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Experience with a novel Autoencoder-based Online Data Quality Monitoring system in CMS ECAL

The Online Data Quality Monitoring (DQM) of the CMS electromagnetic calorimeter (ECAL) is a crucial tool that allows ECAL experts to quickly identify, localize, and diagnose a broad range of detector issues that would impact on the quality of the data for physics. A real-time autoencoder-based anomaly detection system using semi-supervised machine learning is presented enabling the detection of anomalies in the CMS electromagnetic calorimeter data. A novel method is introduced which maximizes the anomaly detection performance by exploiting the time-dependent evolution of anomalies as well as spatial variations in the detector response.

The autoencoder-based system, which was previously described in ACAT 2022, is able to efficiently detect anomalies, while maintaining a very low false discovery rate. The focus of this presentation will be on the deployment of this system in the online DQM workflow during LHC Run 3 (2022+), the operational experience during this run period, and the ability to detect issues that are missed by the existing cut-based anomaly detection system.

Significance

References

<https://doi.org/10.1007/s41781-024-00118-z>

Experiment context, if any

CMS experiment

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Session Classification: Poster session with coffee break

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