Contribution ID: **58** Type: **Talk**

Phase Space Reconstruction of Beams Using Machine Learning Based Representations

Thursday, 15 September 2022 09:25 (20 minutes)

Characterizing the phase space distribution of particle beams in accelerators is often a central part of accelerator operation and optimization. However, with the introduction of more exotic target distributions that are ideal for current accelerator applications conventional diagnostic techniques, which assume simplified beam distributions, start to become inaccurate. By contrast, methods that enable high-fidelity phase space distribution reconstructions require specialized procedures or diagnostics that may not be efficient or available for most accelerator facilities. In this Letter, we introduce a machine learning based technique to reconstruct 6D phase space distributions from common accelerator diagnostics. We first demonstrate that our algorithm reconstructs exotic phase space distributions with corresponding confidence intervals in simulation. We then demonstrate the technique in experimental conditions, improving upon results obtained from conventional diagnostic methods. Finally, we discuss how this technique is widely applicable to almost any accelerator diagnostic, enabling simplified 6D phase space reconstruction diagnostics in the future.

Primary authors: EDELEN, Auralee; Dr MAYES, Christopher; RATNER, Daniel (SLAC); GONZALEZ-AGUILERA, Juan Pablo (University of Chicago); ROUSSEL, Ryan

Presenter: ROUSSEL, Ryan

Session Classification: Applications in Particle Physics

Track Classification: Particle Physics