



हैदराबाद विश्वविद्यालय  
University of Hyderabad

# My Progress

MonoHiggs to  $b\bar{b}$

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# Table of contents

1. Thu, 5<sup>th</sup> October 2023

Basic kinematic plots (Without any scale factors or corrections)

2. Thu, 26<sup>th</sup> October 2023

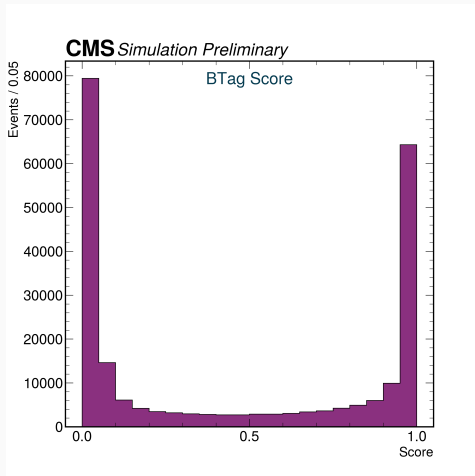
MET Filters / MET Flags

3. Tue, 2<sup>nd</sup> January 2024

Contribution of various backgrounds: Resolved; 2018

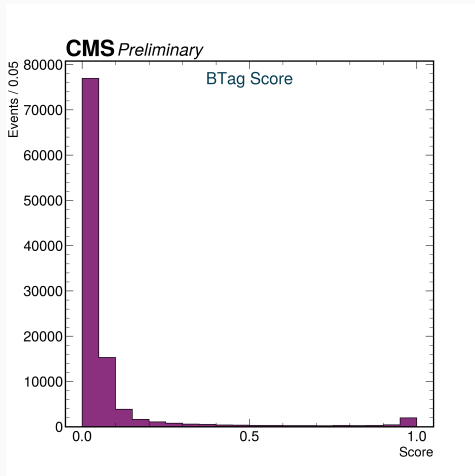
## Basic kinematic plots

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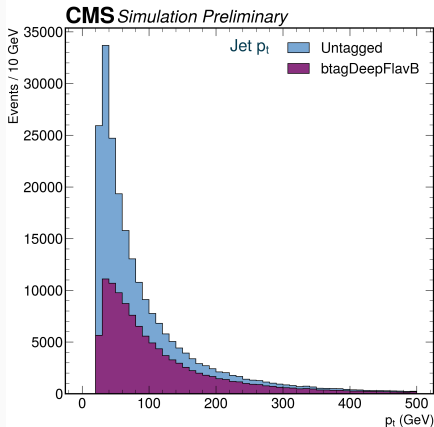
- Btagger used :  
**btagDeepFlavB**
- Sample used:  
**MonoHTobb\_ZpBaryonic**
- Lots of bjets in Signal  
MC

**Figure 1:** BTag score for signal MC sample



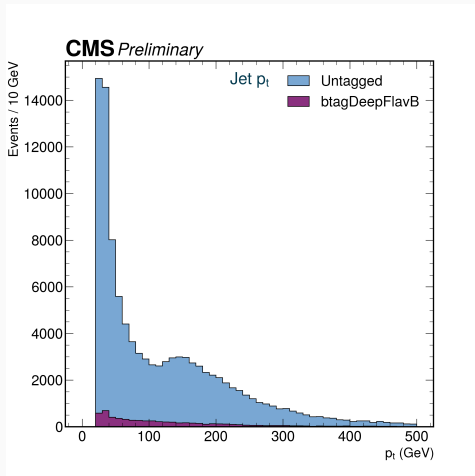
- Btagger used :  
**btagDeepFlavB**
- Sample used:  
**Run2018A/MET**
- Less number of bjets in  
Data

**Figure 2:** BTag score for Data samples



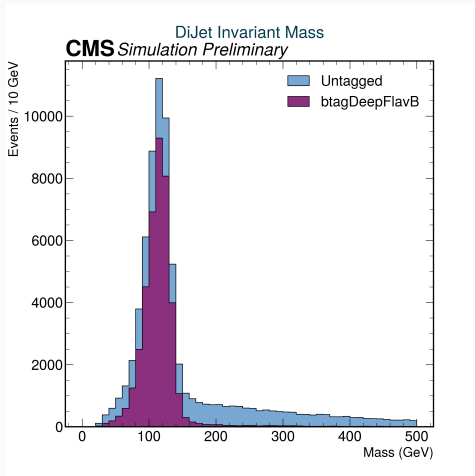
- Basic selections :  
 $p_t > 25\text{GeV}$  and  
 $|\eta| < 2.5$
- Btagger used :  
**btagDeepFlavB**
- Sample used:  
**MonoHTobb\_ZpBaryonic**
- Medium Weight  
Parameter used for  
ak4bjets : 0.3040

**Figure 3:** Jet  $p_t$  of signal MC samples



- Basic selections :  
 $p_t > 25\text{GeV}$  and  
 $|\eta| < 2.5$
- Btagger used :  
**btagDeepFlavB**
- Sample used:  
**Run2018A/MET**
- Medium Weight  
Parameter used for  
ak4bjets : 0.3040
- Not as predictable as  
signal MC

**Figure 4:** Jet  $p_t$  of Data samples

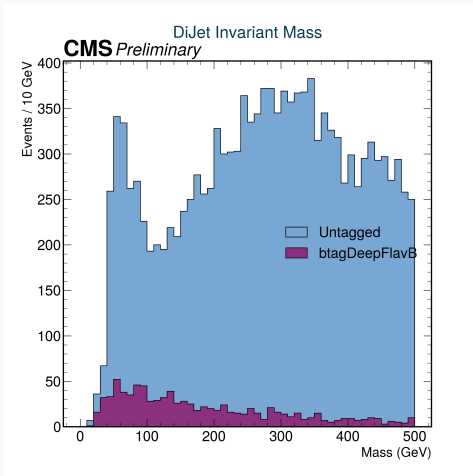


- Basic selections :  
 $p_t > 25\text{GeV}$  and  
 $|\eta| < 2.5$  for each jet
- Btagger used :  
**btagDeepFlavB**
- Sample used:  
**MonoHTobb\_ZpBaryonic**
- Medium Weight  
Parameter used for  
ak4bjets selection :  
0.3040
- Peaks around SM Higgs  
mass

Figure 5: DiJet mass of signal MC samples

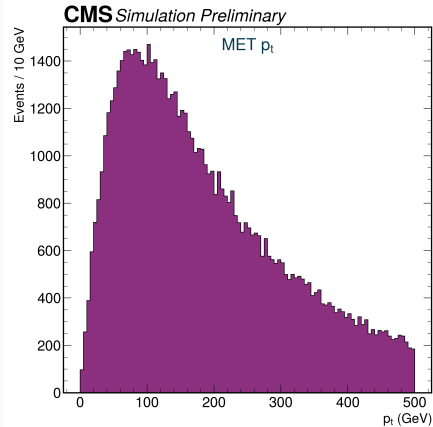


# Dijet mass : Data



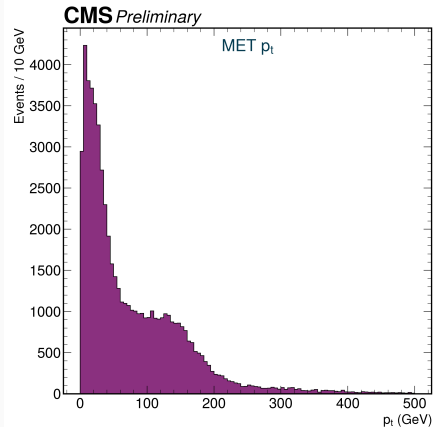
- Basic selections :  
 $p_t > 25\text{GeV}$  and  $|\eta| < 2.5$  for each jet
- Btagger used :  
**btagDeepFlavB**
- Sample used:  
**Run2018A/MET**
- Medium Weight  
Parameter used for  
ak4bjets selection :  
0.3040
- Lot of noise, no clear  
structure

Figure 6: Dijet mass of Data samples



- No filters or Trigger applied

**Figure 7:** MET  $p_t$  for signal MC samples

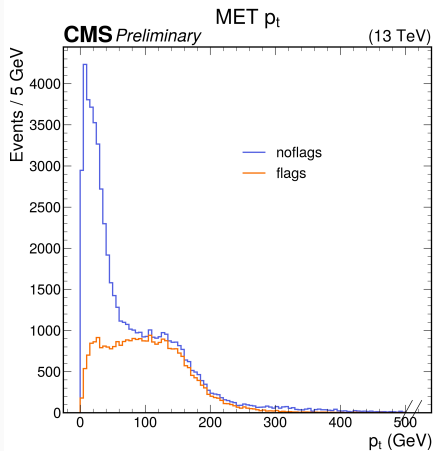


- No filters or Trigger applied
- Looks similar to the Jet data

**Figure 8:** MET  $p_t$  for Data samples

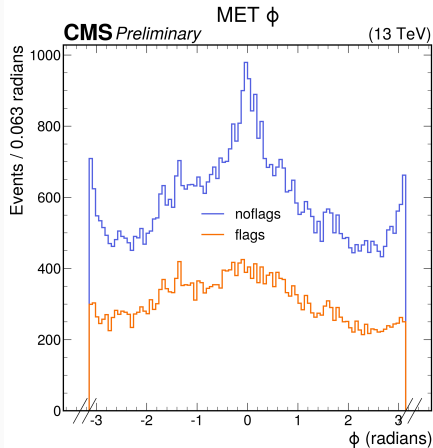
## MET Filters

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- Compared how the MET  $p_t$  looks with and without MET triggers on Data

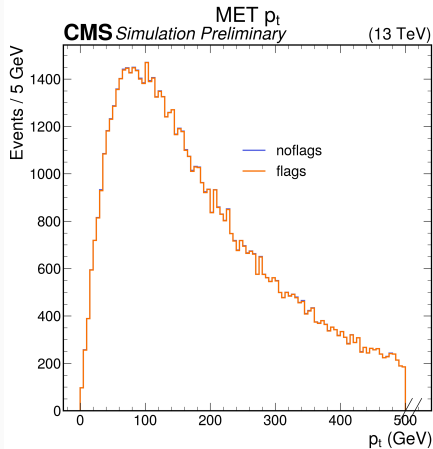
**Figure 9:** MET  $p_t$  for MET2018A



- Compared how the MET  $\phi$  looks with and without MET triggers
- .jf

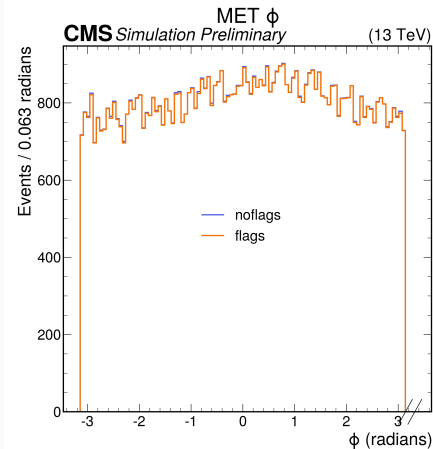
Figure 10: MET  $\phi$  for MET2018A

# MET $p_t$ : MonoHtobb\_ZpBaryonic



- Compared how the MET  $p_t$  looks with and without MET triggers on Signal MC
- .jf

Figure 11: MET  $p_t$  for MonoHtobb\_ZpBaryonic



- Compared how the MET  $\phi$  looks with and without MET triggers on Signal MC

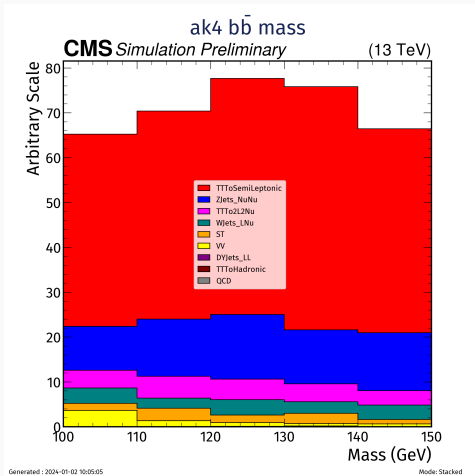
• .

Figure 12: MET  $\phi$  for MC



Contribution of various  
backgrounds:Resolved;2018

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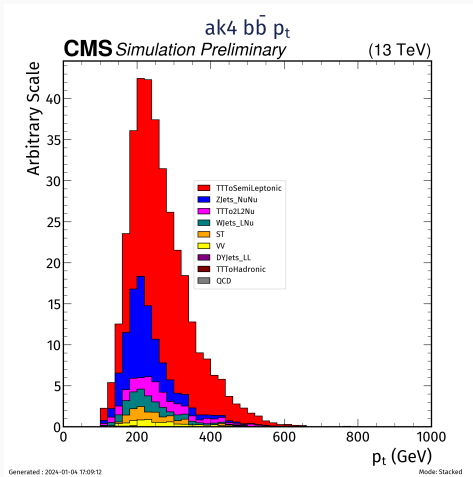
## Selections Applied: Event Selections:

- $MET > 200$  GeV
- no leptons
- no photons

## Object Selections:

- jet  $p_t > 30$  GeV
- jet  $|\eta| < 2.5$
- $\Delta\phi(Jet, MET)$
- at least 2 tight bjets (algorithm:DeepFlavB)
- leading bjet  $p_t > 50$  GeV
- subleading bjet  $p_t > 30$  GeV
- atmost 2 additional jets
- dijet = leading bjet + subleading bjet
- dijet mass between (100 GeV;150 GeV)
- dijet  $p_t > 100$  GeV

**Figure 13:** Simulated contribution of various backgrounds to the signal in the resolved  $b\bar{b}$  bar case for 2018



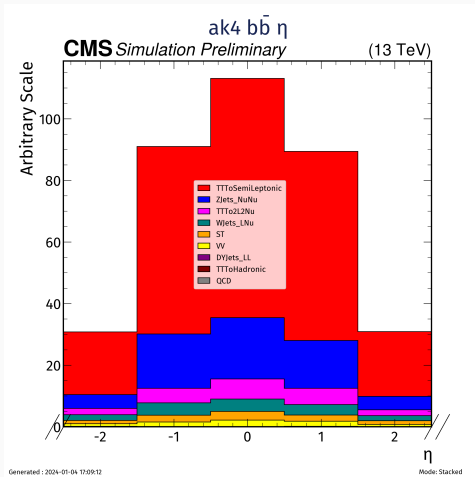
## Selections Applied: Event Selections:

- $MET > 200$  GeV
- no leptons
- no photons

## Object Selections:

- jet  $p_t > 30$  GeV
- jet  $|\eta| < 2.5$
- $\Delta\phi(Jet, MET)$
- at least 2 tight bjets (algorithm:DeepFlavB)
- leading bjet  $p_t > 50$  GeV
- subleading bjet  $p_t > 30$  GeV
- atmost 2 additional jets
- dijet = leading bjet + subleading bjet
- dijet mass between (100 GeV;150 GeV)
- dijet  $p_t > 100$  GeV

**Figure 14:** Simulated contribution of various backgrounds to the signal in the resolved  $b\bar{b}$  bar case for 2018



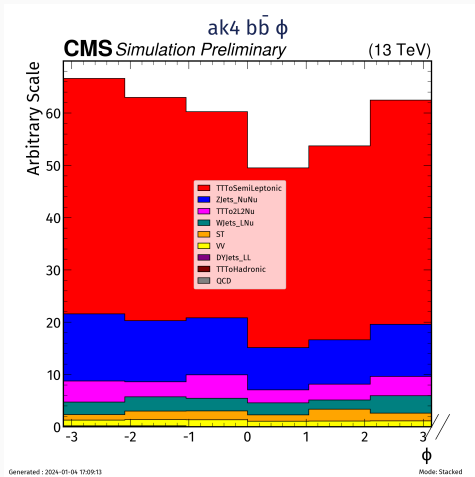
## Selections Applied: Event Selections:

- $MET > 200$  GeV
- no leptons
- no photons

## Object Selections:

- jet  $p_t > 30$  GeV
- jet  $|\eta| < 2.5$
- $\Delta\phi(Jet, MET)$
- at least 2 tight bjets (algorithm:DeepFlavB)
- leading bjet  $p_t > 50$  GeV
- subleading bjet  $p_t > 30$  GeV
- atmost 2 additional jets
- dijet = leading bjet + subleading bjet
- dijet mass between (100 GeV;150 GeV)
- dijet  $p_t > 100$  GeV

**Figure 15:** Simulated contribution of various backgrounds to the signal in the resolved  $b\bar{b}$  bar case for 2018



## Selections Applied:

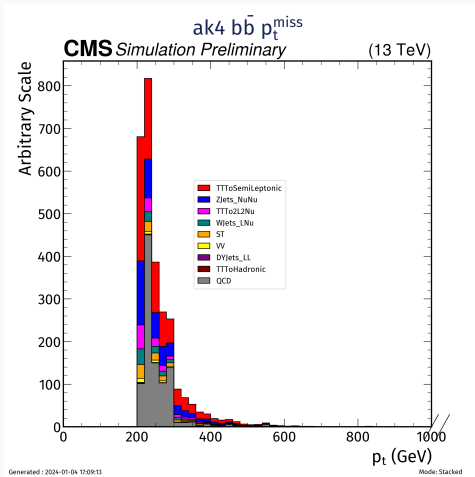
### Event Selections:

- MET > 200 GeV
- no leptons
- no photons

### Object Selections:

- jet  $p_t > 30$  GeV
- jet  $|\eta| < 2.5$
- $\Delta\phi(\text{Jet}, \text{MET})$
- at least 2 tight bjets (algorithm:DeepFlavB)
- leading bjet  $p_t > 50$  GeV
- subleading bjet  $p_t > 30$  GeV
- atmost 2 additional jets
- dijet = leading bjet + subleading bjet
- dijet mass between (100 GeV;150 GeV)
- dijet  $p_t > 100$  GeV

**Figure 16:** Simulated contribution of various backgrounds to the signal in the resolved  $b\bar{b}$  bar case for 2018



## Selections Applied:

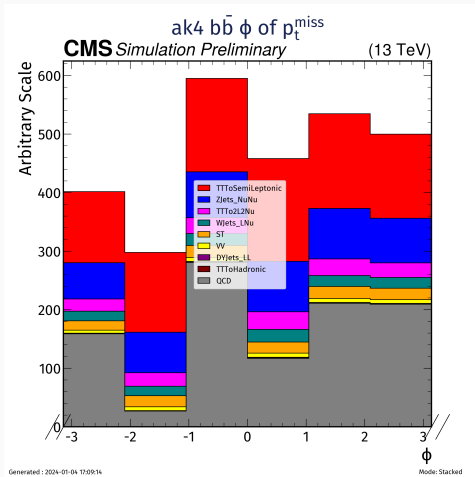
### Event Selections:

- $\text{MET} > 200 \text{ GeV}$
- no leptons
- no photons

### Object Selections:

- $\text{jet } p_t > 30 \text{ GeV}$
- $\text{jet } |\eta| < 2.5$
- $\Delta\phi(\text{Jet}, \text{MET})$
- at least 2 tight bjets (algorithm:DeepFlavB)
- leading bjet  $p_t > 50 \text{ GeV}$
- subleading bjet  $p_t > 30 \text{ GeV}$
- atmost 2 additional jets
- dijet = leading bjet + subleading bjet
- dijet mass between (100 GeV;150 GeV)
- dijet  $p_t > 100 \text{ GeV}$

**Figure 17:** Simulated contribution of various backgrounds to the signal in the resolved  $b\bar{b}$  bar case for 2018



## Selections Applied:

### Event Selections:

- $\text{MET} > 200 \text{ GeV}$
- no leptons
- no photons

### Object Selections:

- $\text{jet } p_t > 30 \text{ GeV}$
- $\text{jet } |\eta| < 2.5$
- $\Delta\phi(\text{jet}, \text{MET})$
- at least 2 tight bjets (algorithm:DeepFlavB)
- leading bjet  $p_t > 50 \text{ GeV}$
- subleading bjet  $p_t > 30 \text{ GeV}$
- atmost 2 additional jets
- dijet = leading bjet + subleading bjet
- dijet mass between (100 GeV;150 GeV)
- dijet  $p_t > 100 \text{ GeV}$

**Figure 18:** Simulated contribution of various backgrounds to the signal in the resolved  $b\bar{b}$  bar case for 2018

