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Fiducialziation in DEAP-3600 using machine learning algorithms with robust validation

Tuesday 30 May 2017 13:30 (15 minutes)

An analysis of several machine learning algorithms performing position classification on data in the DEAP-3600 detector will be presented. Due to possible surface contamination, the sensitivity of the experiment can be improved by selecting an inner sub-volume (fiducial volume) from the data. One method used to do this is called the "MBLikelihood" algorithm, which maximizes a likelihood function to determine the location of an event in the detector. A machine learning approach simply tries to classify each event as *surface* or *fiducial* in a binary fashion. This technique for fiducialization is more direct, and can thus be more aggressively optimized. Results will be presented on a comparison of the performance of several widely used machine learning algorithms, as well as their robustness against changes in the Monte Carlo detector optical parameters. Finally, the performance of each algorithm on a small data set of real events will be discussed. A limited sample of data expected to have come from the surface, based on other considerations than position reconstruction, is used as a validation of each algorithm outside of the Monte Carlo environment.

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