Xuan Lin

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Google scholar: Google Scholar

Research Interests

Computational methods for motion planning and control of robot manipulation and locomotion.

Academic Positions and Education

Georgia Institute of Technology 2024-2025
Postdoctoral Scholar, Georgia Tech Manufacturing Institute.

University of California Los Angeles 2024
Doctor of Philosophy, Mechanical Engineering, Major: Systems and Control, Minor: Robotics, Optimization.

University of California Los Angeles 2019
Master of Science, Mechanical Engineering, Major: Systems and Control.

Awards and Honors

Outstanding Reviewer Award, Robotics Science and Systems (RSS). 2025
First Place, Humanoid Adult Size Division, RoboCup. 2024
Finalist, Best Paper Award, UR. 2024
Best Paper Award on Safety, Security, and Rescue Robotics, IROS. 2019

Invited Talks

"Scaling up mixed-integer programs for robotics: tight convex relaxation and model decomposition" February 7, 2025
Host: Prof. Sam Coogan (Georgia Tech)
Decision and Control Laboratory (DCL) seminars, Georgia Tech.

"Towards fast mixed-integer quadratic programming algorithms for real-time model predictive control" December 12, 2023
Host: Prof. Yan Gu (Purdue)
Workshop for Generalizable and Robust Decision Making, Planning, and Control for Humanoid Loco-Manipulation, IEEE Humanoids 2023, Austin.

Industrial Experience

Research Intern, Toyota Research Institute. 06/23/2025 – 09/11/2025

- Developed real-time whole-body control framework for dual-arm mobile manipulators.
- Developed admittance and impedance control algorithms for safe interaction with objects and humans.
- Integrated whole-body control with admittance control to enable complex sequential tasks, including fridge-door opening, item retrieval, and door closing.

Applied Scientist Intern, Amazon Robotics and AI. 04/2020 – 09/2020

- Developed task-space impedance control on 7-DoF robot arms.
- Generated a heuristics-based trajectory planner to manipulate items in environments crowded by other items.
- My work was included in Amazon news "How Amazon Robotics researchers are solving a beautiful problem".

Professional Membership and Service

Journal reviews
- IEEE Transactions on Robotics (T-RO)
- IEEE Transactions on Mechatronics (TMECH)
- IEEE Transactions on Automation Science and Engineering (T-ASE)
- IEEE Robotics and Automation Letters (RA-L)
- ASME Journal of Mechanisms and Robotics (JMR)

Conference reviews
- Robotics: Science and Systems (RSS)
- IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)
- IEEE International Conference on Robotics and Automation (ICRA)
- IEEE-RAS 16th International Conference on Humanoid Robots (Humanoids)

Workshop Organizations
- Workshop for Generalizable and Robust Decision Making, Planning, and Control for Humanoid Loco-Manipulation Humanoids 2023 website.

Peer Reviewed Publications

[1] **Xuan Lin**, Jiming Ren, Samuel Coogan and Ye Zhao. "Optimization-based Task and Motion Planning under Signal Temporal Logic Specifications using Logic Network Flow." 2025 IEEE International Conference on Robotics and Automation (ICRA).

[2] **Xuan Lin**, et al. "Optimization Based Motion Planning for Multi-Limbed Vertical Climbing Robots." 2019 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS). IEEE, 2019. **(Best Paper Award on Safety, Security, and Rescue Robotics).**

[3] **Xuan Lin**, Gabriel I. Fernandez, and Dennis W. Hong. "Evaluating Data-driven Performances of Mixed Integer Bilinear Formulations for Book Placement Planning." 2024 21st International Conference on Ubiquitous Robots (UR). IEEE, 2024. **(Finalist, Best Paper Award).**

[4] **Xuan Lin**, et al. "Multi-Limbed Robot Vertical Two Wall Climbing Based on Static Indeterminacy Modeling and Feasibility Region Analysis." 2018 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS).

[5] Y Shirai, **Xuan Lin**, Y Tanaka, A Mehta, D Hong, "Risk-Aware Motion Planning for a Limbed Robot with Stochastic Gripping Forces Using Nonlinear Programming." 2020 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)/IEEE Robotics and Automation Letters 5 (4), 4994-5001.

[6] Jingwen Zhang, **Xuan Lin**, and Dennis W Hong, "Transition Motion Planning for Multi-Limbed Vertical Climbing Robots Using Complementarity Constraints." 2021 IEEE International Conference on Robotics and Automation (ICRA).

[7] **Xuan Lin**, Gabriel I. Fernandez, Dennis W. Hong, "Multi-Modal Multi-Agent Optimization for LIMMS, A Modular Robotics Approach to Delivery Automation." 2022 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS).

[8] **Xuan Lin**, Gabriel I. Fernandez, Dennis W. Hong , "ReDUCE: Reformulation of Mixed Integer Programs using Data from Unsupervised Clusters for Learning Efficient Strategies." 2022 IEEE International Conference on Robotics and Automation (ICRA).

[9] **Xuan Lin**, Min Sung Ahn, and Dennis W Hong, "Designing Multi-Stage Coupled Convex Programming with Data-Driven McCormick Envelope Relaxations for Motion Planning." 2021 IEEE International Conference on Robotics and Automation (ICRA).

[10] Yusuke Tanaka, **Xuan Lin**, Yuki Shirai, Alexander Schperberg, Hayato Kato, Alexander Swerdlow, Naoya Kumagai, and Dennis Hong, "SCALER: A Tough Versatile Quadruped Free-Climber Robot." 2022 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS).

[11] Yuki Shirai, **Xuan Lin**, Alexander Schperberg, Yusuke Tanaka, Hayato Kato, Varit Vichathorn, and Dennis Hong, "Simultaneous Efficient Contact-Rich Grasping and Locomotion Optimization Enabling Free-Climbing for Multi-Limbed Robots." 2022 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS).

[12] Yusuke Tanaka, Yuki Shirai, Zachary Lacey, **Xuan Lin**, Jane Liu, Dennis Hong, “An Under-Actuated Whippletree Mechanism Gripper based on Multi-Objective Design Optimization with Auto-Tuned Weights.” 2021 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS). IEEE, 2021.

[13] Shirai, Yuki, **Xuan Lin**, Ankur Mehta, and Dennis Hong. “LTO: Lazy Trajectory Optimization with Graph-Search Planning for High DOF Robots in Cluttered Environments.” 2021 IEEE International Conference on Robotics and Automation (ICRA).

[14] Tanaka, Yusuke, Yuki Shirai, Alexander Schperberg, **Xuan Lin**, and Dennis Hong. "Scaler: Versatile multi-limbed robot for free-climbing in extreme terrains." *IEEE Transactions on Robotics*.

Publications in Progress

[1] **Xuan Lin**, and Ye Zhao. “Towards Tighter Convex Relaxation of Mixed-integer Programs: Leveraging Logic Network Flow for Task and Motion Planning”. International Journal of Robotics Research (IJRR). (Under revision).

[2] **Xuan Lin***, Jiming Ren*, Roman Mineyev, and Ye Zhao. “Accelerating Signal-Temporal-Logic-Based Task and Motion Planning of Bipedal Navigation using Benders Decomposition”. IEEE Transactions on Automation Science and Engineering (T-ASE). (Under revision).

[3] **Xuan Lin**. “Data-driven Acceleration of Mixed-integer Bilinear Programs: A Comparative Study for Robot Motion Planning”. Frontiers in Robotics and AI. (Under revision).

[4] **Xuan Lin**. “Accelerate Hybrid Model Predictive Control using Generalized Benders Decomposition”. *arXiv preprint arXiv:2406.00780* (2024).