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Machine Learning-Based Virtual Diagnostic

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Existing beam diagnostics are invasive, and oftentimes cannot operate at the required resolution. In this work we present a Machine learning-based Virtual Diagnostic (VD) tool to accurately predict the Longitudinal phase space (LPS) for every shot using spectral information collected non-destructively from the radiation of a relativistic electron beam. VD is a computational tool based on deep learning that can be used to predict a diagnostic output. VDs are especially useful in systems where measuring the output is invasive, limited, costly or runs the risk of altering the output. We show a few applications (experimental or simulated data) for high repetition-rate machine (LCLS-II) or a high-current, ultra-short bunch facility (FACET-II). Then, given a prediction, we relay how reliable that prediction is, i.e., quantify the uncertainty of the prediction. Finally, we show how VD can be used for machine optimization as aberration corrector tuning with ML-based emittance measurements.

I have read and accept the Privacy Policy Statement

Yes

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