Title: Optimizing input data collection for ranking and selection

Abstract: This talk will start by introducing a general challenge in the area of simulation analysis known as input uncertainty problem. When simulation model is calibrated with a finite amount of real-world input data, stochastic simulation output is subject to additional uncertainty caused by the calibration error referred to as input uncertainty. A vehicle content portfolio optimization problem at General Motors will be discussed as a motivating example.

In particular, this talk focuses on a Bayesian ranking and selection (R&S) problem when all solutions share the common estimated input models. In this case, the estimated best solution from the R&S procedure is subject to error due to input uncertainty. Assuming that there are multiple independent input data sources from which data can be collected at a cost to reduce input uncertainty, one can pose a question of how to optimize the data collection strategy to find the true best solution for the real-world problem. We first show that the most probable best (MPB)—the solution with the largest posterior probability of being optimal (posterior preference)—is a strongly consistent estimator for the true optimum. We investigate the optimal asymptotic static sampling ratios from the input data sources that maximize the exponential convergence rate of the MPB's posterior preference. A sequential sampling rule that balances the simulation and input data collection effort is proposed and demonstrated. The algorithm stops with posterior confidence in the solution quality.

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