

LSM-Seminar

Wednesday February 13, 2019, 14:00-15:30, OSGA/EG06

Robust Bayesian Optimization for SwissFEL

MSc thesis defense

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Abstract: The task of this thesis is to develop a robust Bayesian optimization algorithm capable of optimizing the beam energy of the Swiss free electron laser (SwissFEL) while keeping possibly multiple losses below a given threshold. In this thesis we introduce the Line-UCB algorithm. The Line-UCB is a novel Bayesian optimization algorithm capable of tuning up to 40 parameters simultaneously. We analyze the Line-UCB algorithm theoretically for a simple class of functions, evaluate and compare its performance in a synthetic environment to other state-of-the-art methods and test it on the SwissFEL. We show that the Line-UCB algorithm outperforms other state-of-the-art methods currently in use at other FEL facilities and performs better than the Gaussian process upper-confidence bound (GP-UCB) algorithm for high dimensions. We also make the preprocessing of the data more robust by adding an outlier detection and introduce the Parameter-Scan, an algorithm to determine some of the hyperparameters of the Line-UCB algorithm.