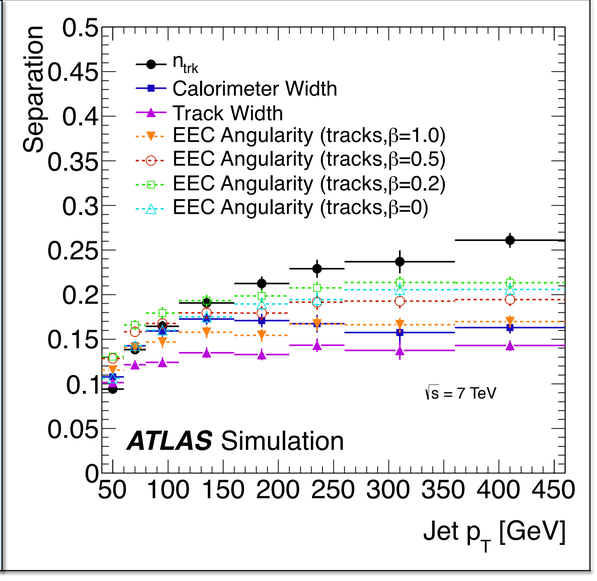
#8 – LHCP Poster Session – Columbia University – 6 June 2014

Light-quark and Gluon Jet Discrimination in pp Collisions at √s = 7 TeV with the ATLAS Detector

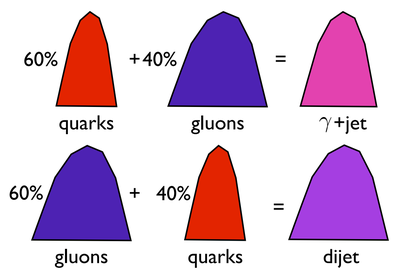
ATL-PERF-2013-02, arXiv:1405.6583

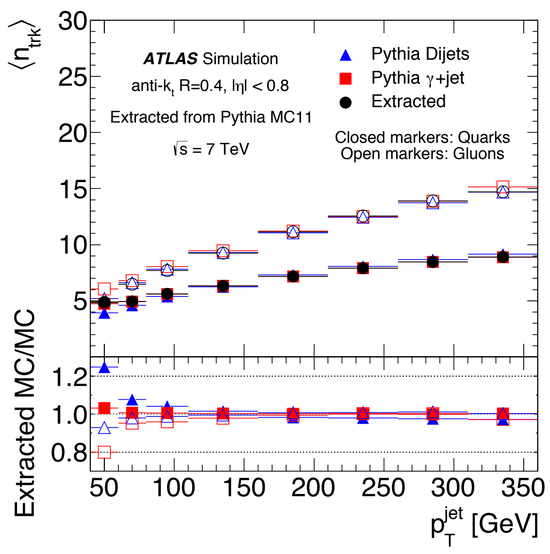
Overview

Quark and gluon jets arise from different processes at collisions at the LHC: depending on the final state, selecting quarks may increase the sensitivity of an analysis. Many variables have been proposed to discriminate between quarks and gluons: the likelihood presented is a simple combination between the number of charged tracks and the track width $\left(\frac{\sum_i (p_T^i \Delta R(i,jet))}{\sum_i p_T^i}\right)$ of a jet.



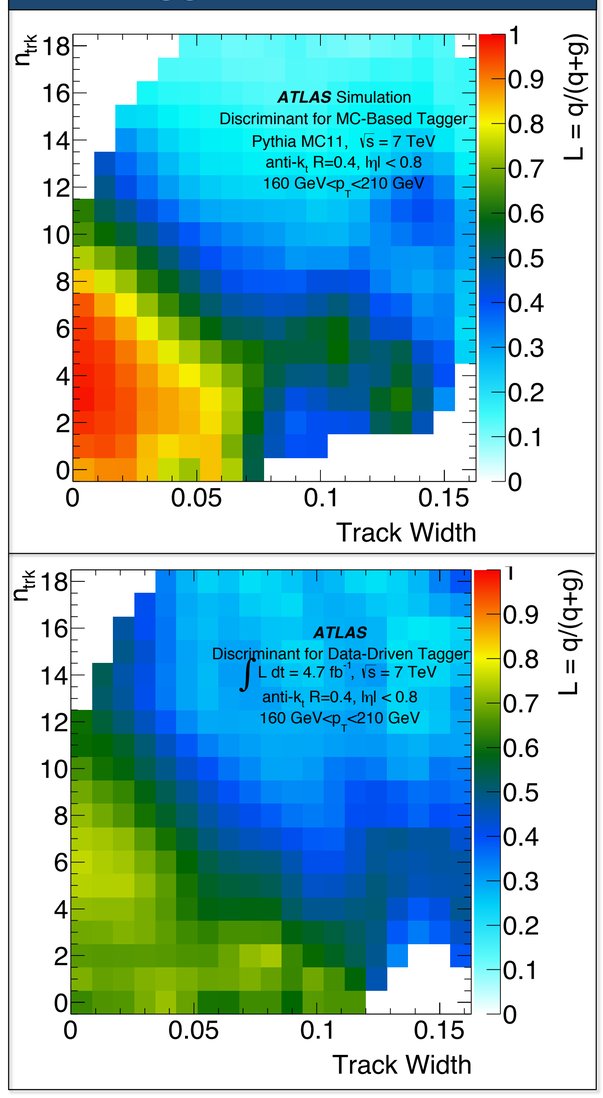
Template Extraction





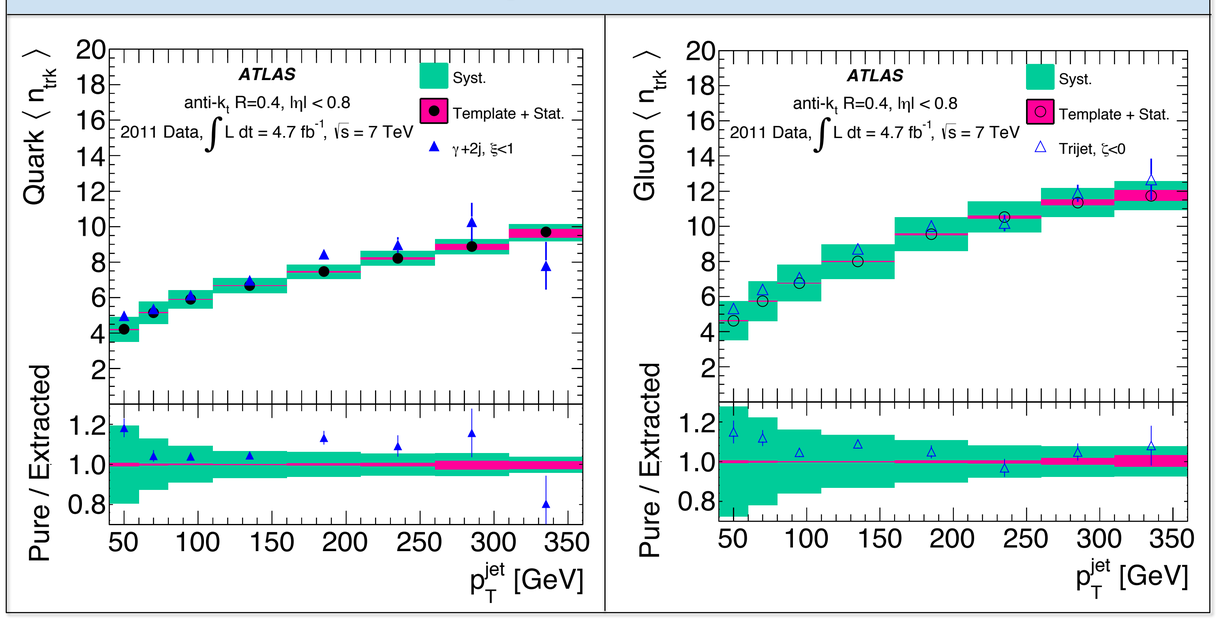
Tagger input shapes can be obtained in data by selecting samples enriched in gluon jets and quark jets: dijets and γ+jets respectively. Flavors are obtained using leading order matrix elements, and shapes from the samples are mixed to form pure quark and gluon templates.

Tagger Construction



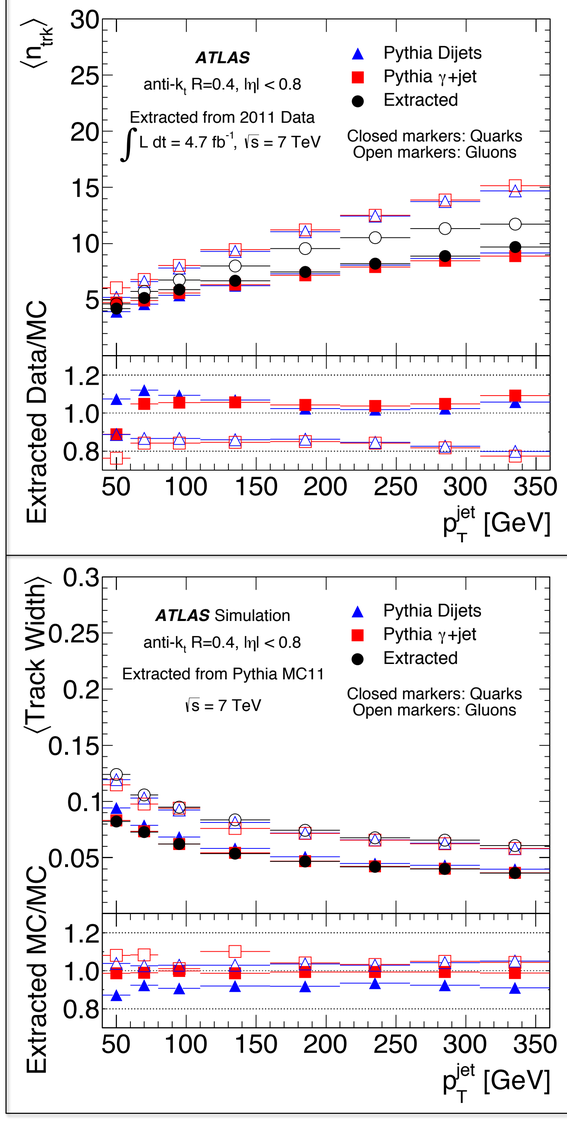
Template Validation

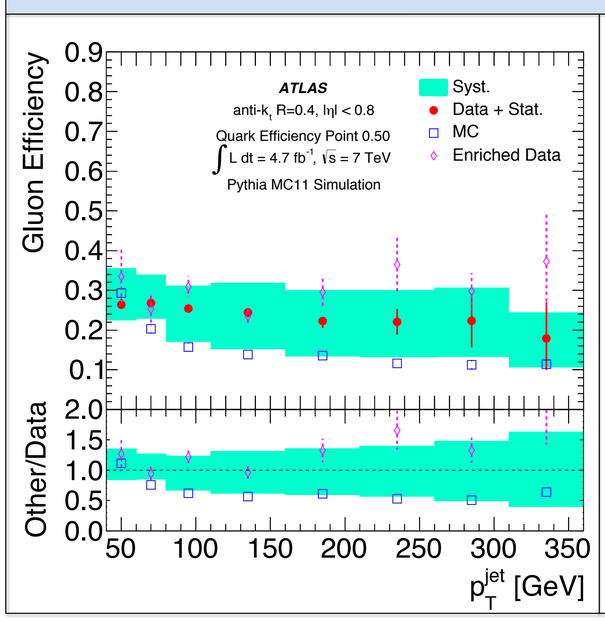
The results from the primary template determination are cross-checked by selecting a low-statistics, high-purity sample of quarks or gluons. The lack of a gluon EM coupling allows for a pure sample of quarks in narrow-angle photon emission in dijet events. Similarly, three-jet events are kinematically purified to select a gluon jet that has been radiated from a parton in a dijet event. Data samples agree within uncertainties.

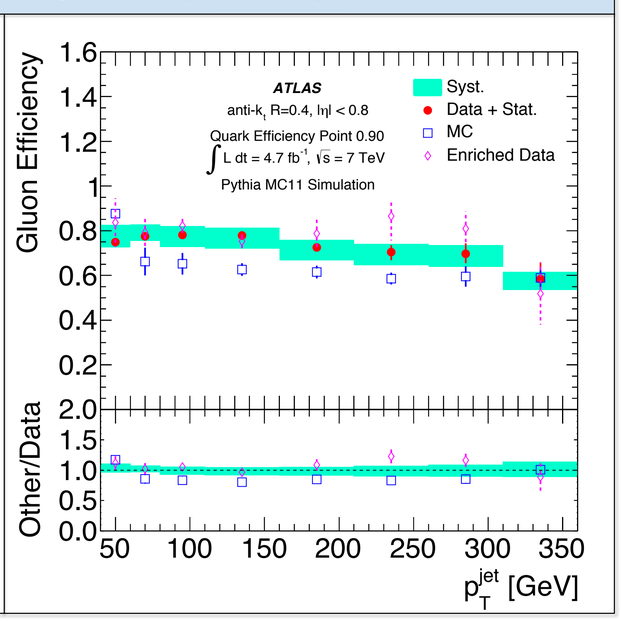


Tagger Performance

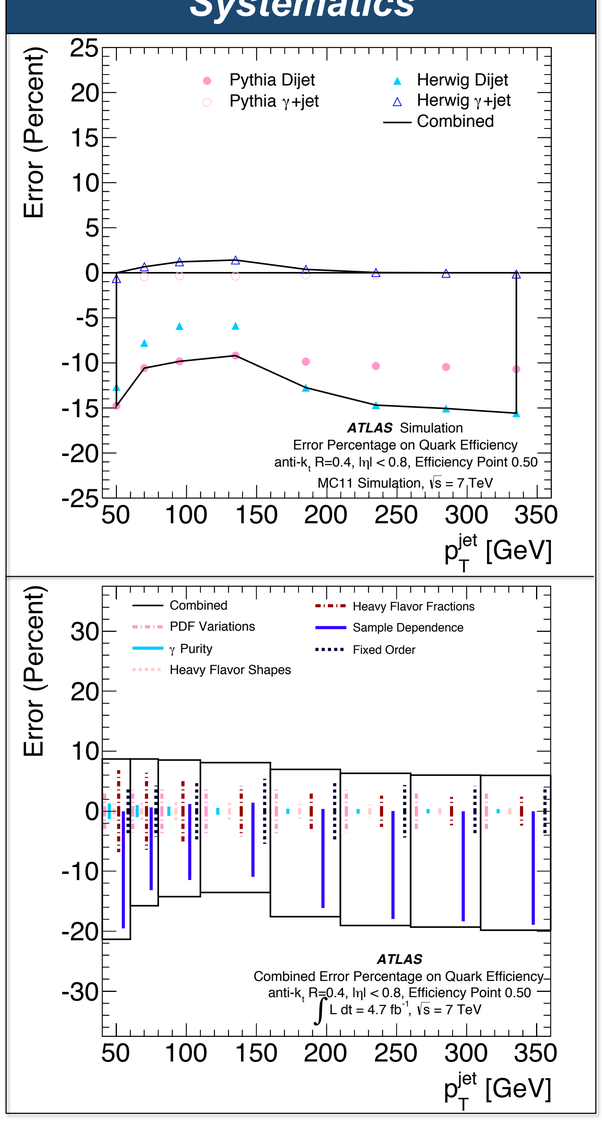
Tagger performance is verified in MC on labeled samples of quarks and gluons from dijet events, and in data with the pure, extracted templates. The topologically enriched samples are also used to validate the performance in data. The two data samples are consistent (within uncertainties), while the MC consistently overperforms. Systematic uncertainties are dominated by sample dependence.







Systematics



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