Progress Update

Trevor Towstego
UofT Neutrino/DM Meeting
July 26, 2017

Current Status of Aluminum Sourcing

Company	Aluminum Type	MOQ	Price/Piece (USD)	Mould Price (USD)	Add. Fees (USD)	Min Price (USD)	OD Tolerance	WT Tolerance	Shipping notes
Modern International Trade Co.	6061	10	410			4100	+2.40/-0.80 mm	+/- 10%	FOB Tianjin
Foshan Kaiya Aluminum Co.	6063-T5	1	114.56	2132	517.29[1]	2763.85	+/- 2 mm		CIF Toronto
Ningbo City Beilun Fayi Metal Product Co.	6061	10	471.4			4714	+/- 2 mm		CIF Toronto[2]

1. Additional courier fee for small order, refunded when placing full order. For initial order, 45 day production time because of new mould. For full order, 15 day production time

2. Shipping was changed from FOB Shanhai to CIF Toronto: added 239.90 USD per piece. For 10 pieces, 20 day production time. For full order, 50 day production time

ν_e CC1π^+ Status

$$\nu_e + p/n \rightarrow e^- + \pi^+ + p/n$$

- Moved fully to T2K MC – no longer using atm MC
- Discrepancies between my 1Re/1Re1de selections and those in TN319 due to lack of BANFF tuning in my selection
  - Confirmed by Xiaoyue, who was kind enough to re-run her code without BANFF tuning
  - BANFF tuning not used in Mark Hartz's T2HKK studies, so I'll just try to implement it for T2K
- Just now beginning to re-examine cut optimization for the 2Reπ and 2Reπ1de selections
  - Evis and wall
  - Distance between sub-events for 2Reπ1de selection
  - π^0 rejection?
  - μ rejection?

MLHEP2017

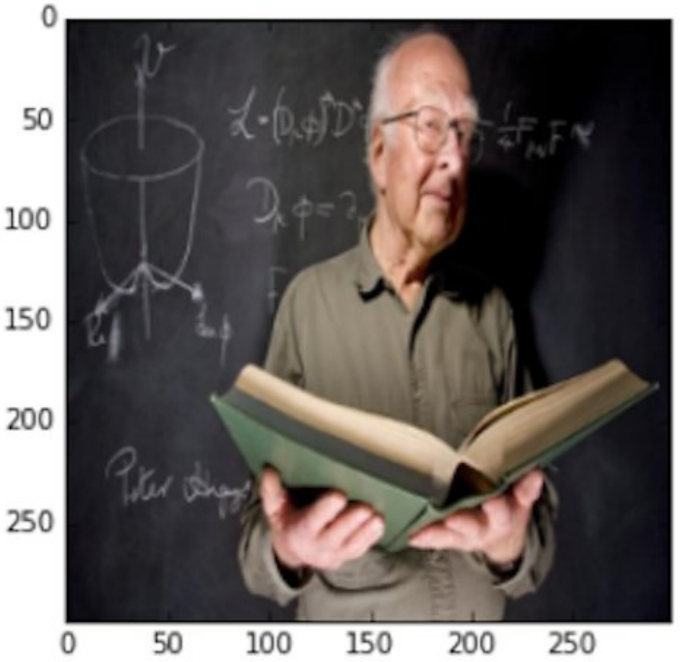
- Learned about machine learning and some of its possible applications to HEP
- If interested, slides and some python notebooks can be found here:
  - https://github.com/yandexdataschool/mlhep2017
- Topics covered: ML theory, overfitting, figures of merit, regularization, decision trees (bagging, RandomForest, boosting), neural networks (CNNs, RNNs), unsupervised learning, generative models

Some thoughts

- Use Keras rather than directly using TensorFlow?
- In general, CNNs seem to be best at image classification
- Theo's code currently pre-processes rings to get them to be uniform
  - Have any studies been done on how CNNs handle raw event display data?
  - CNNs excel at extracting features, but currently the images have very few features for the CNN to extract
    - Perhaps look at using deeper CNNs on raw event display data?
    - Risk of overtraining – many methods available to combat this
- Looking forward to jumping into studying multi-ring events

Some ML Fun

- Play around with a neural network:
  - http://playground.tensorflow.org



Peter Higgs is 36% cucumber

```
top-10 classes are:
0.3624  cucumber
0.1434  ear
0.0900  zucchini
0.0711  corn
0.0242  tench
0.0128  toilet seat
0.0107  book jacket
0.0103  barracouta
0.0099  artichoke
```