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NA61/SHINE online noise filtering using machine learning methods

Friday, 3 December 2021 16:00 (10 minutes)

NA61/SHINE is a high-energy physics experiment operating at the SPS accelerator at CERN. The physics programme of the experiment was recently extended, requiring a major upgrade of the detector setup. The main goal of the upgrade is to increase the event flow rate from 80Hz to 1kHz by exchanging the read-out electronics of the NA61/SHINE main tracking detectors (Time-Projection-Chambers - TPCs). As the amount of collected data will increase significantly, a tool for online noise filtering is needed. The standard method is based on the reconstruction of tracks and removal of clusters which do not belong to any particle trajectory. However, this method takes a substantial amount of time and resources.

In this talk, a novel approach based on machine learning methods will be presented. It is a promising solution which can reduce computing time. Two techniques are considered: usage of decision trees and deep neural networks. For the second method, different neural network architectures were compared, including convolutional neural networks. The two approaches were tested using previously collected NA61/SHINE data. The preliminary results of cluster classification by these models show a classification efficiency of about 90%. The performance of both methods will be discussed and compared. Integrated algorithms with NA61/SHINE software will be used in the future data-taking campaigns.

Significance

The project covers a novel approach for the data filtering using machine learning methods. Data filtering is crucial for the future NA61/SHINE data-taking campaigns.

References

Speaker time zone

Compatible with Europe

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Session Classification: Lightning talks session

Track Classification: Track 2: Data Analysis - Algorithms and Tools