Leo Sun

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Education

Massachusetts Institute of Technology (MIT) Cambridge, MA
B.S. in Artificial Intelligence with a focus on Robotics *Exp. May 2028*
Cumulative GPA: 5.0/5.0
Relevant Courses: Robotics: Science and Systems, Dynamic System Modeling and Control Design, Robotic Manipulation, Algorithms, Machine Learning, Programming in Python, Linear Algebra, Differential Equations, Math for CS, Multivariable Calculus

Experience

MIT Motorsports, FSAE Team **Cambridge, MA**
Autonomous Systems Engineer *July 2025 – Present*
- Deployed a ROS2 drive-by-wire node by using cubic mapping from gamepad inputs to smooth steering and velocity commands.
- Proposed and implemented a Stanley controller that achieved **34%** lower cross-track error than the prior Pure Pursuit solution.
- Supported testing and data collection workflows, enabling the team to gather high-quality data for perception model training.

Laboratory for Information and Decision Systems, MIT **Cambridge, MA**
Robotics Engineer/Developer *May 2025 – Present*
- Built a multi-agent pathfinding testbed integrating VMAS simulation and Dockerized ROS2 stack on holonomic robots.
- Engineered a path-planning algorithm combining Conflict-Based Search with low-level repulsive force collision avoidance.
- Validated algorithm w/ **400+** random simulations, demonstrating **84%+** reduction in collisions compared to baseline methods.
- Applied an Extended Kalman Filter, fusing dual-camera ArUco detection and robot odometry for multi-robot pose estimation.

The 77 Lab, MIT **Cambridge, MA**
Robotics Research Assistant *Jan. 2025 – Mar. 2025*
- Recruited participants to participate in an experiment comparing the effects of haptic feedback on excavator learning/operation.
- Conducted **36+** hours of human subject training simulations, showing a **50%** reduction in operator force exertion w/ haptics.
- Developed real-time forward kinematics visualization for a **4-DOF** robotic arm w/ Python, Matplotlib, C++ and Unity.

Existential Robotics Laboratory, UCSD **San Diego, CA**
Robotics Engineer Intern *June 2023 – Aug. 2023*
- Developed obstacle avoidance algorithm for depth-sensing robots in Pybullet, achieved **90%** success in collision-free navigation.
- Created a dual-PID waypoint navigation controller allowing consistent convergence across **100+** randomized waypoints.
- Converted depth-images into 2d occupancy maps integrated with A* and dynamic replanning for real-time obstacle avoidance.

FIRST Tech Challenge Team Scorpio 15171 **San Diego, CA**
Founder and Captain *Sep. 2018 – Mar. 2024*
- Led 15-member robotics team to place **18th** globally out of 7500+ teams, managed annual **$10k** budget, led **30+** outreach events.
- Leveraged sensor fusion of odometry wheels and IMU to achieve **<1** inch localization error in pose-to-pose navigation algorithm.
- Integrated subsystems into autonomous robot w/ PID motor controllers and vision pipelines using OpenCV and TensorFlow.

Projects

PoolBot **Cambridge, MA**
Motion Planning and Control Engineer *Sep. 2025 – Dec. 2025*
- Built an autonomous pool-playing robot using Pydrake, achieving high-precision shots with avg. angular error of **0.0418** rad.
- Built a shot planner that evaluates **3000** candidate cue-ball angles per turn to generate collision-free, pocket-feasible trajectories.
- Developed the trajectory-generation pipeline, creating multi-keyframe task-space motions and solving IK for consistent striking.
- Co-developed the Drake environment, implementing accurate table geometry, hydroelastic contacts, and friction dynamics.

Self-Driving Car **Denver, CO**
Motion Planning Lead *Mar. 2025 – July 2025*
- Implemented a pure pursuit controller w/ ROS 2 & Python, allowing an autonomous Ackermann-drive car to follow paths.
- Created a directed graph roadmap w/ **52 nodes** and used Dijkstra's to compute optimal paths for Uber-like ride requests.
- Competed at the American Control Conference Quanser Student Self-Driving Car Competition, placing **6th** out of 28 teams.

Skills

Languages/Libraries: Python, C++, Java, PyTorch, TensorFlow, OpenCV, NumPy, Matplotlib, PyBullet, Pandas, ArUco
Frameworks/Tools: ROS 2, VMAS, Drake, Docker, Unity, Git, Linux, Onshape