Shixuan (Alan) Zhao

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Education

Stanford University — Sep. 2025 – Present
M.S. in Mechanical Engineering (Distinction in Research) — *GPA: 3.86/4.0*

The University of Arizona — Sep. 2021 – July 2025
B.S. in Mechanical Engineering, Summa Cum Laude — *GPA: 4.0/4.0*

Hebei University of Technology — Sep. 2021 – July 2025
B.Eng. in Mechanical Engineering (Dual Degree), Outstanding Graduate — *GPA: 3.95/4.0 (Rank 2/73)*

Experience

Graduate Research Assistant — Jan. 2026 – Present
Biomimetics & Dexterous Manipulation Lab (BDML), Stanford University — *PI: Prof. Mark Cutkosky*

Research Intern, Stanford Robotics Center — *June 2026 – Sep. 2026*

Project: Humanoid Wall Climbing with Compliant Spines *[1]* — *Co-advised by Prof. C. Karen Liu*

- **Probabilistic Contact Model:** Built a model of how a 12-unit micro-spine palm holds and fails (fit to 296 bench trials, GPU-sampled in MjLab), then used it to place the palm hinge and design a compliant fork palm.
- **Demonstration-Free Motion Generation:** Built an LLM-agent-driven, physics-based whole-body reference generator for skills where human mocap is unavailable (hazardous terrain) or infeasible (robot-specific motions); a QP maximizes palm hold probability and a 10-check certificate verifies each reference.
- **Policy Learning:** Trained PPO teachers with privileged spine states for ground-to-wall transition and 90° climbing (0.97 engagement-schedule match); distilling them via DAgger into a proprioceptive student.
- **Sim-to-Real Deployment:** Deployed policies on the 27-DoF humanoid via an onboard C++ stack shared with simulation (500 Hz real-time loop, 50 Hz policy inference) for first sim-to-real tests.

Co-Authored Projects — *Submitted to ICRA 2027*

- **Compliant Wrist [2]:** Implemented robot-arm control for contact and 1 m/s high-speed experiments.
- **Whisker Array [3]:** Built a lightweight CNN that decodes 2 s of whisker deformation into underwater source position (88 mm, 2.5° mean error) and tracks moving sources in real time.
- **DistalShift [4]:** Built a manager-based arm–wrist control pipeline of reusable, robust primitives.

Research Intern — July 2024 – Sep. 2024
Institute of Automation, Chinese Academy of Sciences (CASIA) — *PI: Dr. Xiaohu Zhou*

- Built a motor-imagery EEG pipeline and online BCI programs that control ping-pong games in real time.

Undergraduate Research Assistant — Sep. 2022 – Aug. 2023
Hebei University of Technology — *Supervisors: Prof. Lixin Sun, Prof. E Cheng*

- Designed RoboBLUE, a campus welcome robot: chassis design, 3D prototyping, and Omron PLC programming.

Publications

[1] **S. Zhao**, S. Xie, H. Li, H. Zhao, J. Chen, T. Ren, S. Chen, Z. He, Q. Wu, C. K. Liu, M. R. Cutkosky, "Humanoid Wall Climbing with Compliant Spines," *in preparation.*

[2] S. Yao, X. Xie, **S. Zhao**, Y. Li, H. Li, M. R. Cutkosky, G. Chen, "Lego-Like Stiffness Configuration of Planar Compliant Modules for Task-Specific Flexible Interfaces," *submitted to ICRA 2027*, arXiv:2610.07319.

[3] X. Xie*, H. Li*, **S. Zhao**, S. Yao, S. Song, M. R. Cutkosky, "Fluorescence-Enhanced Whisker Array with Vision-Based Deformation Analysis for Underwater Source Localization," *submitted to ICRA 2027*, arXiv:2610.07275.

[4] T.-A. Ren*, T. Wang*, **S. Zhao**, R. Karunaratne, T. Zhang, R. Thomasson, M. R. Cutkosky, "DistalShift: How Distal Redundancy Shapes Robot Arm Motion and Joint Loading," *submitted to ICRA 2027.* *Equal contribution

Technical Skills

Robot Learning & Control: Deep RL, Imitation Learning, Whole-Body Control, Contact Modeling, Sim-to-Real
Software: Python, C/C++, MATLAB, PyTorch, MuJoCo / MjLab, Isaac Gym, Isaac Sim, ROS 2, OpenCV
Hardware & Design: SolidWorks, ANSYS, ABAQUS, 3D Printing, STM32, Arduino, Raspberry Pi