

CUNXI DAI

Robotics Institute, School of Computer Science
Carnegie Mellon University, Pittsburgh, Pennsylvania.
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EDUCATION

- Carnegie Mellon University (CMU)** Pittsburgh, Penn.
Master of Robotics (MSR)
• **GPA: 4.08/4.0** Sept. 2023 - present
• Advisor: Ralph Hollis
- Southern University of Science and Technology (SUSTech)** Shenzhen, China
Bachelor of Engineering in Robotics Engineering Aug. 2019 - Aug. 2023
• **GPA: 3.78/4.0**
• SUSTech-MIT Program (top 0.1%, based on outstanding academic performance)
• SUSTech Merit Scholarship (two-time winner, 2019, 2020)
- Massachusetts Institute of Technology (MIT)** Cambridge, Mass.
Special Student Aug. 2021 - Jun. 2022
• **GPA: 5.0/5.0**
• Core Courses: Underactuated Robotics, Numerical Computation, Bio-Inspired Robotics, Electronics Mechatronics Systems II, Feedback System Design, Product Engineering Process

PUBLICATIONS AND PATENTS

*Equal Contribution

- C. Dai*, X. Liu*, R. Shu and R. Hollis, "[Wheelchair Maneuvering with a Single-Spherical-Wheeled Balancing Mobile Manipulator](#)", IROS 2024, (Accepted).
- C. Dai*, X. Liu*, J. Zhou*, Z. Liu, and Z. Jia, "[SWheg: A Wheel-Leg Transformable Robot with Minimalist Actuator Realization](#)", submitted to *Journal of Field Robotics (JFR)*, Aug 2023 (under review).
- C. Dai, X. Liu, J. Zhou, Z. Liu, Z. Zhu, and Z. Jia, "[SWhegPro: A Novel Robust Wheel-Leg Transformable Robot](#)" *IEEE International Conference on Robotics and Biomimetics (ROBIO)*, 2022.
- C. Dai, P. Fu, B. Zhong, K. Guo, and M. Zhang, "[Human-Exoskeleton Misalignment Reduction on Knee Joint via an RPR Mechanism-Based Device](#)" *2022 IEEE International Conference on Advanced Robotics and Mechatronics (ICARM)*, 2022, pp. 45-50. **(Best Paper Finalist)**
- Z. Liu, C. Dai, X. Liu, J. Zhou, and Z. Jia, "[A Hybrid Wheel-Leg Transformable Robot with Minimal Actuator Realization.](#)" *2022 IEEE International Conference on Advanced Robotics and Mechatronics (ICARM)*, 2022, pp. 731-736.

RESEARCH EXPERIENCE

- Microsystems Dynamics Lab, Robotics Institute (RI), CMU** Pittsburgh, Penn. USA
Graduate Researcher Assistant under Prof. Ralph Hollis Sept. 2023–present
- **Wheelchair Manipulation with Ballbot**
 - Proposed control framework for dynamic bimanual mobile manipulator to maneuver cart-like systems with non-holonomic constraints (e.g. wheelchairs), while considering safe physical human-robot interaction. Accepted to IROS 2024 as oral presentation.
 - Formulated whole-body motion optimizer based on online system identification for wheelchair inertia parameters with EKF, demonstrated adaptability to varying loads.
 - **Navigation Among Movable Objects with Learned Adaptive Dynamics**
 - Propose framework for a dual-arm ball-balancing robot. Utilizing learned adaptive dynamics to quickly adapt to different obstacle dynamics, and interactively navigate in complicated indoor environments.
- Biomechatronics Group, MIT Media Lab** Cambridge, Mass. USA
Undergraduate Researcher Assistant under Prof. Hugh Herr Jan. 2023–June 2023
- **2-DoF Powered Ankle-Foot Prosthesis**
 - Designed a force-sensing tendon for the SEA actuation. The design was optimized based on finite element analysis and large force bandwidth analysis of the system.
 - Redesigned the mechatronics of the power management module for the 2-DoF ankle-foot prosthesis, making it 25% smaller in size and 20% larger in battery capacity compared to the previous design.

SUSTech Institute of Robotics (SIR)

Undergraduate Researcher under Prof. Zhenzhong Jia

Shenzhen, China
Feb. 2021–Aug. 2023

➤ *Wheel-Leg Transformable Robot*

- Developed wheel-leg transformable robots with different actuation methodologies, integrating the advantages of wheels and legs seamlessly on a single platform.
- **SWheg robot:** A tendon-driven wheel-leg transformable robot with minimalist actuation, using only one actuator to power the transformation of all wheels. Submitted a journal paper to *the Journal of Field Robotics (JFR)* as the first author.
- **SWhegPro robot:** A novel robust wheel-leg transformable robot using electric push rods. Paper published (the first author) at the *2022 IEEE International Conference on Robotics and Biomimetics (ROBIO)*.
- *Wheeled Bipedal Robot Control with E-jet Assistance*
- Developed trajectory optimization and MPC controller for the e-jet-assisted underactuated wheeled bipedal robot in long-distance jumping, which first demonstrated the effectiveness of e-jet in enabling more agile maneuvers.
- Undergraduate thesis was selected **Honorary Undergraduate Thesis of SUSTech**. Paper in preparation.

Undergraduate Researcher under Prof. Mingming Zhang

Apr. 2020–Jun. 2021

➤ *Human-Exoskeleton Misalignment Reduction on Knee Joint*

- Developed the first lightweight wearable measuring device for human exoskeleton knee joint motion characterization based on RPR mechanism that weighs only 252 grams.
- Achieved 51% misalignment reduction compared to the single revolute knee joint.
- Published a paper (the first author) at the *2022 IEEE International Conference on Advanced Robotics and Mechatronics (IEEE ARM)* -- nominated as **Best Paper Finalist**

SELECTED PROJECTS AND INTERNSHIPS

Engineering Vehicle in Robomaster

Shenzhen, China

Team Leader

Aug. 2019–Sept. 2020

- Robomaster is a robot combat competition organized by DJI. The engineering vehicle is an omnidirectional high-payload platform equipped with auto-aiming aided by computer vision, pneumatically actuated graspers, and a novel step-climbing mechanism (fastest in that year)

Agjunction Inc. & University of Notre Dame

Remote

Summer Intern, supervised by Prof. Bill Goodwine

Aug. 2020–Mar. 2021

- Developed a realistic tractor model with suspension dynamics and controllers for autosteering. The model was calibrated with data acquired from field experiments, with IMUs placed on real tractors

Single Leg Hopping Robot

Cambridge, Mass. USA

Course Project (2.74 Bio-inspired Robotics, MIT. Instructor: Sangbae Kim)

Sept. 2021–Nov. 2021

- Investigated human single-leg hopping, particularly the effect of the hanging leg on jumping speed
- Designed and built a hardware platform to perform experiments and validate simulation results

[Robook](#) (Robotics Community in SUSTech)

Shenzhen, China

Builder

April. 2023–present

- A robotics handbook for beginners. Contents include introductions to robotics, robotics competitions, and undergraduate research opportunities (in simplified Chinese)
- Achieved 15000+ views and comments.