Shaoxiong Yao

WeChat ID: wxid_51y5vgqe3u7l22 • syao16@illinois.edu • ShaoxiongYao

Education

University of Illinois at Urbana-Champaign — Champaign, IL
PhD Candidate, Computer Science, GPA: 4.00/4.00 — *Aug. 2021 – Present*

University of Michigan — Ann Arbor, MI
Bachelor of Engineering, Computer Science, GPA: 3.98/4.00 — *Sept. 2019 – May 2021*

Shanghai Jiao Tong University — Shanghai, China
Bachelor of Engineering, Electrical and Computer Engineering, GPA: 3.89/4.00 — *Sept. 2017 – Aug. 2021*

Work Experience

Robotics Research Intern — Cambridge, MA
Mitsubishi Electric Research Laboratories (MERL) — *Sept. 2025 – Dec. 2025*
- Conducting research on dexterous hand manipulation with tactile sensing.

Robotics Engineer Intern — Palo Alto, CA
Tacta Systems, Inc. — *May 2025 – Aug. 2025*
- Developed a system for collecting human dexterous manipulation demonstrations to enable training of tactile-aware robotic manipulation policies.

Research Experience

My research focuses on developing **physically grounded models** for robotic manipulation through multimodal real-world observations, including vision, touch, and language, with works in **Robotic Manipulation [CVPR2026, ICRA2026W, ICRA2025]**, **Multimodal Perception [ICRA2023, CoRL2024, ICRA2025]** and **Physical Modeling [ICRA2024]**.

[Robotic Manipulation] Simulation-Enabled Action Planning using Vision-Language Models — Cambridge, MA
Advisor: Prof. Yilun Du; Collaborators: Haowen Liu, Haonan Chen — *Sept. 2025 – Present*
- Built a real-to-sim pipeline that reconstructs rigid and deformable object simulators from single-view RGB-D inputs.
- Developed a manipulation planning framework that equips VLMs with physical reasoning for complex robotic tasks.
- Achieved strong gains over state-of-the-art VLA models and prior VLM-based planning approaches.

[Robotic Manipulation] Guided Diffusion for Dexterous Grasping in Cluttered Environments — Cambridge, MA
Advisor: Dr. Devesh Jha and Diego Romeres — *Sept. 2025 – Dec. 2025*
- Built a system for dexterous grasp planning in clutter, supporting automatic non-prehensile manipulation behaviors.
- Developed an algorithm that uses guided diffusion to generate physically feasible manipulation actions.
- Deployed the system on a real Shadow Hand platform with tactile sensing.

[Multimodal Perception] Meta-learning for data-efficient visual-tactile model estimation — Champaign, IL
Advisor: Prof. Kris Hauser — *Oct. 2022 – Nov. 2024*
- Developed a meta-learning framework to learn heterogeneous physical models from real-world objects.
- Implemented a PyTorch-based visual-tactile model estimation and meta-learning library.
- Demonstrated ∼10x data efficiency when estimating the VSF visual-tactile model using a vision-based prior learned from a real-world dataset with ∼4000 touching sequences, project page.

[Multimodal Perception] Neural material field for high-resolution tactile model estimation — Champaign, IL
Advisors: Prof. Kris Hauser; Collaborator: Jiaheng Han — *May 2024 – Present*
- Extend volumetric stiffness field to model high-resolution tactile sensors, project page.
- Demonstrated ∼30% detection accuracy in palpation tasks to detect stiffness inclusion.

[Robotic Manipulation] Safe leaf manipulation for accurate occluded fruit monitoring — Bonn, Germany
Advisors: Prof. Kris Hauser and Prof. Maren Bennewitz; Collaborator: Sicong Pan — *March. 2024 – May 2024*
- Developed a planning framework for safe leaf manipulation to reveal hidden fruits, project page.
- Proposed a DeepSDF-based novel scene-consistent shape completion for fruit estimation under heavy occlusion.
- Developed a perception-driven deformation graph model for model-based leaf manipulation planning.

[Physical Modeling] 3D contact forces estimation of visual-tactile sensor — Champaign, IL
Advisor: Prof. Kris Hauser, collaborator: Jing-Chen Peng — *March 2023 – Sept. 2024*
- Developed and calibrated an FEM model for soft-bubble visual-tactile sensor Punyo.
- Developed an optimization-based dense force estimator using RGBD image inputs, and open-source code.
- Achieved 1.24 N forces prediction error and contact patch estimation mIoU=0.51.

[Multimodal Perception] Real time elastic deformable objects tactile model estimation — Champaign, IL
Advisor: Prof. Kris Hauser — *Sept. 2021 – Sept. 2022*

- Developed a point-based tactile model of elastic deformable object: volumetric stiffness field(VSF).
- Implemented real-time VSF estimation system that run ≥ 20 Hz with GPU acceleration.
- Estimated VSF predicted tactile response(joint torques) of novel touches at average ~ 1 Nm error and achieved at least $\times 2$ higher accuracy compared to baselines.

Publications

The symbol * indicates authors who contributed equally.

- Shaoxiong Yao, Chengyi Xing, Yuki Shirari, Devesh Jha and Diego Romeres. "Dexterous Non-prehensile Manipulation using Environment Guided Diffusion Models", ICRA 2026 Dexterous Manipulation Workshop on Dexterity with Multifingered Hands: Hardware, Sensing, and Skills.
- Chengyi Xing, Shaoxiong Yao, Devesh Jha and Diego Romeres. "ContactDP: Contact-Guided Diffusion Policy for Tight Insertion Tasks", in submission, https://arxiv.org/pdf/2609.23800.
- Haowen Liu*, Xirui Li*, Shaoxiong Yao*, Peng Shi, Tianyi Zhou, Jia-Bin Huang, Furong Huang, Jiayuan Mao. "Guava: An Effective and Universal Harness for Embodied Manipulation", in submission, https://arxiv.org/abs/2606.18363.
- Haowen Liu*, Shaoxiong Yao*, Haonan Chen, Jiawei Gao, Jiayuan Mao, Jia-Bin Huang and Yilun Du. "SIMPACT: Simulation-Enabled Action Planning using Vision-Language Models", Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition 2026.
- Jiaheng Han, Shaoxiong Yao, Wei-Cheng Huang and Kris Hauser. "Dense Robotic Packing of Heterogeneous Deformable Objects", to present at IROS 2026.
- Chaoqi Liu, Haonan Chen, Sigmund H Høeg, Shaoxiong Yao, Yunzhu Li, Kris Hauser, Yilun Du. "Flexible multitask learning with factorized diffusion policy", IEEE Robotics and Automation Letters, 2026.
- Shaoxiong Yao*, Sicong Pan*, Maren Bennewitz and Kris Hauser. "Safe Leaf Manipulation for Accurate Shape and Pose Estimation of Occluded Fruits", IEEE International Conference on Robotics and Automation (ICRA), 2025.
- Jiaheng Han*, Shaoxiong Yao* and Kris Hauser. "Estimating High-Resolution Neural Stiffness Fields using Visuotactile Sensors", IEEE International Conference on Robotics and Automation (ICRA), 2025.
- Shaoxiong Yao, Yifan Zhu and Kris Hauser. "Structured Bayesian Meta-Learning for Data-Efficient Visual-Tactile Model Estimation", in 8th Annual Conference on Robot Learning (CoRL 2024), 2024.
- Shaoxiong Yao and Kris Hauser. "Generating and Estimating Linear FEM Plant Simulation Models", IROS2024 Workshop on Agricultural Robotics for a Sustainable Future.
- Jing-Chen Peng, Shaoxiong Yao and Kris Hauser. "3D Force and Contact Estimation for a Soft-Bubble Visuotactile Sensor Using FEM", IEEE International Conference on Robotics and Automation (ICRA), 2024.
- Shaoxiong Yao and Kris Hauser. "Estimating Tactile Models of Heterogeneous Deformable Objects in Real Time", IEEE International Conference on Robotics and Automation (ICRA), 2023.

Honors and Awards

- UIUC Graduate College Conference Presentation Award, 2023
- UIUC Graduate College Conference Presentation Award, 2022
- Excellent Graduate of Shanghai 2021, by Shanghai City Ministry of Education
- James B. Angell Scholar at University of Michigan, 2021
- Excellent Undergraduate Scholarship (First class, 1%) by Shanghai Jiao Tong University

Service Activities

- Organized the RSS 2026 workshop Tactile Sensing for Robotic Foundation Models Workshop, ICRA 2025 workshop on contact-rich manipulation, the UIUC Robotics Seminar Series, and a robotics session at the CSL Student Conference.

Open-Source Software

- **OpenVSF** — Open-source volumetric stiffness field framework for deformable object estimation, simulation, and learning. `https://github.com/uiuc-iml/openvsf`
- **PyTorch Deformation Simulation Package** — Developed a GPU-accelerated PyTorch library for elastic deformation simulation, with coding assistance from Claude Code. `https://github.com/ShaoxiongYao/pytorch_deform`

Skills

- Proficient in programming with Python, with extensive experience in machine learning using PyTorch and physics-based simulation using tools such as Klampt, Warp, and Drake, MuJoCo. Skilled in tactile perception technologies, including the use of Punyo, GelSight, Digit and TouchLab sensors.
- Proficient in operating robotic manipulator platforms (Kinova Gen3 and UR5), with expertise in motion planning using Klampt and ROS software packages.