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"Stochastic optimal control as a theory of brain-machine interface operation"

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Abstract:

The closed-loop operation of brain-machine interfaces (BMI) provides a framework to study the mechanisms behind neural control through a restricted output channel, with emerging clinical applications to stroke, degenerative disease, and trauma. Despite significant improvements in closed-loop BMI systems, a fundamental, empirically validated theory of closed-loop BMI operation is lacking. Here we propose a compact model based on stochastic optimal control to explain empirical studies of the brain in skillfully operating canonical decoding algorithms. As a practical tool for BMI development, the optimal control model may provide a simple testbed to examine proficient closed-loop performance before more expensive testing with animal and human models.