

Zihao Wang

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EDUCATION

Tsinghua University, Weiyang College

Major: Mathematics and Physics Foundations Science + Materials Science and Engineering

- **Expected Dual Degrees:** Bachelor of Science & Bachelor of Engineering
- **Duration:** Sep 2023 – Jun 2027
- **GPA:** 3.8/4.0 **Rank:** 30%
- **Language Proficiency:** IELTS 7.0
- **Relevant Courses:**

Basic Courses: Calculus A, Linear Algebra, Probability and Statistics, Fundamentals of Physics, Mathematical Physics Equations, Data Structure.

Robotics-Related Courses: Pattern Recognition and Machine Learning, Introduction to Deep Learning, Signals and Systems, Reinforce learning (CS285), ROS2.

Research Experience

Development and Optimization of Vision-Based Tactile Sensor Systems for Softness/Hardness Discrimination

- Supervisor: Associate Professor **Jiang Yao** (Department of Mechanical Engineering, Tsinghua University)
- Duration: Sep 2024 – Sep 2025
- Addressed insufficient softness discrimination in traditional homogeneous elastomers (due to indistinct deformation across objects) by contributing to the design of a novel gradient-stiffness elastomer. Conducted literature collection/collation on robotic vision-based tactile sensors, summarized softness discrimination research status, bottlenecks, and optimization directions to provide theoretical support. Assisted in Abaqus simulations, including model establishment and key data verification.
- Independently led research on hardness measurement for vision-based tactile sensors: derived the elastomer deformation-hardness relationship, established Contact Strain Rate (CSR)-hardness mapping. Completed full-process Abaqus and Hypermesh simulations, designed contact region extraction algorithms, and obtained hardness values via machine learning—reducing interference from surface characteristics and improving measurement accuracy/stability. Participated in gradient-stiffness elastomer prototype fabrication; independently collated academic achievements, prepared PPT, led technical exchanges and progress reporting.
- Core Academic Achievements: ① 2nd author: Enhancing Softness Discrimination in Vision-Based Tactile Sensors (ICIRA 2025, Okayama, Japan; DOI: 10.1007/978-981-95-2095-4_26; Lecture Notes in Computer Science, Vol. 16074). ② Drafted 1st-author follow-up paper (core content validation completed; real-robot experiments pending) for submission to international journals.

Development of Full-Body Tactile Perception and Manipulation System for Unitree G1 Humanoid Robots

- Supervisor: Assistant Professor **Mengdi Xu** (Institute for Interdisciplinary Information Sciences, Tsinghua University)
- Duration: Oct 2025 – Present
- Focused on developing a full-body tactile perception and manipulation system for the Unitree G1 humanoid robot, aiming to achieve complex interactive tasks such as lifting heavy objects, navigating in dark environments, and assisting others in walking.
- The project covers two core directions: simulation development and real-robot verification. Conducted comparative evaluations of IsaacLab and mjlab simulation environments, ultimately selecting mjlab as the core development platform. Completed the construction of tactile sensor models at multiple locations on the robot surface and environment initialization, laying a foundation for verifying tactile-manipulation fusion algorithms. For the real-robot side, purchased and initially adapted electronic skin suits from Juqiao Technology for full-body tactile signal collection and interactive experiments.

- Currently, the preliminary construction of the simulation environment has been completed, and the reproduction of the BeyondMimic algorithm is underway. Subsequent plans involve optimizing the fusion strategy of tactile perception and robot control based on the reproduction results to enhance interactive adaptability in complex scenarios.

Development of Embodied Intelligent Robot Interaction System for Smart Elderly Care Scenarios

- Supervisor: Engineer **Bo Feng** (iCenter Artificial Intelligence Laboratory, Tsinghua University)
- Duration: Oct 2025 – Present
- Project Introduction: Built an LLM & multi-Agent embodied intelligent robot interaction system for nursing homes, focusing on engineering deployment to support elderly care tasks like companionship and health monitoring.
- Current Progress: Completed on-site surveys at Beijing pilot nursing homes; designed LLM+Agent workflow nodes and scheduling logic; advancing core Agent module prototyping to validate LLM capabilities in elderly care scenarios.

Other Research Experience

- Single-image and Text-driven 3D Mesh Semantic Stylization Reconstruction Based on InstantMesh
- Filter Design-based Implementation of Face Recognition, Audio Separation and Video Object Tracking
- Peripheral Hardware Circuit Design Based on Two-dimensional (2D) Material Devices
- Research on Fine Tactile Perception and Application of Robotic Fingertips
- Excellence Award, the 3rd University VR/AR Challenge of the Goertek Cup (Team Leader)
- Excellence Award, the 8th 3D Printing Competition (Team Leader)
- First Prize, Beijing Metallographic Conference Selection Contest & National College Students Metallographic Conference Semi-final

Awards & Honors

- 2024 & 2025 Tsinghua Comprehensive Excellence Scholarship
- 2024 Outstanding Scholarship for Scientific and Technological Innovation in Weiyang College
- 2025 Outstanding Scholarship for Scientific and Technological Innovation in Tsinghua
- Selected into the Spark Program (the highest-level undergraduate scientific and technological innovation organization at Tsinghua University, with 40 students selected annually)

Professional Skills

1. Simulation & Modeling

- Master Mujoco and IsaacLab simulation environments; independently conduct tactile sensor simulation setup, function verification, and control scenario testing.
- Proficient in mechanical structure design and simulation tools: Abaqus, Hypermesh, SolidWorks.

2. Programming & Algorithm Application

- Proficient in Python and MATLAB; familiar with PyTorch for deep neural network development.
- Understand Reinforcement Learning algorithms; proficient in camera calibration via Aruco markers based on OpenCV.

Others

- League Branch Secretary & Organization Committee Member, Class
- Vice Minister of Liaison Department, Student Union & Deputy Leader of Volunteer Group,
- Member of the Science and Technology Service Team
- Deputy Leader, "Love for Alma Mater" Public Welfare Lecture Campaign
- Head of Liaison Group, "Nanming Feihong" Overseas Program Team (Singapore & Malaysia)
- Member, Traditional Archery Association, Diving Association, Karate Association & Fencing Association