

Hadron Identification based on DNN at BESIII

BESIII provides an important research platform for physics topics in the tau-charm energy region. The physics processes in the tau-charm energy region involve a significant amount of hadronic components in the final state, making particle identification crucial.

Currently, BESIII achieves particle identification through the combination of dE/dx and TOF measurements. Due to the absence of a Cherenkov detector, the particle identification efficiency in the high momentum region is relatively low and cannot fully meet the physics requirements.

In fact, all four sub-detectors of BESIII have a certain degree of particle identification capability. However, due to the complex correlations between information from different detectors, traditional methods are extremely challenging to handle and cannot achieve the optimal particle identification performance. Machine learning methods have a strong advantage in addressing such complex correlation problems.

Therefore, I conducted research on particle identification using machine learning methods in BESIII. In order to meet the requirements of particle identification efficiency and computing speed at the same time, I select the deep neural network (DNN) method. After feature selection and model structure adjustment, obtained a machine learning model suitable for particle identification of π^0, η in BESIII. Compared to traditional methods, the particle identification algorithm based on DNN significantly improves particle identification efficiency in the high momentum region, with minimal increase in time consumption. By separately training on real data and MC, the systematic error has also been significantly reduced. The more efficient particle identification efficiency and smaller systematic error will effectively enhance signal significance and improve physical accuracy.

I am

non-PhD student

Primary authors: 袁, 昊 (高能所); Dr 陈, 正元 (中国科学院高能物理研究所); SUN, Sheng-Sen (Institute of High Energy Physics); ZHAO, Guang (高能所)

Co-authors: LIUHM@IHEP.AC.CN, LIU Huaimin (高能所); DENG, Ziyang (高能所); LI, Gang (高能所); WEN, Shuopin (IHEP)

Presenter: 袁, 昊 (高能所)

Track Classification: Machine Learning