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Comparing gradient-based and non-gradient modelling and optimisation methods for investigating synchrotron dynamics

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Differentiable modelling has garnered significant interest in the accelerator physics community, but literature is lacking on its specific application to synchrotron dynamics. In principle, access to the gradients should reduce the number of trials required in an optimisation loop. As a 'real test case', we want to optimise the best set of beam perturbations to achieve the goals of 'Pulse Picking By Resonant Excitation' – a mode of operation that caters to timing-mode users. By comparing the application of gradient-descent methods, using gradients computed from JAX, to gradient-free methods, I discuss the applicability of each approach.

Primary Keyword

differentiable models

Secondary Keyword

bayesian optimization

Tertiary Keyword

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