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Jet-SIFTing for New Physics

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We describe a new scale-invariant jet clustering algorithm that does not impose a fixed cone size on a collider event. The proposed construction unifies large-radius jet finding, substructure axis-finding, and recursive filtering of soft wide-angle radiation into a single procedure. The sequential clustering measure history facilitates high-performance substructure tagging with a boosted decision tree. Excellent object discrimination and kinematic reconstruction is maintained for highly-boosted partonic systems, while asymptotically recovering favorable behaviors of both the standard KT anti-KT algorithms.

We explore applications of this new technology to searches for new physics in a collider setting. In particular, we consider a Hidden Valley model which generates high-multiplicity showering from strong dynamics within the dark sector, followed by decays back into Standard Model states. The reconstruction of dark sector masses in such a setting is obscured by a thick combinatoric background. By cutting an ordered slice through possible recombinations, the SIFT algorithm may be able to help lift backgrounds of this variety.

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