Weekly Report

CMS DQM-ML4DC
Patomporn (Jab)
5 August 2019

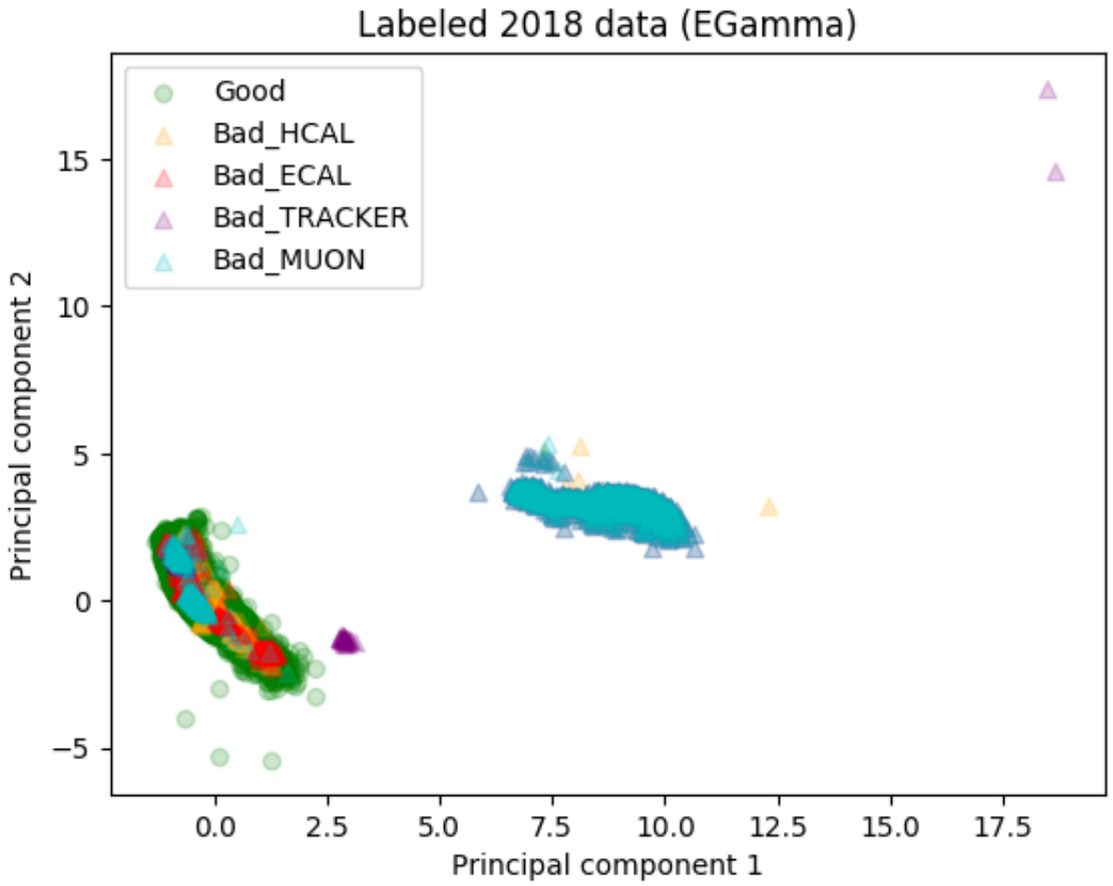
Outline

- Update the work for new selected features
    - Investigate Malfunction of Sub-System
        - Inspect sampling of outlier and inlier of JetHT for MUON malfunction
- Feature importance
- Retrain the model

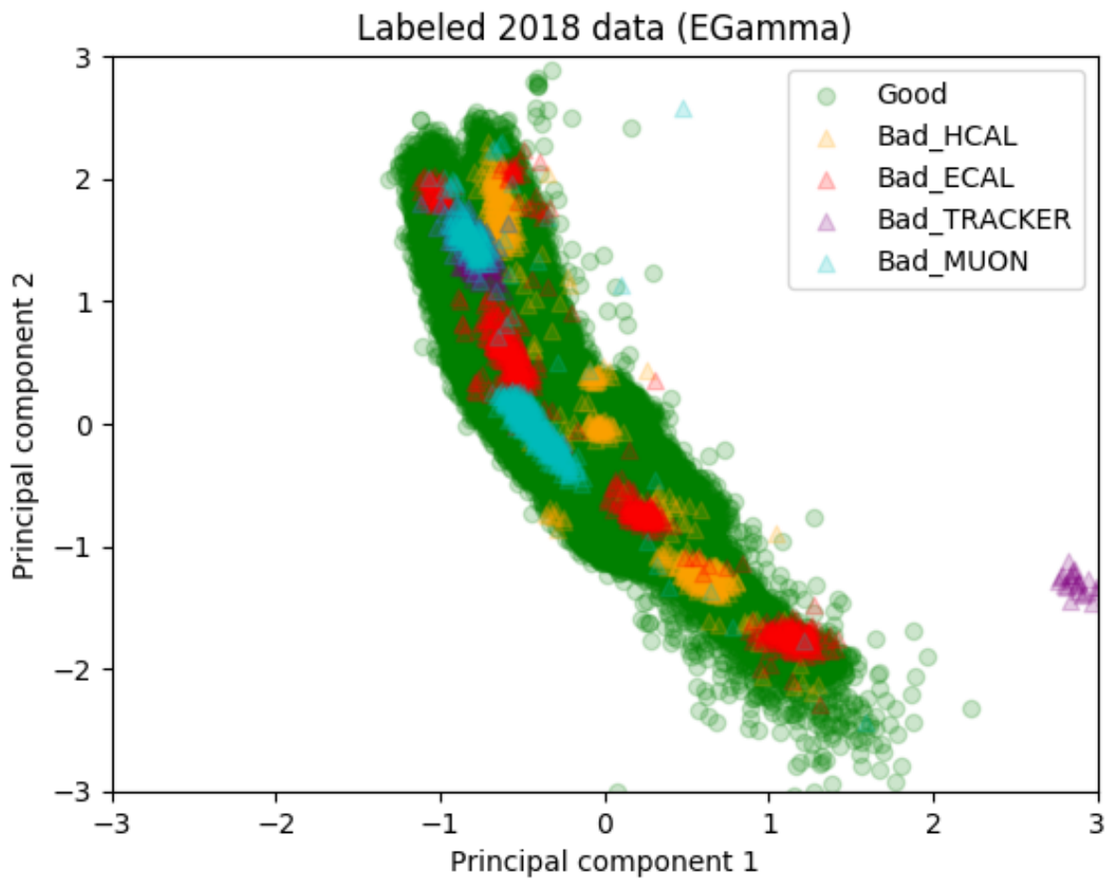
Investigate Malfunction of Sub-System

PCA (EGamma)

Full Plot



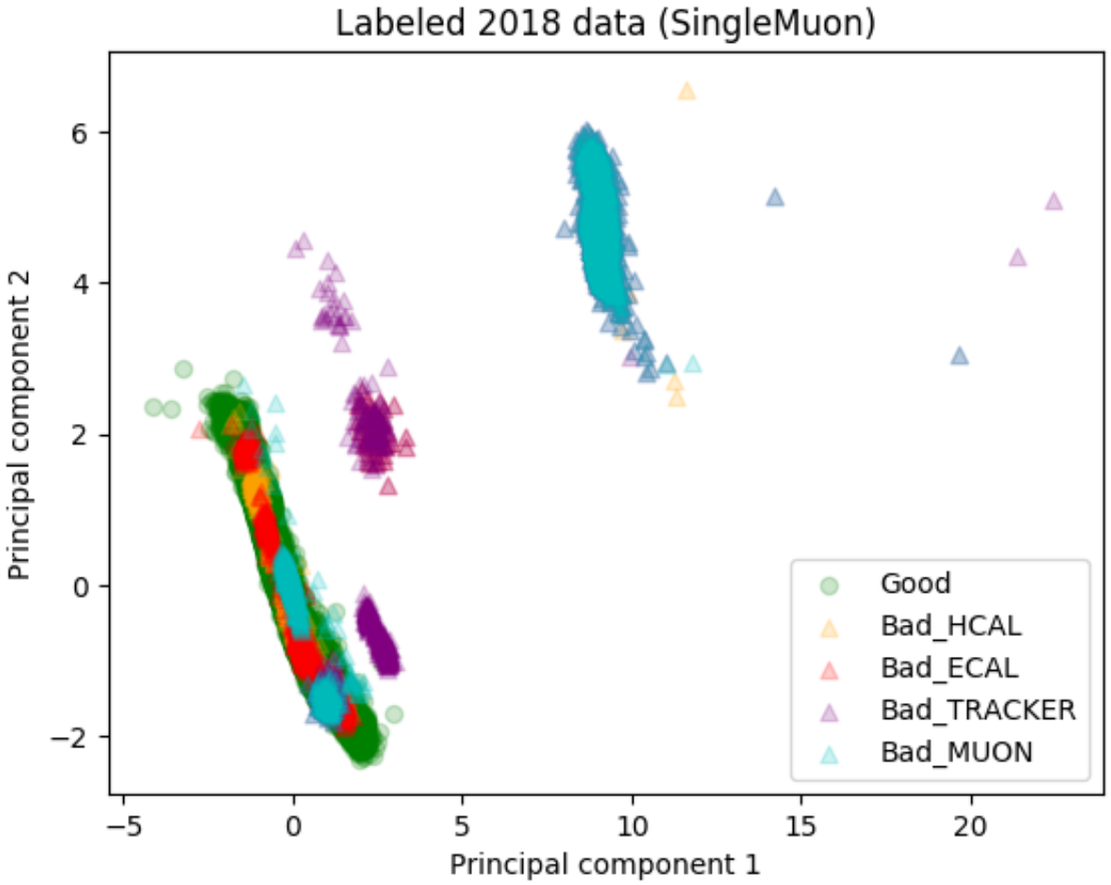
Zoom in



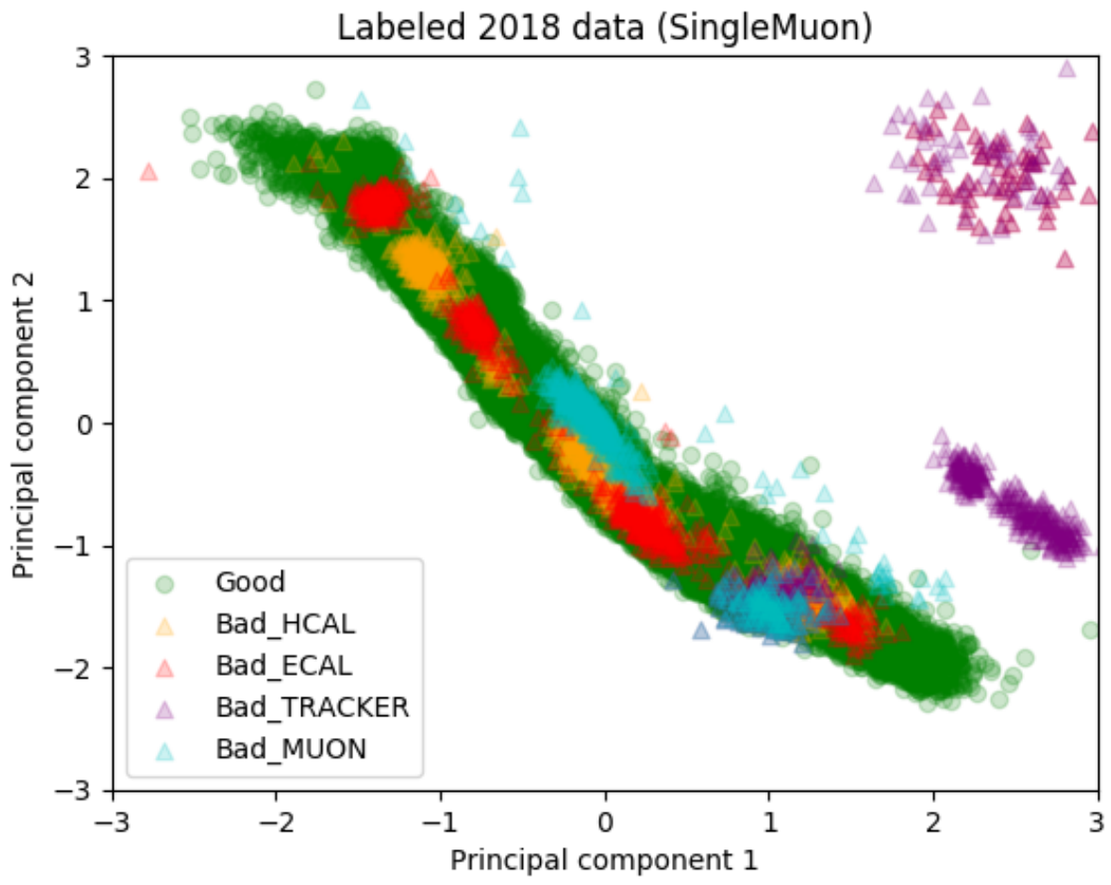
- **Only MUON and some TRACKER has outlier**
- **Inlier MUON still clustering**
- **HCAL and ECAL are inlier located in hyperplane but still clustering**

PCA (Single Muon)

Full Plot



Zoom in



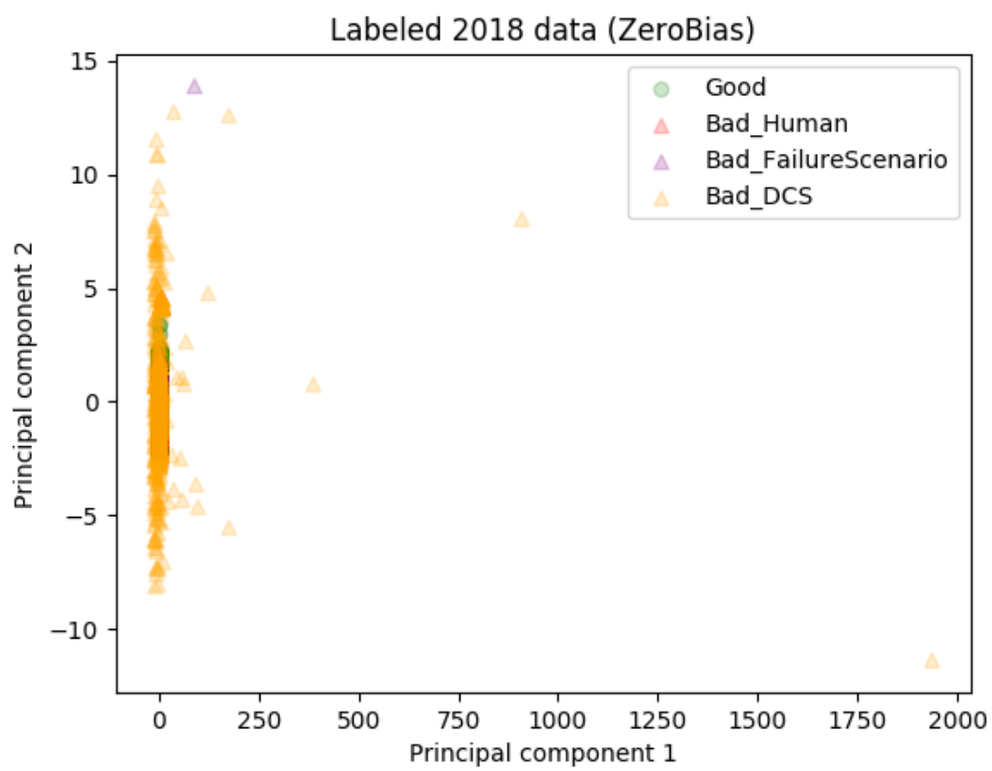
- **Only MUON and some TRACKER has outlier**
- **Inlier MUON still clustering**
- **HCAL and ECAL are inlier located in hyperplane but still clustering**

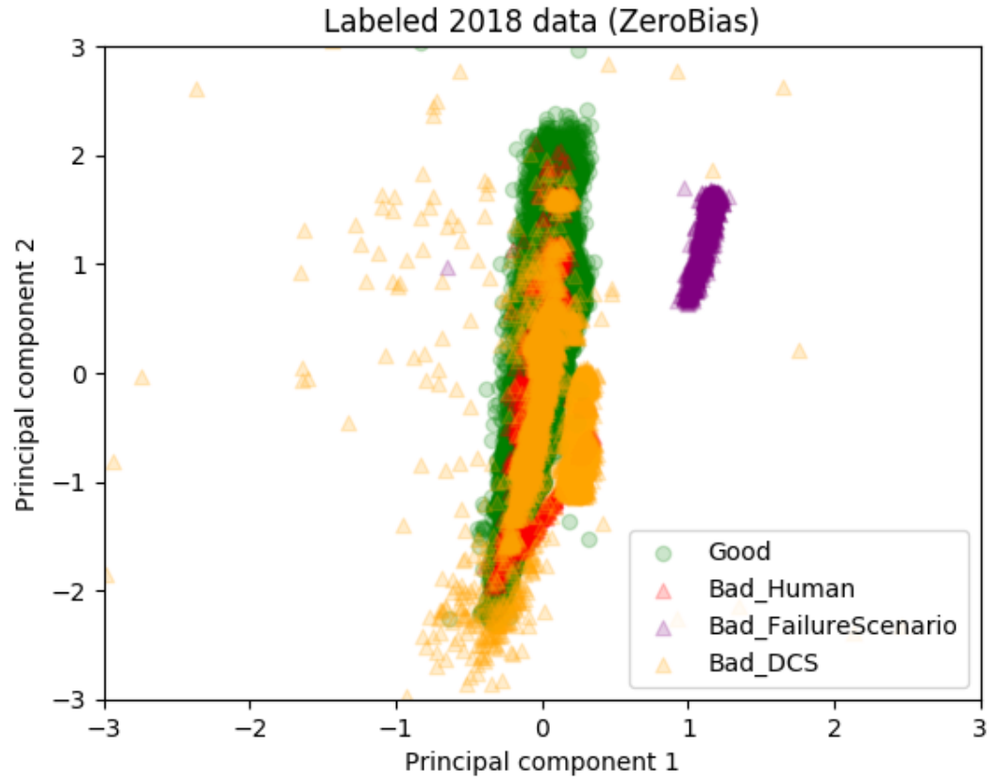
PCA (ZeroBias)

Full Plot

Zoom in

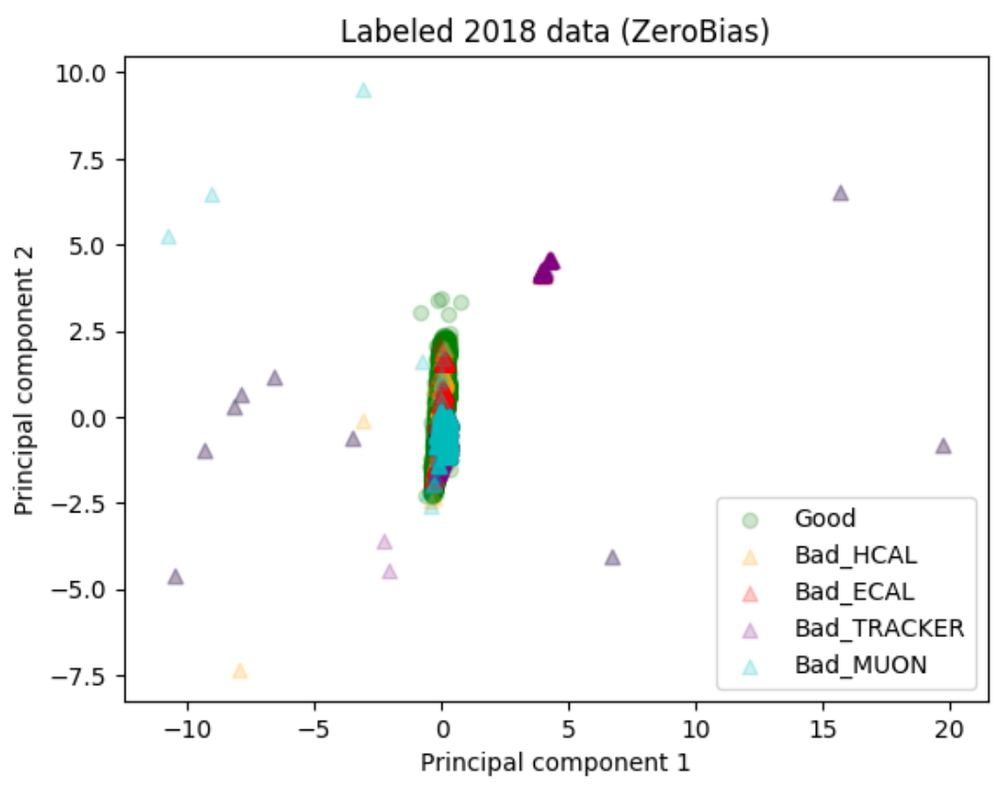
Separate Bad case

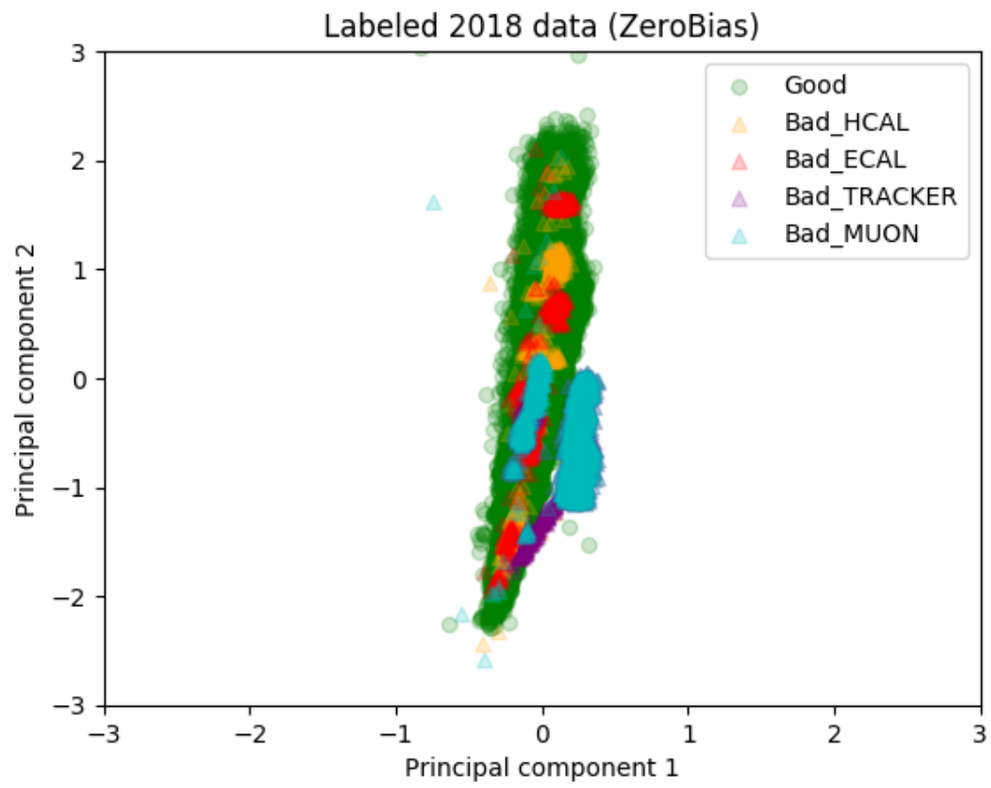




Sub-system from RR's API

(doesn't include FailureScenario)

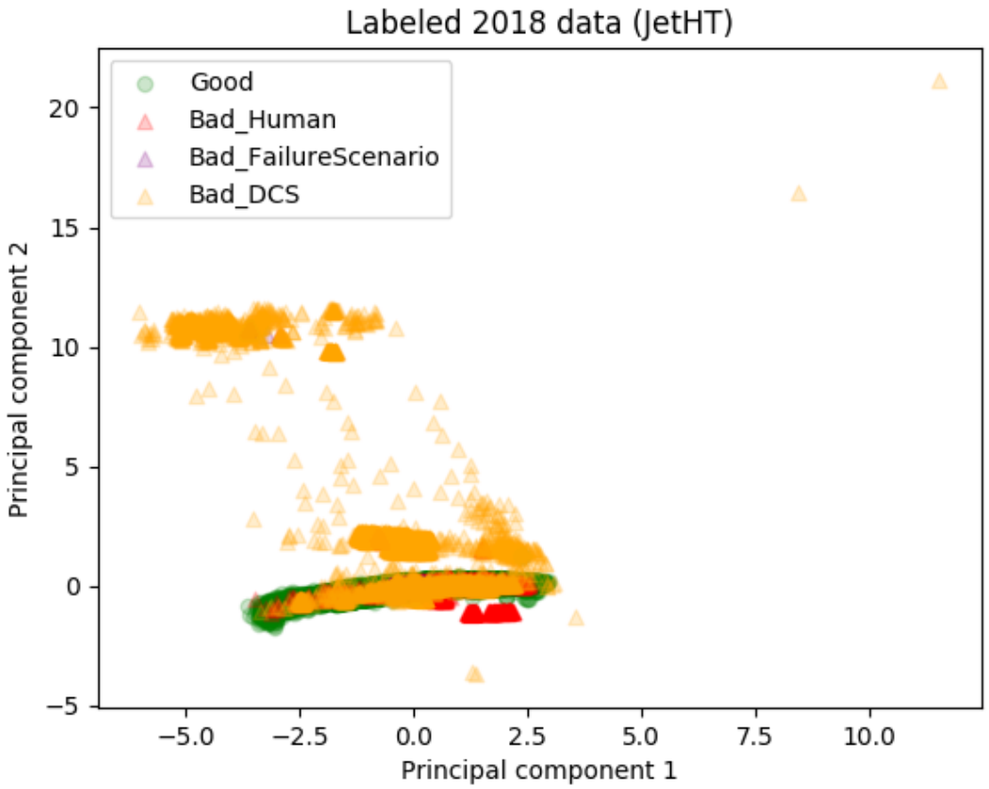




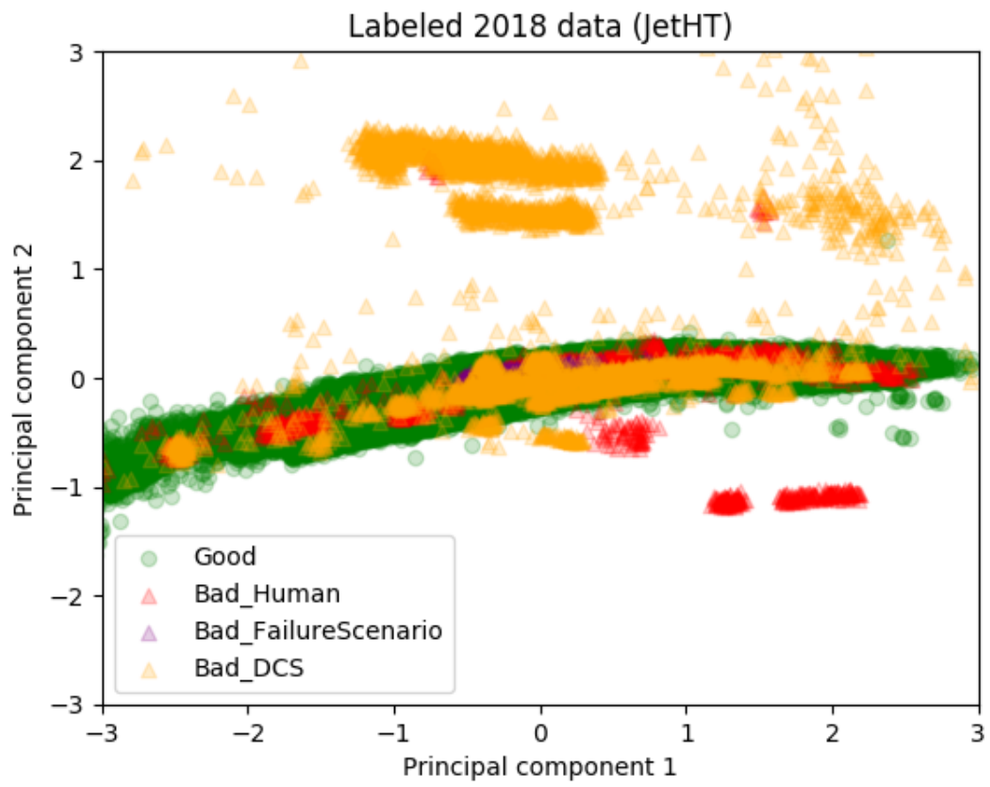
PCA (JetHT)

Separate Bad case

Full Plot

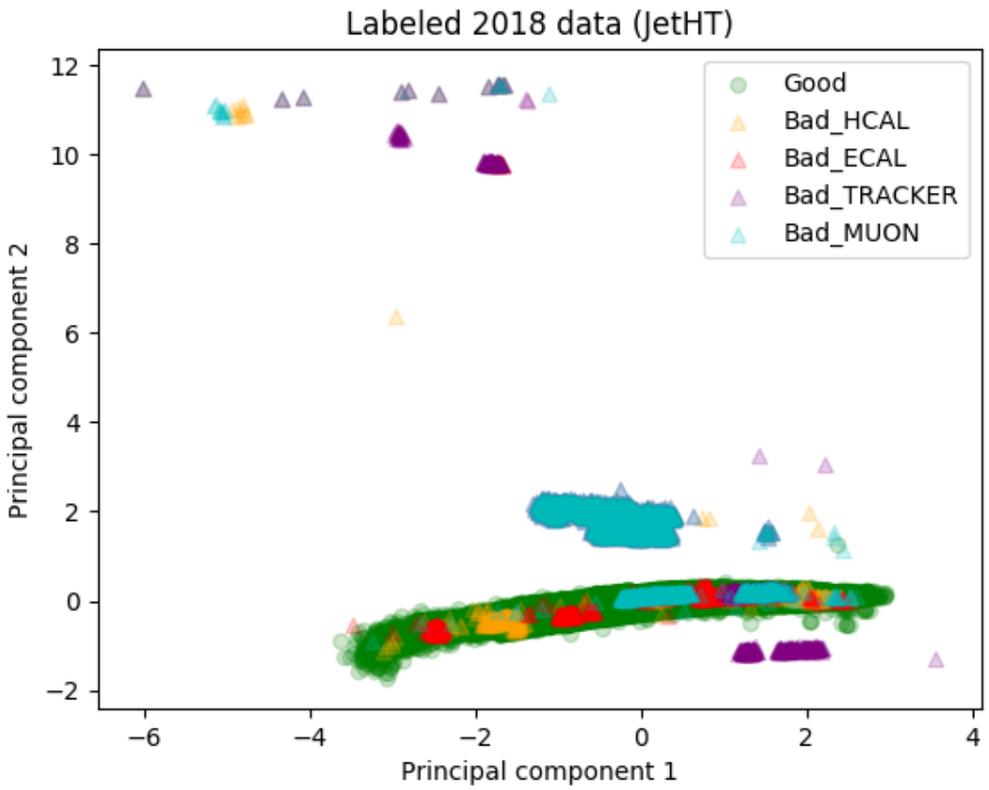


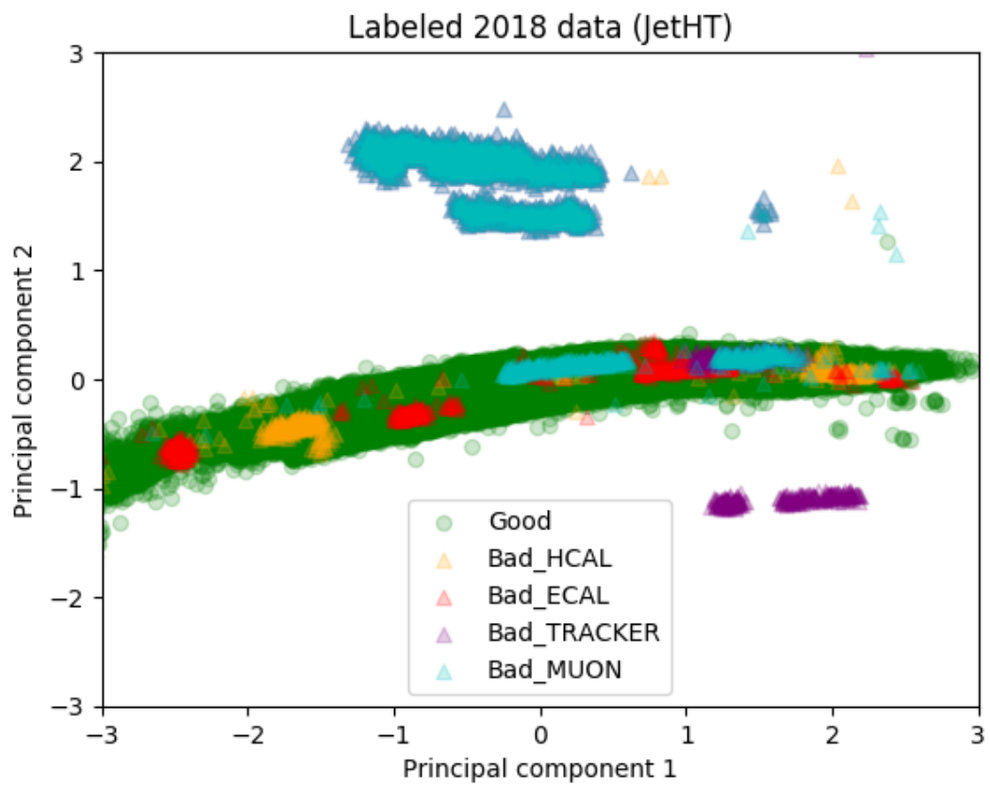
Zoom in



Sub-system from RR's API

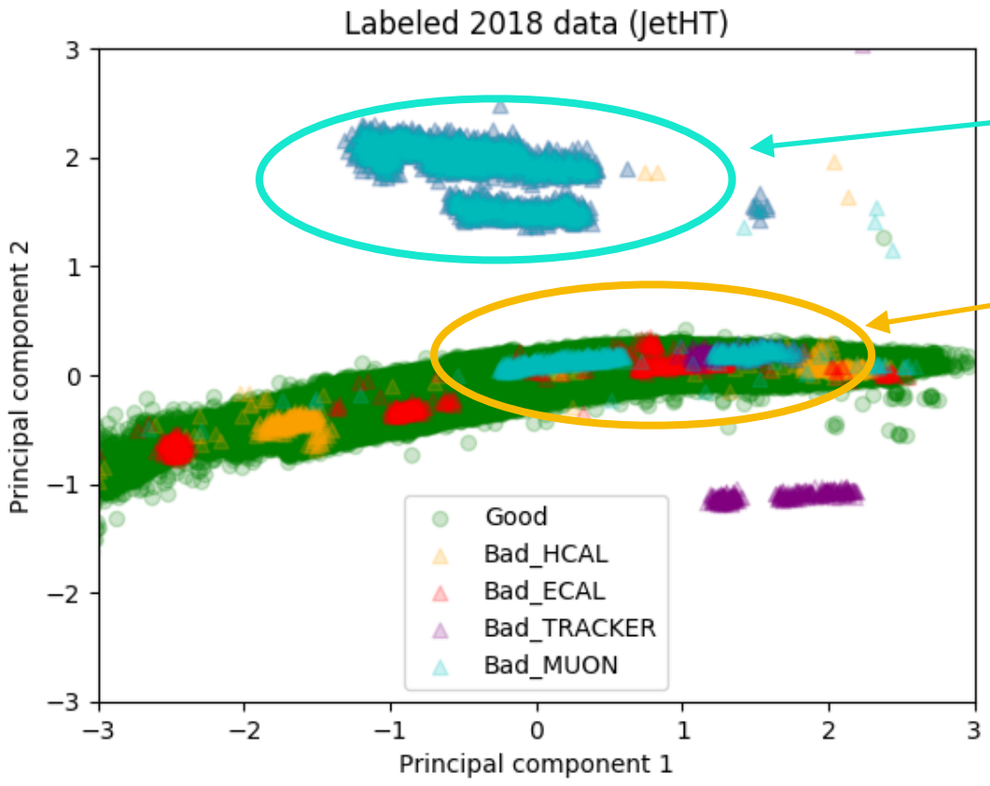
(doesn't include FailureScenario)





Inspect sampling of outlier and inlier of JetHT for MUON malfunction

Inspect outlier and inlier MUON malfunction for JetHT



Inspect 10 samples of those outlier
By randomly picking up

Inspect 10 samples of those inlier
By randomly picking up

Detail of 10 sample LSs

Outlier

Run ID	Lumi ID	Comment for MUON
324078	89	– Weird Eta distribution – Probably due to **trigger or tracker** problem
	45	
	703	
	37	
	166	
	387	
323700	45	– Weird pt distribution – some **tracker** modules empty
	307	
315787	280	– PIXEL or TK not in the DAQ (EXCL) – **Strip detector** was excluded, and we think that this can be the cause of what we observe
	295	

Inlier

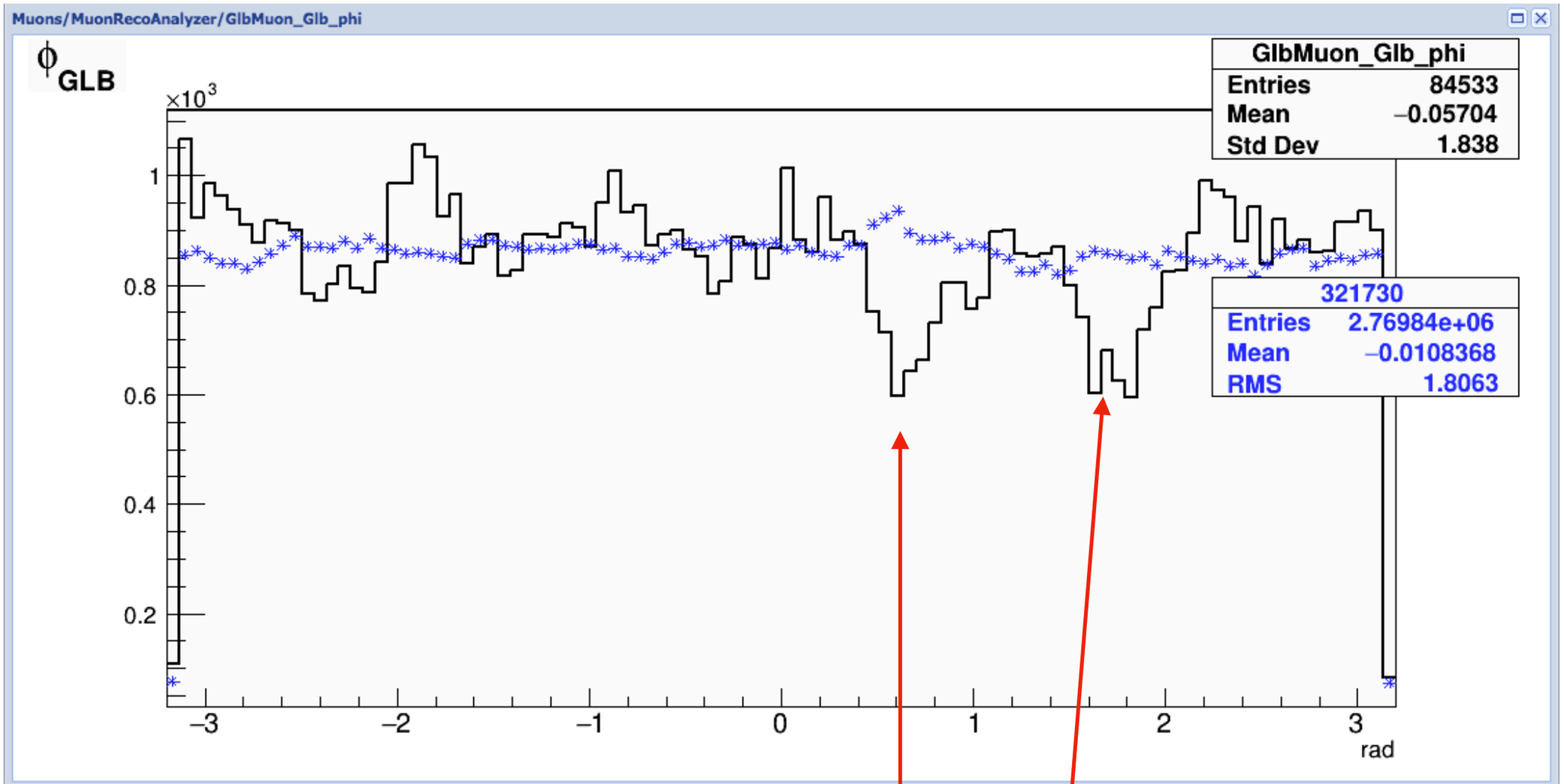
Run ID	Lumi ID	Comment for MUON
320009	47	– significant drop in efficiency (~50%) in the **positive endcap** is observed https://goo.gl/oNfFGk – Distributions typically used to check quality of muon (pulls, residuals, invariant mass) look unaffected
	69	
	83	
320008	36	– significant drop in efficiency (~50%) in the **positive endcap** is observed https://goo.gl/1RnXCp – Distributions typically used to check quality of muon (pulls, residuals, invariant mass) look unaffected
	74	
323416	28	- trigger/tracker problem? https://goo.gl/xzRJ3x
323418	39	– trigger/tracker problem? https://goo.gl/mG4K6V
	40	
316456	1	- The **CSC (endcap)** were not in the DAQ
321261	56	- a significant efficiency loss in the **endcaps** (50%) is observed for global muons https://goo.gl/LcQzRD

Information taken from https://dev-cmsrunregistry.web.cern.ch/offline/datasets/global

Inspect

323416	28	- trigger/tracker problem? https://goo.gl/xzRJ3x

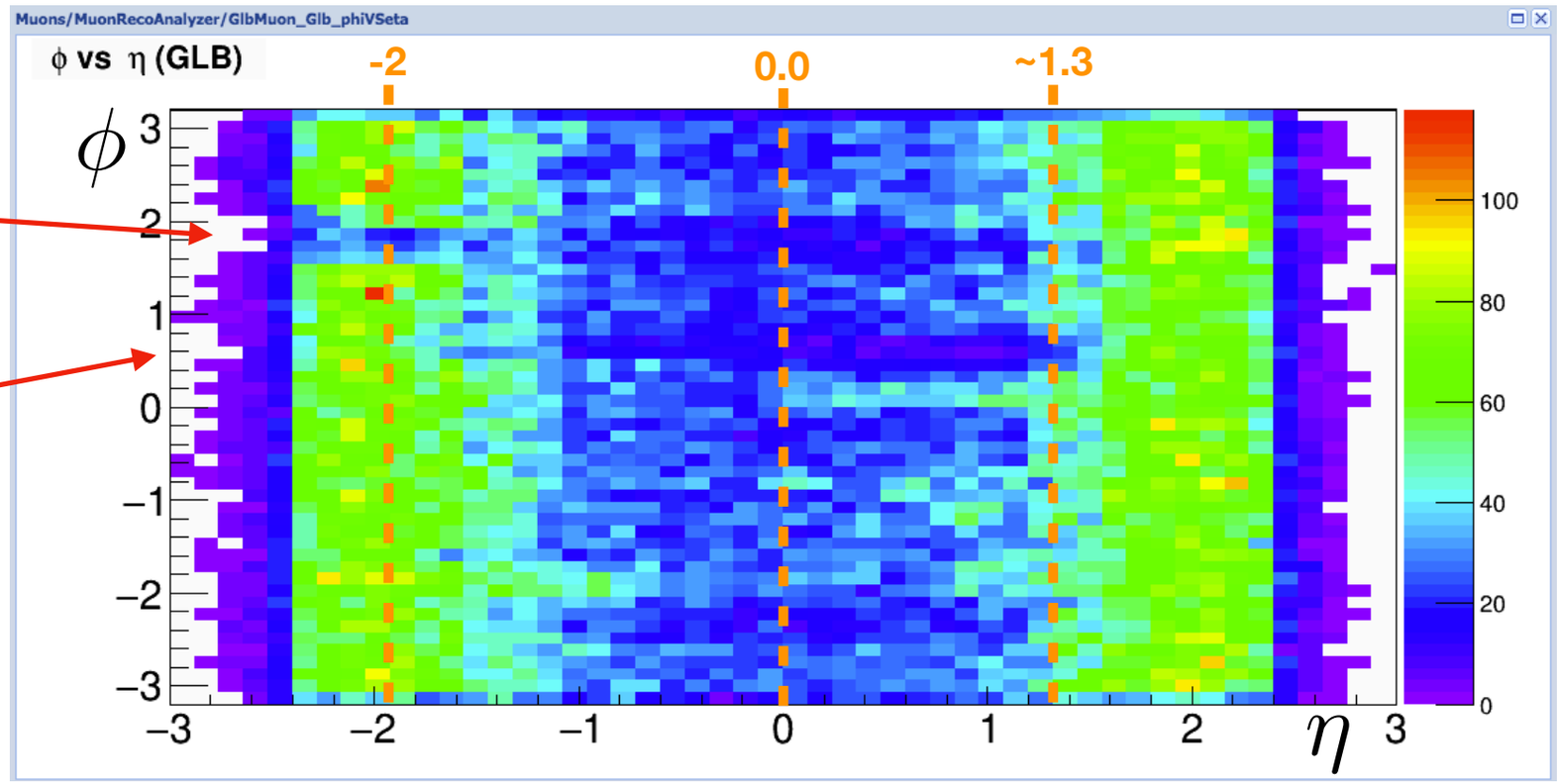
- When open session of the link

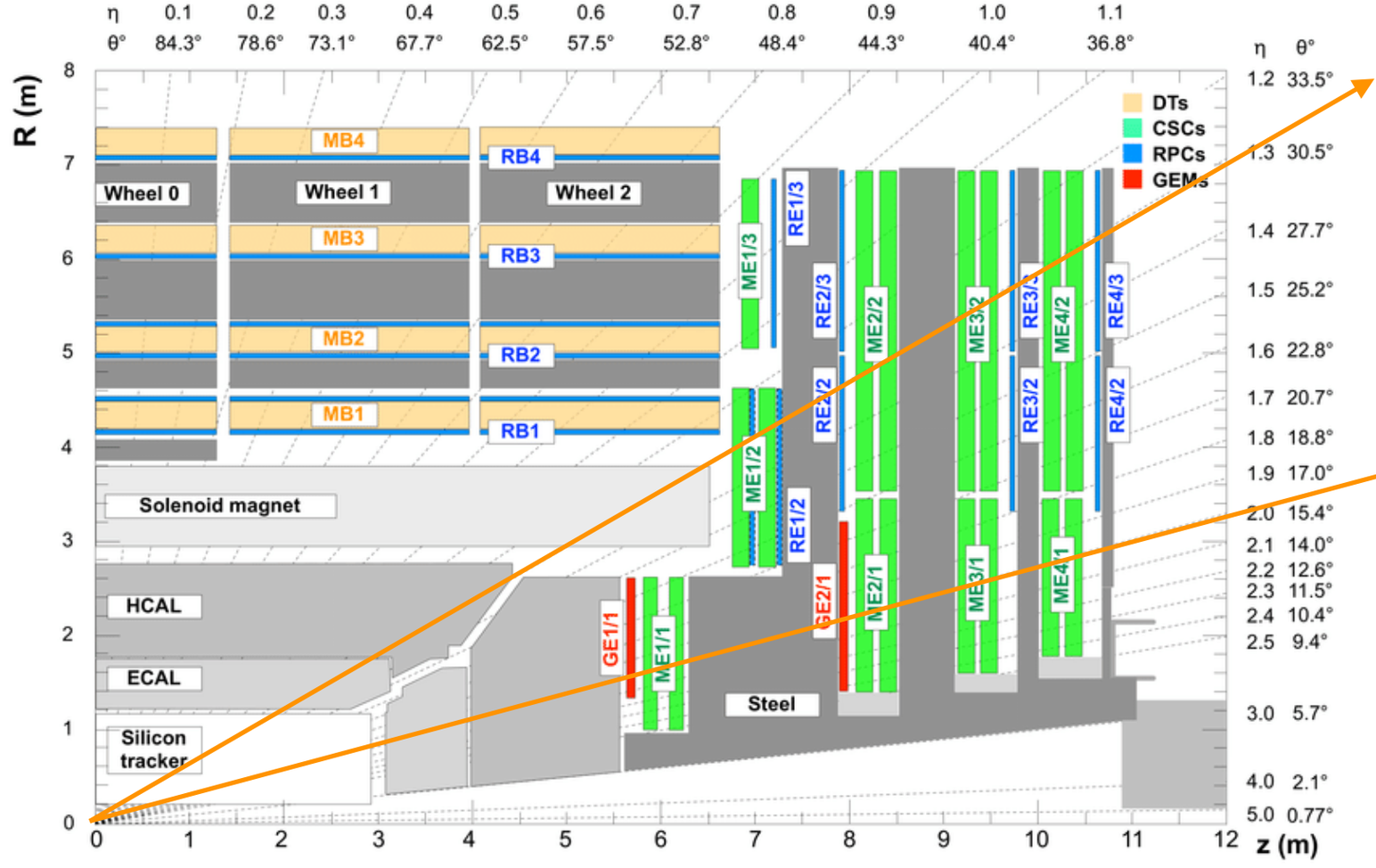


Efficiently in Phi angle drop around 0.5 and 1.7

Let's dig a bit deeper

0.5 and 1.7



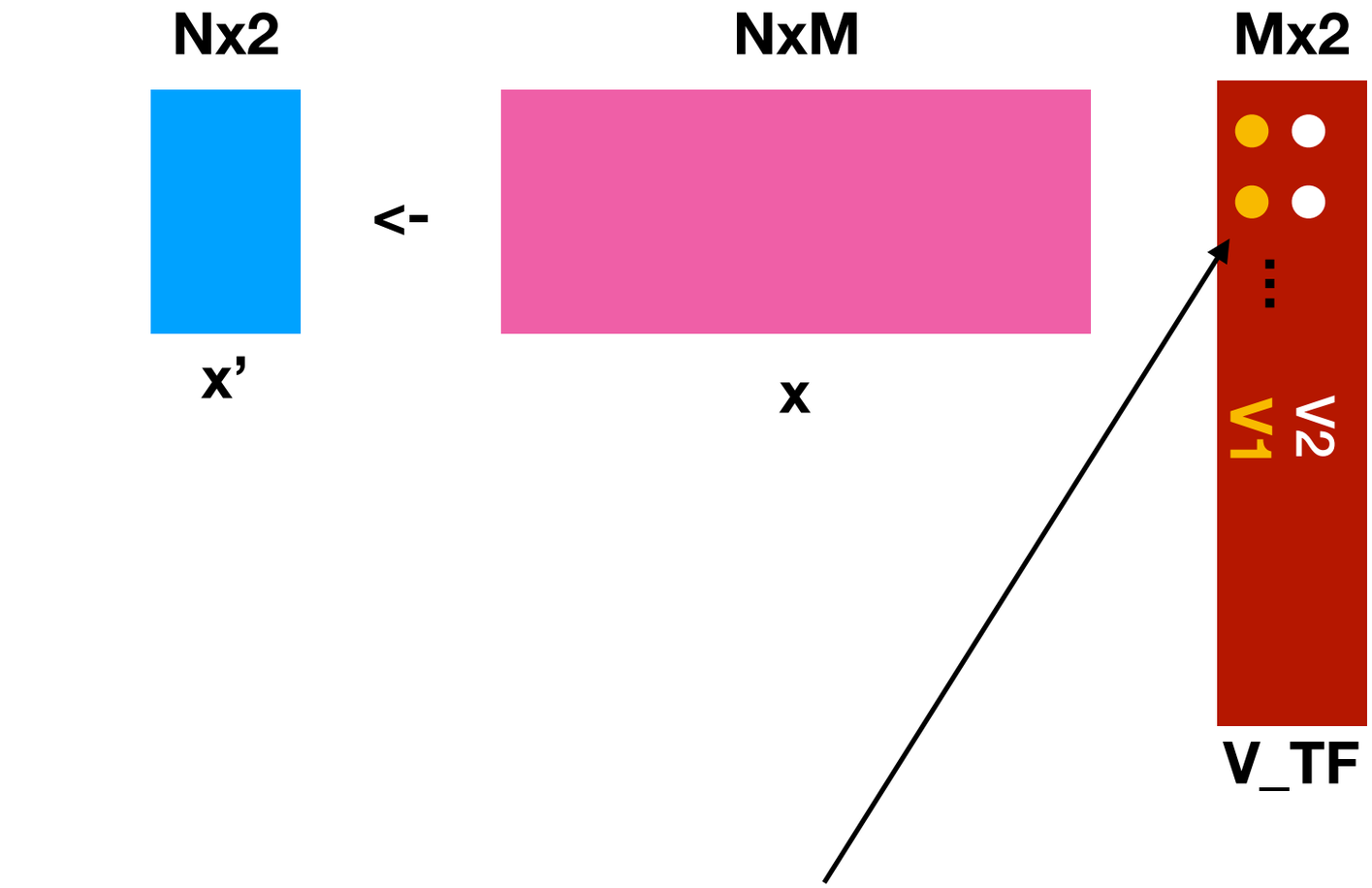


$|\eta| = 1.3$

$|\eta| = 2$

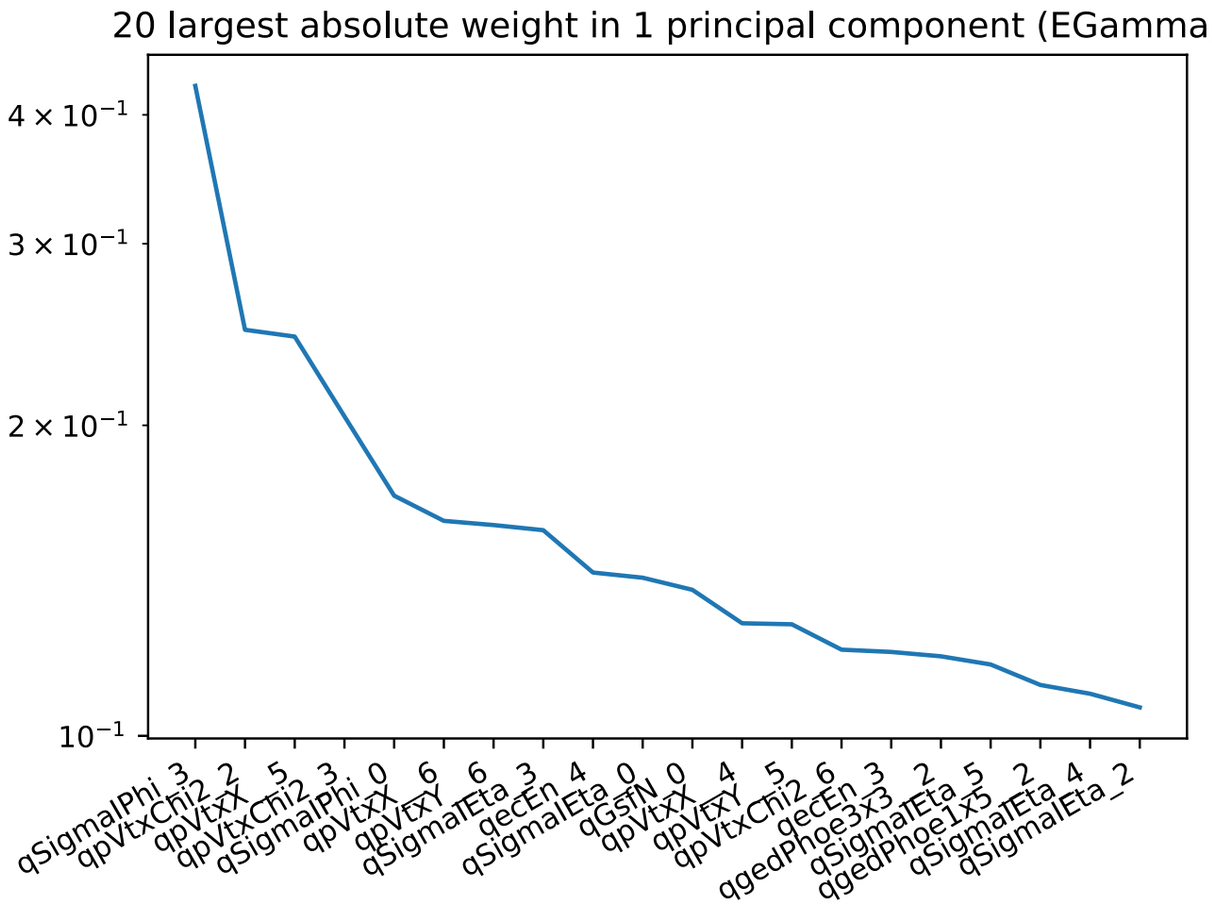
Feature importance

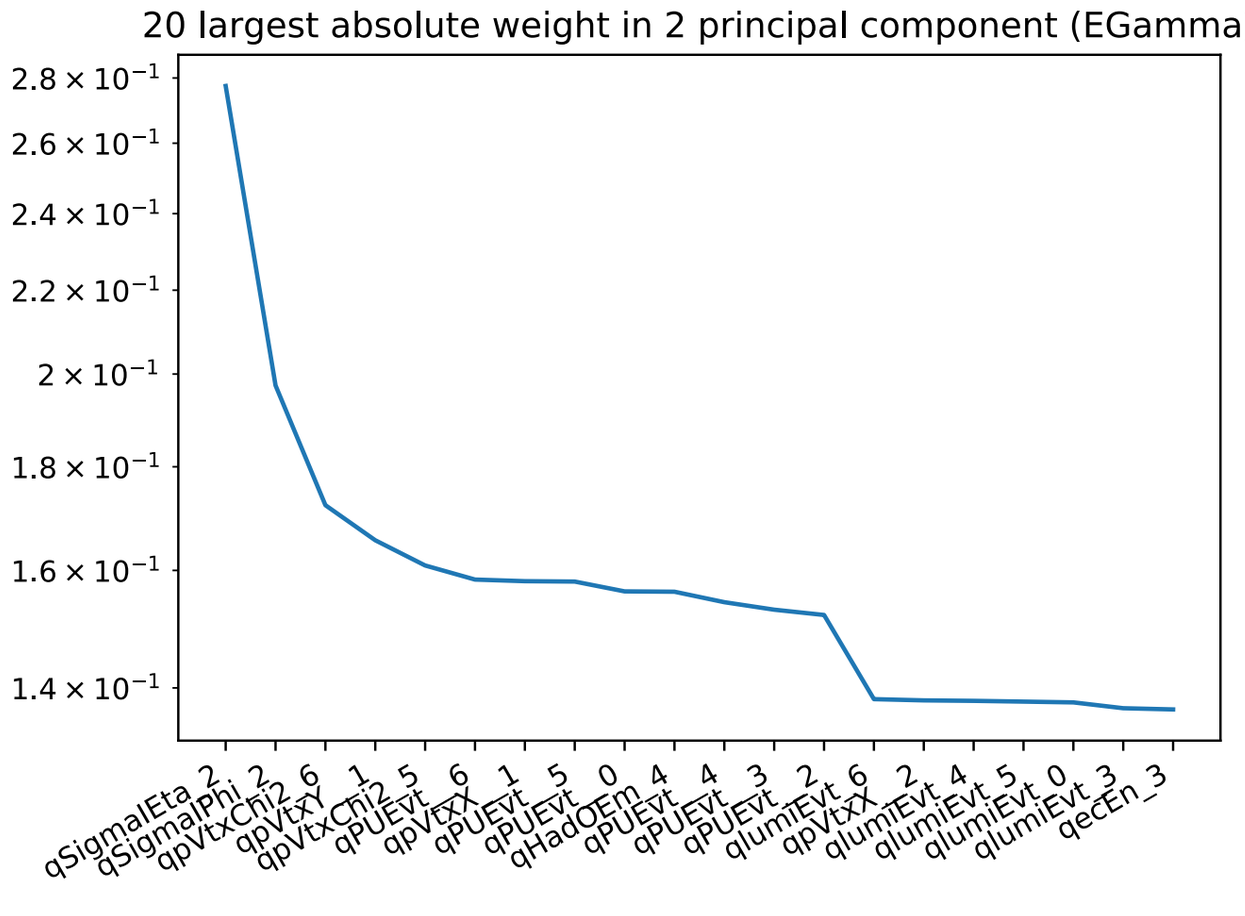
Under transformation



Picking up the element in eigenvector
and take absolute value to see how much significance
of each feature contribute to a principal component

Contribution of each feature to Principal Axis (EGamma)





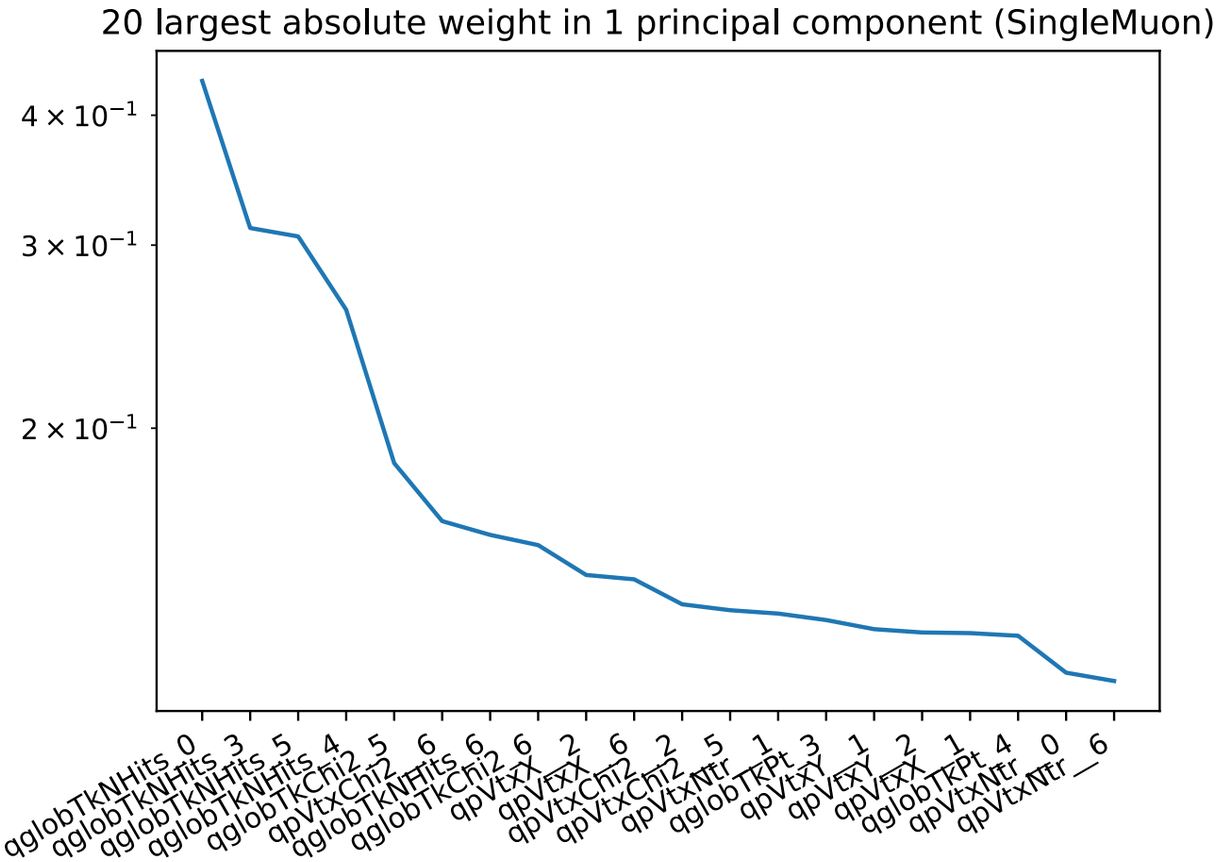
Dominated features
- **qpVtxX and qpVtxY**
- **qSigmalEta**

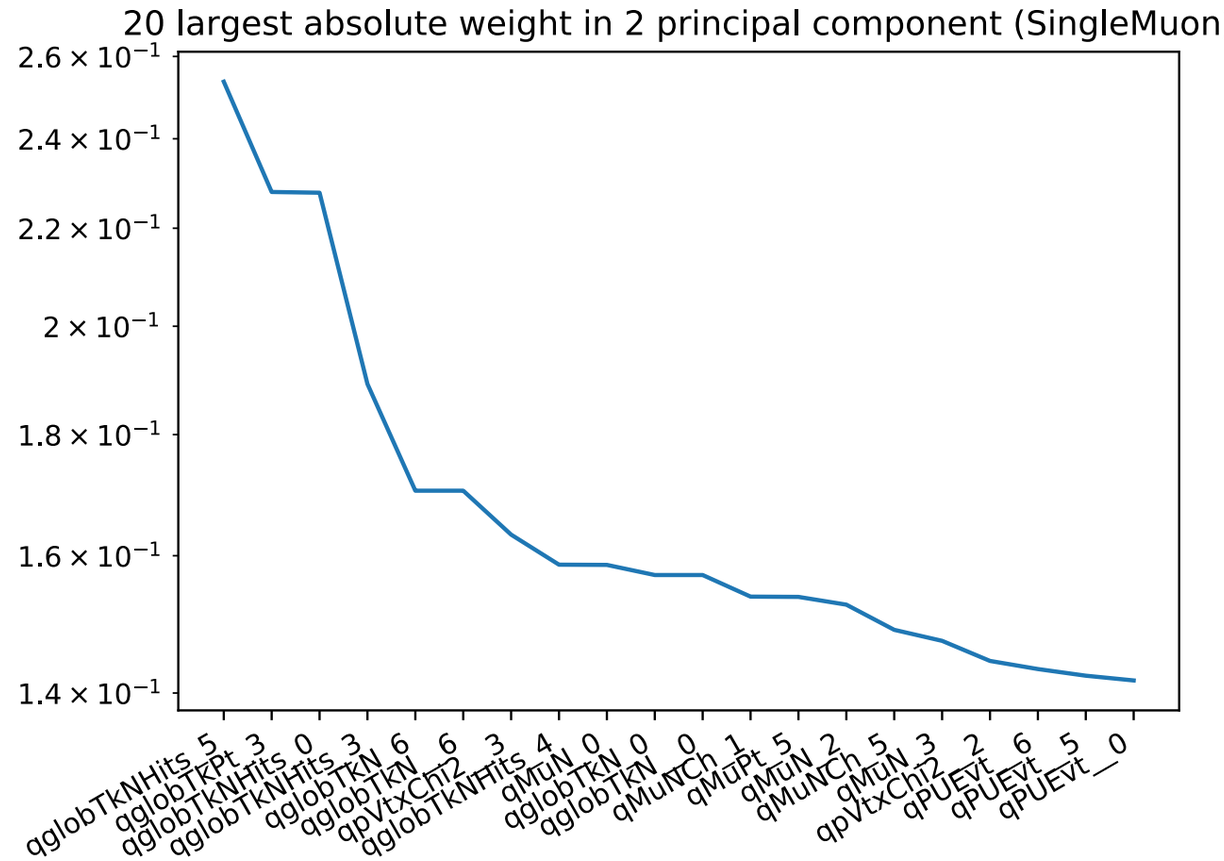
Overlapping feature
- **qSigmalPhi**
- **qpVtxChi2**

Dominated features
- **qPUEvt**
- **qlumiEvt**

Explained variance ratio ~ [0.31 0.25]

Contribution of each feature to Principal Axis (Single Muon)





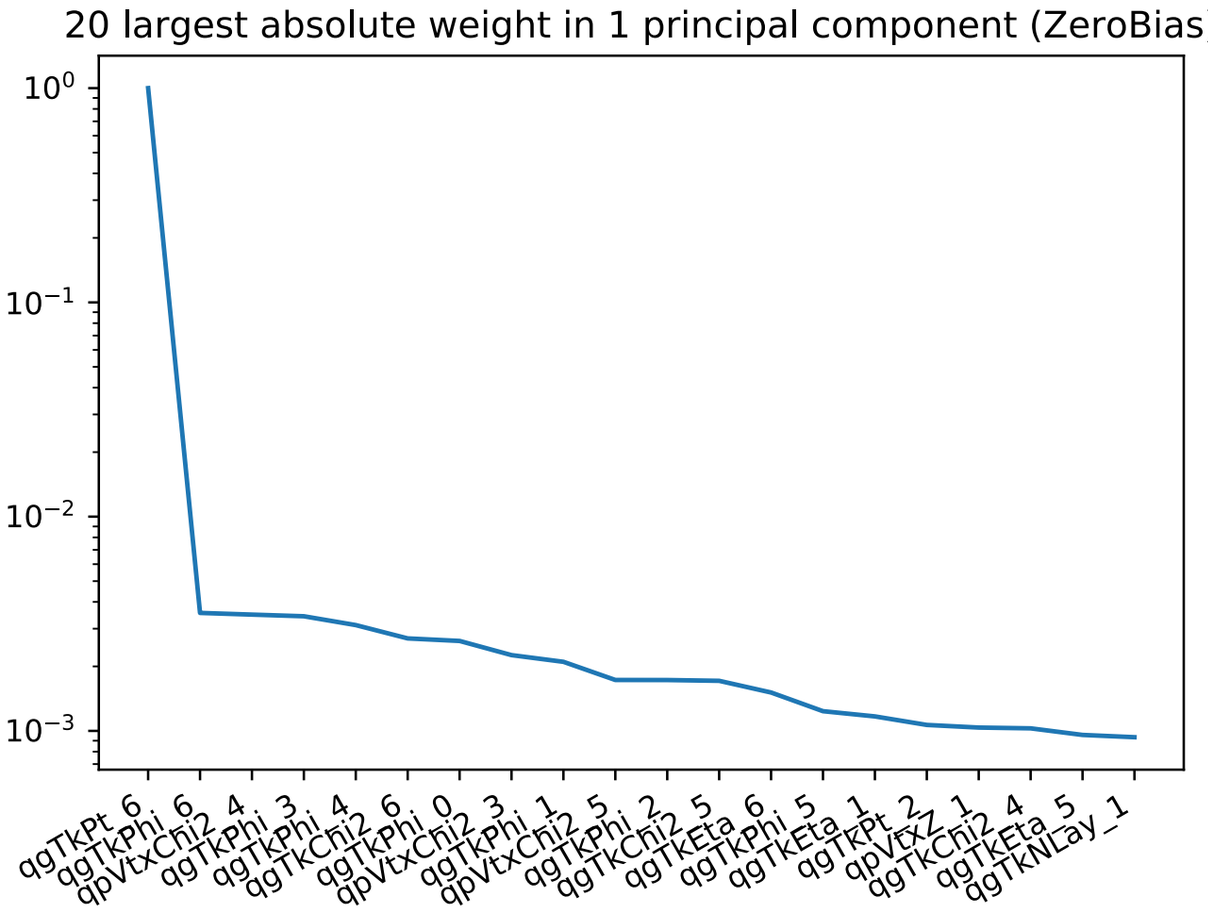
Dominated features
- **qglobTkChi2**
- **qpVtxX and qpVtxY**

Overlapping feature
- **qglobTkNHits**

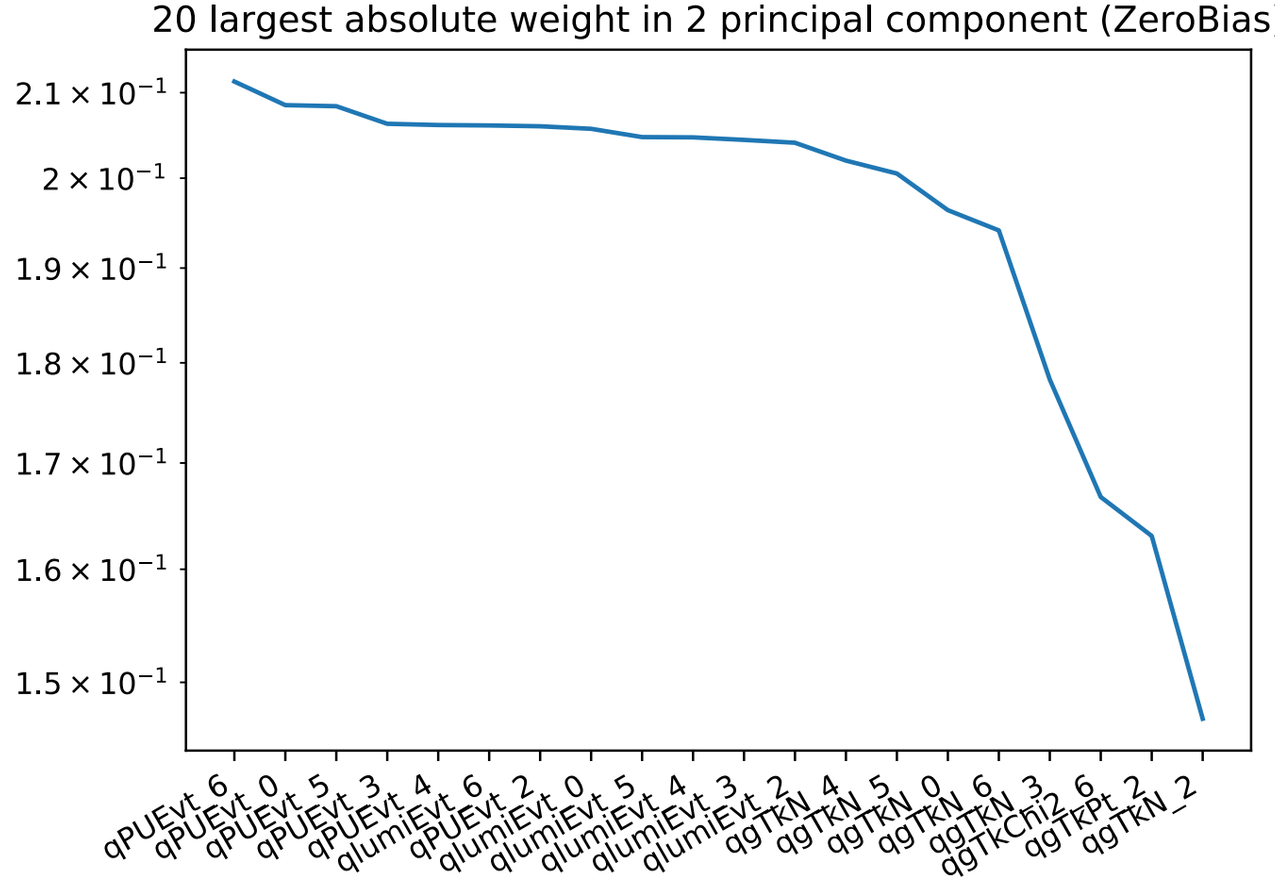
Dominated features
- **qPUEvt**
- **qMuN and qMuNCh**

Explained variance ratio ~ [0.37 0.22]

Contribution of each feature to Principal Axis (ZeroBias)



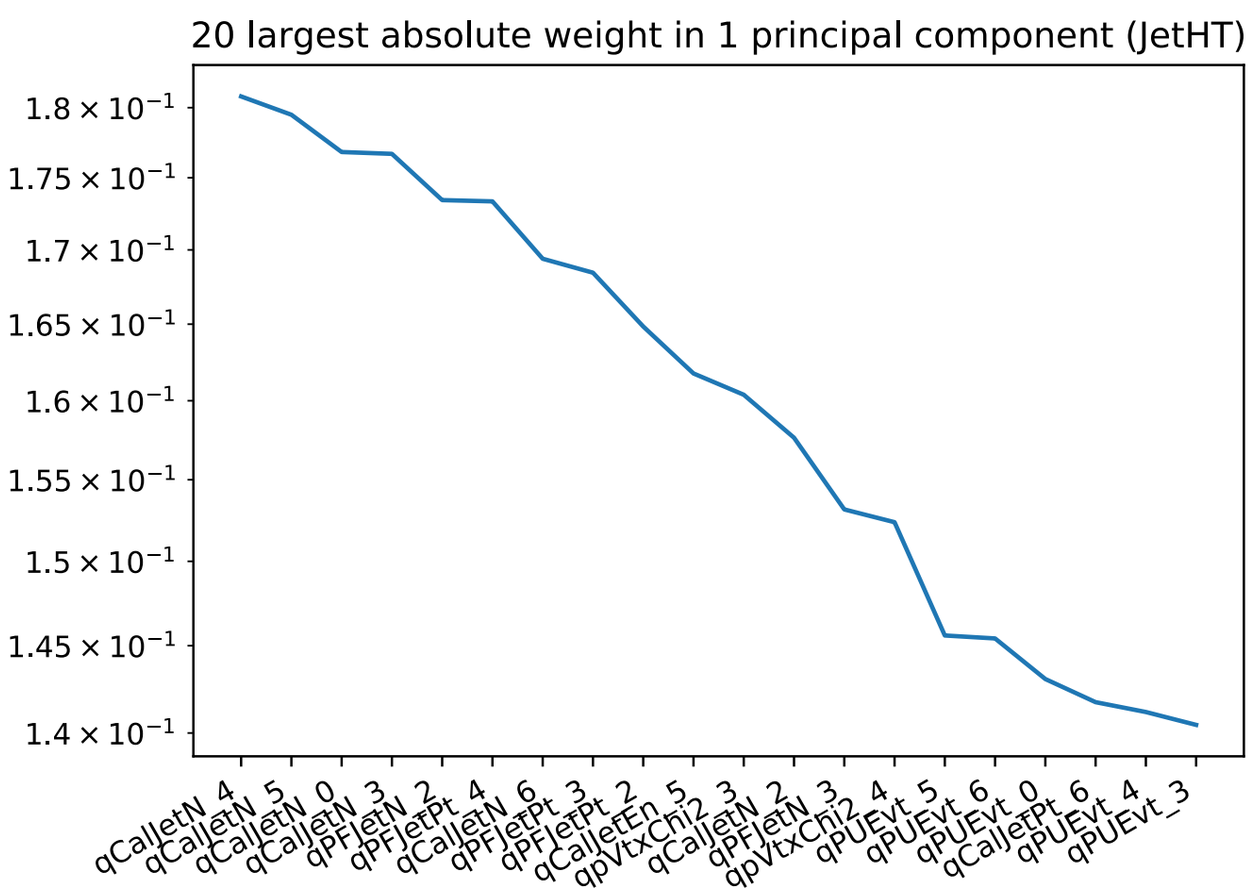
Dominated features
- **qgTkPt**
- **qgTkPhi**



Dominated features
- **qPUEvt**
- **qlumiEvt**
- **qgTkN**

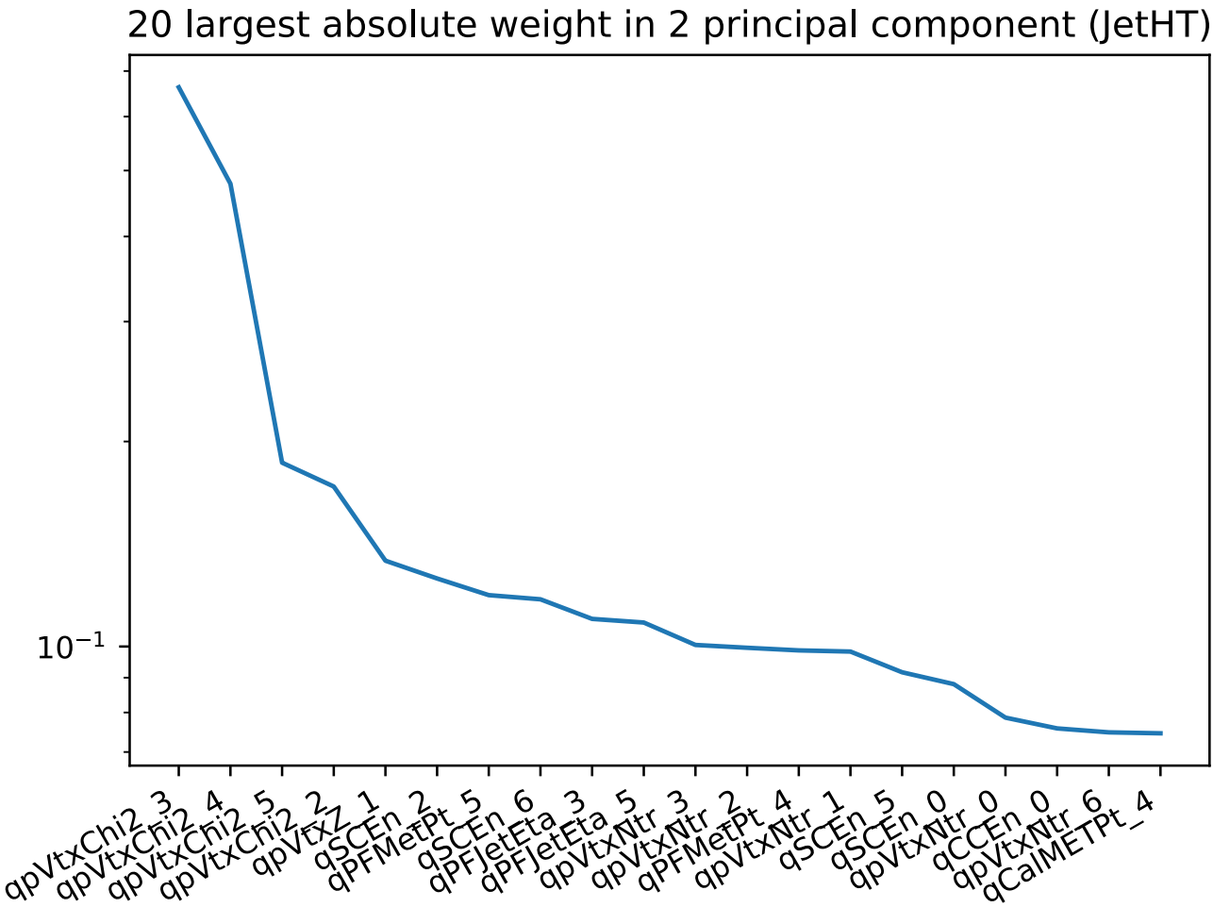
Explained variance ratio ~ [0.89 0.0225]

Contribution of each feature to Principal Axis (JetHT)



Dominated features

- **qCalJetN**
- **qCalJetPt**
- **qPUEvt**



Dominated features

- **qpVtxChi2**
- **qPFMetPt and qPFJetEta**

Explained variance ratio ~ [0.45 0.21]