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Machine Learning based global particle identification algorithms at LHCb experiment

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One of the most important aspects of data processing at LHC experiments is the particle identification (PID) algorithm. In LHCb, several different sub-detector systems provide PID information: the Ring Imaging CHerenkov (RICH) detector, the hadronic and electromagnetic calorimeters, and the muon chambers. To improve charged particle identification, several neural networks including a deep architecture and gradient boosting have been applied to data. These new approaches provide higher identification efficiencies than existing implementations for all charged particle types. It is also necessary to achieve a flat dependency between efficiencies and spectator variables such as particle momentum, in order to reduce systematic uncertainties during later stages of data analysis. For this purpose, “flat” algorithms that guarantee the flatness property for efficiencies have also been developed. This talk presents this new approach based on machine learning and its performance.

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