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Reconstruction of Electromagnetic Shower Axis in the AMS-02 ECAL using Deep Learning Method

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The Electromagnetic Calorimeter (ECAL) in the AMS-02 experiment is a 3D imaging detector and plays a pivotal role in various physics analysis results. The precise reconstruction of electromagnetic shower axis in the ECAL contributes to a better understanding of its performance in particle identification as well as pointing capability of gamma rays. Conventional methods reconstruct the shower axis based on 3-dimensional shower profiles combined with detector-related effects.

In this talk, we present an innovative deep learning technique using Residual Network (ResNet) model to obtain the key parameters of shower axis, including the inclination angle and the incident position. The ResNet model is trained with Monte Carlo simulation and validated in the cosmic ray electron data collected on the ISS. Significant improvement in the angular and spatial resolution covering the energy range from 2 GeV to 1 TeV is observed and presented.

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