Juntao He

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Education

Georgia Institute of Technology Atlanta, GA

PhD in Robotics *Sep.2022 - present*

MS in Computer Science *Sep.2023 - May.2025*

- GPA: 3.95/4.0
- Advisors: Daniel I. Goldman and Sehoon Ha
- **Coursework:** Deep Learning, Machine Learning, Deep Reinforcement Learning, Computer Vision, Human Robot Interaction

Northwestern University Evanston, IL

MS in Mechanical Engineering *Sep.2019 - Aug.2021*

- GPA: 3.99/4.0
- Advisors: Kevin Lynch, Paul Umbanhowar
- Thesis: Model Predictive Control of Legged Robot Locomotion on Deformable Terrain

Huazhong University of Science and Technology Wuhan, China

BS in Naval Architecture and Ocean Engineering *Sep.2015 - June.2019*

- GPA: 3.83/4.0

Experience

Analog Devices Inc., PhD research intern — Boston, MA, May 2025 – Aug 2025

- Developed a control framework for a high-precision wire harness assembly task by integrating computer vision and tactile sensing, achieving over 95% success rate in power connector insertion on Jetson Nano and other circuit boards.
- Designed and prototyped a low-cost ($10) shear force sensor. File a **patent** for the tactile sensor design.

Georgia Institute of Technology, Full-time Research Engineer (Paid Position) — Atlanta, GA, Jan 2022 – Aug 2022

- Designed mechanical structure, user inferface, mechantronic system for multi-legged robotic system.
- Published papers in Proceedings of the National Academy of Sciences of the United States of America (**PNAS**) and The International Journal of Robotics Research (**IJRR**).

Selected Publications

[1] Chong, Baxi, **Juntao He**, Shengkai Li, Eva Erickson, Kelimar Diaz, Tianyu Wang, Daniel Soto, and Daniel I. Goldman. "Self-propulsion via slipping: Frictional swimming in multilegged locomotors." Proceedings of the National Academy of Sciences 120, no. 11 (2023): e2213698120. Link.

[2] Chong, Baxi, **Juntao He**, Daniel Soto, Tianyu Wang, Daniel Irvine, Grigoriy Blekherman, and Daniel I. Goldman. "Multilegged matter transport: A framework for locomotion on noisy landscapes." Science 380, no. 6644 (2023): 509-515. Link

- **Media Coverage:** BBC, New Scientist, Georgia Tech Research News, Science, Physics World, CBC Radio, New Atlas, QHubo News, Conversation, Fast Company.

[3] **He, Juntao**, Baxi Chong, Massimiliano Iaschi, Vincent R Nienhusser, Sehoon Ha, and Daniel I. Goldman. "Tactile sensing enables vertical obstacle negotiation for elongate many-legged robots." Robotics: Science and Systems (**RSS**) 2025. Project website.

- **Media Coverage:** IEEE Spectrum, Best Demo Finalist in the ICRA 2025 Expo Session.

[4] **He, Juntao**, Baxi Chong, Zhaochen Xu, Sehoon Ha, and Daniel I. Goldman. "Learning to enhance multi-legged

robot on rugged landscapes." IEEE Robotics and Automation Letters (under review). Link.

[5] **He, Juntao**, Baxi Chong, Jianfeng Lin, Zhaochen Xu, Hosain Bagheri, Esteban Flore, and Daniel I. Goldman. "Probabilistic approach to feedback control enhances multi-legged locomotion on rugged landscapes." IEEE Transactions on Robotics (**TRO**) 2025 (accpeted in July 2025). Project website.

[6] Chong, Baxi* **Juntao He***, Daniel Irvine, Tianyu Wang, Esteban Flores, Daniel Soto, Jianfeng Lin, Zhaochen Xu, Vincent R. Nienhusser, Grigoriy Blekherman, Daniel I. Goldman "Robust control for multi-legged elongate robots in noisy environments" Science Robotics Under Review. (∗ equal contribution)

Projects

A State of Art Multi-legged Robot *Sep.2022 - June.2024*

- Advisor: Daniel I. Goldman.
- Led the **end-to-end development** of a state-of-the-art multi-legged robot platform (25+ degrees of freedom), including **mechanical design, mechatronics, tactile sensing, control programming, and gait development**. Designed and built the robot from the ground up, with heavy involvement in the robot's architecture and design.
- Achieved robust traversal in highly unstructured and confined environments. A commercialized version of this robot was recognized as a **Best Demo Finalist at the ICRA 2025 Expo**.
- Related research published in top journals and conferences, including **Science** and **PNAS**.
- The developed robot laid the foundation for a startup, with associated proposals receiving over **$1.5 million** in funding from various sources, including NSF and the Georgia Research Alliance.Company website

Multi-legged Robot Learning *Mar.2024 - Present*

- Advisors: Daniel I. Goldman and Sehoon Ha.
- Developed MuJoCo-based and Isaac Sim simulators for high-degree-of-freedom multi-legged robots, enabling detailed testing and validation of control algorithms. Validated the simulators through real-world experiments, achieving a sim-to-real discrepancy of only 5% in laboratory settings.
- Built a Reinforcement Learning (RL) pipeline for training control policies tailored to multi-legged locomotion.
- Trained policies that enable robust navigation across diverse and rugged terrains—including step fields, warehouse-like environments with random racks and beams, and outdoor landscapes with mud, bushes, ferns, pine straw, and robot-sized rocks. These learning-based policies improve locomotion speed by 50% over state-of-the-art non-learning-based control frameworks in both laboratory and outdoor tests.

Open-World Navigation for Multi-Legged Robots *May 2025 – Present*

- Advisors: Daniel I. Goldman and Sehoon Ha.
- Developing a Reinforcement Learning (RL) pipeline to train a 3D motion gait generator for a multi-legged robot.
- Designing a hierarchical framework that integrates vision and tactile sensing, enabling the robot to adaptively select appropriate gaits in open-world environments.
- Targeting autonomous navigation in unstructured and confined maze-like environments under low-light conditions.

Honors & Awards

- ICRA 2025 Expo session, best demo finalist.
- Georgia Tech Topping Fellowship for Research Excellence, awarded twice (2023, 2024)
- Star of Naval Architecture & Ocean, 2018 (the highest honor in school; 3/700)
- Outstanding Undergraduate in Term of Academic Performance, 2018 (7/700)
- First Prize in National Undergraduate Marine Vehicle Design Contest, 2017

Technical Skills

Programming: C++, C, Python, C#, MATLAB

Tools: PyTorch, MuJoCo, Isaac Sim, Isaac Lab, ROS, Git, OpenCV, SOLIDWORKS

Academic Service

Reviewer of ICRA, IROS, IJRR, Journal of Field Robotics, Npj Robotics, RoboSoft