

CSDS 500 and ECSE 500 Spring 2021 Colloquium

11:30AM to 12:30PM
Thursday, April 8, 2021

Zoom Webinar ID: 998 2943 6376 / Passcode: 357363

Clinical Translation of Peripheral Nerve Interfaces: From Restoring Movement to the Future of the Human-Technology Relationship

Abstract: Over the past three decades, I have been developing devices to interface with the human peripheral nervous system. The human, as described by Norbert Wiener in 1948, is a complex message processing system. The brain is the message processor that takes external information from the senses, processes that information in the context of its internal state and prior experience, and then outputs a message through the muscles. Neural engineering is the field of developing methods of interacting with and using the human message processing system. There are several potential points of interaction, but broadly speaking, are either in the peripheral nervous system or the central nervous system. The peripheral nervous system is the biological wiring that carries information from the sensor to the brain and from the brain to the muscles. In this seminar, I will discuss the core concepts guiding development of peripheral nerve electrodes, present the most advanced clinically-implemented interfaces, show our experience in producing motor output, and show input through sensory systems. Lastly, I will introduce the Human Fusions Institute (HFi). Since neural interfaces connect to both the input and output of the human message processing system, the HFi is exploring this new revolution in the connection between humans and technology, referred to as NeuroReality(TM). NeuroReality enables human scalability in both spatial existence and functional capability.

Bio

Dustin J. Tyler, Ph.D is the Kent H. Smith Professor II in Biomedical Engineering at Case Western Reserve University in Cleveland, OH and Director of the Human Fusions Institute. He has a secondary appointment as a principal investigator at the Louis-Stokes Cleveland Department of Veterans' Affairs Medical Center (LSCDVAMC) and is the Associate Director of the Advanced Platform for Technology Center, a Department of Veteran's Affairs Rehabilitation Research & Development National Center. Dr. Tyler's expertise and interests include directly connecting humans and technology over neural system to improve human performance and capability. His areas of work include clinical trials of Class III medical devices with emphasis on neural interfaces; acute and chronic pre-clinical studies in small and large mammalian models, and computational neuroscience. His research activity ranges from early technology innovation to clinical implementation of neural interface devices and systems; application of neural interfaces for restoration of natural sensation and control in limb loss; neuromimetic devices and materials; MEMS technology applied to development of advanced neural devices; neuromodulation system development; computational neural modeling; neural prostheses for restoration of lost function in physically intact, but neurologically impaired individuals; and neural prostheses for head and neck applications. He holds Research Career Scientist award from the Veterans Affairs Rehabilitation Research and Development service. He is a member of American Institute for Medical and Biological Engineering (AIMBE). Dr. Tyler has had more than \$30M in funding from the VA, NIH, NSF, and DARPA and more than 25 issued US and international patents and 30 pending patent applications. Prior to his academic research career, Dr. Tyler spent several years in the commercial sector commercializing neural prosthesis for restoration of function in spinal cord injured and stroke patients. He led research and development efforts for neuromodulation of patients with dysphagia, as well as, managing the development of clinical programming software for Class III medical devices. Dr. Tyler received BS in EE from Michigan Technological University in Houghton, Michigan, USA and his PhD in Biomedical Engineering from Case Western Reserve University in Cleveland, Ohio, USA.

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