DA vertices for *b*-tagging in single-top trigger

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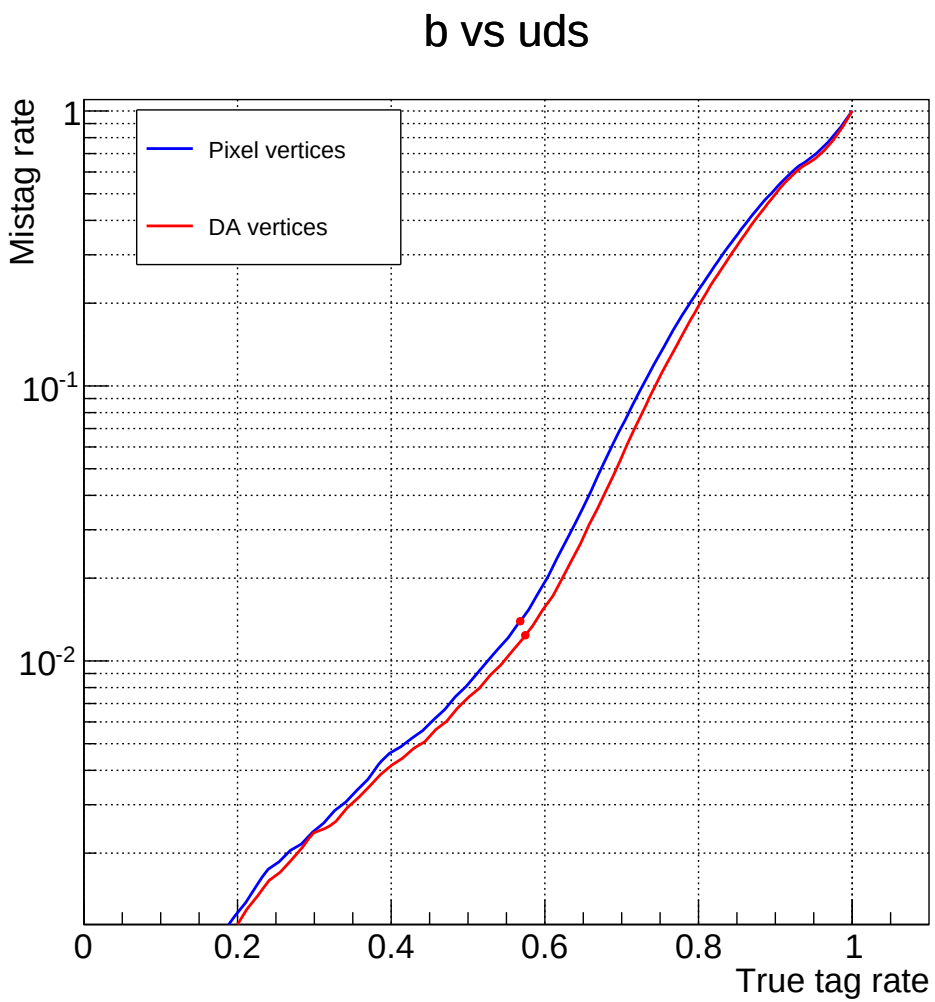
Motivation

- Single-top cross triggers ask for an isolated lepton and a central *b*-tagged jet
  - E. g. `HLT_IsoMu17_eta2p1_CentralPFNoPUJet30_BTagIPIter_v*`
- The *b*-tagging is done with pixel vertices
  - Collection `hltPixelVertices` produced by an instance of `PixelVertexProducer`
- However, the *b*-tagging step is performed after the PF reconstruction
  - It means the DA vertices used in online CHS are available for free
- DA vertices, being more precise, might improve the performance

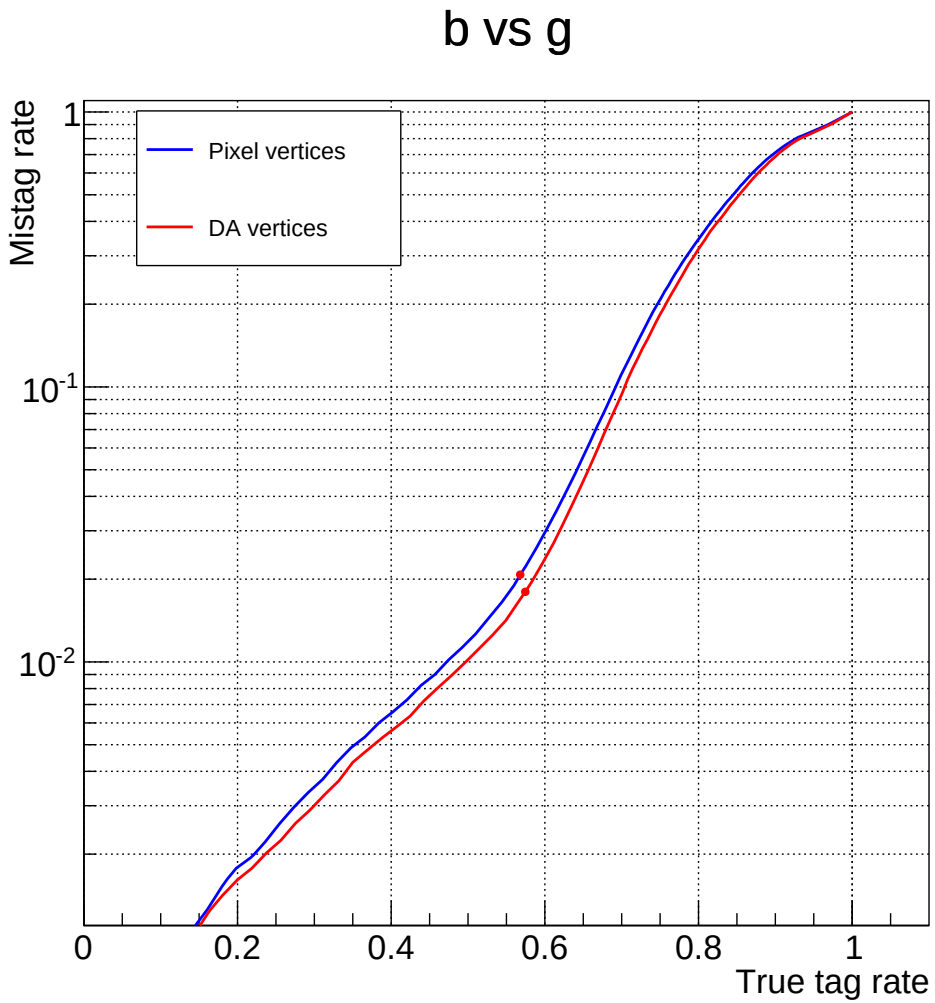
Outline of the study

- Replaced `hltPixelVertices` collection by `hltGoodOnlinePVs` in all b-tagging modules
- Studied performance of the modified trigger path with a $t\bar{t}$ dataset
  - `/TTbar_TuneZ2star_13TeV-pythia6-tauola/Summer13dr53X-PU25bx25_START53_V19D-v1/GEN-SIM-RAW`
- The following slides present ROC curves in comparison with the original path
  - Adopted cut at tag-value $= 3.3$ is also marked in the graphs

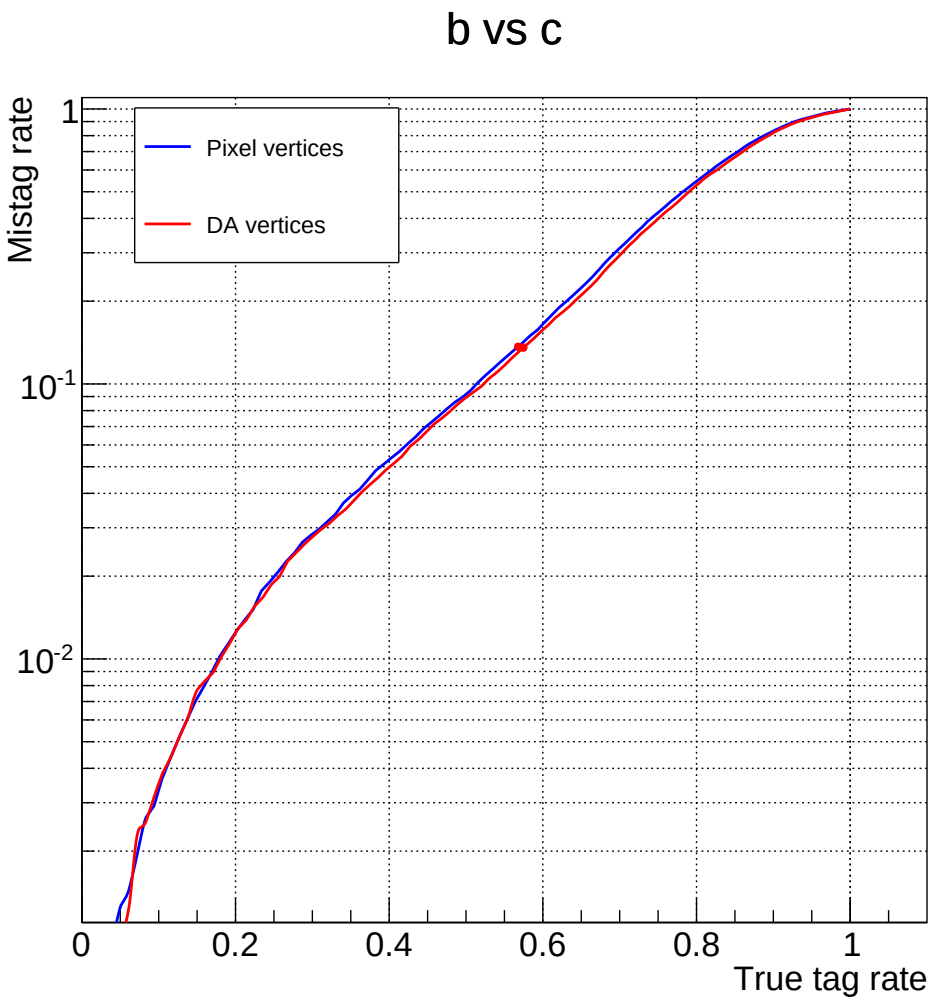
ROC curves


b vs uds
Mistag rate
1
10^{-1}
10^{-2}
Pixel vertices
DA vertices
0
0.2
0.4
0.6
0.8
1
True tag rate

ROC curves


b vs g
Mistag rate
1
10^{-1}
10^{-2}
Pixel vertices
DA vertices
0
0.2
0.4
0.6
0.8
1
True tag rate

ROC curves


b vs c
Mistag rate
1
10^{-1}
10^{-2}
Pixel vertices
DA vertices
0
0.2
0.4
0.6
0.8
1
True tag rate

Conclusions

- Although certain improvements are visible, they are negligible
  - No point in accepting this modification
- Might be useful to check it again when the trigger is converted to CSV
- Selected cut at 3.3 looks too tight
  - To be checked again after the trigger is converted to CSV