Supplementary Materials: Re-Examining Supervised Dimension Reduction for High-Dimensional Bayesian Optimization (PPSN 2024)

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A Runtime Performance

In this section, we compare our methods (KDR-BO, MKDR-BO) to the selected methods on three 50-dimensional synthetic functions (Ackley, Levy, and Griewank) as a function of the runtime performance.

The computational cost of BO methods is typically related to fitting a surrogate model and optimizing the acquisition function. In addition, embedding-based methods take extra time to get the embedding and its inverse. Specifically, MKDR-BO is drastically slower than the rest of the BO methods, because it constructs an extremely time-consuming inverse mapping by fitting a batch of GPs.

As seen in Fig. 1, even though KDR-BO is a little slow, it still outperforms other embedding methods in most cases, and gets the best runtime performance of all methods on the 50-dimensional Levy function. TuRBO gets the best runtime performance of all methods on the 50-dimensional Ackley function. Add-GP-UCB gets the best runtime performance of all methods on the 50-dimensional Griewank function.

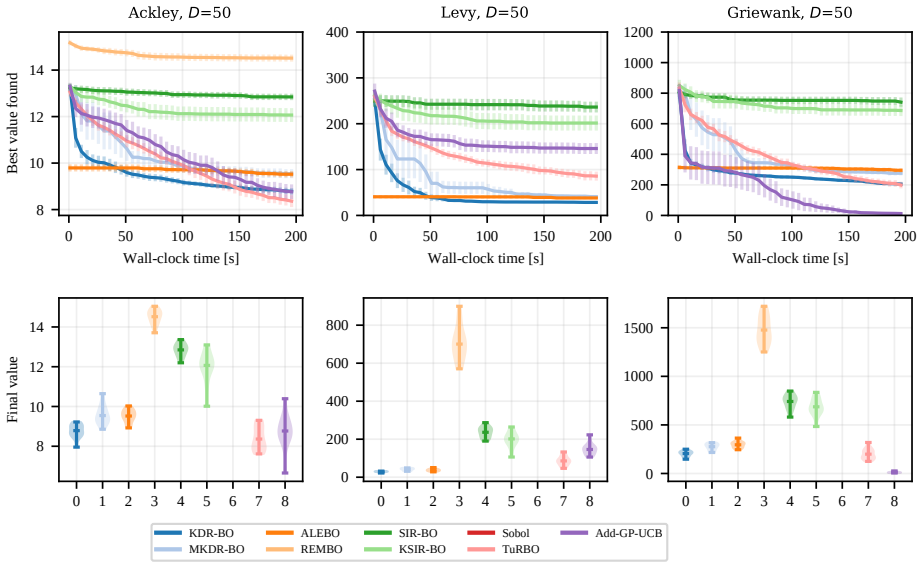

Fig. 1. Comparison between the high-dimensional BO methods on three 50-dimensional functions as a function of the wall-clock time [s], showing (Top row) optimal values by each iteration averaged over 20 repeated runs, and (Bottom row) the distribution over the final optimal values over 20 repeated runs.