APS Scientific Computation Seminar Series

Speaker: Sara Miskovich
Machine Learning Research Associate
SLAC National Accelerator Laboratory

Title: Online Bayesian Optimization for the SECAR Recoil Mass Separator

Date: Monday, August 23, 2021

Time: 1:00 p.m. (Central Time)

Location: https://bluejeans.com/676026417/3600

Hosts: Mathew Cherukara and Nicholas Schwarz

Abstract:

The SEparator for CApture Reactions (SECAR) is a next-generation recoil separator system under commissioning at the National Superconducting Cyclotron Laboratory (NSCL) and Facility for Rare Isotope Beams (FRIB) at Michigan State University. SECAR is optimized for the direct measurement of capture reactions on unstable nuclei that drive some stars to explode and synthesize crucial nuclei that make up our universe. Once SECAR is operational, these precise measurements will improve our understanding of astrophysical processes such as X-ray bursts, novae and supernovae. To maximize the performance of the device, careful beam alignment to the central ion optical axis needs to be achieved, which can be difficult to attain through manual tuning in a quantitative and reproducible way. Additionally, the ion optical settings need to be verified and optimized to ensure adequate mass separation. In this talk, the first development of an online Bayesian optimization with a Gaussian process model to tune a nuclear astrophysics recoil separator and improve its ion optical properties is reported. The method is shown to improve recoil separator performance, increase objectivity and reproducibility, and reduce setup and tuning time significantly. It is now used routinely for all separator tuning.