VBF MVA Optimization at 13 TeV

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Weekly Meeting

Plans

- VBF is part of
  - coupling/mass analysis
  - cross section measurement
- It can be
  - independent VBF signal search
  - Moriond conference note, run2 paper (observation)
- The work is
  - VBF MVA application, statistical results
  - VBF MVA optimization
  - VBF related systematics
  - VBF validation
    - variable modelling, cut-based/other MVA comparison, background composition, additional checks

Optimization - Variable Selection

- Re-do variables selections
  - variables selection defines MVA performance
  - important to achieve evidence/observation
  - necessary step/material for documentation

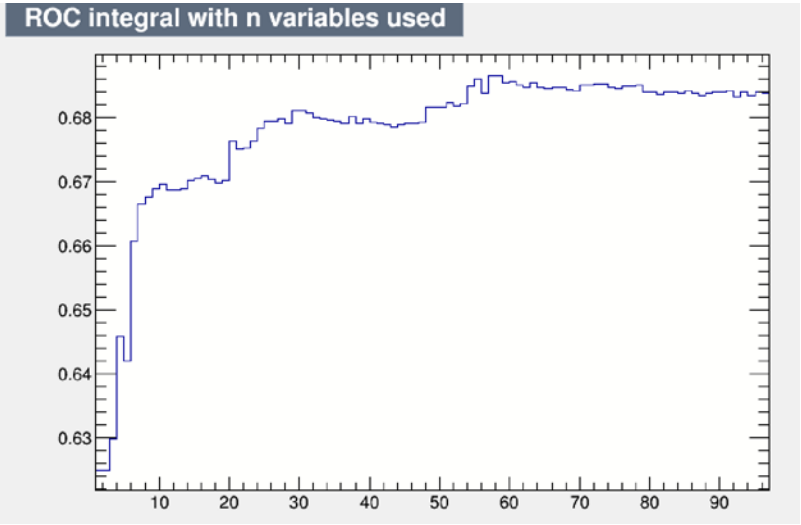
- What to do?
  - test all object kinematics, angular correlations, system properties/difference, event topology
  - choose a combination that maximize MVA performance
    - high separation power, high importance, low correlation, low systematic sensitivity

Optimization - Variable Selection

- Optimization procedure
  1. loop all variables, rank them by separation power
  2. keep the most powerful one if variables are correlated
  3. remove variables correlates with $m_{\gamma\gamma}$
  4. find the combination of variables gives best performance

N variables	2j2γ
total	169
low-correlation	67
independent with $m_{\gamma\gamma}$	42
best combination	15

improvement >8%

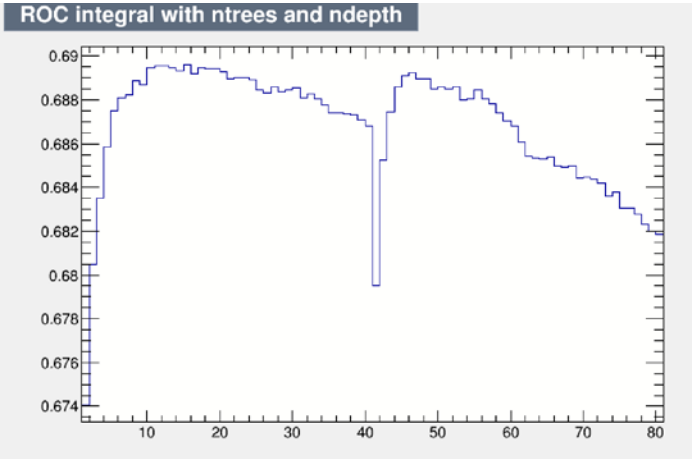


Optimization – MVA configuration

- Re-optimize MVA configuration
  - improve MVA performance
  - control overtraining
    - similar/same test/training distributions
      - better performance
      - no overestimate results

- Re-optimize MVA configuration
  - Loop all configuration parameters
    - NTrees, Ndepth
    - Others

improvement ~5%



Summary

- An exercise with a small fraction of 13TeV samples
  - /eos/atlas/atlasgroupdisk/phys-higgs/HSG1/MxAOD/h007
  - still need to check selections, weights, variables calculations

- Will finish a preliminary optimization