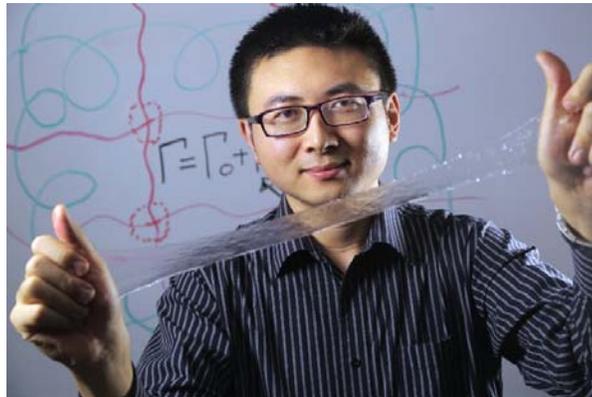


The Department of Mechanical Engineering
College of Engineering and Applied Sciences
Stony Brook University

Mechanical Engineering Seminar



Dr. Xuanhe Zhao
Associate Professor, Soft Active Materials Laboratory
Massachusetts Institute of Technology

Lecture Title: Merging Human and Machines via Soft-Matter Technology
Friday, April 27, 2018 at 1:30 PM, Room 173 Light Engineering Building

Abstract

While human tissues are mostly soft, wet and bioactive; machines are commonly hard, dry and biologically inert. Bridging human-machine interfaces is of imminent importance in addressing grand societal challenges in healthcare, security, sustainability and joy of living. However, interfacing human and machines is extremely challenging due to their fundamentally contradictory properties. At MIT SAMs Lab, we exploit soft-matter technology to bridge human-machine interfaces. On one side, soft matters such as bioactive hydrogels with similar physiological properties as tissues can naturally integrate with human body, playing functions such as scaffolds, catheters, stents, implants and wearable devices. On the other side, the soft matters embedded with electronic and mechanical components can control and respond to external machines. In this talk, I will first discuss the mechanics to design extreme properties for soft matters, including tough, resilient, adhesive, strong and antifatigue, which are necessary for reliable robust human-machine interfaces. Then I will discuss a new multi-material 3D printing platform to fabricate personalized and customized microstructures devices of soft matters. Based on the soft-matter design and fabrication technologies, we create a set of soft-matter devices such as i). long-term high-efficacy hydrogel neural probe, ii). ingestible and GI-resident hydrogel machine, and iii). untethered fast and forceful hydrogel robots controlled by magnetic fields. We will then discuss a systematic approach to design human-machine interfaces with unprecedented efficacy and biocompatibility based on soft-matter technology.

Biography

Xuanhe Zhao is an associate professor in mechanical engineering at MIT. The current research goal of his group is to understand and design soft materials that possess unprecedented properties and functions for addressing grand societal challenges. Dr. Zhao is the recipient of early career award and young investigator award from National Science Foundation, Office of Naval Research, Society of Engineering Science, American Vacuum Society and Adhesion Society. He held the Hunt Faculty Scholar at Duke and d'Arbeloff Career Development Chair and Robert N. Noyce Career Development Professor at MIT.

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