

ttH: 6J+Lepton Update

T. Price

University of Birmingham

txp@hep.ph.bham.ac.uk

November 28, 2012



ttH:
6j+Lepton

T. Price

Combination

Cut Based
TMVA

Conclusions

Overview

① Combination
Cut Based
TMVA

② Conclusions

Cut Based Events Passed Cuts

Pe-0.8 Pp+0.2, 500 fb⁻¹

Cut	tth-ln4q-hbb	tth-other	ttz-all-all	ttbb-all-all	6f_ttbar
Total Events	417.2	1054.1	3872.9	956.2	223710.5
IsoLep=1	261.5	278.0	1292.8	331.8	78968.2
626 < E _{vis} < 986	237.1	239.7	981.3	274.9	56208.2
nPFOs > 152	175.3	168.8	544.3	161.5	11003.0
Thrust < 0.88	153.3	147.2	448.2	115.4	5188.7
Y ₅₆ > 0.0008	128.3	134.3	361.3	90.0	3052.4
Btag ₃ > 0.7	89.9	19.3	64.0	57.2	182.3
χ ² < 82.5	83.6	14.7	56.8	50.9	155.1
385 < M _{Total} < 650	83.6	14.4	56.0	50.3	152.6
100 < M _t ^{lep} < 326	83.2	14.0	55.7	49.5	151.8
118 < M _t ^{had} < 274	83.2	13.4	54.8	49.2	150.9
98 < M _H < 188	80.5	12.8	44.2	44.7	136.8

Cut Based Events Passed Cuts

Pe+0.8 Pp-0.2, 500 fb⁻¹

Cut	tth-ln4q-hbb	tth-other	ttz-all-all	ttbb-all-all	6f_ttbar
Total Events	211.5	534.2	1459.5	478.3	84216.1
IsoLep=1	137.4	136.2	493.4	169.2	30108.6
577 < E _{vis} < 976	132.4	124.7	412.7	152.6	23993.9
nPFOs > 143	110.1	95.8	246.7	106.9	6560.5
Thrust < 0.88	96.3	83.6	206.2	77.5	2980.5
Y ₅₆ > 0.001	77.5	75.1	153.1	58.1	1555.5
Btag ₃ > 0.78	51.5	6.3	27.1	30.5	83.8
χ ² < 167	50.6	5.6	26.4	30.2	78.5
390 < M _{Total} < 750	50.3	5.6	25.7	29.8	77.2
74 < M _t ^{lep} < 338	49.8	5.6	24.7	29.3	75.8
116 < M _t ^{had} < 282	49.6	5.5	24.3	28.0	73.7
68 < M _H < 224	49.6	5.5	24.3	27.6	73.4

Combined Results

- $N_{sig}^{exp} = 628.7 (417.2 + 211.5)$
- $N_{sig}^{obs} = 150.1 (80.5 + 49.6)$
- $N_{BG}^{exp} = 316281.9 (229593.8 + 86688.1)$
- $N_{BG}^{obs} = 369.4 (238.5 + 130.9)$
- $\epsilon_{sig}^{sel} = \frac{150.1}{628.7} = 0.2387$
- $\rho_{sample}^{sel} = \frac{150.1}{150.1+369.4} = 0.2890$
- $\frac{S}{\sqrt{S+B}} = \frac{150.1}{\sqrt{150.1+369.4}} = 6.58$

$$\left(\frac{\Delta g_{ttH}}{g_{ttH}} \right)_{stat} = 9.4\%$$

weights

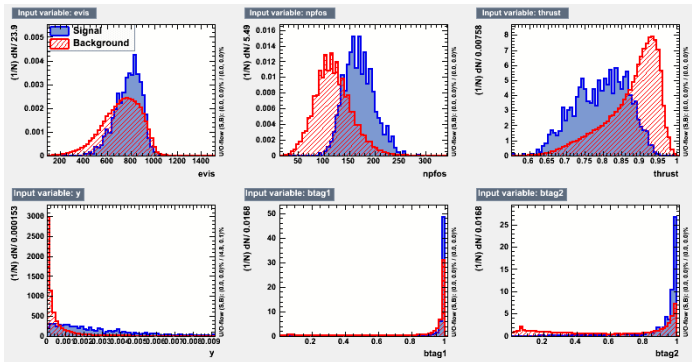
- eL.pR = 0.58
- eR.pL = 0.58
- eL.pL = 0.42
- eR.pR = 0.42

Variables

E_{vis} , nPandoraPFOs, Thrust, Y_{56} , B_{tag1-4} , χ^2
reconstruction, total mass, top masses, higgs mass

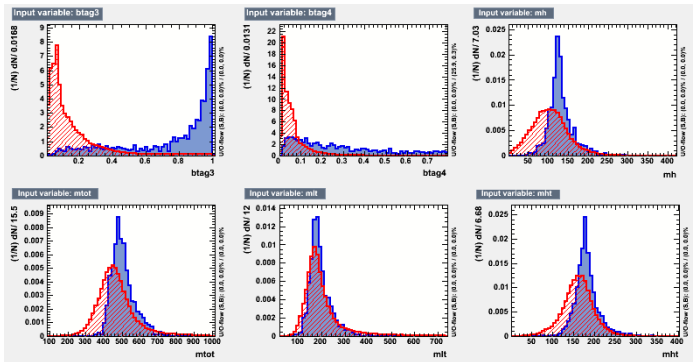
TMVA

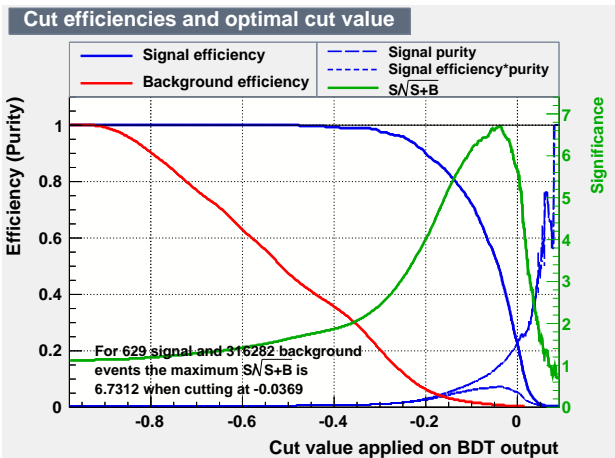
Combined Polarisation



TMVA

Combined Polarisations





$$\left(\frac{\Delta g_{ttH}}{g_{ttH}} \right)_{stat} = 7.5\%$$

Conclusions

Future Work

- Update Lepton Isolation criteria (LAL method purer)
- Implement Higgs Helicity in cut based and TMVA
- Kinematic Fit? At the moment not working may need some help! (Time running low)
- Add in $t\bar{t}h \rightarrow 2l2n4q$ backgrounds
- Combine results with 8J analysis

Conclusions

Cut Based

$$\left(\frac{\Delta g_{ttH}}{g_{ttH}} \right)_{stat} = 9.4\%$$

TMVA

$$\left(\frac{\Delta g_{ttH}}{g_{ttH}} \right)_{stat} = 7.5\%$$

Gain in precision when using TMVA and BDT