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Proton/Deuteron Separation at the LArIAT Experiment

Thursday 30 October 2025 10:50 (15 minutes)

We present a study of proton–deuteron separation in the Liquid Argon In A Testbeam (LArIAT) experiment at Fermilab. LArIAT, which operated from 2015–2017, was designed to study and characterise charged particles in liquid argon that commonly occur in neutrino–Ar interaction final-states. Deuterons are rare and subject to significant background contamination in the LArIAT dataset, and their short, highly ionising tracks can closely resemble those of stopping protons, making them difficult to distinguish. Yet, this separation is crucial in reconstructing neutrino events accurately. Here, we present techniques, machine learning and otherwise, to separate proton and deuteron tracks and discuss their performance and limitations.

Presenter: SULTAN, Mohammed

Session Classification: Innovative PID Approaches