Qualification Task AFT 455:

Optimization of Inputs for High Level Discriminants (DL1 and MV2) to Improve Performance of B-Tagging in Heavy Ion Collisions

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# Discussion and Comments

IP3D ROC curve with pp

- IP3D:
  - Some lines in ROC curve doesn't have a point at full efficiency. (slide 32)
    - Check my math, again.
  - Can inefficiency be caused by disabling the anti-pile up tools?
    - Can do a check with/without.
    - pp samples: multi vertices are allowed, jets are reconstructed using HI algorithm, no pile-up effects are added
- For next steps,
  - What performance is "sufficient" for HI analysis?
  - Do we need to retrain the whole DL1? Or we can implement individual taggers if they're good enough.
  - Full tagger calibration could be difficult.
    - More difficult to calibrate with IP3D which uses no secondary vertex info (why?)
- Discussion with Dominik
  - My current IP3D evaluation: custom codes using the "EvaluationMode" from their scripts.
  - Way to do it through retag:
    - Produce new templates and save them in root file.
    - Setup a local COOL database and change tags in configuration files.
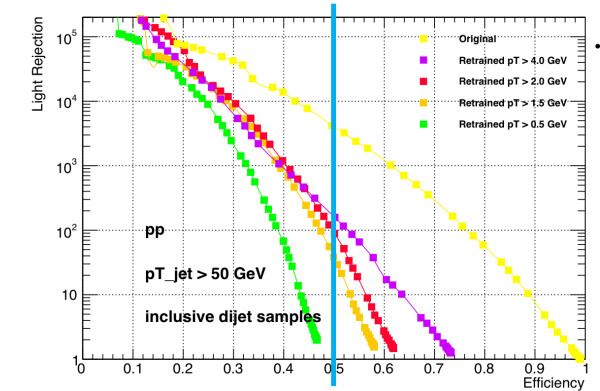
Fixing the IP3D ROC Curve

- Problem:
  - integral was truncated (overflow and underflow)
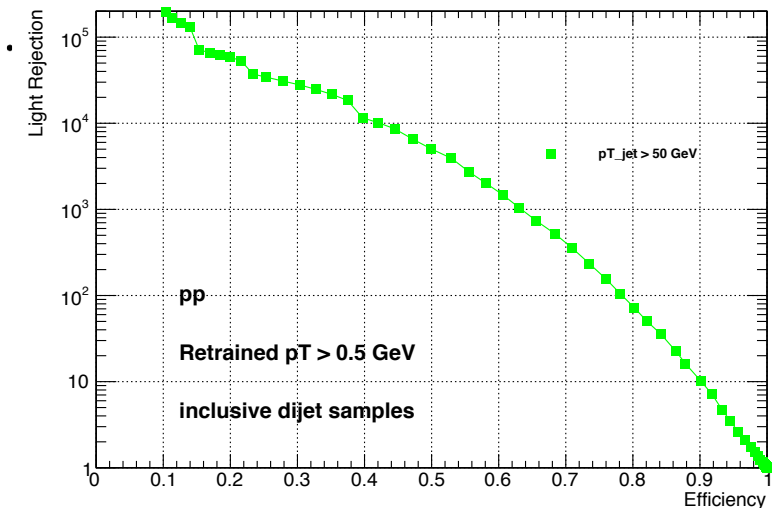 - Jets probability calculation looks wrong… (from the original code)
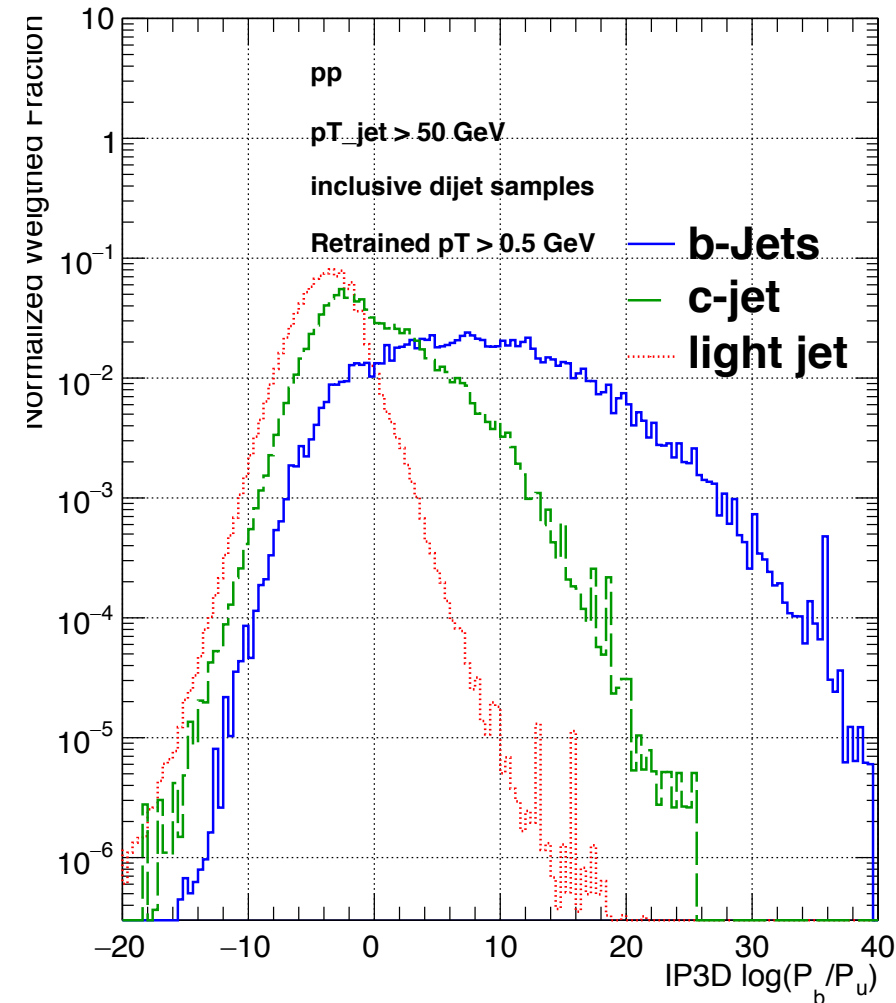

```
if(prob != -999) { prob *= iProb; }
```
--prob: jet probability; iProb: each track probability
--iProb = -999 if track is not in "IP3D_TrackParticleLinks"

In b-jets, ~53% jets were excluded (llr set to -100) in left plot due to an odd number of tracks.

Original
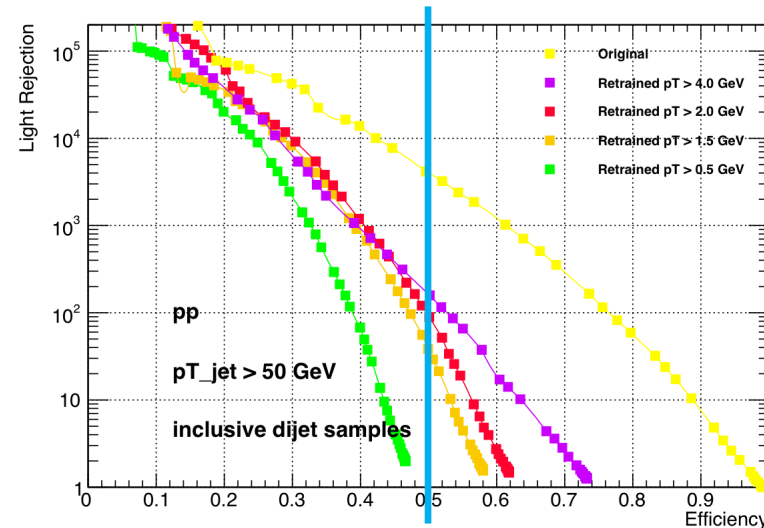
New

Back-up

- From ATL-PHYS-PUB-2017-013

  - $p_T > 1$ GeV;

  - $|d_0| < 1$ mm and $|z_0 \sin\theta| < 1.5$ mm;

  - seven or more silicon hits with at most two silicon holes, at most one of which is in the pixel detector, where a hole is defined as a hit expected to be associated with the track but not present [10].

- Confirming with Francesco from flavor tagging group for the actual implementation

- Working on TMVA tutorial for writing BDT of JetFitter & SV1.