Contribution ID: **346** Type: **Poster**

Real-Time Beam Control Utilizing In-Situ FPGA-Based Neural Network

Rhea Space Activity (RSA) proposes to develop a real-time beam control with an in-situ FPGA-based neutral net. RSA plans to develop a collection of machine learning (ML) algorithms designed to learn the global features of large parameter spaces with the agility of adaptive feedback methods that are model-independent and can automatically adapt to changing and potential anomalies. This adaptive ML approach will utilize artificial neural networks (ANNs) that can be tuned online to monitor and modify the complex dynamics of neutrino factory accelerator beams. The beam monitoring and control algorithms will be implemented within a high-speed Field-Programmable Gate Array (FPGA) to perform millions of iterative updates within a fraction of a second, providing real-time diagnostics that make predictions between pulses at facilities with beam repetition rates of 0.7-1.2 sec and 10 μs pulse duration. Our goal will be to operate on non-destructive measurements, but to output synthetic time-dependent images of particle bunches typically produced by destructive means. Our plan is to develop a model-independent approach that can be tailored to any accelerator facility, including small scale accelerators used by the medical and military industries, with an initial development plan that is tailored to improve the performance of LBNF at FNAL.

Working group

WG3

Primary authors: LANCE, Cameo (Rhea Space Activity); USMAN, Shawn; ROSENZWEIG, Suzanne (University of Florida (US))

Presenter: ROSENZWEIG, Suzanne (University of Florida (US))

Session Classification: Poster session NB: do not use Safari; use Firefox, Chrome or Edge