XIANGYU PENG

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Homepage Google Scholar LinkedIn

EDUCATION

University of Michigan (Ann Arbor), USA *August 2021 - Present*
Ph.D. in Robotics, GPA: 4.0/4.0

University of Michigan (Ann Arbor), USA *August 2019 - April 2021*
M.S. in Robotics, GPA: 4.0/4.0

Shanghai Jiao Tong University, China *September 2015 - June 2019*
B.E. in Mechanical Engineering, GPA: 86.4/100

RESEARCH INTERESTS

My research is centered on the field of **wearable technologies** and **medical devices**, with a particular emphasis on the **human-robot interaction**, **biomechanics** and **human factors**. I am especially interested in understanding how individuals interact with and utilize wearable devices and medical technologies. My work aims to develop training paradigms that facilitate the learning and adaptation process for users, while also examining user behaviors to guide the design of intelligent, user-centric wearable systems. Additionally, I am passionate about advancing medical devices that enhance rehabilitation and improve life quality, ensuring they are both effective and accessible for diverse populations.

SKILLS

Programming Languages	Python (Proficient), MATLAB (Porficient), C/C++
Packages & Tools	PyTorch, NumPy, Pandas, Scikit-learn, Git
Others	Eye Tracking, Motion Capture, OpenSim, Human Study

PUBLICATIONS

[1] **Xiangyu Peng**, Shunzhang Li, and Leia Stirling, "Improving Complex Task Performance in Powered Upper Limb Exoskeletons with Adaptive Proportional Myoelectirc Control for User Motor Strategy Tracking", *IEEE Robotics and Automation Letters (RA-L)*, 2024

[2] Leia Stirling, Man I Wu, and **Xiangyu Peng**, "Measuring Trust for Exoskeleton Systems", Workshop on *19th Annual ACM/IEEE International Conference on Human-Robot Interaction (HRI)*, Boulder, CO, March 11-15, 2024

[3] **Xiangyu Peng** and Leia Stirling, "Examination of Biofeedback to Support the Use of Upper-Extremity Exoskeletons Under Proportional Myoelectric Control", *IEEE Transactions on Medical Robotics and Bionics (T-MRB)*, 2024

[4] **Xiangyu Peng** and Leia Stirling, "Effects of Biofeedback on Muscle Effort Reduction when Holding Positions with a Powered Upper Limb Exoskeleton", *67th Annual Meeting of the Human Factors and Ergonomics Society (HFES)*, Washington DC, October 23-27, 2023 (**OETG (Occupational Ergonomics Technical Group) Best Experimental Paper**)

[5] **Xiangyu Peng**, Yadrianna Acosta-Sojo, Man I Wu, and Leia Stirling, "Actuation Timing Perception of a Powered Ankle Exoskeleton and its Associated Ankle Angle Changes During Walking", *IEEE Transactions on Neural Systems and Rehabilitation Engineering (TNSRE)*, 2022

[6] **Xiangyu Peng**, Yadrianna Acosta-Sojo, Man I Wu, and Leia Stirling, "Perception of Powered Ankle Exoskeleton Actuation Timing During Walking: A Pilot Study", *The 43rd Annual International*

Conference of the IEEE Engineering in Medicine and Biology Society (EMBC), Guadalajara, Mexico, October 31 - November 4, 2021

[7] **Xiangyu Peng**, Ningbin Zhang, Lisen Ge, and Guoying Gu, "Dimension Optimization of Pneumatically Actuated Soft Continuum Manipulators", *The 2nd IEEE International Conference on Soft Robotics (RoboSoft)*, Seoul, Korea, April 14-18, 2019

RESEARCH EXPERIENCE

Enabling Co-adaptation of an Upper Extremity Exoskeletons *Sep 2023 - Present*

- Designed a co-adaptive controller to be adaptable, enabling the exoskeleton parameters to adjust over time to the user's evolving capabilities, generating synergistic coordinated motion between the human-exoskeleton team.
- Designed the co-adaptive controller to be legible, allowing users to understand changes in exoskeleton behavior, leading to improved human-exoskeleton performance.
- Used an eye-tracking system to evaluate when biofeedback provides the most benefit to users.

Adaptive Controller that Tracks User Motor Strategy *Oct 2022 - Aug 2023*

- Developed a data-driven proportional myoelectric controller with real-time adaptive parameters, designed to continuously track the user's evolving motor program and enhance intent classification.
- Conducted a human study to demonstrate the effectiveness of the proposed controller, showing reductions in both intention classification error magnitude and muscular effort during movement initiation.

Examination of Biofeedback to Support Exoskeleton Usage *Sep 2021 - Oct 2022*

- Investigated the impact of visual and haptic EMG biofeedback on users performing a matching task with a EMG-based powered upper limb exoskeleton.
- Highlighted the challenges of implementing effective biofeedback due to users' difficulty in adopting the necessary exoskeleton motor program, but demonstrated its positive impact on movement smoothness and participant perceptions.

Human Perception of Exoskeleton Control Parameters *May 2020 - August 2021*

- Implemented torque profile algorithms with a two-alternative forced choice (2AFC) task to assess user perception and developed an Android app to enable user-friendly interaction with the system.
- Conducted a human study to quantify a just-noticeable difference (JND) of $2.8 \pm 0.6\%$ in stride period across participants, highlighting the remarkable sensitivity of humans to exoskeleton control parameters.

AWARDS AND HONORS (SELECTED)

HFES OETG Best Experimental Paper Award	2023
Robotics Outreach Ambassadors	2023
Rackham Travel Grant ($900)	2023
NIOSH PPRT award ($20,000)	2023
Robotics PhD Fellowship	2021
Excellent Undergraduate in Shanghai	2019
Honors degree for outstanding scholastic and scientific research performances in SJTU	2019
Hongyi Overseas Research Scholarship (Top 10%)	2018
1^{st} Prize NPIC Scholarship	2016, 2017
Excellent Student of SJTU selected with overall performance (Top 5%)	2016, 2017

RELEVANT GRADUATE COURSES

Robotics	Machine Learning (EECS 545)
	Computational Machine Learning & Data Science (EECS 505)
	Robotics Systems Lab (ROB 550)
	Math for Robotics (ROB 501)
	Introduction to Algorithmic Robotics (EECS 498)
	Control Systems Analysis and Design (EECS 460)
	Foundations of Computer Vision (EECS 504)
BioMede	Neural Engineering (BIOMEDE 517)
	Locomotor Mechanics and Design / Control of Wearable Robotic Systems (ROB 646)
Others	Design of Experiment (IOE 465)
	Dynamic Programming (IOE 512)
	Nonlinear Programming (IOE 611)

OTHERS

Membership	IEEE Student Member, 2021, 2023, 2024
	EMBS Graduate Student Member, 2021, 2024
	HFES Student Member, 2021, 2023
Reviewer	IEEE Robotics and Automation Letters (RA-L), 2022
	IEEE Transactions on Neural Systems and Rehabilitation Engineering (TNSRE), 2022
	Human Factors and Ergonomics Society Annual Meeting (HFES), 2023, 2024
Outreach	Discover Engineering Camp, 2022
	WISE Camp, 2022, 2023
	Wines Elementary School, 2022
	Allen Elementary School Robotics Visit, 2023
	Pittsfield Elementary School, 2023