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Deep Convolutional Networks for Event Reconstruction and Particle Tagging on NOvA and DUNE

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Deep Convolutional Neural Networks (CNNs) have been widely applied in computer vision to solve complex problems in image recognition and analysis. In recent years many efforts have emerged to extend the use of this technology to HEP applications, including the Convolutional Visual Network (CVN), our implementation for identification of neutrino events. In this presentation I will describe the core concepts of CNNs, the details of our particular implementation in the Caffe framework and our application to identify NOvA events. NOvA is a long baseline neutrino experiment whose main goal is the measurement of neutrino oscillations. This relies on the accurate identification and reconstruction of the neutrino flavor in the interactions we observe. In 2016 the NOvA experiment released results for the observation of oscillations in the $\nu_{\mu} \rightarrow \nu_e$ channel, the first HEP result employing CNNs. I will also discuss our approach at event identification on NOvA as well as recent developments in the application of CNNs for particle tagging at NOvA, event identification at DUNE and other ongoing work.

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Session Classification: Identification and Tagging Mini-Workshop