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## Hybrid beamline element ML-training for surrogates in the impactX beam-dynamics code

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The modeling of current and next-generation particle accelerators is a complex endeavour, ranging from the simulation-guided exploration of advanced lattice elements, over design, to commissioning and operations. This paper explores hybrid beamline modeling, towards coupling s-based particle-in-cell beam dynamics with machine-learning (ML) surrogate models.

As a first example, we train a surrogate model of an advanced accelerator element, a laser-wakefield accelerator stage, via the time-based particle-in-cell code WarpX [1].

A second example trains a model for the IOTA nonlinear lens via the s-based code ImpactX [2].

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### Footnotes

- L. Fedeli et al., SC22, 978-1-6654-5444-5, pp. 25-36 (2022) \*\* A. Huebl et al., NAPAC22, arXiv:2208.02382 (2022)

### I have read and accept the Privacy Policy Statement

Yes

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