Dachuan Liu

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Research interests: Multi-Agent Path Finding (MAPF), Multi-Robot Planning & Coordination, Self-Reconfigurable Modular and Swarm Robotics

Education

University of Michigan Ann Arbor, MI
B.S.E. in Computer Engineering | GPA: 3.91/4.00 *Expected May 2027*
- Relevant coursework: Machine Learning, Robot Kinematics and Dynamics, Self-Driving Cars: Perception and Control

Shanghai Jiao Tong University, UM-SJTU Joint Institute Shanghai, China
B.S.E. in Mechanical Engineering (Dual Degree) | GPA: 3.64/4.00 *Expected Aug 2027*
- Relevant coursework: Design and Manufacturing, Mechanical Laboratory, Differential Equations and Linear Algebra

Publications

[C1] **D. Liu**, S. Zhou, S. Zhao, Z. Ren. "LSRP*: Scalable and Anytime Planning for Multi-Agent Path Finding with Asynchronous Actions." *Under review*, IEEE International Conference on Robotics and Automation (ICRA), 2027. arXiv:2611.10363.

[J1] **D. Liu**, S. Zhao, Z. Ren. "LSRP*-LA: Scalable and Anytime Multi-Agent Path Finding for Large Agents with Asynchronous Actions." *Under review*, IEEE Robotics and Automation Letters (RA-L), 2026. arXiv:2611.33793.

Academic Service

- Sub-reviewer, *IEEE Transactions on Intelligent Transportation Systems* (T-ITS), 2026

Research Experience

Robotics, Autonomy, and Planning Lab, Shanghai Jiao Tong University Shanghai, China
Research Assistant | Advisor: Prof. Zhongqiang Ren *Apr 2026 – Present*
- Developed **LSRP***, an anytime C++ solver for MAPF with Asynchronous Actions (MAPF-AA) that uses dominance pruning and restart strategies to keep improving solution quality within the time budget. Scales to 1,000 agents and reduces sum of costs by over 40% compared with LSRP; first-author paper submitted to ICRA 2027.
- Developed **LSRP*-LA**, extending LSRP* to large agents of any shape, with a swept-area occupancy model and a rule layer that uses recursive push trees and lane evacuation to improve scalability and solution quality. Tested with up to 800 agents; reduces sum of costs by up to 62% compared with Layered LA-LaCAM. First-author paper submitted to RA-L 2026.

Swarming Modular Robotics, Robotics Department, University of Michigan Ann Arbor, MI
Undergraduate Researcher (ROB 490) | Advisor: Prof. Steven Ceron *Sep 2026 – Present*
- Built a complete cylindrical robot module for a planned swarm of 20–25 robots; modules attach to neighbors with a rotating internal magnet and reconfigure by rolling around each other.
- Built a MuJoCo simulation of 20 modules with full physics (contact, friction, magnetic attachment, servo torque up to 0.13 N·m); extended a greedy planner with CBS so that up to 3 modules move at once, cutting reconfiguration time from 67 to 28 min.
- Created *lattice_sim*, an event-driven C++ simulator with a concurrent prioritized planner; plans block-to-U reconfiguration of 1,000,000 modules in about 30 s, with up to 500 modules moving at once and plans verified rule by rule up to 100,000 modules.

Multidisciplinary Design Program, University of Michigan Ann Arbor, MI
Undergraduate Researcher | Advisor: Prof. Paul Green *Jan 2026 – Present*
- Designed driving-simulation experiments in Unreal Engine 5 that vary obstacle type and curve radius, and analyze drivers' visual demand using the visual occlusion method.
- Running participant experiments and data analysis for a manuscript in preparation.

Software Engineering Research Group, Shanghai Jiao Tong University Shanghai, China
Research Assistant | Advisor: Prof. Yan Liu *Feb 2024 – Oct 2024*
- Built the teacher-side platform of an interactive teaching system (Python, HTML/CSS/JS, MySQL) for teacher–student interaction and research data management; the platform received a registered software copyright for our team.

Teaching Experience

EECS 216: Introduction to Signals and Systems, University of Michigan Ann Arbor, MI
Instructional Aide *Sep 2026 – Dec 2026*

- Lead 5 lab sections (30 students each), hold weekly office hours, and grade lab reports and exams.

ECE 216: Introduction to Signals and Systems, UM-SJTU Joint Institute Shanghai, China
Teaching Assistant | Instructor: Prof. Heng Qiao *May 2026 – Aug 2026*
- Taught twice-weekly recitations and weekly office hours; led 3 lab sessions (30 students) and graded assignments, lab reports, and exams.

MATH 286: Differential Equations and Linear Algebra, UM-SJTU Joint Institute Shanghai, China
Teaching Assistant | Instructor: Prof. Horst Hohberger *Sep 2025 – Dec 2025*
- Taught weekly recitations covering linear algebra, ODEs, Fourier series/transforms, and Laplace transforms; graded weekly assignments, four quizzes, and two exams.

Guanzhong Primary School (Volunteer Teaching) Yingshang, Anhui, China
Volunteer Teacher *Aug 2024 – Sep 2024*
- Taught geography and basketball at a rural primary school and organized a school-wide sports meeting.

Selected Projects

Learning Priority Orders for Prioritized SIPP in MAPF-AA (ECE 7606) Shanghai, China
C++, Reinforcement Learning *May 2026 - Aug 2026*
- Trained a Plackett-Luce ranking policy with REINFORCE over per-agent conflict features to order agents for prioritized SIPP in MAPF with asynchronous actions; on held-out four maps (den312d, Room64, Warehouse, Random32) instances, raised success rate at 60 agents from 35% to 65% and the largest solved team from 80 to 140 agents.

Drone Delivery Route Optimization (EECS 281) University of Michigan
C++ *Sep 2025 – Dec 2025*
- Solved TSP-style delivery routing on graphs: Prim's MST for connectivity, branch-and-bound with pruning for exact solutions, and arbitrary insertion + 2-opt for near-optimal solutions under strict runtime limits.

Column-Climbing Robot (ME 350) UM-SJTU Joint Institute
SolidWorks, Raspberry Pi, Python *May 2025 – Aug 2025*
- Designed and fabricated a robot that climbs columns of varying diameter; invented a bicycle-clamp locking mechanism that holds position without power, and built the motor and laser-sensor control loop.

Skills

Programming: C++, Python, C, MATLAB
Tools: PyTorch, Simulink, Git, MuJoCo
Hardware: SolidWorks, Arduino, Raspberry Pi
English: TOEFL iBT 5.5/6

Honors and Awards

JI Student Development Scholarship, UM-SJTU Joint Institute 2023 – 2024
Outstanding Student Scholarship (Class B), Shanghai Jiao Tong University 2023 – 2024
Registered Software Copyright (interactive teaching platform, team) Sep 2024
Basic Teaching Assistant Certificate, UM-SJTU Joint Institute Aug 2024

Links

Homepage: `https://dachuan-liu-repo.github.io/`
[C1] LSRP*: `https://arxiv.org/abs/2611.10363`
[J1] LSRP*-LA: `https://arxiv.org/abs/2611.33793`