Lepton identification and isolation

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Tau ID

- DeepTau provides **three discriminators**:
  - VSjet
  - VsEle
  - VsMu
- **Corrections must be applied** depending on the discriminator working point, the gen matching of the reco tau, and more
- I rewrote the TAU POG tools in C++ (only available in python)

Corrections to DeepTau

- VSjet discriminator
  - ID SFs
  - Tau energy scale corrections
- VSele discriminator
  - ID SFs
  - Fake tau energy scale corrections (**missing item from last time**, **done**)
- VSmu discriminator
  - ID SFs
  - No fake tau energy corrections needed

Electron ID

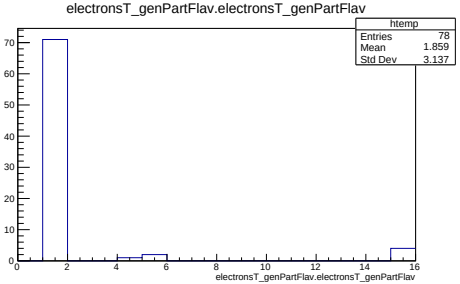
- SUSY electron criteria not maintained anymore (not recommended for UL)
- We switch to EGamma POG recommendations
- ID: use mvaFall17V2noIso_WP90 (ZhangYu checked performance, similar to old ID)
- ISO: **where are the recommended ISO recipes from EGamma? And the corresponding SF?!?**
  - Spoke with Anshul, working in EGamma
  - He suggested to use mvaFall17V2**Iso**_WP90
  - It uses ISO variables as input features to MVA
  - A given WP should also imply ISO requirements
  - SFs are centrally provided

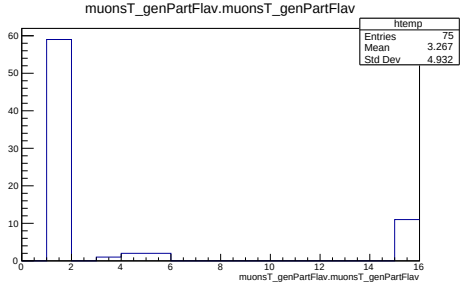
Muon ID

- SUSY muon criteria not maintained anymore (not recommended for UL)
- We switch to MUO POG recommendations
- ID: we used MUO POG medium MuonID already before. Keep this
- ISO: similarly to electrons, we used SUSY-inspired IDs
- MUO POG provides with some ISO WPs and related SFs (see here)
  - MiniIsoLoose: Relative MiniIso < 0.40
  - MiniIsoTight: Relative MiniIso < 0.10
  - They correspond to the cuts on Relative MiniIso that we were requiring before
  - SFs are centrally provided for those

Issue (mystery?!?) with muon ISO

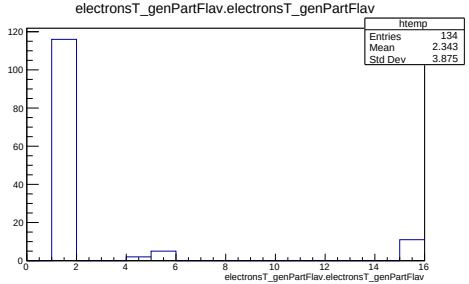
- I implemented the Relative MiniIso $<$ x.xx cuts by hand
  - There's a branch in NanoAOD storing the Relative MiniIso
  - Everything looks nicely balanced in $\bar{t}\bar{t}t\bar{t}$

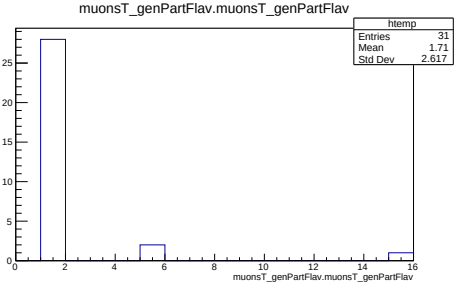




Issue (mystery?!?) with muon ISO

- After, I discovered there's a flag in NanoAOD for MiniIsoLoose/Tight
- I expected it to be equivalent to the cuts by hand, but it's not





Summary

- With taus, all looks fine
- With leptons, we need to finalize the selection
- All looks in shape **if we neglect the mystery**
  - Can we?
  - Can we claim that implementing the cut by hand, we can use the centrally produced SFs?
  - I would like to avoid computing them by hand, painful...