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Identifying hadronically decaying vector bosons and top quarks in ATLAS

Hadronic decays of vector bosons and top quarks are increasingly important to the ATLAS physics program, both in measurements of the standard model and searches for new physics. At high energies, these decays are collimated into a single overlapping region of energy deposits in the detector, referred to as a jet. However, vector boson and top quarks are hidden under an enormous background of other processes producing jets. The ATLAS experiment has employed boosted decision trees and deep neural networks to the challenging task of identifying hadronically decaying vector boson and top quarks and rejecting other jet backgrounds. These discriminants are becoming increasingly complex and using more advanced machine learning techniques. The methods currently used to tag these objects are described. In order to improve the tagger performance on the signal efficiency and background rejection, new in-situ techniques are applied, thus directly evaluating the agreement between data and simulation after applying an arbitrarily complex classifier. The precision obtained by applying the in-situ techniques is presented.

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