Guanrui Li

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Education

2019-present **Ph.D. in Electrical and Computer Engineering**, *New York University*, NY, USA, GPA-**3.9/4.0**
Advisor: Giuseppe Loianno

2016-2018 **Master of Science and Engineering in Robotics**, *University of Pennsylvania*, PA, USA, GPA-**4.0/4.0**
Advisor: Mark Yim, Vijay Kumar

2012-2016 **Bachelor of Engineering in Theoretical and Applied Mechanics**, *Sun Yat-sen University*, China, GPA-**3.9/4.0**
Advisor: Jianliang Huang, Yun Bao

Awards and Recognitions

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.

Journal Articles

under review **Safety-Aware Human-Robot Collaborative Manipulation of a Cable Suspended Payload with Multiple MAVs**
Guanrui Li*, Xinyang Liu*, and Giuseppe Loianno (* equal contribution).
submitted to the IEEE Transactions on Robotics, (T-RO), 2023.

under review **RotorTM: A Flexible Simulator for Aerial Transportation and Manipulation**
Guanrui Li, Xinyang Liu, and Giuseppe Loianno
submitted to IEEE Transactions on Robotics, (T-RO), 2023
Also presented as an oral presentation at **aerial robotics workshop** (ICRA, 2022) and **New Frontiers in Parallel Robotics workshop** (ICRA, 2022).

paper link **Physics-Inspired Temporal Learning of Quadrotor Dynamics for Accurate Model Predictive Trajectory Tracking**
Alessandro Saviolo, **Guanrui Li**, and Giuseppe Loianno
IEEE Robotics and Automation Letters, (RA-L), 2022
Presented as an oral presentation at the IEEE Conference on Robotics and Automation (ICRA), 2022.

paper link **Cooperative Transportation of Cable Suspended Payloads with MAVs using 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

under review **Nonlinear Model Predictive Control for Cooperative Transportation and Manipulation of Cable Suspended Payloads with Multiple Quadrotors**
Guanrui Li, Giuseppe Loianno
IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2023

under review **Geometric Fault-Tolerant Control of Quadrotors in Case of Rotor Failures: An Attitude Based Comparative Study**
Jennifer Yeom, **Guanrui Li**, and 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**
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**
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**
Jeffrey Mao, **Guanrui Li**, Stephen Nogar, Christopher Kroninger, and 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**
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**
Guanrui Li, Giuseppe Loianno
17th International Symposium on Experimental Robotics (ISER), 2020

paper link **Efficient Trajectory Library Filtering for Quadrotor Flight in Unknown Environments**
Vaibhav Viswanathan, Eric Dexheimer, **Guanrui Li**, Giuseppe Loianno, Michael Kaess, and Sebastian Scherer
IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2020

paper link **ModQuad-DoF: A Novel Yaw Actuation for Modular Quadrotors**
Bruno Gabrich, **Guanrui Li** and Mark Yim
IEEE International Conference on Robotics and Automation (ICRA), 2020

paper link **ModQuad-Vi: A Vision-Based Self-Assembling Modular Quadrotor**
Guanrui Li, Bruno Gabrich, David Saldaña, Jnaneshwar Das, Vijay Kumar and Mark Yim
IEEE International Conference on Robotics and Automation (ICRA), 2019

paper link **ModQuad: The Flying Modular Structure that Self-Assembles in Midair**
David Saldaña, Bruno Gabrich, **Guanrui Li**, Mark Yim, and Vijay Kumar
IEEE International Conference on Robotics and Automation (ICRA), 2018

Workshop Publications

paper link **Observabilty-Aware Trajectories for Geometric and Inertial Self-Calibration**
Christoph Bohm, **Guanrui Li**, Giuseppe Loianno, and Stephan Weiss
Power-On-and-Go Robots: 'Out-of-the-Box' Systems for Real-World Applications Workshop, Robotics: Science and Systems (RSS) Conference, 2020

Work Experience

Spring, 2019 **CMU Robotics Institute Field Robotics Center** *Pittsburgh, PA*
Research Associate, under Prof. Sebastian Scherer
- Developed a fast and lightweight planning method for a quadrotor navigating through a dense forest.
- Published a paper in IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2020

2017-2018 **University of Pennsylvania GRASP Lab** *Philadelphia, PA*
Research Assistant, under Prof. Mark Yim
- Worked on mechanical design and manufacture of the robots for the ModQuad project.
- Developed geometric controller for assembled modular quadrotor structure.

- Developed visual servo control method for quadrotor docking using camera and IMU.
- Published three papers in IEEE International Conference on Robotics and Automation (ICRA), 2018, 2019, 2020 respectively.

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.

Research Mentorship

2021-2022 **Xinyang Liu (now Master student at Stanford University)**
2020-2021 **Alex Tunchez (now Software Engineer at CANVAS)**
2019-2020 **Rundong Ge (now Now Software Engineer at TuSimple)**
2019-2020 **Jueun Kwon (Now Undergraduate at Cornell University)**
2020-2021 **Kelsey Fontenot (Now Undergraduate at MIT)**

Academic Services

Conference Organization

2022 Aerial Robotics IV Session Chair, ICRA

Reviews

2020-2023 IEEE Robotics and Automation Letters (RA-L)
2021-2023 IEEE Transactions on Robotics (T-RO)
2019-2023 IEEE International Conference on Robotics and Automation (ICRA)
2020-2023 IEEE/RSJ Conference on Intelligent Robots and Systems (IROS)
2022 International Conference on Unmanned Aircraft Systems (ICUAS)
2020-2021 IEEE International Symposium on Safety and Rescue Robotics (SSRR)

Teaching Experience

Fall 2019 **ROB 6003: Foundation of Robotics** *NYU*

Guest Lecturer

Instructor: Prof. Giuseppe Loianno
Gave 1-2 lectures on dynamic model of a manipulator, using Lagrange approach and Newton-Euler approach.

Fall 2017 **MEAM 510: Design of Mechatronic Systems** *UPenn*

Graduate Teaching Assistant

Instructor: Prof. Mark Yim and Prof. Paul Stegall
Held regular office hour and answered students questions on basic electronics and microprocessor. 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.

Summer 2017 **edX: Robotics: Dynamics and control** *UPenn*

Graduate Teaching Assistant

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.