

# CHI ZHANG

zhc@umich.edu ◇ Personal Page ◇ GitHub ◇ LinkedIn

## EDUCATIONAL EXPERIENCE

### University of Michigan

MS, Robotics

- GPA: 4.0/4.0

Ann Arbor, USA

09/2024 - present

### Shanghai Jiao Tong University (SJTU)

Bachelor, Mechanical Engineering - Mathematics and Applied Mathematics

- GPA: 3.82/4.3(Major), 3.71/4.3(Overall)

Shanghai, China

09/2020 - 06/2024

## PUBLICATIONS

### Morphology-Aware Graph Reinforcement Learning for Tensegrity Robot Locomotion

Chi Zhang, Mingrui Li, Wenzhe Tong, and Xiaonan Huang

*arXiv preprint, arXiv:2510.26067, 2025, submitted to IEEE Robotics and Automation Letters*

### SPOT: Sensing-augmented Trajectory Planning via Obstacle Threat Modeling

Chi Zhang\*, Xian Huang\*, and Wei Dong (\*Equal contribution)

*arXiv preprint, arXiv:2510.16308, 2025, submitted to IEEE/ASME Transactions on Mechatronics*

## 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

Institute of Marine Equipment, SJTU

06/2023 - 07/2023

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

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### Instructional Assistant

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

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**Programming:** Python, C++, MATLAB

**ML Frameworks:** PyTorch, MuJoCo

**DevOps:** Ubuntu, Git, Docker

**Robotics:** ROS, MoCAP

**Writing:** LaTeX, Illustrator