

Status of $t\bar{t} \rightarrow qZ \rightarrow 3 \text{ leptons}$
08/07/2015

Comparing signal samples

With fakes	Initial	3 leptons	At least 2 jets	At least 1 CSVL	At least 1 OSSF pair	Inv Mass Z
IIHE						
TTsemilep Kappa Zct Ztoll	$2.09e+03 \pm 0.718$	241 ± 0.238	179 ± 0.206	149 ± 0.188	149 ± 0.187	142 ± 0.183
TTsemilep Kappa Zut Ztoll	$2.11e+03 \pm 0.916$	225 ± 0.294	125 ± 0.218	98.5 ± 0.194	98.2 ± 0.193	93.7 ± 0.189
tZ-Kappa-Zct	257 ± 0.0808	36.9 ± 0.0302	11.6 ± 0.0169	9.33 ± 0.0151	9.25 ± 0.0151	8.41 ± 0.0144
tZ-Kappa-Zut	$2.09e+03 \pm 0.685$	271 ± 0.236	86.2 ± 0.134	66.4 ± 0.117	65.7 ± 0.117	58.7 ± 0.11
IPHC						
TTto3L-Kappa-zct	$2.13e+03 \pm 1.05$	241 ± 0.348	237 ± 0.345	191 ± 0.309	190 ± 0.309	182 ± 0.302
TTto3L-Kappa-zut	$2.13e+03 \pm 1.05$	240 ± 0.349	236 ± 0.346	180 ± 0.302	179 ± 0.301	172 ± 0.295
tZ-Kappa-zct	267 ± 0.344	37.2 ± 0.129	11.7 ± 0.0722	9.41 ± 0.0647	9.33 ± 0.0644	8.49 ± 0.0615
tZ-Kappa-zut	$2.26e+03 \pm 2.92$	267 ± 1	86.4 ± 0.571	66.2 ± 0.499	65.5 ± 0.497	58.5 ± 0.469

Cutflow

With fakes	Initial	3 leptons	At least 2 jets	At least 1 CSVL	At least 1 OSSF pair	Inv Mass Z
IIHE						
TTsemilep Kappa Zct Ztoll	$2.09e+03 \pm 0.718$	241 ± 0.238	179 ± 0.206	149 ± 0.188	149 ± 0.187	142 ± 0.183
TTsemilep Kappa Zut Ztoll	$2.11e+03 \pm 0.916$	225 ± 0.294	125 ± 0.218	98.5 ± 0.194	98.2 ± 0.193	93.7 ± 0.189
tZ-Kappa-Zct	257 ± 0.0808	36.9 ± 0.0302	11.6 ± 0.0169	9.33 ± 0.0151	9.25 ± 0.0151	8.41 ± 0.0144
tZ-Kappa-Zut	$2.09e+03 \pm 0.685$	271 ± 0.236	86.2 ± 0.134	66.4 ± 0.117	65.7 ± 0.117	58.7 ± 0.11
IPHC						
TTto3L-Kappa-zct	$2.13e+03 \pm 1.05$	241 ± 0.348	237 ± 0.345	191 ± 0.309	190 ± 0.309	182 ± 0.302
TTto3L-Kappa-zut	$2.13e+03 \pm 1.05$	240 ± 0.349	236 ± 0.346	180 ± 0.302	179 ± 0.301	172 ± 0.295
tZ-Kappa-zct	267 ± 0.344	37.2 ± 0.129	11.7 ± 0.0722	9.41 ± 0.0647	9.33 ± 0.0644	8.49 ± 0.0615
tZ-Kappa-zut	$2.26e+03 \pm 2.92$	267 ± 1	86.4 ± 0.571	66.2 ± 0.499	65.5 ± 0.497	58.5 ± 0.469
BACKGROUND						
TTdilep WToLNU madspin	$1.93e+03 \pm 7.6$	147 ± 2.1	99.6 ± 1.73	89.7 ± 1.64	68.8 ± 1.44	16.9 ± 0.712
<u>TTdilep ZToLL madspin</u>	803 ± 2.54	208 ± 1.29	140 ± 1.06	127 ± 1.01	118 ± 0.975	88.9 ± 0.846
TTdilep madspin	$6.78e+06 \pm 3.44e+03$	145 ± 15.6	85.1 ± 11.9	75.1 ± 11.2	43.4 ± 8.51	18.4 ± 5.53
TTsemilep HToZZ madspin2	267 ± 0.34	2.64 ± 0.0339	2.55 ± 0.0333	2.29 ± 0.0316	2.25 ± 0.0313	1.69 ± 0.0271
TTsemilep ZToLL madspin 1	$1.68e+03 \pm 5.3$	108 ± 1.35	89.5 ± 1.23	79.2 ± 1.15	77.4 ± 1.14	66 ± 1.05
TTsemilep ZToLL madspin 2	$1.68e+03 \pm 5.3$	110 ± 1.36	89.9 ± 1.23	79.1 ± 1.15	76.8 ± 1.14	66.2 ± 1.05
<u>WZToLLLNU</u>	$2.57e+05 \pm 60.5$	$1.52e+04 \pm 15.4$	$6.64e+03 \pm 10.1$	$2.26e+03 \pm 5.9$	$2.25e+03 \pm 5.89$	$2.05e+03 \pm 5.62$
ZToLL50-3Jets sm-no masses	$6.28e+06 \pm 3.39e+03$	33.3 ± 7.85	14.8 ± 5.23	13 ± 4.9	13 ± 4.9	9.25 ± 4.14
ZToLL50-4Jets sm-no masses	$2.16e+06 \pm 1.49e+03$	6.05 ± 2.47	5.04 ± 2.25	3.02 ± 1.75	3.02 ± 1.75	3.02 ± 1.75
<u>ZZToLLLL sm-no masses</u>	$3.59e+04 \pm 135$	$2.74e+03 \pm 37.3$	378 ± 13.9	117 ± 7.7	116 ± 7.69	107 ± 7.36
TZq madspin triplep	$2.31e+03 \pm 2.12$	249 ± 0.694	94.1 ± 0.426	75.3 ± 0.381	75 ± 0.381	68.8 ± 0.365

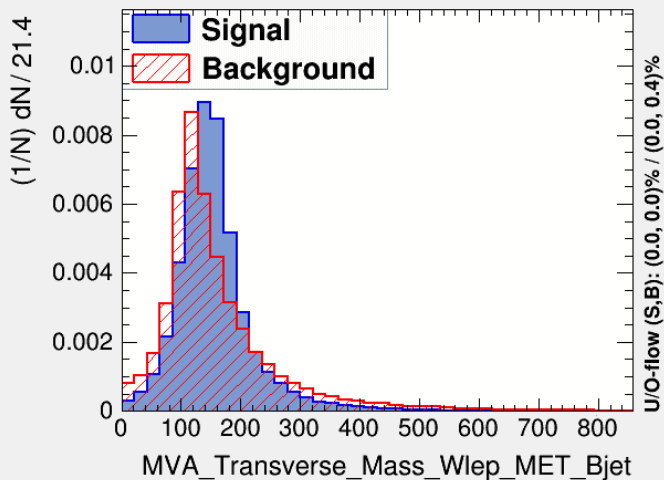
Cut and count

	# signal	# background	$S / \text{Sqrt}(S + B)$	$S / \text{Sqrt}(S + B + (\Delta WZ)^2)$
ttbar cZ	182	2496	3.52	0.29
ttbar uZ	172	2496	3.33	0.28
ttbar + ST cZ	190	2496	3.66	0.31
ttbar + ST uZ	186	2496	3.59	0.30

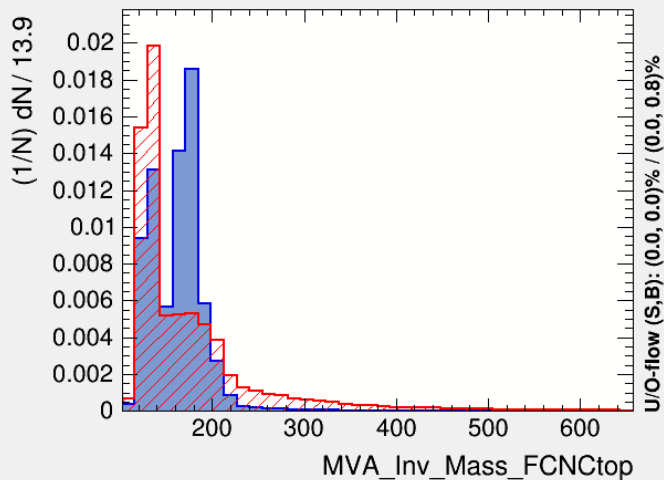
Zct MVA trained on WZ

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Ranking input variables (method unspecific)...  
Ranking result (top variable is best ranked)  
-----  
Rank : Variable : Separation  
-----  
1 : MVA_Nb_CSVM_jets : 4.019e-01  
2 : MVA_Nb_jets : 2.358e-01  
3 : MVA_Inv_Mass_FCNCtop : 1.519e-01  
4 : MVA_SM_lb : 1.192e-01  
5 : MVA_Ht : 1.162e-01  
6 : MVA_Transverse_Mass_Wlep_MET_Bjet : 5.014e-02  
7 : MVA_DeltaR_Bjet_Zcan : 3.713e-02  
8 : MVA_MET : 1.483e-02  
9 : MVA_DeltaR_Wlep_MET : 1.011e-02  
10 : MVA_DeltaPhi_Wlep_MET : 5.388e-03  
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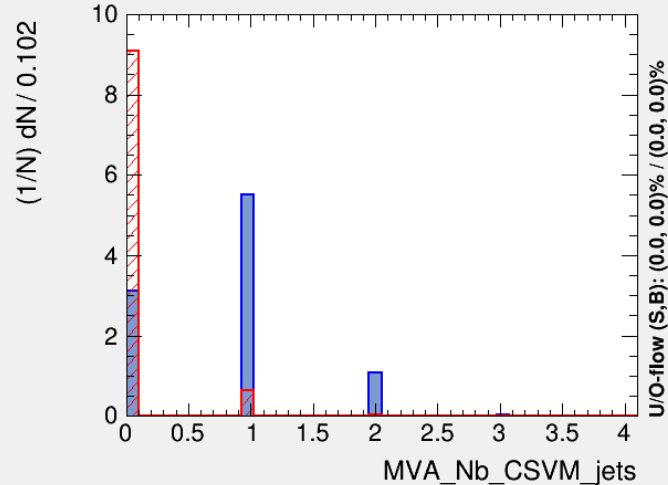
Input variable: MVA_Transverse_Mass_Wlep_MET_Bjet



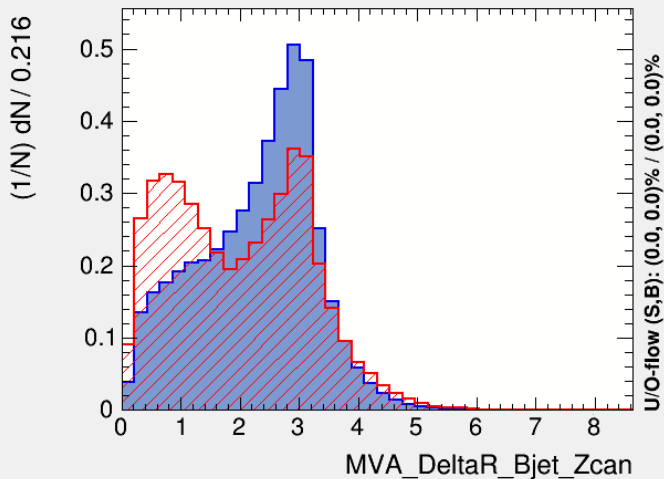
Input variable: MVA_Inv_Mass_FCNCtop



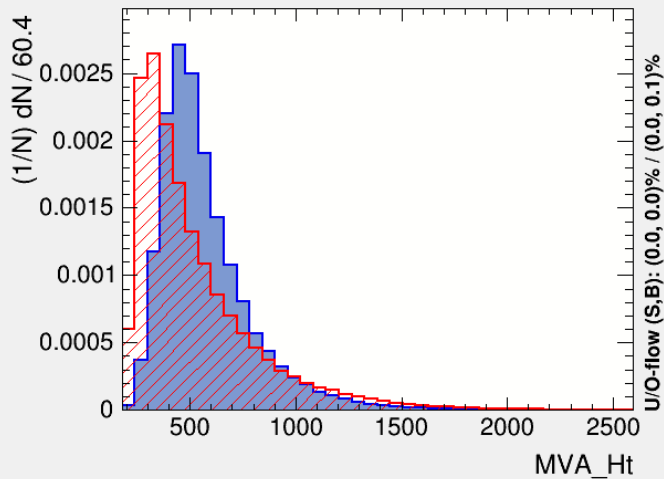
Input variable: MVA_Nb_CSVM_jets



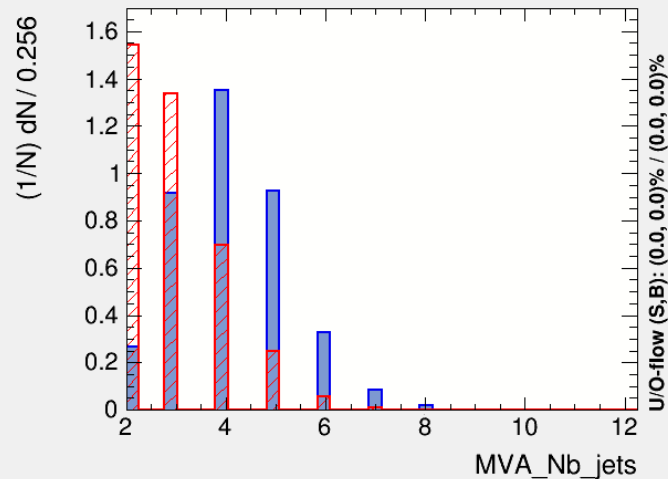
Input variable: MVA_DeltaR_Bjet_Zcan



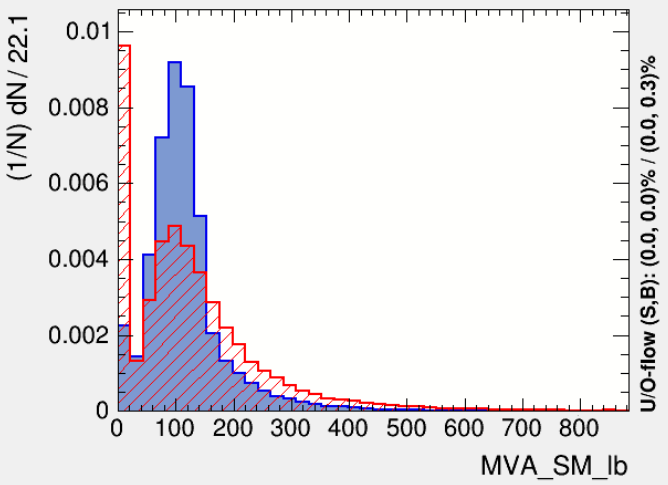
Input variable: MVA_Ht



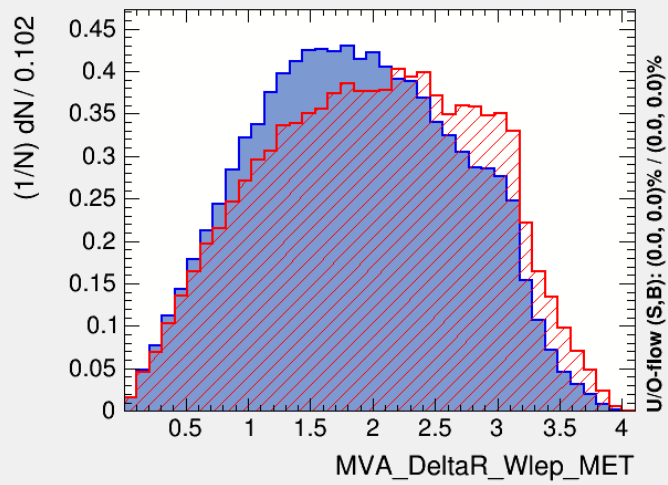
Input variable: MVA_Nb_jets



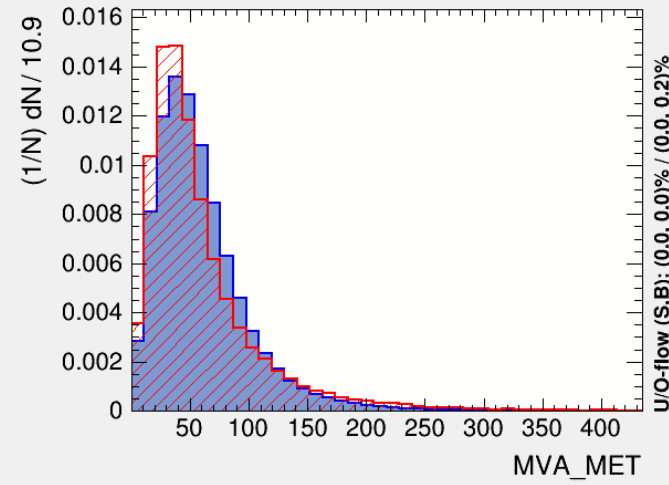
Input variable: MVA_SM_Ib



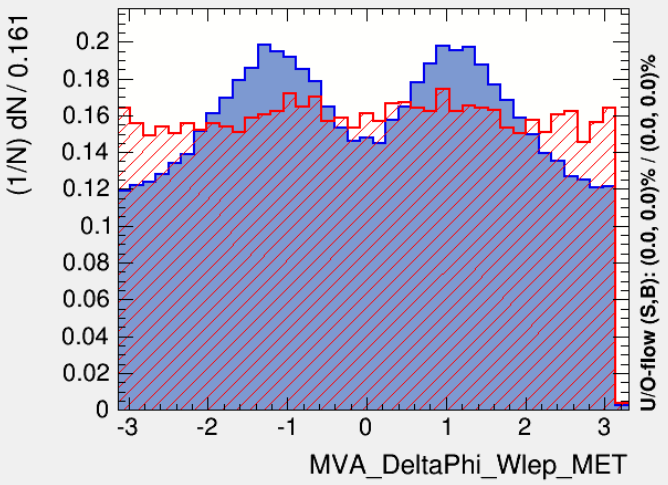
Input variable: MVA_DeltaR_Wlep_MET



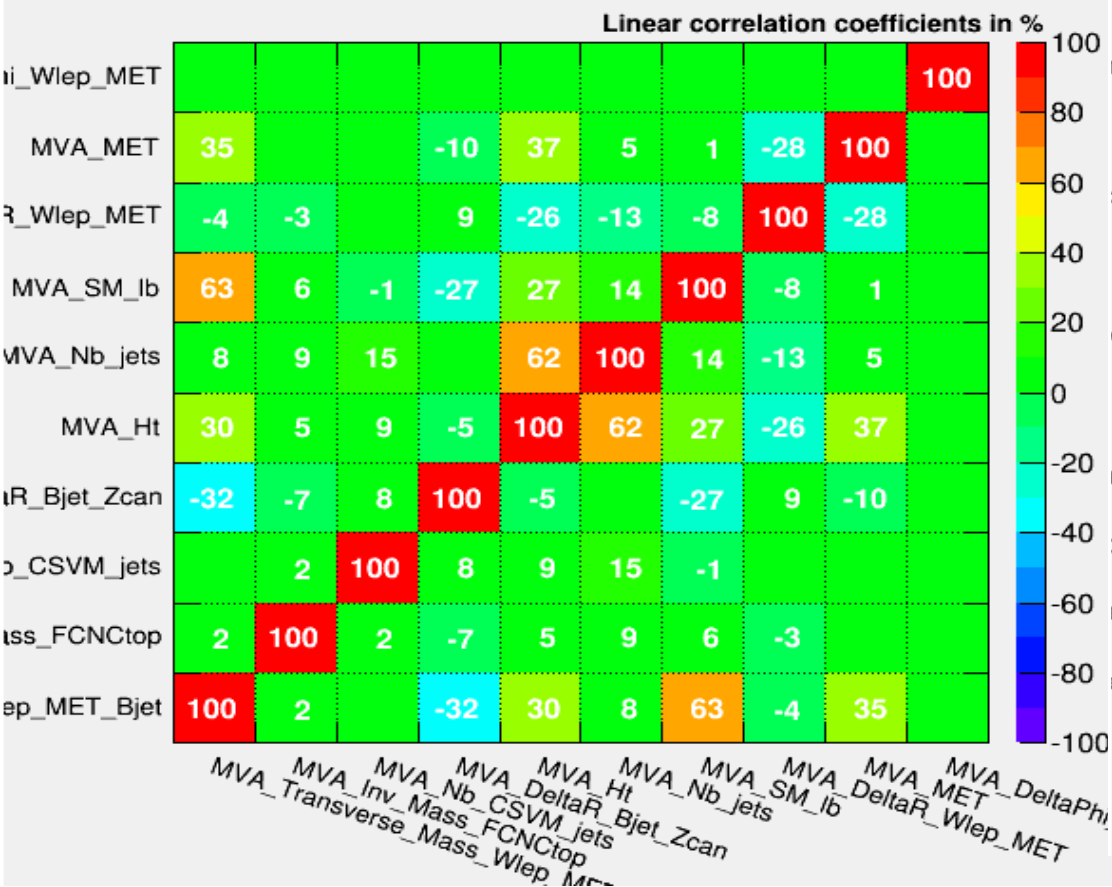
Input variable: MVA_MET



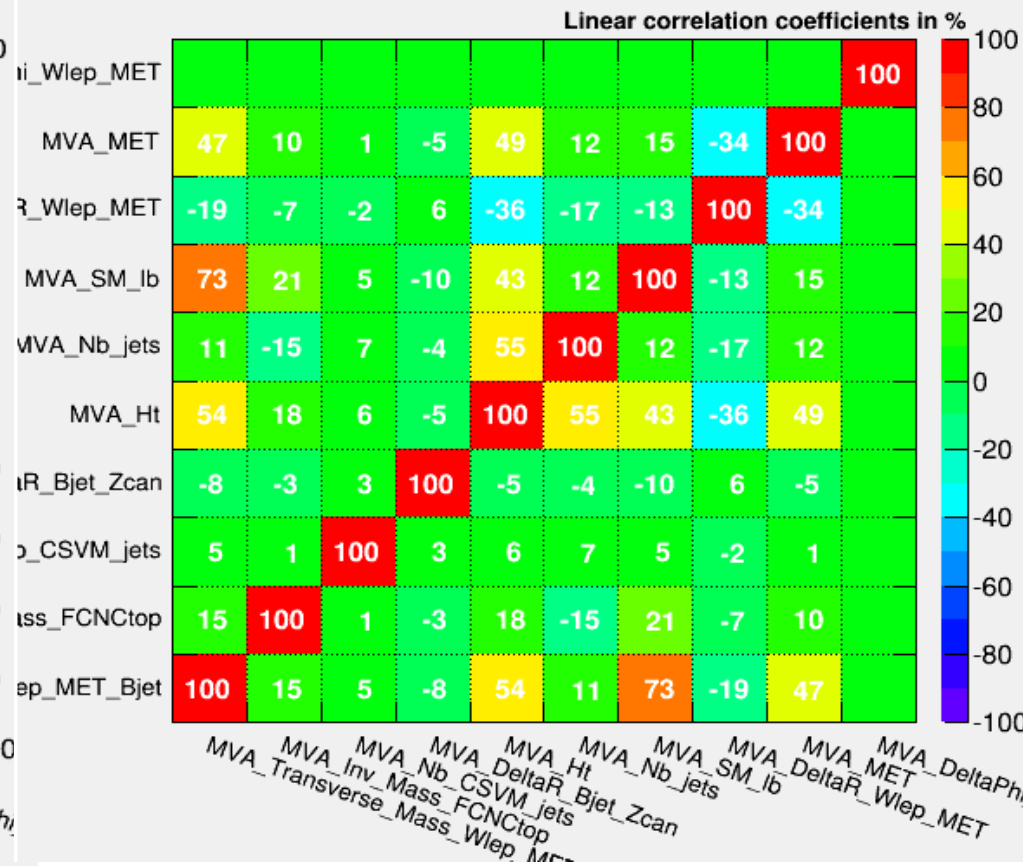
Input variable: MVA_DeltaPhi_Wlep_MET



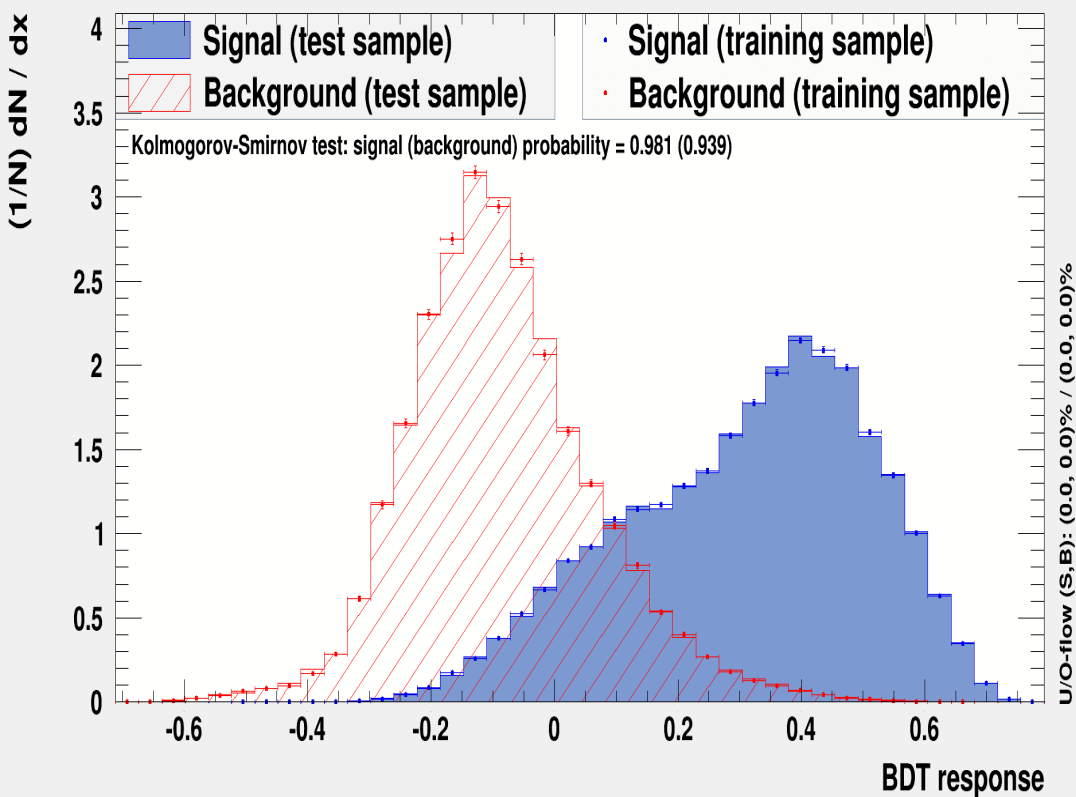
Correlation Matrix (signal)



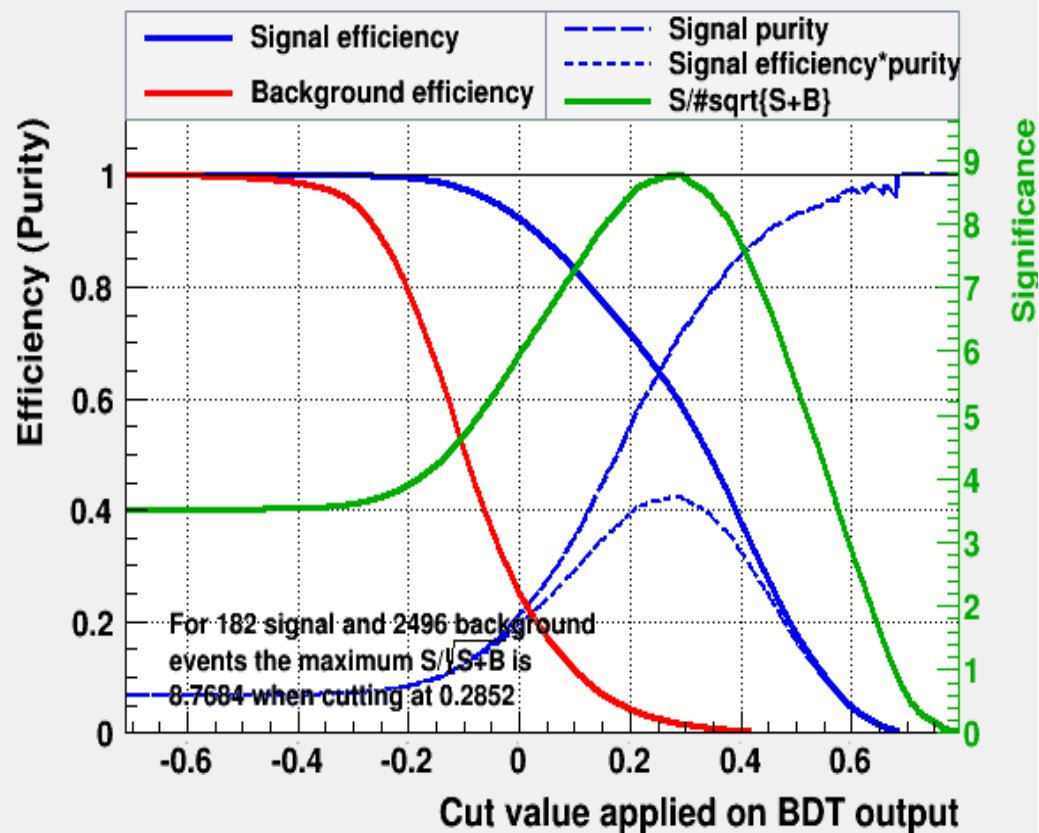
Correlation Matrix (background)



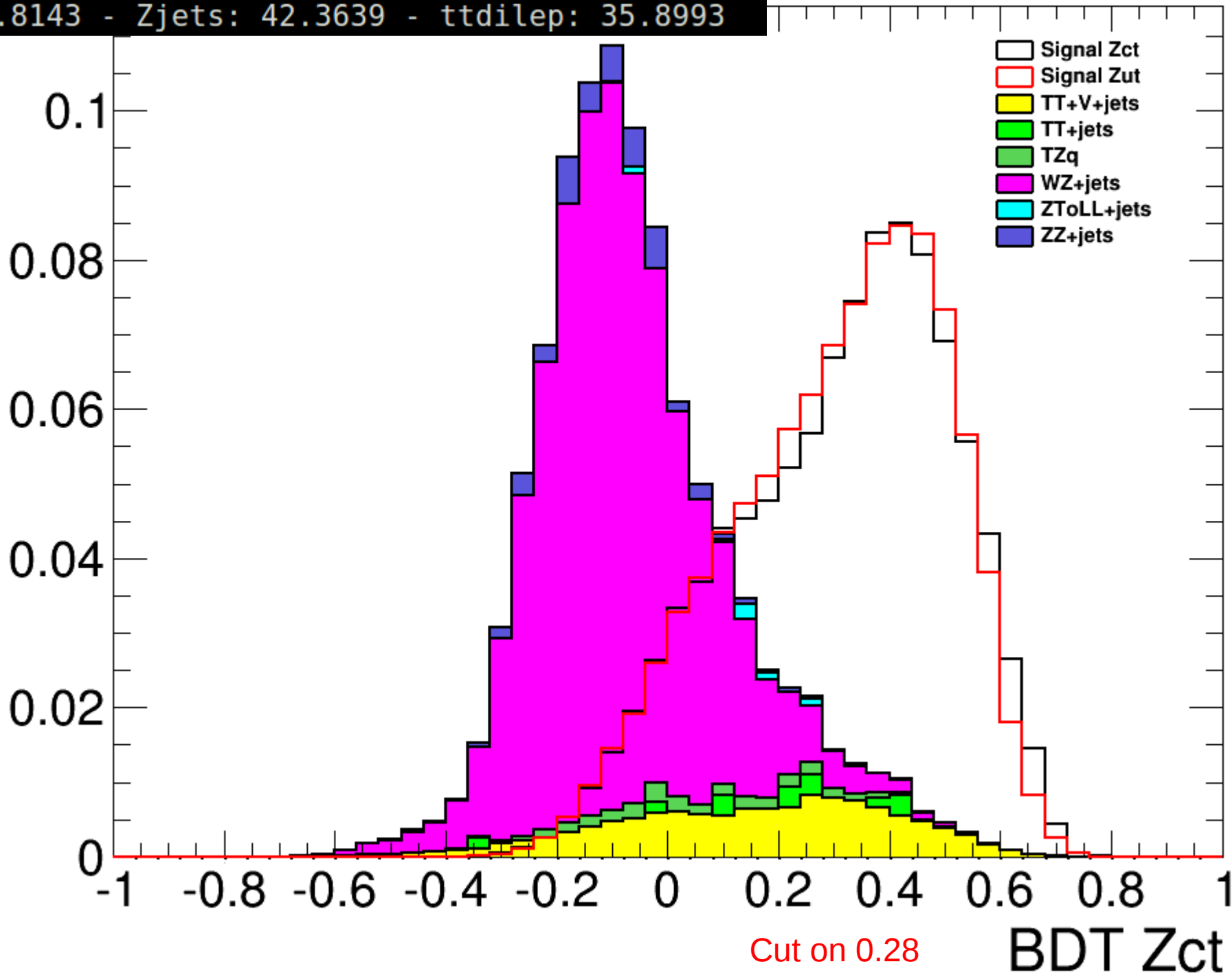
TMVA overtraining check for classifier: BDT



Cut efficiencies and optimal cut value



Bin: 33 - Significance: 6.62512
S: 115.199 - B: 187.15
WZ: 28.8143 - Zjets: 42.3639 - ttdilep: 35.8993

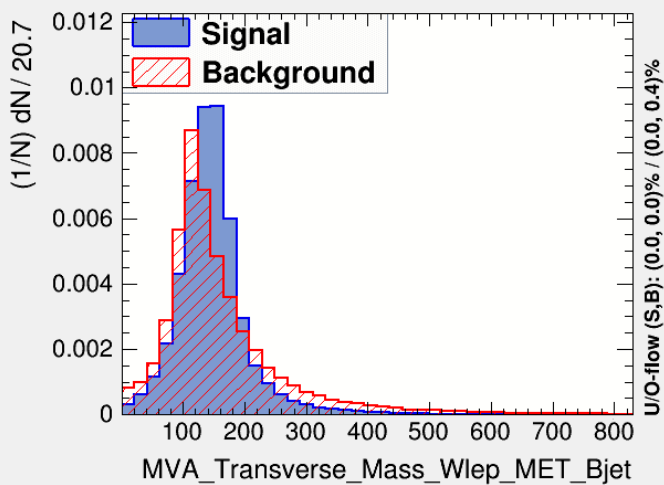


Zut MVA trained on WZ

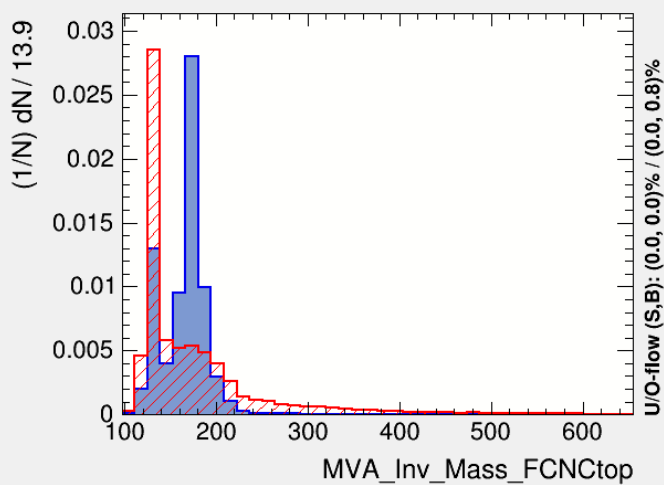
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Ranking input variables (method unspecific)...  
Ranking result (top variable is best ranked)
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-----  
Rank : Variable                               : Separation  
-----  
  1 : MVA_Nb_CSVM_jets                        : 3.654e-01  
  2 : MVA_Nb_jets                             : 2.413e-01  
  3 : MVA_Inv_Mass_FCNCtop                    : 2.385e-01  
  4 : MVA_SM_lb                              : 1.409e-01  
  5 : MVA_Ht                                  : 1.203e-01  
  6 : MVA_Transverse_Mass_Wlep_MET_Bjet      : 5.780e-02  
  7 : MVA_DeltaR_Bjet_Zcan                   : 4.491e-02  
  8 : MVA_MET                                 : 1.404e-02  
  9 : MVA_DeltaR_Wlep_MET                    : 1.123e-02  
 10 : MVA_DeltaPhi_Wlep_MET                  : 5.925e-03  
-----
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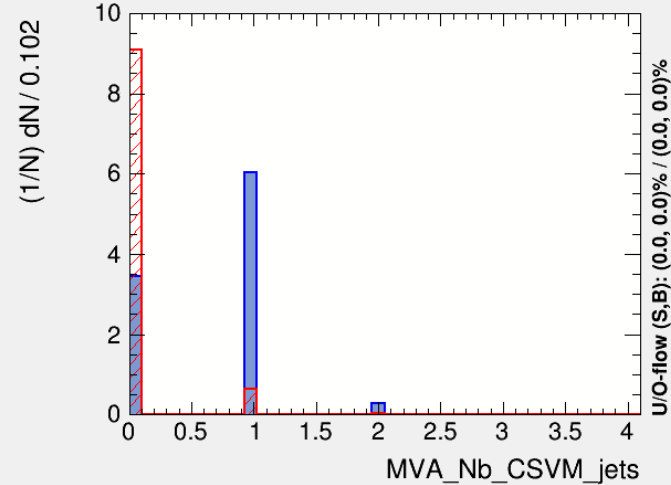
Input variable: MVA_Transverse_Mass_Wlep_MET_Bjet



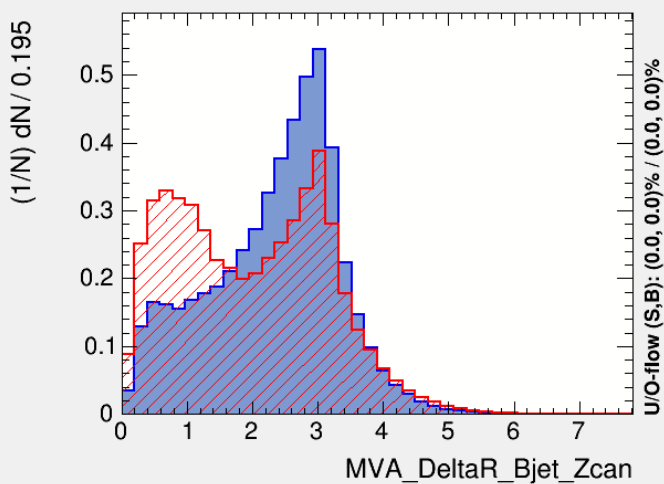
Input variable: MVA_Inv_Mass_FCNCtop



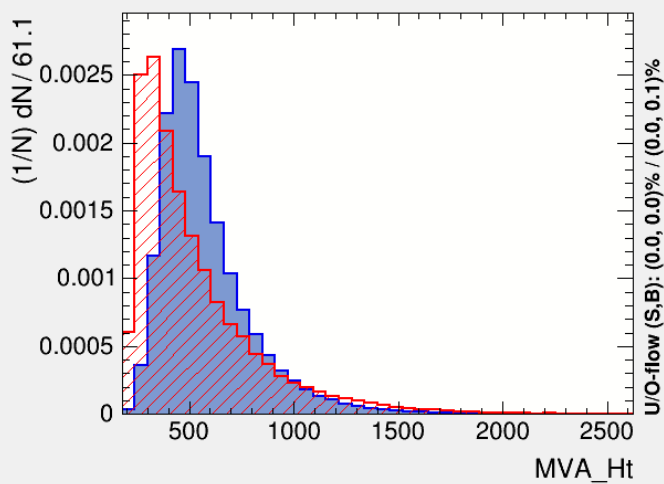
Input variable: MVA_Nb_CSVM_jets



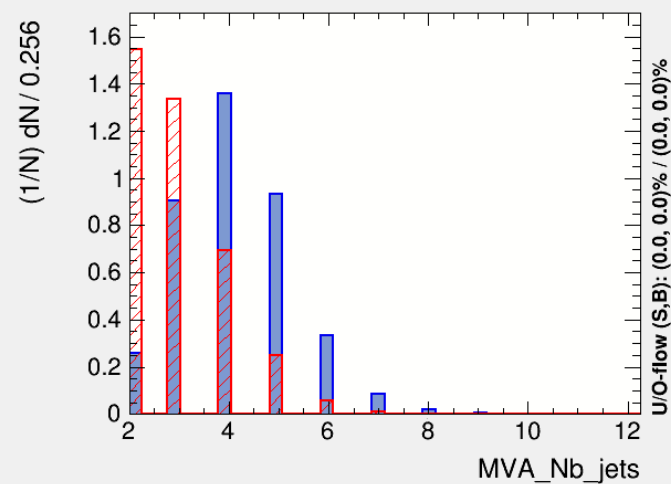
Input variable: MVA_DeltaR_Bjet_Zcan



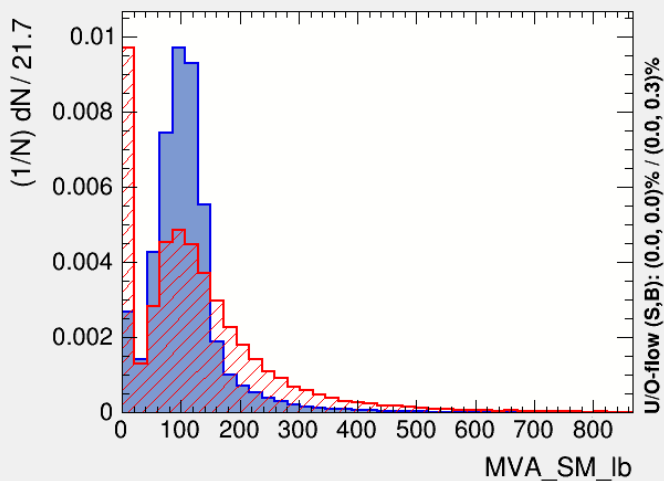
Input variable: MVA_Ht



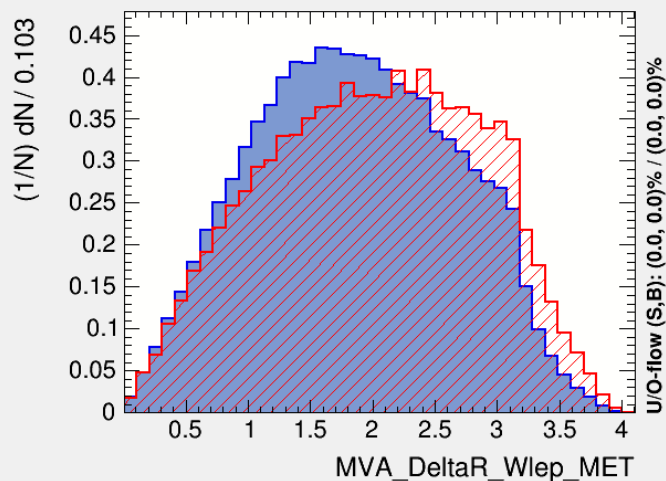
Input variable: MVA_Nb_jets



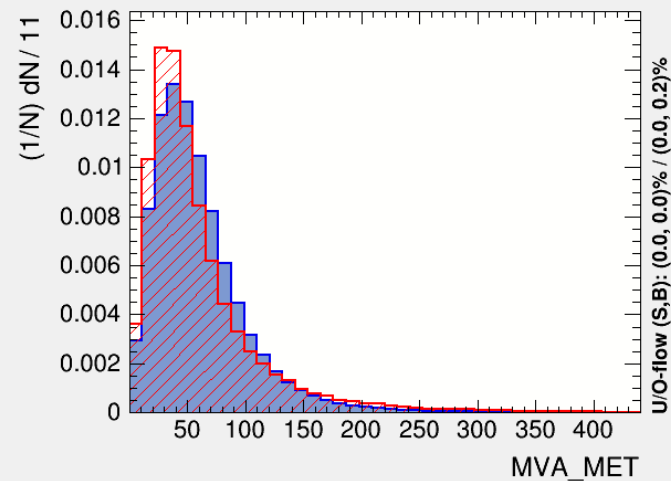
Input variable: MVA_SM_Ib



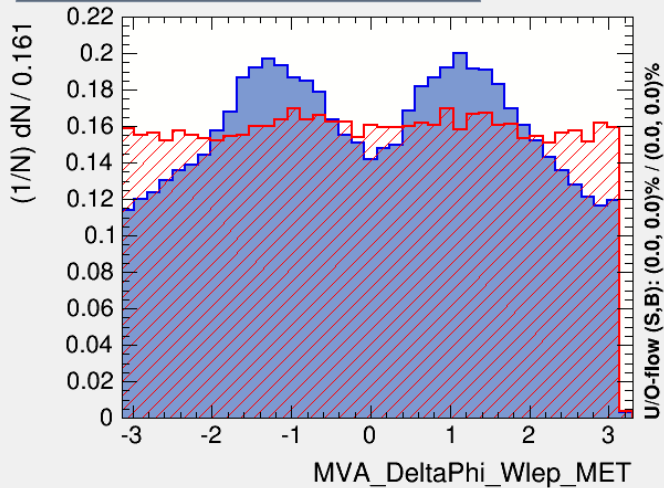
Input variable: MVA_DeltaR_Wlep_MET



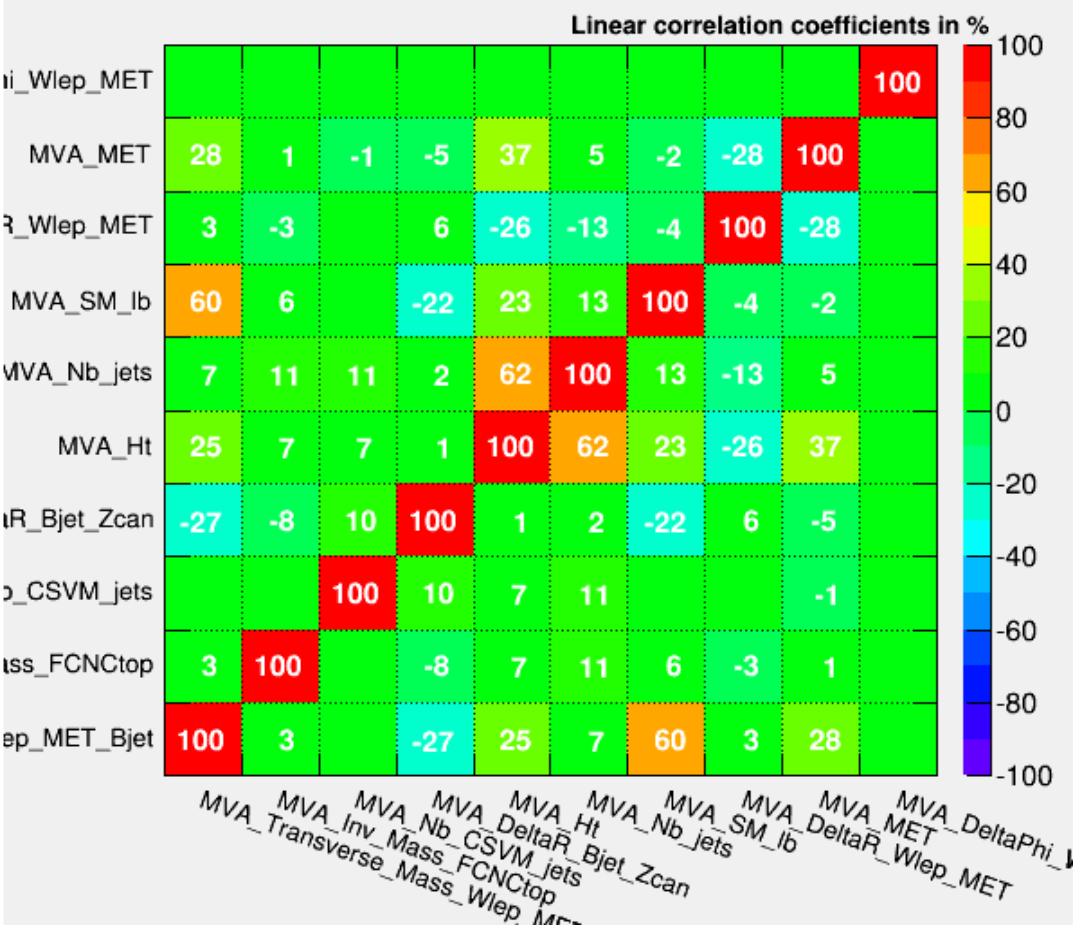
Input variable: MVA_MET



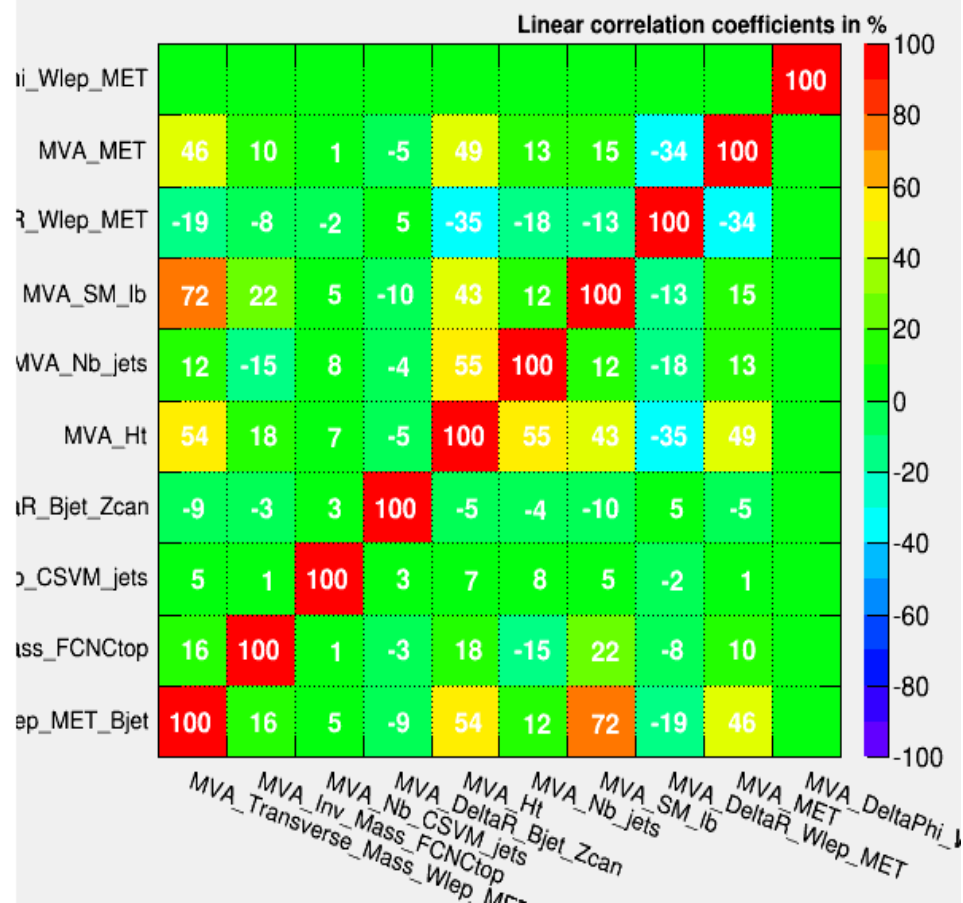
Input variable: MVA_DeltaPhi_Wlep_MET



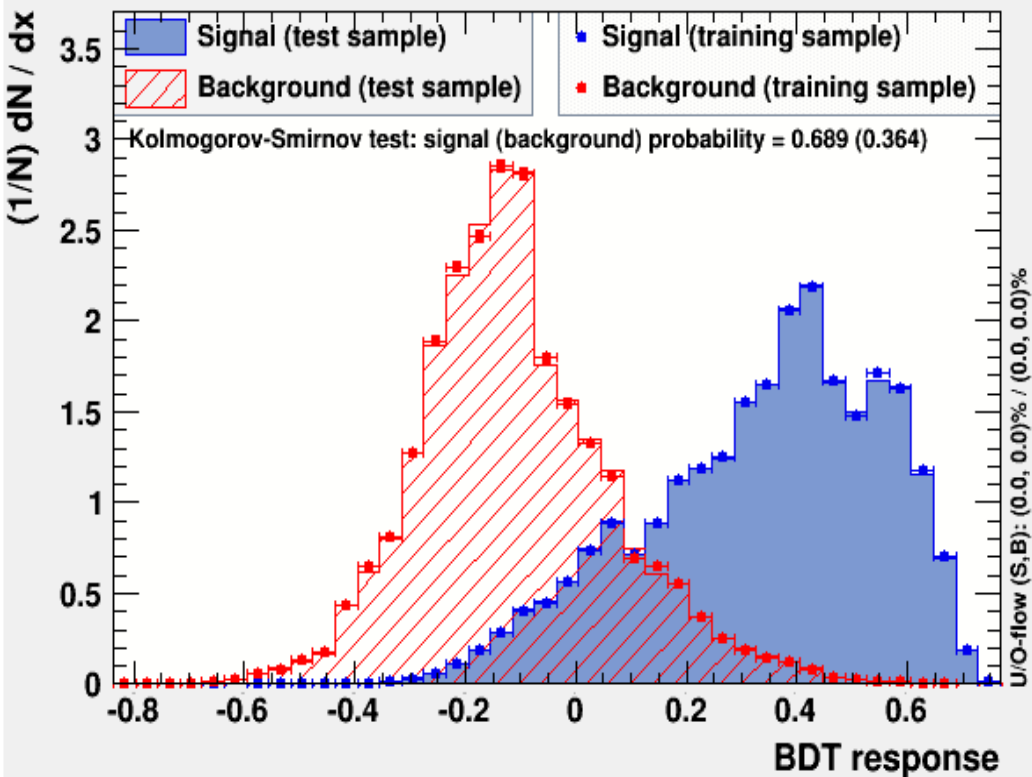
Correlation Matrix (signal)



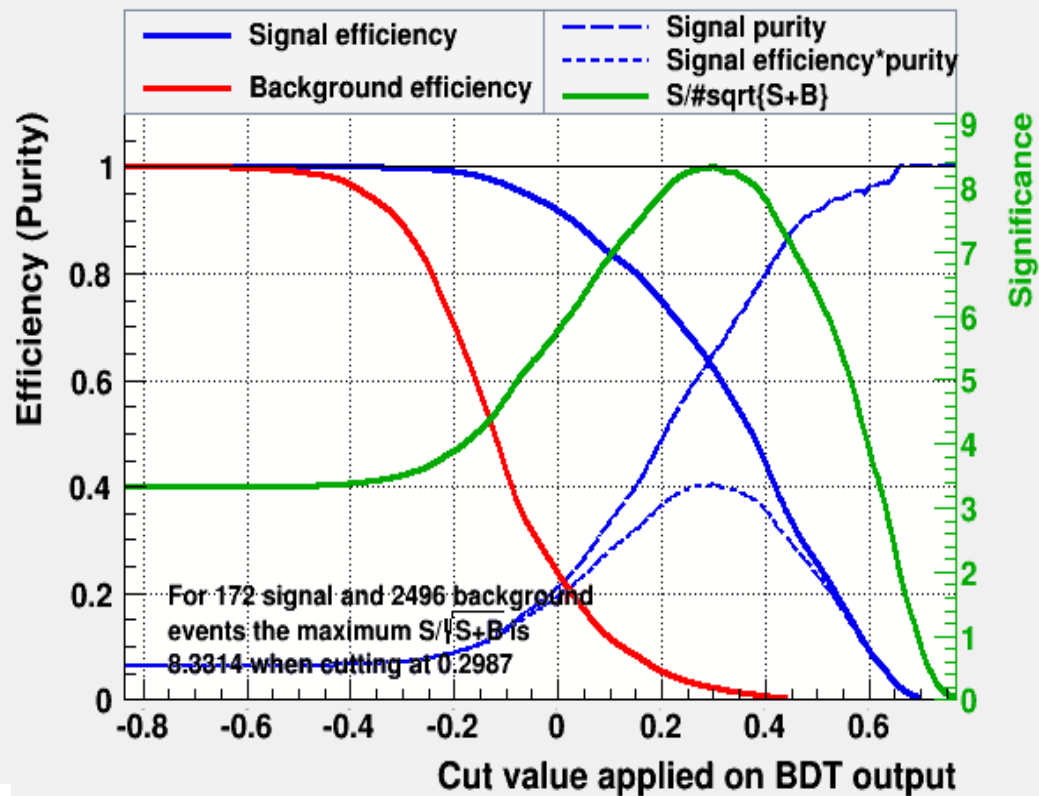
Correlation Matrix (background)



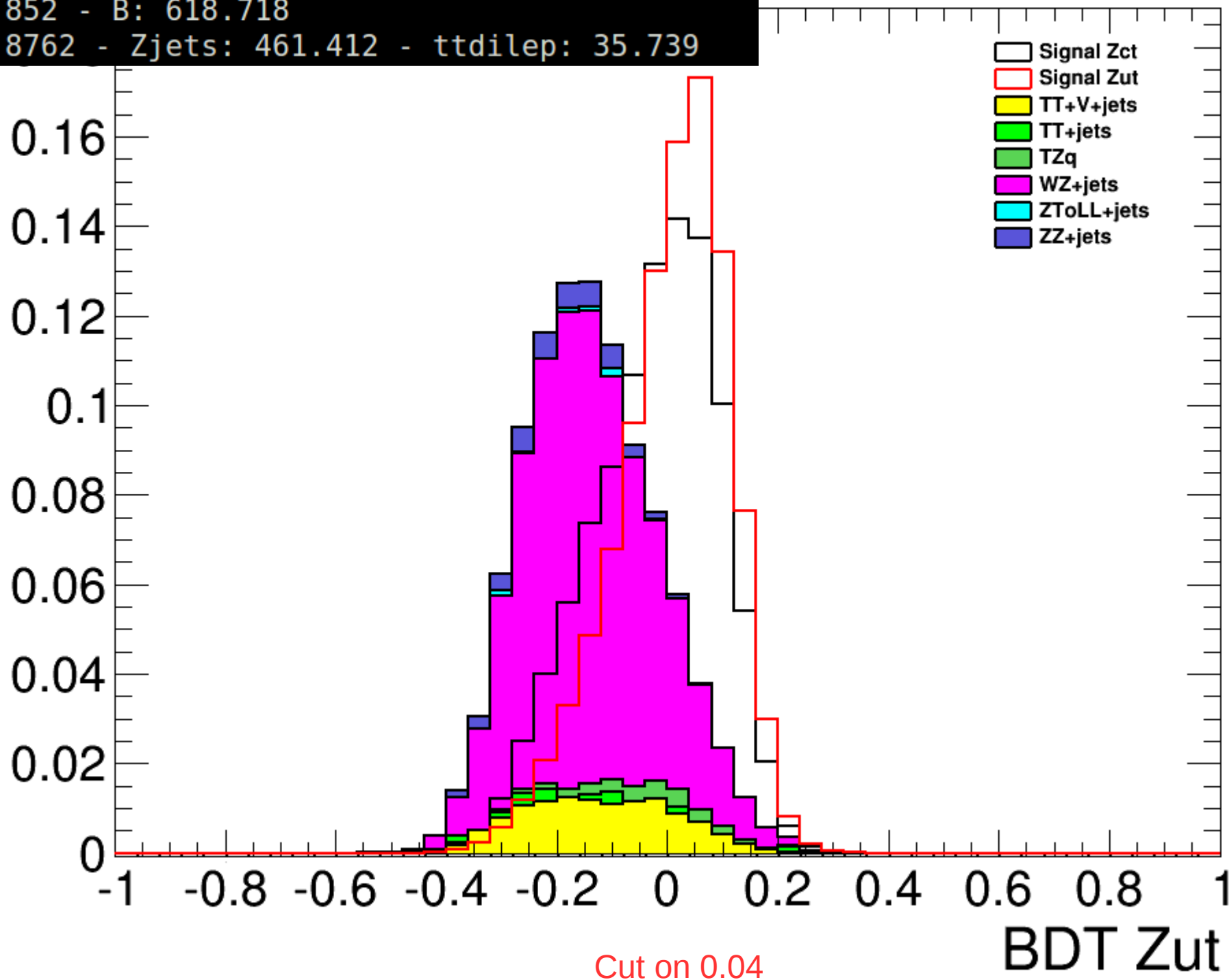
TMVA overtraining check for classifier: BDT

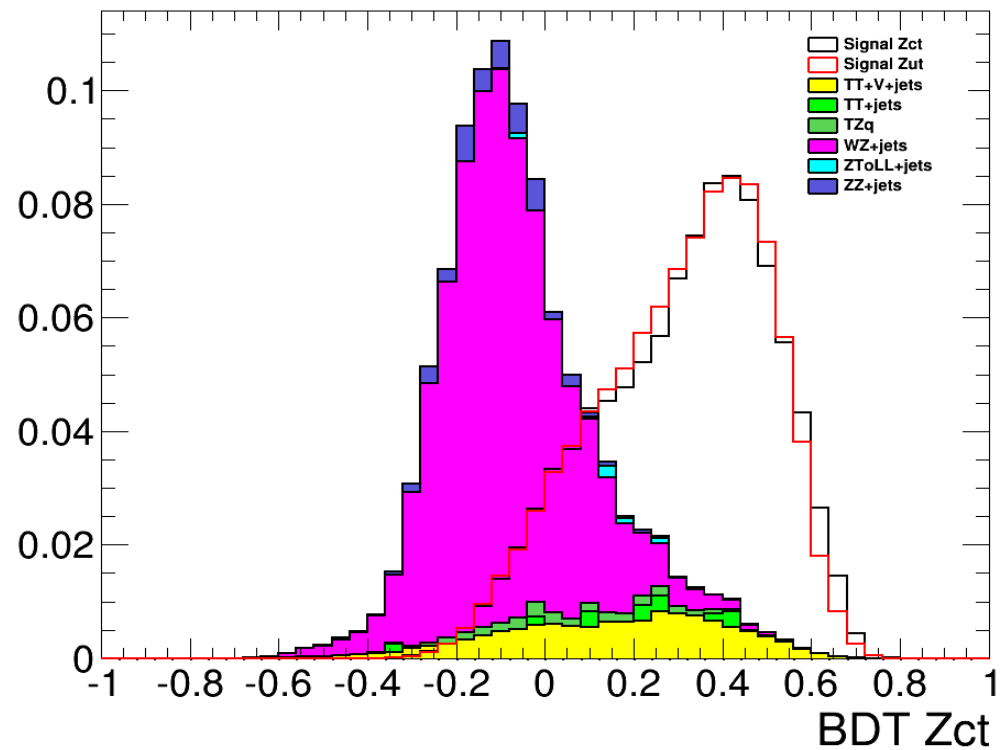
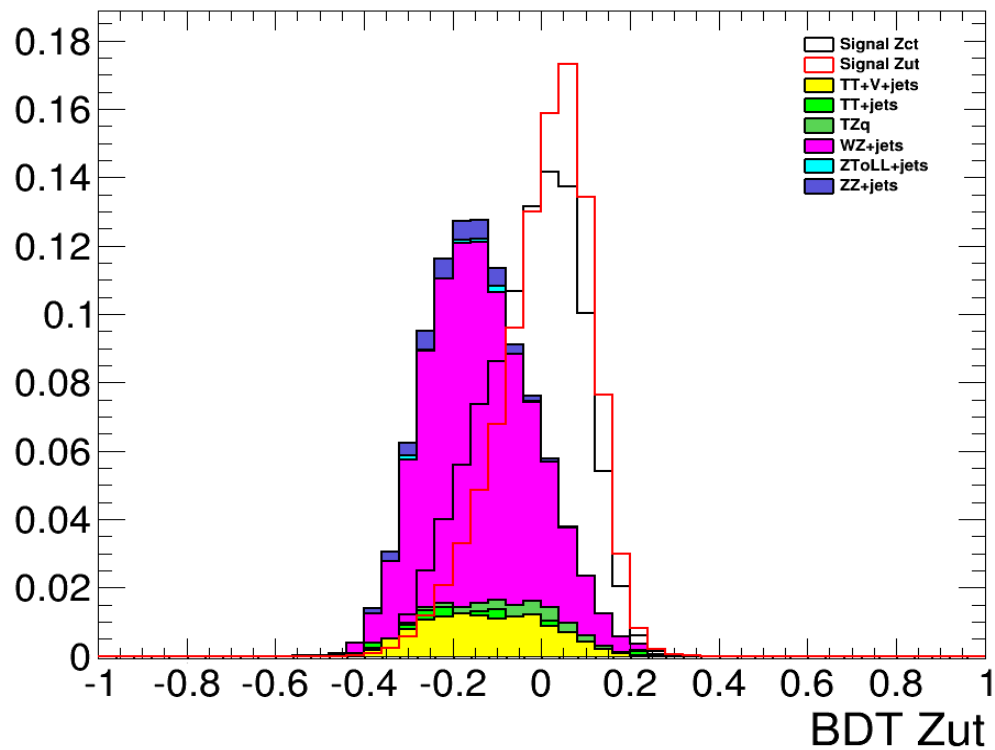


Cut efficiencies and optimal cut value

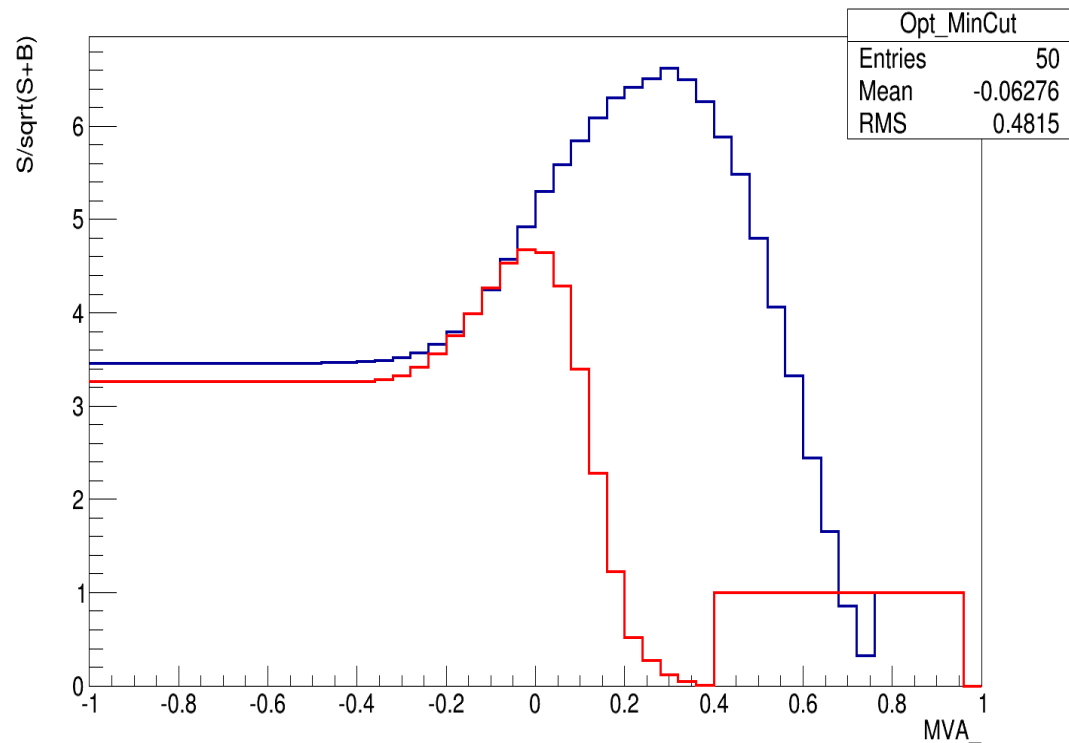


Bin: 25 - Significance: 4.67921
S: 127.852 - B: 618.718
WZ: 22.8762 - Zjets: 461.412 - ttdilep: 35.739





Lower bound scan for MVA: blue = Zct, Red = Zut



Cut and count

	# signal	# background	$S / \text{Sqrt}(S + B)$	$S / \text{Sqrt}(S + B + (\Delta WZ)^2)$
ttbar cZ	182	2496	3.52	0.29
ttbar uZ	172	2496	3.33	0.28
ttbar + ST cZ	190	2496	3.66	0.31
ttbar + ST uZ	186	2496	3.59	0.30

MVA cut and count

	# signal	# background	$S / \text{Sqrt}(S + B)$	$S / \text{Sqrt}(S + B + (\Delta WZ)^2)$
ttbar cZ	115	189	6.62	5.92
ttbar uZ	128	619	4.68	4.54