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Real Time End to End Supernova Pointing

Tuesday 26 September 2023 14:30 (15 minutes)

The Deep Underground Neutrino Experiment (DUNE) presents promising approaches to better identify and understand supernova (SN) events. Using simulated Liquid Argon Time Projection Chamber (LarTPC) data, we develop an end to end edge-AI pipeline that has the potential to significantly reduce SN pointing time. Using a sequence of machine learning algorithms, we are able to reject radiological background, suppress electronics noise, and identify neutrino electron elastic scattering interactions. We may distinguish such interactions from the more abundant charged current neutrino interactions that carry little to no SN directional information. Such a pipeline enables us to significantly reduce the amount of data required for downstream event analysis, allowing determination of the SN's position within real-time latency constraints. The algorithms in this pipeline also more accurately identify low-energy (LE) signals in low SNR samples. These low energy signals are relevant for detector calibration studies and downstream analysis of particle interactions. We show the potential performance of such a pipeline in a real time setting, and evaluate its potential for identification of critical supernova events, and analysis of downstream LE events.

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