

# $B \rightarrow K e \mu$ analysis

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# Motivation

- There are number of papers linking the  $B^0 \rightarrow K^* \mu^- \mu^+$  and  $R_k$  anomalies with LFV.
- The main reason is that if you have LU breaking the LFV breaking scale in natural way should be close.
- A lot of groups concentrate their efforts on  $B^0 \rightarrow K \tau \mu$ .
- In my opinion the  $B \rightarrow K e^- \mu^+$  might be a better candidate.
- You lose a factor of 10 because of the hierarchical structure of NP, but you can fix this back because of  $\tau$  branching fraction.
- ... and still you do not have the neutrinos to worry about.

# Stripping

- Another nice thing about the  $B \rightarrow K\mu e$  is the fact we have all the stripping lines there.
- Stripping lines used:
  - LFVLinesB2heMuLine
  - LFVLinesBu2KJPsi eeLine
  - Bs2MuMuLinesBu2JPsiKLine

# Stripping

Daughter particles	
MIPCHI2DV	$> 25$
TRCHI2DOF	$< 3$
TRGHOSTPROB	$< 0.3$
PIDe	$> 2$

$B$ particles	
VFASPF (VCHI2/VDOF)	$< 9$
$\Delta m$	$< 600$
BPVDIRA	$> 0$
BPVVDCHI2	$> 225$
BPVIPCHI2	$< 25$

# MVA training

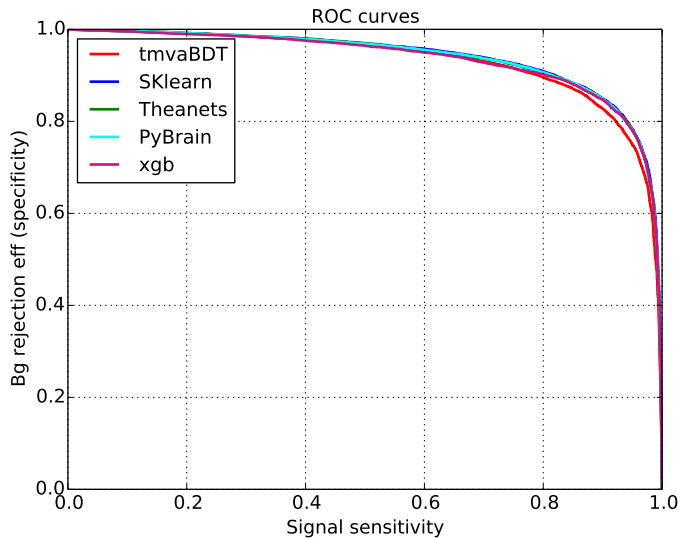
- The main reason for the talk is this one ;)
- Thanks to kaggle we know what are the most useful ML frameworks:
  - Sklearn
  - XGBoost
  - Theanets
  - Neurolab
  - Pybrain
- There is a developing framework for simultaneous training of this all this classifiers:  
<https://github.com/yandex/rep>
- python based, for last 2 weeks was playing with it.

This has a couple of nice features:

- Build in k-Folding technique (DONE).
- Build in classifier and cut optimization (DONE).
- Build in parallelization (testing).

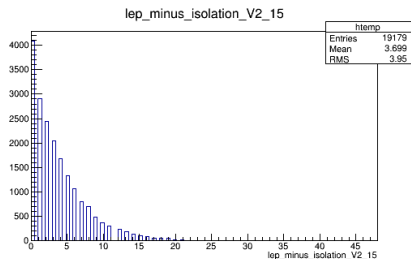
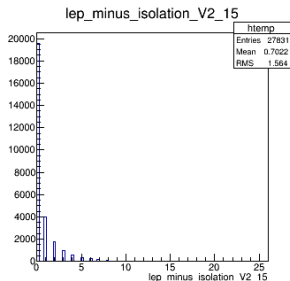
# Something to piss up Jampi

A first test I did is to compare our old tmva with the other classifiers:



# Isolations

- I decided to reuse the isolations created for  $B^0 \rightarrow K^* \mu^- \mu^+$ .
- The isolations are now generalized and work for all:  
 $B \rightarrow K J/\psi(\ell\ell')$ .
- Since the lines I am using are present in Stripping 20 I don't need to wait for any MDSTS rerunning.
- This variable was quite powerfull in  $B^0 \rightarrow K^* \mu^- \mu^+$  and had specially designed data-mc agreement.





# Sum up

- Last jobs with control channels are finishing.
- Work starting but looks promising.
- Finish the nasty DaVinci stuff.
- Still want to play with the full optimization of the MVA.
- Will start calibrating mass.

# Backup