Code Documentation for the LLTopAna repository of Paul Vaucelle

LLTopAna.h / LLTopAna.C / LLTopAna_Run.C / plot1_compare.C / plot3_compare-rap_eta.C / plot1_perf.C

CMS

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README

The directory for the simulation, generation and reconstruction of tracks is called LLTopAna. It is composed of several files and directories but not all of them were modified by Paul Vaucelle. The ones that were not modified are still useful nevertheless. Here is March 30, 2022's list of the files and repertories:

- AutoDict_vector_vector_int_allocator_int_____cxx.so*
- LLTopAna.h
- CMSSW_10_6_20/
- LLTopAna_Run.C*
- HistogramManager.C*
- LLTopAna_Run.C.bck*
- HistogramManager_C.d
- MACROS/
- HistogramManager_C.so*
- output/
- HistogramManager.h*
- LLTopAna.C*
- system.h*
- AutoDict_vector_vector_int_allocator_int_____.cxx
- LLTopAna_C.d
- AutoDict_vector_vector_int_allocator_int_____cxx.d
- LLTopAna_C.so*

Main Directory: LLTopAna

/opt/sbg/cms/ui2_data1/pvaucell/LLTopAna

Not modified files

- AutoDict_vector_vector_int_allocator_int_____cxx.so*
- AutoDict_vector_vector_int_allocator_int_____cxx.d
- LLTopAna_C.so*
- LLTopAna_C.d
- HistogramManager.C*
- LLTopAna_Run.C.bck*
- HistogramManager_C.d
- HistogramManager_C.so*
- HistogramManager.h*
- system.h*

These files are mostly useful to make the treatment of event easier, no more comment will be made since these files don't matter for the use of other algorithm (with the way we want to use these algorithm). Note that a file .rootrc can be found in most repositories that are going to be mentioned. This file is just to setup the font of the ROOT software.

Main Directory: LLTopAna

/opt/sbg/cms/ui2_data1/pvaucell/LLTopAna

Modified files

- CMSSW_10_6_20/
- MACROS/
- LLTopAna_Run.C*
- LLTopAna.h
- LLTopAna.C*
- output/
- plot1_perf.C
- plot2_perf.C

First, we are going to have at the first two repositories mentioned above then the files to end with the output repository.

CMSSW_10_6_20/ : This repository is filled with sub-directories but only one is useful : /MC/2018. Indeed, it gives access to all the samples of simulated data (ex : UDD_bgctau10_smu250_snu200. each of them having different set of parameters. These sets of data will be used later on to study the discrimination parameters to separate particles coming from LLP and the ones that do not.
MACROS/ : Contains all the necessary ROOT macros to launch :

- **plot1_compare.C:** Superposition of two histograms
- **plot3_compare-rap_eta.C:** Superposition of two (or more) histograms with their ratios. Here, it is used to compare one histogram describing isFromLLP with a particular parameter and one histogram describing NotFromLLP with the same parameter (ex : p_t, eta,...)

- **plot1_perf.C:** Evaluation of the capability of a parameter to discriminate between a particle coming from a LLP and the ones that do not. The last implementation allows to compare the discrimination power of this parameter for the 4 MC samples (it is also available for 2 or 3 samples).

- **plot2_perf.C :** Comparison of the evaluation of the capability of two parameters to discriminate between a particule coming from a LLP and the ones that do not. The last implementation allows to compare for a maximum of 4 files

- **plot3_compareIsFromLLP.C :** Compares one histogram describing isFromLLP with one particular parameter **of one sample of data** with 3 other histograms (coming from the 3 other MC samples describing NotFromLLP.

- **plot3_compareNotFromLLP.C :** Compares one histogram describing NotFromLLP with one particular parameter **of one sample of data** with 3 other histograms (coming from the 3 other MC samples describing NotFromLLP.

FILES:

- **LLTopAna_Run.C* :** File to run to execute LLTopAna.C. It also shows the sample of MC Data that is used in the track reconstruction and characterization (root -b LLTopAna_Run.C -q)

- **LLTopAna.h :** Header file, initialisation of the branches

- **LLTopAna.C* :** Track reconstruction and characterization considering this Feynman Diagram : After the
LLTopAna_Run.C is run, all the histograms defined in LLTopAna.C are stored in the output repository.

You can find these files and macros on the github repo :
https://github.com/Threshic/CMSTracking1.git

output/ : In the output directory, many things are displayed:

- The results of the application of LLTopAna.C on of the samples (ex : UDD_bgctau10_smu250_snu200.root -> h_UDD_bgctau10_smu250_snu200.root)
- isFromLLP4s : Comparison between the 4 samples of each parameter when the particle registered is coming from a LLP.
- isFromLLPNotFromLLP4s : Comparison for each sample , for each parameter between the parameter when the particle registered coming from a LLP and when it is not.
- NotFromLLP4s : Comparison between the 4 samples of each parameter when the particle registered is not coming from a LLP.
- ROC1param4sampl : ROC curve for each of the 18 parameters, the curve is done for all 4 samples on the same plot for each parameter.