Yuxuan (Ethan) Mao

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Education

Northwestern University, U.S. **Sep. 2022 – Present**

M.S. in Mechanical Engineering (Dual Degree with Shanghai Jiao Tong University) *GPA: 3.86/4.00*

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

*B.S.(Hons.) in Mechanical Engineering (Zhiyuan Honors Program for **Top 5%** elite students)* *GPA: 3.65/4.00*

Background Coursework

- Bio-electronics
- Mechatronics
- Design & Manufacture
- Solid/Fluid Mechanics
- Robotics
- Deep Learning
- Modern Control Theory
- Vibrations and Acoustics

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 review), Sep. 2024
- [J2] 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*** (conditionally accepted), June 2024.
- [J3] 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.
- [J4] 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] 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, *China Biomedical Engineering Conference*, 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 Bioelectronics (Northwestern) **Sep. 2023 – Present**

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

- Keywords: Haptic Interface, Extended Reality, 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, Micro-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 Engineering (SJTU) **Sep. 2021 – Aug. 2023**

Research Assistant *Advisor: Dr. Xiaojun Chen*

- Keywords: Robot-Assisted-Surgery, Lung 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 (SJTU) **June 2021 – Aug. 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 (SJTU) **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

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

Teaching Assistant *Instructor: Dr. Kevin Lynch*

- Assisted with course material preparation, grading, and leading office hour for a class of 80 students.

Top Scholars Club (SJTU) **Feb. 2020 – Dev. 2020**

Peer Tutor

- Conducted weekly Q&A and review sessions for 2 students; recognized as an Outstanding Tutor.

Industry Experience

Espressif Systems **Jan. 2022 – Nov. 2022**

Software Development Intern *Department of Applications Engineering*

- Developed a lightweight, modular 12-DOF quadruped robot with **all-stack** skills.
- Verified the compatibility of ESP32 platform with Micro-ROS to expand its applicability in robotics.

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
- Guanghua Scholarship 2021
- TYACHT Outstanding Student (**Top 1%**, 5/424) 2021
- Zhiyuan Outstanding Leader Scholarship 2021
- COSCO-shipping Scholarship 2021
- **1st Prize**, Shanghai Mechanical Engineering Innovation Competition 2020
- Shanghai Scholarship (**Top 1%**, 1/206) 2019

Technical Skills

- **Mechanical:** CAD, 3D Rapid Prototyping, Machining, Mechatronics Implementation, Pneumatic Implementation;
- **Electrical:** (Micro)Soldering, Embedded System Development (Arduino, STM32, ESP32), Signal Processing, Sensors;
- **Programming:** MATLAB/Simulink, LabVIEW, C/C++, Python, Swift;
- **Robotics:** ROS/ROS2/MicroROS, Protocols (UART, I2C, SPI, CAN);
- **Equipments:** Tensile/Compression Tester, Dynamic Fatigue Tester, Oscilloscope, High-resolution Camera, Vital Signs Monitor (SPO2, HR, Resp), EEG Cap, Optical/Electromagnetic NDI Tracker;
- **Others:** Thin-film Coating Processes, Digital Image Correlation (DIC), Statistical/Machine Learning.