James Zhu

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Education

Carnegie Mellon University
PhD in Mechanical Engineering *Spring 2025*
3.89/4.00 GPA

Carnegie Mellon University
Master of Science in Mechanical Engineering *December 2022*
3.89/4.00 GPA

Vanderbilt University
Bachelor of Engineering in Mechanical Engineering and Mathematics – Cum Laude *May 2020*
3.79/4.00 GPA

Current and Recent Projects

Control Theory for Legged Robots

Convergent iLQR for Safe Trajectory Planning and Control of Legged Robots
IEEE Conference on Decision and Control (CDC) *December 2023*

- Developed trajectory optimization algorithm that leverages nonlinearities in smooth and hybrid dynamics to plan trajectories that improve tacking performance and robustness while requiring less actuator effort to track
- Demonstrated efficacy of algorithm on monoped hopper and quadruped robot models

Hybrid Event Shaping to Stabilize Periodic Hybrid Orbits
IEEE International Conference on Robotics and Automation (ICRA) *May 2022*

- Proposed novel framework to optimize stability of open-loop walking gaits using saltation matrix in Floquet analysis
- Unified previous works of stable paddle juggling and swing-leg retraction and extended to complex bipedal walker system

Robot Ethics

Grounding Robot Navigation in Self-Defense Law
IEEE Conference on Robot and Human Interactive Communication (RO-MAN) *August 2023*

- Examined how self-defense law can inform robot developers on the current drawbacks of human-aware path planning algorithms
- Made four actionable recommendations to roboticists in industry, academia, and professional associations to design robots around mitigating the likelihood of self-defense scenarios arising

By Air or by Land: How Locomotion Methods Dictate Drone Ethics
ICRA Workshop on Ethics and Lethal Autonomous Weapons Systems *May 2022*

- Considered ethical implications of teleoperated weaponized ground robots in comparison to aerial counterparts
- Discussed a robot's ability/inability to quickly comprehend and act upon noisy data gathered in a complicated human environment

Experience

Robomechanics Lab at CMU **Pittsburgh, PA**
Graduate Research Assistant *May 2020 – Current*
Advisor: Aaron Johnson

Medical Engineering and Discovery Lab at Vanderbilt **Nashville,TN**
Undergraduate Research Assistant *August 2018 – May 2020*
Advisor: Robert Webster

Jet Propulsion Laboratory — **Pasadena, CA**
High Contrast Imaging Intern — *May 2019 – July 2019*
Supervisor: Stuart Shaklan

Robotics and Autonomous Systems Lab at Vanderbilt — **Nashville,TN**
Undergraduate Research Assistant — *September 2017 – May 2018*
Advisor: Nilanjan Sarkar

Publications

Convergent iLQR for Safe Trajectory Planning and Control of Legged Robots
CDC 2023

Grounding Robot Navigation in Self-Defense Law
RO-MAN 2023

By Air or by Land: How Locomotion Methods Dictate Drone Ethics
ICRA 2022 Workshop on Ethics and Lethal Autonomous Weapons Systems

Hybrid Event Shaping to Stabilize Periodic Hybrid Orbits
ICRA 2022

Design and System Validation of Rassle: A Novel Active Social Assistive Robot with a User Interface for Elderly with Dementia
RO-MAN 2018

Presentations and Additional Conferences

CMU MechE PhD Symposium
Presented poster, "Convergent Planning and Control of Legged Robots" — *March 2023*

WeRobot
Attended conference to discuss policy recommendations for ethical use of robots — *September 2022*

Robotics: Science and Systems (RSS) Risk Aware Decision Making Workshop
Gave lightning talk "Convergent iLQR for Underactuated Hybrid Dynamical Systems" — *June 2022*

Carnegie Mellon Locomotion Seminar
Gave talk, "Hybrid Event Shaping to Generate Stable Robotic Gaits" — *March 2022*

Teaching

Inclusive STEM Teaching Certificate — *April 2023*
Teaching Assistant: Dynamics — *Spring 2022 and Spring 2023*
Graduate Teaching Fellow: CMU Eberly Center — *Fall 2022 – Present*
Teaching Assistant: Intro to Robotics — *Spring 2019*
Teaching Assistant: Probability and Statistical Inference — *Spring 2019*

Leadership and Honors

Equity Researcher: Equitable and Just Greater Pittsburgh — *December 2022 – Present*
Tech Stewardship Practice Program Certificate — *December 2022*
Organizer: Robotics Outreach for Gwen's Girls after-school program — *Fall 2020 – Present*
Featured in CMU Engineering Magazine article
Carolyn Commer Graduate Student Involvement Award — *May 2021*
Co-chair: Mechanical Engineering DEI Outreach Subcommittee — *January 2021 – May 2022*
Student Mentor: Carnegie Mellon Tartan Scholars Program — *August 2020 – May 2021*
Schiff Family Scholarship — *2018–2020*

Memberships

IEEE Control Systems Society	*2023 - Present*
ASME Graduate Student Member	*2022 - Present*
IEEE Robotics and Automation Society	*2022 - Present*
IEEE Student Member	*2022 - Present*