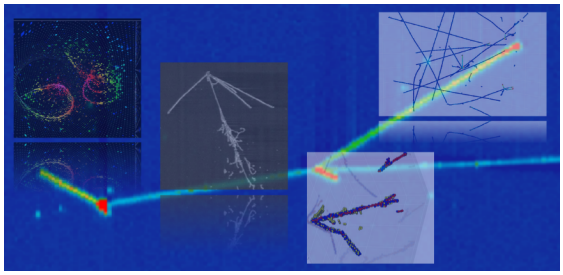

Contribution ID: **10** Type: **Individual Talk**

Translating Near to Far Detector with Deep Learning for DUNE-PRISM

Wednesday, 23 August 2023 15:05 (25 minutes)

The Deep Underground Neutrino Experiment (DUNE) is a next-generation long-baseline neutrino oscillation experiment that aims to measure CP-violation in the neutrino sector as part of a wider physics programme. DUNE consists of a near and far detector in a high power wide band neutrino beam. The Precision Reaction Independent Spectrum Measurement (PRISM) refers to the capacity of part of the DUNE near detector to move off-axis from the beam to sample different neutrino energy spectra. Due to the wide range of off-axis positions, the set of fluxes can be treated as a linearly independent basis and combined to approximate any target flux. This is used to extract oscillation parameters with little dependence on an interaction model by producing a prediction of the oscillated spectrum at the far detector using near detector measurements. An important part of this extrapolation is to correct for the differences in resolution and efficiency of the detectors with minimal reliance on Monte Carlo. This work presents a deep learning approach to accomplish this by predicting the far detector response given a near detector neutrino event. The problem is posed as an image-to-image translation between two domains defined by the distinct types of detector technology. The capacity for the model to accurately predict far detector reconstructed variables is demonstrated and the network is integrated in the simulation chain to conduct an initial study of its performance over Monte Carlo based smearing.

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