Data-driven track reconstruction performance studies in MicroBooNE

Pavel Zhelnin representing the MicroBooNE collaboration

1Rutgers University-New Brunswick, plz9@scarletmail.rutgers.edu

**MicroBooNE**

**CHARACTERISTICS**
- Liquid argon time projection chamber (LArTPC) experiment
- Situated on Fermilab Booster Neutrino Beam (BNB) beamline
- 170 tons with 89 tons of active mass

**PRIMARY GOALS**
- Investigate low energy excess observed by MiniBooNE [2]
- Precision neutrino-argon cross section measurements
- LArTPC technology development

**MCS Momentum Reconstruction**
- Muon momentum is reconstructed using two methods: range (track length) and MCS (based on Multiple Coulomb Scattering [3])
- MCS and range are compared for 'pseudo-exiting' tracks — a set of fully-contained tracks with 10 cm removed from the end
- Fractional bias quantifies the overprediction or underprediction of the MCS momentum reconstruction
- Fractional resolution is the spread in MCS momenta relative to the range-based measurement

**Track Vertex Resolution**
- Vertex resolution measurement method: four-track events are taken and split into two sets
- Each set is independently fit and the resolution of a two-track vertex is extracted by comparing the positions from these two split vertices

**EVENT SELECTION**
- Applied a muon neutrino CC inclusive selection to produce a sample of neutrino-induced muon tracks
- Optimized for high purity, requiring high consistency with neutrino-like topology and high-quality tracks

**References**
1. [https://microboone.fnal.gov/microboone-physics/](https://microboone.fnal.gov/microboone-physics/)
4. MICROBOONE-NOTE-1049-PUB (https://microboone.fnal.gov/public-notes/)