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The Library Event Matching classifier for ν_e events in NOvA

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In this paper we present the Library Event Matching (LEM) classification technique for particle identification. The LEM technique was developed for the NOvA electron neutrino appearance analysis as an alternative but complimentary approach to standard multivariate methods. Traditional multivariate PIDs are based on high-level reconstructed quantities which can obscure or discard important low-level detail in high granularity detectors. LEM, by contrast, uses the full hit by hit information of the event, comparing the hit charges and positions of each physics event to a large “template” library of simulated signal and background events. This is a powerful classification technique for the finely segmented NOvA detectors, but poses computational challenges due to the large Monte Carlo template libraries required for to reach the optimal physics sensitivity. We will present both the LEM classification technique as well as its technical implementation for the NOvA experiment exploiting memory mapping techniques on high memory Linux platforms.

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