

Sandra Q. Liu

Robotist - Applied Scientist

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Work Experience

Robotics and AI Institute

Feb 2024 - Current

Cambridge, MA

Design and rapid prototyping of various handheld robotic grippers to collect data for machine learning algorithm development and be incorporated into robotic systems. Developing underactuated linkage mechanisms which enable multiple grasps and fine manipulation. Also wrote an OnShape plugin for linkage tracing. Researching robotic fingertip designs that include compliant structures and fingernails. Worked on incorporating off-the-shelf force/tactile sensors into hands.

Research

Soft-Rigid Tactile Fingers

July 2022 - Jan 2024

MIT

Designed an underactuated human-inspired soft finger and novel passive palm with rigid endoskeletons and continuous high-resolution tactile sensing. Incorporated fingers into a gripper that is capable of handling heavier and more delicate objects, while also classifying arbitrarily oriented objects using tactile sensing and a neural network architecture.

S. Q. Liu and E. H. Adelson, "A Passively Bendable, Compliant Tactile Palm with Robotic Modular Endoskeleton Optical (ROME) Fingers," in *2024 IEEE International Conference on Robotics and Automation*.

S. Q. Liu, L. Z. Yañez, and E. H. Adelson, "GelSight EndoFlex: A Soft Endoskeleton Hand with Continuous High-Resolution Tactile Sensing," in *2023 6th IEEE International Conference on Soft Robotics*. [Winner of Best Student Paper Award]

Tactile Fin Ray-Inspired Grippers

Oct 2020 - Jan 2024

MIT

Designed and fabricated multiple novel soft compliant Fin Ray grippers that can passively conform to objects they grasp while also providing tactile 3D reconstruction, object orientation, and shear force information. Implemented software that can interface with a commercial robotic arm, parallel jaw gripper, and the tactile Fin Rays to do manipulation tasks such as sorting nut shells and reorienting and placing down a wine glass utilizing only tactile sensing data.

S. Q. Liu, Y. Ma, and E. H. Adelson, "GelSight Baby Fin Ray: A Compact, Compliant, Flexible Finger with High-Resolution Tactile Sensing," in *2023 6th IEEE International Conference on Soft Robotics*.

S. Q. Liu and E. H. Adelson, "GelSight Fin Ray: Incorporating Tactile Sensing into a Soft Compliant Robotic Gripper," in *2022 5th IEEE International Conference on Soft Robotics*.

Skills

Design & Prototype

3D CAD
(Solidworks/Onshape), 3D printing (SLA/FDM), silicone molding, water jet, laser cutter, CNC, mill, lathe, ANSYS, Altium, soldering

Programming

Python, ROS, OpenCV, SciKit, MATLAB, Tensorflow, Pytorch, Arduino

Education

Massachusetts Institute of Technology

MS/PhD in Mechanical Engineering

GPA - 4.8/5.0

Sept 2018 - Jan 2024

California Institute of Technology

BS in Mechanical Engineering

GPA - 3.8/4.0

Sept 2014 - June 2018

Invited Talks

MIT Abstracts

Oct 2024

Williams College Computer Science Colloquium

May 2023

CMU Robotics Institute Seminar

Aug 2022