Resource Aware Active Learning for Multifidelity Optimization

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Part of MS300 Active Learning and Information Fusion for Reliable Predictions - Part I of II
Resource Aware Active Learning for Multifidelity Optimization

Abstract. In traditional methods for black-box optimization, a considerable number of objective function evaluations are required, which can be time consuming and often unfeasible for many engineering applications with expensive models to evaluate. Bayesian Optimization methods can improve the efficiency of the optimization procedure by actively learning a surrogate model of the objective function which exhausts and synthesizes the available information along the search path to lower the amount of required expensive function evaluations. Efficiency can be further improved in a multifidelity setting, where cheaper but potentially biased approximations to the function that can be used to assist the search of optimal points. In this talk we investigate further computational benefits offered by the availability of parallel/distributed computing architectures, whose optimal usage is an open opportunity within the context of active learning. We introduce the Resource Aware Active Learning (RAAL) algorithm, a multifidelity Bayesian scheme that exploits at each optimization step the current surrogate model together with the parallel/distributed computational budget, and computes the set of best sample locations and associated fidelity sources to evaluate in order to maximize the information gain on the objective function. The scheme is demonstrated for a variety of single and multifidelity benchmark problems, and the results show a major speedup of the optimization task.

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