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Assigning quality labels in the high-energy physics experiment ALICE using machine learning algorithms

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Data Quality Assurance plays an important role in many high-energy physics experiments, e.g. the ALICE experiment at Large Hadron Collider (LHC) in CERN. Currently employed quality assurance methods rely heavily on manual labour and human expert judgments. This is also true for the Time Projection Chamber (TPC), one of the detectors employed by the ALICE experiment. To ease the burden of human quality label assignment, we investigated several state-of-the-art machine learning methods that can automate this process. The selection of the machine learning methods evaluated include artificial neural networks, support vector machines (with linear and non-linear kernels), as well as random forests and logistic regression. Our results for the TPC detector indicate, that over 30% of all data points classified as correct by human experts, i.e. without errors, can be correctly evaluated without any human interaction using random forest classifier with over 98% certainty.

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