

ResNet Convolutional Neural Networks for Particle Identification in Water Cherenkov Detectors

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Current and next generation water Cherenkov detectors require precise event reconstruction to maximise detectors' capabilities. Machine learning is being explored in numerous areas related to these detectors for its potential to provide this precision, potentially aiding projects like Super-Kamiokande, and its successor Hyper-Kamiokande. Event reconstruction has been a particular area of focus of these machine learning efforts, including tasks such as particle type identification. This task is complicated by challenges such as the presence of gamma events, which produce multiple highly proximal Cherenkov rings, resulting in a signal that is very difficult to discriminate from single electron events. This talk will provide a discussion of the progress and challenges of ongoing efforts towards event classification in water Cherenkov detectors, with a focus on results achieved with the ResNet architecture. This will include an outline of the approach, an examination of its ability to resolve the e/γ discrimination problem, and a comparison of performance with existing reconstruction algorithms. Future developments and applications related to ResNet classifiers will also be explored, such as the characterization of systematic uncertainties.

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Please select: Experiment or Theory

Experiment

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