

# AI/ML Coupling & Surrogates in BLAST Accelerator Modeling Codes

by Axel Huebl, Ryan T Sandberg, Remi Lehe, Chad E Mitchell, Marco Garten, Ji Qiang, Jean-Luc Vay (LBNL)

## Modeling of accelerator elements



Simulation time: full geometry, full physics

hrs      sec      hrs      hrs      min

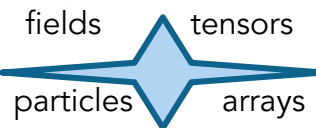
ML boosted: in seconds a specific problem



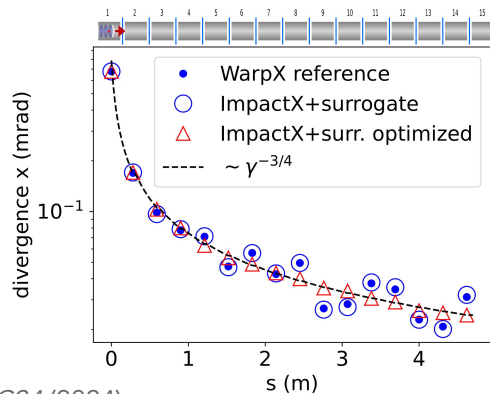
- start-to-end collider design
- digital twins & 'real-time' feedback



PyTorch



Numba



CuPy



A Huebl et al., NAPAC22, DOI:10.18429/JACoW-NAPAC2022-TUYE2 (2022)

RT Sandberg et al and A Huebl, IPAC23, DOI:10.18429/JACoW-IPAC-23-WEPA101 (2023)

A Huebl et al., AAC22, arXiv:2303.12873 (2023); RT Sandberg et al. and A Huebl, accepted to PASC24 (2024)