# Status/Updates of VBF MVA

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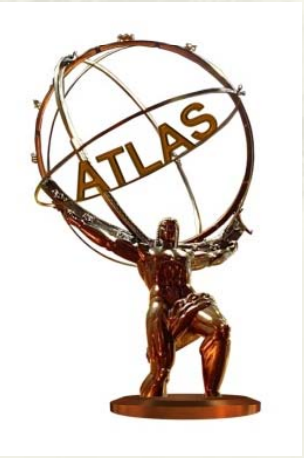
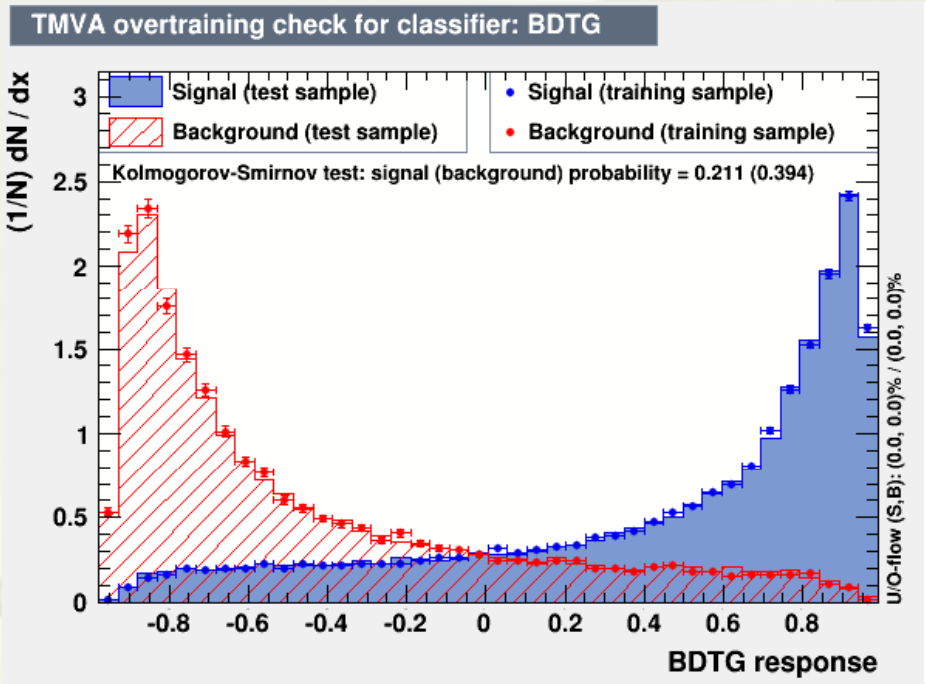
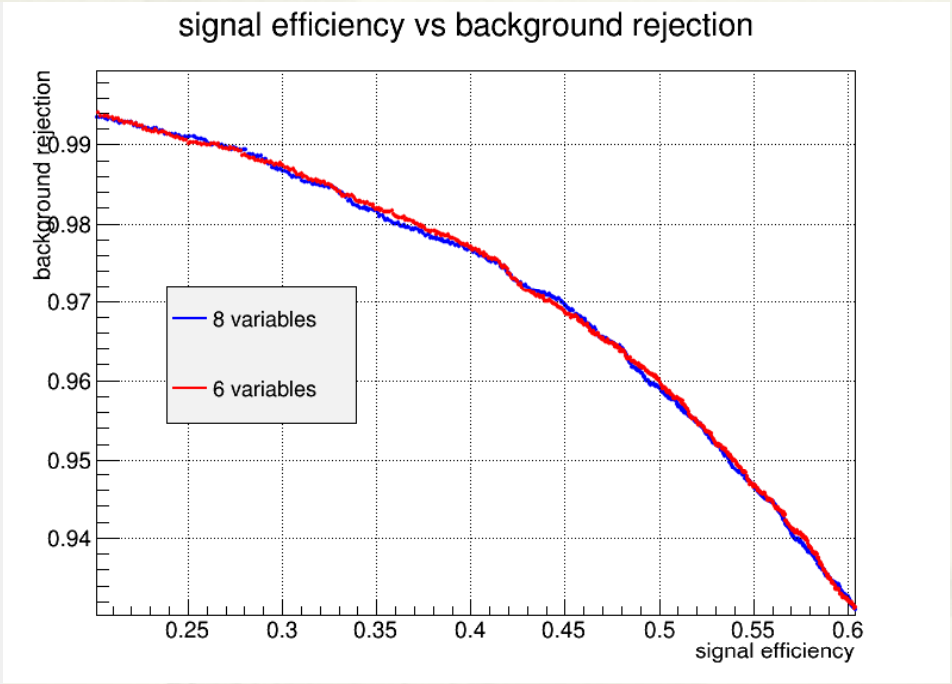


# Results from 6 Variable Training

# MVA Shape and Roc Curve

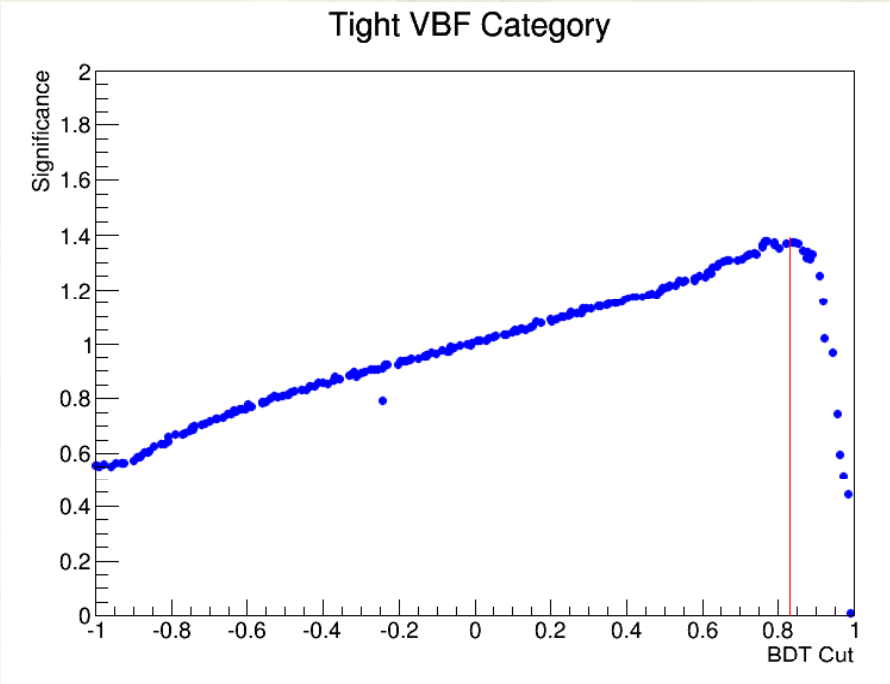


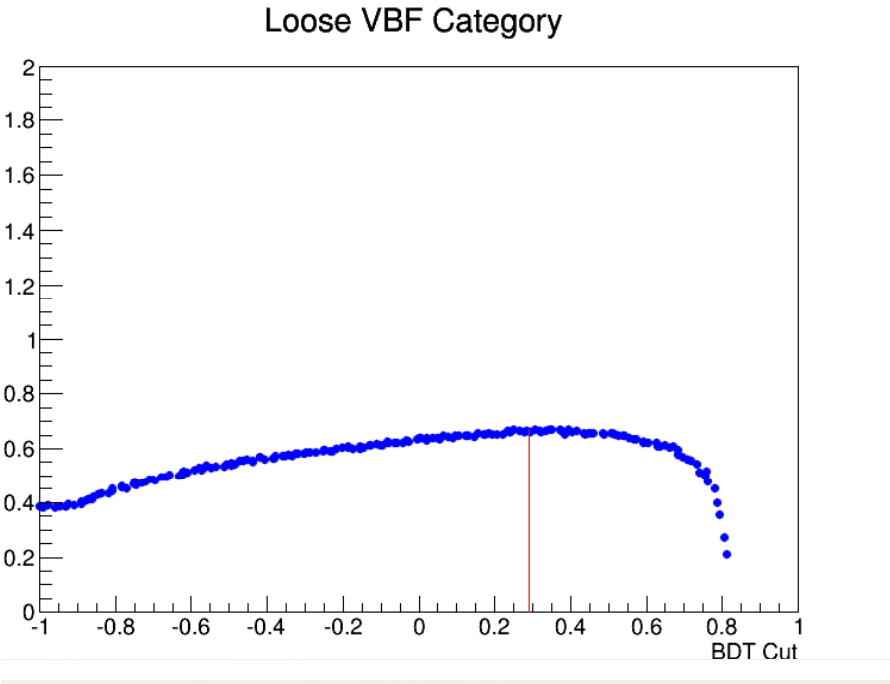




almost the same as 8 variable training

# Categorization

- Using Sherpa+RevISO sample for optimization
- Optimized categorization: [0.29,0.83], >0.83



# Results

| Results (5GeV wind) | 8 variable loose | 8 variable tight | 6 variable loose | 6 variable tight |
|---|---|---|---|---|
| VBF signal | 4.4 | 4.1 | 4.8 | 3.9 |
| ggF | 3.6 | 1.0 | 3.8 | 0.96 |
| bk model | 38.1 | 7.0 | 41.8 | 6.2 |
| Purity | 54.7% | 79.4% | 54.9% | 79.8% |
| significance | 0.67 | 1.34 | 0.70 | 1.35 |
| Data (100-160 GeV) | 395 | 74 | 436 | 64 |

Results from 6 variable training is a little bit better than 8 variable training

# Including 3rd category in VBF

## 3rd Category

| Results (5GeV wind) | 3rd category with only 2 jet cut | 3rd category with VBF pre-cut |
|---|---|---|
| VBF signal | 5.8 | 3.5 |
| ggF | 27.3 | 12.3 |
| fitted N_bkg | 1374.6 | 394.5 |
| purity (VBF) | 11.1% | 20.7% |
| purity (ggF) | 72.1% | 73.8% |
| VBF significance | 0.19 | 0.21 |
| data (100-160 GeV) | 13551 | 3882 |

Won't bring improvement to VBF u measurement du to large ggF contamination

# Xifeng's MVA Optimization

- My default optimization with 8 variable training:
  - NTrees=850:nEventsMin=500:BoostType=Grad:Shrinkage=0.06:UseBaggedGrad:GradBaggingFraction=0.5:nCuts=30:MaxDepth=4
- Xifeng's optimization shows that the default one is very close to optimal point as below:
  - NTrees=750:nEventsMin=500:BoostType=Grad:Shrinkage=0.06:UseBaggedGrad:GradBaggingFraction=0.4:nCuts=20:MaxDepth=4
  - NTrees=850:nEventsMin=250:BoostType=Grad:Shrinkage=0.06:UseBaggedGrad:GradBaggingFraction=0.6:nCuts=20:MaxDepth=4
  - NTrees=750:nEventsMin1500:BoostType=Grad:Shrinkage=0.06:UseBaggedGrad:GradBaggingFraction=0.6:nCuts=30:MaxDepth=4
  - The improvement is only 1% level

# MVA VBF Next

- Full cross checks as been done in Moriond
- Reweighting
- 7TeV MVA VBF
- 3rd 2 jet category impact on inclusive coupling analysis

# VBF Spin/CP Study

- New paper shows that NLO correction could reduce the theoretical uncertainties on total rates as well as to reliably predict the shapes of the distributions in VBF Spin/CP study:
  - http://arxiv.org/abs/1311.1829
- Madgraph+Pythia8 prescription:
  - https://twiki.cern.ch/twiki/bin/viewauth/AtlasProtected/MadGraphMatching
  - Using a latest patch of Pythia8:
    - https://indico.cern.ch/getFile.py/access?contribId=5&resId=0&materialId=slides&confId=282178
    - Talks from JB about X+N parton MC production