# Gregory Xie

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Full-stack roboticist focusing on robot hand design, with experience spanning from mechanism design to modeling and control. 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 robotic hands and wrists for dynamic, bimanual manipulators, owning decisions from concepts through detailed drawings and integration.

- Designed underactuated and fully articulated tendon-driven hands (6-12 DoF) with integrated tactile sensing, enabling robust grasping and fine manipulation
- Designed a robotic forearm housing a compact 2-DoF parallel wrist and finger actuators, balancing strength, weight and packaging constraints. Optimized structure for weight using finite element analysis
- Designed rotary and linear quasi-direct drive finger and wrist actuators (20-40 mm diameter), enabling compliant yet forceful manipulation behaviors
- Developed simplified models to study the effects of friction, mass, and latency on the dynamic performance of robot hands, informing actuator, transmission, and sensor design.
- Developed simulation tools to evaluate hand morphologies and kinematics
- Performed workspace analysis and trajectory optimization for a bimanual manipulator, determining kinematic parameters, motor sizing, gearing, bearing selection, and power system requirements.
- Created detailed part drawings using GD&T, performed tolerance analyses to ensure accurate and repeatable assemblies
- Held regular design reviews with researchers from across multiple projects to incorporate stakeholder requirements

**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 peer-reviewed publications
- Designed modular expanding robots enabling novel swarm locomotion behaviors, resulting in peer-reviewed publications

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

- Developed motion planning, filtering, and simulation features for a planning stack interfacing with industrial robot arms

**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 dynamometer testing
- Diagnosed and resolved 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 detailed part and assembly drawings

## Patents and Publications

[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

## 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)

## Skills

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| **Robotics** | Robot kinematics, modeling, computational design optimization, MuJoCo, Drake |
| **Programming** | Python, C++, MATLAB |
| **Mechanical and Electrical** | CAD (Solidworks, Onshape), FEA (Ansys), GD&T, DFM/DFA, KiCAD, LTSpice |
| **Fabrication** | CNC and manual machining, 3D printing, laser and waterjet cutting, soldering |