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Jet SIFT-ing: a new scale-invariant jet clustering algorithm for the substructure era

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We describe a new jet clustering algorithm named SIFT (Scale-Invariant Filtered Tree) that maintains the resolution of substructure for collimated decay products at large boosts. The scale-invariant measure combines properties of kT and anti-kT by preferring early association of soft radiation with a resilient hard axis, while avoiding the specification of a fixed cone size. Integrated filtering and variable-radius isolation criteria block assimilation of soft wide-angle radiation and provide a halting condition. Mutually hard structures are preserved to the end of clustering, automatically generating a tree of subjet axis candidates. Excellent object identification and kinematic reconstruction for multi-pronged resonances are realized across more than an order of magnitude in transverse energy. The clustering measure history facilitates high-performance substructure tagging, which we quantify with the aid of supervised machine learning. These properties suggest that SIFT may prove to be a useful tool for the continuing study of jet substructure.

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