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A deep-learning based waveform region-of-interest finder for the liquid argon time projection chamber

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The Liquid Argon Time Projection Chamber (LArTPC) detector technology has been used by many accelerator-based neutrino experiments. It offers excellent spatial and energy resolutions in detection of particles traversing the detector. This becomes particularly crucial for the low energy neutrino physics. However, extracting small signals from huge background in LArTPC waveforms is very challenging for low energy phenomena. It is important to understand the capability and threshold of reconstructing low energy signals in a LArTPC. Here, we consider a unique approach of using a simple 1D convolutional neutral network (1D-CNN) to look directly at raw waveforms from single wires in a LArTPC. We will present encouraging results in the application of a 1D-CNN to the task of finding the region-of-interest in LArTPC waveforms using ArgoNeuT data and show its capability to explore the low energy physics in LArTPC detectors.

Collaboration name

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