

ECSE Faculty Candidate Seminar

11:30 AM to 12:30 PM
Tuesday, February 21, 2023
White 411

Electrical Actuation, Sensing, and Control of Soft Fluidic Robots

Abstract:

Soft robots made of compliant materials are adaptive to environment, robust to impact, and lightweight, making them safe for human-centered applications. Fluidic robots, as one of the most commonly used soft robots, have been widely applied in wearable technologies, including assistive devices, therapeutic tools, and human-machine interfaces. However, the power and control systems for fluidic robots generally are not only rigid, but also ten times heavier than the actuators, significantly limiting the robots' mobility, flexibility, and safety to human. In this talk, I will introduce compliant, lightweight, and compact transducing and sensing systems that have enabled actuation and control of fluidic actuators. I will start by presenting centimeter scale, electrically-responsive soft valves and peristaltic pumps that employ high power density soft actuators as the core components. I will discuss the working mechanism and design criteria of these valves and pumps, and demonstrate their capabilities to generate and control fluidic flows. Then, I will introduce a highly linear soft sensor that is biocompatible and reliable for motion detection in wearables. Lastly, I will demonstrate closed-loop control of a bending hydraulic actuator with the aforementioned soft sensors, valves, and pumps. These soft sensing and transducing systems show the potential for onboard actuation and control of soft fluid-driven robots, creating a new path for the future wearable technologies and applications.



Siyi Xu
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Bio:

Siyi Xu is a postdoctoral fellow at the Microrobotics Laboratory at Harvard University. She received her PhD in Mechanical Engineering at Harvard University under the supervision of Professor Robert J. Wood. Her research focuses on developing soft robotic platforms equipped with compliant, lightweight, and compact sensing and transducing systems for human-centered applications. Siyi received her bachelor's degree in Materials Science and Engineering from the University of Illinois at Urbana-Champaign. She was selected as a Rising Star in Mechanical Engineering in 2021. She is also a co-recipient of the IEEE Transactions on Robotics King-Sun Fu Memorial Best Paper Award.

This is to certify that _____ attended this seminar. Certified by _____.
Certificates of attendance and other evidence of CPD activity should be retained by the attendee for auditing purposes.



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