen Tian, Yu Peizhuo, Ye Ziyang, Zhuang Hanyang, and Lan Jianglin, "SLAM2: Simultaneous Localization and Multimode Mapping for indoor dynamic environments," *Pattern Recognition (PR)*, vol. 158, p. 111 054, 2025.

[12] **Zhihao Lin**, Zhen Tian, Qi Zhang, Zhuang Hanyang, and Lan Jianglin, "Enhanced Visual SLAM for Collision-Free Driving with Lightweight Autonomous Cars," *Sensors*, vol. 24, no. 19, p. 6258, 2024.

[13] **Zhihao Lin**, Qi Zhang, Zhen Tian, Yu Peizhuo, and Lan Jianglin, "DPL-SLAM: Enhancing Dynamic Point-Line SLAM Through Dense Semantic Methods," *IEEE Sensors Journal*, vol. 24, no. 9, pp. 14 596–14 607, 2024.

[14] Zhen Tian†, **Zhihao Lin**†, et al., "Dual-mode spl-slam: A robust semantic point-line slam system with monocular neural depth and sensor fusion for intelligent transportation," *IEEE Transactions on Intelligent Transportation Systems (TITS)*, Jun. 2026, Accepted.

[15] Zhen Tian†, **Zhihao Lin**†, Chunhong Yuan, Sunil Prajapat, Jing Yang, and Lip Yee Por, "Consumer-Electronics-Oriented Safe Interaction-Aware Motion Planning for Autonomous Ramp Driving with Perception Uncertainty Quantification," *IEEE Transactions on Consumer Electronics (TCE)*, 2026, Early Access. †Equal contribution.

[16] Zhen Tian†, **Zhihao, Lin**†, Dezong Zhao, Wenjing Zhao, David Flynn, Shuja Ansari, and Chongfeng Wei, "Evaluating Scenario-based Decision-making for Interactive Autonomous Driving Using Rational Criteria: A Survey," *IEEE Transactions on Intelligent Transportation Systems (TITS)*, vol. 27, no. 2, pp. 1709–1730, 2026, †Equal contribution.

[17] Zhen Tian, Dezong Zhao, **Zhihao Lin**, Wenjing Zhao, David Flynn, Daxin Tian, and Yao Sun, "Balanced exploration and attention-inspired decision making for autonomous driving," *IEEE Transactions on Vehicular Technology (TVT)*, vol. 75, no. 1, pp. 84–99, 2026.

[18] Zhen Tian, Dezong Zhao, **Zhihao Lin**, Wenjing Zhao, David Flynn, Yuande Jiang, Daxin Tian, Yuanjian Zhang, and Yao Sun, "Efficient and Balanced Exploration-Driven Decision Making for Autonomous Racing Using Local Information," *IEEE Transactions on Intelligent Vehicles (TIV)*, vol. 10, no. 3, pp. 1732–1748, 2025.

[19] Zhen Tian, Dezong Zhao, **Zhihao Lin**, David Flynn, Wenjing Zhao, and Daxin Tian, "Balanced reward-inspired reinforcement learning for autonomous vehicle racing," in *Proceedings of the 6th Annual Learning for Dynamics & Control Conference (L4DC)*, PMLR, 2024, pp. 628–640.

RESEARCH EXPERIENCE

Structure-Aware Learning for Policy, Reasoning, and Decision [1, 2] Jul. 2025 - Current

- Developed advantage-guided and preference-based methods for adaptive exploration in RL.
- Designed stability-aware objectives and proxy supervision signals to improve structural generalization.
- Formulated geometry-aligned policy learning principles beyond Gaussian action distributions.
- Built unified perspectives linking action manifolds, Bellman stability, and structural RL supervision.

Multi-Agent Safety Planning in Dynamic Scenarios [3–6, 9, 14] Aug. 2024 - Jul. 2025
Supervisors: Dr. J. Lan, Prof. D. Flynn, Dr. Chris A. and Dr. A. Nguyen UofG & LAMIH

- Developed MCTS-based coordination algorithms for interactive driving at unsignalized intersections.
- Proposed a scalable framework for mixed traffic with centralized and decentralized policies.
- Developed safety-critical pruning and interaction-graph filtering to reduce planning complexity.
- Designed contingency-aware trajectory optimization for safe planning under uncertainty.

Interactive Decision Making for Autonomy [6–8, 10, 15–19] Nov. 2023 - Aug. 2024
Supervisors: Dr. Jianglin Lan and Prof. Dezong Zhao UofG

- Developed KAN-based RL systems for driving tasks like roundabouts and ramp merging.
- Proposed multi-agent actor-critic models with LSTM intention modeling for road interactions.
- Designed reward shaping and exploration for efficient policy learning in racing scenarios.
- Integrated uncertainty-aware game-theoretic planning modules for safe interactive autonomy.

Robust and Dynamic-Aware SLAM for Autonomy [11–13] Feb. 2023 - Nov. 2023
Supervisor: Dr. Jianglin Lan and Dr. Hanyang Zhuang UofG & SJTU

- Developed visual SLAM for dynamic environments using point-line features and semantic cues.
- Built a multi-modal mapping pipeline that filters dynamic objects via detection and epipolar constraints.
- Integrated SLAM with CLF-CBF and TEB planning for safe navigation in unstructured scenes.
- Optimized trajectories with stability and dynamic-awareness for long-term autonomous deployment.

INVITED TALKS AND PRESENTATIONS

Conference Presentation, "RAction Manifold Smoothing," ICML 2026 *July. 2026*
Conference Presentation, "Reconstructed Level-k MCTS," AAMAS 2026 *May. 2026*
Conference Presentation, "Geometric Action Control," ICLR 2026 *Apr. 2026*
Invited Talk, "Geometric Action Control," KTH Royal Institute of Technology, Stockholm *Jan. 2026*
Conference Presentation, "Distributed MCTS for Safe Coordination," IEEE ICDCS 2025 *Jul. 2025*

OPEN-SOURCE SOFTWARE

AMS, Action Manifold Smoothing (*ICML 2026*)
GAC, Geometric Action Control (*ICLR 2026*)
SLAM2, Multimodal SLAM for dynamic indoor environments (*Pattern Recognition*)

SKILLS

Programming Languages	Python, C/C++, MATLAB, R, and LaTeX
Machine Learning Tools	PyTorch, Sklearn, Pandas, and NumPy

ACADEMIC SERVICE

IEEE Transactions: T-RO, T-ITS, T-IV, T-ASE, T-TE, T-CSVT, T-IM

Journals: TR-C, JFR, Pattern Recognition, Neural Networks, Neurocomputing, ISA Trans.