



CEPC Jet@Clusters

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Update in CEPCSW

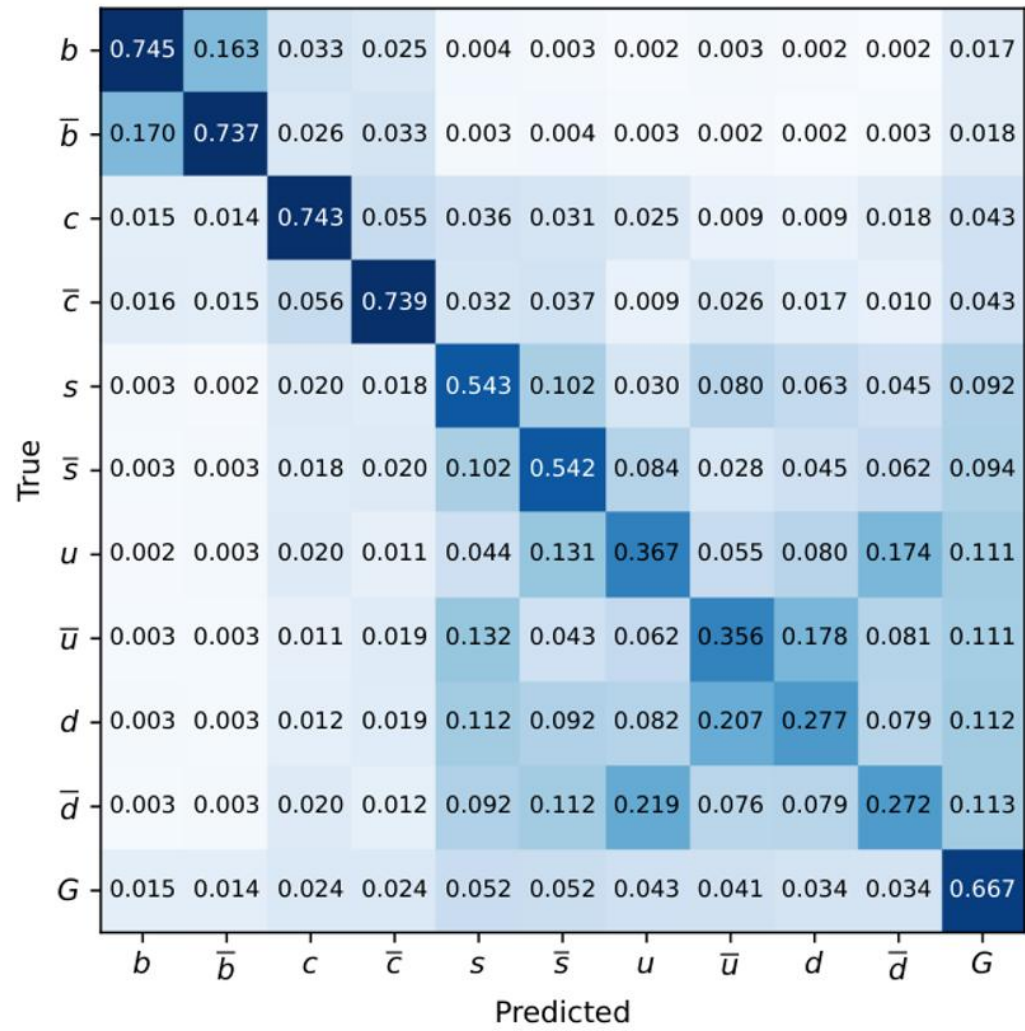
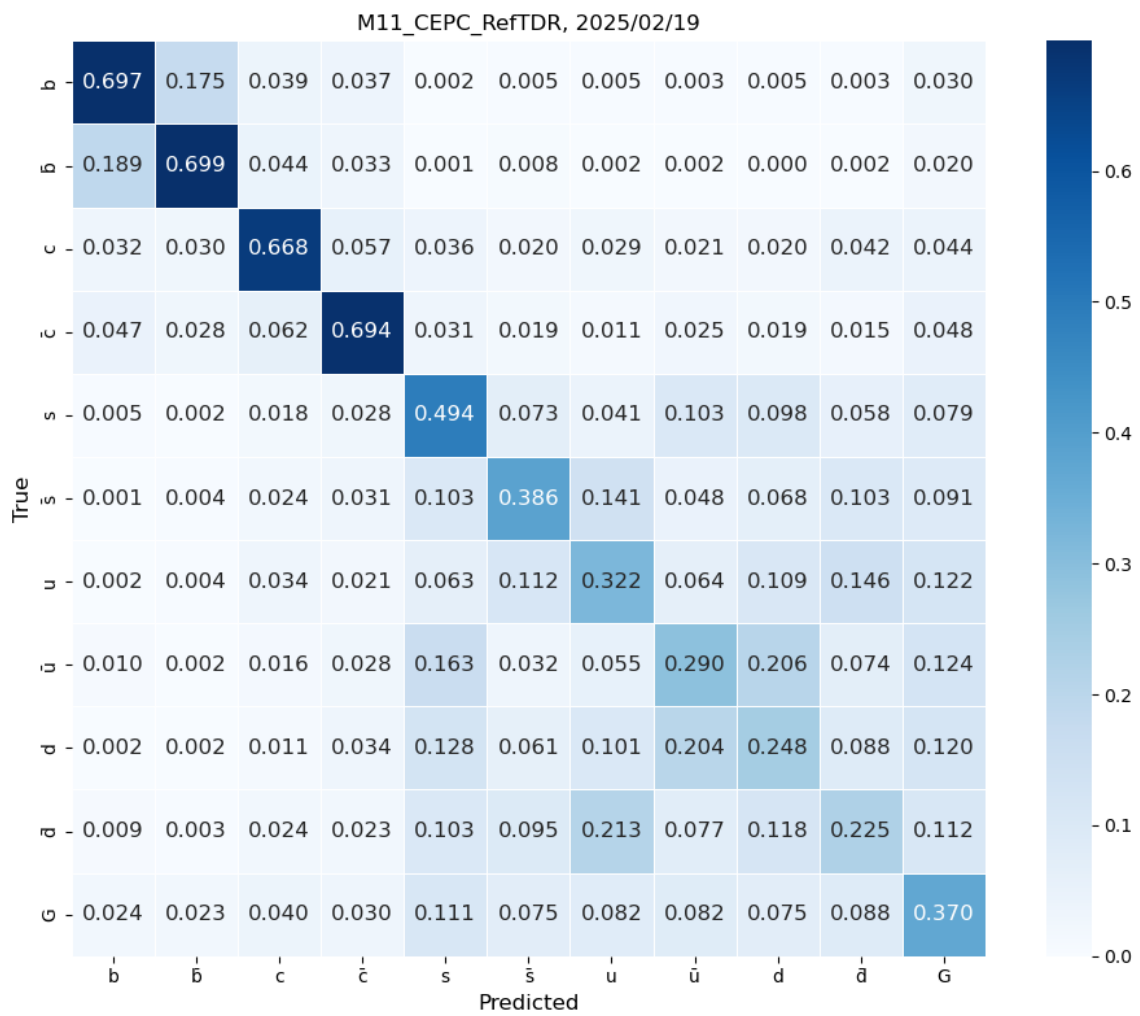


- Calo reco update
 - BMR improved; See Geliang's report.
- Sample usage
 - Sample Production for TDR, list?

Current JOI

Discrepancy should be in training parameters. Under tuning.
Length=30, only charged particle in training.

2309.13231



backup

Machine Learnings on Jets



- P-CNN
 - <https://scipost.org/10.21468/SciPostPhys.7.1.014>
- Particle Flow Network
 - <https://arxiv.org/abs/1810.05165>
 - CEPC@Xiaotian : <https://arxiv.org/abs/2410.04465v2>
- LundNet
 - [https://doi.org/10.1007/jhep03\(2021\)052](https://doi.org/10.1007/jhep03(2021)052)
- ParticleNet
 - Arxiv:1902.08570
 - <https://github.com/hqucms/ParticleNet>

- <https://arxiv.org/abs/2202.03772>
- https://github.com/jet-universe/particle_transformer
- Platforms: <https://github.com/hqucms/weaver-core>
- Application on CEPC: [2309.13231](#), [PRL 132, 221802 \(2024\)](#)
- Tutorial on CEPC: <https://github.com/ZHUYFgit/CEPC-Jet-Origin-Identification>
- Inputs from CEPCsoft: `/cefs/higgs/zhangkl/AI/datasets`
- Inputs from LHC, [JetClass](#): `/cefs/higgs/zhangkl/AI/jetclass`
- Require higgsgpu group. Request on <https://ccsinfo.ihep.ac.cn/>
- Follow the tutorial, build the env if you are interested.

ParticleTransformer @ CEPC



<https://github.com/ZHUYFgit/CEPC-Jet-Origin-Identification>

- Variable list in M11origin.cc
 - Under development to CEPCSW
 - Unit as one jet: 4 momentum, M11 id information.....
- Train in Weaver: JetClass_full.yaml
- Submit jobs on IHEP: train_JetClass.sh
- Output: Pred.root: Label and score for each jets.
- Application: onnx format

Inputs for JOI

/cefs/higgs/zhangkl/CEPCSW/Analysis/JetOrigin/src



- Jet->Event;
- PFO->Component;
- Length: 200
- Label: M11
- Current training use truth PID information, in application reco PID will be used.

Type	Var	Comment
PFO point distance	$\Delta\phi(pfo, Jet)$	Delta Phi, pfo to jet
	$\Delta\eta(pfo, Jet)$	Delta Eta, pfo to jet
PFO Vector variable	(px, py, pz, E)	4 momentum of PFO
PFO feature variable	$p_t^{PFO}, \log \frac{p_t^{PFO}}{p_t^{jet}}$	Pfo pt and relative pt
	$E_t^{PFO}, \log \frac{E_t^{PFO}}{E_t^{jet}}$	Pfo E and relative E
	$\Delta R(pfo, Jet)$	Delta R, pfo to jet
	N_charge, N_chargeflip	Charge of PFO
	D0, Z0, D0err, Z0err	(if with track) impact parameters
	N_Ecluster, N_Hcluster	
	E_ecal, E_hcal	
	PID	Truth PID type

Variable convention



- Feature variable, Transformer prefer normal distribution with mean ~ 0 , range $(-1, 1)$ with cut edge maximum $(-5, 5)$.
- (4-momentum vector variable not included)
- Normalization functions like $\text{Tanh}()$ used.
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