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Improving Event Reconstruction in Hyper-Kamiokande with ResNet

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A key goal of neutrino physics is to measure CP violation in neutrino oscillations, which may explain why the universe is dominated by matter over antimatter. The upcoming Hyper-Kamiokande experiment will be central to this effort. With a much larger detector volume and more photomultipliers than Super-K, Hyper-K will collect data at kilohertz rates. Traditional reconstruction tools are already at their computational limits, motivating new approaches. To this end, we will present our work on machine-learning-based reconstruction. We have developed an ensemble of ResNet models that improve particle momentum, position, and direction reconstruction, alongside a multi-class classifier to distinguish between key particle types. These networks achieve reconstruction and classification at speeds up to three to five orders of magnitude faster than existing techniques.

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Session Classification: Experiments - SK/HK