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Application of machine learning techniques for event reconstruction in JUNO

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Jiangmen Underground Neutrino Observatory (JUNO) is an up-coming experiment aiming to resolve the neutrino mass hierarchy, precisely measure $\sin^2\theta_{12}$, Δm^2_{21} and $|\Delta m^2_{31}|$, investigate solar, atmospheric and geo-neutrinos and address other questions using optical light produced in a 20-kton liquid scintillator in response to the energy deposited by charged particles. The central detector has a spherical shape and is surrounded by about 18 thousand 20"and 26 thousand 3"photo-multiplier tubes (PMT). For achieving the physical goals it is necessary to reconstruct vertex and energy of events using the charge and time information coming from PMTs. Due to the tremendous amount of channels and variety of effects taking place in the detector this task becomes very challenging for traditional methods. Convolutional neural networks (CNN) seem to be a promising alternative. Usually CNN are working with data in Cartesian space, e.g. with rectangular images. In JUNO the sensitive elements (PMT) are arranged on the spherical surface of the central detector. This leads to the necessity of using a projection procedure or a re-design of the neural network structure. The talk is covering different approaches to address this problem.

Working group

WG6

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