XIANGYU PENG

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EDUCATION

University of Michigan (Ann Arbor), USA *August 2021 - Present*
Ph.D. in Robotics, HFES Chapters, GPA: 4.0/4.0
Relevant classes: Machine Learning; Quantifying Human Motion Through Wearable Sensors; Locomotor Mechanics and Design Control of Wearable Robotic Systems; Computational Data Science & Machine Learning; Design of Experiment; Neural Engineering

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.

TECHNICAL SKILLS

Programming & Softwares	Python, Matlab, Simulink, Vicon Nexus, OpenSim, Solidworks, Git
Wearable Sensing Tech	Tobii Eye Tracker, Motion Capture Systems, EMG Sensors
Others	Human Study, Experimental Design, Statistics

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

Investigating Training for Effective Biofeedback in Exoskeleton Use *Sep 2023 - Present*

- Designed a between-subject study to compare two groups using an exoskeleton with EMG biofeedback, examining whether targeted biofeedback training paradigms enhance user efficiency and benefits.
- Evaluated user performance through an assessment task (target matching) and a functional task (bimanual lifting), analyzing biomechanics data with motion capture markers to assess user interactions and adaptive strategies with the exoskeleton.
- Utilized an eye-tracking system to determine when biofeedback provides the greatest benefit to users.

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

- Designed and developed a data-driven myoelectric controller with real-time adaptive parameters, enabling continuous tracking of the user's evolving motor program to improve intent classification.
- The proposed controller used real-time EMG and joint position data to establish a dynamic relationship, termed the Exoskeleton Motor Program, to infer user intentions based on current EMG signals and joint positions.
- Conducted a human study with 12 participants, demonstrating the controller's effectiveness in reducing both intention classification error magnitude and muscular effort during movement initiation.

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

- Conducted a human study with 36 participants to investigate the effects of visual and haptic EMG biofeedback on task performance using an EMG-based powered upper limb exoskeleton.
- Designed a GUI display and a haptic armband to provide real-time exoskeleton status feedback to users via a colored bar and directional vibrations.
- Identified challenges in implementing effective biofeedback, including users' difficulty in adopting the required exoskeleton motor program, while highlighting its positive impact on movement smoothness and participant perceptions.

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

- Designed and implemented a two-alternative forced choice (2AFC) task to evaluate user perception of exoskeleton control parameters by fitting psychometric curves.
- Developed an algorithm utilizing IMU data to reliably detect human walking strides and dynamically adjust the timing of assisted torque based on user performance in recognizing timing changes.
- Conducted a human study with 15 participants, quantifying a just-noticeable difference (JND) of $2.8 \pm 0.6\%$ in stride period, demonstrating humans' high sensitivity to exoskeleton control parameters.