

AISSAI Anomaly Detection Workshop



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Advanced anomaly detection algorithms to search for semivisible jets in the CMS experiment at the CERN LHC

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Semivisible jets are an intriguing signature predicted to arise at hadron colliders when the Standard Model (SM) of particle physics is extended with a new, hidden sector, governed by a confining interaction. Made of a mixture of SM particles and undetectable bound states of new particles, semivisible jets present a unique radiation pattern. Exploiting the resulting differences in jet substructure compared to SM jets is key in the search for strongly-coupled dark sectors. Advanced anomaly detection tools provide a powerful way to achieve this discrimination and, compared to supervised machine learning strategies, have the advantage of not being reliant on a finite set of signal model hypotheses to train on. In this talk, we present the application of normalized autoencoders to the task of separating semivisible jets from SM backgrounds. We show how this architecture drastically improves the performance in detecting signal events compared to a standard autoencoder. Finally, we demonstrate a failure mode in the training of normalized autoencoders, and propose a novel procedure to optimize the performance of the normalized autoencoder in a fully signal agnostic fashion using the Wasserstein distance.

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Classification de Session: Contributed