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Graph Neural Networks for Hyper K Reconstruction

Monday 27 October 2025 10:15 (15 minutes)

“The Hyper-Kamiokande Detector represents the next generation of neutrino observatories, following in the lineage of the Kamiokande and Super-Kamiokande experiments. With significantly enhanced sensitivity, Hyper-Kamiokande will support a diverse and ambitious physics program, including searches for proton decay, studies of solar neutrinos under non-standard scenarios, and the potential first observation of leptonic CP violation.

Designed to contain 260 kilotons of water and equipped with 20,000 photomultiplier tubes (PMTs), the scale and complexity of Hyper-Kamiokande necessitate the development of advanced event reconstruction algorithms. Existing techniques, originally developed for Super-Kamiokande, are beginning to show their limitations in this new experimental context.

In this presentation, we explore how next-generation approaches from the field of deep learning—specifically, Deep Neural Networks—can enhance reconstruction performance for Hyper-Kamiokande. Particular emphasis will be placed on the application of Graph Neural Networks (GNNs), presenting early promising results, and a performance comparison with the current reconstruction algorithms used in Super-Kamiokande adapted for Hyper-Kamiokande

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Session Classification: Experiments - SK/HK