ID contributo: **48** Tipo: **Poster**

Machine Learning Approaches to Particle Identification in the DUNE Far Detector

martedì 18 giugno 2024 17:30 (2 ore)

One of the primary oscillation physics goals of the Deep Underground Neutrino Experiment (DUNE) far detector (FD) is the measurement of CP violation in the neutrino sector. To achieve this, DUNE plans to employ large-scale liquid-argon time-projection chamber technology to capture neutrino interactions in unprecedented detail. Such fine-grain images demand a highly sophisticated automated reconstruction software such as Pandora to unlock the potential for a highly efficient and pure selection of charge-current (CC) muon/electron neutrino interactions. This poster presents the Pandora-based CC muon/electron neutrino interaction selection and explores its employed particle-identification methods, which range from simple boosted-decision trees to more complex deep learning approaches. This work illustrates the reconstruction-to-analysis continuum, via which specific Pandora reconstruction improvements are motivated and targeted, moving DUNE ever closer to uncovering the mysteries of neutrinos.

Poster prize

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Classifica Sessioni: Poster session and reception 1

Classificazione della track: Neutrino oscillations