

Xinlei Lin

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EDUCATION

Guangdong Technion – Israel Institute of Technology (GTIT)

B.Eng. in Mechanical Engineering (Robotics)

Expected Jun. 2027

GPA: 95.6/100 — Rank: 2/112 (Top 1%)

Selected Coursework: Introduction to Robotics, Advanced Robotics Lab, Linear Systems, Control Theory, Dynamics, Probability & Statistics, Sensor-Integrated Systems, Digital Image & Signal Processing

Current Coursework: Control System Design, Computational Methods in Mechanical Engineering, Kinematics of Mechanisms

MANUSCRIPTS UNDER REVIEW

Xinlei Lin, Chenyu Lin, Yue Zhang, “Activation-Aligned Asynchronous Residual MPC for Position-Controlled Manipulators with Learned Dynamics,” *IEEE ROBIO 2026*, under review.

Yue Zhang, **Xinlei Lin**, “Stability-Gated Closed-Loop Eye-in-Hand Tracking and Grasping of a Manually Moved Target,” *IEEE EPIC 2026*, extended abstract, under review.

RESEARCH EXPERIENCE

Research Assistant – Energy-Efficient Bipedal Locomotion [\[Project Page\]](#)

Jul.–Dec. 2025

Guangdong Technion – Israel Institute of Technology

Advisor: Prof. Mingyi Liu

- Independently developed a 2D biped simulation environment with rigid-body dynamics, foot–ground contact, and PD actuation, and implemented PPO training to evaluate gait- and energy-related reward designs.
- Trained 3D PPO locomotion policies for the LIMX TRON 1A using the lab’s Isaac Gym framework, tuning reward terms and control parameters; contributed to Isaac Gym–MuJoCo cross-simulator evaluation.
- Analyzed hip, knee, and ankle trajectories against human walking references, and evaluated joint torque, mechanical power, and cost of transport (CoT) to characterize gait coordination and energy use.
- Processed physical-robot joint-angle and body-pose data and developed 3D motion replays; participated in simulation–hardware comparisons of joint position, velocity, and torque to characterize discrepancies in system response.

Research Assistant – Guidewire Dynamics & Vascular Contact Modeling [\[Project Page\]](#)

Apr. 2026 – Aug. 2026

Guangdong Technion – Israel Institute of Technology

Advisor: Prof. Zhujiang Wang

- Co-developed a 3D Discrete Elastic Rods (DER) framework to model guidewire stretching, bending, and large deformation in analytic and mesh-defined tubular environments.
- Implemented implicit-Euler dynamic relaxation with Newton–Raphson solves, assembling nonlinear residuals and Jacobians for quasi-static guidewire deformation under regularized wall contact.
- Led C++/Eigen backend development for rod mechanics and BVH-based mesh contact; implemented analytic bending gradients and Hessians with regression tests against PyTorch autograd over 1,000 randomized local rod configurations.
- Developed a planar guidewire-insertion benchmark with proximal displacement loading and Coulomb stick–slip friction to study insertion forces and contact behavior in a multi-bend channel.

Research Assistant – Mobile Robot Navigation & Control [\[Project Page\]](#)

Sep. 2026 – Present

Guangdong Technion – Israel Institute of Technology

Advisor: Prof. Mingyi Liu

- Built a ROS 2/Gazebo navigation testbed for an omnidirectional mobile robot and extended Nav2 with a custom controller wrapper that combines kinodynamic A* local guidance with MPPI, asynchronous replanning, and fallback to the global plan.
- Integrated a pretrained stochastic occupancy predictor through a custom C++ Nav2 costmap layer, fusing uncertainty-aware predictions into navigation costs with coordinate-consistent grid projection and stale-prediction expiry.
- Designed rosbag-based evaluations at 0.5-s and 1.0-s prediction horizons with matched prediction-on/off simulations, separating prediction quality from downstream closed-loop navigation performance.
- Refactored vendor STM32/FreeRTOS firmware into a single 10-ms motion-control task, adding command arbitration, timeout braking, and anti-windup PI wheel-speed control.

SELECTED RESEARCH & ENGINEERING PROJECTS

Activation-Aligned Residual MPC for Robot Manipulators [\[Project Page\]](#) [\[Code\]](#)

May 2026 – Aug. 2026

– *Lead Developer*

- Led the design, implementation, and end-to-end experimental development of a learned-dynamics residual MPC framework for position-controlled manipulators, combining continuously generated DLS-IK nominals, GRU-based closed-loop dynamics modeling, and residual CEM optimization.
- Designed and implemented an activation-aligned asynchronous execution protocol that advances the predicted activation state, recurrent context, and reference window before re-anchoring timestamped residuals at execution time.
- Built the complete evaluation pipeline across ABB IRB 2400 and UR5e MuJoCo platforms and a physical SO-ARM101; across 54 held-out hardware trials, reduced joint RMSE from 0.910° to 0.353° (61.2%) and FK-derived TCP RMSE from 8.912 to 3.715 mm (58.3%), with zero control deadline misses across all 63 hardware trials.

– *Lead Software & Systems Developer*

- Led ROS 2/Gazebo/MoveIt 2 simulation development and system integration for a Piper manipulator, connecting wrist-mounted RGB-D perception, 3-D target localization, collision-aware planning, and grasp-and-lift execution; contributed to physical-robot deployment.
- Integrated snapshot, continuous-tracking, and stability-gated target selection through one interface; the gate required fresh, spatially consistent observations sustained before grasp-target commitment.
- Designed 150 matched Gazebo trials with ground-truth and simulated RGB-D inputs; in 30 RGB-D trials, gated commitment achieved 10/10 task success versus 5/10 snapshot and 0/10 continuous tracking across static and move-stop scenes.

STOL UAV Design & Flight Testing – National First Prize, CUADC [\[Project Page\]](#)

Apr. 2025 – Oct. 2025

– *Airframe Design & Flight Testing*

- Co-developed a **770-mm-span short-takeoff UAV** with a **905-g unladen mass**; the final aircraft carried a **2.845-kg competition payload** and achieved takeoff within **2.4 m** during competition testing.
- Iterated through multiple aerodynamic and propulsion architectures under the competition’s **single-motor constraint**: from an initial single-propeller triplane to a gearbox-driven twin-propeller configuration with increased wing area for higher payload capacity, before converging on a substantially lighter **single-propeller monoplane** after identifying structural and drivetrain mass as critical design constraints.
- Modeled the airframe in **SolidWorks** and redesigned the final wing around an **MH114 airfoil** using a lightweight balsa/basswood framework, carbon-fiber main spar, 3D-printed connectors, and heat-shrink covering film; integrated the required payload directly along the main spar to eliminate a separate payload-support structure and increase roll moment of inertia, reducing sensitivity to transient roll disturbances.

RoboMaster KongFu Team, GTIT

Dec. 2025 – Present

Electrical Control Group Member – Control & Algorithm Development

Wheel-Legged Robot Dynamics & Control [\[Code\]](#) [\[Project Page\]](#)

- Modeled the coupled wheel-leg-body dynamics of a RoboMaster wheel-legged chassis and designed an **LQR controller** for body balance and longitudinal motion, with feedback gains scheduled by leg length to account for configuration-dependent dynamics.
- Derived five-bar leg kinematics and Jacobians and implemented **virtual model control in C** to map desired leg forces and moments to joint torques, incorporating workspace and singularity constraints.
- Built a nonlinear **MATLAB simulation** that executes the embedded C controller directly, validating attitude recovery, disturbance rejection, and velocity tracking across different leg configurations and evaluating robustness to mass and inertia uncertainty.

MENTORING

Peer Mentor – Reinforcement Learning

2025

Guangdong Technion – Israel Institute of Technology

Bipedal Locomotion Research Group

- Developed and shared structured reinforcement-learning onboarding materials for research-group members, progressing from value-based and policy-gradient methods to actor-critic and PPO; prepared annotated PyTorch and pendulum-control examples connecting algorithmic derivations with implementation, advantage estimation, and reward design.

HONORS & AWARDS

National First Prize, UAV Short Takeoff; Second Prize, Design Report – China Universities Aircraft Design Competition (CUADC)

2025

GTIT Vice Chancellor’s List (Top 5%)

2023–2024; 2024–2025

TECHNICAL SKILLS

Programming	Python, C/C++, MATLAB
Robotics Software	ROS 2, Nav2, MoveIt 2; custom controller and costmap plugins, rosbag-based evaluation
Control & Planning	CEM-based MPC, MPPI integration, gain-scheduled LQR, virtual model control, kinodynamic A*, inverse kinematics
Robot Learning	PyTorch; PPO locomotion training, reward design, GRU-based dynamics modeling
Modeling & Simulation	MuJoCo, Isaac Gym, Gazebo; robot kinematics and dynamics, discrete elastic rods, contact and friction modeling
Numerical Computing	NumPy, Eigen; implicit integration, Newton–Raphson solvers, analytic Jacobians and Hessians, numerical validation
Embedded Control	STM32, FreeRTOS; wheel-speed PI control, anti-windup, motion-command arbitration, timeout braking
Design & Development	SolidWorks; Linux, Git, CMake; regression testing