

EDUCATION

University of California, Los Angeles (UCLA), Los Angeles, CA	Sep 2021 - Dec 2027 (Expected)
Ph.D. Candidate, Mechanical and Aerospace Engineering	
Worcester Polytechnic Institute (WPI), Worcester, MA	

Bachelor of Science, Robotics Engineering and Mechanical Engineering, GPA 3.85/4.00 Aug 2017 - May 2021

SKILLS

Programming & Tool: Python, C++, MATLAB, ROS2

Hardware: Mechanical Design (Solidworks, Onshape, AutoCAD), Prototyping (3D Printing, 3-axis CNC, Laser Cutting)

Control & Mechatronics: Whole Body Control (WBC), Model Predictive Control (MPC), Sensor integration, and extensive experience developing real-world robotic systems

RESEARCH INTERESTS

Dexterous manipulation; Mechanisms and designs; Model-based locomotion; Robot Soccer

PROJECT EXPERIENCE

Co-design of Dexterous Robotic Hand and Data Collection Device, UCLA	Oct 2025 – Present
• Led a team of 20 in the creation of MERLIN, a dexterous robotic hand and an exoskeleton device that are co-designed for aligned embodiment, defining system architecture across mechanism design, embedded electronics, sensing, and data-collection pipelines.	

Underactuated Massage Hand, UCLA	Sep 2025 – Dec 2025
• Designed and built an anthropomorphic underactuated massage hand for BODYFRIEND, enabling multiple massage modalities using only two actuators through mechanical transmission design.	

Humanoid Movie Character, UCLA	Dec 2023 – Apr 2025
• Collaborated on the creation of a fully functional humanoid named COSMO, a robot equipped with 20 proprioceptive actuators, featured in Netflix's sci-fi film <i>The Electric State</i> , ensuring cinematic realism and technical performance.	
• Designed the upper body of COSMO, integrating all electronics within strict spatial constraints to match the character's cinematic design.	
• Developed and tuned the model-based locomotion stack in C++, enabling the robot to stand and walk with coordinated and expressive upper-body movements.	

Robotics Soccer Competition (RoboCup), UCLA	Oct 2023 – May 2025
• Led RoboCup 2024 world champion team, managing integration across vision, localization, path planning, locomotion and hardware test for fully autonomous soccer performance.	
• Developed a novel path planning and tracking algorithm using MPC and visibility graphs for efficient obstacle-aware navigation in Python.	
• Tuned multi-layered locomotion control stack of our humanoid robot ARTEMIS, enabling stable walking up to 1.5m/s and autonomous dynamic ball-kicking behavior.	

Low-cost Quadruped with Customized Actuation Module, UCLA	May 2022 - Sep 2022
• Designed a 12-DOF quadruped robot featuring a custom actuation module integrating BLDC motors, two-stage belt transmission, and optical encoders.	
• Developed and implemented Field Oriented Control (FOC) algorithms for BLDC speed and torque control.	

A Climbing Robot with Extending and Bending Limb, UCLA	Jan 2023 – May 2023
• Designed and built magnetic grippers enabling the climbing robot to traverse freely along 3D ferromagnetic surfaces.	

Steerable Laser Delivery System for Laryngeal Surgery, WPI	Jun 2020 - May 2021
• Investigated the feasibility of miniaturization of steerable laser probes for laryngeal surgery.	

- Built and tested a fiber coupling system transferring surgical laser source to thinner, flexible optical fibers.

BATTLEBOTS Season 9, Los Angeles

Apr 2019

- Designed and operated the 220lb robot ‘Railgun Max’ with a high-power spinner weapon.

WORK EXPERIENCE

Teaching Assistant , Mechanical Engineering Capstone Design, UCLA	Jan 2023 – Present
• Assist students with their capstone design project, including brainstorming, components design and selection.	
Summer Robotics Engineer Internship , Lingzhi Science and Technology LTD, Shanghai	May 2019 - Aug 2019
• Created CAD model for the chassis of a medical service robot and plotted sketches for manufacturing. • Assembled and debugged face recognition door locks.	
Summer Mechanical Engineer Internship , Mark Punk Technology LTD, Shanghai	May 2018 - Jul 2018
• Designed a wheel-legged robot prototype and verified its technical feasibility.	

RESEARCH EXPERIENCE

Graduate Researcher , UCLA, Robotics and Mechanisms Laboratory (RoMeLa)	Sep 2022 – Present
• Researching dynamic locomotion and mechanism design for high-performance humanoid robots.	
Undergraduate Researcher , WPI, Optomechanics Lab	Dec 2019 - May 2021
• Developed miniaturized steerable laser probes and fiber coupling systems for medical applications.	

PUBLICATIONS

1. M. Zhu*, Q. Wang*, R. Hou, et al., “A Hierarchical, Model-Based System for High-Performance Humanoid Soccer”, submitted to Advanced Intelligent Systems, under review.
2. M. Zhu*, H. Liu*, A. Flores, G. Lo, and F. Parres, “Design and control of a robot movie character: Kid COSMO,” in *2025 IEEE-RAS Int. Conf. Humanoid Robots (Humanoids)*.
3. R. Hou, M. Zhu, H. Nam, G. I. Fernandez, and D. W. Hong, “Fast and robust localization for humanoid soccer robot via iterative landmark matching,” submitted to *Proc. 2026 IEEE Int. Conf. Robotics and Automation (ICRA)*, under review.
4. R. Hou, G. I. Fernandez, M. Zhu, and D. Hong, “Model Predictive Control with Visibility Graphs for Humanoid Path Planning and Tracking Against Adversarial Opponents,” in *Proc. 2025 IEEE Int. Conf. Robotics and Automation (ICRA)*.
5. G. Fernandez, M. Zhu et al., “RoboCup 2024 Adult-Sized Humanoid Champions Guide for Hardware, Vision, & Strategy”, Robot World Cup, Jul. 2024.
6. J. Quan, M. Zhu, and D. Hong, “Re-examining climbing robots: Design and performance of a lightweight, low-cost robot with a highly extendable limb,” in *Proc. 2024 Int. Conf. Reconfigurable Mechanisms and Robots (ReMAR)*, Jun. 2024.
7. J. Quan, M. Zhu, and D. Hong, “A Lightweight Mobile Robot for Climbing Steel Structures With an Extending and Bending Tape Spring Limb,” in *ASME 2023 Int. Design Eng. Technical Conf. (IDETC)*, Aug. 2023.
8. M. Zhu, Y. Shen, A. J. Chiluisa, J. Song, L. Fichera, and Y. Liu, “Optical fiber coupling system for steerable endoscopic instruments,” in *Proc. 43rd Annu. Int. Conf. IEEE Eng. Med. Biol. Soc. (EMBC)*, Nov. 2021.

HONORS

IEEE Humanoids, Mike Silman Award	Seoul, Korea, Sep 2025
ICRA EXPO Best Demo Award	Atlanta, USA, May 2024
First Place in RoboCup Humanoid League AdultSize Soccer Competition	Eindhoven, Netherland, Jul 2024
ICRA EXPO Best Demo Award	Yokohama, Japan, May 2024
IEEE Humanoids Conference Humanoid Free Walk Winner	Austin, USA, Dec 2023

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WPI Presidential Scholarship

Worcester, USA, Aug 2017 - May 2021