Yuxuan (Ethan) Mao

415 Howard St., Evanston, IL 60202

(773)869-3450 yuxuanmao2024@u.northwestern.edu Google Scholar Personal Website/Portfolio

Education

Northwestern University **Sep. 2022 – Mar. 2025**

M.S. in Mechanical Engineering (Dual Degree program with Shanghai Jiao Tong University) *GPA: 3.86/4.0*

Shanghai Jiao Tong University **Sep. 2018 – June 2022**

B.S.(Hons.) in Mechanical Engineering (Zhiyuan honors program for Top 5% students) *GPA: 3.65/4.30*

Coursework (A)

- Solid/Fluid Mechanics
- Design & Manufacture
- Mechanical Vibration
- Robotics
- Bio-electronics Lab
- Control Theory
- Machine Intelligence
- ...

Ongoing Works

- [J1] K.-H. Ha*, J. Yoo*, S. Li*, Y. Mao, S. Xu, H. Qi, H. Wu, C. Fan, H. Yuan, J.-T. Kim, M. Flavin, S. Yoo, P. Shahir, S. Kim, H.-Y. Ahn, E. Colgate, Y. Huang, J. A. Rogers., "Full Freedom-of-Motion Actuators as Advanced Haptic Interfaces", ***Science*** (under revision), Sep. 2024
- [J2] Y. Mao*, D. Li*, W. Sun, D. Zhao, C. Chen, X. Chen., "Efficient Tumor Localization During Respiration with Minimal Scanning Based on Recursive Deformable Diffusion Models", submission planned Dec. 2024.
- [J3] W. Maeng, Z. Lyu, K. Kim, K.-H. Ha, Y. Mao, S. Xu, L. Praba, Y. Hwang, J. A. Rogers., "Multimodal Microscaled Soft Robotic Actuator for Human Organoids Interfaces", in preparation, submission planned Dec. 2024.
- (* Equal authorship))

Publications

- [J1] M. Flavin*, K.-H. Ha*, Z. Guo*, S. Li*, J.-T. Kim*, T. Saxena, D. Simatos, F. Al-Najjar, Y. Mao, S. Bandapalli, C. Fan, D. Bai, Z. Zhang, J. Yoo, M. Park, J. Shin, A. Huang, H. Shin, Y. Huang, Z. Xie, H. Jiang, J. A. Rogers., "Bioelastic State Recovery for Haptic Sensory Substitution", ***Nature***, Nov. 2024.
- [J2] D. Li*, Y. Mao*, P. Tu, H. Shi, W. Sun, D. Zhao, C. Chen, X. Chen., "A Robotic System For Transthoracic Puncture of Pulmonary Nodules Based on Gated Respiratory Compensation", *Computer Methods and Programs in Biomedicine*, Jan. 2024.
- [C1] Y. Mao, P. Tu, W. Liu, Z. Liu, X. Chen., "A Real-Time Respiratory Analysis System for PET-CT Based on Fiber-Optic Pressure Sensors", Oral, *Conference on Biomedical Engineering (China)*, May. 2023.
- [C2] Y. Mao, J. Yu, L. Wang, Y. Zou, Z. Lin, W. Chen, A. Gao., "A Cable-Driven Hyper-Redundant Robot with Angular Sensing", Oral, *IEEE International Conference on Robotics and Biomimetics (ROBIO)*, Nov. 2021.

Research Experience

Simpson Querrey Institute for Bio-electronics **Sep. 2023 – Present**

Research Assistant *Advisor: Dr. John A. Rogers*

- Keywords: Haptics, Multi-modal Interface, Electromagnetic Actuator
- Led experimental study of electromagnetic multi-modal actuators for advanced haptic interfaces. Conducted characterization of skin and skin phantom, and psychophysical test of human perception.
- Keywords: Soft Robot, Milli-scale Robot, Organoid Interface
- Design and implemented a multi-channels pneumatic system, for precise control of mm-scale 3D organoid interface.

Institute of Biomedical Manufacturing and Life Quality **Sep. 2021 – present**

Research Assistant *Advisor: Dr. Xiaojun Chen*

- Keywords: Robot-Assisted-Surgery, Tumor Tracking, Diffusion Model
- Designed and clinically verified a robot-assisted puncture system with optical navigation. Developed a novel recursive diffusion deformation model to generate 4D-CT from limited CT scans, significantly corrected localization error from respiration.

Institute of Medical Robotics **June 2021 – Sep. 2021**

Undergraduate Research Assistant *Advisor: Dr. Anzhu Gao*

- Keywords: Serpentine Robot, Cable-Driven Mechanism, Constrained Manipulation
- Led the serpentine robot project. Designed and implemented optimal trajectory planning algorithm and a multi-sensor fusion controller for a redundant manipulator.

Institute of Robotics **Feb. 2020 – Feb. 2021**

Undergraduate Research Assistant *Advisor: Dr. Jianjun Meng*

- Keywords: Brain-Computer-Interface, Haptics, Stroke Rehabilitation
- Participated in hardware building and data analysis. Conducted human subject research to analyze the relationship between bilateral vibration and motor imagery performance of the dominant hand.

Teaching Experience

Robotic Manipulation (ME449) **Sep. 2024 – Dev. 2024**

Teaching Assistant *Professor: Kevin Lynch*

- Led office hours and graded assignments for a class of 80 students.

Academic Aid Center **Feb. 2020 – Dev. 2020**

Peer Tutor

- Conducted weekly one-to-one tutoring for 2 students; recognized as an Outstanding Tutor.

Professional Experience

United Imaging Healthcare **Aug. 2024 – Sep. 2024**

Intern *Department of Molecular Imaging*

- Designed real-time respiration processing algorithms, and integrated them in MCU platform for PET/CT scan.

Espressif **Jan. 2022 – Nov. 2022**

Embedded System Intern *Department of Applications Engineering*

- Developed a miniature, modular 12-DoFs quadruped robot with ESP32 MCU with all-stack skills.

Selected Honors

- 1st Prize, Outstanding Paper of Young Scholar, BME2023 (China) 2023
- Agilent Scholarship (Top 0.6%, 5/773) 2023
- Excellent Bachelor Thesis of SJTU (Top 1%, 40/3928) 2022
- Outstanding Graduate of Shanghai (Top 2%) 2022
- Zhiyuan Honors Scholarship (Top 5%) 2019 & 2020 & 2021
- TYACHT Outstanding Student (Top 1%, 5/424) 2021
- 1st Prize, Shanghai Mechanical Engineering Innovation Competition 2020
- Shanghai Scholarship (Top 1%, 1/206) 2019

Skills

- **MechE:** CAD (Solidworks, AutoCAD), Simulation (Abaqus, Adams), Mechanics Test, Rapid Prototyping (3D Printing, Laser Cutting, CNC), Motors (DC, Step, Servo), Valves (Solenoid, Proportional), PID Control;
- **ECE:** Embedded Developing (Arduino, STM32, ESP32), (Micro) Soldering, IMU, Protocols (UART, I2C, SPI, CAN), Statistical/Machine Learning;
- **MedE:** Vital Signs Monitoring (EEG, EMG, SPO2, Resp), CT Scans, NDI Trackers (optical/electromagnetic), Psychophysics Test, Silicon Rubber Fabrication, Bio-signal Processing, Medical Image Processing;
- **Programming:** MATLAB/Simulink, LabVIEW, C/C++, Python, Swift;
- **Others:** Digital Image Correlation, UR Robots, ROS/ROS2/MicroROS, V-REP/CoppeliaSim.

Please check out my portfolio for more everyday-inspired robots !