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Machine-learning-based particle identification

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In this work, we introduce a novel method for Particle Identification (PID) within the scope of the MPD experiment at the NICA accelerator complex of Joint Institute for Nuclear Research. Identifying products of ultrarelativisitc collisions produced in the heavy-ion experiments is one of the crucial objectives of most of the physics analysis. The principal challenge for PID is to provide good identification in a wide range of the particle momentum. Typically employed PID methods rely on hand-crafted selections, which compare experimental data to theoretical predictions. We propose using Machine Learning (ML) approach the method for PID, which has a wide range of different models for classification task. This study demonstrates the use of gradient boosted decision trees (GBDT) for particle identification, focusing on six particle types in simulated Bi+Bi collisions at $\sqrt{s_{NN}} = 9.2$ GeV. Our approach improves the PID purity and efficiency in momentum ranges, where feature overlap limits classical methods, of the selected sample for all investigated particle species.

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