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Enhancing atmospheric background reduction using Convolutional Neural Networks in DSNB searches at Super-Kamiokande Gd

Wednesday 30 August 2023 17:00 (15 minutes)

The detection of the Diffuse Supernova Neutrino Background (DSNB) flux will provide invaluable insights into constraining cosmological models, core-collapse dynamics and neutrino properties. The Super-Kamiokande Gd (SK-Gd) experiment currently exhibits the best sensitivity for discovery due to enhanced neutron tagging capability with 0.01% gadolinium sulphate loading, as per this analysis. While the IBD coincidence signature significantly reduces backgrounds, the signal region remains dominated by cosmic muon spallation and atmospheric neutrinos. This study explores a novel approach to background reduction by leveraging topological features of SK events with the discriminative power of convolutional neural networks (CNNs). Well-established techniques for data pre-processing, event selection and feature extraction are applied to effectively train a CNN model on SK DSNB and atmospheric Neutral Current (NC) events. Preliminary performance of the CNN model shown in this presentation highlights the potential of machine learning techniques to outperform traditional methods and significantly improve the DSNB signal efficiency.

Submitted on behalf of a Collaboration?

Yes

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