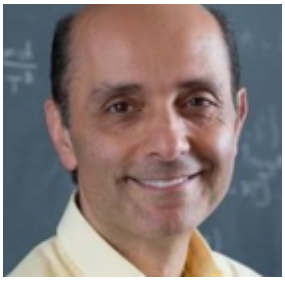
The cerebellum as a supervised learning machine



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LECTURE ABSTRACT

The cerebellum contains more than half of all the neurons in the brain, and is responsible for endowing us with a lifetime of precise, accurate movements. Here I summarize some recent work regarding neural basis of learning in the cerebellum, with emphasis on forming internal models that predict consequences of ongoing motor commands. A principle of design that emerges is one in which small populations of neurons are organized based on a common preference for a specific part of the sensory prediction error space. This anatomy appears to allow the cerebellum to acquire models and protect them despite evidence that runs against their predictions. The result is a computational system that learns quickly, but resists erasure of memories.

SPEAKER BIOSKETCH

Prof. Shadmehr is an Iranian-born, US educated neuroengineer who has studied the question of how the brain learns to control physics of our movements. His work has shown that the cerebellum plays a critical role in transforming sensory prediction errors into corrective motor commands, learning to form internal models of physics. This has led to a new understanding of the neural code that the cells in the cerebellum use to predict and control motion of the body.

Reza received a BS in Electrical Engineering from Gonzaga University, Spokane. He was a Ph.D. student in Robotics with Michael Arbib at USC, where he performed theoretical studies on control of multi-joint limbs. He was a postdoc in the laboratory of Emilio Bizzi at MIT, where he used robots to perform research on human motor control and motor learning. He was appointed Assistant Professor of Biomedical Engineering at Johns Hopkins in 1995, where he has remained his entire career.