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Collecting events based on jet substructure with the ATLAS detector

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The most common feature produced in the proton-proton collisions of the Large Hadron Collider (LHC) are collimated sprays of particles referred to as jets, which are typically produced from quarks or gluons. The large centre-of-mass energy of the LHC collisions also enables the production of heavy particles with a significant Lorentz-boost. The decay products of such a boosted heavy particle can be reconstructed as a single jet, and hence at a first glance, look very similar to the jets produced from quarks and gluons.
However, these classes of jets have different internal structure. The study of the internal jet substructure is currently a hot topic within High Energy Physics. A long list of analyses at the LHC exploit features of the radiation pattern within jets to identify jets from heavy boosted objects, often in searches for new physics phenomena. A significant limitations for some of these analyses at the ATLAS experiment is that many of the interesting collision events are never recorded since they are not accepted by the trigger system that filters out the vast majority of collisions only keeping the ones deemed most interesting. This presentation will give an overview of jet substructure used in physics studies of boosted objects with particular emphasis on the development of dedicated, optimized triggers that select data events based on features of the substructure of jets. This has potential to significantly improve the sensitivity of several analyses that search for new physics phenomena.

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