Optimization under uncertainties by composing sampling and optimization with Bayesian algorithms.

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Abstract

Optimization problems where the objective and constraint functions take minutes to hours to be evaluated are very common : they occur, for example, when the functions are based on high-fidelity simulations or on real experiments, or in the case of hyper-parameters tuning in machine learning. Bayesian algorithms are methods of choice to optimize such expensive functions because, by putting a Gaussian prior on the functions, many calls to the functions can be saved. The talk will start with an introduction to Bayesian optimization algorithms. In the second part of the talk, the objective and constraint functions will be further affected by uncontrolled random parameters. The optimization criteria become statistical measures such as means or quantiles. We will explain how to simultaneously optimize the controlled variables and sample the uncontrolled parameters with Bayesian, Gaussian, approaches.