Print Generator level particle decay scheme from NanoAOD MC simulation files

Set up CMS NanoAOD toolkit

NanoAOD postprocessing tool:
https://twiki.cern.ch/twiki/bin/view/CMSPublic/
WorkBookNanoAOD#Quickly_make_plots_with_Nano_AN1

```
cmsrel CMSSW_9_4_11_cand1
cd CMSSW_9_4_11_cand1/src
cmsenv
git cms-init   #not really needed unless you later want to add some other cmssw
stuff
git clone https://github.com/cms-nanoAOD/nanoAOD-tools.git
PhysicsTools/NanoAODTools
scram b
voms-proxy-init -voms cms

cd PhysicsTools/NanoAODTools/python/postprocessing/examples/
python exampleAnalysis.py
```

Get list of NanoAOD files to process:

Lets say we want to analyze list of selected events stored in file
/home/ssawant/hhAnalysis/2016/20210129_hh_2lss_0tau_2016_Datacards_wUpdatedZveto_3/
cfgs/hh_2lss/Tight_SS/W4JetsToLNu/central/analyze_W*JetsToLNu_Tight_SS_central_1_cfg.py
for W4JetsToLNu sample from 2016.

1. Name of the miniAOD file of the sample:
    Search for "W4JetsToLNu" in https://raw.githubusercontent.com/HEP-KBFI/tth-htt/master/
    python/samples/tthAnalyzeSamples_2016_base.py

    ```
    samples_2016["/W4JetsToLNu_TuneCUETP8M1_13TeV-madgraphMLM-pythia8/RunIISummer16MiniAODv3-PUMoriond17_94X_mcRun2_asymptotic_v3-v2/MINIAODSIM"] = OD([
        ("type",                    "mc"),
        ("sample_category",         "EWK"),
        ("process_name_specific",   "W4JetsToLNu"),
    ```
    MiniAOD file name:
    /W4JetsToLNu_TuneCUETP8M1_13TeV-madgraphMLM-pythia8/RunIISummer16MiniA
    ODv3-PUMoriond17_94X_mcRun2_asymptotic_v3-v2/MINIAODSIM
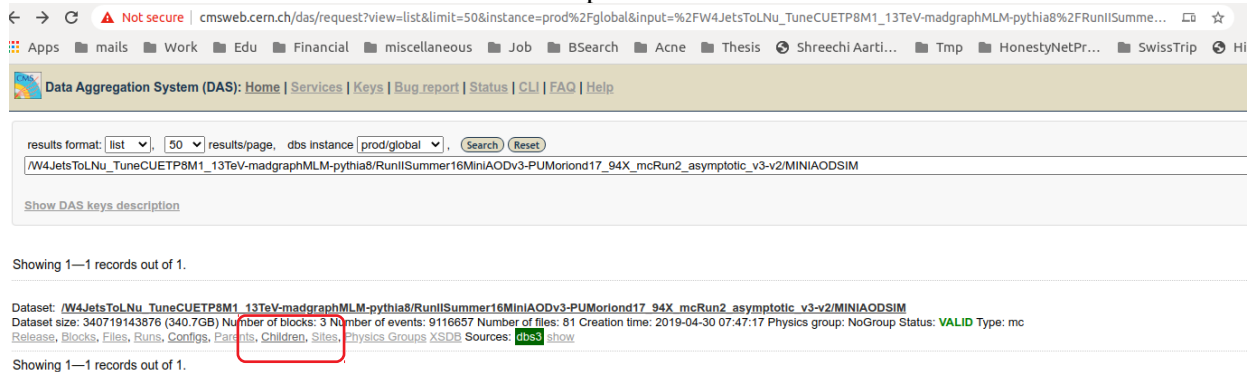
2. Get NanoAOD file:
    1. Search for the miniAOD file in DAS:
        https://cmsweb.cern.ch/das/request?view=list&limit=50&instance=prod
        %2Fglobal&input=%2FW4JetsToLNu_TuneCUETP8M1_13TeV-madgraphMLM-

pythia8%2FRunIISummer16MiniAODv3-
PUMoriond17_94X_mcRun2_asymptotic_v3-v2%2FMINIAODSIM
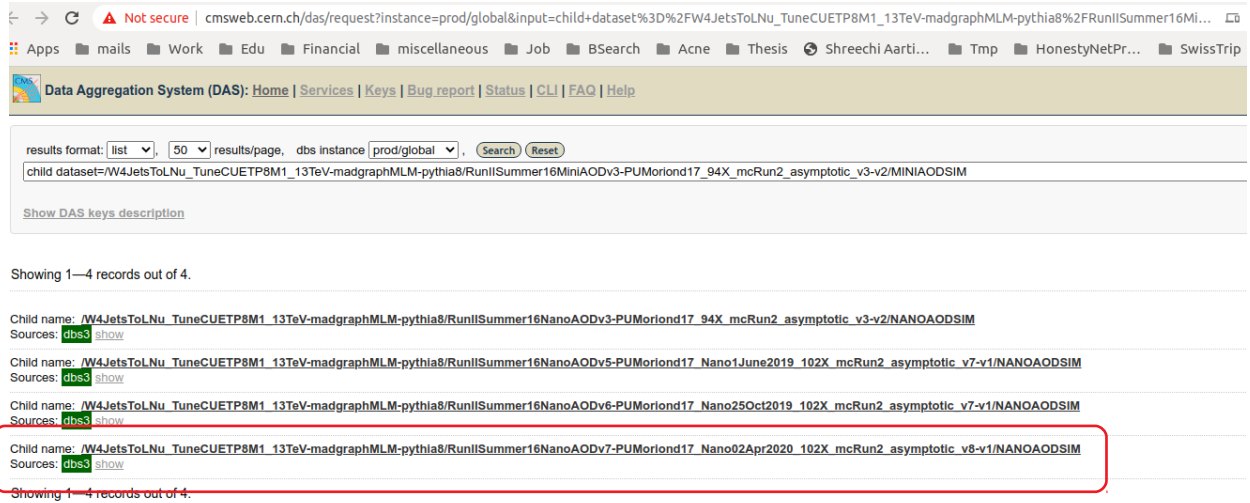
2. Click on "Children" link of the sample:

3. This opens list of NanoAOD samples processed from that miniAOD sample. Choose NanoAOD-v7 sample:

https://cmsweb.cern.ch/das/request?instance=prod/global&input=child+dataset%3D
%2FW4JetsToLNu_TuneCUETP8M1_13TeV-madgraphMLM-
pythia8%2FRunIISummer16MiniAODv3-PUMoriond17_94X_mcRun2_asymptotic_v3-
v2%2FMINIAODSIM

4. Open NanoAOD v7 sample and click on "Files" tab of the nanoAOD sample:
https://cmsweb.cern.ch/das/request?input=dataset%3D
%2FW4JetsToLNu_TuneCUETP8M1_13TeV-madgraphMLM-
pythia8%2FRunIISummer16NanoAODv7-
PUMoriond17_Nano02Apr2020_102X_mcRun2_asymptotic_v8-
v1%2FNANOAODSIM&instance=prod/global

5. This open the list of NanoAOD files: https://cmsweb.cern.ch/das/request?instance=prod/global&input=file+dataset%3D%2FW4JetsToLNu_TuneCUETP8M1_13TeV-madgraphMLM-pythia8%2FRunIISummer16NanoAODv7-PUMoriond17_Nano02Apr2020_102X_mcRun2_asymptotic_v8-v1%2FNANOAODSIM

Run printGenEventFromNanoAOD macro

1. A code that print generator level particle decay chain in a form of family tree is at https://github.com/siddhesh86/myCodes/blob/d4d30c2f26f24c8756fda62bec3bb81b6a530f75/python/CMSNanoAOD/printGenEventsFromNanoAOD/anaGenEventsFromNanoAOD.py

2. It takes input from https://github.com/siddhesh86/myCodes/blob/d4d30c2f26f24c8756fda62bec3bb81b6a530f75/python/CMSNanoAOD/printGenEventsFromNanoAOD/anaGenEventsFromNanoAOD_inputs_cfg.json json file.

Put all of the NanoAOD files as list into the json file under "NanoAOD_PostProc" variable. Prepend "root://cms-xrd-global.cern.ch:1094/" to the NanoAOD file path that needs to include in the "NanoAOD_PostProc" list.

Provide path+name of the file, containing run:lumi:event number of the events which needs to run from the NanoAOD file, to "runOnSelectedEventsList" variable in the json file.

3. Run anaGenEventsFromNanoAOD.py with command:
```
python anaGenEventsFromNanoAOD.py anaGenEventsFromNanoAOD_inputs_cfg.json
```
4. Example of the outpu is given at
https://github.com/siddhesh86/myCodes/blob/d4d30c2f26f24c8756fda62bec3bb81b6a530f7 5/python/CMSNanoAOD/printGenEventsFromNanoAOD/ anaGenEventsFromNanoAOD_W4JetsToLNu.log

5. Generator level praticle decay chain is printed in the following format:

```
printFamilyTree:

0 (21) [0, 23168.00, 0.000]
        2 (24) [47, -2.70, -2.672]
                7 (24) [56, -2.54, -3.109]
                    8 (24) [55, -2.53, -3.102]
                        10 (24) [55, -2.53, -3.102]
                          11 (24) [55, -2.53, -3.102]
                              12 (24) [55, -2.53, -3.109]
                                  13 (24) [56, -2.53, -3.109]
                                      15 (24) [56, -2.52, -3.102]
                                      17 (-13) [32, -1.71, 1.523]
                                      18 (14) [66, -2.08, -2.602]

        3 (21) [142, 1.60, -0.427]
            9 (21) [162, 1.45, -0.446]
                19 (-5) [131, 1.50, -0.578]
                20 (511) [121, 1.50, -0.578]
                        35 (14) [25, 1.50, -0.551]
                        36 (-13) [72, 1.50, -0.576]
                        37 (-411) [24, 1.46, -0.613]
                                40 (11) [0, 0.87, -2.961]
                                41 (-12) [2, 1.41, -0.531]
                22 (5) [18, 0.83, 0.264]
                23 (-533) [17, 0.87, 0.242]
                        39 (-531) [16, 0.86, 0.243]
                                44 (-431) [11, 0.84, 0.093]
        4 (21) [62, -0.23, -2.859]
            16 (21) [0, -0.25, -0.547]
            27 (21) [1, -0.79, -2.703]
            28 (21) [5, -0.30, -2.930]
            29 (21) [1, -0.15, 2.898]
            30 (21) [15, -0.17, -2.805]
            31 (21) [30, -0.13, -2.844]
            32 (21) [5, -0.19, -2.984]
            33 (21) [3, -0.77, -2.797]
        5 (21) [19, 1.16, 2.328]
            14 (21) [14, 1.34, 2.344]
            26 (21) [2, 0.25, 1.996]
        6 (3) [85, -0.32, 1.754]
            24 (3) [40, -0.24, 1.707]
            25 (21) [17, -0.20, 1.715]
```

24(W+) -> -13(μ⁻) 14(ν_μ)

Each particle is printed in the following format:

<particle index in GenParticleCollection> (<pdgID>) [<pt>, <eta>, <phi>]

for e.g. 2 (24) [47, -2.70, -2.672] : 2 is particle index in GenParticleCollection, 24 is pdgID of W$^+$, and   47, -2.70, -2.672 are pT, eta and phi of W$^+$.

Particle decay chain is shown in the following order:
- Column represents generation of the particle family
- Rows in a given column represents 'sibling particles' in a family.

Particle pdgID can be found at https://pdg.lbl.gov/2007/reviews/montecarlorpp.pdf