Gregory Xie

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Full-stack roboticist focusing on robot hand design, with experience spanning from mechanisms to software. Expert at optimizing high performance robots by systems integration and tightly coupling electromechanical design to software and controls.

Experience

Roboticist | Robotics and AI Institute | Cambridge, MA *June 2023 - Present*

Technical lead for the design of high performance hands and wrists for highly dynamic, bimanual manipulators. Owned the mechanical design including mechanisms, structures, and actuators.

- Designed underactuated and fully articulated tendon-driven hands with tactile sensing, ranging from 6-12 DoF
- Designed a forearm supporting aforementioned hands, housing a compact 2 DoF parallel wrist and finger actuators. Used FEA to optimize for size, weight, and strength using loads extracted from robot simulations
- Designed and integrated rotary and linear quasi-direct drive finger and wrist actuators ranging from 20 - 40mm in diameter enabling compliant and powerful manipulation behaviors
- Developed simplified models to investigate the effects of various parameters (friction, mass, latency, etc) on the dynamic performance of hands. Developed simulation tools to evaluate candidate hand morphologies and kinematics
- Performed workspace analysis and optimization for a bimanual manipulator, optimized motor sizing/gearing and determined design requirements (structure and bearing loads, power supply impedance, etc) through trajectory optimization
- Created detailed part drawings using GD&T, performed tolerance analyses to ensure accurate and repeatable assemblies

Graduate Research Assistant | MIT CSAIL | Cambridge, MA *Sep 2022 - May 2023*
Undergraduate Research Assistant *June 2019 - June 2021*

- Designed robotic grippers for in-hand manipulation and grasp proprioception, resulting in publications [3, 4]
- Designed modular expanding robots optimized for speed [2] and strength [5], enabling swarm locomotion behaviors

Robotics Software Engineering Intern | Realtime Robotics | Boston, MA *Sep 2022 - May 2023*

- Developed planning, filtering, and simulation features for a motion planning stack interfacing with industrial robot arms (Kuka, Fanuc, Mitsubishi, etc)

Mechatronics Intern | Nimble Robotics | San Francisco, CA *June 2021 - Aug 2021*

- Wrote firmware for BLDC motor drivers, improving actuator torque accuracy and field weakening performance
- Built electromechanical and thermal models of actuators using a dynamometer
- Diagnosed and fixed intermittent failures of actuator CAN bus, improving robot reliability.

Mechanical Engineering Intern | Formlabs | Somerville, MA *June 2020 - Aug 2020*

- Designed and ran lifetime and design verification tests for the Form Wash L and Form Cure L
- Created part and assembly drawings

Education

Massachusetts Institute of Technology *2022 - 2023*
M. Eng. in Electrical Engineering and Computer Science (GPA: 5.0/5.0)

Massachusetts Institute of Technology *2018 - 2022*
B.S. in Electrical Engineering and Computer Science and B.S in Mechanical Engineering (GPA: 5.0/5.0)

Patents and Publications

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[1] **Xie, G** and Rojas, N. Wrist Mechanism for a Robot Arm U.S. Patent Application 19/043,948, filed February 3, 2025.

[2] Chin, L., **Xie, G.**, Lipton, J., Rus, D. “Large-Expansion Bi-Layer Auxetics Create Compliant Cellular Motion” in *IEEE ICRA.* 2025

[3] **Xie, G.**, Chin, L., Kim, B., Holladay, R., Rus, D. “Strong Compliant Grasps Using a Cable-Driven Soft Gripper” in *IEEE IROS.* 2024

[4] **Xie, G.**, Holladay, R., Chin, L., Rus, D. “In-Hand Manipulation With a Simple Belted Parallel-Jaw Gripper” in *IEEE RA-L.* 2024

[5] Chin, L., Burns, M.*, **Xie, G.***, Rus, D. “Flipper-Style Locomotion through Strong Expanding Modular Robots” in *IEEE RA-L.* 2023

Areas of Expertise

Mechanical and Electrical	CAD (Solidworks, Onshape), FEA (Ansys), GD&T, DFM/DFA, KiCAD, LTSpice
Programming	Python, C++, MATLAB
Robotics	Robot kinematics, modeling, computational design optimization, MuJoCo, Drake