UNIVERSITY of HOUSTON

CULLEN COLLEGE of ENGINEERING

Defense Announcement

Closed-Loop Regulation of Internal Brain States using Wearable Brain Machine Interface Architectures with Real-World Experimental Implementation

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Degree: PhD in Electrical Engineering

Date: Wednesday, December 8th, 2021 Time: 3:00 – 5:00 pm (CT)
Location: Zoom meeting
https://uh-edu-cougarnet.zoom.us/j/97677964969?pwd=TXp2b0xrR1B4Q3ZjcTZnMm5MTmFmUT09
Meeting ID: 976 7796 4969, Passcode: 319014
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Committee chair: Dr. Rose Faghih

Committee members: Dr. Jose Luis Contreras-Vidal
Dr. Joe Francis
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Dr. Marzia Cescon

Abstract

The brain is a control system with a strong impact on all human functions. Inspired by the recent advances in wearable technologies, we design wearable-machine interface (WMI) architectures for controlling brain responses. The WMI architecture encompasses collecting physiological data using wearable devices, inferring neural stimuli underlying pulsatile signals, estimating an unobserved state based on the underlying stimuli, designing the control, and closing the loop. In this thesis, we design WMI architectures for regulating human's cognitive stress state and controlling energy levels in patients with hypercortisolism. With ongoing recent advances in wearable technologies, the proposed research could open avenues of opportunities addressing mental and hormone-related disorders within the remote monitoring properties. Moreover, the proposed architectures are well-aligned on the basis of the physiology and could provide an excellent infrastructure to incorporate medical expertise. Humankind would derive a benefit from the proposed real-time monitoring and regulation toolsets by receiving the personalized effective suggestions and medications with minimized side-effects to enhance their overall quality of life.