Jinyuan Zhang

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RESEARCH INTERESTS

I am focusing on developing intelligent and collaborative robotic systems. I am particularly interested in reinforcement learning and control theory, and how these methodologies enable autonomous decision-making and coordination for multi-robot systems. My current work explores learning-based control and multi-agent coordination that supports cooperation in confined environments. I am actively seeking PhD positions for Fall 2026.

EDUCATION

University of Pennsylvania — Philadelphia, US
M.S.E. in Robotics, GRASP Lab — *Aug 2024 – May 2026*
Current GPA: 3.88/4.0

University College London — London, UK
BEng in Electronic and Electrical Engineering — *Sep 2021 – May 2024*
First Class Honours (Top 10%)
Cumulative GPA: 3.92/4.0

RESEARCH EXPERIENCE

Kumar Lab, University of Pennsylvania — *Sep 2025- Present*
Advisor: Prof. Vijay Kumar, Yuwei Wu
Language-Augmented Formation Adaptation via Deformation and Reconfiguration in Constrained Environments

- Proposed a hierarchical framework that leverages LLM spatial reasoning for adaptive formation planning in constrained environments (e.g., narrow corridors), unifying continuous deformation (affine transformations) and discrete reconfiguration (split/merge) with low-level distributed controllers (RL-based or classical) for decentralized execution.
- The LLM-driven planner further enables dynamic membership, fault tolerance, online replanning, and heterogeneous robot support, extending multi-robot formation capabilities beyond what rigid, handcrafted strategies can achieve.

Robotics Lab, Zhejiang University — *Jun 2024 -Jul 2025*
Advisor: Prof. Yue Wang
Bi-level Learning for Traffic Simulation

- Developed a bi-level imitation learning framework composed of a Spatial Goal Network (predicting a 2D distribution of short-horizon goals) and a Goal-Conditioned Policy that learns low-level controls to drive the ego vehicle toward sampled goals.
- Designed a prediction-and-planning module that forecasts neighboring agents' trajectories (CNN + RoIAlign + MLP) and performs cost-based trajectory selection to choose collision-free, on-road, and efficient ego trajectories.

Control and Optimization Research Group, University College London — *Sep 2023 – Mar 2024*
Advisor: Dr. Boli Chen
Distributed Cooperative Control for Multi-Agent Systems in Unknown Environments

- Developed a distributed, safety-guaranteed control framework for multi-agent systems, incorporating a leader–follower strategy and a consensus protocol for formation and containment control, as well as an improved artificial potential field method for obstacle avoidance.
- Demonstrated the proposed method through a robot rescue mission (using a multi-agent formation system to retrieve the lost robot), showcasing its ability to achieve target formations while avoiding any potential collisions in a cluttered environment.

SELECTED PROJECTS

Dynamic Block Stacking with a Franka Panda *(Course Winner)* — *Dec 2025 – Nov 2025*

- Developed an end-to-end perception-to-control pipeline for autonomous pick-and-place with a 7-DoF Franka Panda, integrating AprilTag-based vision, FK/IK, and real-time control in ROS–Gazebo.
- Achieved robust stacking of both static and dynamic blocks using real-time motion timing and feedback, setting a record score of 18,000 points and winning **1st place out of 20 teams**.

Model Predictive Control and Reinforcement Learning for Autonomous Drone Racing *Apr 2025 – May 2025*

- Developed an autonomous drone racing control stack by implementing a linear MPC-based tracking controller to follow offline time-optimal paths and PPO/actor–critic algorithms in PyBullet to train a quadrotor on a circular track for continuous control.

Quadrotor's State estimation, Planning and Control *Jan 2025 – April 2025*

- Implemented a quaternion-based Error-State Kalman Filter for Visual-Inertial Odometry to estimate 6-DoF pose by fusing stereo vision and IMU measurements.
- Developed a motion planning pipeline that computes collision-free paths using A* in a voxel-based environment, refines waypoints via a DP algorithm, and generates a piecewise smooth trajectory through minimum-snap polynomial with full differential flatness outputs.
- Implemented an SE(3) geometric controller that performs position tracking via PD feedback (outer loop) and computes the desired attitude from the thrust direction and yaw angle for SO(3)-based nonlinear attitude stabilization (inner loop).

End-Effector Design for Robotic Arm *Jan 2024 - Feb 2024*

- Designed a soft, multi-modal gripper to prevent multiple picks and avoid package defects, validated on the Amazon Robotic Manipulation Benchmark dataset.
- Designed an ultrasonic bone knife-based end effector for a surgical robot to remove tumors.

Vision-Guided Robotic Pick-and-Place Task *Oct 2023*

- Implemented an image processing algorithm from scratch to detect the object's position, orientation, circularity, edges, and corners. Performed camera and robot calibration to enable coordinate transformations among the world, camera, and robot frames.
- Used a cubic polynomial to generate the robot arm's trajectory, thus reducing wear and tear on the motors.

SERVICE

Teaching Assistant, MEAM 6200 Advanced Robotics, University of Pennsylvania *Spring 2026*

Honour

High-Scoring Final Year Dissertation *May 2024*
High Distinction in Australian Mathematics Competition *Sep 2019*

Skills

Related Courses: Control theory, Reinforcement Learning, Machine Perception, Learning in Robotics, Advanced Robotics, Control and Optimization in Robotics. Analog Electronics, Digital Design, Control Systems, Introduction to Robotics.
Tools: Python, Pytorch, MuJoCo, Isaac Gym, MATLAB, C, SystemVerilog, RISC-V, CAD, Robot DK, Git, Arduino.
Language: English, Chinese(Mandarin).