Contribution ID: **237** Type: **Poster**

Neutral Pion Production on CH at $< E_\nu > \sim 6$ GeV.

Quasi-elastic scattering is generally used to measure oscillation due to being the channel where final state interactions and energy reconstruction are best understood. However, the most important background comes from the pion resonances, in which the pion might not be observed due to final state interactions. This is particularly true for CC neutral pion production from the Delta resonance. In this work we study a sample of charged current (π^0) production in the scattering channel $\nu_\mu + CH \longrightarrow \mu^- + \pi^0 + X(nucleons)$ on a hydrocarbon target using the medium energy NuMI beam (peak energy of ~ 6 GeV). We encounter the scenario where neutral pions are misidentified. Event when improvements in traditional methods were introduced, these were not efficient enough to distinguish between charged pions and neutral pions. To overcome this issue we determined to use a machine learning (ML) approach via semantic segmentation method. This is the process of partitioning a digital image into multiple segments, linking each pixel in an image to a class label (particles). We present here traditional reconstruction techniques employed for neutral pion and a comparison with ML for the final selection.

Mini-abstract

Pion FS interactions of $\nu_\mu + CH \longrightarrow \mu^- + \pi^0 + X(nucleons)$ in MINERvA

Experiment/Collaboration

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Session Classification: Poster Session 1