Chi Zhang

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Educational Experience

University of Michigan Ann Arbor, USA
MS, Robotics 09/2024 - present
- GPA: 4.0/4.0

Shanghai Jiao Tong University (SJTU) Shanghai, China
Bachelor, Mechanical Engineering - Mathematics and Applied Mathematics 09/2020 - 06/2024
- GPA: 3.82/4.3(Major), 3.71/4.3(Overall)

Research Interest

Reinforcement learning for robot locomotion and navigation.

Publications

Morphology-Aware Graph Reinforcement Learning for Tensegrity Robot Locomotion
Chi Zhang, Mingrui Li, Wenzhe Tong, and Xiaonan Huang
arXiv preprint, 2025

SPOT: Sensing-augmented Trajectory Planning via Obstacle Threat Modeling
Chi Zhang*, Xian Huang*, and Wei Dong (*Equal contribution)
arXiv preprint, arXiv:2510.16308, 2025

Selected Projects

Graph-based Reinforcement Learning for Tensegrity Robot Locomotion 09/2024 - 08/2025
Robotics, University of Michigan, Ann Arbor Advisor: Xiaonan Huang, Assistant Professor
► Developed a reinforcement learning framework for tensegrity robots that leverages robot morphology to improve learning efficiency and locomotion performance.
- Proposed a morphology-aware policy architecture by designing a Graph Neural Network (GNN)-based actor that encodes the physical topology of tensegrity robots, capturing intrinsic coupling between components.
- Integrated the GNN actor into the Soft Actor-Critic (SAC) framework, achieving faster convergence, higher final rewards, and improved sample efficiency compared to MLP-based baselines.
- Trained policies for locomotion primitives including straight-line tracking and in-place turning, which transferred successfully from simulation to a physical 3-bar tensegrity robot.

UAV Active Vision System Planning for Obstacle Avoidance 11/2023 - 11/2024
School of Mechanical Engineering, SJTU Advisor: Wei Dong, Associate Professor
► Developed an observation-aware planning framework (SPOT: Sensing-augmented Planning via Obstacle Threat modeling) that enables UAVs with a single RGB-D camera to achieve dynamic obstacle avoidance in cluttered and uncertain environments.
- Proposed a Gaussian Process-based obstacle belief map that unifies the representation of recognized dynamic obstacles and potential unseen threats.
- Formulated an observation urgency inference method that transforms spatial uncertainty and trajectory proximity into a time-varying urgency map for sensing prioritization.
- Designed a fast gradient-based optimization scheme (< 10 ms) that optimizes UAV trajectory and camera orientation under sensing constraints.
- Demonstrated improved obstacle awareness, detecting dynamic obstacles 2.8 s earlier and increasing visibility by over 500% compared to baselines.

Dynamic Visual SLAM using Hybrid Segmentation and Optical Flow 02/2025 - 04/2025
Robotics, University of Michigan, Ann Arbor Advisor: Maani Ghaffari
► This project aims to enhanced the robustness of visual SLAM in dynamic environments by masking moving regions using real-time segmentation and optical flow.
- Utilize YOLOv11-seg and FastSAM for real-time instance segmentation, and identify dynamic regions by analyzing differences in optical flow between segmented objects and the static background.

- Developed a real-time pipeline to improve ORB-SLAM3 performance in dynamic environments by excluding unstable feature points using generated dynamic masks. The method was validated on the TUM and Bonn benchmark datasets.

Obstacle-Aware Path Planning for Robotic Arm 06/2023 - 07/2023
Institute of Marine Equipment, SJTU Advisor: Yanjun Wang

► This project focuses on implementing a collision-free path planning algorithm for a robotic arm, given predefined start and goal positions.

- Develop both forward and inverse kinematics formulations using Denavit–Hartenberg (DH) parameters, and implement collision detection for the robotic arm using a simplified cylindrical approximation model.
- Developed an obstacle-aware path planning approach by implementing the Rapidly-exploring Random Tree (RRT) algorithm in the robot arm's joint space, validated through simulations in CoppeliaSim.

Work Experience

Course Tutor Fall 2025
University of Michigan
Duties include: Tutored students in "Mathematics for Robotics" during scheduled help sessions.
Supervisor: Dimitra Panagou

Robotics Research Intern Summer 2023
Institute of Marine Equipment, SJTU
Duties include: Conducted a short-term research project on robotic arm path planning and motion algorithms.
Supervisor: Yanjun Wang

Technical Skills

Programming: Python, C++, MATLAB
ML Frameworks: PyTorch, MuJoCo
DevOps: Ubuntu, Git, Docker
Robotics: ROS, MoCAP
Writing: LaTeX, Illustrator