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Likelihood and Deep Learning Analysis of the electron neutrino event sample at Intermediate Water Cherenkov Detector (IWCD) of the Hyper-Kamiokande experiment

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Hyper-K is a next-generation long baseline neutrino experiment. One of its primary physics goals is to measure neutrino oscillation parameters precisely, including CP-asymmetry. As conventional νμ beam from J-PARC neutrino baseline contains only 1.5% of νe interaction of total, it is challenging to measure νe/νe(anti) scattering cross-section on nuclei. To reduce systematic uncertainty, IWCD will be built to study neutrino interaction rate with higher accuracy. The presented, simulated data comprises νeCC0π as main signal & NCπ0, νμCC are major background events. To reduce the backgrounds, initially a log-likelihood-based reconstruction algorithm to select candidate events was used, which however, sometimes struggles to distinguish π0 events properly from electron-like events. Thus, ML-based framework has been developed to enhance the purity & signal efficiency rate of νe events. Implementing it notably enhances both the efficiency & purity of νe signals over the conventional approach.

Alternate track

I read the instructions above

Yes

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