Simulation Methods and Statistical Learning for Stochastic Storage Problems

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Abstract

We consider solution of stochastic storage problems through Regression Monte Carlo methods. Taking a statistical learning perspective, we develop the dynamic emulation algorithm (DEA) that unifies the different existing approaches in a single modular template. We then investigate the two central aspects of regression architecture and experimental design that constitute DEA. For the regression piece, we discuss various non-parametric approaches, in particular introducing the use of Gaussian process regression in the context of stochastic storage. For simulation design, we compare the performance of traditional design (grid discretization), against space-filling, and several adaptive alternatives. The overall DEA template is illustrated with multiple examples drawing from natural gas storage valuation, and optimal control of back-up generator in a microgrid.

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