Contribution ID: **38** Type: **Poster**

Machine learning applications for atmospheric neutrinos in JUNO

Monday, July 3, 2023 3:30 PM (1 hour)

The Jiangmen Underground Neutrino Observatory (JUNO) aims to determine the neutrino mass ordering at 3σ level within six years of taking. To enhance its sensitivity, JUNO will be able to combine reactor and atmospheric neutrino data. The sensitivity from the atmospheric neutrino measurement depends on the performance of the event reconstruction (energy and zenith angle) and the capability to separate the neutrino flavor and neutrinos from anti-neutrinos. However, these tasks pose significant challenges for large unsegmented liquid scintillator detectors like JUNO. This poster presents a multi-purpose machine learning method for atmospheric neutrinos to reconstruct the neutrino directionality, energy, and vertex, as well as identify neutrino flavors. Preliminary results based on Monte Carlo simulations show promising potential for this approach.

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Session Classification: Poster session & Coffee break