Contribution ID: **145** Type: **Parallel talk**

Enhancing Supernova Neutrino Detection in DUNE: Optimizing Pandora Reconstruction and Energy Estimation

Wednesday 9 April 2025 12:15 (15 minutes)

The Deep Underground Neutrino Experiment (DUNE) will allow for the detection of low-energy neutrinos from core-collapse supernovae, providing critical insights into core-collapse supernova processes such as neutronization and accretion. However, reconstructing these interactions in liquid argon time projection chambers (LArTPCs) presents significant challenges due to the low-energy depositions, and background contamination from radiological sources. To address these challenges, the Pandora multi-algorithm reconstruction software is being optimized for the efficient reconstruction of \nu_e CC interactions at the tens of MeV energy scale. These interactions differ substantially from those expected from other neutrino sources at DUNE, such as those from the LBNF beam. Accurate energy reconstruction is then essential for determining the neutrino energy spectrum and constraining supernova neutrino emission models. This work explores novel techniques that integrate deep learning with traditional reconstruction algorithms to improve the neutrino reconstruction efficiency and energy resolution. It will then assess the impact of systematic uncertainties.

Author: OSBISTON, Matthew James (University of Warwick (GB))

Presenter: OSBISTON, Matthew James (University of Warwick (GB))

Session Classification: Detectors and Instrumentation

Track Classification: Detectors and Instrumentation