

MC, η , TMVA

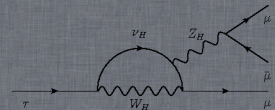
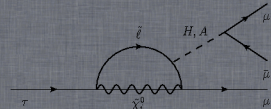
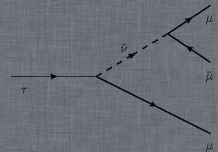
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25th July 2013



University of
Zurich ^{UZH}

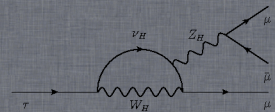
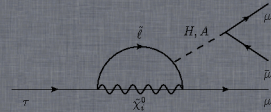
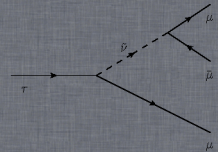
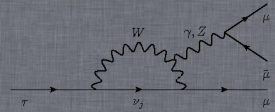


MC studies

η fits

TMVA

Plans for next week



MC Signal

Reminder:

- In 2011 we simulated a mixture of $\tau \rightarrow 3\mu$.
- We found out that the cross section is wrong in MC.
- We reweighed all these distributions to match the correct cross section.
- But what with DPC? This can't be reweighed!
- Let's check how ϵ_{DPC} depends on signal channel.

Cross check procedure

Let's run Pythia6 with 8 TeV CM energy. With old decfile(aka the wrong mixture of $c\bar{c}$ and $b\bar{b}$). We get:

- $\epsilon_{DPC} = 17.9\%$
- For 7 TeV% we had:17.7%
- This part looks reasonable. We would expected a small gain.

Cross check procedure

We then simulate two samples for each of 5 sources of τ .

- 1st Sample with Geometry+Daughter¹ Cuts. $\epsilon_{DPC+DAU}$
- 2nd Sample with Daughter Cut. ϵ_{DAU}

¹Daughter cuts forces τ to come from a specific mother. Ex. B.

MC Signal

τ source	$\epsilon_{DPC+DAU}[\%]$	$\epsilon_{DAU}[\%]$	$\epsilon_{DPC}[\%]$
$D \rightarrow \tau$	12.12 ± 0.07	32.71 ± 0.13	18.5 ± 0.1
$B \rightarrow D \rightarrow \tau$	1.36 ± 0.01	3.99 ± 0.03	17.0 ± 0.1
$D_S \rightarrow \tau$	11.79 ± 0.07	31.53 ± 0.13	18.6 ± 0.1
$B \rightarrow D_S \rightarrow \tau$	1.75 ± 0.01	5.04 ± 0.03	17.4 ± 0.1
$B \rightarrow \tau$	5.16 ± 0.05	14.85 ± 0.13	17.4 ± 0.2

Let's take wrong weights from MC and calculate the ϵ_{DPC} :

$\epsilon_{DPC,WRONG} = 17.86$, with agriment with simulating the wrong mixture from beginning!

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$\epsilon_{DPC,WRONG} = 17.86\%$, with agriment with simulating the wrong mixture from beginning!

If we take the correct weights we obtain:

$\epsilon_{DPC,CORRECT} = 18.60\%$. We underestimated our efficiency!

MC Signal

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How ever the overall effect will be smaller cuz the same thing will happen for the normalization channel.

Pythia Wars

I have found an other disturbing thing. Lets compare pythia 6 with pythia8:

	$\epsilon_{DPC}[\%]$
Pythia 6	17.9
Pythia 8	19.1

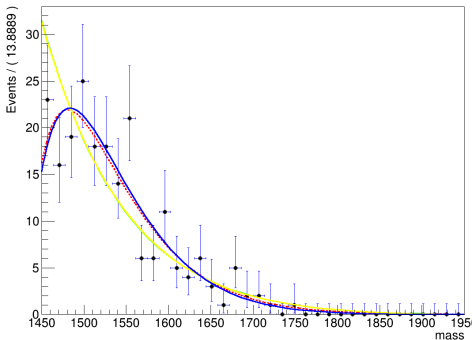
This looks worse than it is. Jon checked and this happens not only to $\tau \rightarrow 3\mu$. Turn out this is common. $B_s \rightarrow \mu\mu$ aslo has the same problem. However thanks to normalization this the ratio of efficiencies changes by 0.1%.

We are safe anyway.

- Till yesterday we took η for fitting directly from MC.
- But how much eta is there?
- We might have combinatorial background with partially reconstructed η .
- Lots of thanks to Paul for speedy implementation of this idea!
- To increase the sensitivity I took left mass range larger! Make the fit more stable.

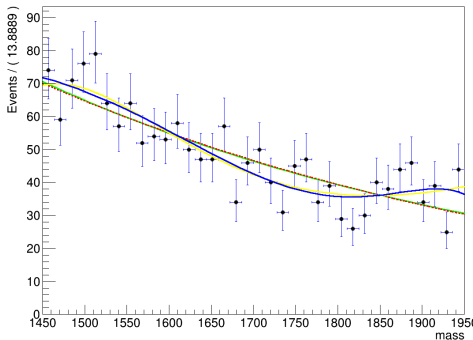
Extreme case: Trash bins Only η

A RooPlot of "mass"



η with combinatorics.

A RooPlot of "mass"



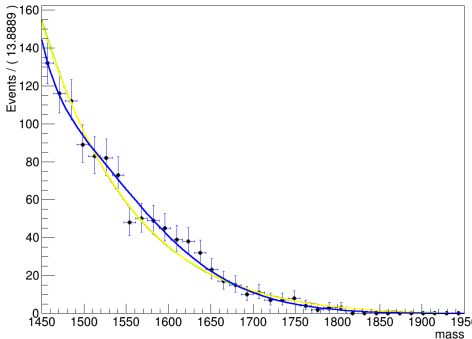
η fits

Not only the trash bin is affected: pid 0.725 – 0.86

geo: -0.48 – 0.05

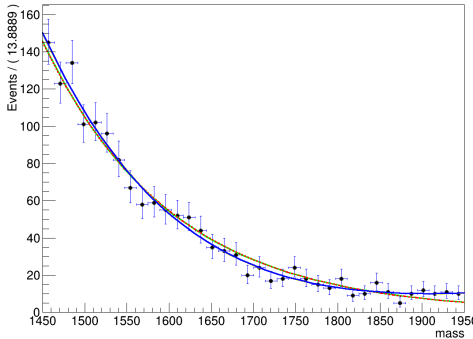
Only η

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A RooPlot of "mass"



η fits

As old Chinese wisdom says: "One event can make a difference"

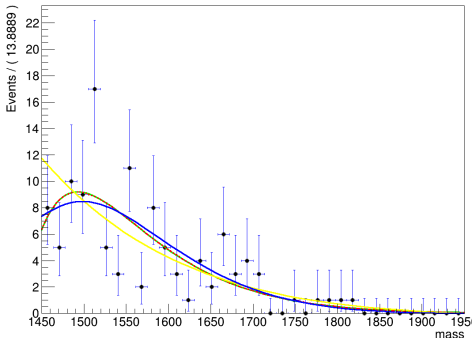
Not only the trash bin is affected: pid 0.6 – 0.65

geo: 0.65 – 0.74

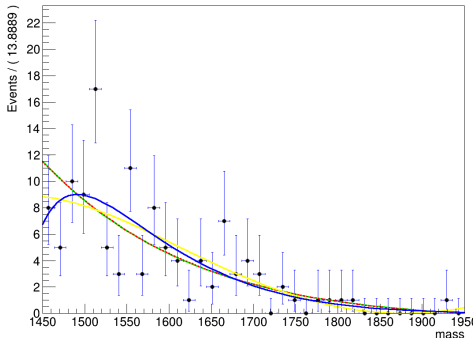
Only η

η with combinatorics.

A RooPlot of "mass"



A RooPlot of "mass"



Conclusions on η

- 23% of events in the ntuple are background.
- Much better shape of η .
- PDF similar in each bin!
- Much smaller linkage of η to mass window!
- PDFs are ready for fitting with 2012 data!

Introduction

Kaggle (leading machine learning competition platform).



If you notice how people win this competition; you'll notice that sometimes people combine two or more algorithm into ensemble and get better results.

This is called blending.

Isn't $\tau \rightarrow 3\mu$ perfect environment to play?

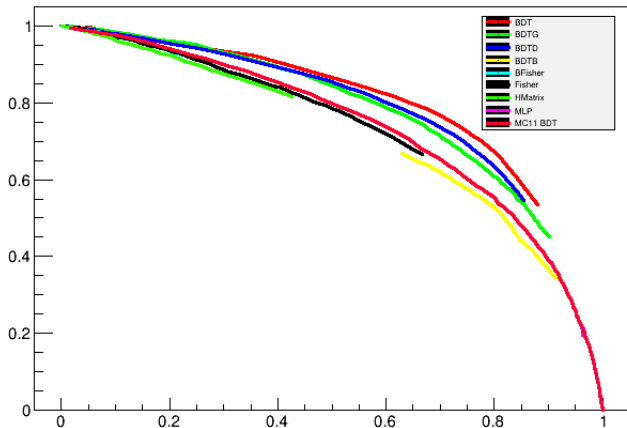
First attempts

- Let's take our background produced so far.
- Already a comparable sample to 2011! Generator cuts are doing their job.
- Let's train each signal on separate source of τ .

$B \rightarrow \tau$

We really suck in selecting this channel.

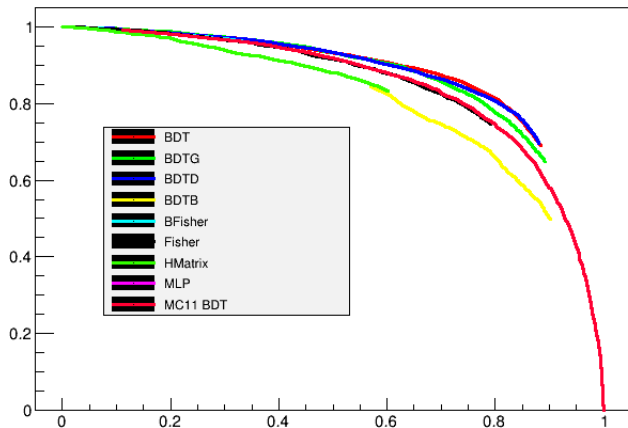
ROC curves



$$B \rightarrow D_s \rightarrow \tau$$

On the biggest contributing channel we are quite optimal.

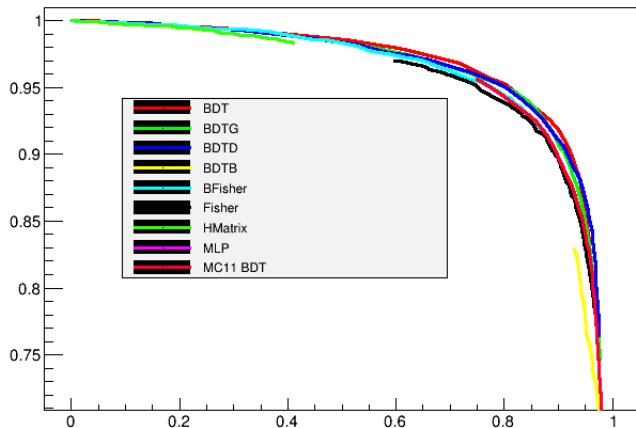
ROC curves



$$D_S \rightarrow \tau$$

On the biggest contributing channel we are quite optimal.

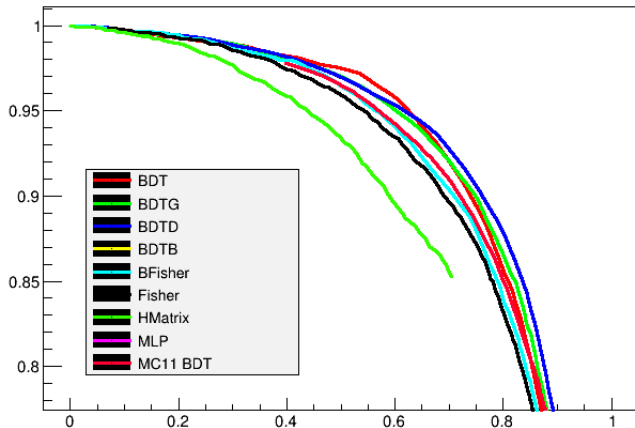
ROC curves



$$B \rightarrow D^+ \rightarrow \tau$$

On the biggest contributing channel we are quite optimal.

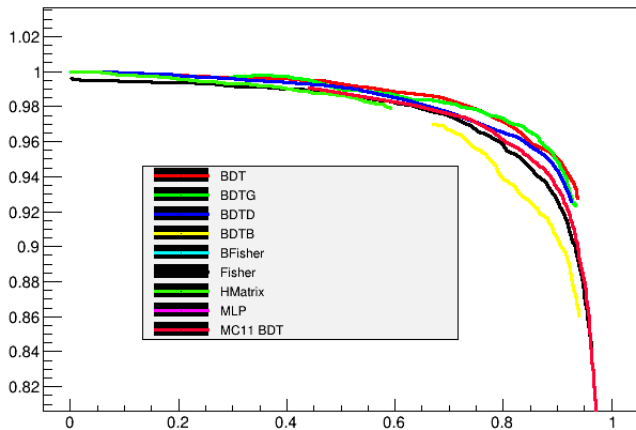
ROC curves



$$D^+ \rightarrow \tau$$

On the biggest contributing channel we are quite optimal.

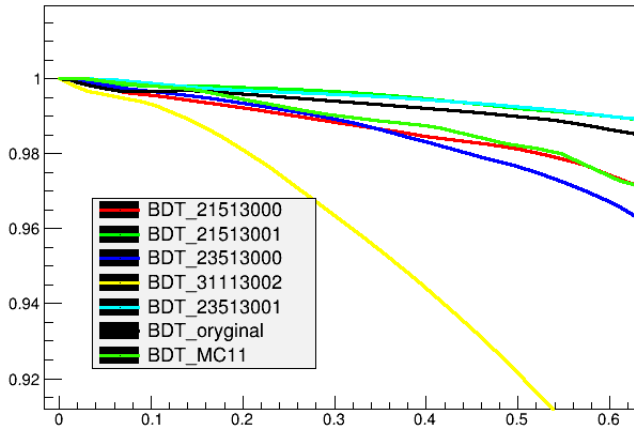
ROC curves



Comparison on mix sample

On the biggest contributing channel we are quite optimal.

ROC curves



Conclusions on TMVA

- Each of the signal components is enormously larger than MVA trained on mix.
- Method looks very promising if we can find a nice blending method(work for next week).
- Maybe discussion on TMVA/MatrixNet/Neurobayes is next to leading order effect compared to this method?

Conclusions on TMVA

- Finish producing cc bck
- Continue blending.
- Finish calculating new 2D binning optimisation(last night it was still calculating).
- Start Normalizing the η
- Produce Normalization channel MC.