

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

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This project studies a robust anti-QCD tagger with mass de-correlating jet image data produced using the pre-processing method introduced in arXiv: 1903.02032. A semi-supervised (where data is only trained on background) learning anomaly detection approach using convolutional autoencoder neural networks is explored as an anti-QCD tagger in this study. Jet image data is used to train the algorithm instead of conventional high level multivariate 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 experience non-linear correlation of the jet-mass with other jet observables.

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