

CEPC

Wednesday working meeting

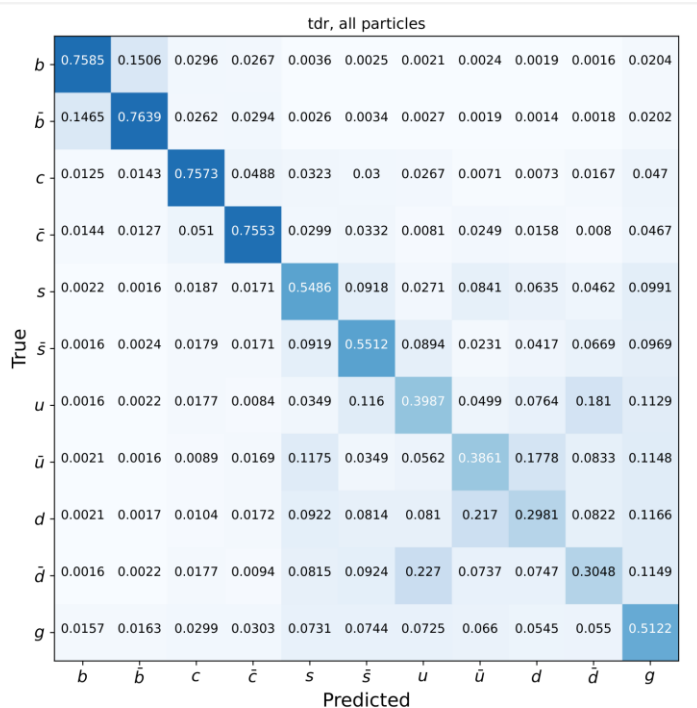
Kaili Zhang

zhangkl@ihep.ac.cn

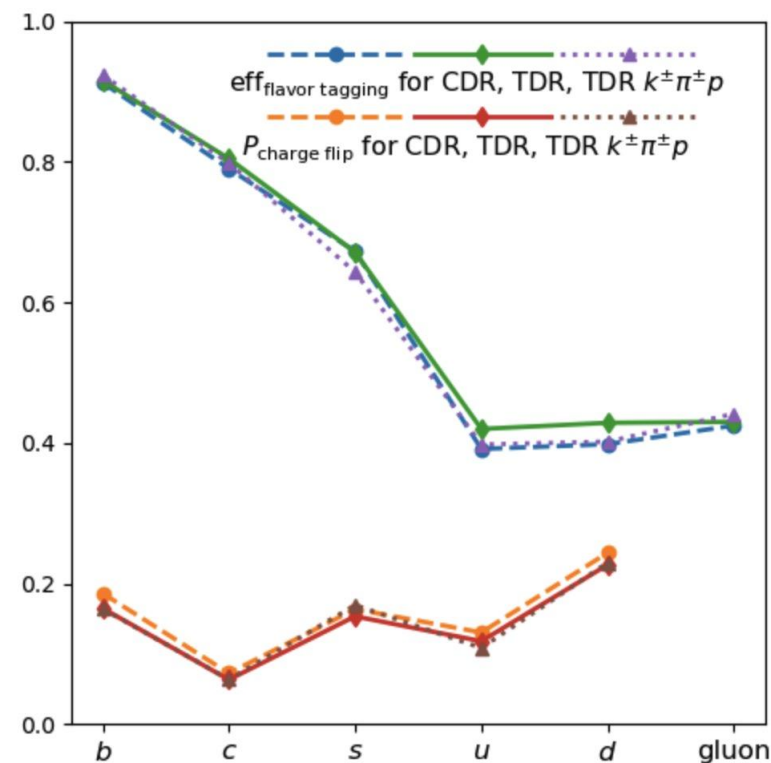
PID & JOI

Input: https://code.ihep.ac.cn/zhangkl/jetorigin/-/tree/master?ref_type=heads

- Now truth PID, reco PID implemented in JOI.
- Lepton ID (90% and noLep) specified.



Perfect PID.



NaN error in JOI Prediction

- Sample training successfully

```
[2025-03-30 13:10:57,734] INFO: Epoch #11 training
^M0it [00:00, ?it/s]^M0it [00:00, ?it/s, lr=1.00e-03, Loss=1.14072, AvgLoss=1.14072, Acc=0.60547, AvgAcc=0.60547]^M1it [00:00, 4.37it/s, lr=1.00e-03, Loss=1.14072, AvgLoss=1.14072, Acc=0.60547, AvgAcc=0.60547]^M1it [00:00, 4.37it/s, lr=1.00e-03, Loss=1.16983, AvgLoss=1.15527, Acc=0.57812, AvgAcc=0.59180]^M1it [00:00, 4.37it/s, lr=1.00e-03, Loss=1.16192, AvgLoss=1.15749, Acc=0.56250, AvgAcc=0.58203]^M3it [00:00, 7.94it/s, lr=1.00e-03, Loss=1.16192, AvgLoss=1.15749, Acc=0.56250, AvgAcc=0.58203]^M3it [00:00, 7.94it/s, lr=1.00e-03, Loss=1.11314, AvgLoss=1.14640, Acc=0.58594, AvgAcc=0.58301]^M3it [00:00, 7.94it/s, lr=1.00e-03, Loss=1.20327, AvgLoss=1.15778, Acc=0.56445, AvgAcc=0.57930]^M5it [00:00, 9.15it/s, lr=1.00e-03, Loss=1.20327, AvgLoss=1.15778, Acc=0.56445, AvgAcc=0.57930]^M5it [00:00, 9.15it/s, lr=1.00e-03, Loss=1.04820, AvgLoss=1.13951, Acc=0.62305, AvgAcc=0.58659]^M5it [00:00, 9.15it/s, lr=1.00e-03, Loss=1.08260, AvgLoss=1.13138, Acc=0.59570, Av
```

- Error in prediction:

```
[2025-03-30 13:07:08,012] INFO: Epoch #10 validating
^M0it [00:00, ?it/s]^M0it [00:00, ?it/s, Loss=nan, AvgLoss=nan, Acc=0.13672, AvgAcc=0.13672]^M1it [00:00, 4.54it/s, Loss=nan, AvgLoss=nan, Acc=0.13672, AvgAcc=0.13672]^M1it [00:00, 4.54it/s, Loss=nan, AvgLoss=nan, Acc=0.03516, AvgAcc=0.08594]^M1it [00:00, 4.54it/s, Loss=nan, AvgLoss=nan, Acc=0.18750, AvgAcc=0.11979]^M3it [00:00, 7.93it/s, Loss=nan, AvgLoss=nan, Acc=0.18750, AvgAcc=0.11979]^M3it [00:00, 7.93it/s, Loss=nan, AvgLoss=nan, Acc=0.04102, AvgAcc=0.10010]^M4it [00:00, 5.64it/s, Loss=nan, AvgLoss=nan, Acc=0.04102, AvgAcc=0.10010]^M4it [00:00, 5.64it/s, Loss=nan, AvgLoss=nan, Acc=0.04883, AvgAcc=0.08984]^M5it [00:00, 6.52it/s, Loss=nan, AvgLoss=nan, Acc=0.04883, AvgAcc=0.08984]^M5it [00:00, 6.52it/s, Loss=nan, AvgLoss=nan, Acc=0.13672, AvgAcc=0.09766]^M5it [00:01, 6.52it/s, Loss=nan, AvgLoss=nan, Acc=0.0527
```

```
[2025-03-30 13:10:57,677] INFO: Processed 542720 entries in total (avg. speed 2363.1 entries/s)
[2025-03-30 13:10:57,677] INFO: Evaluation class distribution:
[(0, 49384), (1, 49401), (2, 49211), (3, 49244), (4, 49149), (5, 49077), (6, 49076), (7, 49072), (8, 49615), (9, 49616), (10, 49875)]
[2025-03-30 13:10:57,701] ERROR: Input contains NaN.
[2025-03-30 13:10:57,719] ERROR: Input contains NaN.
[2025-03-30 13:10:57,733] INFO: Evaluation metrics:
```

Trace back:

- We confirm there is no NaN in inputs.
- This error not in weaver.
 - weaver will silently transform nan to 0.
 - Adviced by Congqiao using different rapidity
- Using onnx reader to try
 - <https://code.ihep.ac.cn/pimohan/onnxreader>

```

开始异常值检查:
[INFO] vec_pf_points检查正常
[INFO] vec_pf_features检查正常
[INFO] pf_mask检查正常
output.size(): 11
output : 0.114832
output : 0.109351
output : 0.0915786
output : 0.104998
output : 0.0601544
output : 0.0462752
output : 0.0431451
output : 0.0571789
output : 0.0610831
output : 0.0312613
output : 0.280143
PFOAna          DEBUG jetID is : -5
InputReader     DEBUG Registering collection to read CyberPFO
InputReader     DEBUG Registering collection to read MCParticle
InputReader     DEBUG Registering collection to read ECALBarrelParticleAssoCol
InputReader     DEBUG Registering collection to read ECALEndcapsParticleAssoCol
InputReader     DEBUG Registering collection to read HCalBarrelParticleAssoCol
InputReader     DEBUG Registering collection to read HCalEndcapsParticleAssoCol
InputReader     DEBUG Registering collection to read CompleteTracksParticleAssociation
PFOAna          DEBUG Jet1ID 5: Jet2ID = -5
PFOAna          DEBUG Size of jets is: 2
PFOAna          DEBUG label q 0: label d = 0

```

```

51 pt = torch.sqrt(to_pt2(x, eps=eps))
52 # rapidity = 0.5 * torch.log((energy + pz) / (energy - pz))
53 # rapidity = 0.5 * torch.log(1 + (2 * pz) / (energy - pz).clamp(min=1e-20))
54 rapidity = 0.5 * torch.log((energy + pz).clamp(min=1e-20) / (energy - pz).clamp(min=1e-20))
55 phi = (atan2 if for_onnx else torch.atan2)(py, px)
56 if not return_mass:
57     return torch.cat((pt, rapidity, phi), dim=1)
58 else:
59     m = torch.sqrt(to_m2(x, eps=eps))

```

```

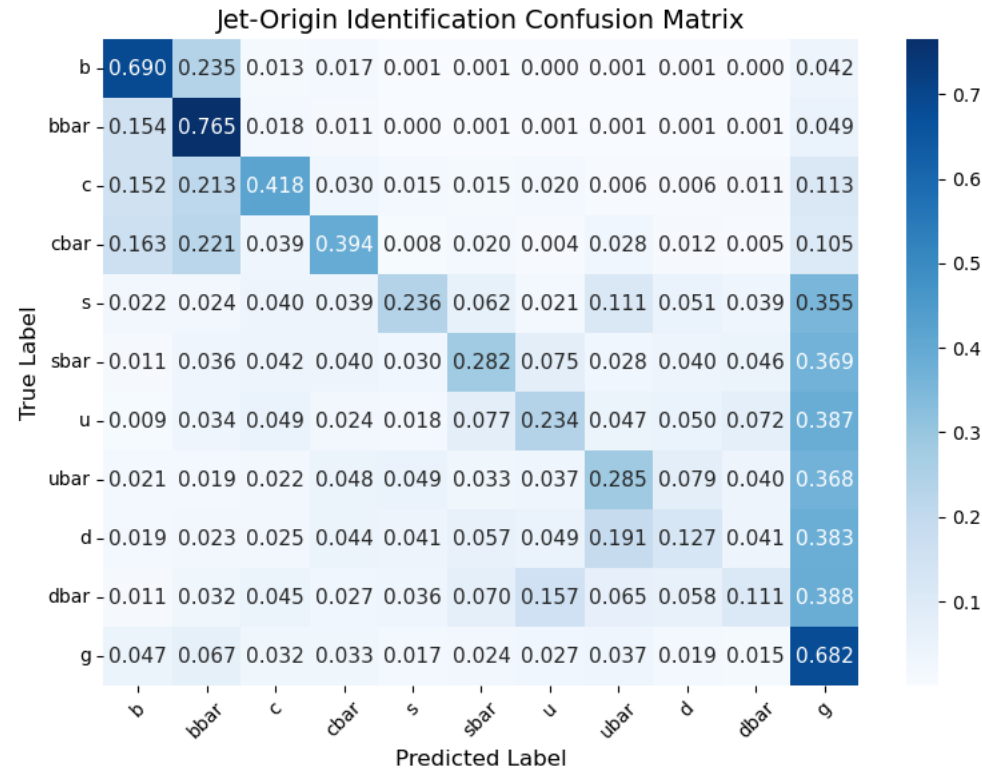
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL  PORTS
[2025-04-02 01:30:47,125] ERROR: Input contains NaN.
[2025-04-02 01:30:47,135] INFO: Evaluation metrics:
- roc_auc_score:
None
- roc_auc_score_matrix:
None
- confusion_matrix:
[[0. 0.]
 [1. 0.]]
[2025-04-02 01:30:47,154] INFO: Test metric 0.00000
[2025-04-02 01:30:47,381] INFO: Written output to pred/pred_0401_test.root
(weaver) bash-5.1$

```

Onnx M11 Matrix



Can print out information but buggy. Under tuning.



backups

PID in Jets

Tdr25.3.6; ZH->vvbb; stats: 100w events, 200w b jets.

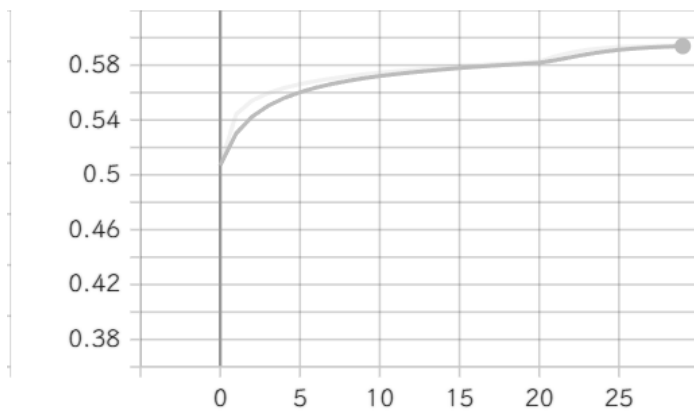


@Haoyue Xu, Kaili Zhang

Tracks per jet						
Endcap:	e	mu	pi	k	p	Tot
Init	0.05	0.03	1.46	0.21	0.07	1.81
Tpc	0.03	0.02	0.83	0.14	0.05	1.07
Tof	0.02	0.02	0.58	0.11	0.03	0.76
Pt>1	0.01	0.02	0.34	0.09	0.02	0.49
Barrel:	e	mu	pi	k	p	Tot
Init:	0.33	0.19	9.83	1.33	0.42	12.10
Tpc	0.23	0.18	8.26	1.21	0.40	10.29
Tof	0.18	0.17	5.65	0.97	0.33	7.31
Pt>1	0.17	0.16	4.96	0.93	0.31	6.53

In average, for one b jet,
initially it have (generatorstatus=1) **14.3** truth tracks: **11.7Pion, 1.51 Kaon, 0.50Proton, 0.41 electron and 0.23 muon.**
Then, it has **14** reco tracks: **11.19 Pion, 1.5 Kaon, 0.49 Proton. 0.38 electron and 0.22 muon.**
For those **7** “good” tracks, it has 5.30 Pion, 0.96 Kaon, 0.33Proton, 0.18 electron and 0.18 muon.

Acc/train (epoch)
tag: Acc/train (epoch)

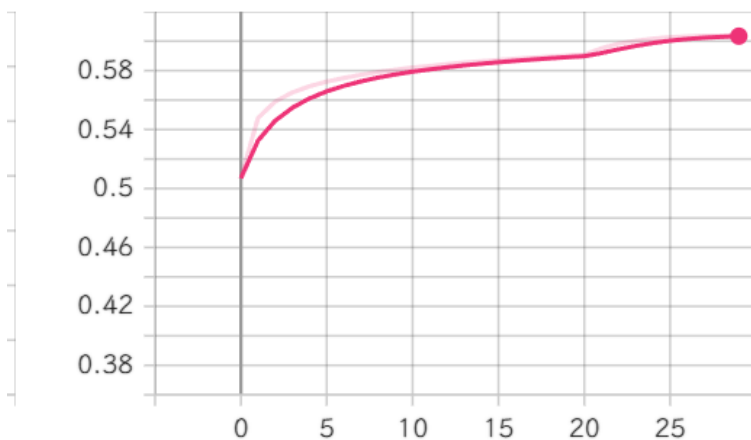


TDR, reco PID (only p, k, pi)

Name	Smoothed Value	Value	Step	Time	Relative
● Mar30_05-56-27_gpu033.ihep.ac.cnJet_0320reco_higgs_full_ParT	0.5939	0.5945	29	Mon Mar 31, 11:03:35	1d 3h 56m 55s

Lepton id still under tuning.

Acc/train (epoch)
tag: Acc/train (epoch)



TDR, prefect PID

Name	Smoothed Value	Value	Step	Time	Relative
● Mar14_04-57-27_gpu029.ihep.ac.cnJet_0314_higgs_full_ParT	0.6034	0.6041	29	Sun Mar 16, 00:19:28	1d 17h 48m 8s

- Latest: 25.3.7

```
detsim_anatool.IsTrk2Primary = False # True: primary; False: ancestor  
# Set to primary, always fall back to primary track in generator level.  
# Set to ancestor, fall back to the first ancestor of the track. Can be the particle generated in simulation.
```

- Add one switch:

- Truth link will have different behavior before&after.

- MCP.getSimulatorStatus()

- isCreatedInSimulation()
- isDecayedInTracker()
- isDecayedInCalorimeter()
- daughters_size()

- Scripts for run:

<https://code.ihep.ac.cn/zhangkl/cepcsampleproduction/-/tree/main>

- Please make consistent for Sample/CEPCSW/Script version.

Charged track ratio



per jet						
Endcap:	e	mu	pi	k	p	Tot
Init	2.49%	1.70%	80.73%	11.50%	3.58%	100%
Tpc	2.41%	2.23%	77.40%	13.45%	4.51%	100%
Tof	2.39%	2.73%	76.27%	14.07%	4.54%	100%
Pt>1	3.07%	3.63%	70.46%	17.71%	5.13%	100%
Barrel:	e	mu	pi	k	p	Tot
Init:	2.72%	1.59%	81.23%	10.96%	3.50%	100%
Tpc	2.26%	1.79%	80.29%	11.76%	3.90%	100%
Tof	2.47%	2.30%	77.37%	13.29%	4.57%	100%
Pt>1	2.63%	2.48%	75.91%	14.21%	4.77%	100%

Charged track eff



per jet						
Endcap:	e	mu	pi	k	p	Tot
Init	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Tpc	57.12%	77.79%	56.73%	69.24%	74.49%	59.17%
Tof	40.17%	67.42%	39.56%	51.26%	52.99%	41.88%
Pt>1	32.95%	57.28%	23.35%	41.20%	38.26%	26.75%
Barrel:	e	mu	pi	k	p	
Init:	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Tpc	70.59%	95.91%	84.00%	91.19%	94.73%	84.99%
Tof	54.66%	87.60%	57.52%	73.24%	78.93%	60.39%
Pt>1	52.10%	84.28%	50.41%	69.94%	73.67%	53.95%