RUILIN ZHANG

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Research Goal

My research goal mainly focuses on **multimodal tactile sensing** and **embodied robotic perception**, especially visuotactile sensors, edge computing, proximity–tactile perception for dexterous manipulation. I aim to develop compact, high-speed, and intelligence-ready tactile systems that enable robots to perceive, understand, and respond to physical interactions with human-like dexterity.

Education

- **ShanghaiTech University** *Sep. 2023 - Present*
  B.S., School of Information and Science Technology (SIST) Shanghai, China
  - **GPA**: 3.61/4.00

Research Experience

- **Robotics Interface and Manipulation Lab (RIMLAB)** *Aug. 2025 - Present*
  Undergraduate Researcher | Advisor: Prof. Chenxi Xiao ShanghaiTech University
  - **Hardware & Sensor Design:** Engineered and fabricated ultra-fast visuotactile sensors and multimodal fingertips, leading the overall design of mechanical structures and electronic circuits.
  - **System Integration & Simulation:** Deployed Jetson-based edge computing algorithms, calibrated vision modules, and constructed high-fidelity MuJoCo simulation environments for heterogeneous dexterous hands.
  - **Embodied Experiments & Writing:** Led system debugging, data collection, and physical embodied experiments for biomimetic robotic manipulation. Co-authored 3 manuscripts for top-tier venues including *Nature Machine Intelligence*, *T-RO*, and *ICRA*.
- **Motor and Motion-control Lab (m&m Lab)** *Feb. 2025 - Aug. 2025*
  Undergraduate Researcher | Advisor: Prof. Jiahao Chen ShanghaiTech University
  - Developed custom physics simulations in MuJoCo and performed hyperparameter optimization for Reinforcement Learning models to achieve stable robotic motion control.

Publications & Manuscripts

[3] **Ruilin Zhang**, Xiaoying Zhou, Chenxi Xiao*. **ProxiTac: A Plug-and-Play Wearable Proximity-Tactile Sensor for Cross-Embodiment Hand Data Collection**. *To be submitted to The International Conference on Robotics and Automation **(ICRA)***, 2027.
Contribution: Designed a multimodal fingertip of both tactile and proximity modes, compatible with both human hands and dexterous hands. Deployed a cloth-hanging task with Franka and Xhand-1 in a dark environment.

[2] Runze Hu, **Ruilin Zhang**, Kefei Wu, Xiaoying Zhou, Jinyu Li, Chenxi Xiao*. **TriCoSphere: A Lightweight, High-Speed, and Large-Workspace Coaxial Spherical Parallel Manipulator for Learning-Based Dexterous Grasping**. *To be submitted to IEEE Transactions on Robotics **(T-RO)***, before 2026.06.
Contribution: Designed tactile sensor at fingertip, optimized mechanical structure, and established MuJoCo simulation environment of the dexterous hand.

[1] Zhengying Zhu, **Ruilin Zhang**, Chenxi Xiao*. **Physical Near-sensor Computing for Instantaneous Embodied Visuo-tactile Perception**. *To be submitted to **Nature Machine Intelligence***, before 2026.07.
Contribution: Built a 400-fps RGB visuotactile sensor, deployed Jetson-based Poisson reconstruction for contrast experiments, implemented several robotic experiments such as withdrawal-reflex, pick-and-place, wiping, and balloon-puncture tasks, prepared paper figures, and contributed to manuscript writing.

Honors and Awards

- **Second Place, TI Cup National Undergraduate Electrical Design Contest** *2025*
  National Level Competition
  - **Contribution:** Led the hardware design, PCB fabrication, and system debugging. Designed the core system architecture for the provincial comprehensive contest.
- **Outstanding Student of SIST** *2024 – 2025*
  ShanghaiTech University
  - Awarded to top-performing students in the School of Information and Science Technology for academic excellence.

PROJECTS

- **Image Signal Processing** *Sep 2023 - Jan 2024*
  Tools: MATLAB [GitHub]
  - *Reconstructed RGB image from RAW camera data, and adjusted image parameters to adapt human-eye vision.*
  - *Evaluated the quality of reconstructed images by major property metrics.*
- **LCR meter** *Month 2024 - Month 2025*
  Tools: JLCEDA, Multisim, CubeMX, Keil [GitHub]
  - *Measured resistance, capacitance, and inductance by analyzing the impedance response of components under an AC excitation signal.*
  - *Realized the analog and digital system within* $40cm^2$*, and the marigin of error is within* 5%*.*

TEACHING EXPERIENCE

- **Teaching Assistant, EE115B Digital Circuits** *Spring 2026*
  ShanghaiTech University
  - Assisted in teaching digital circuit principles, graded assignments, and guided students in hands-on lab sessions.

SKILLS

- **Hardware Design:** JLCEDA, SolidWorks, Multisim
- **Embedded System:** ARM (Jetson, STM32), Arduino (ESP32, XIAO, etc.)
- **Machine Learning Tools:** PyTorch, OpenCV, NumPy, Scikit-learn
- **Writing Experiences:** Graphing skills for Springer Nature and IEEE journals
- **Programming Languages:** Python, C/C++, MATLAB