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b-tagging tutorial

Complete: 

Btagging example

Let's create a working area based on CMSSW 1.1.1, add the latest b tagging software packages, and run the TrackCounting and SoftLepton algorithms on some b and c jets:

```
scramv1 project -n Tutorial20061116 CMSSW CMSSW_1_1_1
cd Tutorial20061116/src/
project CMSSW
cvs co -r Tutorial20061116 DataFormats/BTauReco
cvs co -r Tutorial20061116 RecoBTau
cvs co -r Tutorial20061116 RecoBTag
scramv1 b -r
eval `scramv1 runtime -sh`
cd ..
```

Two sample config files are test_b.cfg and test_c.cfg.

```
mkdir analysis
cd analysis
wget https://twiki.cern.ch/twiki/pub/CMS/BTagTutorialFnal/test_b.cfg
cmsRun test_b.cfg
```

and

```
wget https://twiki.cern.ch/twiki/pub/CMS/BTagTutorialFnal/test_c.cfg
cmsRun test_c.cfg
```

We can look at the output with ROOT and fwLite:

```
gSystem->Load("libFWCoreFWLite.so");
AutoLibraryLoader::enable();
TFile* file = new TFile("test_b.root");
new TBrowser;

Events->SetAlias("tkCountBase", "recoJetTags_trackCountingJetTags__bTag.obj");
Events->SetAlias("tkCountExt", "recoTrackCountingTagInfos_trackCountingJetTags__bTag.obj");
Events->SetAlias("leptonBase", "recoJetTags_softLeptonJetTags_softLepton_bTag.obj");
Events->SetAlias("leptonExt", "recoSoftLeptonTagInfos_softLeptonJetTags__bTag.obj");

c1 = new TCanvas();
c1->Divide(2,2);
c1->cd(1);
Events->Draw("tkCountBase.discriminator()", "tkCountBase.jet().pt() > 20");
c1->cd(2);
Events->Draw("tkCountBase.jet().pt()");
c1->cd(3);
Events->Draw("tkCountExt.discriminator(3,1)", "tkCountBase.jet().pt() > 20");
c1->cd(4);
Events->Draw("tkCountExt.discriminator(3,0)", "tkCountBase.jet().pt() > 20");

c2 = new TCanvas();
c2->Divide(2,2);
c2->cd(1);
Events->Draw("leptonExt.discriminator()", "(leptonExt.jet().pt() > 20) && (leptonExt.leptons() > 2)");
c2->cd(2);
Events->Draw("leptonExt.jet().pt()");
c2->cd(3);
```

```
Events->Draw("leptonExt.properties(0).sip3d", "(leptonExt.jet().pt() > 20) && (leptonExt.leptons(
c2->cd(4);
Events->Draw("leptonExt.properties(0).ptRel", "(leptonExt.jet().pt() > 20) && (leptonExt.leptons(
```

Analysis

For this tutorial, check out the head of `RecoBTag/Analysis` and `RecoBTag/MCTools`, and compile the two packages.

The full explanation of the Analysis package is given in this page.

Exercise:

- Run on your sample of *b* jets, calling the output file `plots_b.root`. Use the configuration file `RecoBTag/Analysis/test/bTagAnalysisExample.cfg` and replace the name of the output file:

```
replace bTagTrackCountingAnalysis.rootfile = "plots_b.root"
```

- Run on your sample of *c* jets, calling the output file `plots_c.root`
- You now have two root files. Merge the files obtained using the root executable `hadd` (you should have this in your path, in `$ROOTSYS/bin`):

```
hadd plots_add.root plots_b.root plots_c.root
```

- Run the cfg file `nicePlots.cfg` to produce the final performance plots and produce a root file (`test_final.root`) and eps and ps files of the merged plots (= `cmsRun nicePlots.cfg`). Notice in `nicePlots.cfg` the replace statements, to replace the parameters of the default configuration. In case you have used different eta and pt bins, put in the correct bins through two other replace statements. For example:

```
replace bTagTrackCountingAnalysis.etaRanges = { 0.0, 2.4 }
replace bTagTrackCountingAnalysis.ptRanges = { 30.0, 400.0 }
```

Look at the plots produced, either in the root file, the ps or the eps file.

MC tools

An example of the usage of the Jet flavour identification tools is given in the EDAnalyzer `RecoBTag/MCTools/test/BtagMCTest.cc`. It is explained in the `SWGuideBTagMCTools` page. A sample configuration file to run it is provided in the same directory (`test.cfg`).

Review Status

Editor/Reviewer and date	Comments
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JennyWilliams - 30 Mar 2007	

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