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Direction reconstruction of atmospheric neutrinos in JUNO with machine learning method

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The Jiangmen Underground Neutrino Observatory (JUNO) is a next-generation large liquid-scintillator neutrino detector. Its main goal is the determination of neutrino mass ordering, one of the most crucial open questions for neutrinos. To enhance its sensitivity to the mass ordering, JUNO will combine the measurements of reactor anti-neutrinos at low energies with those of atmospheric neutrinos at high energies (GeV level). The sensitivity from the atmospheric neutrino measurement significantly depends on the angular resolution of the incident neutrino.
This poster presents the direction reconstruction of atmospheric neutrinos with the machine learning method. In this method, multiple features extracted from tens of thousands of PMT waveforms are utilized to characterize the direction properties of atmospheric neutrinos. And two independent machine learning models, including a deep convolutional neural network and a spherical graph neural network, are used to perform the reconstruction. Preliminary results based on full Monte Carlo simulation show great potential for the high-precision reconstruction of the neutrino direction.

In-person participation

No

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