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AI/ML at DUNE

Wednesday 29 October 2025 09:00 (25 minutes)

The Deep Underground Neutrino Experiment (DUNE) is the flagship next-generation neutrino experiment in the United States, designed to decisively measure neutrino CP violation and determine the neutrino mass hierarchy. DUNE employs Liquid Argon Time Projection Chamber (LArTPC) technology, which provides exceptional spatial resolution and enables detailed reconstruction of final-state particles and neutrino interactions. However, this high granularity demands advanced and cutting edge reconstruction techniques to unlock its full potential.

Artificial intelligence and machine learning (AI/ML) techniques—such as convolutional neural networks, graph neural networks, and transformers—are being actively developed within DUNE and have already demonstrated strong performance in signal processing, kinematic reconstruction, clustering, and interaction/particle identification. Beyond reconstruction, AI/ML methods are playing an increasingly important role in simulation, trigger and DAQ data processing, beam design and monitoring, documentation search, and quality assurance/quality control (QA/QC). In parallel, DUNE has been developing dedicated AI/ML infrastructures to support these efforts.

In this talk, I will review the progress of AI/ML approaches and the supporting facilities within DUNE.

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Session Classification: Experiments - DUNE