Contribution ID: **41**   Type: **not specified**

Machine Learning for the pfRICH Particle Identification subsystem

Tuesday 28 October 2025 11:35 (15 minutes)

We present an overview of the proximity-focusing Ring Imaging Cherenkov (pfRICH) detector developed for the ePIC experiment at the Electron-Ion Collider (EIC). Designed for the backward pseudorapidity region (−3.5 ⊠ η ⊠ −1.5), the pfRICH enables at least 3σ separation of pions, kaons, and protons up to 7 GeV/c, which is crucial for Semi-Inclusive Deep Inelastic Scattering (SIDIS) studies. In this talk, we explore the use of AI/ML techniques for pattern recognition of Cherenkov photon rings on photosensors in order to improve the PID capabilities of the pfRICH as a function of particle momentum. We use data from simulations of optical photon transport in Geant4, accelerated with NVIDIA OptiX and GDML-based detector geometries.

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Session Classification: AI/ML for ePIC and Beyond