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sPHENIX Heavy Flavor Jet Studies with Machine Learning Algorithm in p+p Collisions

Heavy-flavor jets produced in high-energy collisions are a unique probe to test the pertubative quantum chromodynamics (pQCD), and are one of the major science portfolios for the new sPHENIX experiment. Searching for charm and bottom jets is one of most challenging measurements in collider experiments due to their rare production rate and extensive backgrounds. The sPHENIX experiment has collected 13.3 pb^{-1} of triggered full-system (i.e, tracking+calorimeter) data with 1.5˜mrad crossing angle and $|z_{vertex}| < 10$ cm in 200 GeV $p + p$ collisions of Run˜2024. We will present the heavy flavor jet studies using both the traditional selection methods and new Machine Learning (ML) algorithms in sPHENIX 200 GeV $p+p$ simulation. A Graph Neural Network (GNN) is used to tag the jet flavor, and is expected to significantly enhance the jet identification performance especially for bottom and charm jets. We will also discuss the ongoing studies of sPHENIX Run˜2024 data quality assurance (QA) and calibration such as tracking qualities related with the heavy flavor jet measurements.

Category

Experiment

Collaboration (if applicable)

sPHENIX

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