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Automated proton track identification in MicroBooNE using gradient boosted decision trees

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MicroBooNE is a liquid argon time projection chamber (LArTPC) neutrino experiment that is currently running in the Booster Neutrino Beam at Fermilab. LArTPC technology allows for high-resolution, three-dimensional representations of neutrino interactions. A wide variety of software tools for automated reconstruction and selection of particle tracks in LArTPCs are actively being developed. Short, isolated proton tracks, the signal for low-momentum-transfer neutral current (NC) elastic events, are easily hidden in a large cosmic background. Detecting these low-energy tracks will allow us to probe interesting regions of the proton's spin structure. An effective method for selecting NC elastic events is to combine a highly efficient track reconstruction algorithm to find all candidate tracks with highly accurate particle identification using a machine learning algorithm. We present our work on particle track classification using gradient tree boosting software (XGBoost) and the performance on simulated neutrino data.

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Session Classification: Computing, Analysis Tools, and Data Handling

Track Classification: Computing, Analysis Tools and Data Handling