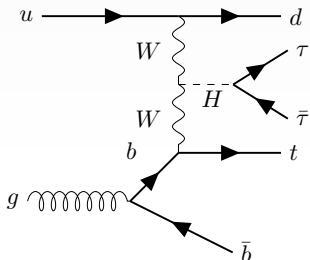# Hadhad MVA

Christian Kirfel

21st of September 2021

Event selection

- n-jets: at least 2 (b-jets: >0)
- b-jet WP: 70 DL1r
- nLeptons & nTaus: 1e/μ 2τ_{had}
- $E_{\text{T,miss}}$: no cut (to 800 GeV)

- jets:
  - $p_T > 35\,\text{GeV}$
  - $|\eta| < 4.5$
  - EMPFlow
- electrons:
  - $p_T > 20\,\text{GeV}$ leading 27 GeV
  - $|\eta| < 2.5$ not in 1.37 - 1.52
  - WP: LooseAndBLayerLH ; isolation: no requirement
- muons:
  - $p_T > 20\,\text{GeV}$ leading 27 GeV
  - $0.01 < |\eta| < 2.5$
  - WP: Loose ; isolation: no requirement
- taus:
  - $p_T > 20\,\text{GeV}$ leading 27 GeV
  - $|\eta| < 2.5$ not in 1.37 - 1.52
  - WP: RNNLoose
  - ASG recommended OLR (τ_{had} remove jets)

Data/MC agreement
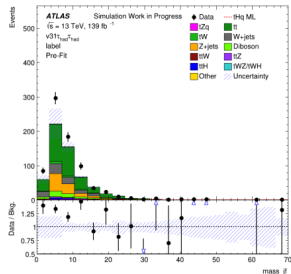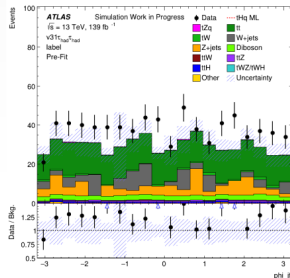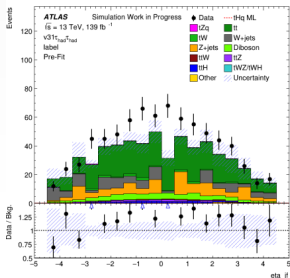
plots to be added

Preliminary feature selection

Mostly final state kinematics

|	
eta__jf	forward jet eta
pt__jf	forward jet transverse momentum
mass__jf	forward jet mass
phi__jf	forward jet phi
eta__b	b-jet eta
pt__b	b-jet transverse momentum
phi__b	b-jet phi
mass__b	b-jet mass
m__met	Missing energy
Reco__w__mass__2	Reconstructed mass of the W case 1
Reco__w__mass__1	Reconstructed mass of the W case 2
fs__had__tau__1__pt	Hadronic tau 1 pt
fs__had__tau__1__eta	Hadronic tau 1 eta
fs__had__tau__2__pt	Hadronic tau 2 pt
fs__had__tau__2__eta	Hadronic tau 2 eta

|	
deltaRTau	Delta R of the hadronic taus
deltaPhiTau	Delta phi of the hadronic taus
HvisMass	mass of LorentzV sum of hadronic taus
HvisPt	pt of LorentzV sum of hadronic taus
HvisEta	eta of LorentzV sum of hadronic taus
TvisMass	mass of reconstructed top
TvisPt	pt of visible top
TvisEta	eta of visible top
M__b__jf	Mass of LorentV sum of b and jf
HT	Sum of transverse energies
lep__Top__pt	Light lepton pt
lep__Top__eta	Light lepton eta

WIP

Negative weight handling
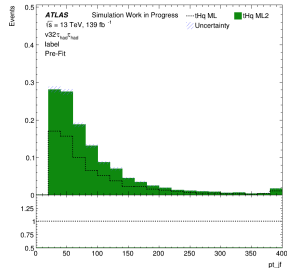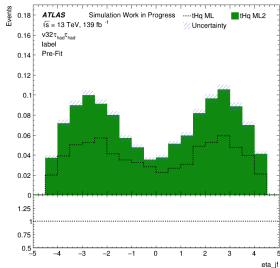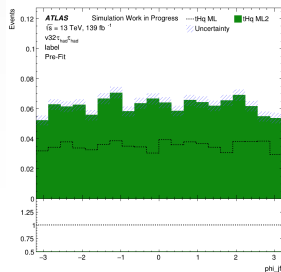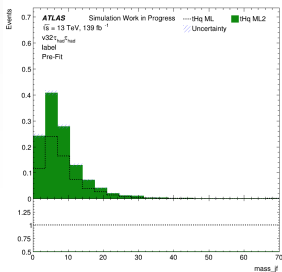
Negative weight correlation
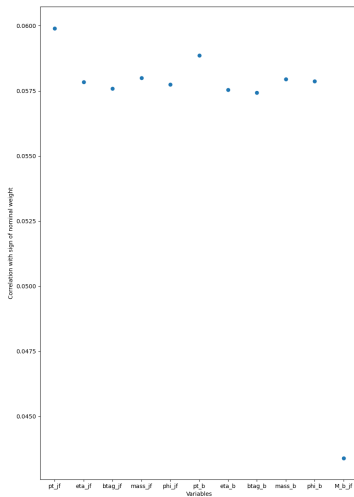
Input preparation
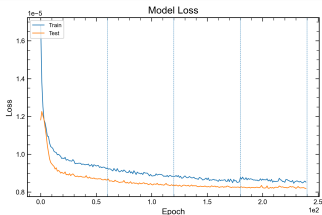
WIP

Network Hyperparamterts

- Coarse optimisation: Evolutionary
- Fine optimisation: Grid search

Hyperparameter	Setting
Model	Categorical
Nodes	120
Layers	6
Dropout	0.65
Batchnormalisation	On
Activation	elu
Output activation	softmax
Batch size	1000
Optimisation	Adam
Weight Initialisation	Lecun Normalisation
K-folds	4

Results

- Stable training
- Good AUC