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Application of Machine Learning Methods for Event Reconstruction in the SPD Range System

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The Joint Institute for Nuclear Research (JINR) is approaching the commissioning and operational readiness of the NICA (Nuclotron-based Ion Collider fAcility) mega-science accelerator complex. One of its future detectors is the SPD (Spin Physics Detector), designed to study the spin structure of nucleons. The Range System (muon system) is an integral part of the detector, used for muon identification and coarse hadron calorimetry. This report is devoted to the simulation and reconstruction of events in the SPD Range System using the SpdRoot software framework. In particular, it provides an overview of machine learning algorithms, such as DBSCAN, BDT, and CNN, applied to clustering and particle classification tasks. These results provide the foundation for critical measurements, such as charmonium probing in the SPD experiment.

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