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Reconstruction of Cosmic Muon with Machine Learning in JUNO

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The Jiangmen Underground Neutrino Observatory (JUNO), located in Southern China, is a next-generation neutrino experiment that consists of a 20-kton liquid scintillator detector. JUNO's primary objective is to determine the neutrino mass ordering (NMO) via reactor neutrino oscillation measurements. Cosmic muons contribute to one of the dominant background sources to reactor neutrinos by producing isotopes that mimic the inverse beta decay (IBD) signal. Good capability of reconstructing cosmic muon tracks is crucial to reject those background. In this poster, I present a comprehensive approach based on machine learning for the cosmic muon track reconstruction. The muons are first classified into different categories according to their track multiplicity and containment. Reconstruction strategies are developed for each category, and their performances with Monte-Carlo simulations are presented. This study demonstrates the feasibility of presice reconstruction of cosmic muon tracks in a large liquid scintillator detector such as JUNO with machine learning, and shows great potential for background reduction for future reactor neutrino oscillation analyses.

Working Group

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