Notes for FastJet tutorial n.1

1. Get yourself a copy of FastJet at fastjet.fr and install it or, at least, get a copy of the manual if you plan to use the virtual machine
2. Get the code for the first tutorial, **01.tgz**, from the school Indico page, indico.cern.ch/conferenceDisplay.py?confId=253947, and unpack it somewhere convenient
    2.1. Note that you'll likely need to modify the location of the FastJet install in the Makefile
3. Get the datafiles **pythia8-Zprime-npileupXX-nev1000.UW.gz** with XX={20,50} from the USB stick (NB. 50MB and 117MB files)
    3.1. These files contain 1000 MC events each of signal from a **heavy Z' of unknown mass**, produced together with an average of 20 and 50 minbias events from pileup respectively
4. Use the 01-subtraction.cc code to produce a histogram of the invariant mass of the two hardest jets in each event. **Your job is to measure the mass of the Z'**
5. In fact, what you see is not the correct mass, because the pileup has been adding p_t to each jet. **Different pileup levels give different masses.**
    5.1. Modify the code and use the FastJet techniques to **subtract the pileup** from each jet, and recover the correct value for the mass.
        5.1.1. You may also try varying the jet algorithm and/or the jet radius

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If fastjet.fr does not work for you, you can find the fastjet 3.0.3 distribution and the manual here:

www.cern.ch/~cacciari/fastjet/

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Ones you've compiled 01-subtraction.cc, run it over the event files using, e.g.,
gunzip -c pythia8-Zprime-npileup20-nev1000.UW.gz | ./01-subtraction

This produces the output file
01-subtraction.hist
which contains the invariant mass distribution of the two hardest jets in each event. The 4 columns are (min,centre,max) of each bin, and event count.
Visualize this distribution using the tool that you prefer.

The path to fastjet-config on the virtual machine is
/usr/local/bin/fastjet-config
so, in the Makefile, FASTJET_DIR=/usr/local

(if you get errors when compiling 01-subtraction with the fastjet pre-installed on the virtual machine you may need to run
scl enable devtoolset-1.1 bash
in order to get the right version of the compiler)

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A check that you've done things correctly will be to run subtraction on both data files, with different pileup, and verify that you get roughly the same mass (to +- 5-10 GeV)

And the value of the Z' mass is.....?

We will do crowdsourcing: send me an email before tomorrow afternoon (matteo.cacciari@cern.ch) with the value in GeV that you think that you have estimated. I'll do the average, and show it tomorrow together with the correct result.