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Bayesian optimization of a laser-plasma accelerator

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Plasma based accelerators, conceptual or experimental, are characterised by high dimensional non-linearly coupled parameter spaces. Further, the cost of probing each set of parameters, i.e. a plasma simulation or a measurement, is typically high. This makes simple exploration approaches like multidimensional scans unpractical and calls for more advanced strategies to optimise parameters.

Here we discuss recent work of using Bayesian optimisation for the conceptual design and operation of experiments at the LUX laser plasma accelerator at DESY. Using a machine learning based optimiser we are able to exploit operation regimes of the accelerator with improved beam quality and stability.

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