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Optimizing a CNN to Reconstruct Low Energy IceCube Neutrino Events

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The IceCube Neutrino Observatory, located at the South Pole, instruments a cubic kilometer of ice with 5160 optical modules that are used to detect astrophysical and atmospheric neutrinos. Near the lowest energies that IceCube can resolve, at the 10s of GeV-scale, these events leave a Cherenkov signature that only a few optical modules will record. Thus, these events are difficult to accurately reconstruct. Improving the speed and resolution of low energy event reconstruction in IceCube is important to advance analyses such as measuring the neutrino oscillation parameters. This work focuses on applying a convolution neural network (CNN) to reconstruct low energy events in IceCube. The CNN is optimized to handle the sparse, low energy data with the aim to reconstruct the energy and direction of neutrino events. Some of these optimizations will be discussed along with showing the current results for the resolution.

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