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Reconstruction and Identification of Atmospheric Neutrino Events at JUNO Using Machine-Learning Methods

Monday 27 October 2025 16:45 (25 minutes)

The Jiangmen Underground Neutrino Observatory (JUNO) is a next-generation multipurpose liquid scintillator detector with a 20-kiloton target mass, located in southern China. One of its primary goals is to determine the neutrino mass ordering (NMO) with a significance of at least 3σ by precisely measuring the oscillation pattern of reactor antineutrinos over a 53 km baseline. Beyond reactor neutrinos, JUNO also provides a unique opportunity to study atmospheric neutrinos, which play an important role in enhancing the NMO sensitivity through matter effects. The construction of the detector has been completed, and JUNO has already started physics data taking. Detecting atmospheric neutrinos in a liquid scintillator detector poses several challenges, such as the reconstruction of complex event topologies and the separation of interaction channels. Advanced machine learning methods, in particular deep-learning-based reconstruction techniques, offer promising solutions to address these difficulties. This talk will present recent progress in using such methods to reconstruct the energy, direction, and vertex of atmospheric neutrino events, as well as their performance in particle identification from Monte Carlo studies, highlighting both the challenges and the advantages of these innovative approaches.

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Session Classification: Experiments - JUNO