

Optimal Control with learning on the fly

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Abstract:

Complex engineering solutions often rely on control strategies that can be adapted to changing system parameters with little data and little time available. Motivated by this fundamental problem, we study control problems in which the system's dynamics depend on a parameter that is initially unknown and must be learned over a short time horizon. Our goal is the design of adaptive control strategies that minimize notions of worst-case regret. We present results for two dynamical models: Systems with an unknown drift and systems with unknown feedback. In the first case, we derive an optimal strategy that achieves constant regret. In the second case, we propose a strategy, which is optimal to within a multiplicative constant. Based on joint work with J. Carruth, M. Eggl, C. Fefferman, B. Guillen Pegueroles and C. Rowley.