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Bayesian Optimization with Neural Network Prior Mean Models

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Bayesian optimization using Gaussian processes is a powerful tool to automate complex and time-consuming accelerator tuning tasks and has been demonstrated to outperform conventional methods at several facilities. In high-dimensional input spaces, however, even this sample efficient search may take a prohibitively large number of steps to reach convergence. In this contribution, we discuss the use of neural networks as a prior mean to inform the surrogate GP model and thereby speed-up convergence. We present collaborative results obtained in simulations and experiments at the Linac Coherent Light Source (LCLS) and the Argonne Tandem Linear Accelerator System (ATLAS). We show that high quality models can significantly improve optimization performance and discuss further measures to recover performance in cases where only models of limited accuracy are available.

Primary Keyword

bayesian optimization

Secondary Keyword

Tertiary Keyword

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