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Distortions in the sPHENIX TPC using Digital Current with Machine Learning

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The Time Projection Chamber (TPC) to be used for tracking and particle identification in the sPHENIX experiment at the Relativistic Heavy Ion Collider (RHIC) is expected to experience significant distortions from build-up of backflowing ions created by the combination of high collision rates and amplification from Gas Electron Multiplier (GEM). By integrating the digitized readout from the detector, one produces a 'digital current' which serves as a proxy for the ion backflow current. The digital current can then be used to reconstruct the ion space charge density to calculate the electric and magnetic field distortions in the chamber, but at significant computational cost. Machine learning methods provide a mechanism to reduce this computational cost while also reducing errors by training and validating with experimental data. We will present methods and results using machine learning techniques to predict and correct for space-charge induced distortions in the sPHENIX TPC.

Category

Experiment

Collaboration (if applicable)

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