

Changqing Guo

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Education Experience

Tsinghua University

2024.09 – Present

- M.Sc. in Data Science and Information Technology, GPA: 4.0/4.0 Advisor: Prof. Wenbo Ding & Shoujie Li
- Master's Thesis: **Mechanism-Algorithm Co-Design for Robots in Extreme Environments.**

South China University of Technology

2020.09 – 2024.06

- B.Sc. in Robotic Engineering (Minor in Finance), GPA: 3.9/4.0 Advisor: Prof. Hongjie Jiang
- Excellent Bachelor's Thesis (Top 5%): **Multimodal Embodied Intelligence for Object Detection and Robotic Grasping.**
- Representing Coursework: Robotic Theory, Machine Vision, Dynamic System Control, Mechanics of Materials, Econometrics.

Research Interests

- **Robotic Perception:** Event-based vision for robotic. Design and application of tactile sensor in grippers.
- **Robotics System Design:** Designs for snakelike robot, including mechatronics, locomotion, perception from scratch. Novel actuation design of tendon-driven robot, enhancing locomotion in actuation-space with intrinsic fault-tolerance ability.
- **Embodied Intelligence:** Leveraging Vision-Language-Action (VLA) models for end-to-end dexterous manipulation. Advancing Sim2Real transfer policies to enable robust robotic operation in unstructured and dynamic environments.

Selected Publications

[1] SandWorm: Event-based Visuotactile Perception with Active Vibration for Screw-Actuated Robot in Granular Media

S. Li*, C. Guo*, et al. | [IEEE Transactions on Robotics \(T-RO\)](#) | Published, 2026 (*Equal Contribution, Student First Author)

- *Overview:* Targeting the challenges of subsurface exploration in **granular media**, we developed a **snake-like robot** with peristaltic-rotating locomotion ability and an integrated **event-based visuotactile sensor**. We proposed a dedicated mechanism utilizing **active vibration** to simultaneously enable **1000 Hz pixel-level** tactile imaging and enhanced subsurface propulsion. We developed **model-based algorithms** tailored to event stream sparsity and elastomer mechanics to significantly improve perceptual performance.
- *Contributions:* Engineered the full-stack system, including the mechatronic design and elastomer fabrication. Conceptualized and implemented the IMU-guided temporal filter algorithm. Conducted extensive field validation and maintenance. Complete manuscript writing with all academic figures.

[2] Time-Division Multiplexing Actuation for Tendon-Driven Arms: Lightweight Design and Fault Tolerance

S. Li*, C. Guo*, J. Xu*, et al. | [IEEE Transactions on Mechatronics \(T-MECH\)](#) | Major Revision, 2026

- *Overview:* To address the **weight-reliability trade-off in aerospace robotics**, we proposed the **Time-Division Multiplexing Actuation (TDMA)** framework of **tendon-driven arms** to control 9 DOFs with only 4 motors, achieving a high-performance 10 kg payload at a 2.17 kg self-weight with **intrinsic fault tolerance**. We developed an optimization-based trajectory planning algorithm in actuation space, reducing tendon load by 50% and maintaining end-effector accuracy within 1% under actuator failure.
- *Contributions:* Systematized the TDMA concept. Optimized the mechanical architecture of the MuxArm platform. Developed the fault-tolerant trajectory planning algorithm. Conducted comprehensive experimental validation. Complete manuscript writing with all academic figures.

[3] A Machine Vision Enabled Implantable pH Sensing Scheme Using Ultrasonic Images of Compositd Hydrogels

C. Guo, Y. Wu, Y. Ma, H. Jiang. | [IEEE Sensors Journal](#) | Published, 2023

- *Overview:* To mitigate ultrasonic probe misalignment in implantable sensors, we developed a **3D reconstruction scheme** from serial 2D ultrasonic images of the cross-sections. We also modelled and implemented a **projection correction algorithm** to accurately recover the true gel deformation from tilted or rotated scans, achieving reliable wireless pH monitoring with computer vision techniques.
- *Contributions:* Developed the end-to-end algorithm pipeline for the ultrasonic gel images. Complete manuscript writing with all academic figures.

[4] MultiHand: Design and Verification of a Dexterous Hand with Multi-modal Grasping Capabilities

Y. Tian, C. Guo, et al. | [IEEE International Conference on Robotics and Automation \(ICRA\)](#) | Accepted, 2026

- *Overview:* We developed a three-fingered **dexterous hand** integrating electromagnetic, suction, and controllable adhesive modalities, with a granular jamming palm to enhance in-hand operability. We created an **open-source dataset** of 102 3D-scanned objects, achieving a 90% grasping success rate.

- *Contributions:* Structural design optimization for the multi-modal finger. Executed extensive grasping experiments across diverse object categories

[5] Chemistry3D: Robotic Interaction Toolkit for Chemistry Experiments

S. Li*, Y. Huang*, C. Guo*, et al. | **IEEE International Conference on Robotics and Automation (ICRA)** | Published, 2025

- *Overview:* Developed Chemistry3D built on NVIDIA Omniverse, designed to train **robotic agents** for autonomous chemical experiments; integrated real-time chemical kinetics with fluid dynamics simulation to enable agents to perceive and manipulate transparent glassware and hazardous liquids in a physics-faithful environment.
- *Contributions:* Engineered the reinforcement learning benchmark tasks, enabling the agent to master complex skills (e.g., pouring, stirring).

Leadership & Service

- **Academic Service:** Reviewer for IEEE ICRA, IROS, IJPST.
- **Open-Source Community:** Contributor to "Embodied AI Guide" in Chinese robotic community, with 10000+ GitHub stars.
- **Academic Organizer:** Hosted academic seminars with 50+ attendees; facilitated discussions on robotics innovation.
- **Team Captain:** Captain of the School Football Team. Led the team to win the Runner-up title in the University-level Competition.

Research Internship

Meituan, Embodied AI Lab

2025.11 – 2026.02

Research Focus: **End-to-end Tactile-VLA Integration for Dexterous Manipulation**

Advisor: Dr. Ruichen Zhen

- *Overview:* Implemented a VLA-based autonomous loading system for Meituan's **drone delivery network** to automate the handling of food packages. Integrated a custom **3-fingered tactile-enabled dexterous hand** and established a full-stack research pipeline ranging from teleoperated data collection to policy training and deployment. Specifically focused on fine-tuning the **π -0.5 model with multi-modal integration**, leveraging tactile feedback to achieve robust manipulation of **deformable objects** (e.g., meal bags) in unstructured environments.

Awards

- Outstanding Bachelor's Thesis Award | Top 5% | 2024
- Mathematical Contest in Modeling (MCM/ICM) | Honorable Mention | 2022
- University Academic Scholarship | 2021, 2023, 2025
- Mechanical Structure Design Course Project | Best Design Award | 2023

Skills

- Robotics & AI: ROS/ROS2, VLA Models, Diffusion Policy, Reinforcement Learning, Computer Vision, PyTorch
- Programming: Python, C/C++, Linux/Shell, Git.
- Mechatronics: Mechanical Design (SolidWorks), Embedded Systems (ESP32), Soft Robotics Fabrication, Sensor Integration.
- English: Professional Working Proficiency (English-taught Programs for B.Eng. & M.Sc.); ICRA Oral Presenter; CET-6 (558).