Contribution ID: **44** Type: **Plenary**

Data Reconstruction Using Deep Neural Networks for Particle Imaging Neutrino Detectors

Wednesday 22 April 2020 19:20 (25 minutes)

A Liquid Argon Time Projection Chamber (LArTPC) is type of particle imaging detectors that can record an image of charged particle trajectories with high (˜mm/pixel) spatial resolution and calorimetric information. In the intensity frontier of high energy physics, LArTPC is a detector technology of choice for number of experiments including Short Baseline Neutrino program and Deep Underground Neutrino Experiment for high precision neutrino oscillation measurements to answer fundamental questions of the universe. However, the analysis of detailed particle images can be difficult, and high quality data reconstruction chain for a large scale (over 100 tonne) LArTPC detector remains challenging. The research team at SLAC leads the R&D of Machine Learning (ML) based full data reconstruction chain for LArTPC detectors. Our chain is a multi-task network cascade that performs pixel feature extraction (semantic segmentation using Sparse U-Net with ResNet modules), particle start/end point prediction (Point Proposal Network), pixel clustering for particle instance identification (custom convolution and instance attention layers), and particle flow analysis using Graph Neural Networks (GNNs). The result of the chain is fully reconstructed event information that can be used by physicists to infer the neutrino oscillation physics. This R&D takes a significant step forward from the current state of the art in the experimental neutrino physics. In this talk, we present our reconstruction chain development using open data set. Our software is made publicly available to improve reproducibility and transparency of our research work.

Consider for young scientist forum (Student or postdoc speaker)

No

Second most appropriate track (if necessary)

Enhanced performance of tracking algorithms

Authors: TERAO, kazuhiro (Stanford University); DRIELSMA, François (Universite de Geneve (CH))

Presenter: DRIELSMA, François (Universite de Geneve (CH))

Session Classification: Recording sessions