NEURAL ENGINEERING SEMINAR SERIES

Shaping and Optimizing Learning in Brain-Machine Interfaces

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ABSTRACT: Brain-machine interfaces (BMIs) change how the brain sends and receives information from the environment, opening new ways to treat neurological disorders and study brain function. For instance, motor BMIs directly map neural activity to the movements of an external device to restore movements to paralyzed people. Recent work highlights that motor BMIs do not simply "decode" subjects' intentions—they effectively create a new motor system the brain learns to control. This observation changes the engineering problem for clinical BMIs. Insights into sensorimotor learning and control in BMIs will be critical for improving BMI performance and usability and may also shed light on basic principles of neural computation. In this talk, Dr. Orsborn will first present a study where her team leveraged the unique properties of BMI to probe the roles of feed-forward and feedback sensorimotor control in BMI. The study sheds light on sensorimotor control mechanisms, and, in turn, led to state-of-the-art neural interface performance. She'll then discuss the role of learning in motor BMIs and some new directions developing tools to actively shape or "engineer" brain learning and neural encoding to optimize BMI performance.

BIOGRAPHY: Dr. Amy Orsborn is a Clare Boothe Luce Assistant Professor in Departments of Electrical & Computer Engineering and Bioengineering at the University of Washington. She's also a core staff scientist at the Washington National Primate Research Center. She works at the intersection of engineering and neuroscience to develop neural interfaces to restore motor function. Her lab explores neural interfaces as adaptive closed-loop systems that engage plasticity. She designs engineering approaches that shape neural adaptation to improve system performance and uses neural interfaces as a tool to study brain learning. Among her honors, she received a L'Oreal USA for Women in Science postdoctoral award, the L'Oreal USA Changing the Face of STEM award, a Google Faculty Research Award, an Interdisciplinary Rehabilitation Engineering research fellowship, and a pilot award from the Simons Foundation Collaboration on the Global Brain. She completed her doctorate at the University of California, Berkeley/University of California, San Francisco Joint Graduate Program in Bioengineering and was a postdoctoral researcher at New York University's Center for Neural Science.

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