

Professional Experience

- 2024.Aug-present **Assistant Professor**
Worcester Polytechnic Institute (WPI), Robotics Engineering.
- 2024.Feb-Aug **Postdoctoral Researcher**
Agile Robotics and Perception Lab.
Advisor: Prof. Giuseppe Loianno, University of California, Berkeley
- 2018-2019 **Research Associate**
AirLab, Field Robotics Center.
Supervisor: Prof. Sebastian Scherer, Carnegie Mellon University, Robotics Institute
- 2017-2018 **Research Assistant**
ModLab.
Supervisor: Prof. Mark Yim, University of Pennsylvania, GRASP Lab

Education

- 2019-2023 **Ph.D. in Electrical and Computer Engineering**
New York University (NYU).
Advisor: Prof. Giuseppe Loianno, University of California, Berkeley, EECS
- 2016-2018 **Master of Science and Engineering in Robotics**
University of Pennsylvania (UPenn).
Advisor: Prof. Mark Yim, Prof. Vijay Kumar, University of Pennsylvania
- 2012-2016 **Bachelor of Engineering in Theoretical and Applied Mechanics**
Advisor: Prof. Jianliang Huang, Prof. Yun Bao, Sun Yat-sen University

Journal Publications

- VBT-MPC: Vision-Based Tactile MPC for Contour Following**
Patricio Sánchez, Luis Fernando Recalde, **Guanrui Li**, Pablo Gil
IEEE Robotics and Automation Letters (RA-L), 2026
- paper link **PolyFly: Polytopic Optimal Planning for Collision-Free Cable-Suspended Aerial Payload Transportation**
Mrunal Sarvaiya, **Guanrui Li**, and Giuseppe Loianno
IEEE Robotics and Automation Letters (RA-L), 2025
- paper link **DQ-NMPC: Dual-Quaternion NMPC for Quadrotor Flight**
video link Luis Fernando Recalde, Dhruv Agrawal, Jon Arrizabalaga and **Guanrui Li**
IEEE Robotics and Automation Letters (RA-L), 2025
- paper link **ES-HPC-MPC: Exponentially Stable Hybrid Perception Constrained MPC for**
video link **Quadrotor with Suspended Payloads**
Luis Fernando Recalde, Mrunal Sarvaiya, Giuseppe Loianno, and **Guanrui Li**
IEEE Robotics and Automation Letters (RA-L), 2025

- paper link **DualQuat-LOAM LiDAR Odometry and Mapping parametrized on Dual Quaternions**
Edison P. Velasco-Sánchez, Luis Fernando Recalde, **Guanrui Li**, Francisco A. Candelas-Herías, Santiago T. Puente-Mendez, Fernando Torres-Medina
Robotics and Autonomous Systems, 2025
- paper link **HPA-MPC: Hybrid Perception-Aware Nonlinear Model Predictive Control for**
video link **Quadrotors with Suspended Loads**
Mrunal Sarvaiya, **Guanrui Li**, and Giuseppe Loianno
IEEE Robotics and Automation Letters (RA-L), 2025
- paper link **Human-Aware Human-Robot Collaborative Manipulation of a Cable Suspended**
video link **Payload with Multiple MAVs**
Guanrui Li*, Xinyang Liu*, Giuseppe Loianno (* equal contribution).
IEEE Transactions on Robotics, (T-RO), 2024
- paper link **RotorTM: A Flexible Simulator for Aerial Transportation and Manipulation**
video link **Guanrui Li**, Xinyang Liu, Giuseppe Loianno
IEEE Transactions on Robotics, (T-RO), 2024
Presented as an oral presentation at ICRA 2024, [2022 ICRA aerial robotics workshop](#) and [2022 ICRA New Frontiers in Parallel Robotics workshop](#).
- paper link **Physics-Inspired Temporal Learning of Quadrotor Dynamics for Accurate Model**
video link **Predictive Trajectory Tracking**
Alessandro Saviolo, **Guanrui Li**, Giuseppe Loianno
IEEE Robotics and Automation Letters, (RA-L), 2022
Presented as an oral presentation at the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2022.
- paper link **Cooperative Transportation of Cable Suspended Payloads with MAVs using**
video link **Monocular Vision and Inertial Sensing**
Guanrui Li, Rundong Ge, Giuseppe Loianno
IEEE Robotics and Automation Letters (RA-L), 2021
Presented as an oral presentation at the IEEE Conference on Robotics and Automation (ICRA), 2021.

Conference Publications

- Trajectory Planning Using Safe Ellipsoidal Corridors as Projections of Orthogonal Trust Regions**
Akshay Jaitly, Jon Arrizabalaga, **Guanrui Li**
IEEE International Conference on Robotics and Automation (ICRA), 2026 (accepted)
- paper link **Optimal Trajectory Planning for Cooperative Manipulation with Multiple**
video link **Quadrotors Using Control Barrier Functions**
Arpan Pallar*, **Guanrui Li***, Mrunal Sarvaiya, and Giuseppe Loianno(* equal contribution)
IEEE International Conference on Robotics and Automation (ICRA), 2025
- paper link **Decentralized Nonlinear Model Predictive Control for Safe Collision Avoidance in Quadrotor Teams with Limited Detection Range**
Manohari Goarin, **Guanrui Li**, Alessandro Saviolo, Giuseppe Loianno
IEEE International Conference on Robotics and Automation (ICRA), 2025
- paper link **Enhancing Human-Drone Spatial Awareness with a Mixed Reality Interface for Drone Assisted Interactive Navigation**
Sanket A. Salunkhe*, Pranav Nedunghat*, Luca Morando, **Guanrui Li**, Giuseppe Loianno
IEEE International Conference on Unmanned Aircraft Systems (ICUAS), 2025
- paper link **Experimental System Design of an Active Fault-Tolerant Quadrotor**
Jennifer Yeom, Roshan Balu T M B, **Guanrui Li**, Giuseppe Loianno
IEEE International Conference on Unmanned Aircraft Systems (ICUAS), 2024.

- paper link **Nonlinear Model Predictive Control for Cooperative Transportation and Manipulation of Cable Suspended Payloads with Multiple Quadrotors**
video link **Guanrui Li**, Giuseppe Loianno
IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2023
- paper link **Geometric Fault-Tolerant Control of Quadrotors in Case of Rotor Failures: An Attitude Based Comparative Study**
video link Jennifer Yeom, **Guanrui Li**, Giuseppe Loianno
IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2023
- paper link **Vision-based Detection and Tracking for Relative Localization of Aerial Swarms**
video link Rundong Ge*, Moonyoung Lee*, Vivek Radhakrishnan, Yang Zhou, **Guanrui Li**, Giuseppe Loianno
IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2022
- paper link **Learning Model Predictive Control for Quadrotors**
video link **Guanrui Li***, Alex Tunchez*, Giuseppe Loianno (* equal contribution)
IEEE International Conference on Robotics and Automation (ICRA), 2022
Outstanding Deployed System Paper Award Finalist
- paper link **Aggressive Visual Perching with Quadrotors on Inclined Surfaces**
video link Jeffrey Mao, **Guanrui Li**, Stephen Nogar, Christopher Kroninger, Giuseppe Loianno
IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2021
- paper link **PCMPC: Perception-Constrained Model Predictive Control for Quadrotors with Suspended Loads using a Single Camera and IMU**
video link **Guanrui Li***, Alex Tunchez*, Giuseppe Loianno (*: equal contribution)
IEEE International Conference on Robotics and Automation (ICRA), 2021
- paper link **Design and Experimental Evaluation of Distributed Cooperative Transportation of Cable Suspended Payloads with Micro Aerial Vehicles**
video link **Guanrui Li**, Giuseppe Loianno
17th International Symposium on Experimental Robotics (ISER), 2020
- paper link **Efficient Trajectory Library Filtering for Quadrotor Flight in Unknown Environments**
video link Vaibhav Viswanathan, Eric Dexheimer, **Guanrui Li**, Giuseppe Loianno, Michael Kaess, Sebastian Scherer
IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2020
- paper link **ModQuad-DoF: A Novel Yaw Actuation for Modular Quadrotors**
video link Bruno Gabrich, **Guanrui Li**, Mark Yim
IEEE International Conference on Robotics and Automation (ICRA), 2020
- paper link **ModQuad-Vi: A Vision-Based Self-Assembling Modular Quadrotor**
video link **Guanrui Li**, Bruno Gabrich, David Saldaña, Jnaneshwar Das, Vijay Kumar, Mark Yim
IEEE International Conference on Robotics and Automation (ICRA), 2019
- paper link **ModQuad: The Flying Modular Structure that Self-Assembles in Midair**
video link David Saldaña, Bruno Gabrich, **Guanrui Li**, Mark Yim, Vijay Kumar
IEEE International Conference on Robotics and Automation (ICRA), 2018

Workshop Publications

VLM-Guided Semantic Safety for Onboard Aerial Autonomy

Tarunkumar Palanivelan, Anirudh Nallawar, **Guanrui Li**

3rd AI Meets Autonomy: Vision, Language, and Autonomous Systems Workshop, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2026 (accepted)

Workshop on Embodied Neuro-Symbolic AI for Reliable and Safe Robotics (ReS AI), IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2026 (accepted)

Observability-Aware Trajectories for Geometric and Inertial Self-Calibration

Christoph Bohm, **Guanrui Li**, Giuseppe Loianno, Stephan Weiss

Power-On-and-Go Robots: ‘Out-of-the-Box’ Systems for Real-World Applications Workshop, Robotics: Science and Systems (RSS) Conference, 2020

Journal Manuscripts Under Review

DQ-MPCC: Dual-Quaternion MPCC for Quadrotor Racing

Bryan S. Guevara, Luis F. Recalde, **Guanrui Li**, Tiago Nascimento
IEEE Robotics and Automation Letters (RA-L), under review

Conference Papers Under Review

PACE: Perception-Aware Contact Estimation and Slip Detection through Dynamic Map Analysis

Jared Morgan, Owen Sullivan, Mahdi Agheli, **Guanrui Li**
IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2026 (under review)

Humanoid-UAV Cooperative Manipulation Under Dynamic Locomotion-Induced Disturbances

Yujia Chen, Luis F. Recalde, Zaid Mahboob, **Guanrui Li**, Bowen Weng
Under review

Safety-Critical Quadrotor Navigation Using Fourth-Order Control Barrier Functions with Full Nonlinear Quadrotor Dynamics

Yaşar İdikut, Yanze Liu, Dhruv Madhusudan Agrawal, Wei Xiao, **Guanrui Li**
IEEE International Conference on Robotics and Automation (ICRA), 2027 (under review)

ClearNav: Perception-Aligned Quadrotor Flight Using Differentiable Physics

Aditya Azad*, Arthur Huang*, **Guanrui Li** (* equal contribution)
IEEE International Conference on Robotics and Automation (ICRA), 2027 (under review)

Grants

Amazon Robotics: New Professor Grant

Role: **PI**. One-time new professor research grant, \$200,000 awarded across recipients. *Period*: 2026–2027. *Amount*: \$50,000.

Amazon Robotics: Closed-Loop, Autonomous Task Scheduling and Safe Navigation in High-Density Warehouses

Role: **PI**. Co-Investigators: Kevin Leahy (WPI), Carlo Pinciroli (WPI). *Period*: 2025–2026. *Amount*: \$75,273.

Amazon Robotics: Optimal and Safe Robot Learning through Differentiable Physics Using Differentiable MPC and CBF

Role: **Co-PI**. **PI**: Wei Xiao (WPI). Worcester Polytechnic Institute. *Period*: 2025–2026. *Amount*: \$75,273.

Awards and Recognitions

2024 **NYU University-Wide Outstanding Dissertation Awards**

2024 **Alexander Hessel Award for the Best Ph.D. Dissertation in Electrical Engineering**

2023 **NSF CPS Rising Stars**

A selective academic workshop (34 out of 117 applicants) sponsored by the Natural Science Foundation (NSF) Cyber-Physical System (CPS) program, which aims to identify and mentor outstanding Ph.D. students and postdocs who are interested in pursuing academic careers in CPS-related areas.

2022 **Outstanding Deployed System Paper Award Finalist at IEEE ICRA**

For the paper "Learning Model Predictive Control for Quadrotors".

2022 **Dante Youla Award for Graduate Research Excellence at NYU Tandon**

Research Award for outstanding Graduate at NYU Tandon School of Engineering.

2021 **Microsoft Research PhD Fellowship Finalist**

One of two students nominated by the ECE department at NYU.

- 2019 **Dean's PhD Fellowship at NYU**
Two-year fellowship with annual stipend of \$36000 and an additional bonus award of \$3000 for research.
- 2016 **Honors Undergraduates at SYSU**
Honors Undergraduate students with the strongest academic records at the Sun Yat-sen university.
- 2016 **Outstanding Undergraduate Thesis paper**
One of the two undergraduate theses awarded by the theoretical and applied mechanics department at SYSU.
- 2016 **Fung's Scholarship**
A HK\$5000 scholarship sponsored by Victor and William Fung Foundation for undergraduates from Mainland China selected to exchange at the University of Hong Kong.

Media Coverage

- 2022 **Learning Model Predictive Control for Quadrotors**
The research video of my paper "Learning Model Predictive Control for Quadrotors" is featured in [IEEE robotics blog post](#).
- 2021 **Low-Cost Drones Learn Precise Control Over Suspended Loads**
[IEEE news article](#) reported my research paper "PCMPC: Perception-Constrained Model Predictive Control for Quadrotors with Suspended Loads using a Single Camera and IMU". [DroneDJ](#), [NYU Tandon News](#) followed up with this article as well.
- 2021 **Cooperative Transportation of Cable Suspended Payloads with MAVs**
The research video of my paper "Cooperative Transportation of Cable Suspended Payloads with MAVs" is featured in [IEEE robotics blog post](#).
- 2021 **ModQuad: The Flying Modular Structure that Self-Assembles in Midair**
[Wevolver](#) featured the ModQuad research project video on their blog posts.
- 2018 **These Drones Stick Together: Daily Planet**
[Discovery Channel](#) reported the ModQuad project on their Daily Planet Program.

Academic Services

Professional Society Service

- 2026-present Associate Co-Chair, Technical Committee on Aerial Robotics and Unmanned Aerial Vehicles, IEEE RAS

Editorial Services

- 2024-present Associate Editor, IEEE Robotics and Automation Letters (RA-L)
 - 2025-present Associate Editor, IEEE International Conference on Unmanned Aircraft Systems (ICUAS)
 - 2025-present Associate Editor, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)
 - 2027 Area Chair, Robotics: Science and Systems (RSS)
- Conference and Workshop Organization
- 2026 Organizer, Multi-Robot Autonomy Workshop, NSF FRR PI Meeting, 2026
 - 2026 Lead Organizer, Why Rust for Robotics: A Perspective From Industry Workshop, IROS, 2026
 - 2025 Organizer, Embodied-AI for Aerial Robots Workshop, ICUAS, 2025
 - 2025 Lead Organizer, Rust for Robotics Workshop, ICRA, 2025
 - 2022 Session Chair, Aerial Robotics IV, ICRA, 2022

Reviews

- 2024-2025 Science Robotics
- 2020-2025 IEEE Robotics and Automation Letters (RA-L)

2021-2025 IEEE Transactions on Robotics (T-RO)
 2019-2025 IEEE International Conference on Robotics and Automation (ICRA)
 2020-2025 IEEE/RSJ Conference on Intelligent Robots and Systems (IROS)
 2024 IEEE Transactions on Control Systems Technology (TCST)
 2024 AIAA Journal of Guidance, Control, and Dynamics
 2022 International Conference on Unmanned Aircraft Systems (ICUAS)
 2020-2021 IEEE International Symposium on Safety and Rescue Robotics (SSRR)

Teaching Experience

2025 **Instructor**

RBE 595: Optimal Control, WPI

This course introduces students to the fundamentals of optimal control with a focus on applications in robotics. We begin with foundational concepts in convex optimization, including quadratic programming, which form the basis for many control algorithms. Building on this, students will learn classical optimal control methods such as the Linear Quadratic Regulator (LQR) and Model Predictive Control (MPC). The course then extends to nonlinear MPC, with applications to trajectory planning and control in robotic systems. Finally, we explore emerging learning-based approaches that combine data-driven modeling with optimal control principles, highlighting their potential and limitations in robotics contexts. Throughout the course, theoretical understanding is reinforced with practical examples and assignments involving real or simulated robotic platforms.

2024 - 2025 **Instructor**

RBE 502: Robot Control, WPI

Designed and delivered lectures on robot control throughout the semester, emphasizing the intersection of control theory and robotics. Developed and taught topics including linearization, state-space modeling, feedback control, Lyapunov stability analysis, nonlinear system control, trajectory and motion planning, compliance and force control, impedance control, adaptive control, and robust control. Guided students through hands-on projects focused on simulating and implementing control systems for robotic manipulators and mobile robots.

2019 - 2022 **Guest Lecturer**

ROB 6003: Foundation of Robotics, NYU

Instructor: Prof. Giuseppe Loianno

Gave 1-2 lectures every Fall semester on dynamic model of a robot arm, using the Lagrange approach and Newton-Euler approach.

2017 **Teaching Assistant**

MEAM 510: Design of Mechatronic Systems, UPenn

Instructor: Prof. Mark Yim and Prof. Paul Stegall

Held regular office hours.

Answered students' questions on basic electronics and microprocessors.

Modified a radio-controlled toy excavator to a WiFi-controlled robot for final project prototyping.

Coached a 16-student team to win the first robot MOBA competition in the course.

2017 **Graduate Teaching Assistant**

edX: Robotics: Dynamics and control, UPenn

Instructor: Prof. Ani Heish and Prof. Vijay Kumar

Moderated discussion forums and answered students' questions on the lab assignments.
Checked and fixed the course slides on linear and nonlinear control.