

LONG XU | 徐隆

[Google Scholar](#) | [Personal Homepage](#)

xulon666@gmail.com · (+86) 158-6714-9913

EDUCATION

Zhejiang University (ZJU), Hangzhou, Zhejiang, China

2022 – Present

Ph.D. student in Electronic Information, College of Control Science and Engineering.

- Advisor: Prof. [Fei Gao](#)

Zhejiang University (ZJU), Hangzhou, Zhejiang, China

2018 – 2022

B.Eng. in Automation, College of Control Science and Engineering.

HONORS AND AWARDS

- **1st prize** at ICRA 2022 RoboMaster AI Challenge (rank **2nd**/35) 2022
- Zhejiang Government Scholarship (top **3%**) 2020
- First Academic Scholarship of Zhejiang University (top **3%**) 2019

EXPERIENCES & PROJECTS

ZJU-FAST Lab

05/2021 – Present

Learning legged locomotion with LiDAR [7]

- A **simple** framework combining terrain imagination and measurement.
- **Terrain-guided reward** design for high jumping.
- **Stable and high-speed** elevation map generation.

Motion planning for multi-articulated wheeled robots

- Efficient trajectory planning and learning for **tractor-trailer** robots (passive multi-articulated). [4]
 - SE(2)-based **fast path searching** algorithm.
 - Efficient trajectory optimization model with **differential flatness**.
 - End-to-end obstacle avoidance with **differentiable simulator**.
- Efficient trajectory planning and learning for differential drive **mobile manipulator** (active multi-articulated). [3],[2]
 - Fast path searching via **topological paths search** and sampling **in parallel**.
 - Efficient trajectory optimization model with **arc length-yaw parameterization**.
 - **Primitive-based truncated diffusion model** for diverse and safe paths generation.

Autonomous navigation for wheeled robots on uneven terrain

- **Differentiable optimization** for improving interpretability and ensuring dynamic feasibility of neural network. [5],[1]
- generate trajectory for active or passive **height changes**. [13]
- **Terrain pose mapping** for efficient trajectory optimization. [11]
- **GPU-based** terrain analysis in SE(2) space. [6]
- **Differential flatness** without singularity on uneven terrain. [6]
- **Feature-based sparse gaussian process** for traversability assessment. [8]

RoboMaster 2022 University AI Challenge (RMUA2022)

- Designed motion planning module. [[Vedio](#)]
- Realized **dynamic obstacle avoidance**, **dual-robot collaboration** and **rapid local re-planning**.
- Accelerate the process of trajectory optimization by using **CUDA** and GPU.

Research on motion planning of mobile robots on unstructured road (Graduation Project)

- Designed a geometry-based local **terrain assessment** algorithm.
- Using **B-spline** curve parameterized trajectories, implemented a local planner that considers **curvature constraint** and **terrain roughness**. [[Vedio](#)]

Design and manufacture of Ackermann chassis mobile robot (Research Assistant)

- Refitted the climbing remote control toy car into a **robot**. [[Vedio](#)]
- Implemented basis speed controller with STM32 and PID controller.
- Reproduced and implemented **Stanley trajectory tracking controller** with C++ and ROS.
- Reproduced and implemented the motion planning algorithm proposed in the work "[Driving on Point Clouds](#)"

RESEARCH PUBLICATIONS

([†]Equal Contribution)

- [1] **L. Xu[†]**, Z. Hou[†], F. Gao, "Learning Trajectory Generation on Uneven Terrain with Differentiable Trajectory Optimization and Manifold". To be submitted to RSS 2026.
- [2] **L. Xu[†]**, C. Wong[†], F. Gao, "Primitive-based Truncated Diffusion for Efficient Trajectory Generation of Mobile Manipulators". To be submitted to RSS 2026.
- [3] **L. Xu[†]**, C. Wong[†], M. Zhang, J. Lin, F. Gao, "Trajectory Optimization for Differential Drive Mobile Manipulators via Topological Paths Search and Arc Length-Yaw Parameterization". Under review. Submitted to ICRA 2026
[[Paper](#)][[Code](#)]
- [4] **L. Xu**, K. Chai, B. An, J. Gan, Q. Wang, Y. Zhou, X. Li, J. Lin, Z. Han, C. Xu, Y. Cao, F. Gao, "Tracailer: An Efficient Trajectory Planner for Tractor-Trailer Vehicles in Unstructured Environments". *IEEE Transactions on Automation Science and Engineering (T-ASE)*, 2025.
[[Paper](#)][[Vedio](#)][[Code](#)]
- [5] Z. Han[†], **L. Xu[†]**, L. Pei, F. Gao, "Dynamically Feasible Trajectory Generation with Optimization-Embedded Networks for Autonomous Flight", *IEEE Robotics and Automation Letters (RA-L)*, 2025.
[[Paper](#)][[Web](#)]
- [6] X. Li[†], **L. Xu[†]**, X. Huang[†], D. Xue, Z. Zhang, Z. Han, C. Xu, Y. Cao, F. Gao, "SEB-Naver: A SE(2)-based Local Navigation Framework for Car-like Robots on Uneven Terrain", *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2025.
[[Paper](#)][[Vedio](#)][[Code](#)]
- [7] Z. W, Y. Li, **L. Xu**, H. Shi, Z. Ma, Z. Chu, C. Li, F. Gao, K. Yang, K. Wang, "SF-TIM: A Simple Framework for Enhancing Quadrupedal Robot Jumping Agility by Combining Terrain Imagination and Measurement", *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2025.
[[Paper](#)][[Web](#)]
- [8] S. Tan[†], Z. Hou[†], Z. Zhang[†], **L. Xu**, M. Zhang, Z. He, C. Xu, F. Gao, Y. Cao, "Real-time Spatial-temporal Traversability Assessment via Feature-based Sparse Gaussian Process", *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2025.
[[Paper](#)][[Code](#)]
- [9] K. Chai[†], **L. Xu[†]**, Q. Wang, C. Xu, P. Yin, F. Gao, "LF-3PM: a LiDAR-based Framework for Perception-aware Planning with Perturbation-induced Metric", *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2024.
[[Paper](#)][[Vedio](#)][[Code](#)]
- [10] Z. Han[†], Y. Wu[†], T. Li, L. Zhang, L. Pei, **L. Xu**, C. Li, C. Ma, C. Xu, S. Shen, F. Gao, "An Efficient Spatial-Temporal Trajectory Planner for Autonomous Vehicles in Unstructured Environments", *IEEE Transactions on Intelligent Transportation Systems (T-ITS)*, 2023.
[[Paper](#)][[Vedio](#)][[Code](#)]
- [11] **L. Xu**, K. Chai, Z. Han, H. Liu, C. Xu, Y. Cao, F. Gao, "An Efficient Trajectory Planner for Car-like Robots on Uneven

Terrain”, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2023.

[\[Paper\]](#)[\[Vedio\]](#)[\[Code\]](#)

- [12] C. Ma, Z. Han, T. Zhang, J. Wang, **L. Xu**, C. Li, C. Xu, F. Gao, “Decentralized Planning for Car-Like Robotic Swarm in Cluttered Environments”, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2023.

[\[Paper\]](#)[\[Vedio\]](#)[\[Code\]](#)

- [13] J. Wang[†], **L. Xu[†]**, H. Fu, Z. Meng, C. Xu, Y. Cao, X. Lyu, F. Gao, “Towards Efficient Trajectory Generation for Ground Robots beyond 2D Environment”, *IEEE International Conference on Robotics and Automation (ICRA)*, 2023.

[\[Paper\]](#)[\[Vedio\]](#)[\[Code\]](#)

SKILLS

- **Language:** Mandarin, native speaker; English, IELTS / 7.0
- **Programming:** C++/C, Python, MATLAB, Java, CUDA
- **Software Development:** UE, ROS, Pytorch, IsaacGym, Docker
- **Hardware Development:** IoT chips (STM32, Arduino), SolidWorks

ADDITIONAL ACTIVITIES

- | | |
|---|------|
| • Minister of Youth Volunteer Department of Youth League Committee, ZJU | 2019 |
| • Chief sax of Marching Band of Zhejiang University | 2019 |