Contribution ID: **162** Type: **Poster**

Exploring new directions in enhancing the ACTS parameter optimization suite

Particle tracking is among the most sophisticated and complex parts of the full event reconstruction chain. Various reconstruction algorithms work in sequence to build trajectories from detector hits. Each of these algorithms requires numerous configuration parameters that need fine-tuning to properly account for the detector/experimental setup, the available CPU budget, and the desired physics performance. To automate and optimize the tuning of these parameters, automatic parameter optimization techniques were implemented in "A Common Tracking Software"(ACTS) framework, the open-source track reconstruction software framework. These techniques allow users to flexibly choose tunable parameters and define a cost/benefit function for optimizing the full reconstruction chain. Since their implementation, these techniques have been greatly beneficial for researchers across various experiments.
The current study discusses ongoing advancements in these optimization techniques, including novel approaches that enable a more systematic and gradual refinement of parameter tuning. Specifically, I will explore the integration of Bayesian Optimization techniques for tracking algorithm tuning, highlighting their potential to improve efficiency and precision beyond existing methods.

Significance

This presentation highlights novel developments in the automation and optimization of particle tracking algorithms within the ACTS framework. While the initial implementation of automatic parameter optimization in ACTS already demonstrated significant utility, this work goes beyond a status update by presenting new algorithmic strategies and methodological enhancements. These advancements represent a clear incremental yet impactful step in making tracking optimization more robust, flexible, and accessible across diverse experimental setups.

References

Experiment context, if any

ACTS, ATLAS, CMS

Author: GARG, Rocky Bala (Stanford University (US))

Presenter: GARG, Rocky Bala (Stanford University (US))

Session Classification: Poster session with coffee break

Track Classification: Track 2: Data Analysis - Algorithms and Tools