Supporting Plots Asked during the Dissertation Endorsement based on the $H \rightarrow \tau\tau \rightarrow \mu\mu$ Analysis

Vallary Bhopatkar (Florida Tech)

Training and Testing events

0-Jet

- Total number of events in 0-jet category that passed the selection cuts **3044**
- Split the the number of events in half for training and testing:
  - No. events used for training: **1522**
  - No. of events used for testing and analysis: **1522**

boosted

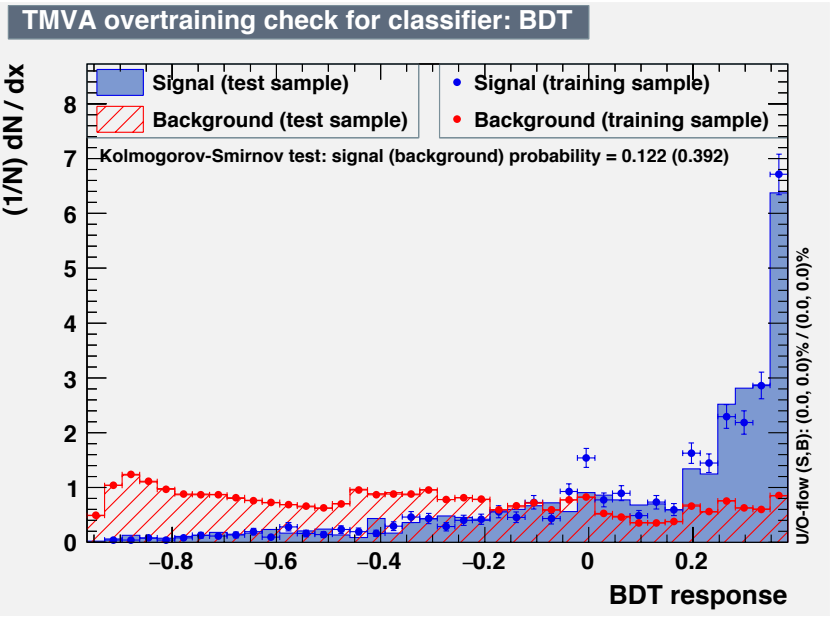
- Total number of events in boosted category that passed the selection cuts **4063**
- Split the the number of events in half for training and testing:
  - No. events used for training: **2031**
  - No. of events used for testing and analysis: **2032**

VBF

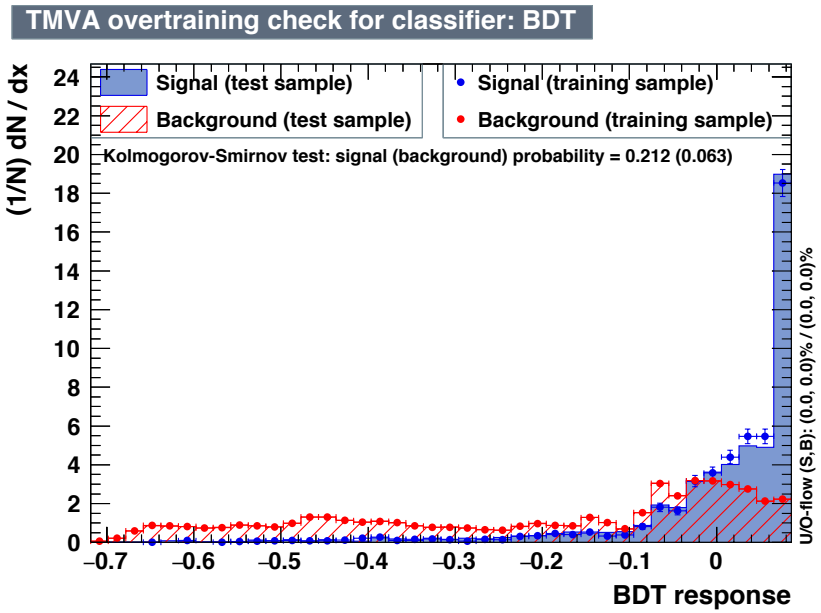
- Total number of events in boosted category that passed the selection cuts **2621**
- Split the the number of events in half for training and testing:
  - No. events used for training: **1310**
  - No. of events used for testing and analysis: **1311**

Overtraining Check BDT training

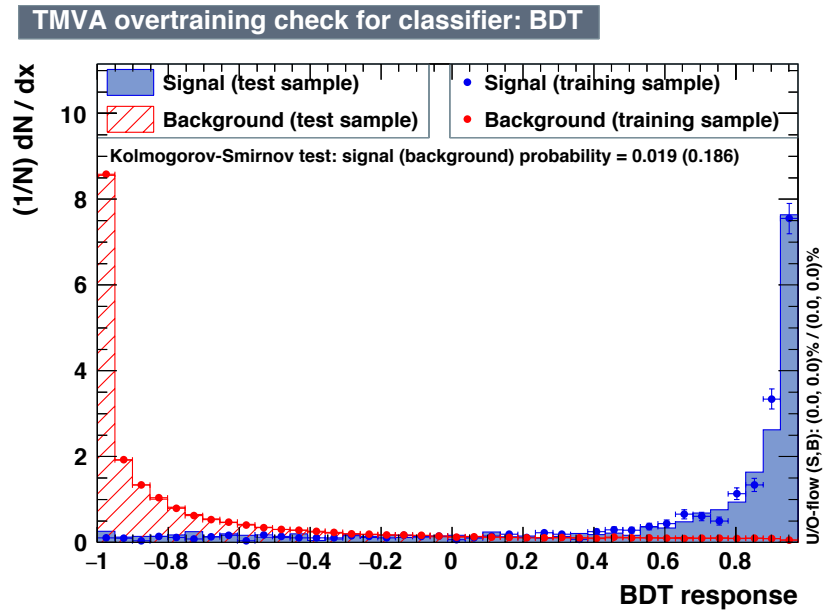
0-Jet



boosted

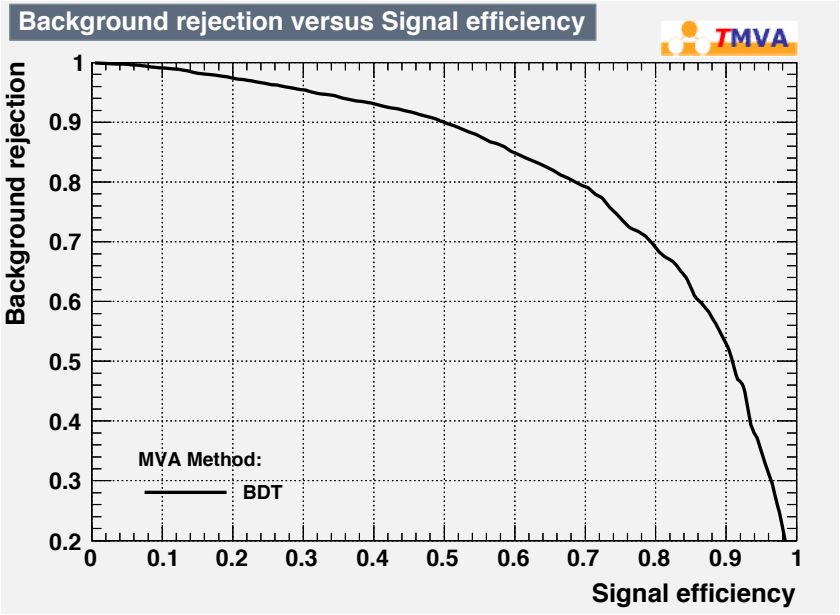


VBF

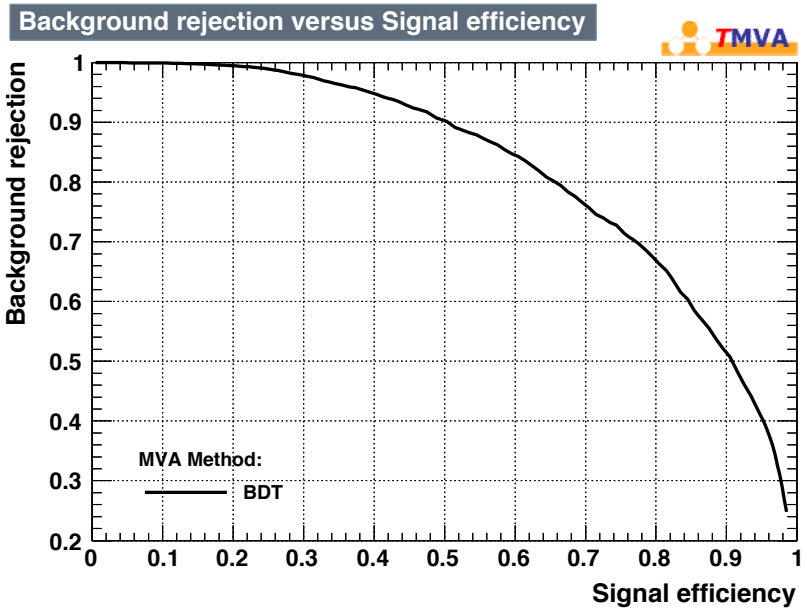


ROC Curves

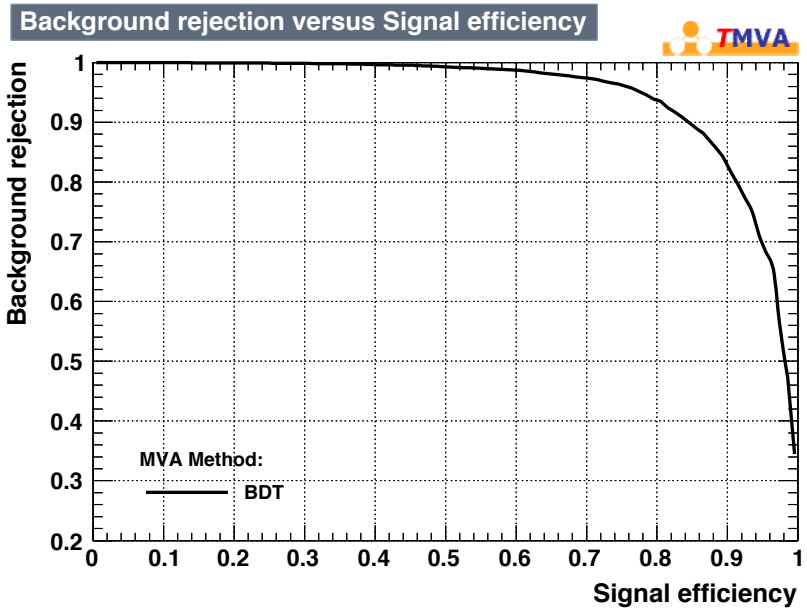
0-Jet



boosted



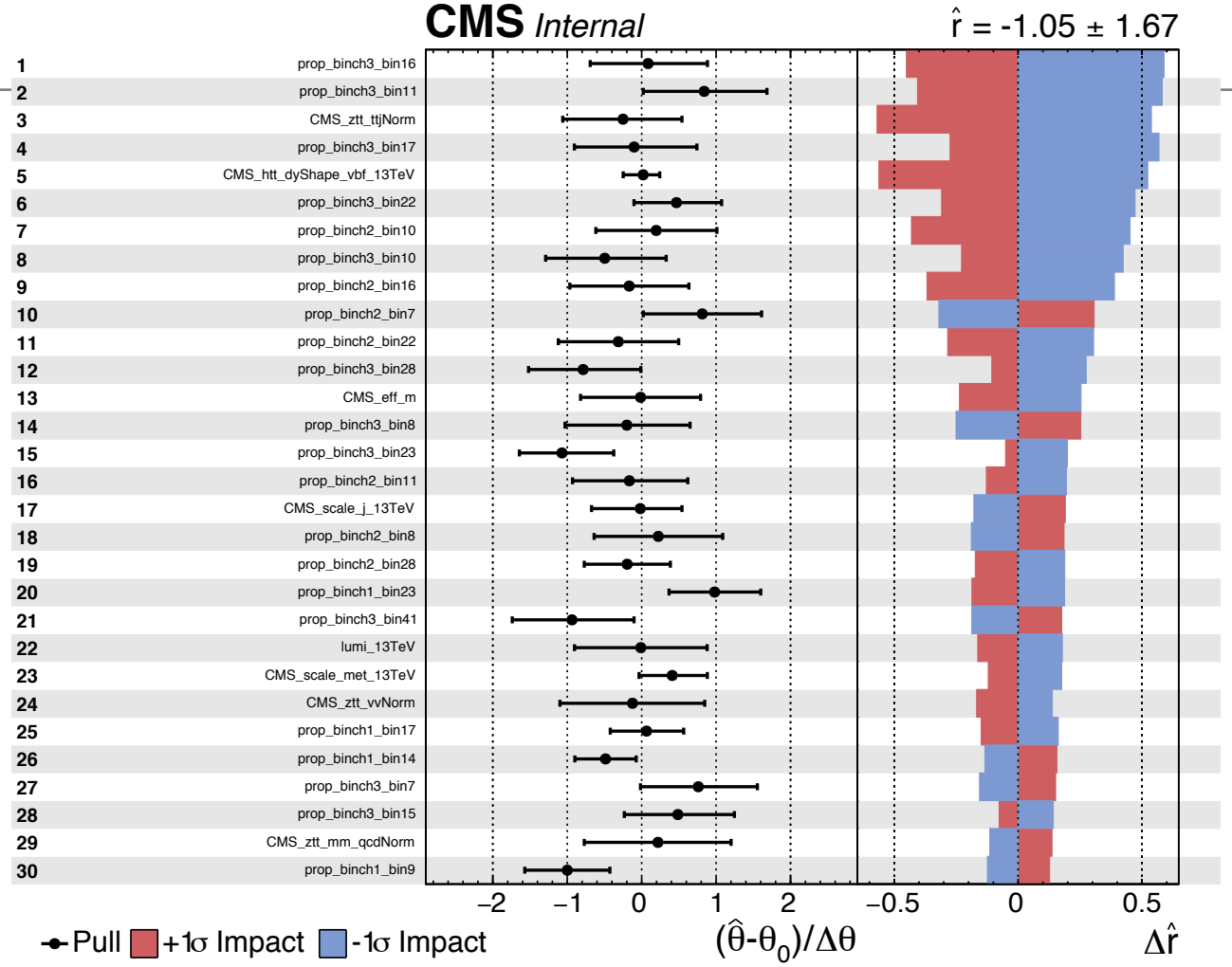
VBF



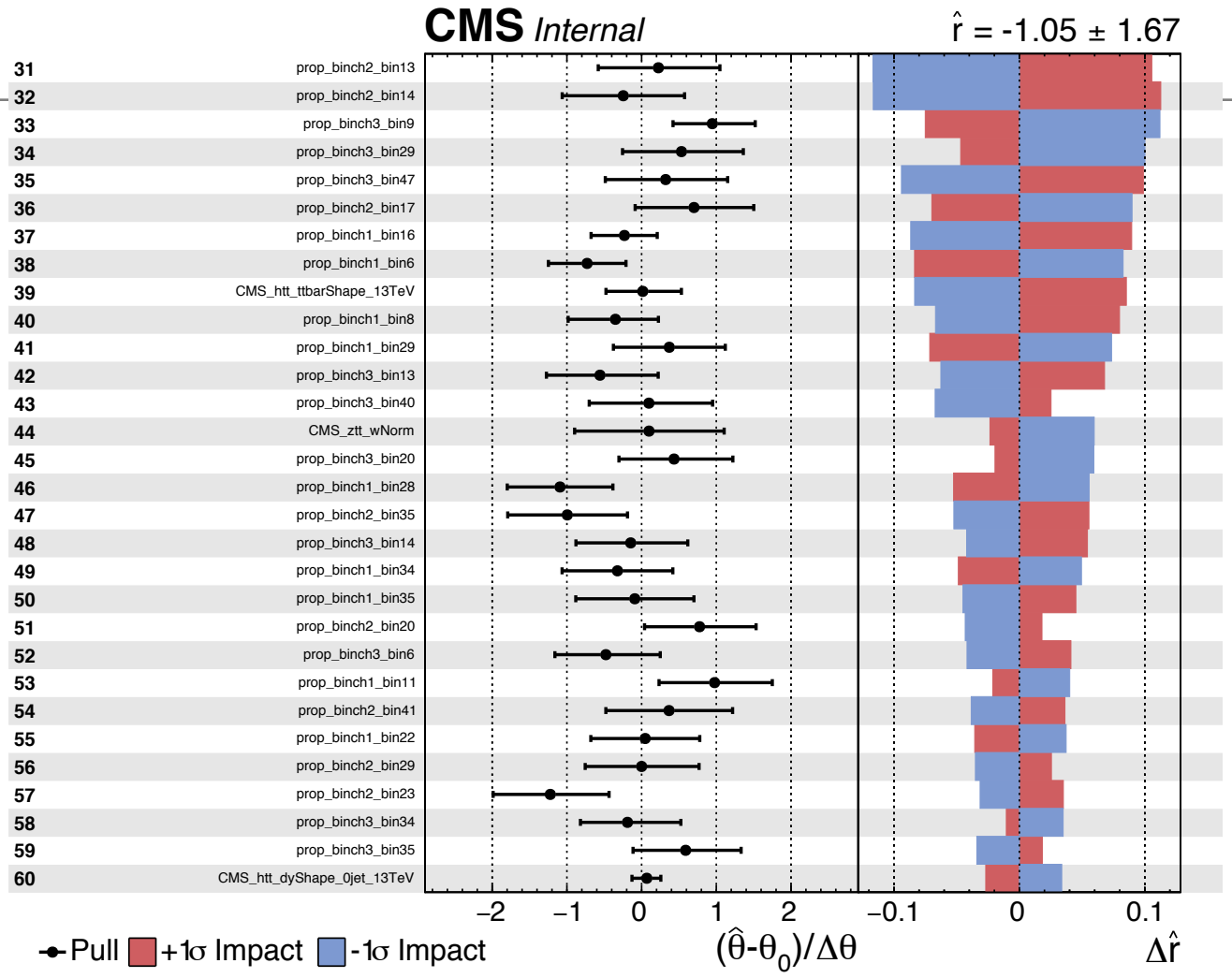
Prefit Uncertainties

Source of uncertainties	Prefit
Jet Energy Scale (JES)	Depending on p_T and η
$\vec{p}_T^{miss}$ Energy Scale	Depending on p_T and η
$Z \to \tau\tau/\ell\ell$ Estimation	Normalization 10%
	Uncertainties in $m_{\ell\ell}$, $p_{T(\ell\ell)}$, and $\eta(\ell\ell)$
W + Jets Estimation	Normalization 15%
QCD Multijet Estimation	Normalization 20%
Diboson Normalization	15%
Single Top normalilzation	15%
$t\bar{t}$ Estimation	Normalization 7%
	Uncertainties on top quark p_T reweighting
Integrated luminosity	2.6%
b-tag Jet rejection	3.5%
Limited number of events	Statistical uncertainty in individual bin

Pulls and Impact (combine) Page1



Pulls and Impact (combine) Page 2



Pulls and Impact (combine) Page 3