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Identification of Hadronically Decaying W Bosons and Top Quarks using Multivariate Techniques at ATLAS

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By colliding protons and examining the particle emitted from the collisions, the Large Hadron Collider aims to study the interactions of quarks and gluons at the highest energies accessible in a controlled experimental way. In such collisions, the types of interactions that occur may extend beyond those encompassed by the Standard Model of particle physics. Such interactions typically occur at energy scales much higher than the rest mass of the incoming or outgoing particles. Because of this, reconstructing highly relativistic particles emitted from these collisions is becoming increasingly important. In particular, the ability to identify the originating particle which decays hadronically using distinguishing features of the radiation pattern of the jet plays a central role in searches. This is typically done by the use of a single physically motivated observable constructed from the constituents of the jet. In this work, multiple complementary observables are combined using boosted decision trees and neural networks to increase the ability to distinguish W bosons and top quarks from light quark jets in the ATLAS experiment.

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