

Seminar Series



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Professor of Biomedical Engineering, Electrical Engineering, and Radiology (Physics)

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174413

Simultaneous EEG-fMRI for inferring brain dynamics

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ABSTRACT

Advances in the instrumentation and signal processing for simultaneously acquired electroencephalography and functional magnetic resonance imaging (EEG-fMRI) have enabled new ways to observe the spatiotemporal neural dynamics of the human brain. Central to the utility of EEG-fMRI neuroimaging systems are the methods for fusing the two data streams, with machine learning playing a key role. In this talk, I will discuss how the fusion of EEG-fMRI can provide new insight into brain dynamics underlying behavior, e.g. decision making. I will also discuss how EEG-fMRI can be used to enable new methods for precise targeting of neurostimulation, both in the context of a tool for cognitive neuroscience as well as for improving the efficacy of therapeutic stimulation.

BIO

Paul Sajda is a professor of biomedical engineering, electrical engineering, and radiology (physics) at Columbia University. He is also a member of Columbia's Data Science Institute and an affiliate of the Zuckerman Institute of Mind, Brain, and Behavior. He received a bachelor of science in electrical engineering from the Massachusetts Institute of Technology in 1989 and a master of science in engineering and a doctorate in bioengineering from the University of Pennsylvania, in 1992 and 1994, respectively. Dr. Sajda is interested in what happens in our brains when we make a rapid decision and, conversely, what processes and representations in our brains drive our underlying preferences and choices, particularly when we are under time pressure. His work in understanding the basic principles of rapid decision-making in the human brain relies on measuring human subject behavior simultaneously with cognitive and physiological state. Important in his approach is his use of machine learning and data analytics to fuse these measurements for predicting behavior and infer brain responses to stimuli. Dr. Sajda applies the basic principles he uncovers to construct real-time brain-computer interfaces that are aimed at improving interactions between humans and machines. He is also applying his methodology to understand how deficits in rapid decision-making may underlie and be diagnostic of many types of psychiatric diseases and mental illnesses. He is a co-founder of several neurotechnology companies and works closely with a range of scientists and engineers, including neuroscientists, psychologists, computer scientists, and clinicians. He is a fellow of the IEEE, AMBIE and AAAS and chair of the IEEE Brain Initiative. He is also a recipient of the Vannevar Bush Faculty Fellowship, which is the U.S Department of Defense's most prestigious single-investigator award.