Extension of the Pareto Active Learning method to multi-objective optimization for stochastic simulators

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Abstract:

We address the problem of optimizing an expensive-to-evaluate stochastic simulator with multiple outputs. The goal is to estimate Pareto-optimal solutions within a limited budget of evaluations. Pareto Active Learning (PAL), proposed by Zuluaga et al. (Proc. 30th Int. Conf. on Machine Learning, PMLR 28(1):462-470, 2013), is presented as an algorithm for this task. However, it appears that significant limitations arise with this algorithm when using stochastic simulators. For instance, the original algorithm assumes that the variance of the output at one point is zero once there is an observation at this point. In this talk, we propose an extension of the original algorithm to deal with stochastic simulators whose outputs may have high variance. The proposed approach is assessed on a set of test problems and compared to other techniques: a random exploration of the search space and a scalarization-based optimization algorithm adapted from ParEGO. Results show a good performance of the new algorithm in the majority of the test cases.