Contribution ID: **230** Contribution code: **TUP230-WEB** Type: **Poster Presentation**

Machine Learning Surrogates for 2D CSR Simulations

Tuesday 20 August 2024 20:40 (20 minutes)

Coherent synchrotron radiation (CSR) has been an important consideration for design of bunch compressors and other beam manipulating sections in FEL linacs. There has been increasing interest and need to move from the most common 1D CSR models to consider 2D and even 3D CSR modeling. However, these simulations are very slow and computationally intensive. Machine learning models are capable of learning to represent complicated, nonlinear systems; however, ML models often struggle to generalize well outside of their training data. In this work we explore the use of ML models to serve as quickly evaluating surrogates for expensive 2D CSR simulations. The issue of model generalization is addressed through the use of regularization terms in training and the addition of 1D CSR calculations into the ML model. Benchmarking of the ML model is shown for several bunch compression chicanes.

Footnotes

Funding Agency

This work is supported by the Office of Science, Office of High Energy Physics, under award number DE-SC0024245

Primary author: HALL, Christopher (RadiaSoft LLC)

Co-authors: EDELEN, Auralee (SLAC National Accelerator Laboratory); EDELEN, Jonathan (RadiaSoft LLC); CAMACHO, Obed (Particle Beam Physics Lab (PBPL)); ROBLES, River (Stanford University)

Presenter: HALL, Christopher (RadiaSoft LLC)

Session Classification: Poster session

Track Classification: Electron beam dynamics