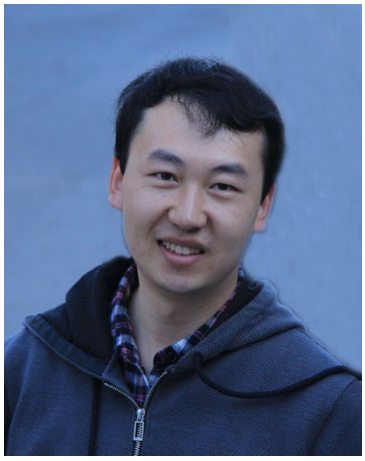
NEURAL ENGINEERING SEMINAR SERIES

Minimally Invasive and Chronically Stable Neural Interfaces

Zoom Link: https://psu.zoom.us/j/99613163586

March 23

12:00 a.m.-1:00 p.m. (E.T.)



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ABSTRACT: Stable chronic mapping of brain activities at the action potential level with high temporal resolution is essential for both fundamental neuroscience research and biomedical applications, including cognitive studies, memory encoding and retrieval, and neural prostheses. Conventional neural probes can provide high spatiotemporal-resolution brain signal recordings independent of probing depth, although they generally trigger foreign body response and tissue damage in the brain. As a result, they are usually unable to stably interface with the brain in a chronic manner, which substantially hinders their applications in neuroscience. In this seminar, I will present a new paradigm, mesh-like electronics, for minimally invasive and chronically stable brain-machine interface. The mesh-like electronics can seamlessly interface with mammal brains with significantly reduced foreign body response and can stably record brain signals with high spatiotemporal resolution for more than 8 months. I will then present the application of mesh-like electronics for chronic recording and modulations of spinal cord sensory and motor neurons in awake mice. In the end, I will present an alternative approach to designing minimally invasive neural electronics with hydrogel-based materials and the rapid fabrication of designed neural electronics with additive manufacturing. Both the mesh-like electronics and hydrogel electronics opened up new windows to stably communicating with the nervous system with minimum perturbation and foreign body responses.

BIOGRAPHY: Tao Zhou is currently a Postdoctoral Associate at MIT. He received his B.S. from Tsinghua university with a major in Chemistry and a minor in Computer Science. He then went to Harvard University to purse his Ph.D. in Chemical Physics (2019), where he worked on mesh-like electronics for neural interfaces. Then he moved to MIT for his postdoc research in the Department of Mechanical Engineering, where he works on hydrogel-based neural interfaces, addictive manufacturing, and bioelectronic medicine.