James Zhu

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Education

Carnegie Mellon University
PhD in Mechanical Engineering — *September 2024*
Thesis: Navigating a Complex World: Improving Robot Outcomes Through Social, Regulatory, and Control Theoretic Approaches

Carnegie Mellon University
Master of Science in Mechanical Engineering — *December 2022*

Vanderbilt University
Bachelor of Engineering in Mechanical Engineering and Mathematics — *May 2020*
Cum Laude

Experience

Robomechanics Lab at CMU — **Pittsburgh, PA**
Graduate Research Assistant — *May 2020 – September 2024*
Advisor: Aaron Johnson

The AI Institute — **Boston, MA**
Robots, Ethics, & Society Research Intern — *January 2024 – June 2024*
Supervisor: Kate Darling

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

Teaching

Teaching Consultant Fellow: CMU Eberly Center — *September 2022 – December 2023*
Advisory Board Member: CMU Teaching & Learning Summit — *September 2023*
Inclusive STEM Teaching Certificate — *April 2023*
Teaching Assistant: Dynamics — *Spring 2022 and Spring 2023*
Teaching Assistant: Intro to Robotics — *Spring 2019*
Teaching Assistant: Probability and Statistical Inference — *Spring 2019*

Leadership and Honors

Co-Founder: Cup of Wontons — *February 2023 – December 2023*
Equity Researcher: Equitable and Just Greater Pittsburgh — *December 2022 – December 2023*
Tech Stewardship Practice Program Certificate — *December 2022*
Organizer: Robotics Outreach for Gwen's Girls after-school program — *Fall 2020 – Fall 2022*
Featured in CMU Engineering Magazine article
Co-chair: Mechanical Engineering DEI Outreach Subcommittee — *January 2021 – May 2022*
Carolyn Commer Graduate Student Involvement Award — *May 2021*
Student Mentor: Carnegie Mellon Tartan Scholars Program — *August 2020 – May 2021*
Schiff Family Scholarship — *2018–2020*

Publications

Journal Papers

The Effect of Gait Parameters on Safe Quadrupedal Robot Locomotion
James Zhu, *Selvin Garcia Gonzalez, David Ologan, Ardalan Tajbakhsh, and Aaron M Johnson*
In Preparation: IEEE Robotics and Automation Letters

Scalable and Safe Motion Planning in Presence of Uncertain Multi-Modal Agents
Ardalan Tajbakhsh, Siddarth Nair, David Ologan, Amey Shah, ***James Zhu****, Lorenz T Biegler, and Aaron M Johnson*
In Preparation: IEEE Robotics and Automation Letters

Saltation Matrices: The Essential Tool for Linearizing Hybrid Dynamical Systems
Nathan J Kong, J Joe Payne, ***James Zhu****, and Aaron M Johnson*
2024 Proceedings of the IEEE

Conference Papers

h-iLQE: Optimal State Estimation for Hybrid Systems
J Joe Payne, ***James Zhu****, Nathan J Kong, and Aaron M Johnson*
In Preparation: 2025 IEEE International Conference on Robotics and Automation

Safe Kinodynamic RRT* for Navigating Friction Transitions
Joshua Ramos, ***James Zhu****, Paul Nadan, and Aaron M Johnson*
In Preparation: 2025 IEEE International Conference on Robotics and Automation

Robot Behaviors Inspired by Human-Horse Interaction: A User Study
Arihant Yadav, Pedro Reynolds-Cuéllar, Nozomi Nakajima, ***James Zhu****, Eakta Jain, and Kate Darling*
In Preparation: 2025 ACM/IEEE International Conference on Human-Robot Interaction

Convergent iLQR for Safe Trajectory Planning and Control of Legged Robots
James Zhu*, J Joe Payne, and Aaron M Johnson*
2024 IEEE International Conference on Robotics and Automation

Grounding Robot Navigation in Self-Defense Law
James Zhu*, Anoushka Shrivastava, and Aaron M Johnson*
2023 IEEE International Conference on Robot and Human Interactive Communication

Hybrid Event Shaping to Stabilize Periodic Hybrid Orbits
James Zhu*, Nathan J Kong, George Council, and Aaron M Johnson*
2022 IEEE International Conference on Robotics and Automation

Design and System Validation of Rassle: A Novel Active Social Assistive Robot with a User Interface for Elderly with Dementia
Zhaobo K Zheng, ***James Zhu****, Jing Fan, and Nilanjan Sarkar*
2018 IEEE International Symposium on Robot and Human Interactive Communication

Other Papers

Double-Anonymous Review for Robotics
Justin K Yim, Paul Nadan, ***James Zhu****, Alexandra Stutt, J Joe Payne, Catherine Pavlov, Aaron M Johnson*
2022 Technical Report: arXiv:2406.10059

By Air or by Land: How Locomotion Methods Dictate Drone Ethics
James Zhu *and Aaron M Johnson*
2022 ICRA Workshop on Addressing Ethical and Technical Challenges in the Development, Use and Governance of Lethal Autonomous Weapons Systems

Presentations

Designing Safe Quadrupedal Gaits
ICRA Advancements in Trajectory Optimization and MPC for Legged Systems Workshop *May 2024*
Poster

Navigating a Complex World: How to Bring Robots Into the Wild
NYU Dynamical Systems Lab Seminar *April 2024*
Invited Talk

An Engineering Perspective on Legislation Challenges for Autonomous Delivery Robots
Georgia Tech Solving for X Workshop *February 2024*
Session Organizer

Grounding Robot Navigation in Self-Defense Law
WeRobot *October 2023*
Poster

Convergent Planning and Control of Legged Robots
IEEE RAS TC on Model-Based Optimization for Robotics Poster Session *July 2023*
Poster

Convergent Planning and Control of Legged Robots
CMU MechE PhD Symposium *March 2023*
Poster

Convergent iLQR for Underactuated Hybrid Dynamical Systems
RSS Risk Aware Decision Making Workshop *June 2022*
Lightning Talk

Hybrid Event Shaping to Generate Stable Robotic Gaits
Carnegie Mellon Locomotion Seminar *March 2022*
Invited Talk

Additional Conferences

Ethical and Legal Dilemmas of Autonomous Weapons in War and National Security Conference *April 2024*
Invited Participant

WeRobot *September 2022*
Participant

Students Mentored

Joshua Ramos *February 2022 - September 2024*
BS in Electrical Enegineering, CMU

Selvin Garcia Gonzalez *February 2024 - July 2024*
MS in Mechanical Engineering, CMU

Karla Soto Cuevas *September 2023 - December 2023*
MS in Mechanical Engineering, CMU

Sasha Kroman *September 2023 - December 2023*
BS in Mechanical Engineering, CMU

Nikhil Chinnalapatti Gopinath *June 2023 - December 2023*
MS in Mechanical Engineering, CMU

Anoushka Srivastava *January 2023 - May 2023*
BS in Artificial Intelligence, CMU