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Implementing a robust anti-QCD tagger with mass de-correlated jet image data

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We implement a robust anti-QCD tagger with mass de-correlating jet image data produced using the pre-processing method introduced in arXiv: 1903.02032. We take a unsupervised (where the algorithm is trained on a mixture of signal and background data to resemble the proportion of signal and background in ATLAS) and semi-supervised (where data is only trained on background) learning anomaly detection approach using different kinds of autoencoder neural networks for our tagger.

We use jet image data to train our algorithm instead of conventional jet observables. The pre-processing steps perform momentum re-scaling to make all jets have the same mass thus mass de-correlating the jets, Lorentz transformation to make all jets have the same energy and remove the residual rotation by applying the Gram-Schmidt on the plane transverse to the jet axis. This is expected to increase the sensitivity of the autoencoder to non-hypothesised resonance and particles as it will not face the drawback experienced by most machine learning algorithms as they tend to learn the non-linear correlation of the jet-mass with other jet observables.

Apply to be considered for a student award (Yes / No)?

yes

Level for award (Hons, MSc, PhD, N/A)?

MSc

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