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Constructing mass-decorrelated hadonic decay taggers in ATLAS

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A large number of physics processes as seen by ATLAS at the LHC manifest as collimated, hadronic sprays of particles known as 'jets'. Jets originating from the hadronic decay of a massive particle are commonly used in searches for both measurements of the Standard Model and searches for new physics. The ATLAS experiment has employed machine learning discriminants to the challenging task of identifying the origin of a given jet, but such multivariate classifiers exhibit strong non-linear correlations with the invariant mass of the jet, complicating many analyses which wish to make use of the mass spectrum. Adversarially trained neural networks (ANN) are presented as a way to construct mass-decorrelated jet classifiers by jointly training two networks in a domain-adversarial fashion. The use of neural networks further allows this method to benefit from high-performance computing platforms for fast development. A comprehensive study of different mass-decorrelation techniques is performed in ATLAS simulated datasets, comparing ANNs to designed decorrelated taggers (DDT), fixed-efficiency k-NN regression, convolved substructure (CSS), and adaptive boosting for uniform efficiency (uBoost). Performance is evaluated using metrics for background jet rejection and mass-decorrelation.

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Session Classification: Track 2: Data Analysis - Algorithms and Tools

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