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A Novel Algorithm to Reconstruct Events in a Water Cherenkov Detector

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We have developed a novel approach to reconstruct events detected by a water-based Cherenkov detector such as Super- and Hyper-Kamiokande using an innovative deep learning algorithm. The algorithm is based on a Generative Neural Network whose parameters are obtained by minimizing a loss function. In the training process with simulated single-particle events, the Generative Neural Network is given the particle identification (ID), 3d-momentum (p), and 3d-vertex position (V) as the inputs for each training event. Then the network generates a Cherenkov event that is compared with the corresponding true simulated event. Once the training is done, for the given Cherenkov event the algorithm will provide the best estimate on ID, p, and V by minimizing the loss function between the given event and the generated event over ranges of input values of ID, p and V. The algorithm serves as a type of fast simulation for a water Cherenkov detector with a fewer number of assumptions than traditional reconstruction methods. We will show some of the algorithm's excellent performance in addition to the architecture and principle of the network.

In-person participation

No

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