Update

~9.4 M events of signal MC ($B \rightarrow K\tau\mu$)
One stream of generic MC

26/11/2024

eID and μID

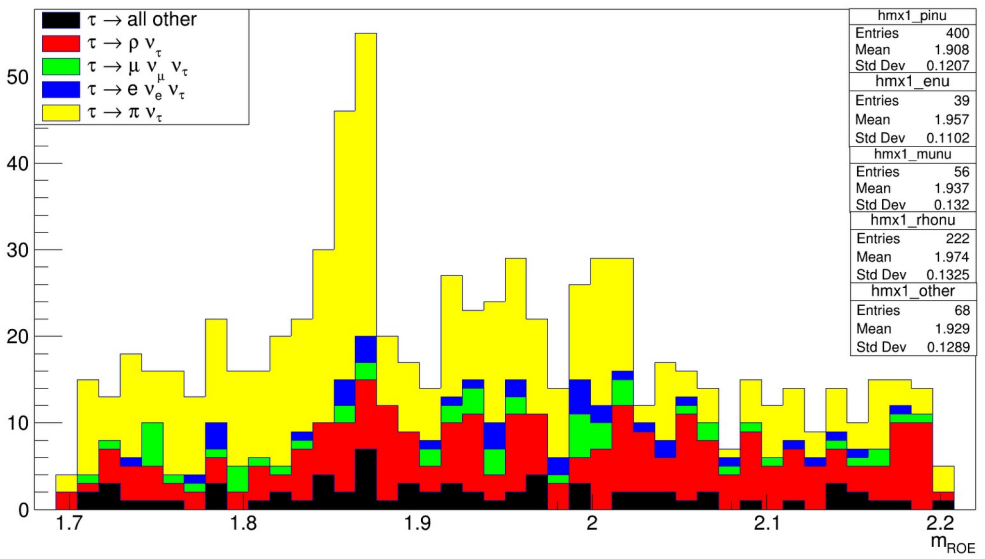
Previous

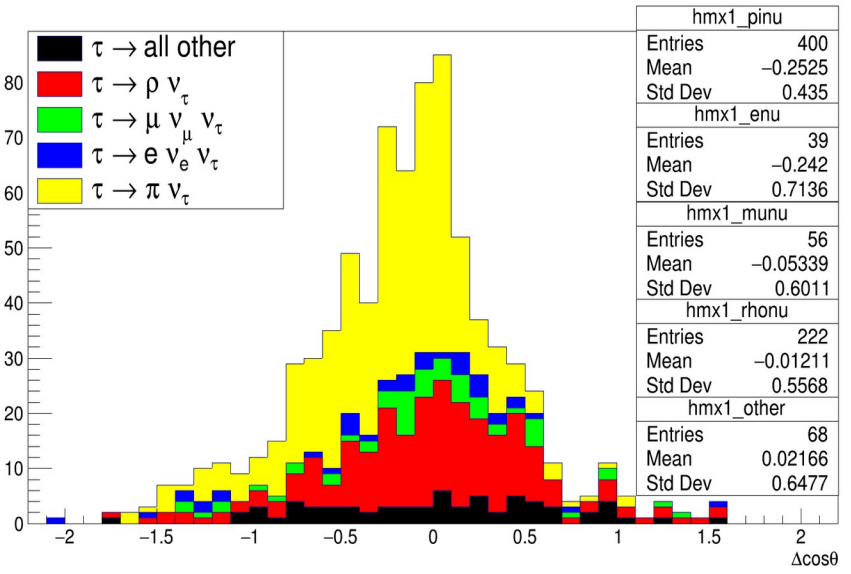
```
# cuts on particles ID and IP
e_cut = 'eIDBelle > 0.6 and muIDBelle < 0.98 and atcPIDBelle(3,0) < 0.98 and d0 < 1 and abs(z0) < 4 and p > 0.05'
mu_cut = 'muIDBelle > 0.6 and eIDBelle < 0.98 and atcPIDBelle(3,1) < 0.98 and d0 < 1 and abs(z0) < 4 and p > 0.05'
pi_cut = 'atcPIDBelle(3,2) < 0.6 and d0 < 1 and abs(z0) < 4 and p > 0.05 and muIDBelle < 0.98 and eIDBelle < 0.98'
K_cut = 'atcPIDBelle(3,2) > 0.6 and muIDBelle < 0.98 and eIDBelle < 0.98 and d0 < 1 and abs(z0) < 4 and p > 0.05'
p_cut = 'atcPIDBelle(4,2) > 0.6 and atcPIDBelle(4,3) > 0.6 and muIDBelle < 0.98 and eIDBelle < 0.98 and d0 < 1 and abs(z0) < 4 and p > 0.05'
```

Current

```
# cuts on particles ID and IP
e_cut = 'eIDBelle > 0.6 and muIDBelle < 0.98 and atcPIDBelle(3,0) < 0.98 and d0 < 1 and abs(z0) < 4 and p > 0.05'
mu_cut = 'muIDBelle > 0.6 and eIDBelle < 0.98 and atcPIDBelle(3,1) < 0.98 and d0 < 1 and abs(z0) < 4 and p > 0.05'
pi_cut = 'atcPIDBelle(3,2) < 0.6 and d0 < 1 and abs(z0) < 4 and p > 0.05 and muIDBelle < 0.6 and eIDBelle < 0.6'
K_cut = 'atcPIDBelle(3,2) > 0.6 and muIDBelle < 0.98 and eIDBelle < 0.98 and d0 < 1 and abs(z0) < 4 and p > 0.05'
p_cut = 'atcPIDBelle(4,2) > 0.6 and atcPIDBelle(4,3) > 0.6 and muIDBelle < 0.98 and eIDBelle < 0.98 and d0 < 1 and abs(z0) < 4 and p > 0.05'
```

Before bdt training





Lower reconstruction efficiency with these particle selections.

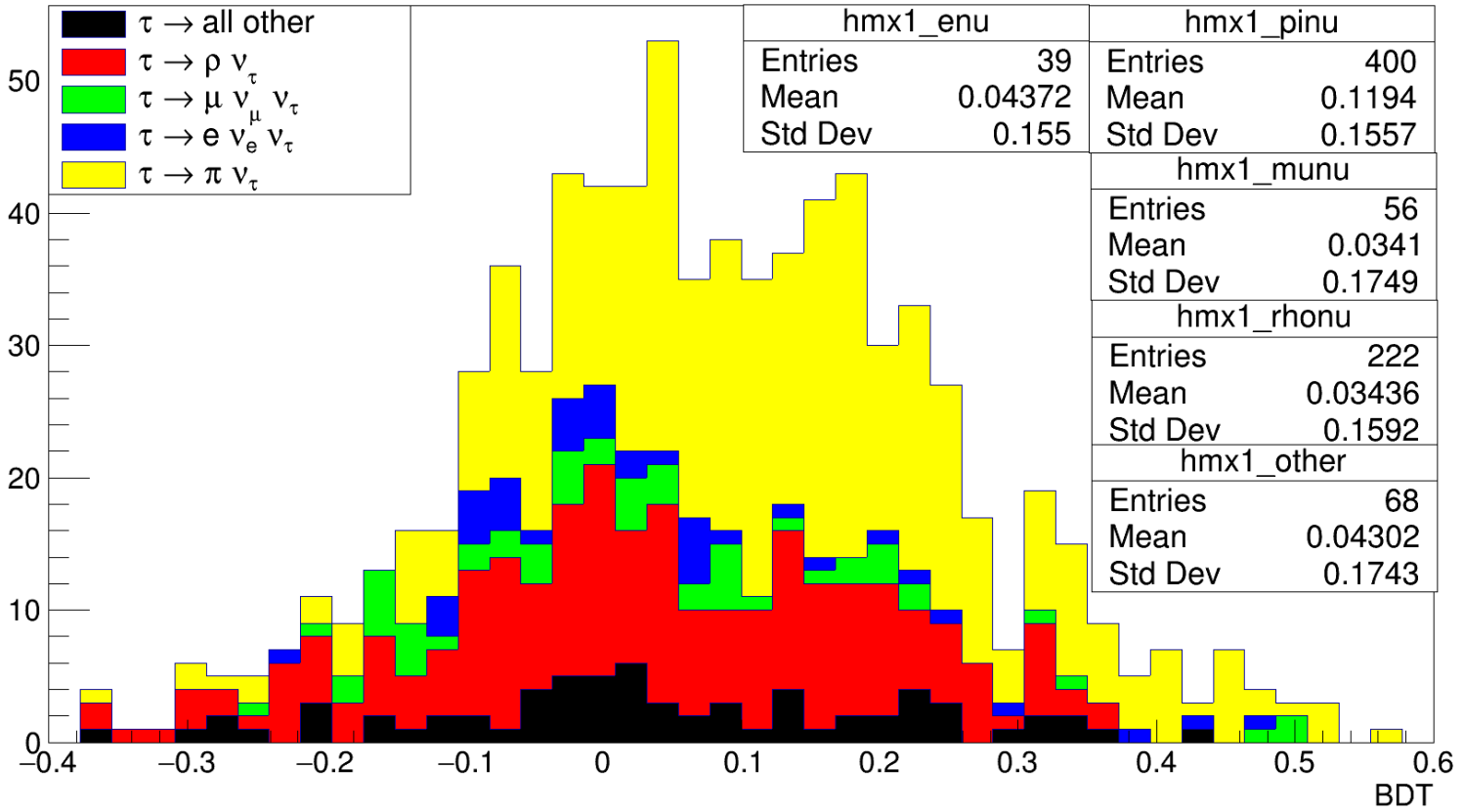
BDT

1- Training and testing is done on the inclusive tau sample

2- Application is done also on the inclusive tau sample

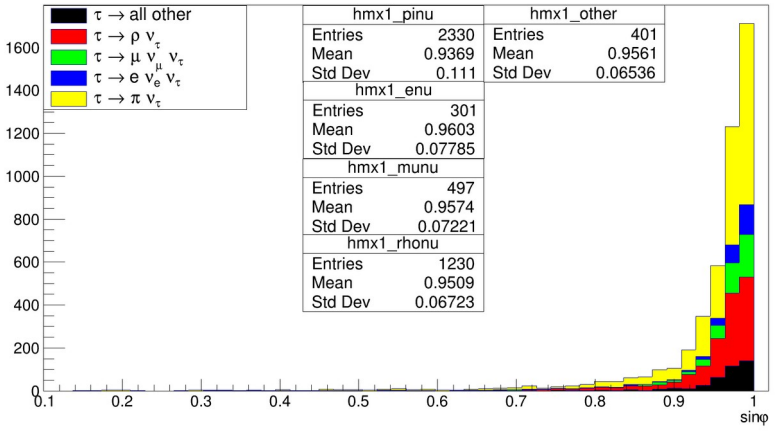
3- Quite less ROC area (0.69)

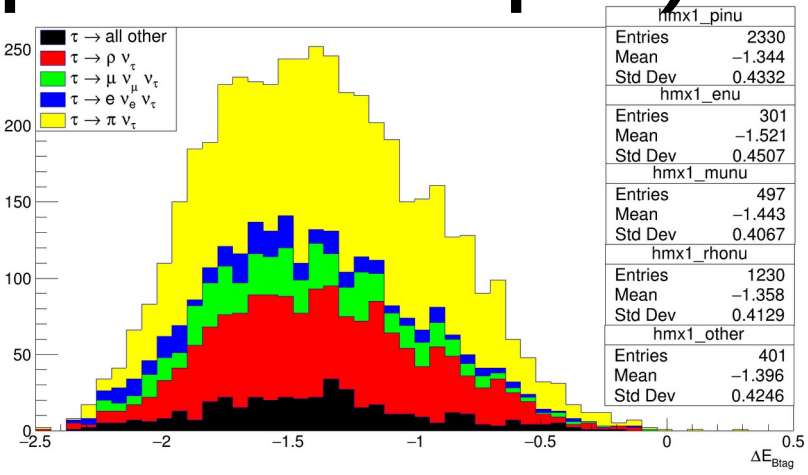
BDT score

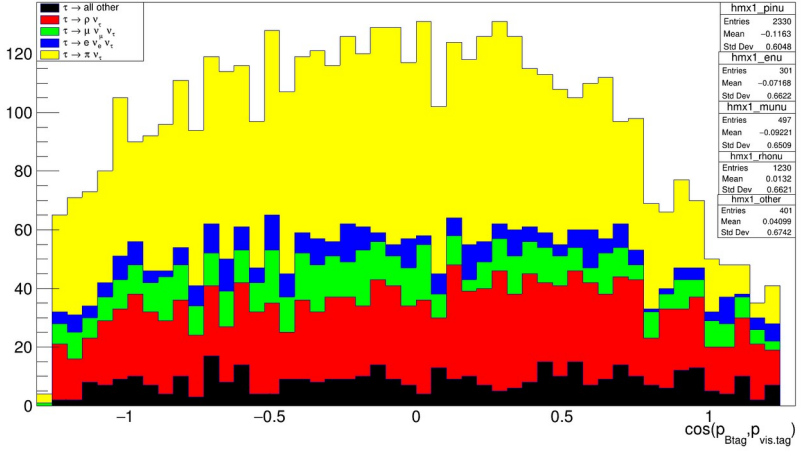

τ → all other
τ → ρ ν_τ
τ → μ ν_μ ν_τ
τ → e ν_e ν_τ
τ → π ν_τ
hmx1_enu
Entries 39
Mean 0.04372
Std Dev 0.155
hmx1_pinu
Entries 400
Mean 0.1194
Std Dev 0.1557
hmx1_munu
Entries 56
Mean 0.0341
Std Dev 0.1749
hmx1_rhonu
Entries 222
Mean 0.03436
Std Dev 0.1592
hmx1_other
Entries 68
Mean 0.04302
Std Dev 0.1743
50
40
30
20
10
0
−0.4
−0.3
−0.2
−0.1
0
0.1
0.2
0.3
0.4
0.5
0.6
BDT

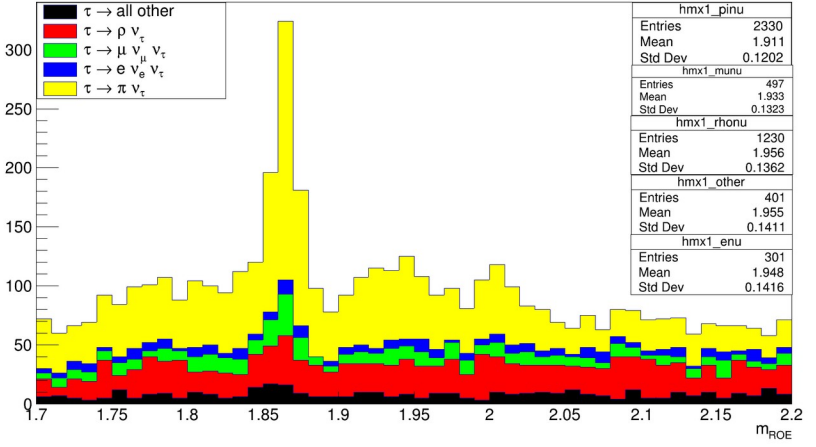
Back up

Basic distributions (prev. sample)

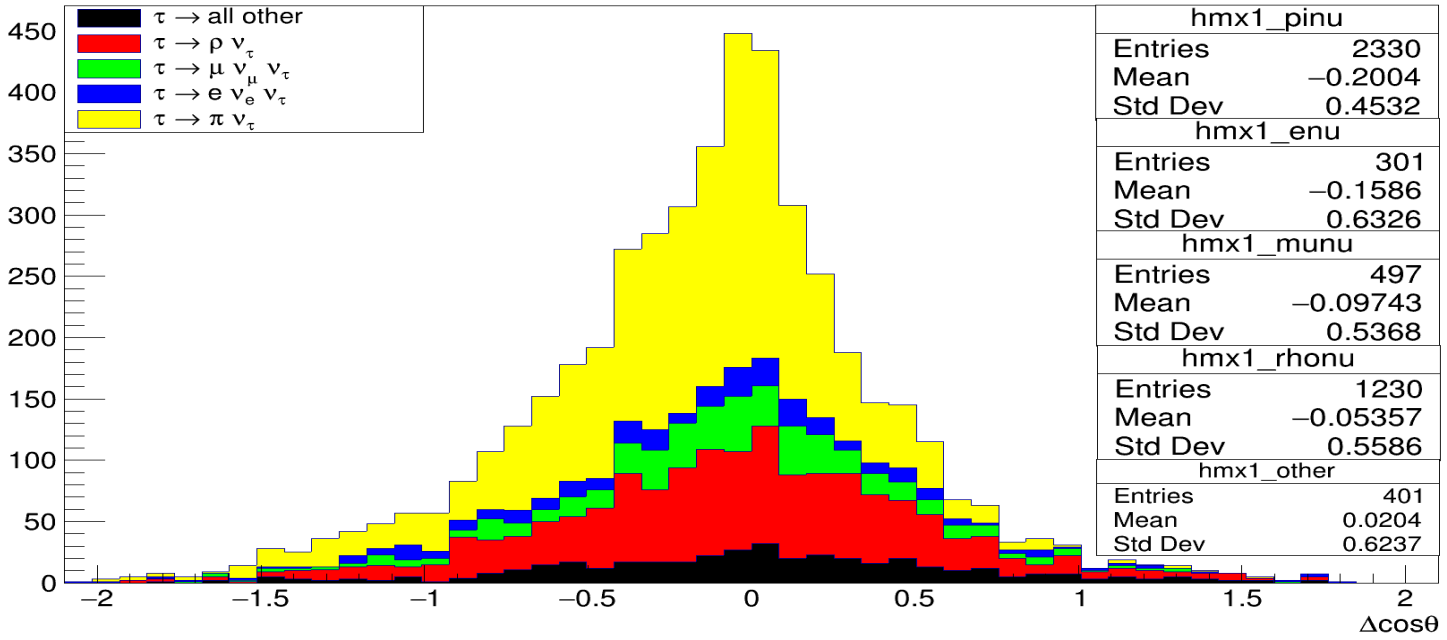




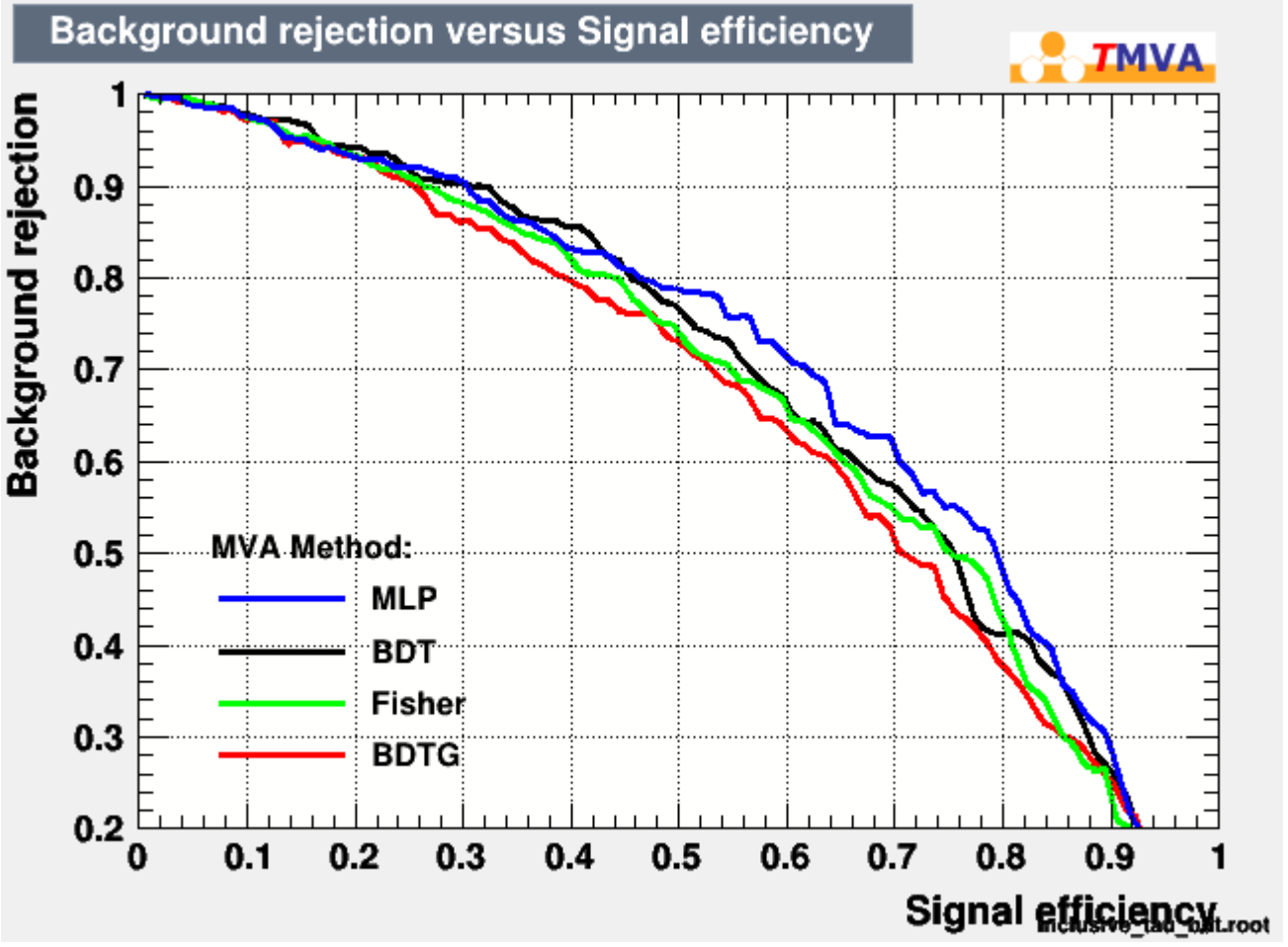




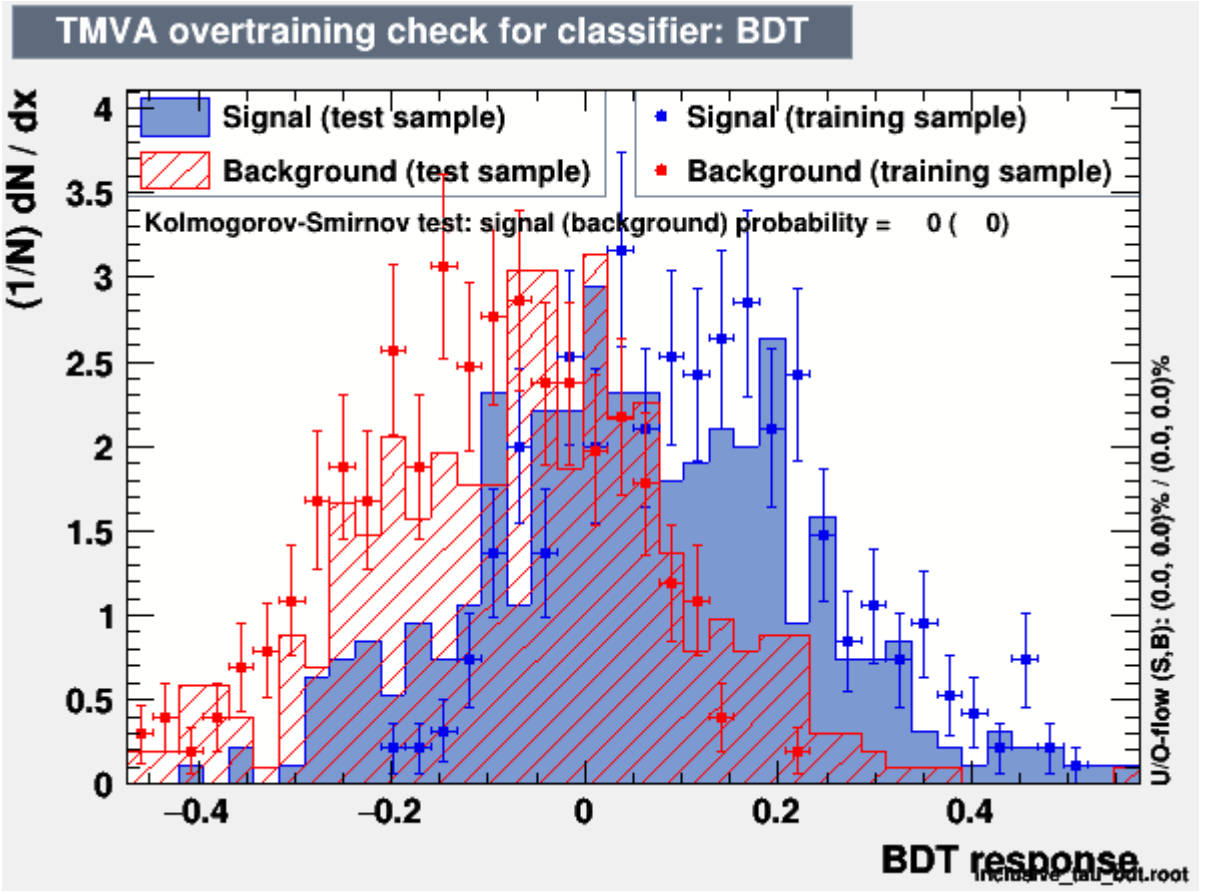
Basic distributions (prev. sample) cont.



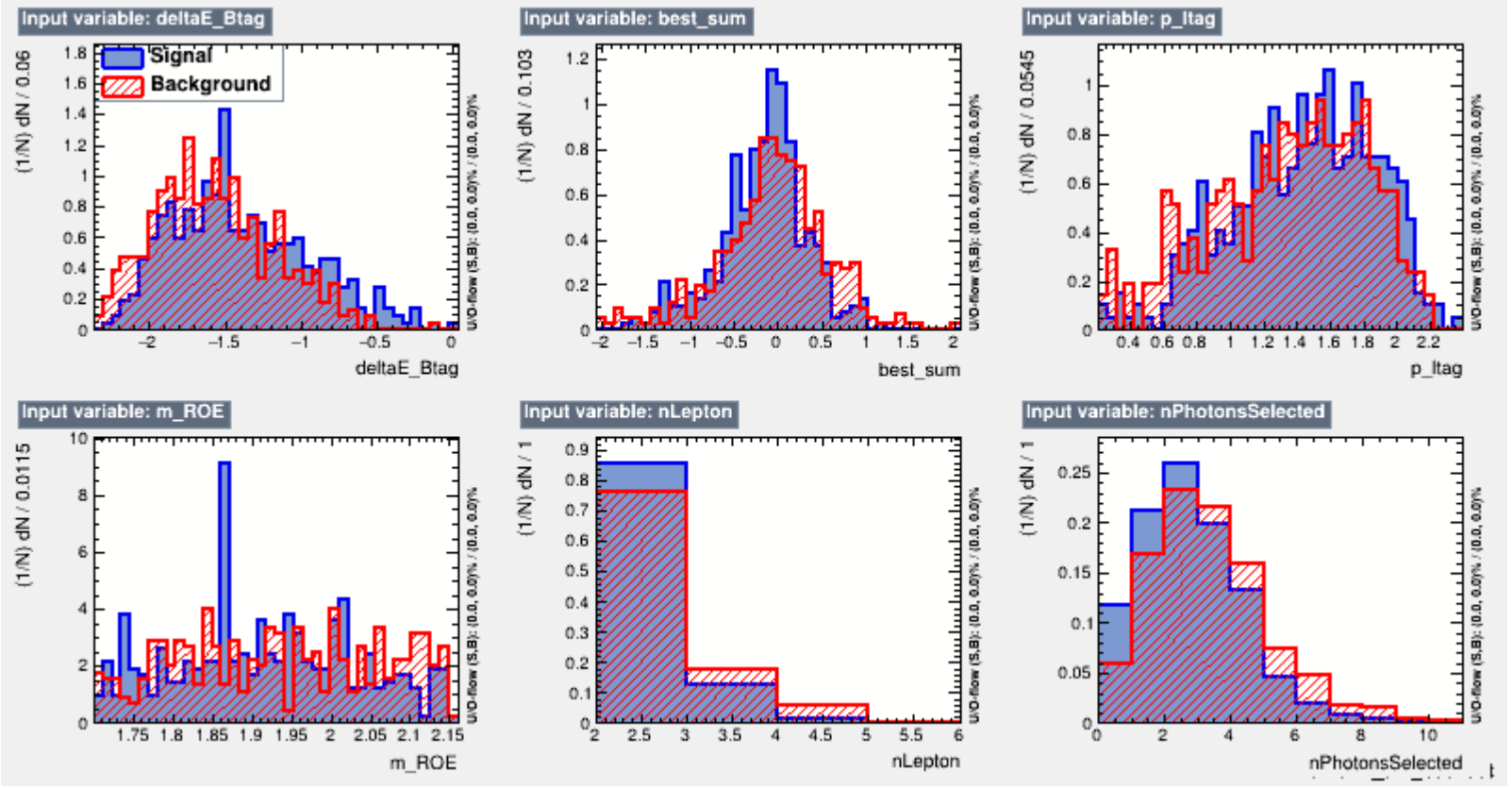
BDT plots


Background rejection versus Signal efficiency
TMVA
Background rejection
Signal efficiency
MVA Method:
MLP
BDT
Fisher
BDTG
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

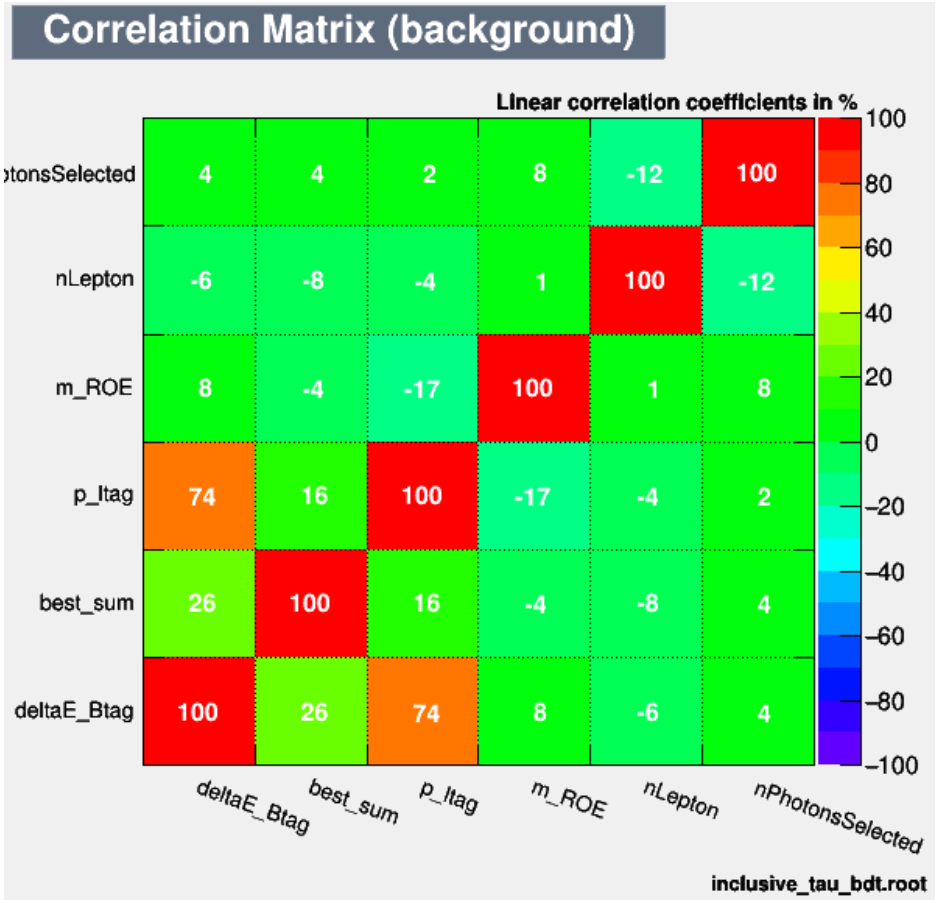
BDT plots

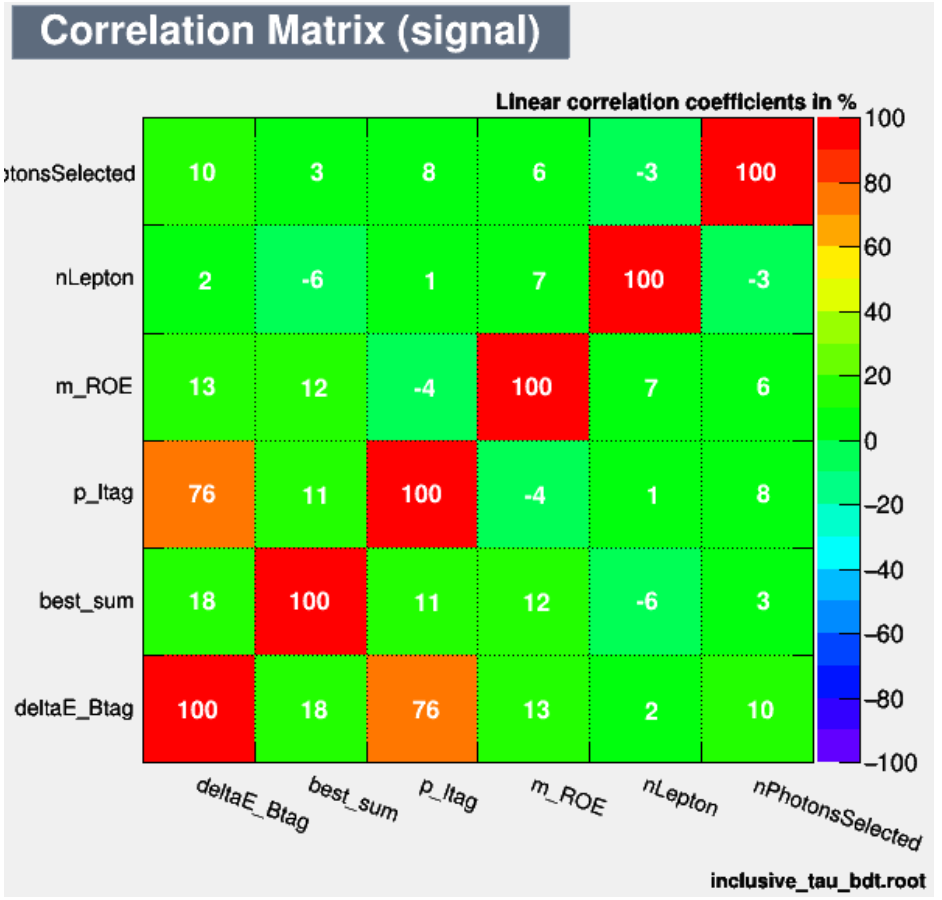

TMVA overtraining check for classifier: BDT
Signal (test sample)
Background (test sample)
Signal (training sample)
Background (training sample)
Kolmogorov-Smirnov test: signal (background) probability = 0 (0)
(1/N) dN / dx
U/O-flow (S,B): (0.0, 0.0)% / (0.0, 0.0)%
BDT response
TMVA_tau_bdt.root

BDT plots


Input variable: deltaE_Btag
Signal
Background
(1/N) dN / 0.06
deltaE_Btag
Input variable: best_sum
(1/N) dN / 0.103
best_sum
Input variable: p_ltag
(1/N) dN / 0.0545
p_ltag
Input variable: m_ROE
(1/N) dN / 0.0115
m_ROE
Input variable: nLepton
(1/N) dN / 1
nLepton
Input variable: nPhotonsSelected
(1/N) dN / 1
nPhotonsSelected

BDT plots


Correlation Matrix (background)
Linear correlation coefficients in %
tonsSelected
nLepton
m_ROE
p_ltag
best_sum
deltaE_Btag
4 4 2 8 -12 100
-6 -8 -4 1 100 -12
8 -4 -17 100 1 8
74 16 100 -17 -4 2
26 100 16 -4 -8 4
100 26 74 8 -6 4
deltaE_Btag
best_sum
p_ltag
m_ROE
nLepton
nPhotonsSelected
100
80
60
40
20
0
−20
−40
−60
−80
−100
inclusive_tau_bdt.root


Correlation Matrix (signal)
Linear correlation coefficients in %
tonsSelected
nLepton
m_ROE
p_ltag
best_sum
deltaE_Btag
10 3 8 6 -3 100
2 -6 1 7 100 -3
13 12 -4 100 7 6
76 11 100 -4 1 8
18 100 11 12 -6 3
100 18 76 13 2 10
deltaE_Btag
best_sum
p_ltag
m_ROE
nLepton
nPhotonsSelected
100
80
60
40
20
0
−20
−40
−60
−80
−100
inclusive_tau_bdt.root