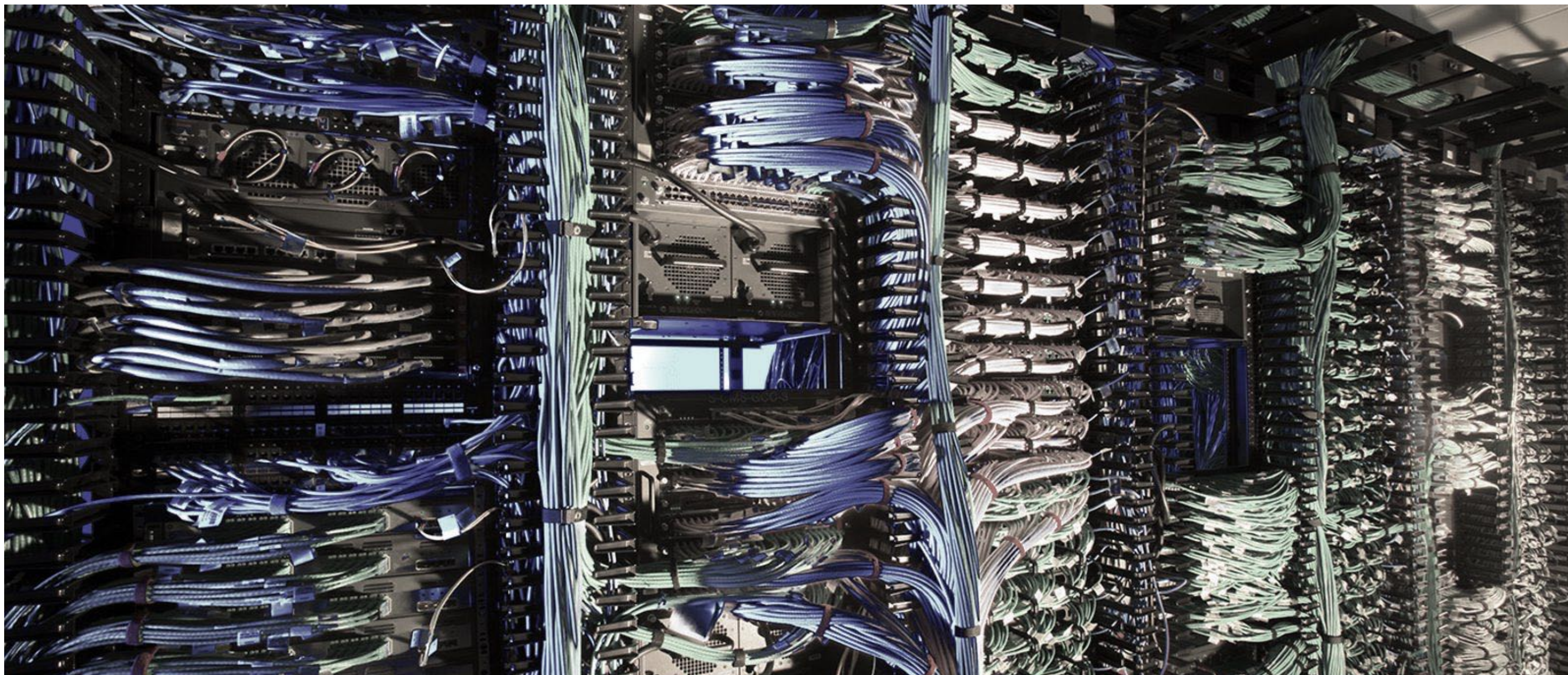


Tutorial: Jet Tagging with Deep Learning

Maurizio Pierini

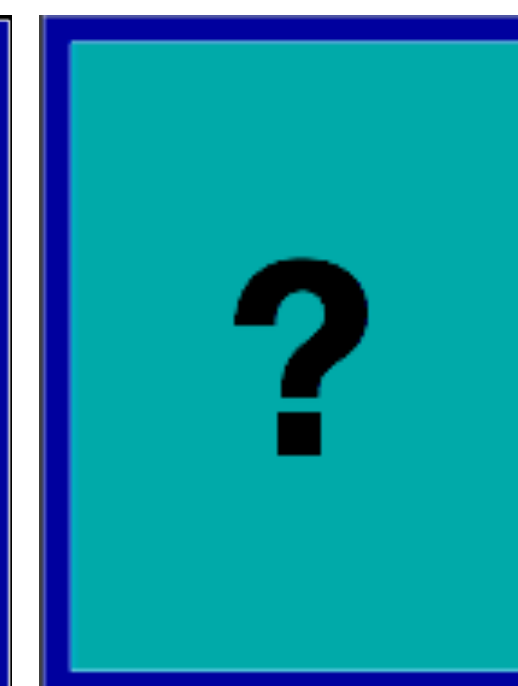
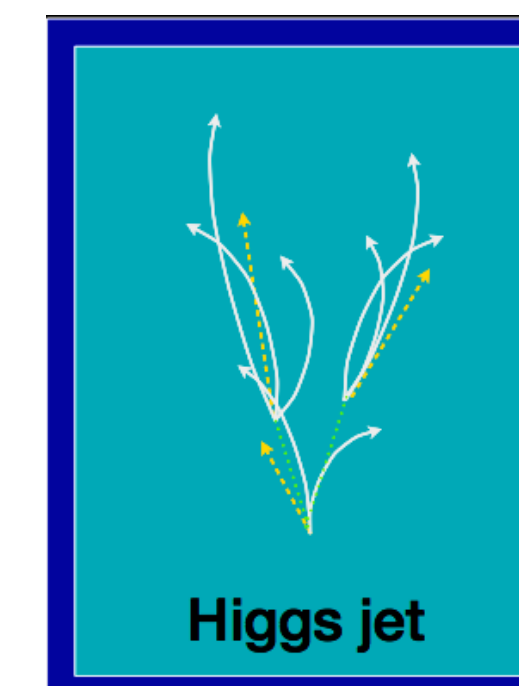
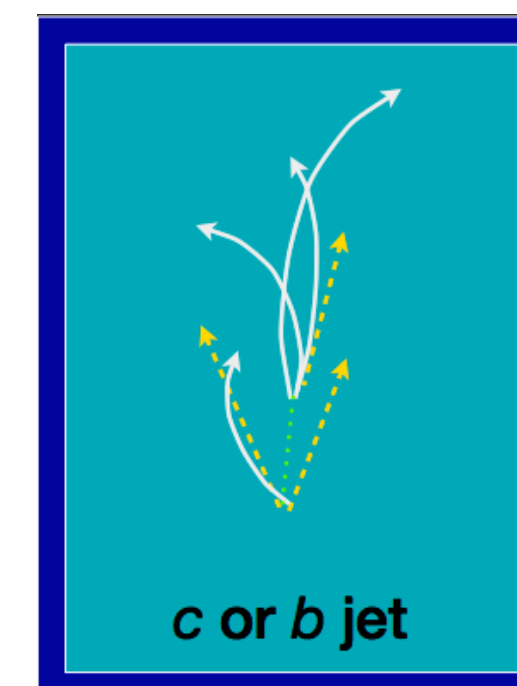
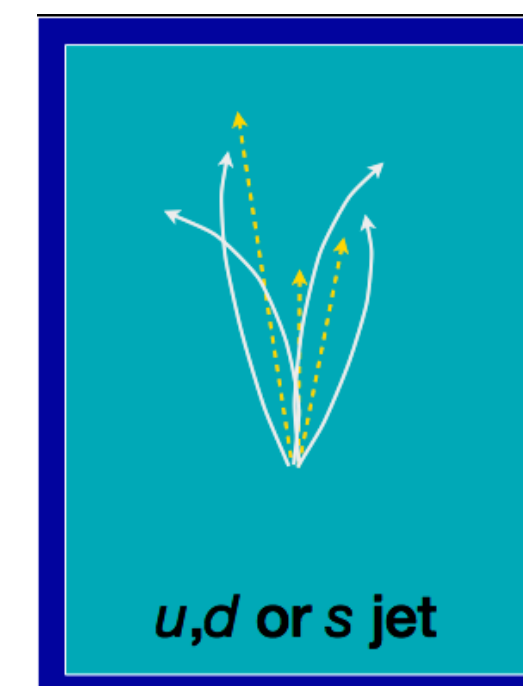




Dataset

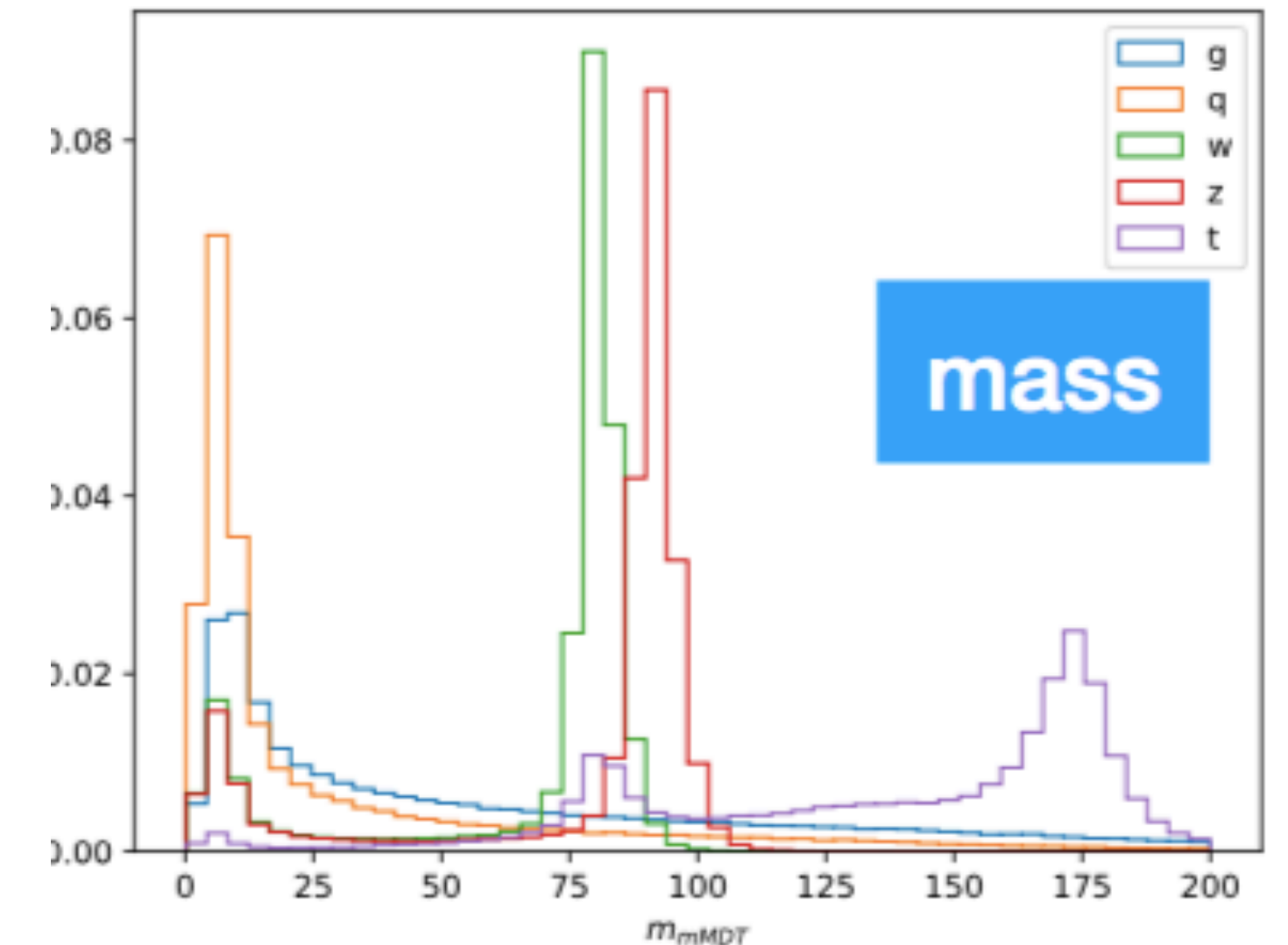
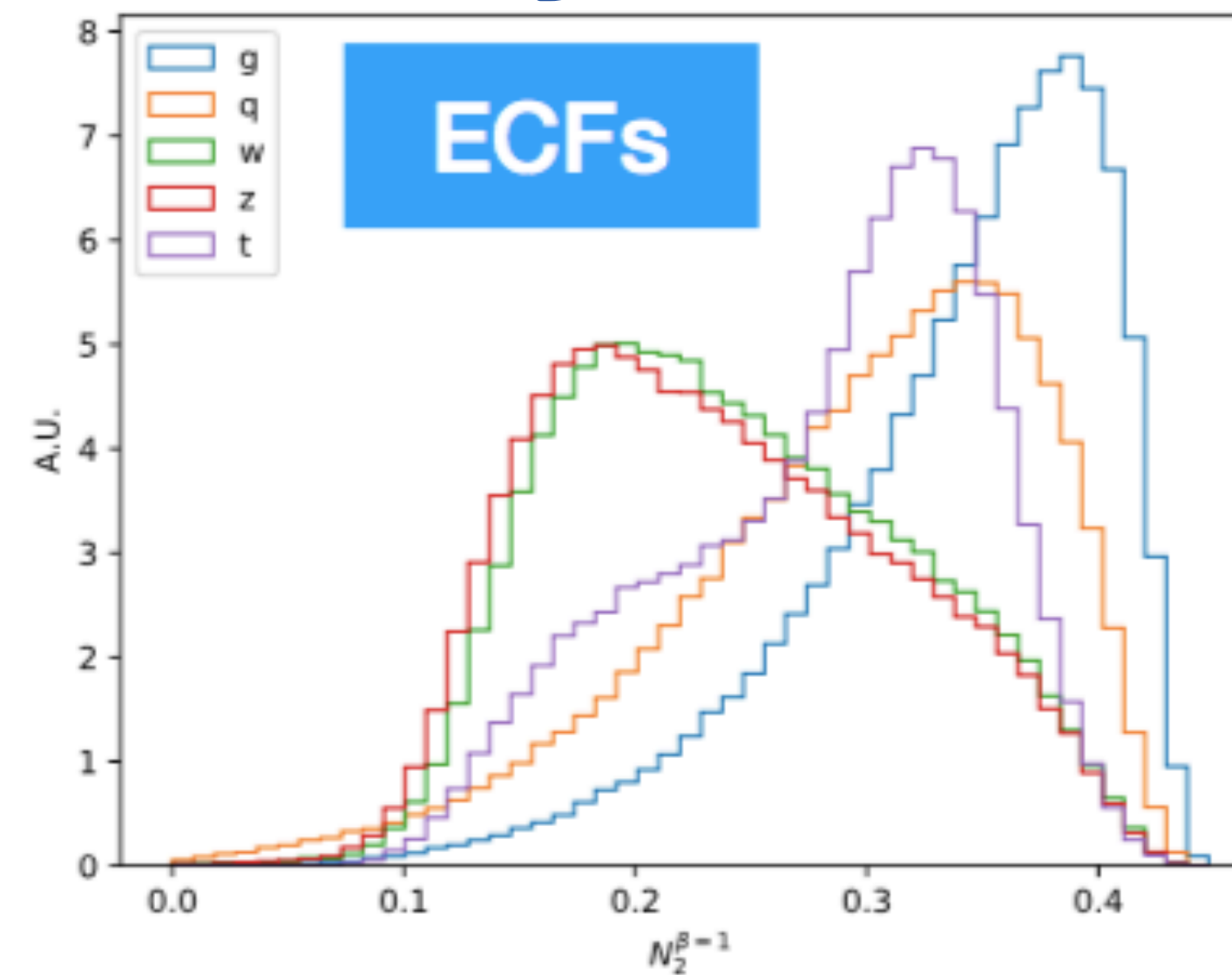
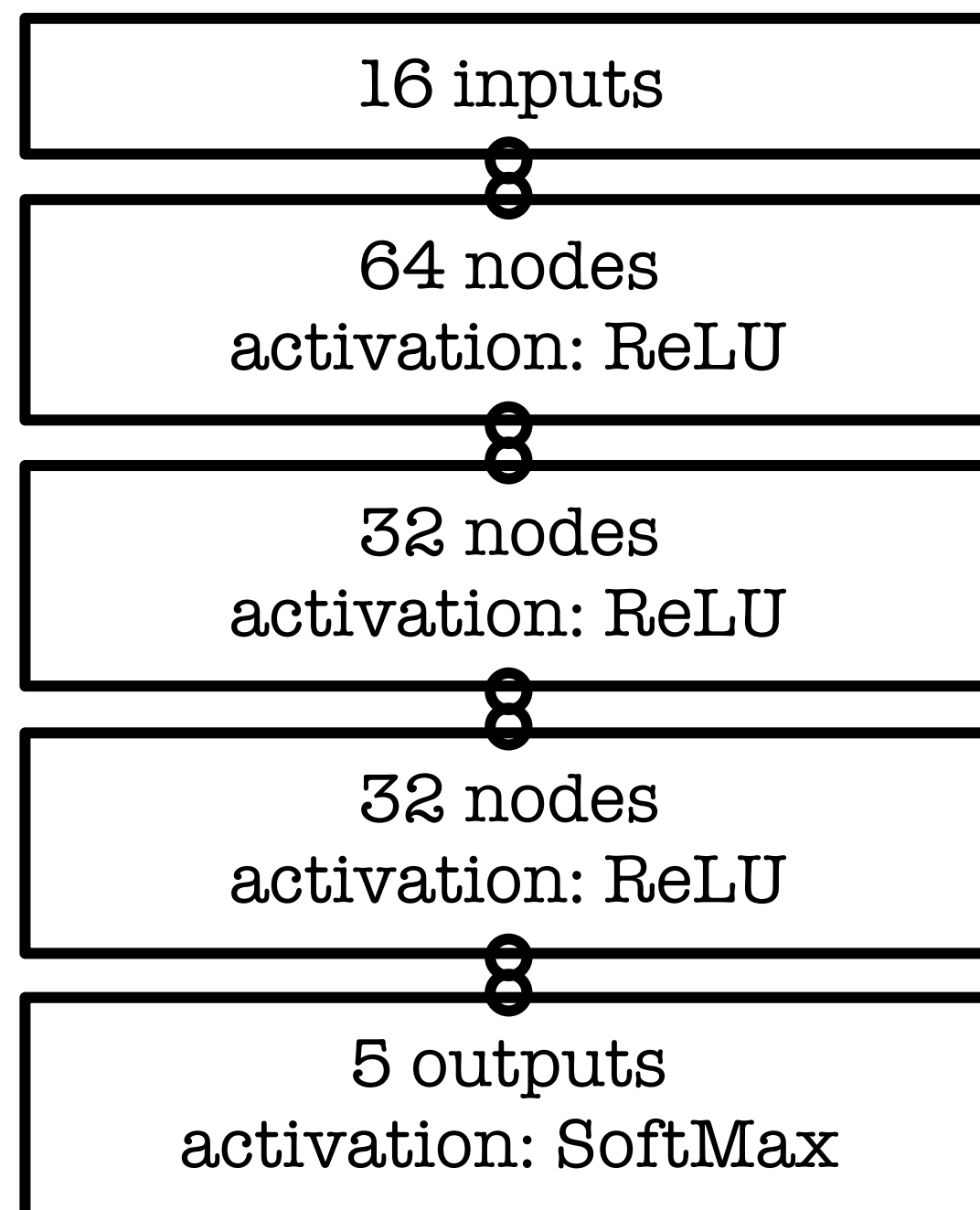
Example: jet tagging

- ◎ You have a jet at LHC: spray of hadrons coming from a “shower” initiated by a fundamental particle of some kind (quark, gluon, $W/Z/H$ bosons, top quark)
- ◎ You have a set of jet features whose distribution depends on the nature of the initial particle
- ◎ You can train a network to start from the values of these quantities and guess the nature of your jet
- ◎ To do this you need a sample for which you know the answer

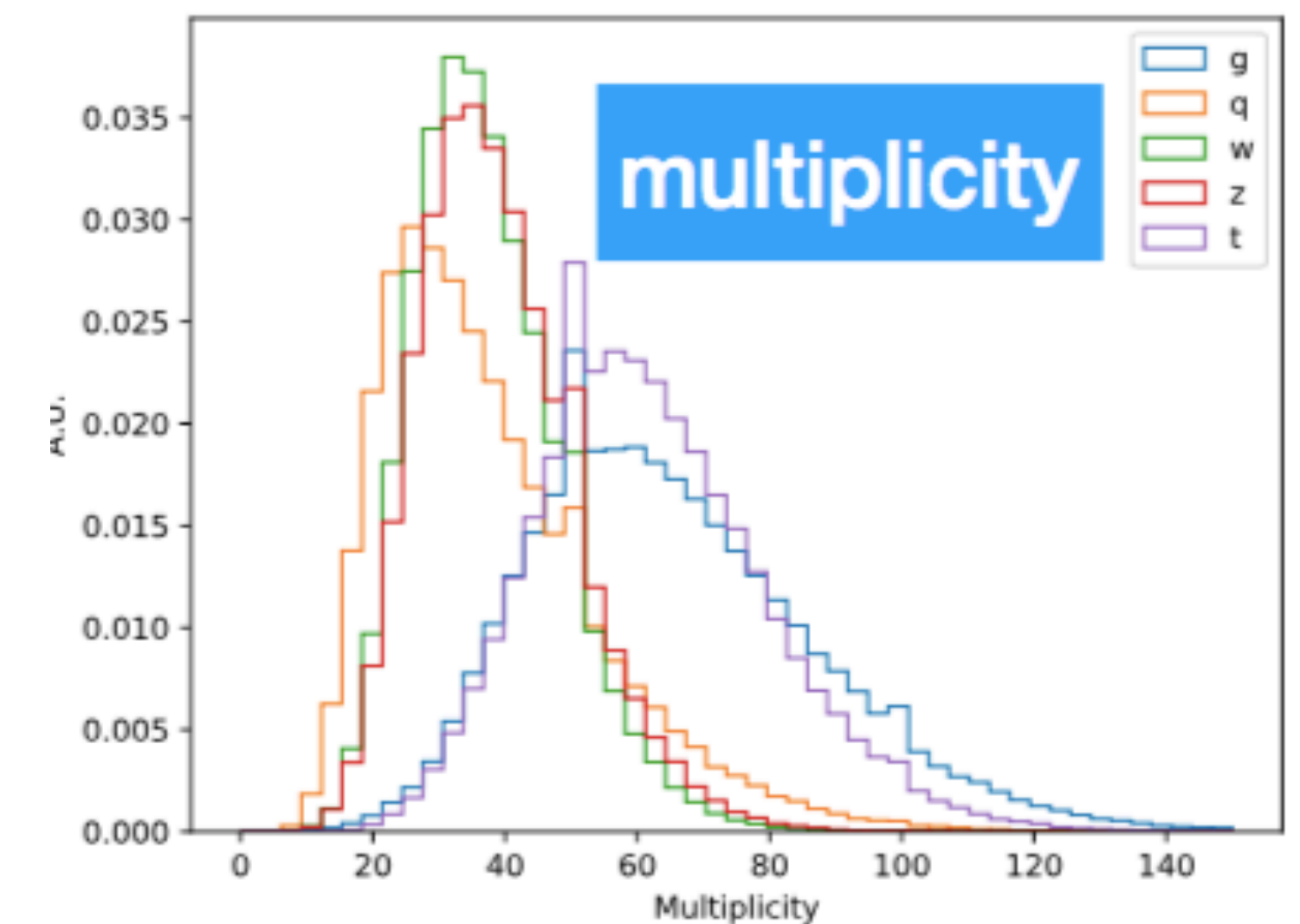


Example: jet tagging

- Simple DNN based on high-level features (jet masses, multiplicities, energy correlation functions)

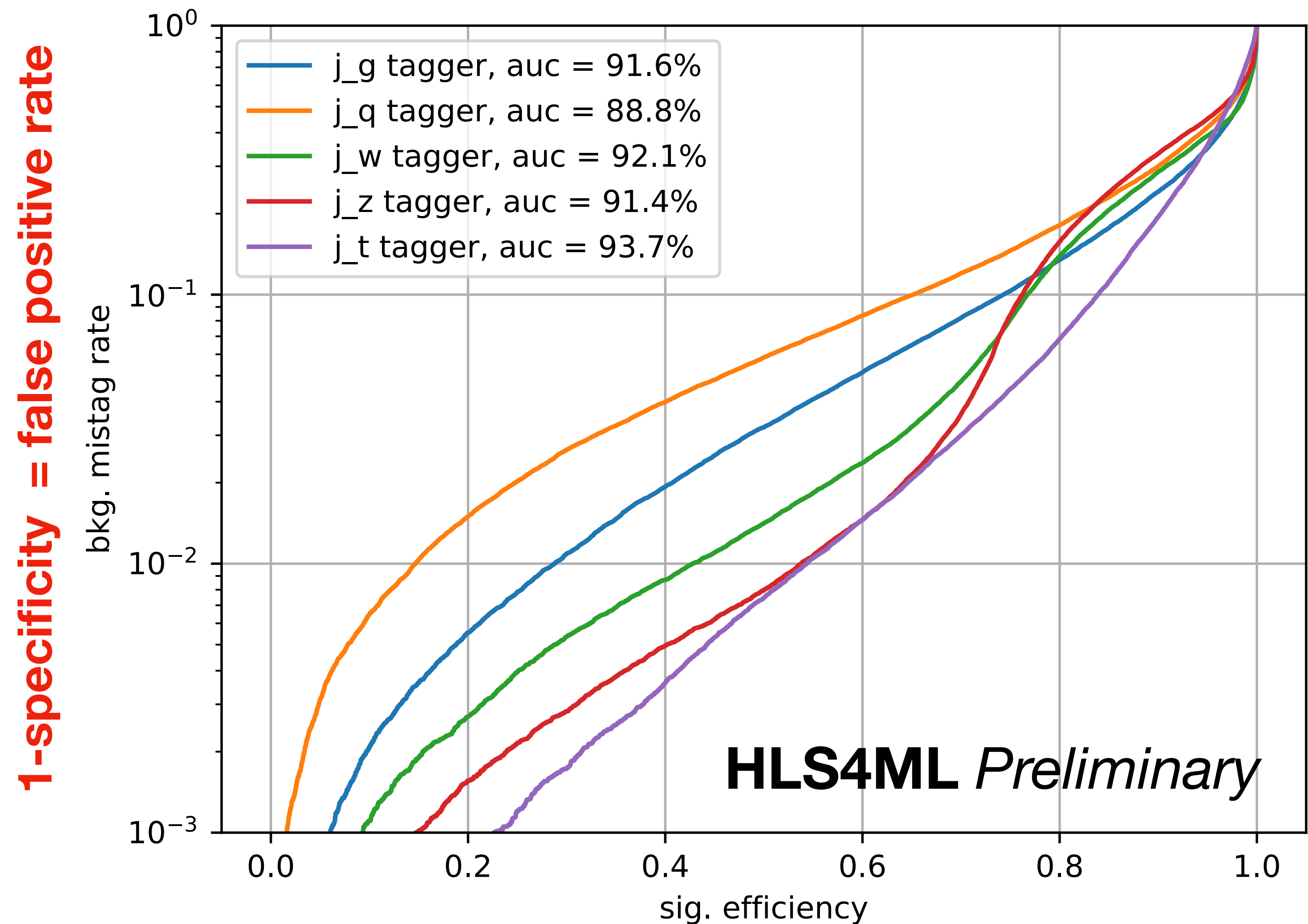
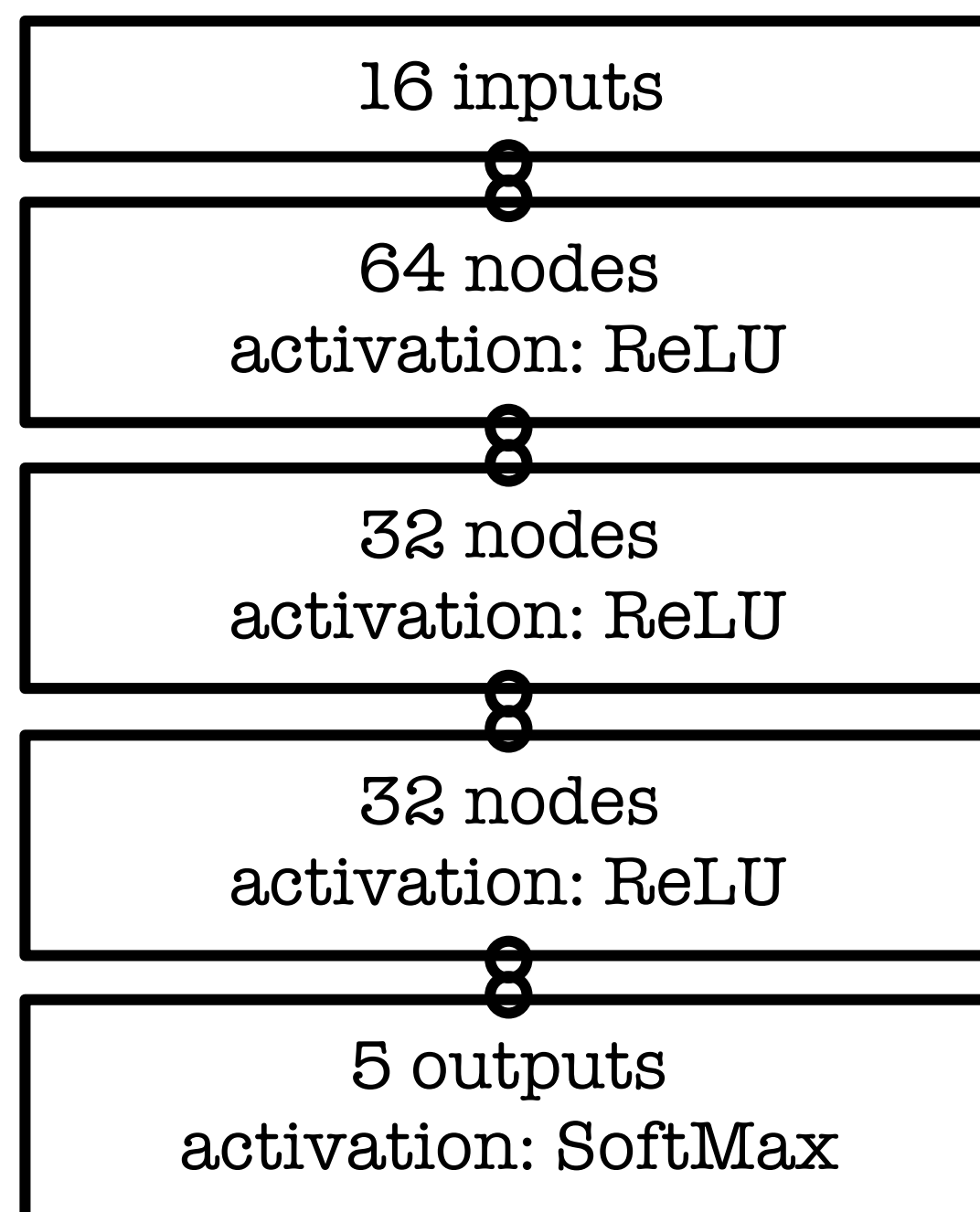


Each input layer transmits a feature to the following hidden layer



Example: jet tagging

- Simple DNN based on high-level features (jet masses, multiplicities, energy correlation functions)



Sensitivity = True Positive Rate



The code

Get the code

- *Download the .tar.gz file at this URL*

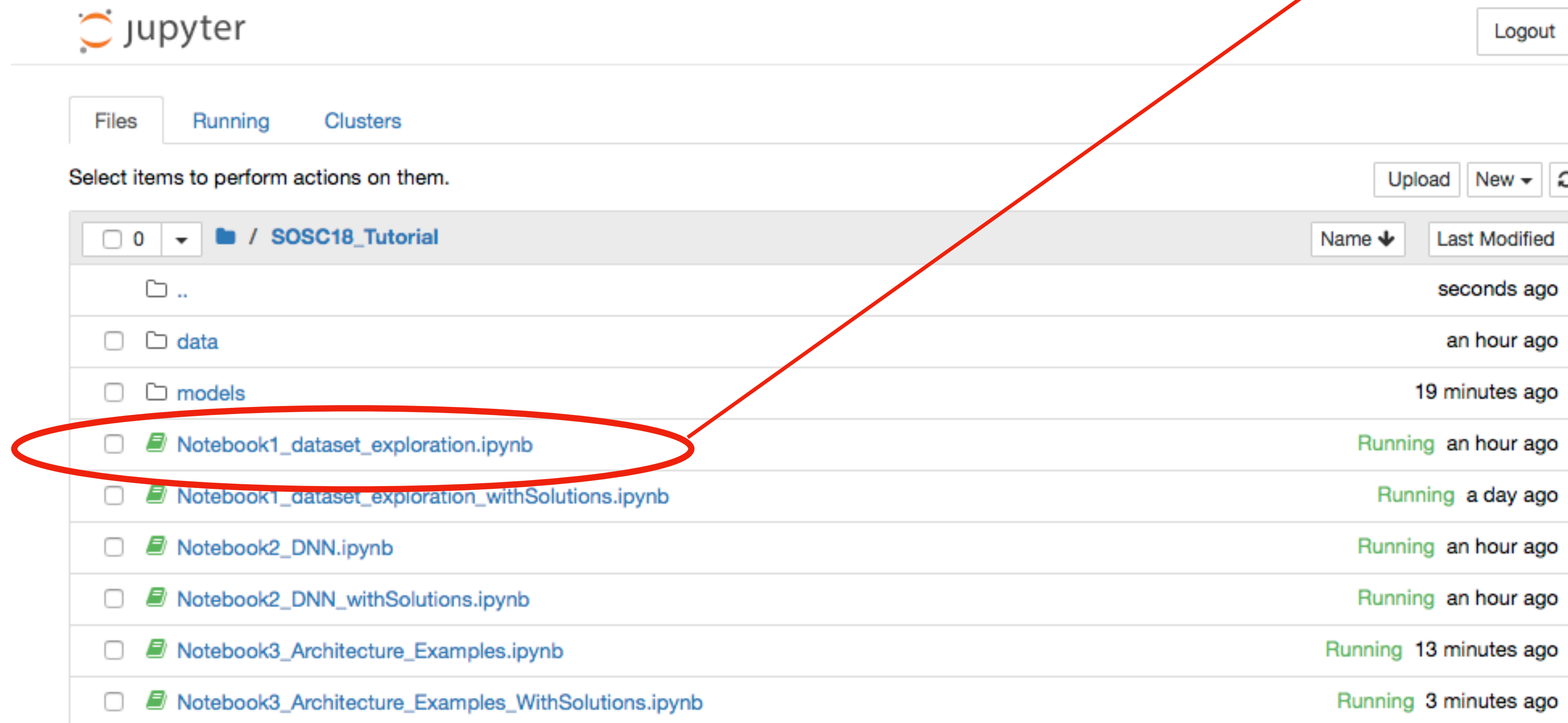
https://www.dropbox.com/s/or43zo8imt5210x/SOSC18_Tutorial.tar.gz?dl=0

and put it somewhere. In that directory, follow the instructions in next slide

Run the Notebook

```
# these are comments to read, not commands to type
> tar -xzf SOSC18_Tutorial.tar.gz
# or tar -xf SOSC18_Tutorial.tar
> cd SOSC18_Tutorial
# start a jupyter notebook
> jupyter-notebook
```

Open this one by clicking on it



The Jupyter interface shows the following notebooks in the / SOSC18_Tutorial directory:

Name	Last Modified
..	seconds ago
data	an hour ago
models	19 minutes ago
Notebook1_dataset_exploration.ipynb	Running an hour ago
Notebook1_dataset_exploration_withSolutions.ipynb	Running a day ago
Notebook2_DNN.ipynb	Running an hour ago
Notebook2_DNN_withSolutions.ipynb	Running an hour ago
Notebook3_Architecture_Examples.ipynb	Running 13 minutes ago
Notebook3_Architecture_Examples_WithSolutions.ipynb	Running 3 minutes ago