Higgs->invisible progress work

Yuhang 2018/9/20

1)Modified the Maoqiang's code according to Ryuta to make the whole process clearer.

The path of signal data:

```
signal_slcio_dir=/cefs/data/DstData/CEPC240/CEPC_v4/higgs/smart_final_states/E240.Pffh_invi.e0.p0.whizard195/
```

Progress:

```
0.2)   echo "Runing signal samples..."

  ;;

0.2.1) echo "Split signal sample with each group 0.5G..."

    mkdir -p ./run/e2E2h_invi/samples
    ./python/get_samples.py ${signal_slcio_dir} ./run/e2E2h_invi/samples/E240_Pffh_invi.txt 0.5G
  ;;

0.2.2) echo "Generate XML input files for Marlin job..."

    mkdir -p   ./run/e2E2h_invi/steers
    mkdir -p   ./run/e2E2h_invi/steers/test
    mkdir -p   ./run/e2E2h_invi/ana

    ./python/get_steerfiles.py ./table/template_jobfile.xml ./run/e2E2h_invi/samples ./run/e2E2h_invi/steers ./run/e2E2h_invi/ana/ana_File.root

  ;;

0.2.3) echo "Run with a few events"

    source setup.sh
    ./build.sh
    Marlin run/e2E2h_invi/steers/test/sample-1.xml

  ;;

0.2.4) echo "Generate Condor job scripts..."

   mkdir -p   ./run/e2E2h_invi/condor/script/marlin
   ./python/gen_condorscripts.py  1  ./run/e2E2h_invi/steers ./run/e2E2h_invi/condor  ${sel_signal}
```

Progress:

```
0.2.5) echo "Submit Condor jobs for pre-selection on signal..."

    cd ./run/e2E2h_invi/condor
    mkdir -p log
    ./condor_submit.sh

    ;;

0.2.6) echo "Select events on signal (with a small sample)..."

    mkdir -p   ./run/e2E2h_invi/events/ana
        mkdir -p   ./run/test
    ./python/sel_events.py  ./run/e2E2h_invi/ana/ana_File-2.root  ./run/e2E2h_invi/events/ana/ana_File-2.root

  ;;

0.2.7) echo "Generate Condor job scripts for event selection..."

    mkdir -p   ./run/e2E2h_invi/events/ana
    mkdir -p   ./run/e2E2h_invi/condor/script/eventsel
    ./python/gen_condorscripts.py  2  ./run/e2E2h_invi/ana ./run/e2E2h_invi/condor  ${sel_signal}

    ;;

0.2.8) echo "Submit Condor jobs for event selection on signal..."

    cd ./run/e2E2h_invi/condor
    mkdir -p log/events
    ./condor_submit_eventsel.sh


    ;;

0.2.9) echo  "Merge event root files..."

    mkdir -p   ./run/e2E2h_invi/hist
    ./python/mrg_rootfiles.py  ./run/e2E2h_invi/events/ana  ./run/e2E2h_invi/hist
```

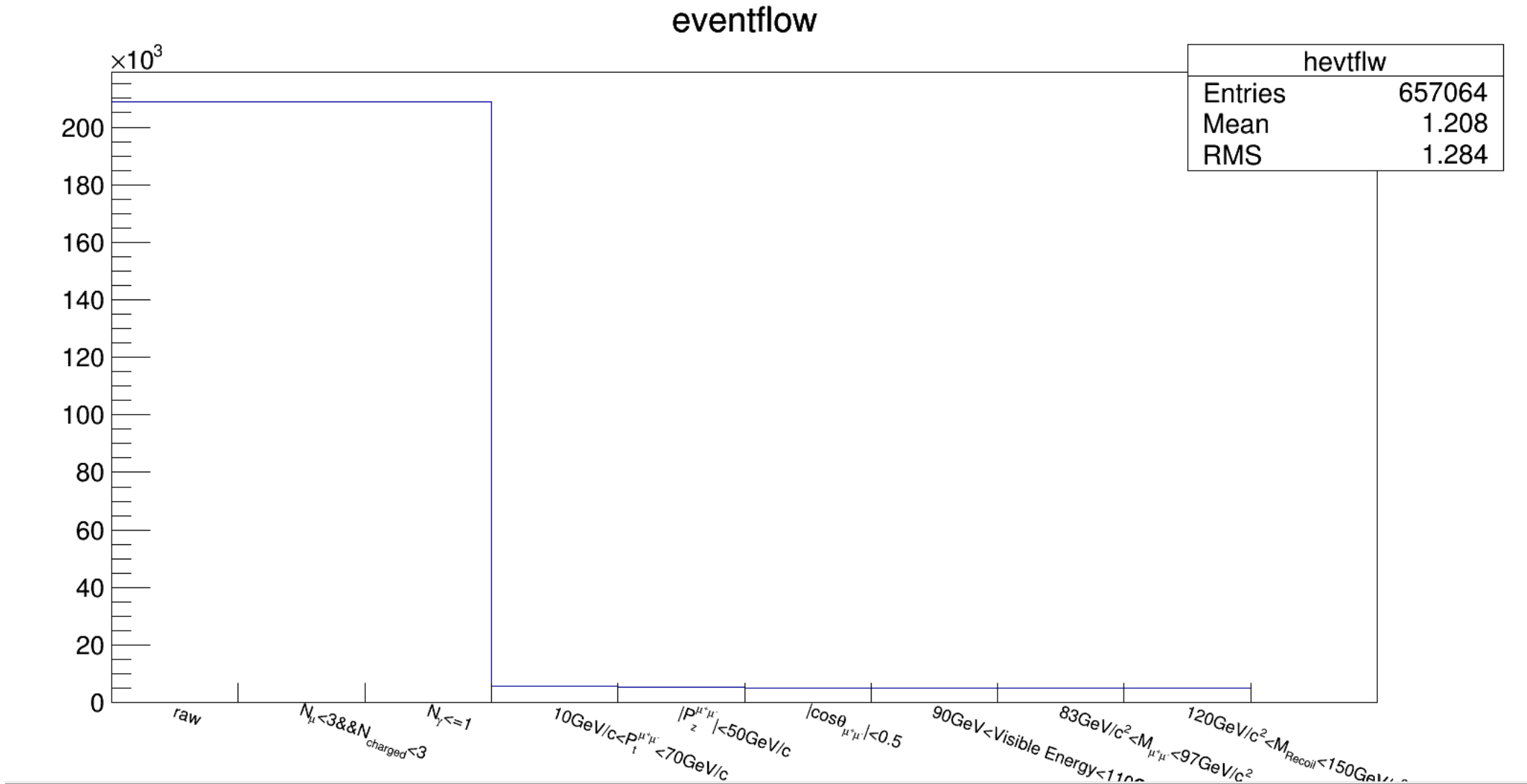
2)Modified sel_events.py file. This file's main process and functions are too long.Hard to maintain.

Main process:

```
    def run(self):
        #Cut eventflow and fill histrogram
        self.cut(self.t_in)
        #Fill root branches after cutting
        self.fill_root(self.t_in)
        #record the select efficiency
        self.out_eff(self.t_in,self.N,self.infile)
        #Write
        self.h_evtflw.Write()
        self.t_out.GetCurrentFile().Write()
        self.outfile.Close()
```

Question:

```
tanyuhang_lxslc603$ ./submit.sh 0.2.6
Select events on signal (with a small sample)...
Error in <TFile::WriteTObject>: Directory ./run/e2E2h_invi/ana/ana_File-2.root is not writable
Running time: 0.68 Seconds
tanyuhang_lxslc603$
```


eventflow
×10^3
200
180
160
140
120
100
80
60
40
20
0
hevtflw
Entries 657064
Mean 1.208
RMS 1.284
raw
N_μ<3&&N_charged<3
N_γ<=1
10GeV/c<P_t^μ⁺μ⁻<70GeV/c
|P_z^μ⁺μ⁻|<50GeV/c
|cosθ_μ⁺μ⁻|<0.5
90GeV<Visible Energy<110
83GeV/c²<M_μ⁺μ⁻<97GeV/c²
120GeV/c²<M_Recoil<150GeV/c²

Efficiency:

```
.....Cut flow.....

InputFile: ./run/e2E2h_invi/ana/ana_File-2.root

Total Events: 8863

Cut No.: 0

Events: 8863

Efficiency: 1.000000

........

Cut No.: 1

Events: 8863

Efficiency: 1.000000

........

Cut No.: 2

Events: 8863

Efficiency: 1.000000

........

Cut No.: 3

Events: 249

Efficiency: 0.028094

........

Cut No.: 4

Events: 246

Cut No.: 5

Events: 229

Efficiency: 0.025838

........

Cut No.: 6

Events: 227

Efficiency: 0.025612

........

Cut No.: 7

Events: 218

Efficiency: 0.024597

........

Cut No.: 8

Events: 218

Efficiency: 0.024597

........
```

Question:

```
TotalP=math.sqrt(t_in.m_p_dilepton[3]*t_in.m_p_dilepton[3]-t_in.m_p_dilepton[0]*t_in.m_p_dilepton[0]-t_in.m_p_dilepton[1]*t_in.m_p_dilepton[1]-t_in.m_p_dilepton[2]*t_in.m_p_dilepton[2])
```

Problem: 43 parameters. Some should be useless.

```
self.m_event=np.zeros(1, dtype='int')
self.m_event_type=np.zeros(1, dtype='int')
self.m_p_neutral=np.zeros(4, dtype='float')
self.m_p_photon=np.zeros(4, dtype='float')
self.m_p_leptonp=np.zeros(4, dtype='float')
self.m_p_leptonm=np.zeros(4, dtype='float')
self.m_p_dilepton=np.zeros(4, dtype='float')
self.m_p_charged=np.zeros(4, dtype='float')
self.m_p_Higgsdaughters=np.zeros(4, dtype='float')
self.m_p_Higgsdaughter1=np.zeros(4, dtype='float')
self.m_p_Higgsdaughter2=np.zeros(4, dtype='float')
self.m_p_Zdaughters=np.zeros(4, dtype='float')
self.m_p_Zdaughterp=np.zeros(4, dtype='float')
self.m_p_Zdaughterm=np.zeros(4, dtype='float')
self.m_pt_photon=np.zeros(1, dtype='float')
self.m_pt_dilepton=np.zeros(1, dtype='float')
self.m_pt_leptonm=np.zeros(1, dtype='float')
self.m_pt_leptonp=np.zeros(1, dtype='float')
self.m_pz_dilepton=np.zeros(1, dtype='float')
self.m_pz_leptonm=np.zeros(1, dtype='float')
self.m_pz_leptonp=np.zeros(1, dtype='float')
self.m_n_charged=np.zeros(1, dtype='int')
self.m_n_gamma=np.zeros(1, dtype='int')
self.m_n_leptonp=np.zeros(1, dtype='int')
self.m_n_leptonm=np.zeros(1, dtype='int')
self.m_n_chargedp=np.zeros(1, dtype='int')
self.m_n_chargedm=np.zeros(1, dtype='int')
self.m_n_Higgsdaughter=np.zeros(1, dtype='int')
self.m_n_neutrino=np.zeros(1, dtype='int')
self.m_m_visible=np.zeros(1, dtype='float')
self.m_m_recoil=np.zeros(1, dtype='float')
self.m_phi_dilepton_1=np.zeros(1, dtype='float')
self.m_phi_dilepton_2=np.zeros(1, dtype='float')
self.m_cos_miss=np.zeros(1, dtype='float')
self.m_cos_Z=np.zeros(1, dtype='float')
self.m_cos_theta_dilepton=np.zeros(1, dtype='float')
self.m_cos_theta_leptonm=np.zeros(1, dtype='float')
self.m_cos_theta_leptonp=np.zeros(1, dtype='float')
self.m_angle_dilepton=np.zeros(1, dtype='float')
self.m_delta_pt=np.zeros(1, dtype='float')
self.m_energy_neutrino=np.zeros(1, dtype='float')
self.m_energy_visible=np.zeros(1, dtype='float')
self.m_energy_leptonm=np.zeros(1, dtype='float')
self.m_energy_leptonp=np.zeros(1, dtype='float')
```

Next Plan

1) Solve the indentation problem of Vscode.

2) Learn python further.

3) Add BDT to the program.

4) Understand the physical quantities that need to be analyzed