

Dipartimento di Matematica ed Applicazioni
“R. Caccioppoli”

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**PARALLEL MONTE CARLO-BASED SURROGATE OPTIMIZATION
OF BUILDING ENERGY MODELS**

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Abstract

Surrogate optimization optimizes expensive black-box functions with minimal number of evaluations. The aim is to quickly identify promising regions of the design space, usually without time constraints on selecting the next evaluation point. With EnergyPlus now supporting multi-threading, multiple building energy simulations can run in parallel. We present a simple method for parallel surrogate optimization of building energy models using XGBoost, which handles real, integer, and categorical variables. The approach uses Monte Carlo optimization to approximate a Pareto front between predicted performance and uncertainty. Candidates are grouped by uncertainty, and sampling combines top predictions, Pareto samples, and most uncertain points. We demonstrate the method on synthetic functions and a Kuwaiti villa model, showing better performance than popular surrogate and genetic optimization techniques.