Updates on Classification of Particles' Pixel Clusters

ATLAS students meeting

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Part I: Processing

- New Data
- Basic Codes

New Data

- Credit to Ben!
- Generated by GEANT4
- Horizontal, No magnetic field, Infinite Plane
- A root tree containing information of each hit pixel, ToT, No Delta Ray info yet
- High pT: pi+/-, e+/-, mu+/-
- Low pT: pi+, e+

posX	posY	energyTot	TOT
286	2008	0.0381529	5
287	2008	0.0381529	26
288	2008	0.0381529	18
289	2008	0.0381529	14
290	2008	0.0381529	9
291	2008	0.0381529	16
292	2008	0.0381529	14
293	2008	0.0381529	29
294	2008	0.0381529	14
295	2008	0.0381529	18
296	2008	0.0381529	14
297	2008	0.0381529	13
298	2008	0.0381529	50
299	2008	0.0381529	14
300	2008	0.0381529	11
301	2008	0.0381529	12
302	2008	0.0381529	11
303	2008	0.0381529	14
304	2008	0.0381529	29
305	2008	0.0381529	14
306	2008	0.0381529	15
307	2008	0.0381529	25
308	2008	0.0381529	11
309	2008	0.0381529	12
310	2008	0.0381529	23

Basic Codes

- Center, truncate to 101*25
- Linear kernel, Penalty
- Events # n, 71% valid, 3 quarters trained

```
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```

Part II: Classification

- High pT
- ToT & Momenta
- Low pT

High pT

- Hit or not, n = 3000

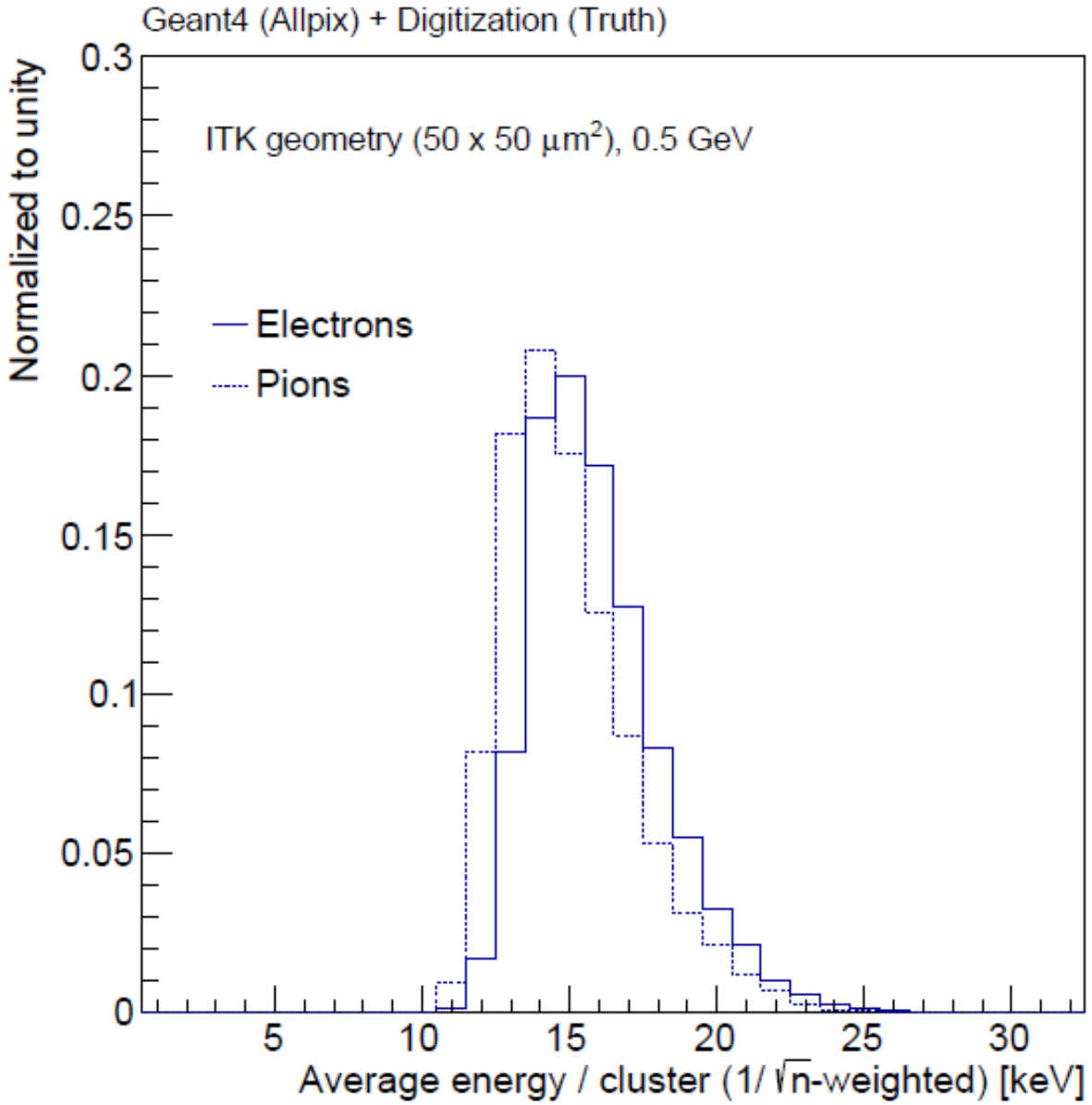
```
el- and el+: 0.495377503852
el- and mu-: 0.507716049383
el- and mu+: 0.510835913313
el- and pi-: 0.492664092664
el- and pi+: 0.512702078522
el+ and mu-: 0.498470948012
el+ and mu+: 0.497699386503
el+ and pi-: 0.501147666412
el+ and pi+: 0.496567505721
mu- and mu+: 0.483870967742
mu- and pi-: 0.498850574713
mu- and pi+: 0.470229007634
mu+ and pi-: 0.511145272867
mu+ and pi+: 0.509954058193
pi- and pi+: 0.483180428135
```

- ToT, n = 2000

```
el- and el+: 0.471064814815
el- and mu-: 0.505800464037
el- and mu+: 0.500579374276
el- and pi-: 0.491898148148
el- and pi+: 0.488452655889
el+ and mu-: 0.521889400922
el+ and mu+: 0.478711162255
el+ and pi-: 0.5
el+ and pi+: 0.491972477064
mu- and mu+: 0.501730103806
mu- and pi-: 0.483870967742
mu- and pi+: 0.493103448276
mu+ and pi-: 0.485615650173
mu+ and pi+: 0.491389207807
pi- and pi+: 0.470183486239
```

Average ToT Distribution of Low-pT Samples

- Credit to Ben



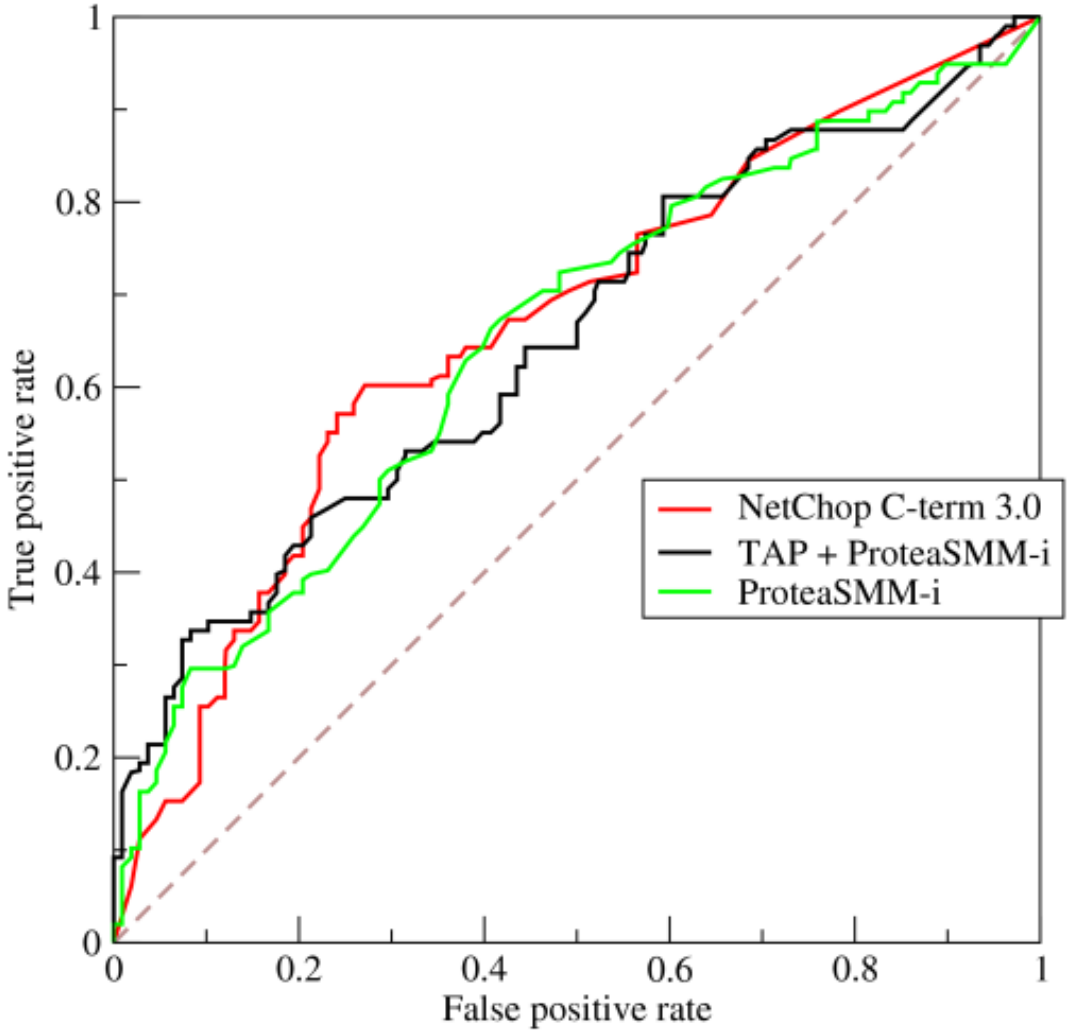
Low pT

- ToT
- Left column: n

```
(1000, 0.55489614243323437)
(1200, 0.55911330049261088)
(1400, 0.56512605042016806)
(1600, 0.51376146788990829)
(1800, 0.59016393442622950)
(2000, 0.57817109144542778)
(2200, 0.58255033557046976)
(2400, 0.56845965770171147)
(2600, 0.56836158192090391)
(2800, 0.56151419558359617)
(3000, 0.54215686274509803)
```

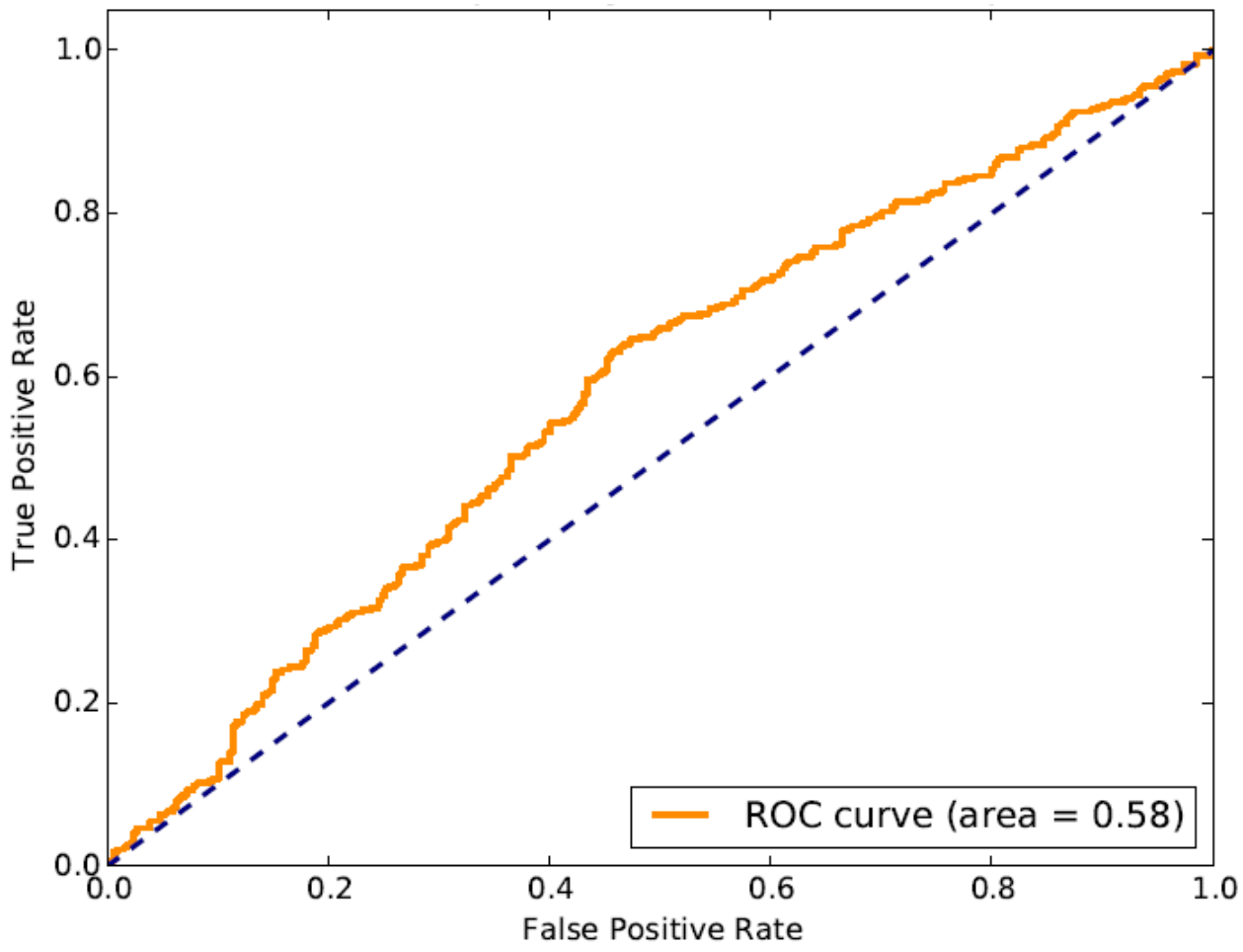
Part III: ROC Curve

- Receiver Operating Characteristic
- TPR = TP/P, FPR = FP/N

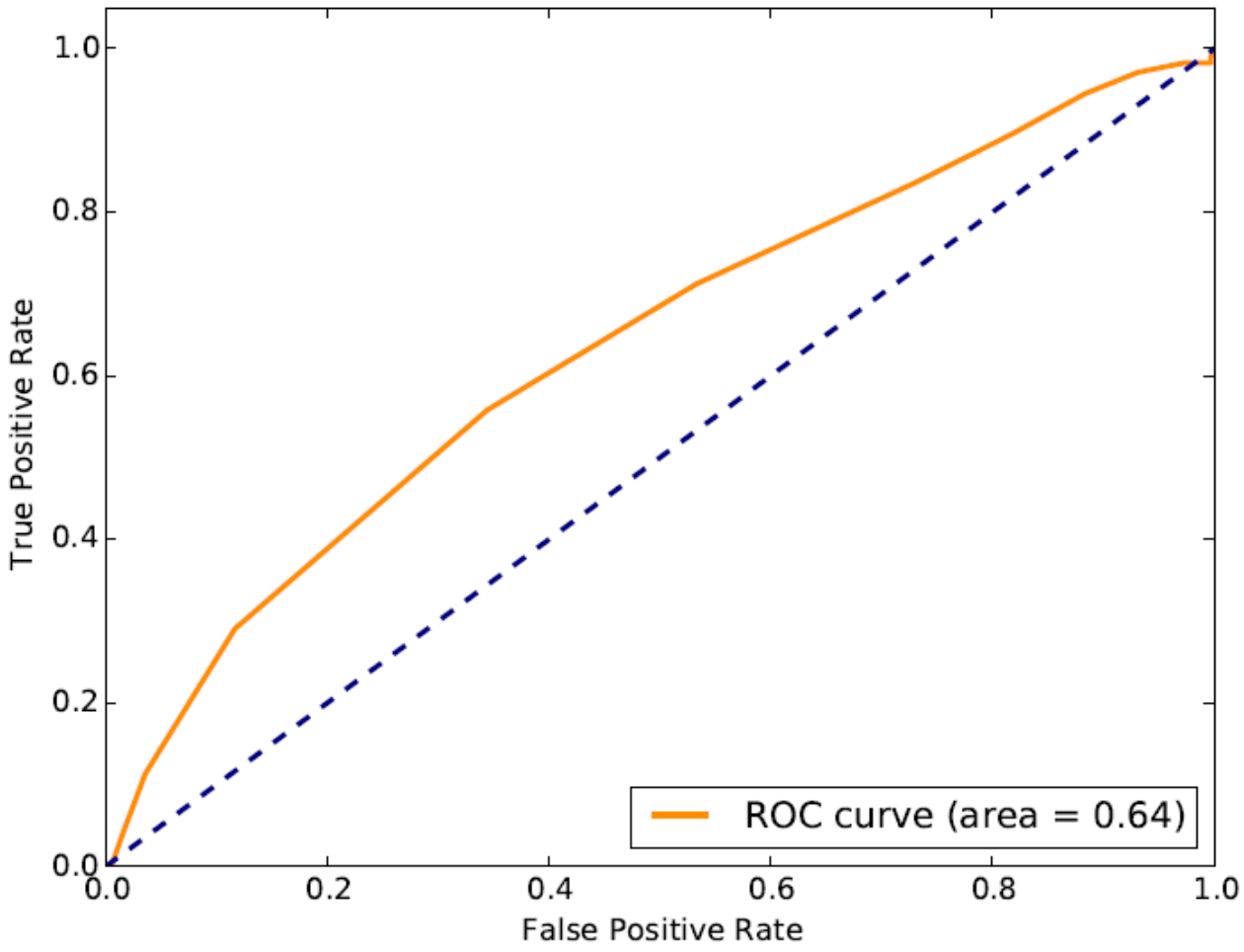


Low pT

- All ToT, n = 2000

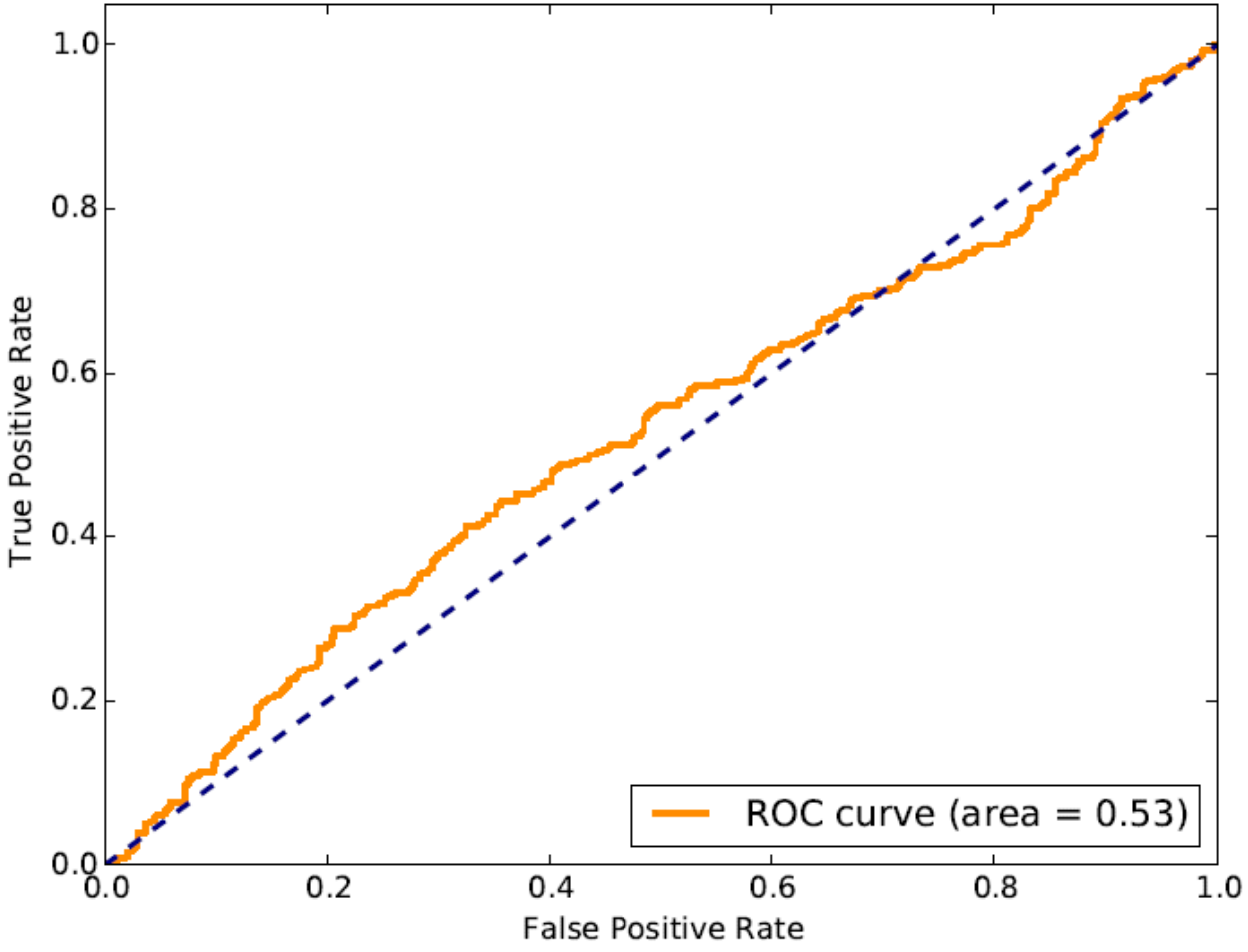


- Average ToT, n = 2000



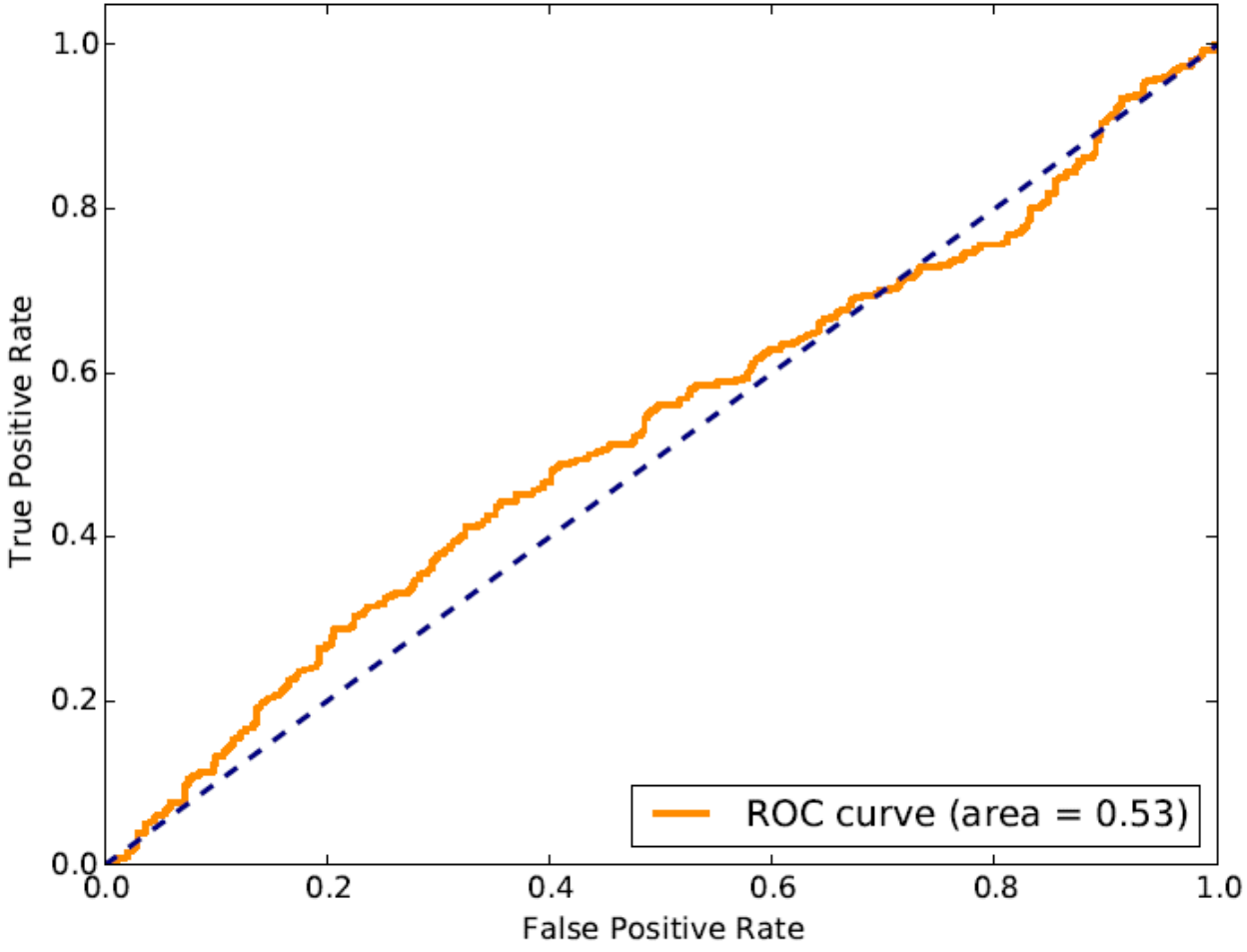
High pT, All ToT

- n = 2000

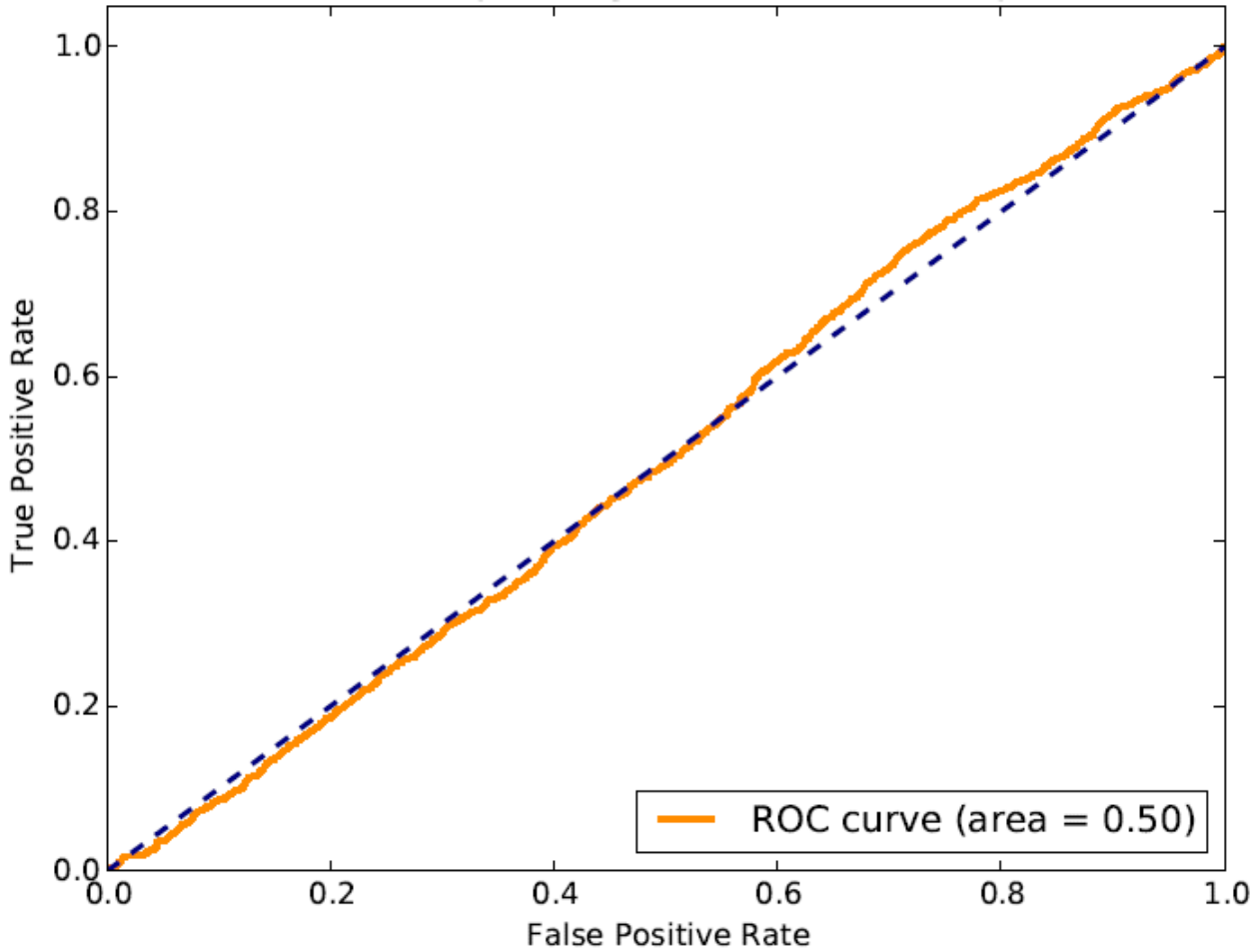


High pT, All ToT

- n = 2000



- n = 7000



Future

- Large sample size……
- Parallel computing……
- Sample with delta rays info……
- Difference between CERN’s and Ben’s Simulation……