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Reconstructing 3D charge positions in LArTPCs using a CNN

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MicroBooNE is a short baseline neutrino experiment at Fermilab aimed at measuring neutrino-argon cross-sections and probing for sterile neutrinos. The detector is a 85t Liquid Argon Time Projection Chamber (LArTPC) with three readout planes, each of which records charge depositions as 2D images of channel position versus time. We present a new deep learning method for reconstructing the 3D positions of charge depositions based on finding spatial correspondence between the three TPC readout plane images. Our method takes advantage of the sparsity of LArTPC by using a sparse convolutional neural network to extract features from the 2D images. Those are used to infer 3D position from geometrically allowed 2D charge triplets. We discuss the performance of this novel approach.

Primary author: SHARANKOVA, Ralitsa (Tufts University)

Presenter: SHARANKOVA, Ralitsa (Tufts University)

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