

# Vertex Reconstruction and Deep Learning Applications in JUNO

Thursday, 30 July 2020 13:45 (3 minutes)

The Jiangmen Underground Neutrino Observatory (JUNO), currently under construction in the south of China, will be the largest Liquid Scintillator (LS) detector in the world. JUNO is a multipurpose neutrino experiment designed to determine neutrino mass hierarchy, precisely measure oscillation parameters, and study solar neutrinos, supernova neutrinos, geo-neutrinos and atmosphere neutrinos. The central detector of JUNO contains 20,000 tons of LS and 18,000 20-inch as well as 25,600 3-inch Photomultiplier Tubes (PMTs). The energy resolution is expected to be  $3\%/\sqrt{E(\text{MeV})}$ . To meet the requirements of the experiment, two algorithms for the vertex reconstruction have been developed. One is the maximum likelihood method which utilizes the time and charge information of PMTs with good understanding of the complicated optical processes in the LS. The other is the deep learning method with the Convolutional Neural Networks architecture, which is fast and avoids to consider the detail optical processes. In general, similar performances of both methods are achieved. The deep learning method tends to give more accurate prediction near the detector border region, where the optical processes are more complicated.

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## Secondary track (number)

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**Session Classification:** Accelerator: Physics, Performance, and R&D for Future Facilities - Posters

**Track Classification:** 17. Technology Applications, Industrial Opportunities and Sustainability