MultiVariate Analysis & Tools

Short Exercise

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Why Bother with MVA Methods?

1995	Discovery: top quark	Tevatron
1998	Measurement: top quark mass	Tevatron
2009	Discovery: single top production	Tevatron
2012	Discovery: Higgs boson	LHC
	: :	
2018	Discovery: *weirdino* !	LHC

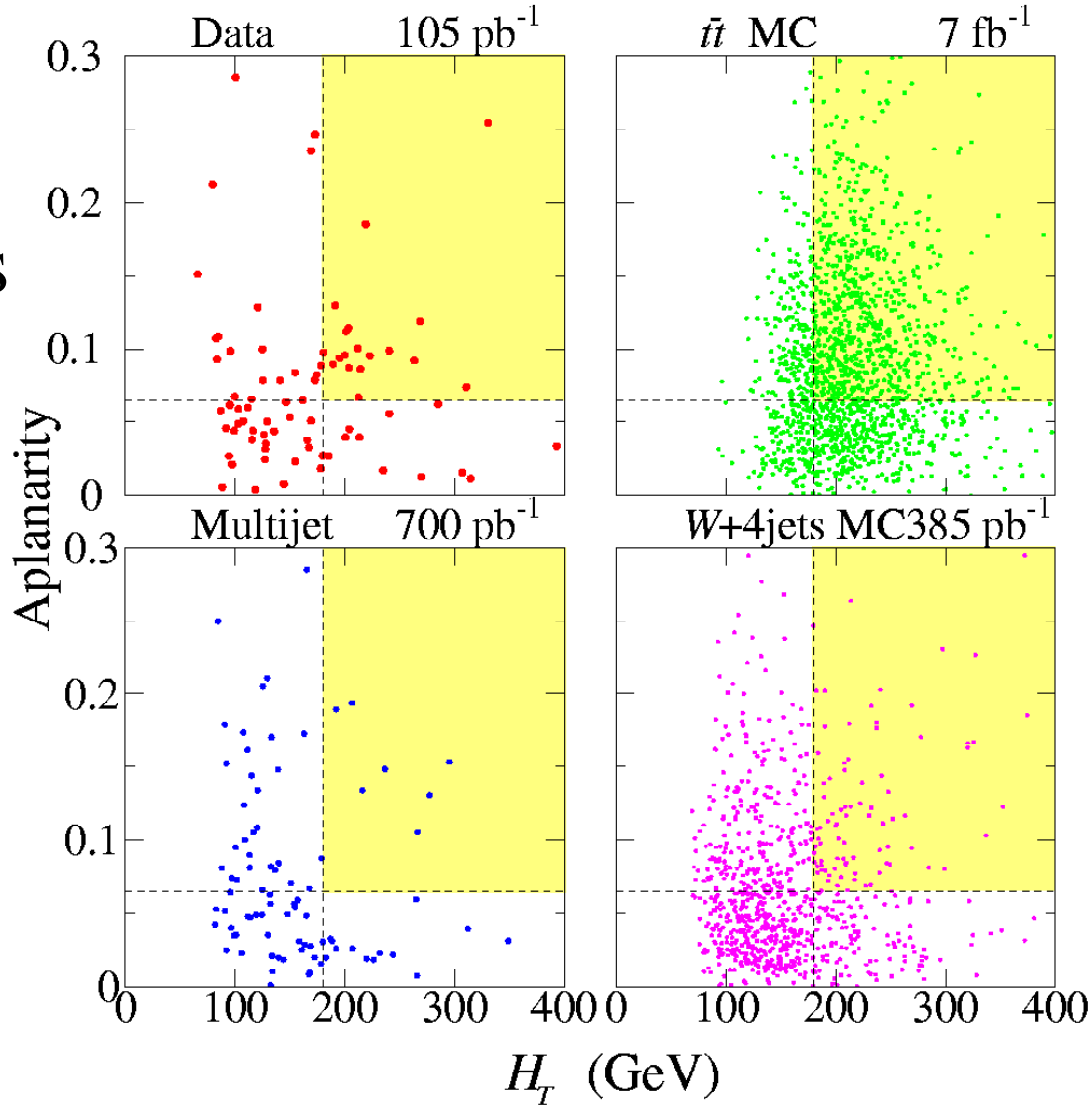
weird

1. of, relating to, or caused by witchcraft or the supernatural
2. of strange or extraordinary character

Top quark discovery: DØ data

$$p\bar{p} \rightarrow t\bar{t} \rightarrow l + \text{jets}$$

$x = (A, H_{\mathrm{T}})$



A *very* short list of MVA methods

- **Random Grid Search** **01_RGS**
- Fisher Discriminant
- Quadratic Discriminant
- Naïve Bayes
- **Kernel Density Estimation** **02_KDE**
- Support Vector Machines
- **Boosted Decision Trees** **03_TMVA**
- **Neural Networks (MLP)**

- **Bayesian Neural Networks** **04_BNN**
- RuleFit
- Random Forests
- : :

Setup – Step 1

Setup Root

```
cd
source logincmsdas.sh
scram project CMSSW CMSSW_7_2_3
cd CMSSW_7_2_3/src
cmsenv

cd
git clone http://github.com/hbprosper/CMSDAS15.git
```

Setup – Step 2

Setup FBM (for BNN)

cd

cd mkdir external

cd external

wget http://www.cs.utoronto.ca/
~radford/ftp/fbm.2004-11-10.tar.gz

tar zxvf fbm.2004-11-10.tar.gz

cd fbm.2004-11-10

./make-all

cd

cd CMSDAS15/exercises

source setup.sh

So Let's Get Started!

Python/PyROOT Basics

cd 00_PyRoot

python fitExpt.py

or

./fitExpt.py