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Development of a Computational Framework for Neural Network Training and Analysis in the CMS Experiment

Content

This work presents the development of a computational environment for the training and application of neural network models using data from the CMS experiment at CERN. The framework is designed to support advanced machine learning techniques for data analysis in experimental particle physics, with a focus on anomaly detection.

The proposed workflow integrates efficient data processing and selection of relevant samples, followed by the training, evaluation, and optimization of neural network models, including but not limited to autoencoders. The environment is built to be scalable and adaptable to different architectures and datasets within the CMS analysis ecosystem.

In the final stage, the trained models are characterized using independent datasets to assess their performance in identifying anomalous events. Special emphasis is placed on the interpretation of the selected events, aiming to distinguish between statistical fluctuations, experimental uncertainties, and potential signals of underlying physical phenomena

Summary

We present a computational framework for training and applying neural network models in the CMS experiment, enabling efficient data processing, model optimization, and anomaly detection with emphasis on interpreting the origin of selected events.

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