John Z. **Zhang**

Robotics · Optimization · Control

1723 Murray Avenue, Pittsburgh, PA, 15217

johnzhang@cmu.edu | johnzhang3.github.io | johnzhang3 | john-zhang-01

Summary

I am a Ph.D. student in Robotics at Carnegie Mellon University advised by Professor Zachary Manchester. My research focuses on numerical optimization algorithms for modeling and decision-making for robotic systems. My expertise lies in numerical optimization, robot simulation, control, and machine learning.

Education

Carnegie Mellon University
Pittsburgh, PA

Doctor of Philosophy in Robotics — *Aug. 2024 - present*

- Contact Simulation, Numerical Optimization, GPU Acceleration
- Advisor: Prof. Zachary Manchester
- Thesis Title: TBD
- GPA: 4.0/4.0

Carnegie Mellon University
Pittsburgh, PA

Master of Science in Robotics — *Aug. 2022 - Aug. 2024*

- Model-Predictive Control, Motion Imitation, Legged Robots
- Advisor: Prof. Zachary Manchester
- Thesis Title: "Advancing Legged Robot Agility: from Video Imitation to GPU Acceleration"
- GPA: 4.0/4.0

Georgia Institute of Technology
Atlanta, GA

Bachelor of Science in Mechanical Engineering — *Aug. 2018 - May. 2022*

- Multi-Agent Reinforcement Learning, Trajectory Optimization through Contact
- Advisors: Prof. Matthew Gombolay, Prof. Ye Zhao
- Highest Honors, GPA:3.9/4.0, Minor in Computer Science

Academic Experience

Robotic Exploration Lab, Carnegie Mellon University
Pittsburgh, PA

Graduate Research Assistant — *Jan. 2023 - present*

- Motion imitation from monocular videos for legged robots
- Fast motion planning and state estimation through contact for legged robots
- GPU-accelerated Quadratic Programming solver for model-predictive control

C.O.R.E. Robotics Lab, Georgia Institute of Technology
Atlanta, GA

Research Scientist — *May. 2022 - Aug. 2022*

- Developed novel deep graphical neural network architecture for end-to-end Multi-Agent Reinforcement Learning (MARL) of communication policies among heterogeneous agents in collaborative teams
- Our algorithm outperformed state-of-the-art benchmarks in multiple partially observable multi-agent domains, including predator-prey, predator capture, and StarCraft Multi-Agent Challenge

C.O.R.E. Robotics Lab, Georgia Institute of Technology
Atlanta, GA

Undergraduate Research Assistant — *Jan. 2021 - May. 2022*

- Developed Neural Network-based Model Predictive Controller for high dimensional dynamics systems
- Empirically validated both meta-active learning and model predictive control algorithms on a physical RC quad-copter

L.I.D.A.R. Lab, Georgia Institute of Technology
Atlanta, GA

Undergraduate Research Assistant — *Aug. 2019 - Dec. 2021*

- Developed novel algorithms for trajectory optimization through contact under uncertainty
- Demonstrated trade-off between trajectory robustness and feasibility in a robust optimal control problem with intermittent contact

School of Mechanical Engineering, Georgia Institute of Technology
Atlanta, GA

Teaching Assistant — *Aug 2020 - May 2021*

- Course: ME 3017 System Dynamics. Fall 2020 and Spring 2021
- Served as head TA for two semesters during COVID. Responsibility included: holding weekly office hours, grading homework and exams, writing exams, and handling course logistics

Publications

2025	**Robots with Attitude: Singularity-Free Quaternion-Based Model-Predictive Control for Agile Legged Robots**, Zixin Zhang, **John Zhang**, Shuo Yang, Zachary Manchester. under reivew	*Atlanta, GA*
2025	**Wallbounce: Push wall to navigate with Contact-Implicit MPC**, Xiaohan Liu, Cunxi Dai, **John Zhang**, Arun Bishop, Zachary Manchester, Ralpha Hollis. under review	*Atlanta, GA*
2025	**Real-Time Whole-Body Control of Legged Robots with Model-Predictive Path Integral Control**, Juan Alverez-Padilla, **John Zhang**, Sofia Kwok, John M. Dolan, Zachary Manchester. under review	*Atlanta, GA*
2024	**Advancing Legged Robot Agility: from Video Imitation to GPU Acceleration**, **John Zhang**. Master of Science in Robotics (MSR) Thesis	*Pittsburgh, PA*
2024	**Heterogeneous Policy Networks for Composite Robot Team Communication and Coordination**, Esmaeil Seraj, Rohan Paleja, Luis Pimentel, Kin Man Lee, Zheyuan Wang, Daniel Martin, Matthew Sklar, **John Zhang**, Zahi Kakish, Matthew Gombolay. IEEE Transactions on Robotics	
2024	**ReLU-QP: A GPU-Accelerated Quadratic Programming Solver for Model-Predictive Control**, Arun Bishop*, **John Zhang***, Swaminathan Gurumurthy, Kevin Tracy, Zachary Manchester (*equal contribution). IEEE International Conference on Robotics and Automation.	*Yokohama, Japan*
2024	**Fast Contact-Implicit Model-Predictive Control**, Simon LeCleac'h*, Taylor Howell*, Shuo Yang, Chiyen Lee, **John Zhang**, Arun Bishop, Mac Schwager, Zachary Manchester. IEEE Transactions on Robotics	
2024	**SLoMo: A General System for Legged Robot Motion Imitation from Casual Videos**, **John Zhang**, Shuo Yang, Gengshan Yang, Arun Bishop, Swaminathan Gurumurthy, Deva Ramanan, Zachary Manchester. IEEE Robotics and Automation Letters and International Conference on Robotics and Automation.	*Yokohama, Japan*
2023	**PPR: Physically Plausible Reconstruction from Monocular Videos**, Gengshan Yang, Shuo Yang, **John Zhang**, Zachary Manchester, Deva Ramanan. IEEE Internation Conference on Computer Vision (oral)	*Paris, France*
2024	**Multi-IMU Sensor Fusion for Legged Robots**, Shuo Yang, Zixin Zhang, **John Zhang**, Ibrahima Sow, Zachary Manchester. under review at T-RO	
2022	**Mediating between Contact Feasibility and Robustness of Trajectory Optimization through Chance Complementarity Constraints**, Luke Drnach*, **John Zhang***, Ye Zhao (*equal contribution). Frontiers in Robotics and AI	

Talks and Presentations

2024	**Real-Time Predictive Control in the Era of Parallel Edge Computation**, CMU Locomotion Seminar hosted by Prof. Aaron Johnson	*Pittsburgh, PA*
2024	**Advancing Legged Robot Agility: from Video Imitation to GPU Acceleration**, Master of Science in Robotics (MSR) Thesis Talk	*Pittsburgh, PA*
2024	**SLoMo: A General System for Legged Robot Motion Imitation from Casual Videos**, International Conference on Robotics and Automation (ICRA)	*Yokohama, Japan*
2023	**PPR: Physically Plausible Reconstruction from Monocular Videos**, International Conference on Computer Vision (ICCV)	*Paris, France*
2023	**SLoMo: A General System for Legged Robot Motion Imitation from Casual Videos**, Workshop on Model-based Optimization for Robotics	*Online*
2021	**Can Chance-Constrained Contact Uncertainty Quantification Improve Feasibility of Robust Trajectory Optimization?**, Dynamic Walking	*Online*

Honors and Awards

2020	**President's Undergraduate Research Fellowship Award**, Georgia Institute of Technology	*Atlanta, GA*
2018-2021	**Faculty Honors**, Georgia Institute of Technology	*Atlanta, GA*

Academic Services

2023-present	**Reviewer**, IEEE Humanoids, ICRA, IROS, and RA-L
2022	**Reviewer**, Frontiers in Robotics and AI

Skills

Programming	Python, MATLAB, Julia, C++, Java
Software Packages	Latex, Git, Linux, SNOPT, ROS, Adobe Illustrator, Torch, TensorFlow, Deep Graph Library, Simulink, MuJoCo, IssacGym
Relevant Courses	Machine learning, Computer Vision, Optimal Control, Rigid Body Dynamics, Robot Learning