

JOINT BIOENGINEERING SEMINAR SERIES



“Optogenetic Interrogation of Hemodynamic Signals in Brain”

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Abstract:

The impressive performance of the brain is the result of the dynamics of two interconnected networks; the network of nerve cells and the vascular network. We use state-of-the-art photonic and electrophysiology technologies to study the coupling between these two networks mainly from a system engineering point of view. In our experiments, we stimulate nerve cells via optogenetics as we record the induced activity in the vascular and neural networks by optical coherence tomography, calcium imaging, and electrocorticography. This combination of stimulation and imaging techniques provide unique features which allow us to study the signaling pathways and the dynamics of the neuro-vascular units in unprecedented detail. In the presentation, I will summarize the significance of the problem, the innovative approach we have adapted for this research, and finally our main experimental procedures and some results.

Bio:

Dr. Ramin Pashaie is an associate professor of electrical engineering at University of Wisconsin-Milwaukee. He received his PhD in electrical and systems engineering department at University of Pennsylvania, in December 2007, under supervision of Prof. Nabil Farhat. His thesis was focused on understanding the mechanisms of information processing in complex networks of cortex. After his PhD, he joined Prof. Karl Deisseroth lab as a Postdoctoral Scholar in the bioengineering department at Stanford University. During his Postdoctoral training, he concentrated on technology development for optical modulation of neural activity using the tools of photonics and molecular genetics. In September 2009, he joined the department of electrical engineering at the University of Wisconsin-Milwaukee as a faculty member and the director of the Bio-Inspired Sciences and Technology Laboratory (BIST-LAB) where the research is about optical interrogation of the dynamics of large scale neural networks mostly in the brain cortical regions. In particular, his current research interests include implementation of neuroprosthetic devices and optoelectronic neuroimaging instrumentation for brain machine interface applications. Dr. Pashaie is the recipient of the National Science Foundation Career Award in 2015 and the Brain and Behavior Research Foundation Young Investigator Awards in 2013 and 2015.

