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A Boosted Event Shape Tagger for Heavy Object Classification

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We present a novel approach to the problem of discriminating jets produced from the hadronic decays of highly-boosted heavy particles (top, W, Z, H) from light jets. By hypothesizing different particle origins for the jets and boosting all jet constituents into the corresponding rest frames, angular and kinematic distributions of reconstructed particles can be used to discriminate 2- or 3-prong topologies from those of light jets produced in QCD processes. Machine learning techniques are utilized to build discriminants capable of simultaneously separating and classifying the particle species. This approach adds additional information relative to existing techniques, thereby improving sensitivities of analyses dependent on such heavy-object tagging tools. We demonstrate the performance of this tagging method and provide a proof-of-principle application to a simple analysis scenario.

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