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Efficiency Analysis of ML-Based Anomaly Detection Triggers for Emerging Jets

Novel machine learning-based anomaly detection Level 1 (L1) triggers are currently under development at CMS, namely AXOL1TL and CICADA. The former employs a variational autoencoder, while the latter utilizes a convolutional autoencoder. These triggers aim to balance rate reduction with model independence, enabling the selection of potentially significant events that might be overlooked by traditional triggers relying on basic kinematic variable selections. Consequently, they have the potential to enhance signals indicative of physics beyond the Standard Model, such as those associated with emerging jets. Such signals are predicted by models featuring a composite dark sector where long-lived particles decay into Standard Model jets with displaced tracks and numerous vertices. This study evaluates the efficiency of these anomaly detection triggers in selecting events with emerging jets produced via the s-channel production of two dark quarks.

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