

James Zhu

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Education

Carnegie Mellon University

PhD in Mechanical Engineering
3.88/4.00 GPA

Spring 2025

Carnegie Mellon University

Master of Science in Mechanical Engineering
3.88/4.00 GPA

December 2022

Vanderbilt University

Bachelor of Engineering in Mechanical Engineering and Mathematics – Cum Laude
3.79/4.00 GPA

May 2020

Current and Recent Projects

Control Theory for Legged Robots.....

Convergent iLQR for Safe Trajectory Planning and Control of Legged Robots

International 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 tracking 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

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

International 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

Graduate Research Assistant
Advisor: Aaron Johnson

Pittsburgh, PA
May 2020 – Current

Medical Engineering and Discovery Lab at Vanderbilt

Undergraduate Research Assistant
Advisor: Robert Webster

Nashville, TN
August 2018 – May 2020

Jet Propulsion Laboratory*High Contrast Imaging Intern*

Supervisor: Stuart Shaklan

Pasadena, CA*May 2019 – July 2019***Robotics and Autonomous Systems Lab at Vanderbilt***Undergraduate Research Assistant*

Advisor: Nilanjan Sarkar

Nashville, TN*September 2017 – May 2018*

Publications

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

In Review

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

In Review

Hybrid Event Shaping to Stabilize Periodic Hybrid Orbits*ICRA 2022*

10.1109/ICRA46639.2022.9811782

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

10.1109/ROMAN.2018.8525819

Additional Presentations and Conferences

CMU Meche Graduate 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*

Leadership

Teaching Assistant: Dynamics

Spring 2022 and Spring 2023

Equity Researcher: Equitable and Just Greater Pittsburgh

December 2022 – Present

CMU Graduate Teaching Fellow

Fall 2022 – Present

Organizer: Robotics Outreach for Gwen's Girls after-school program

Fall 2020 – Present

Featured in CMU Engineering Magazine article

Co-chair: Mechanical Engineering DEI Outreach Subcommittee

January 2021 – May 2022

Student Mentor: Carnegie Mellon Tartan Scholars Program

August 2020 – May 2021

Honors

Inclusive STEM Teaching Certificate

April 2023

Tech Stewardship Practice Program Certificate

December 2022

Carolyn Commer Graduate Student Involvement Award

2021

Schiff Family Scholarship

2018–2020

Memberships

IEEE Control Systems Society

2023 - Present

ASME Graduate Student Member

2022 - Present

IEEE Robotics and Automation Society
IEEE Student Member

2022 - Present
2022 - Present