

Notes for FastJet tutorial n.2

1. Get the code for the second tutorial, **02.tgz**, from the school Indico page, indico.cern.ch/conferenceDisplay.py?confId=253947, and unpack it somewhere convenient
 - 1.1. Note that you'll likely need to modify the location of the FastJet install in the Makefile
2. Get the datafiles **pythia8-200HZ-10000dijets-ptmin500.UW.gz** and **pythia8-dijets-ptmin500.UW.gz** from the USB stick
 - 2.1. **pythia8-dijets-ptmin500.UW.gz** contains 10000 MC dijet events of with a pt larger than 500 GeV
 - 2.2. **pythia8-200HZ-10000dijets-ptmin500.UW.gz** adds to the 10000 dijet 200 boosted HZ events (pt > 500 GeV) with an 'Higgs' of unknown mass
3. Use the 02-boosted-HZ.cc code to produce a histogram of the invariant mass of each of the two hardest jets in each event (meaning, select the two hardest jets, and add both their invariant masses to the same histogram)
 - 3.1. Observe that the histograms differ very little in the two samples, the presence of the 'Higgs' giving only a small correction (*NB: in reality, the problem is **much more difficult**, because the ratio of the dijet and HZ cross sections is much larger*)

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4. Use the template provided in the lectures (or the FastJet Manual, or the examples from the FastJet distribution) to add a tagging (and possibly a grooming) step
5. Observe how the background-only events are affected by the tagging, and especially what happens to the histogram of the events in the file that also contains the signal
6. Determine from the tagged/groomed histogram the mass with which the 'Higgs' has been generated

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7. You may also try different tagging techniques, i.e. using N-subjettiness and in particular the τ_2/τ_1 ratio. For this, you need to install the code from <http://fastjet.hepforge.org/contrib> (it should be very simple), and study how the tagger works in <http://arxiv.org/abs/1011.2268> or from the example given with the code
8. An interesting addition to the tutorial would be to add pileup, and then to check how much grooming techniques and/or (generalised) subtraction can help. This is another tutorial by itself though.