



Electrical and Computer Engineering

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Title:

"Next-generation Closed-Loop Brain-Machine Interfaces (BMIs) for Control of Brain States"

Thursday, March 5 11:00 a.m. - 12:00 p.m.

HEC 438

Abstract

A brain-machine interface (BMI) is a direct control pathway between the brain and an external device. To date, BMIs have largely focused on restoring lost motor function in paralysis by decoding the brain's movement intention and using it to control external prosthetic devices. However, beyond paralysis, many health care applications, such as the treatment of neuropsychiatric disorders, would require controlling the brain state itself using external stimuli such as electrical brain stimulation. In this talk, I will present the design of a new type of closed-loop BMI that controls the brain state by guiding the delivery of stimuli to the brain with the feedback of neural activity. I will focus on two clinical neuroscience applications: treatment of neuropsychiatric disorders and automatic anesthetic delivery. I will talk about the theoretical construction of closed-loop BMIs, the development of stochastic control and machine learning algorithms for closed-loop BMIs, their validation in in-vivo experiments, and how our results pave the way towards clinically feasible closed-loop BMIs for control of various brain states.

Biography

Yuxiao Yang is a postdoc at the University of Southern California (USC). He received the Ph.D. degree (2019) from USC with Prof. Maryam Shanechi, the M.S. degree (2018) in Electrical Engineering from USC, and the B.S. degree (2013) in Electrical Engineering from Tsinghua University. His research interests include neural engineering, control and estimation theory, and machine learning. He was a winner of the Annual Brain-Computer Interface (BCI) Award (2019) and the EMBC Student Paper Award (2015).