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Muon identification with Deep Neural Network in the Belle II K-Long and Muon detector

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Muon identification is crucial for elementary particle physics experiments. At the Belle II experiment, muons and pions with momenta greater than 0.7 GeV/c are distinguished by their penetration ability through the K_L and Muon (KLM) sub-detector, which is the outermost sub-detector of Belle II.

In this presentation, we will firstly discuss the possible room for μ/π identification performance improvement and then present a new method based on Deep Neural Network (DNN). This DNN model utilizes the KLM hit pattern variables as the input and thus can digest the penetration information better than the current algorithm. We test the new method in simulation and find that the pion fake rate is reduced from 4.1% to 1.6% at a muon efficiency of 90%.

Secondary track

T16 - AI for HEP (special topic 2025)

Author: WANG, Zihan (the University of Tokyo)

Presenter: WANG, Zihan (the University of Tokyo)

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