Multi-objective optimization of an agent-based simulator

Mickaël Binois – Inria Sophia Antipolis Méditerranée

Joint work with Nicholson Collier (Argonne National Laboratory), Mert Edali (University of Chicago) & Jonathan Ozik (Argonne National Laboratory, University of Chicago)

Abstract:
Stochastic computer models present a series of unique challenges compared to their deterministic counterpart. With low signal-to-noise ratios, many runs are necessary to identify quantities of interest, making direct estimation too prohibitive even for moderate evaluation times. In the case of multi-objective optimization, this is exacerbated since we aim at finding the Pareto front, the set of optimal compromise solutions. Relying on Gaussian process emulators adapted to heteroscedastic noise, with parallel computing in mind, we propose an efficient batch sequential design strategy balancing replication and exploration. We showcase the method on an agent-based simulator of the population of Chicago in the context of the COVID-19 pandemic, run at a large scale computing facility.