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## Beam condition diagnostics and forecasting with non-destructive measurements at FACET-II

*Monday, 20 May 2024 16:00 (2 hours)*

Beam diagnostic technology is one of the foundations of large particle accelerator facilities. A challenge with operating these systems is the measurement of beam dynamics. Many methods such as beam position monitors have an inherent destructive quality to the beam and produce perturbations after the measurement. The ability to measure the beam conditions with non-destructive edge radiation allows for us to have a more stable understanding and predictability of the beam condition. We are developing a machine learning workflow for the downstream prediction and future forecasting of the beam condition utilizing the non-destructive edge radiation measurements and novel graph neural networks in collaboration with FACET-II at SLAC. We are developing machine learning algorithms with the beam physics integrated within each layer of the network. Additionally, we are developing an online surrogate model of edge radiation using SRW to allow for automatic generation of new beam states due to the changing parameters of accelerator facilities over time. We plan to integrate and test our prediction system at the SLAC facility to perform beam condition prediction and verification at FACET-II.

### Footnotes

### Funding Agency

DOE

### Paper preparation format

LaTeX

### Region represented

North America

**Primary author:** KILPATRICK, Matthew (RadiaSoft LLC)

**Co-authors:** O'SHEA, Brendan (SLAC National Accelerator Laboratory); MOELLER, Paul (RadiaSoft LLC); WATT, Robbie (SLAC National Accelerator Laboratory)

**Presenter:** WATT, Robbie (SLAC National Accelerator Laboratory)

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