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Clustering hits of Time Projection Chamber by using machine learning and neural networks at sPHENIX

Tuesday 5 September 2023 17:30 (2h 10m)

The Time Projection Chamber (TPC) at sPHENIX provides particle tracking over pseudorapidity $|\eta| < 1.1$, and plays a key role in the planned jet and heavy-flavor measurements. The electrons created through ionization of the TPC gas by charged particles produce hits on the TPC readout plane, from which clusters for track reconstruction need to be formed. The traditional method of grouping connected hits into clusters, known as connected component analysis (CCA), becomes less effective in high-multiplicity events, such as Au+Au collisions with event pileup from multiple beam crossings, due to effects from δ-electrons and the high occupancy. A neural network (NN) clustering method, which uses an NN to predict the cluster position based on the distribution of hits, is supposed to improve the clustering performance. We simulate high-multiplicity events and the sPHENIX detector response and train the NN to predict the associated truth cluster position based on the distribution of the reconstructed hits. We will show the implementation of NN clustering at sPHENIX and our plans to enhance its performance by improving truth-information association and fine-tuning the parameters of the NN.

Category

Experiment

Collaboration (if applicable)

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