Mingzhang Zhu
(508) 335-8054, normanzmz@g.ucla.edu

EDUCATION

University of California, Los Angeles (UCLA), Los Angeles, CA
Ph.D. Candidate, Mechanical and Aerospace Engineering Sep 2021 - Dec 2027 (Expected)
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, AutoCAD), Prototyping (3D Printing, CNC, Laser Cutting)
Control & Mechatronics: Model Predictive Control (MPC), Sensor integration, and extensive experience testing real-world robotic systems

RESEACH INTERESTS

Legged robots; Mechanisms and designs; Locomotion Framework; Model Predictive Control

PROJECT EXPERIENCE

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 *The Electric State*, 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.
- Conducted System Identification of BLDC and encoders using MATLAB.
- 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.

Portable Optical Imaging System for Blood Flow Analysis, WPI Dec 2019 - Jun 2020
- Designed and manufactured portable optical imaging mechanisms to measure the blood flow velocity in nailfold and conjunctiva capillaries non-invasively.
- Developed image processing algorithm in MATLAB to calculate the velocity of white blood cells movements.

BATTLEBOTS Season 9, Los Angeles Apr 2019

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- 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.

Research Assistant, UCLA, Bionics Lab Feb 2022 - Jun 2022
- Investigated the constrained Jacobian matrices of the cutting tool of a dental robotics system.

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***, 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)*.
2. 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. 2025 IEEE/RSJ Int. Conf. Intelligent Robots and Systems (IROS)*, under review.
3. 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)*.
4. G. Fernandez, **M.Zhu** et al., "RoboCup 2024 Adult-Sized Humanoid Champions Guide for Hardware, Vision, & Strategy", Robot World Cup, Jul. 2024.
5. 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.
6. 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.
7. **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
WPI Presidential Scholarship Worcester, USA, Aug 2017 - May 2021