# Beautiful_And_Simple_Drawing_Atificer (BASDA)

usage --- example

Yan Wang

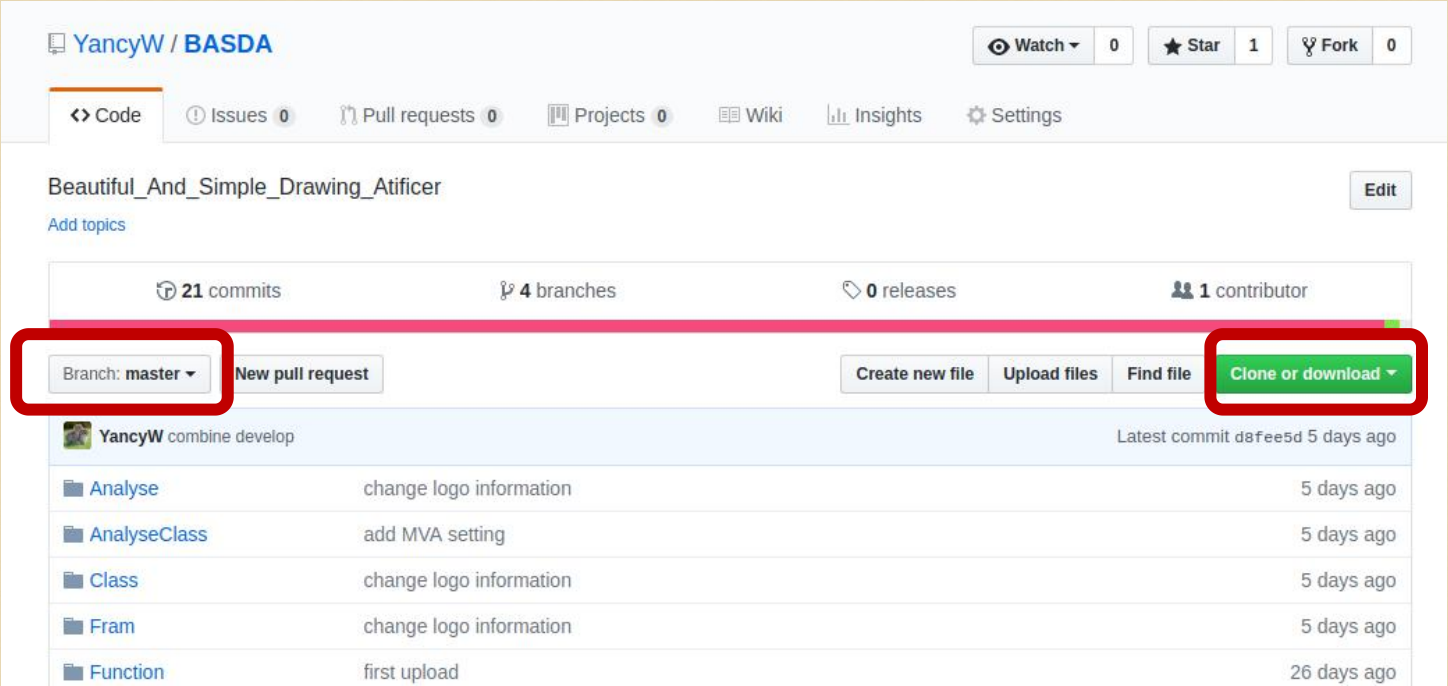
10-04-2018

# Installation

# Installation

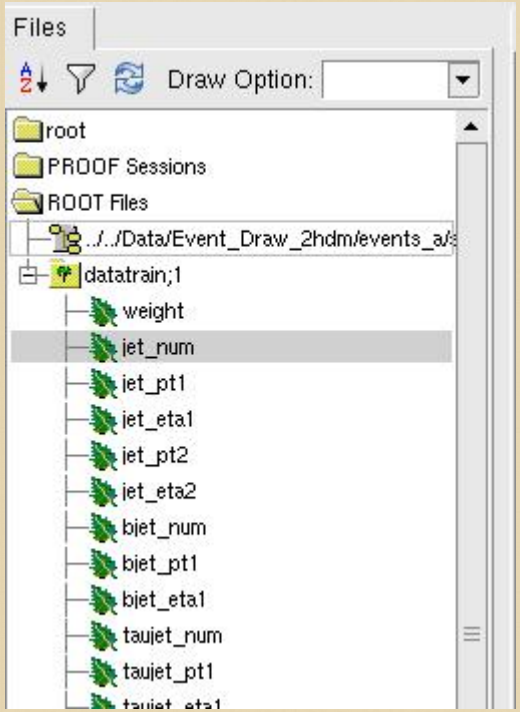
- https://github.com/YancyW/BASDA
  - four branches: master, release, develop, feature.

stable version



# installation

- c++14 ⊕ root6 ⊕ boost_filesystem
- yaml-cpp
  - https://github.com/jbeder/yaml-cpp
- input root file structure
  - weight (not necessary)
  - observables



# Installation (on NAF)

- initialize ilcsoft for gcc ≧ 4.8, root 6
- install YAML, change path for makefile_server
- in BASDA, cover makefile with makefile_server
  - mv makefile_server makefile

51 lines (40 sloc) | 1.92 KB  Raw  Blame  History

```
TARGET=BASDA

CXX=g++
FLAGS=-std=c++14  -Wextra  -Wall ${shell root-config --cflags}

RootPath=/cvmfs/ilc.desy.de/sw/x86_64_gcc48_sl6/v01-17-11/root/6.08.00
YAMLPath=/afs/desy.de/user/y/ywang/Software/Lib/yaml-cpp-master/

INCLUDE = -I. -I..  -I$(RootPath)/include  \
                   -I${YAMLPath}/include

LIBS =  -L${YAMLPath} -lyaml-cpp -lboost_filesystem  -lboost_system -lTMVA -lTMVAGui
ROOTLIBS := $(shell root-config --libs) -lXMLIO

SRCS = \
$(TARGET).cpp \
Class/Path.cpp\
Fram/Fram.cpp Fram/Fsection.cpp \
Function/Fbasic.cpp Function/Fvector.cpp Function/Ffile.cpp Function/FCalc.cpp Function/FString.cpp \
Latex/LTable.cpp Latex/LItem.cpp\
Lib/MessageFormat.cpp Lib/PlotSetting.cpp Lib/Record.cpp Lib/YAML_Assistant.cpp\
RWpara/RWFile.cpp RWpara/RWFlow.cpp RWpara/RWPath.cpp RWpara/RWDebug.cpp RWpara/RWDraw.cpp RWpara/RWbasic.cpp RWpara/RWEvent.cpp
RWpara/RWSensitivity.cpp RWpara/RWCut.cpp RWpara/RWPlot.cpp RWpara/RWMass_Scan.cpp RWpara/RWBKG_Sort.cpp RWpara/RWScenario.cpp R
Analyse/Analyse_Find_Cut.cpp  Analyse/Make_Table.cpp \
Analyse/Make_Complete_Table.cpp \
Analyse/Analyse_Pre_Cut.cpp \
```

change YAML path

# YAML

# YAML format

- YAML---YAML Ain't Markup Language
  - download/manuals https://github.com/jbeder/yaml-cpp
- a human-readable data serialization language
- in BASDA, only use simplest command

```
key :  value
```

or,

```
key :
    key :  value
    key :
            key :  value
```

or list,

```
key: [value1,value2, value3...]
```

# YAML format

it's space, NOT tab

note: DO NOT use tab in YAML.
DO NOT try to modify everything.
comments with #

vim Var_2hdm_a.dat

```
weight:
    Exist                    : False
    Weight_Type              : "F"
variable:
    v0:
      title_name             : "jet_num"
      cut_min                : 2.9
      cut_max                : 100
      latex_name             : "N^{j}"
      Canvas_name            : "c0"
      Canvas_width           : 1000
      Canvas_height          : 700
      leg_left               : 0.6
      leg_up                 : 0.7
      leg_right              : 0.8
```

vim Bkg_Sort.dat

```
# do not change the key name
sort_num    : 4

sub_sort_name : [sig, wtata, tt, txll]
sub_sort_num  : [1,   1,     2,  1   ]

# change below based on sub_sort names
sig   : [HA]
wtata : [l]
tt    : [l, sl]
txll  : [l]
```

```
<marlin>
  <execute>
    <processor name="MyAdd4MomCovMatrixCharged"/>
    <!--processor name="MyThrustReconstruction"/-->
    <processor name="MyIsolatedLeptonTaggingProcessor"/>
    <processor name="MyHiggsProcessor"/>
  </execute>

  <global>
    <parameter name="LCIOInputFiles">
/pnfs/desy.de/ilc/prod/ilc/mc-dbd/ild/dst-merged/250-TDR_ws/np-light-higgs/ILD_o1_v05/v01-16-p10_250
    </parameter>
    <parameter name="GearXMLFile"> GearOutput.xml </parameter>
    <parameter name="MaxRecordNumber" value="0" />
    <parameter name="SkipNEvents" value="0" />
    <parameter name="SupressCheck" value="false" />
    <parameter name="Verbosity" options="DEBUG0-4,MESSAGE0-4,WARNING0-4,ERROR0-4,SILENT">WARNING<
    <parameter name="AllowToModifyEvent" value="true" />
  </global>

  <processor name="MyAdd4MomCovMatrixCharged" type="Add4MomCovMatrixCharged">
    <parameter name="InputPandoraPFOsCollection" type="string"> PandoraPFOs </parameter>
    <parameter name="Verbosity" options="DEBUG0-4,MESSAGE0-4,WARNING0-4,ERROR0-4,SILENT"> MESSAGE
  </processor>
                                                                    4,1           Top
```

# input example

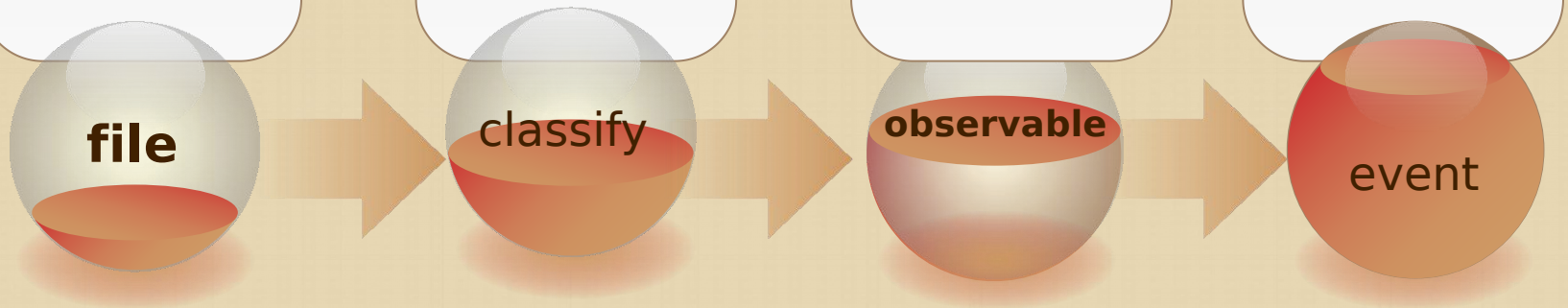
# input data

which file for analysis

sort A: file 1,2
sortB: file 3,
sortC: file 4,5,6

name,
figure setting for this obs,
cut,

which event for running,
all,
the first 100,
101-303...



# Path

**process name**

**main output folder,**

- **sub folders are under this**
- **if doesn't exist, code will create one**

**sub output folder**

**input folder**

- **if doesn't exist, report error**

**advanced input folder**

vim path.dat

```
PROCESS           : zh

# output folder
OUTPUT_FOLDER     : '../../Data/Event_Analyse'

RECORD_FILE       : 'tmp/nh_115.dat'
OUTPUT_FILE       : 'data'
EVENT_FILE        : 'results'
SINGLE_PLOT       : 'plot'
COMBINE_PLOT      : 'plot_compare'
HORIZONTAL_SUMMARY_PLOT : 'Event_Analyse/plot_summary'


# input folder
FLOW_FILE         : './control/flow.dat'
INPUT_FILE        : './control/file.dat'
BKG_SORT_FILE     : './control/Bkg_Sort.dat'

CUT_FILE          : './control/Cut/Cut_nh.dat'
VAR_FILE          : './control/Var/Var_nh_115.dat'

MASS_SCAN_FILE    : './control/Mass_Scan.dat'


#Advanced input setting
PLOT_FILE         : './control/advanced/Plot.dat'
DEBUG_FILE        : './control/advanced/debug.dat'
ANALYSIS_FILE     : './control/advanced/Event.dat'
SENSITIVITY_FILE  : './control/advanced/Sensitivity.dat'
SCENARIO_FILE     : './control/advanced/Scenario.dat'
```

## input file

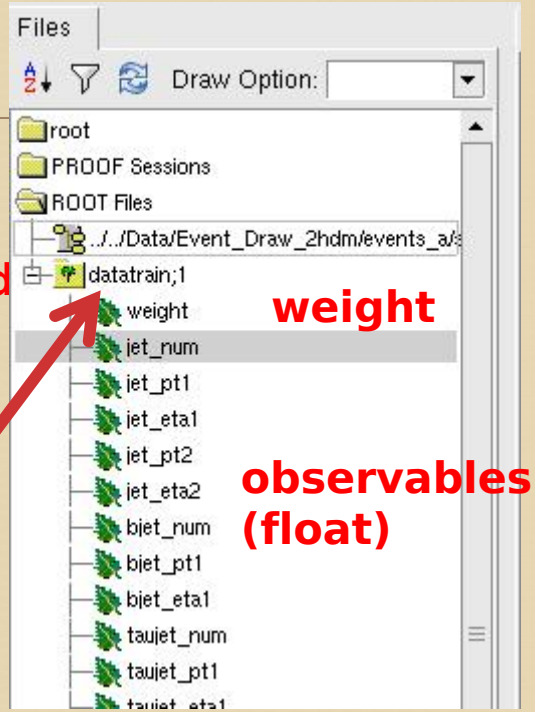
```
FILE_NUM            : 1
FILE_0              :  ./control/xection_aa.dat

CHANNEL_NUM         : 1
FILE_DESCRIP_0      : all
#FILE_DESCRIP_0      : nh
#FILE_DESCRIP_1      : 4f_{zz}^{l}

Root_Head_Name      : datatest
Root_Head_BDT_Name  : datatrain
```

**channel used in this time**

**root tree name**

support "integer", "float" and "double"
force them into float

## input root file structure




**weight**

**observables (float)**

## xection file

```
vim xection_aa.dat
root file 10:
    nh_{10}^{10}:
    |   /home/yancy/Code/Data/Event_Light_Higgs/origin_data/results_10/nh_10_eL.pR.root  :  79.026852
    |   /home/yancy/Code/Data/Event_Light_Higgs/origin_data/results_10/nh_10_eR.pL.root  :  50.415099
    4f_{ww}^{l}:
    |   /home/yancy/Code/Data/Event_Light_Higgs/origin_data/results_10/4f_ww_l_eL.pR.root  :  1564.2091
    |   /home/yancy/Code/Data/Event_Light_Higgs/origin_data/results_10/4f_ww_l_eR.pL.root  :  14.691728
    4f_{ww}^{sl}:
    |   /home/yancy/Code/Data/Event_Light_Higgs/origin_data/results_10/4f_ww_sl_eL.pR.root  :  18780.976
    |   /home/yancy/Code/Data/Event_Light_Higgs/origin_data/results_10/4f_ww_sl_eR.pL.root  :  172.73264
    4f_{zz}^{l}:
    |   /home/yancy/Code/Data/Event_Light_Higgs/origin_data/results_10/4f_zz_l_eL.pR.root  :  157.96041
    |   /home/yancy/Code/Data/Event_Light_Higgs/origin_data/results_10/4f_zz_l_eR.pL.root  :  99.506102
    4f_{zz}^{sl}:
    |   /home/yancy/Code/Data/Event_Light_Higgs/origin_data/results_10/4f_zz_sl_eL.pR.root  :  1422.1429
    |   /home/yancy/Code/Data/Event_Light_Higgs/origin_data/results_10/4f_zz_sl_eR.pL.root  :  713.52633
    4f_{zzww}^{l}:
    |   /home/yancy/Code/Data/Event_Light_Higgs/origin_data/results_10/4f_zzww_l_eL.pR.root  :  1636.0362
    |   /home/yancy/Code/Data/Event_Light_Higgs/origin_data/results_10/4f_zzww_l_eR.pL.root  :  53.955513
    4f_{zzww}^{sl}:
    |   no such class:  0
    4f_{szee}^{l}:
    |   /home/yancy/Code/Data/Event_Light_Higgs/origin_data/results_10/4f_szee_l_eL.pR.root  :  1084.0873
    |   /home/yancy/Code/Data/Event_Light_Higgs/origin_data/results_10/4f_szee_l_eR.pL.root  :  1019.5228
    |   /home/yancy/Code/Data/Event_Light_Higgs/origin_data/results_10/4f_szee_l_eL.pL.root  :  1009.6032
    |   /home/yancy/Code/Data/Event_Light_Higgs/origin_data/results_10/4f_szee_l_eR.pR.root  :  1008.4063
```

support "integer", "float" and "double"

- currently force them into float
- use "I", "F", "D" in Var.dat file to tell the code datatype.

# xection file

**signal property:**

- **seperate different analysis processes**
- **every mh can different input files**

**channel name: a_{b}^{c}**

vim ection_aa.dat

```
root file 10:
    nh_{10}^{10}:
    |   /home/yancy/Code/Data/Event_Light_Higgs/origin_data/results_10/nh_10_eL.pR.root  :  79.026852
    |   /home/yancy/Code/Data/Event_Light_Higgs/origin_data/results_10/nh_10_eR.pL.root  :  50.415099
    4f_{ww}^{l}:
    |   /home/yancy/Code/Data/Event_Light_Higgs/origin_data/results_10/4f_ww_l_eL.pR.root  :  1564.2091
    |   /home/yancy/Code/Data/Event_Light_Higgs/origin_data/results_10/4f_ww_l_eR.pL.root  :  14.691728
    4f_{ww}^{sl}:
    |   /home/yancy/Code/Data/Event_Light_Higgs/origin_data/results_10/4f_ww_sl_eL.pR.root  :  18780.976
    |   /home/yancy/Code/Data/Event_Light_Higgs/origin_data/results_10/4f_ww_sl_eR.pL.root  :  172.73264
    4f_{zz}^{l}:
    |   /home/yancy/Code/Data/Event_Light_Higgs/origin_data/results_10/4f_zz_l_eL.pR.root  :  157.96041
    |   /home/yancy/Code/Data/Event_Light_Higgs/origin_data/results_10/4f_zz_l_eR.pL.root  :  99.506102
    4f_{zz}^{sl}:
    |   /home/yancy/Code/Data/Event_Light_Higgs/origin_data/results_10/4f_zz_sl_eL.pR.root  :  1422.1429
    |   /home/yancy/Code/Data/Event_Light_Higgs/origin_data/results_10/4f_zz_sl_eR.pL.root  :  713.52633
    4f_{zzww}^{l}:
    |   /home/yancy/Code/Data/Event_Light_Higgs/origin_data/results_10/4f_zzww_l_eL.pR.root  :  1636.0362
    |   /home/yancy/Code/Data/Event_Light_Higgs/origin_data/results_10/4f_zzww_l_eR.pL.root  :  53.955513
    4f_{zzww}^{sl}:
    |   no such class:  0
    4f_{szee}^{l}:
    |   /home/yancy/Code/Data/Event_Light_Higgs/origin_data/results_10/4f_szee_l_eL.pR.root  :  1084.0173
    |   /home/yancy/Code/Data/Event_Light_Higgs/origin_data/results_10/4f_szee_l_eR.pL.root  :  1019.228
    |   /home/yancy/Code/Data/Event_Light_Higgs/origin_data/results_10/4f_szee_l_eL.pL.root  :  1009.6032
    |   /home/yancy/Code/Data/Event_Light_Higgs/origin_data/results_10/4f_szee_l_eR.pR.root  :  100.4063
```

**input file name with different polarizations:**

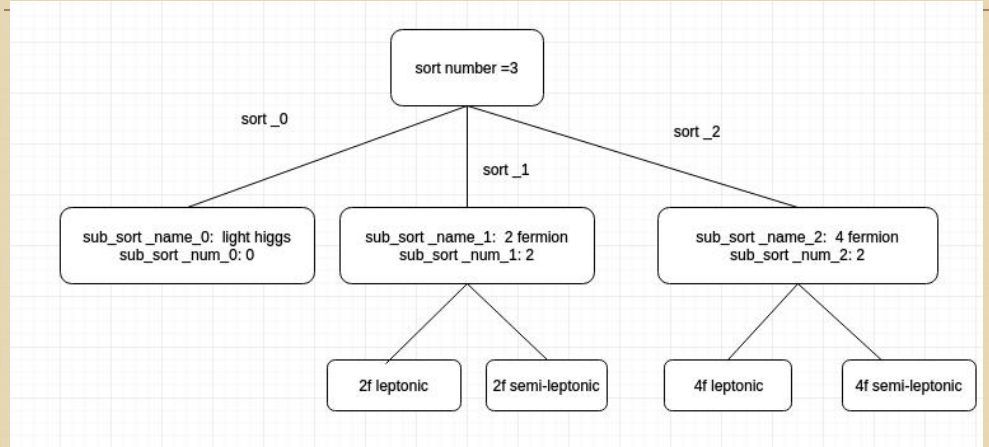
- **1 file : no polarization**
- **2 files: lr/rl**
- **4 files: lr/rl/ll/rr**

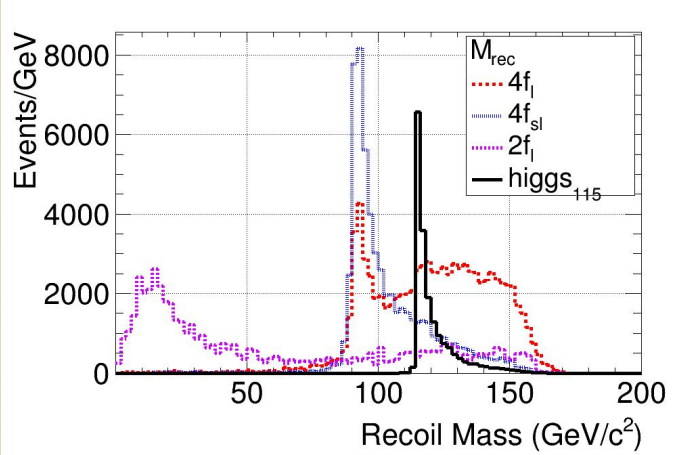
**cross section:**

- **works when choosing no "weight"**
- **when really don't have "weight" in input files**
- **when hoping to reweight events**

# classify

**channel name: a_{b}^{c}**
**a : sort**
**c : sub_sort**
**b : some special label**




```
vim Bkg_Sort.dat
1  # do not change the key name
2  sort_num    : 4
3
4  sub_sort_name : [sig, wtata, tt, txll]
5  sub_sort_num  : [1,   1,     2,  1   ]
6
7  # change below based on sub_sort names
8  sig   : [HA]
9  wtata : [l]
10 tt    : [l, sl]
11 txll  : [l]
12
```

# observables

obs name in code

obs name in input file

cut for this obs

plot para

whether use this obs as MVA input

vim Var_nh_30.dat

```
variable:
  v1:
    title_name           : "po_muon_kcut_zmass"
    cut_switch           : true
    cut_min              : 73.0
    cut_max              : 120.0
    plot_switch          : true
    latex_name           : "M_{l^{+}l^{-}}"
    Canvas_name          : "c1"
    Canvas_width         : 1000
    Canvas_height        : 700
    leg_left             : 0.75
    leg_up               : 0.7
    leg_right            : 0.9
    leg_down             : 0.9
    leg_header           : "e^{+}e^{-}->#mu^{+}#mu^{-} + X @ 250 GeV"
    xaxis_name           : "M_{Z} (GeV/c^{2})"
    xaxis_bin            : 100
    xaxis_min            : 51
    xaxis_max            : 131
    yaxis_name           : "Events"
    yaxis_bin            : 0
    yaxis_min            : 0
    yaxis_max            : 0
    log_yaxis            : true
    normalization_switch : false
    BDT                  : true
  v2:
    title_name           : "po_muon_kcut_zpt"
    cut_switch           : true
    cut_min              :   10.0
    cut_max              :   120.0
    plot_switch          : true
    latex_name           : "P_{T}^{l^{+}l^{-}}"
    Canvas_name          : "c2"
    Canvas_width         : 1000
    Canvas_height        : 700
    leg_left             : 0.80
    leg_up               : 0.7
    leg_right            : 0.95
    leg_down             : 0.9
    leg_header           : "e^{+}e^{-}->#mu^{+}#mu^{-} + X @ 250 GeV"
    xaxis_name           : "P_{T}^{Z} (GeV/c^{2})"
    xaxis_bin            : 100
    xaxis_min            : 0
    xaxis_max            : 150
    yaxis_name           : "Events"
    yaxis_bin            : 0
    yaxis_min            : 0
    yaxis_max            : 0
    log_yaxis            : true
    normalization_switch : false
    BDT                  : false
  v3:
    title_name           : "po_muon_kcut_invis_costheta"
    cut_switch           : true
```

# Cut

**pre-cut order**

**no pre cuts for this case, after Pre-CUT, event should be applied with MVA**

Cut_test.dat

```
pre_cut_num : 0

pre_cut_order : []

cut_num : 17

cut_order : [0, 1, 2, 8, 9, 10, 11, 12, 13, 14, 15, 16, 19, 22, 28, 31, 29]
```

**for normal cut: 17 cuts**

cut order

# Operation Flow

will do which operation with this code

use cut

record everything in log file

draw plots

only works for Summarize_Plot

generate events after all cuts

MVA setting

vim flow.dat

```
#operation

#BeginObject      : Complete_Run
#BeginObject      : Complete_Pol
#BeginObject      : Complete_Direct_Cut
#BeginObject      : Make_Complete_Table
#BeginObject      : Sensitivity
#BeginObject      : Pre_Cut
#BeginObject      : BDT_Train
#BeginObject      : BDT_Attach
#BeginObject      : Summarize_Plot
BeginObject       : Direct_Cut_ReWeight
#BeginObject      : Direct_Cut
#BeginObject      : Make_Table


# choose signal process and work scenario
signal_property   : 125
working_scenario  : running


# choose special setting

cut               : true
record_output     : false
plot              : true
plot_object       : before_cut
record_event      : true
MVA_training      : true
MVA_level         : 2
MVA_weight        : 1
```

# output example

# Pre cuts

sp is "signel property" set in the flow.dat
xxx is channel names set in the xection.dat

- related input: cut.pre_cut
- output:
  - data/sp/xxx_sp_Unpol.dat
    - cut efficiency for pre cuts
  - results/sp_Unpol/xxx_sp.dat
    - root file after applying pre cuts
  - results/sp_MVA/xxx_sp.dat
    - file for attaching MVA values
    - file for applying normal cuts

# MVA trainning

- related input: flow.MVA
- output:
  - data/sp/dataset
    - MVA weight dataset

# MVA value attaching

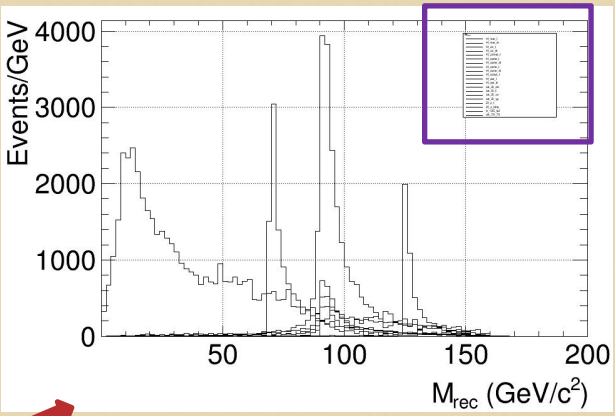
- related input: MVA weight file
- output:
  - results/sp_MVA/xxx_sp.dat
    - add MVA value for each channel

# normal cuts

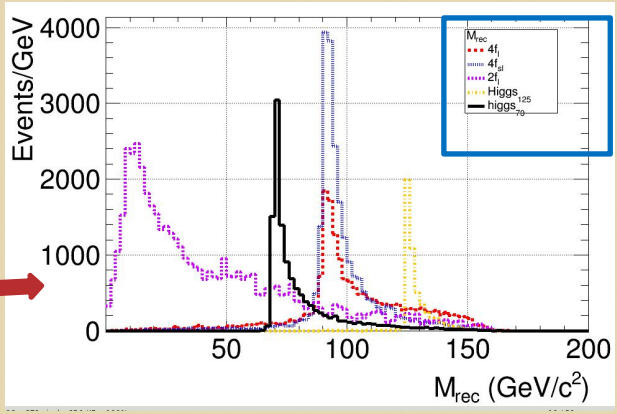
- related input: cut.pre_cut
- output:
  - data/sp/xxx_sp.dat
    - cut efficiency for pre cuts
  - results/sp_CUT/xxx_sp.dat

    file for applying normal cuts
  - plot/sp/obv.png
    - for each channel
  - plot_compare/sp/obv.png
    - for each sort

all channel




combined into sorts

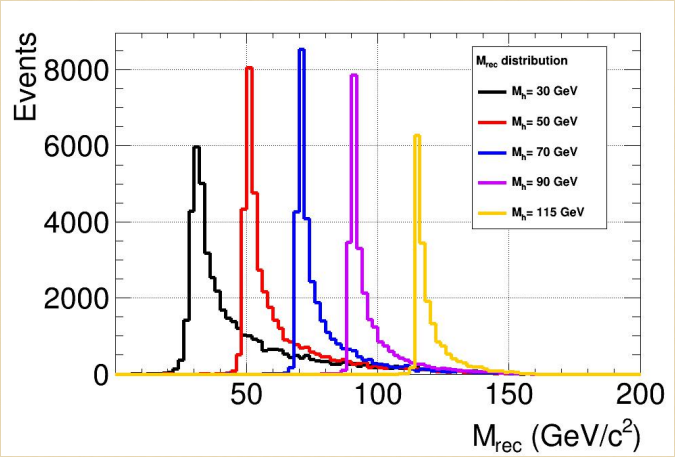


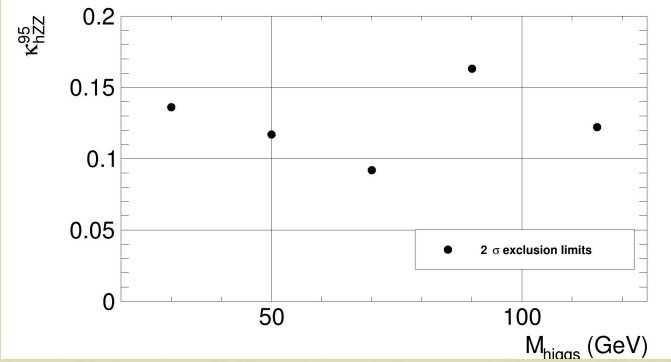
# compare between different signal characters

after generate results for different signal characters

compare them by control/scan.dat

- signal distribution
- cut efficiency table
- sensitivity



# advanced input example

# Event

vim Event.dat

```
#show many first events want to be analyses
first_events_num    : -1

#which events want to analysse
special_events_num : -1

```

1. when first =-1, special=-1 => use all events
2. when first = n, special=-1 => use first n events
3. when first =-1, special= n => use the n-th event
4. when first =n1, special=n2 => use events from n1 to n2

where if n > total events, n = total events, and n1 < n2

# Sensitivity

1. control/Sensitivity.dat
2. get data from root results
3. calculate sensitivities according to the control file.

**rescale signal cross section**

vim Sensitivity.dat

```
ExpCL              : 0.9545
sig_scale_switch   : true
sig_scale_factor   : 1000
sig_scale_pow      : 2
```

# new scenario

1. control/scenario.dat
2. re-use results in Cuts_1 when changing the polarization. (MVA variable need to be recalculated.)
3. re-use results in Cuts_2 when changing the luminosity.

**polarization value**

**luminosity**
**running polarization**

vim Scenario.dat

```
elec_pol        : 0.8
posi_pol        : 0.3

Scenario        :
    scenario1:
        |  name          : running
        |  energy        : 250
        |  luminosity    : 2000
        |  (-,+)         : 0.45
        |  (+,-)         : 0.45
        |  (-,-)         : 0.05
        |  (+,+)         : 0.05
```

# Thank you!