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General Information

B-tagging code

- <https://gitlab.cern.ch/fuhe/athena>
- [JetTagNonPromptLepton](#)
- [GroupData/JetTagNonPromptLepton](#)
 - ◆ [Path: /cvmfs/atlas.cern.ch/repo/sw/database/GroupData/JetTagNonPromptLepton/](#)
 - ◆ [ATLINFR-1090 - mc15a training](#)
 - ◆ [ATLINFR-1106 - mc15c training](#)
 - ◆ [ATLINFR-1341 - new variables](#)
 - ◆ [ATLINFR-2051 - first r21 trainings, including new tau versions](#)
- [xAOD IParticle](#)
- [HIGG8D1.py](#)
- [FlavourTagPerformanceFramework xAOD README](#)
- [B-tagging algorithms and configuration files](#)
 - ◆ [B-tagging reference histograms](#)
- [MV2Tag.cxx](#)
- [b-tagging CVMFS area](#)
- [ATLAS nightly builds](#)
- [RTT website](#)
- [Flavour Tagging Algorithm meeting August 16](#) - useful talk on secondary vertexing
- [Flavour Tagging Algorithm meeting October 11](#) - talk on soft tagging
- <https://gitlab.cern.ch/atlas/athena/blob/21.2/PhysicsAnalysis/MCTruthClassifier/MCTruthClassifier/MCTruthClassifier>
- [ATLAS C++ coding guidelines](#) - guidelines for developing athena code
- [guidelines for reviewing athena merge request](#)
- [Options for Reco_tf.py derivation production jobs:](#)
[DerivationProductionTeam#Info_on_AthDerivation_caches_and](#)

ttH references

- [ATLAS-COM-CONF-2019-062](#) - ttH and ttW CONF with 80 fb⁻¹

Tracking/vertexing code and references

- [Tracking/TrkVertexFitter/TrkVertexBilloirTools](#)
- [Tracking/TrkVertexFitter/TrkVertexFitters](#)
- [InDetImprovedJetFitterVxFinder.cxx](#)
- [Software Tutorial, June 2019](#)
- [Application of Kalman filtering to track and vertex fitting by R.Frühwirth, 1987](#)
- [CERN-THESIS-2010-027](#) - Giacinto thesis

MCP and EGamma code

- [Electron T&P framework](#)
- [EGamma derivations](#)
- [DerivationFrameworkMuons](#) - muon derivations package

Presentations - recent

- MCP October 23, 2019 [↗](#)
- EGamma October 2, 2019 [↗](#)
- CLHCP October 24, 2019 [↗](#)

Presentations - older

- Egamma T&P June 13 [↗](#)
- EGamma March 16 [↗](#)
- EGamma February 24 [↗](#)
- MCP January 29 [↗](#)
- April flavour tagging workshop [↗](#)
- Algorithm meeting May 12 [↗](#)
- ttH to leptons May 17 [↗](#)
- EGamma May 18 [↗](#)
- MCP May 18 [↗](#)
- MCP May 25 [↗](#)
- MCP June 22 [↗](#) - first look at Z T&P for muons
- Isolation forum June 27 [↗](#)
- Flavour tagging plenary Aug 2 [↗](#)
- Flavour tagging plenary November 1 [↗](#)
- Isolation forum December 16, 2016 [↗](#)
- MCP January 11, 2017 [↗](#)
- EGamma January 11, 2017 [↗](#)
- HTop optimisation results January 18, 2017 [↗](#)
- MCP October 18, 2017 [↗](#)
- Flavour Tagging Algorithm meeting November 23, 2017 [↗](#)
- MCP November 29 [↗](#) - input for physics workshop
- EGamma January 17, 2018 [↗](#) - status report
- MCP April 18, 2018 [↗](#) - first release 21 results
- IFF June 24, 2018 [↗](#) - status report
- <https://indico.cern.ch/event/748648/timetable/?view=standard> [↗](#) - EGamma workshop January, 2019
- <https://indico.cern.ch/event/795039/timetable/?view=standard> [↗](#) - 2019 tracking and flavour tagging workshop at DESY
- <https://indico.cern.ch/event/840663/> [↗](#) - internal prompt tagging development workshop at CERN
- https://indico.cern.ch/event/842198 [↗](#) - Fudong's report in USTC weekly meeting

Documentation

- PromptLeptonTagging - prompt lepton tagging TWiki
- PhysicsLightPrompt - new prompt lepton tagging TWiki for Fudong's project
- ATL-COM-PHYS-2018-1083 [↗](#) - our supporting note for release 21
- ATL-COM-PHYS-2016-1444 [↗](#) - our supporting note
- ATL-COM-PHYS-2017-101 [↗](#) - ttH supporting note
 - ◆ ttH note git repository [↗](#)
- Valerio's talk April 21 [↗](#)
- Flavor tagging workshop February 11-13, 2015 [↗](#)
 - ◆ Track selection talk [↗](#)
- ATL-COM-PHYS-2015-644 [↗](#) - Commissioning of the ATLAS b-tagging algorithms on early Run-II data
- ATL-COM-PHYS-2015-642 [↗](#) - Expected performance of the ATLAS b -tagging algorithms in Run 2

- [ATLAS-PERF-2012-04-002](#) - b-tagging performance with 2012 data
- [Run2BtagOptimisationFramework TWiki](#)
- [CMTMakeRosettaStone](#) - CMT to CMake help page
- [ATL-COM-PHYS-2017-290](#) - isolation supporting note
- <https://cds.cern.ch/record/2243540/> - Secondary vertex finding for jet flavour identification PUB note

References

- [MeetingsttHMLEB](#)
- [HSG8](#)
- [Flavour tagging PUB on secondary vertex tagging](#)
- [JetFitter public plots with release 21](#)
- [Optimisation and performance studies of the ATLAS bb-tagging algorithms for the 2017-18 LHC run](#)
- [ttH multi-lepton paper draft for 2017 analysis](#)
- [ATLAS ttW 13 TeV paper](#)

ttbar sample xAOD dsid

mc16_13TeV:mc16_13TeV.410470.PhPy8EG_A14_ttbar_hdamp258p75_nonallhad.merge.AOD.e6337_e5984_s3126
mc16_13TeV:mc16_13TeV.410470.PhPy8EG_A14_ttbar_hdamp258p75_nonallhad.merge.AOD.e6337_e5984_s3126
mc16_13TeV:mc16_13TeV.410470.PhPy8EG_A14_ttbar_hdamp258p75_nonallhad.merge.AOD.e6337_e5984_s3126

ttbar sample MUON5 dsid

mc16_13TeV.410470.PhPy8EG_A14_ttbar_hdamp258p75_nonallhad.deriv.DAOD_MUON5.e6337_e5984_s3126_r9
22.411 TB, 119432000
mc16_13TeV.410470.PhPy8EG_A14_ttbar_hdamp258p75_nonallhad.deriv.DAOD_MUON5.e6337_e5984_s3126_r1
mc16_13TeV.410470.PhPy8EG_A14_ttbar_hdamp258p75_nonallhad.deriv.DAOD_MUON5.e6337_e5984_s3126_r1

Zmumugam sample xAOD dsid

mc16_13TeV:mc16_13TeV.366145.Sh_224_NN30NNLO_mumugamma_LO_pty_7_15.merge.AOD.e7006_e5984_s3126
Total events : 999000
mc16_13TeV:mc16_13TeV.366146.Sh_224_NN30NNLO_mumugamma_LO_pty_15_35.merge.AOD.e7006_e5984_s3126
Total events : 3995000
mc16_13TeV:mc16_13TeV.366147.Sh_224_NN30NNLO_mumugamma_LO_pty_35_70.merge.AOD.e7006_e5984_s3126
Total events : 499000
mc16_13TeV:mc16_13TeV.366148.Sh_224_NN30NNLO_mumugamma_LO_pty_70_140.merge.AOD.e7006_e5984_s3126
Total events : 250000
mc16_13TeV:mc16_13TeV.366149.Sh_224_NN30NNLO_mumugamma_LO_pty_140_E_CMS.merge.AOD.e7006_e5984_s3126
Total events : 250000
mc16_13TeV:mc16_13TeV.366145.Sh_224_NN30NNLO_mumugamma_LO_pty_7_15.merge.AOD.e7006_e5984_s3126
Total events : 1246000
mc16_13TeV:mc16_13TeV.366146.Sh_224_NN30NNLO_mumugamma_LO_pty_15_35.merge.AOD.e7006_e5984_s3126
Total events : 4985000
mc16_13TeV:mc16_13TeV.366147.Sh_224_NN30NNLO_mumugamma_LO_pty_35_70.merge.AOD.e7006_e5984_s3126
Total events : 624000
mc16_13TeV:mc16_13TeV.366148.Sh_224_NN30NNLO_mumugamma_LO_pty_70_140.merge.AOD.e7006_e5984_s3126
Total events : 319000
mc16_13TeV:mc16_13TeV.366149.Sh_224_NN30NNLO_mumugamma_LO_pty_140_E_CMS.merge.AOD.e7006_e5984_s3126

Total events : 320000

mc16_13TeV:mc16_13TeV.366145.Sh_224_NN30NNLO_mumugamma_LO_pty_7_15.merge.AOD.e7006_e5984_s

Total events : 1670000

mc16_13TeV:mc16_13TeV.366146.Sh_224_NN30NNLO_mumugamma_LO_pty_15_35.merge.AOD.e7006_e5984_s

Total events : 6461000

mc16_13TeV:mc16_13TeV.366147.Sh_224_NN30NNLO_mumugamma_LO_pty_35_70.merge.AOD.e7006_e5984_s

Total events : 834000

mc16_13TeV:mc16_13TeV.366148.Sh_224_NN30NNLO_mumugamma_LO_pty_70_140.merge.AOD.e7006_e5984_s

Total events : 418000

mc16_13TeV:mc16_13TeV.366149.Sh_224_NN30NNLO_mumugamma_LO_pty_140_E_CMS.merge.AOD.e7006_e

Total events : 250000

RNN INPUT samples

- Zgam mini-ntup samples (Full run-2) atint:/net/ustc_03/prompt/MININTUP/zgam_mc_fullrun2.root
- Zgam mini-ntup samples atint:/net/ustc_03/prompt/MININTUP/zgam_mca[d,e]
- Zgam ntuple samples atint:/net/ustc_03/prompt/NTUP/zgam_mca[d,e]

Data

- Penn EOS storage space:

```
ssh -XY pennww@lxplus.cern.ch
/eos/atlas/atlascerngroupdisk/penn-ww/
```

Setup atlas environment in release 21

- Follow instructions here: <https://atlassoftwaredocs.web.cern.ch/gittutorial/>
 - ◆ Note that a user has to fork repository from [gitlab.cern.ch](https://atlassoftwaredocs.web.cern.ch/gittutorial/gitlab-fork/): <https://atlassoftwaredocs.web.cern.ch/gittutorial/gitlab-fork/>
 - ◆ Go to the 21.2 athena release
 - ◆ After the fork instructions stop using this guide (but refer back to how the workflow works, like tags and such).
- Setup acm with instructions found here: <https://twiki.cern.ch/twiki/bin/viewauth/AtlasComputing/CMTCTMakeRosettaStone>
 - ◆ Use this release when following the instructions:

```
acmSetup --sourcedir=../source AthDerivation,21.2,21.2.3.0
```

- Checkout packages:

```
acm add_pkg athena/PhysicsAnalysis/DerivationFramework/DerivationFrameworkHiggs
acm add_pkg athena/PhysicsAnalysis/JetTagging/JetTagNonPromptLepton
```

- Download AOD for testing (e.g. mc16_13TeV.410501.PowhegPythia8EvtGen_A14_ttbar_hdamp258p75_nonallhad.merge.AOD.e5458_s3126) and run derivation with command:

```
Reco_tf.py --inputAODFile input_AOD.pool.root --outputDAODFile output.pool.root --reductionConf H
```

- Internal checks of JetTagNonPromptLepton can be run on MUON5 derivations, with commands like this:

```
athena share/JetTagNonPromptLepton_decorate.py -c 'inputDir="{MUON5_file}";EvtMax=10'
```

- When making merge requests be sure to add a "sweep:ignore" label, which stops git trying to merge the 21.2 development branch (the only place JetTagNonPromptLepton lives) with master. Also add "Derivation" label.

Summary of taggers

- SV1
 - ◆ Uses loosest track selection with $p_T > 400$ MeV
- JetFitter is probably most complex tagger
 - ◆ Uses tracks with $p_T > 786$ MeV
 - ◆ Difficult to change configuration and to understand and interpret results
 - ◆ Requires substantial time investment to learn how to operate
- IP3D is most optimal for low and medium p_T jets (based on BDT weights of input variables)
 - ◆ Uses tracks with $p_T > 1000$ MeV
 - ◆ Requires training files with PDFs
 - ◆ Produce training files by setting `doComputeReference=True`
 - ◆ Can we train only for our specific topology?
 - ◆ Important information in sign of impact parameter
- Variable size cone for track selection
 - ◆ 0.45 for jet $p_T = 20$ GeV

Initial plan

- Make full b-tagging ntuples with all tracks
 - ◆ `ReduceInfo = False`
 - ◆ Saves all reconstructed tracks
 - ◆ Flag for which tagger used this track
 - ◆ Flag for whether track matches a particle from b-hadron
- Study which tracks are used by IP3D
 - ◆ Fraction of b-hadron tracks used for different selection
- Change track selection for IP3D
 - ◆ Create new references
 - ◆ Rerun with new references

Proposed tasks for b-tagging algorithm group

- Compare MV2 with standalone IP3D
 - ◆ Can IP3D alone perform as well as MV2 for this topology?
 - ◆ Add default IP3D to our ntuples
 - ◆ Also compare returned IP3D with MV2
- Switch to using b-tagging performance ntuples with all tracks
 - ◆ Check that muon variables are saved: p_T , η , ϕ , isolation and impact variables
 - ◆ Add muon truth matching and parent truth information
- Study track selection for IP3D
 - ◆ Make plots as in page 3 of Valerio's talk on September 17 [↗](#)
 - ◆ Study track p_T , DR, etc - find best track selection for loose isolated lepton topology
- Train new IP3D with updated track selection
 - ◆ Create new references and repeat our study
- Longer term issues
 - ◆ Does fake rejection depends on pileup? What is pileup and underlying event systematic?
 - ◆ Study electrons

Ideas for improvements

- Can we reconstruct K^0 to $\pi^+\pi^-$ decays? Does this help to identify B decays?
 - Does it help to select a reconstructed ID track which has a highest impact parameter when combined with muon track?
 - Make event displays to understand how b-tag veto can be improved
 - Systematic uncertainty: correlations between b-tagging weight and isolation variables
-

Tasks

Current task list

- Develop and document standalone tool - if necessary
 - ◆ Code and instructions for adding necessary input variables to derivations: track jets and flavour tagging
 - ◆ Code and instructions for standalone dual tool that runs on xAOD
- Optimise saving of input and output variables in xAOD
 - ◆ Different prefixes for input and output variables
 - ◆ Add python configuration for saving only BDT weights into DxAOD (to save space for CP derivations)
- Merge package branch and trunk

Working with data

- The calculation of the fake efficiency of whatever algorithm we use can be done by
 - ◆ Looking at the inclusive muon spectrum, whilst subtracting the W and Z components to look at the multijet background.
 - ◆ Looking at the 2ISS $t\bar{t}$ control region: 2 or 3 jets, 2 same sign leptons. The problem with this is that there is a sizeable $t\bar{t}W$ background to disentangle - which would be done with Monte Carlo.
 - The easier of the two is looking at the control region - this is the method that we will use for ICHEP.
 - The other method is less biased but harder - to keep in mind for the long term.
-

To-do list (updated 12-01-17)

Truth study tasks

- Do full truth study of lepton origins, including non-prompt and charge misid - done.
- Plot BDT for electrons with direct tau parent to see if the BDT biases against taus which have similar lifetime to B hadrons - done.

BDT optimisation tasks

- Add $p_T(\text{lepton})/p_T(\text{jet})$ and $dR(\text{lepton}, \text{jet})$ variables in BDT to see how rejection improves - done
- Have an "all-in-one" BDT including isolation, impact parameter etc. and a "b-tagging only" BDT - done

Ideas for updates

- Check $p_{T\text{Rel}}$ variable - like $p_T(\text{lepton})/p_T(\text{jet})$
 - Remove one of ip_2 or ip_3
 - Use both 410000 and 410009 for training to improve statistics
-

This topic: [Main > PhysicsLightSoftTagging](#)

Topic revision: r98 - 2019-11-08 - RustemOspanov



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