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Bayesian Optimization for SASE Tuning at the European XFEL

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Parameter tuning is a regular task and takes considerable time for daily operations at FEL facilities. In this contribution, we demonstrate SASE pulse energy optimization at the European XFEL with Bayesian optimization (BO) as an alternative approach to the widely used simplex method. Preliminary experimental results show that BO could reach a comparable performance as the simplex method, even with an out-of-the-box implementation. Compared to previous attempts, our version of BO does not require setting hyperparameters via additional measurements, thus effectively reducing the required effort for machine operators to use it during operation. On the other hand, BO has the potential to be further improved by introducing prior physical knowledge about the task and fine-tuning the algorithm to specific tasks. This makes BO a promising candidate for routine tuning tasks at particle accelerators in the future.

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Footnotes

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