

Intelligent experiments through real-time AI: Fast Data Processing and Autonomous Detector Control for sPHENIX and future EIC detectors

Friday 19 July 2024 11:19 (17 minutes)

This R&D project, initiated by the DOE Nuclear Physics AI-Machine Learning initiative in 2022, leverages AI to address data processing challenges in high-energy nuclear experiments (RHIC, LHC, and future EIC). Our focus is on developing a demonstrator for real-time processing of high-rate data streams from sPHENIX experiment tracking detectors. Integrating streaming readout and intelligent control with FPGA, the approach efficiently identifies rare heavy flavor events in high-rate p+p collisions (3MHz) within limited DAQ bandwidth (15kHz), using GNN and hls4ml. Success at sPHENIX promises immediate benefits, minimizing resources and accelerating the heavy-flavor measurements. The approach is transferable to other fields. For the EIC, we develop a DIS-electron tagger using AI-ML algorithms for real-time identification, showcasing the transformative potential of AI and FPGA technologies in high-energy nuclear and particle experiments real-time data processing pipelines.

Alternate track

1. Detectors for Future Facilities, R&D, Novel Techniques

I read the instructions above

Yes

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Session Classification: Computing and Data handling

Track Classification: 14. Computing, AI and Data Handling