

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 and evaluated PPO locomotion policies for the LIMX TRON 1A in Isaac Gym, systematically tuning reward terms and control parameters and evaluating locomotion efficiency through joint power and cost of transport.
- Analyzed simulated and physical-robot hip, knee, and ankle trajectories against human walking references, together with joint torque and mechanical power, to characterize gait coordination and simulation-hardware discrepancies.

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-rod framework for large-deformation guidewire mechanics, using implicit Euler/Newton solves with contact against analytic and triangular-mesh vessel geometries.
- Led C++/Eigen backend development for DER mechanics, analytic bending derivatives, and BVH-based mesh contact; matched Python-reference residuals, Jacobians, and Newton updates across 50–800 nodes and achieved **100–181×** faster fixed-workload implicit-step execution.
- Validated triangular-mesh contact against an analytic curved-tube reference; a 128-sided mesh achieved **0.055 mm** configuration RMS error, **0.094%** elastic-energy error, and **0.346%** reaction-curve error.
- Diagnosed mesh-contact nonconvergence at triangle transitions; smoothed, reference-consistent contact completed **20/20** loading steps versus **7/20** with flat-face contact, while converged configurations remained numerically indistinguishable.

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.
- Diagnosed stale-plan errors caused by optimization-to-execution delay and developed an asynchronous execution protocol that predicts the robot state at plan activation and re-anchors residual commands to the current reference at runtime.
- 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 **0.910°→0.353° (61.2%)** and FK-derived TCP RMSE **8.912→3.715 mm (58.3%)**, with **zero deadline misses** across all 63 hardware trials.

Closed-Loop Visual Tracking and Robotic Grasping [\[Project Page\]](#) [\[Code\]](#)

Aug. 2026

– 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 from a single-propeller triplane to a geared twin-propeller concept and ultimately a lightweight monoplane under the single-motor constraint, identifying structural and drivetrain mass as the dominant payload limitation.
- Designed the final MH114-based wing in SolidWorks with a carbon-fiber spar and lightweight balsa/basswood structure, integrating the payload along the main spar to eliminate a separate support structure.

RoboMaster KongFu Team, GTIT

Dec. 2025 – Present

Electrical Control Group Member – Control & Algorithm Development

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

- 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

2025

Aircraft Design Competition (CUADC)

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