Lepton ID Update

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Updates

- 1. Use ee->HX samples provided by Geliang
- 2. Try to use XGBoost to do leptonID
  - Use multiclass to distinguish e, mu, pi, K, p（<1GeV）
  - Check ID performance at 10~15GeV

Scores

```
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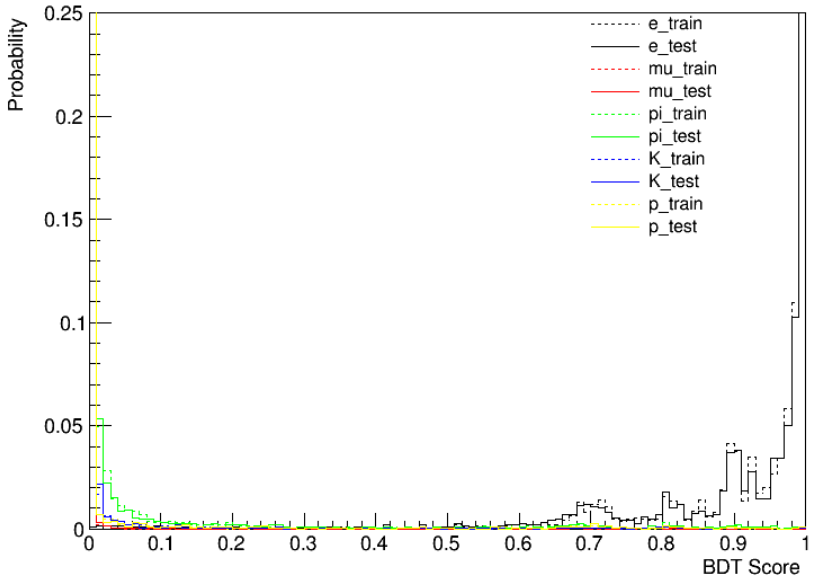
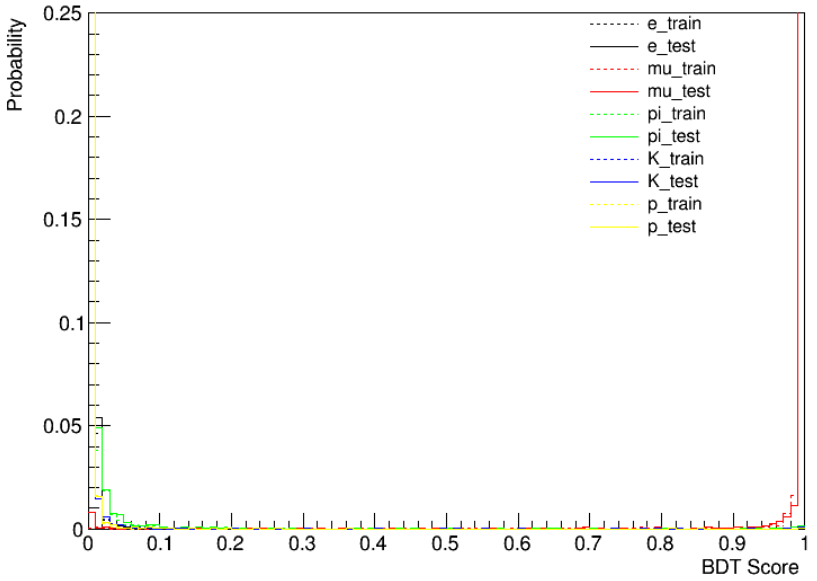
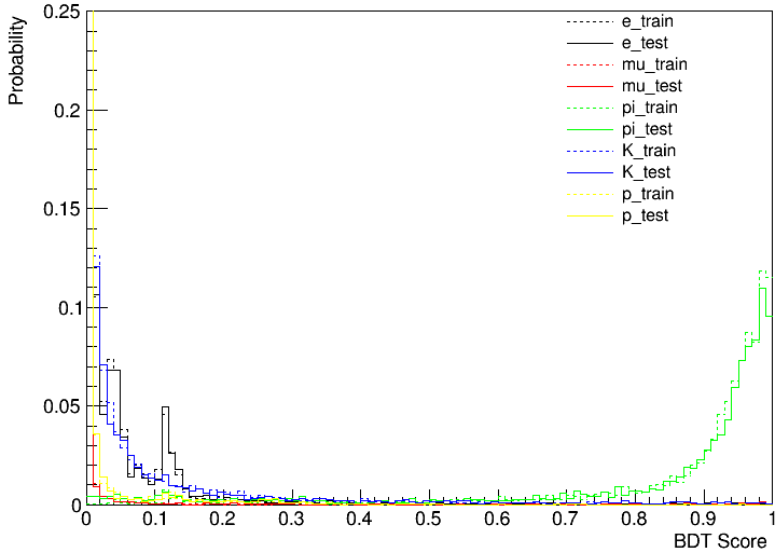
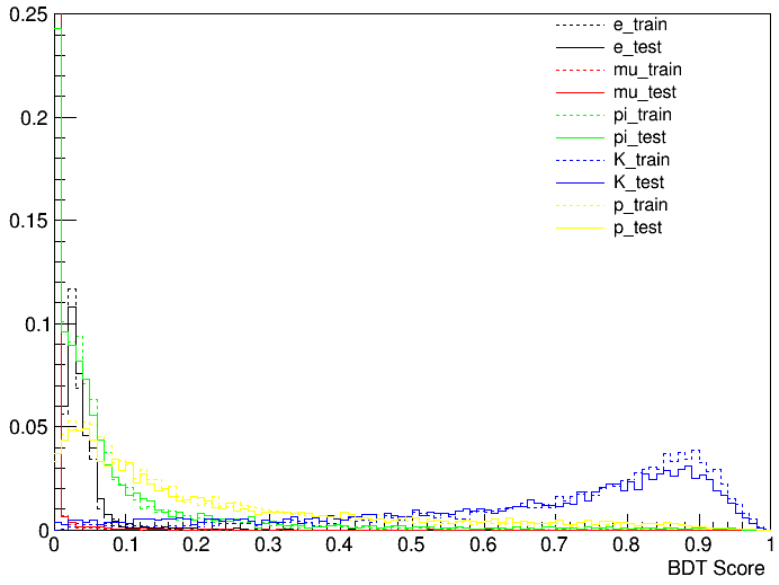
10~15GeV

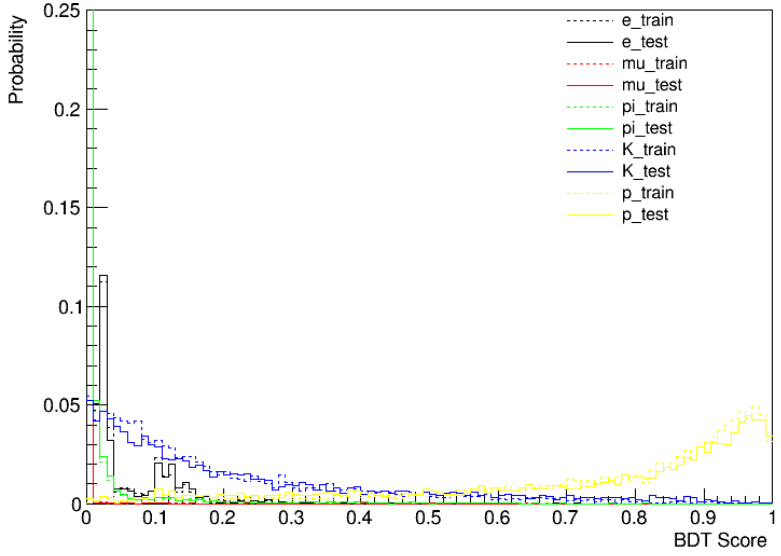
e mu
pi K p



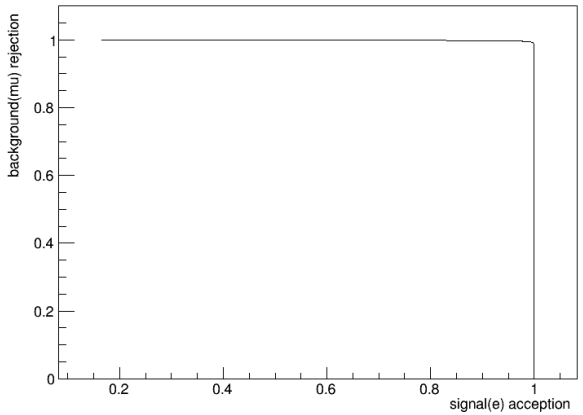


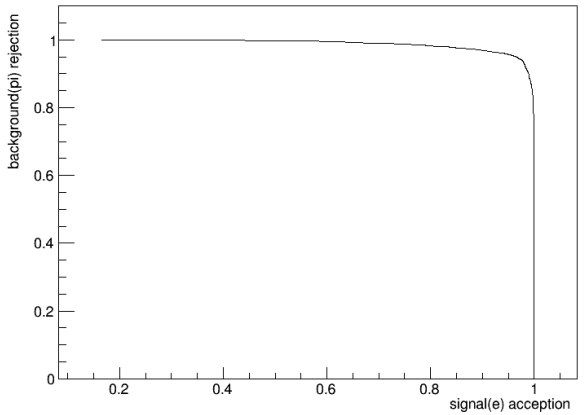


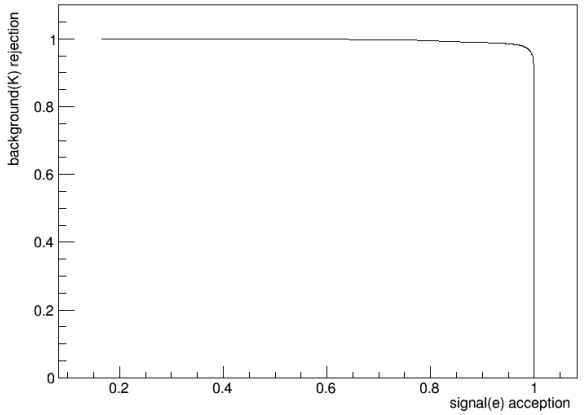


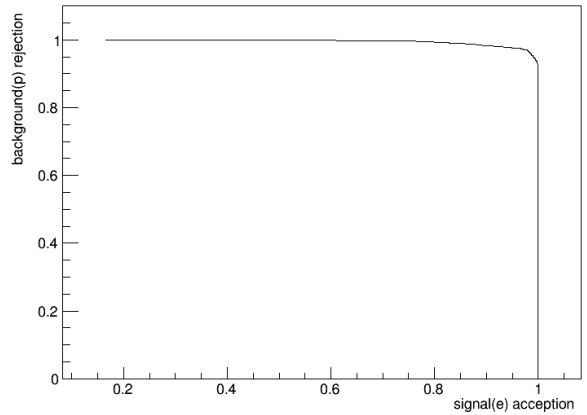


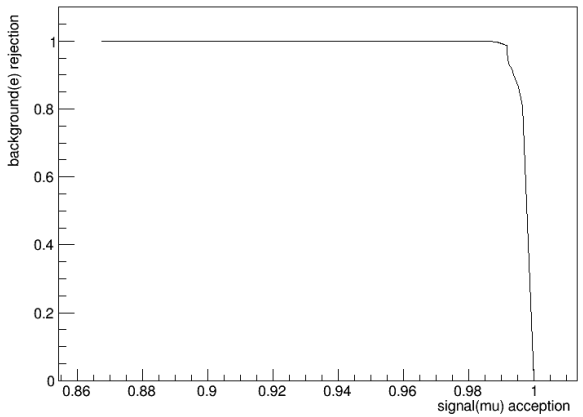
10~15GeV, ROC curve

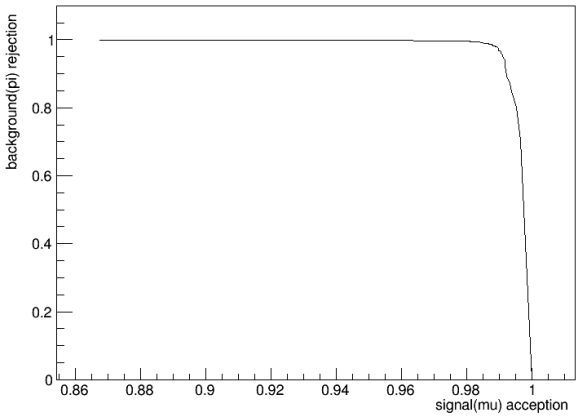


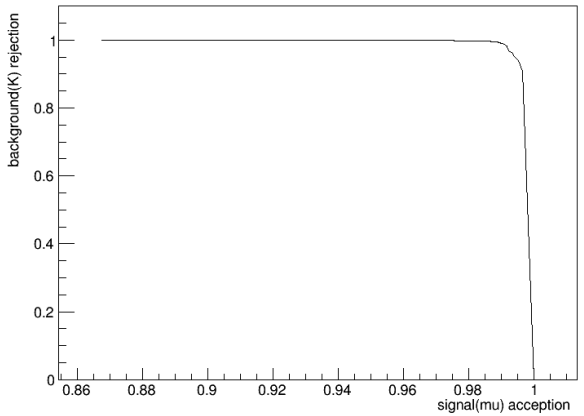


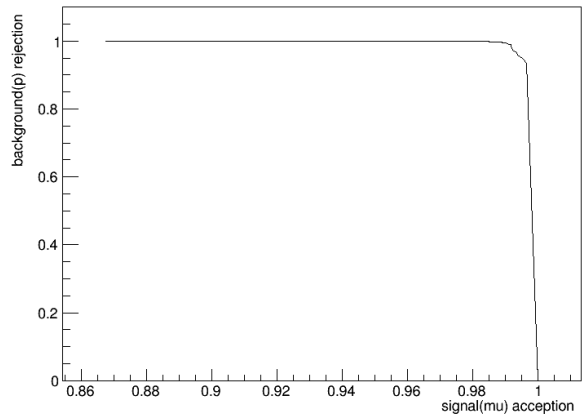


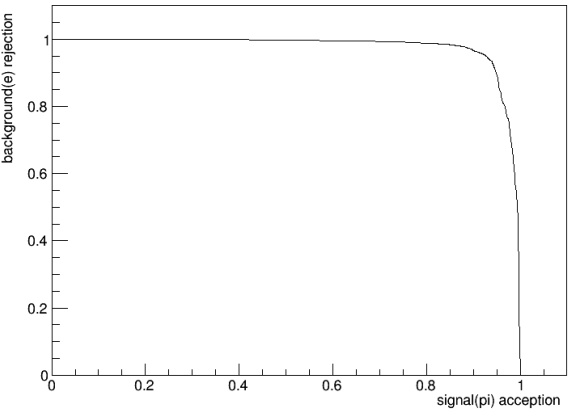


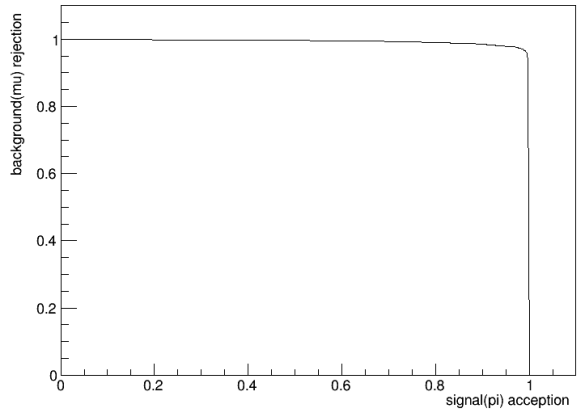


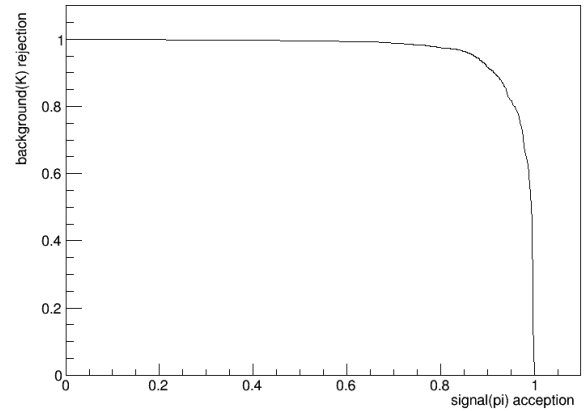


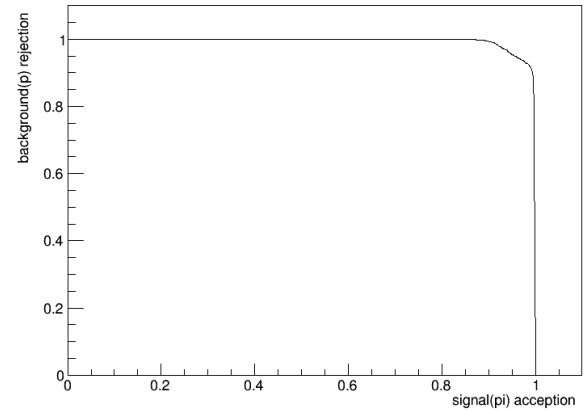


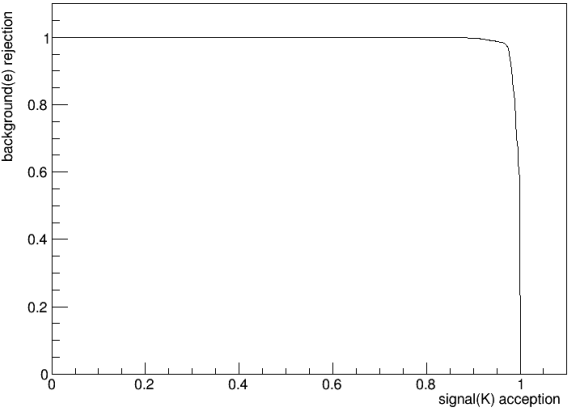


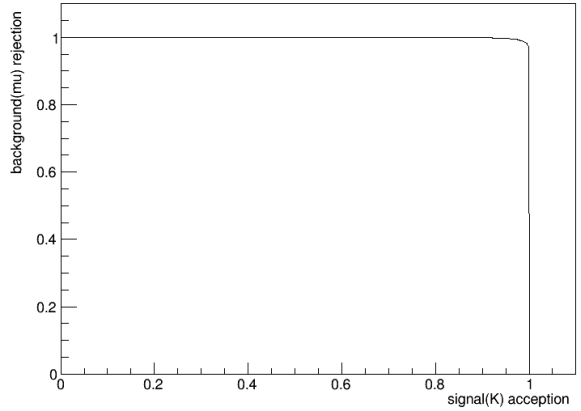

background(e) rejection
signal(pi) acception

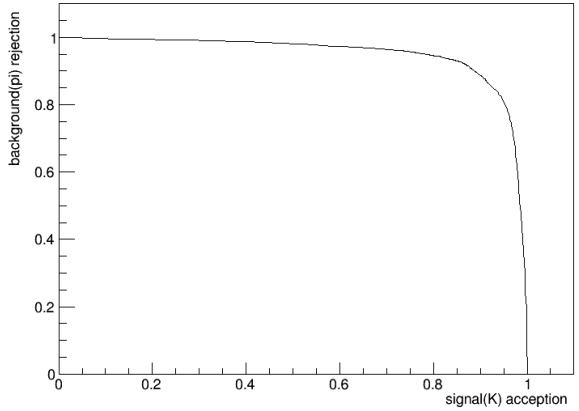

background(mu) rejection
signal(pi) acception

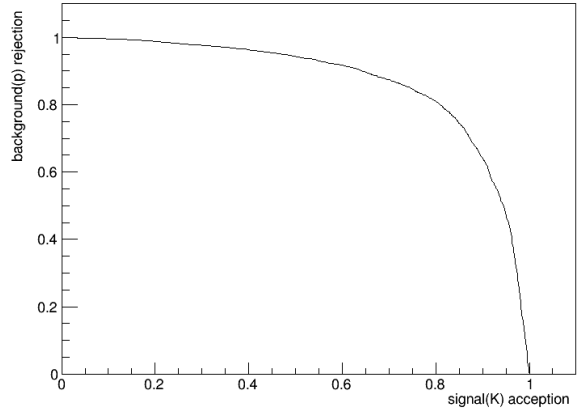

background(K) rejection
signal(pi) acception

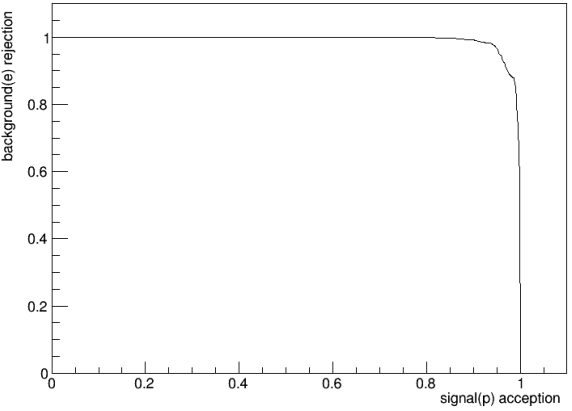

background(p) rejection
signal(pi) acception

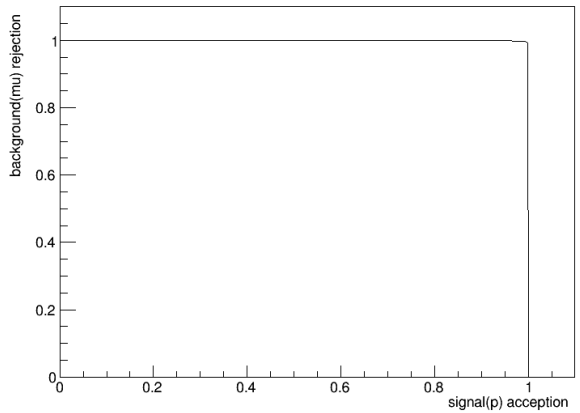

background(e) rejection
signal(K) acception

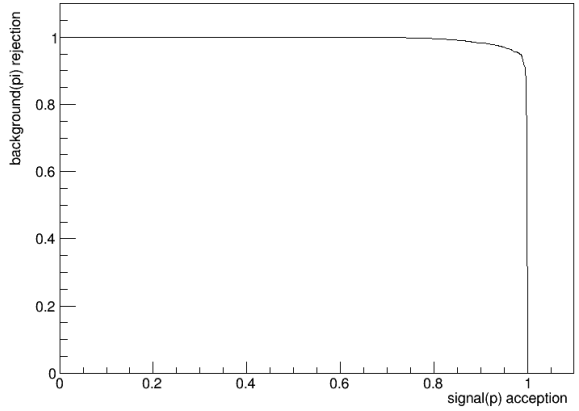

background(mu) rejection
signal(K) acception

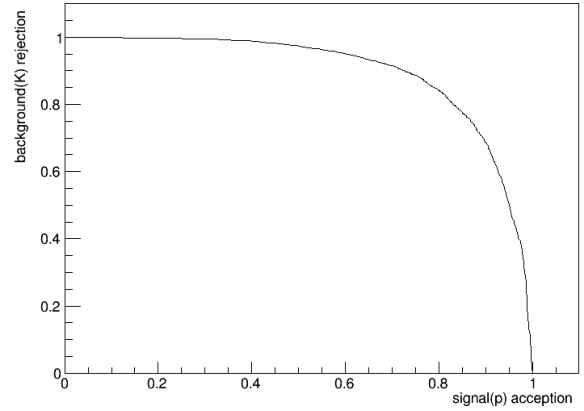

background(pi) rejection
signal(K) acception


background(p) rejection
signal(K) acception


background(e) rejection
signal(p) acception


background(mu) rejection
signal(p) acception

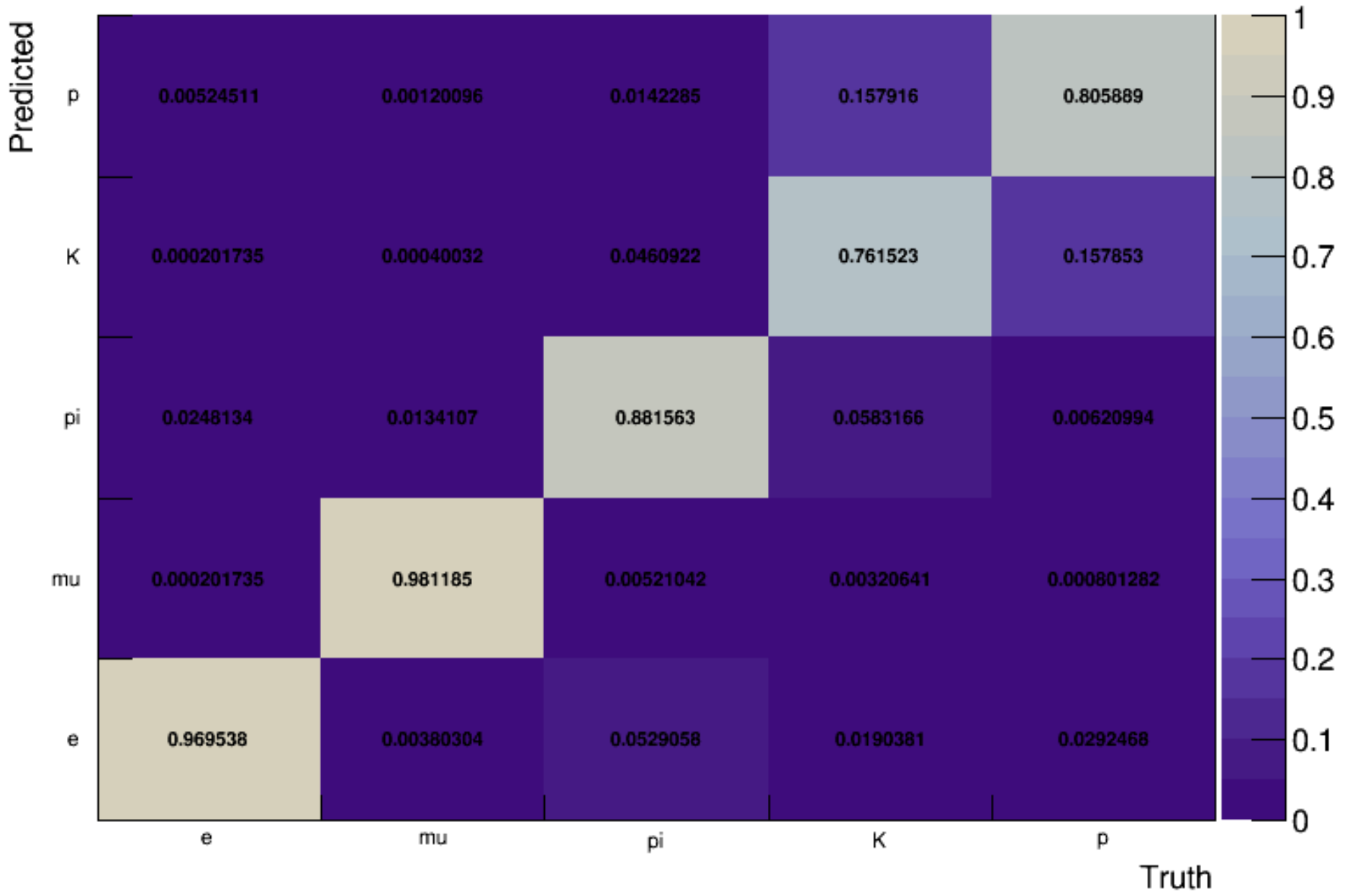

background(pi) rejection
signal(p) acception


background(K) rejection
signal(p) acception

Information in muon detector

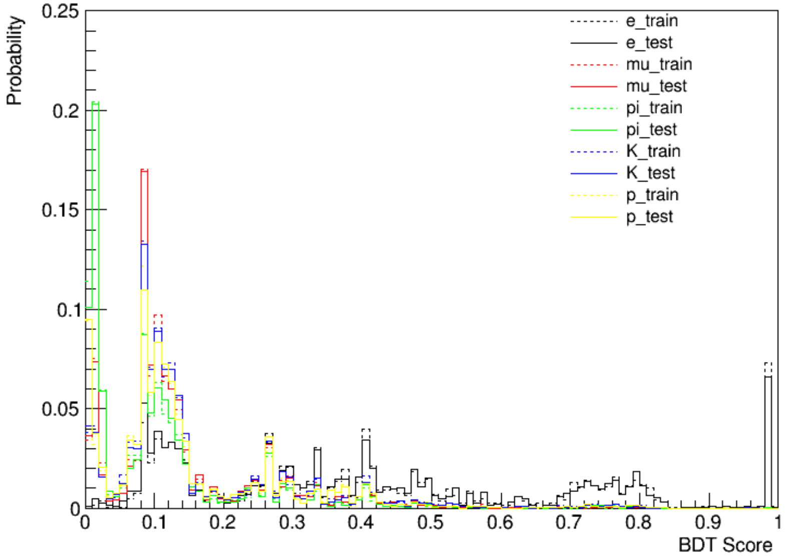
```
number of e in MindR: 14, 1.42%
number of mu in MindR: 984, 98.40%
number of pi in MindR: 62, 6.20%
number of K in MindR: 46, 4.60%
number of p in MindR: 55, 5.51%
number of e in MindR1: 5, 0.51%
number of mu in MindR1: 979, 97.90%
number of pi in MindR1: 28, 2.80%
number of K in MindR1: 16, 1.60%
number of p in MindR1: 23, 2.30%
number of e in MindR2: 1, 0.10%
number of mu in MindR2: 968, 96.80%
number of pi in MindR2: 18, 1.80%
number of K in MindR2: 10, 1.00%
number of p in MindR2: 12, 1.20%
number of e in MindR_last: 13, 1.32%
number of mu in MindR_last: 961, 96.10%
number of pi in MindR_last: 45, 4.50%
number of K in MindR_last: 40, 4.00%
number of p in MindR_last: 45, 4.51%
```

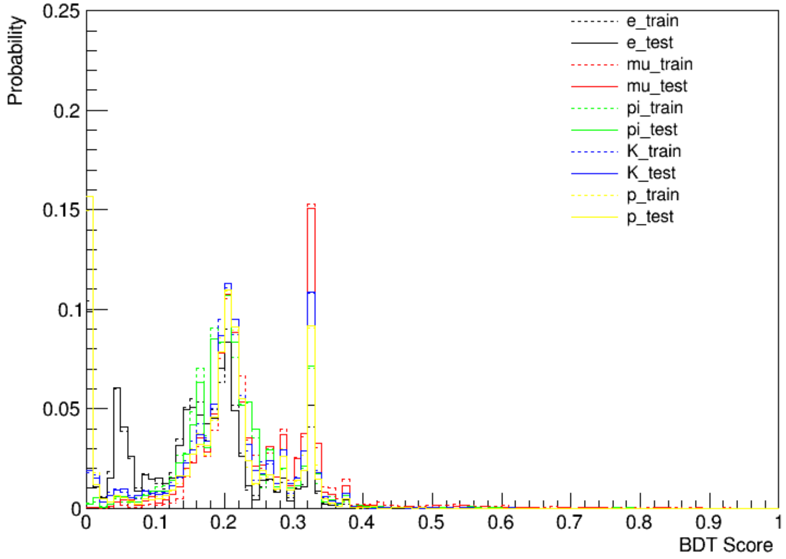
10~15GeV, confusion matrix

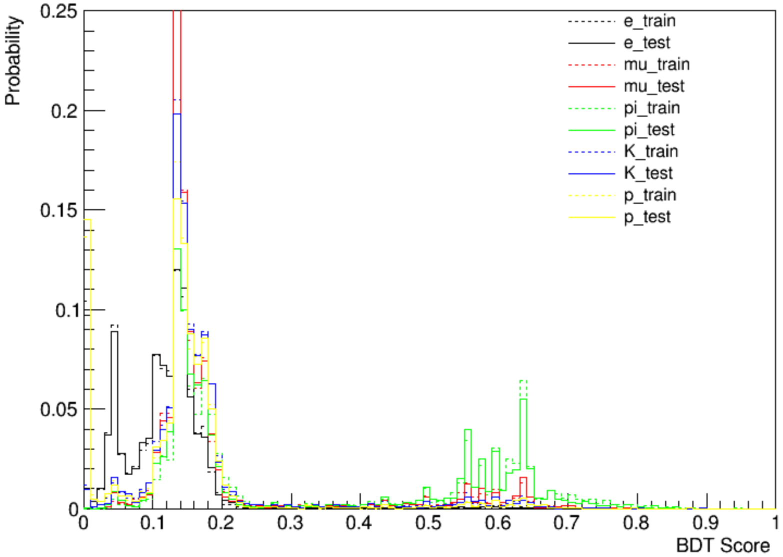


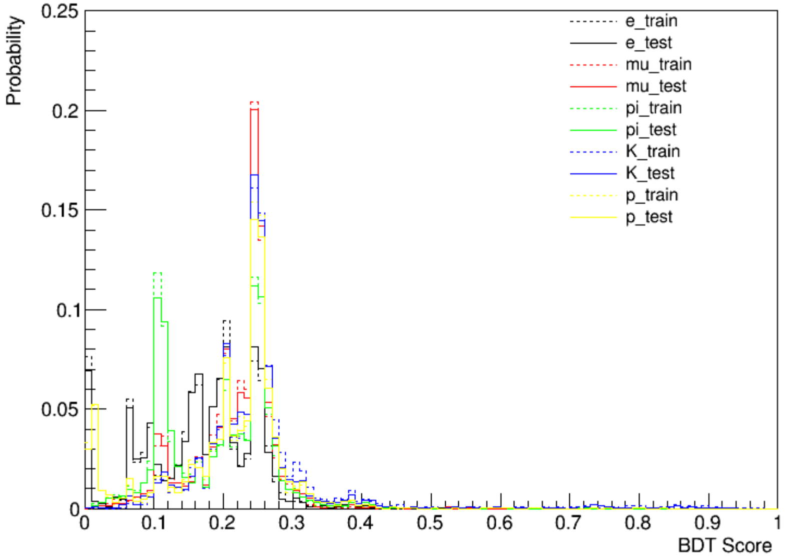
0~1GeV

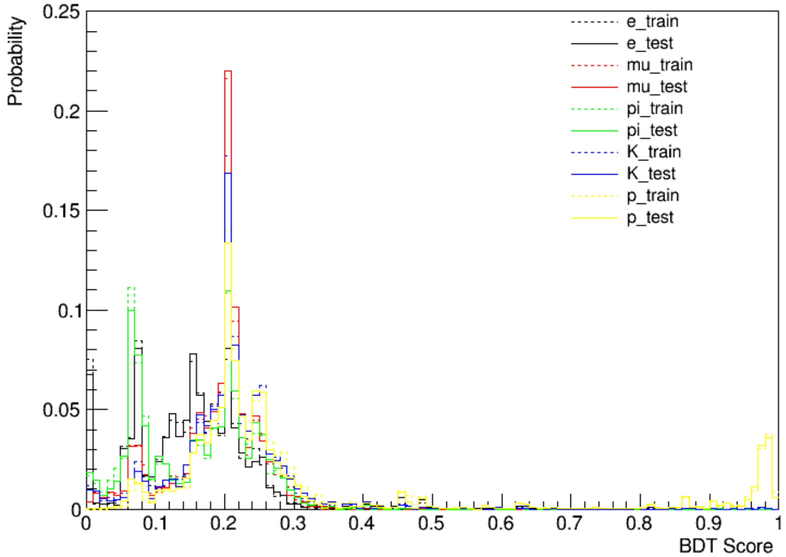
e mu
pi K p



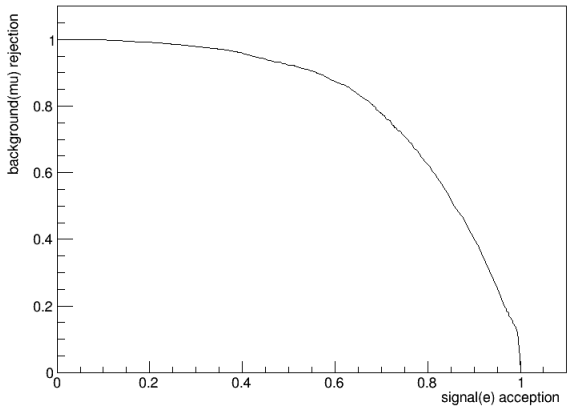


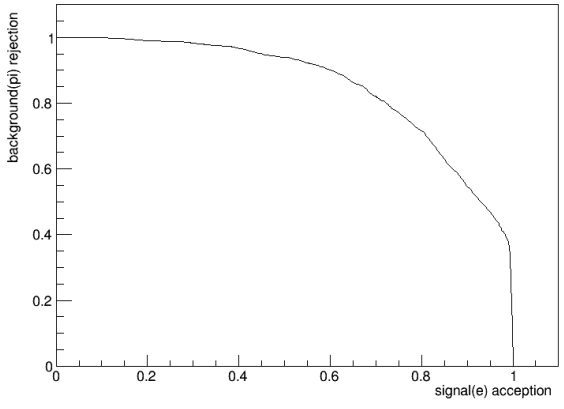


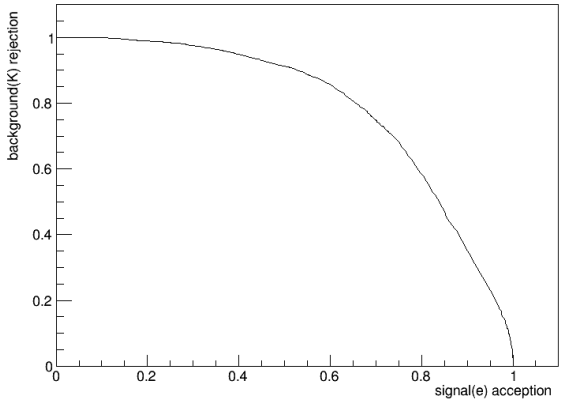


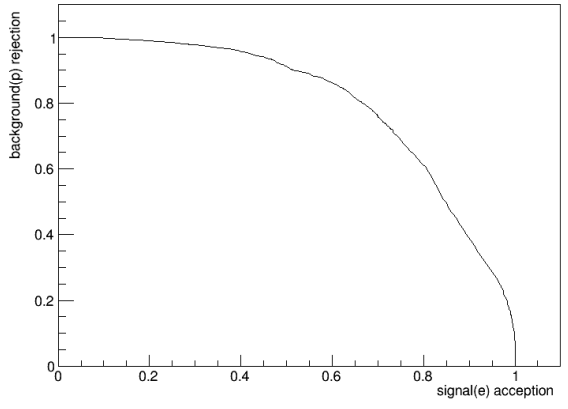


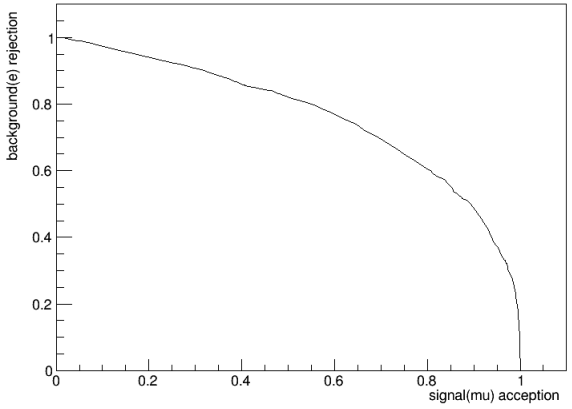
0~1GeV, ROC curve

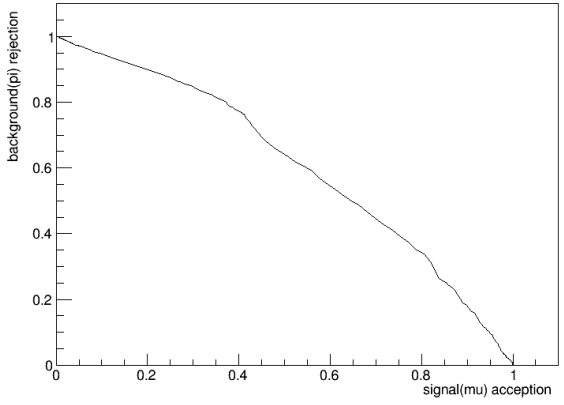


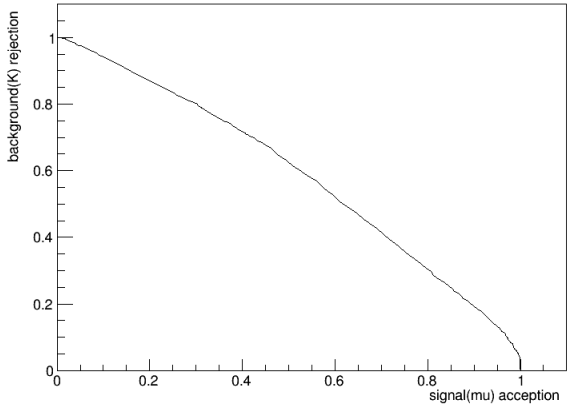


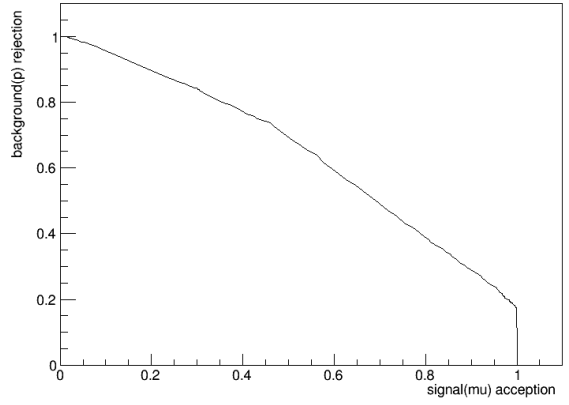


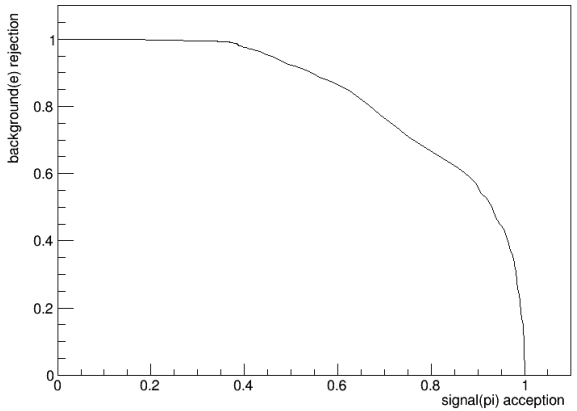


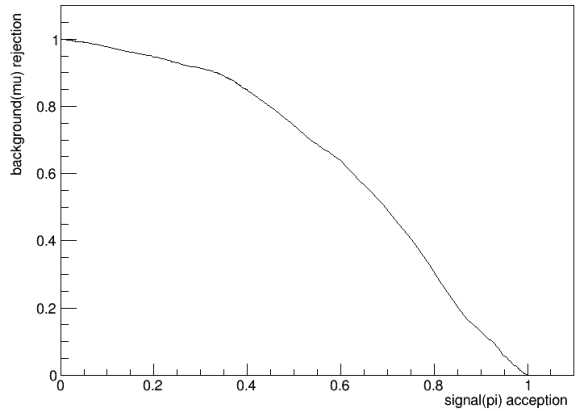


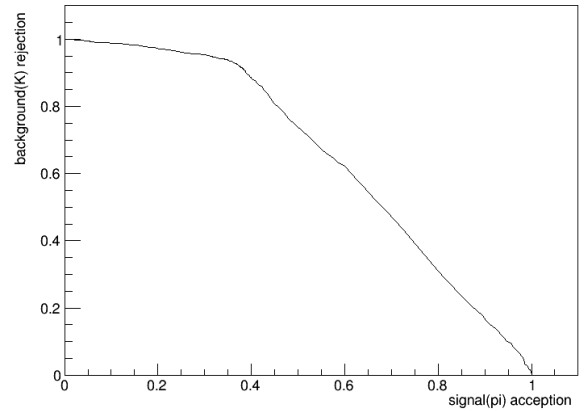


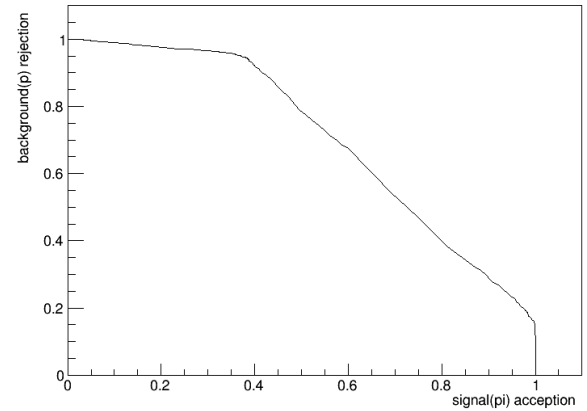


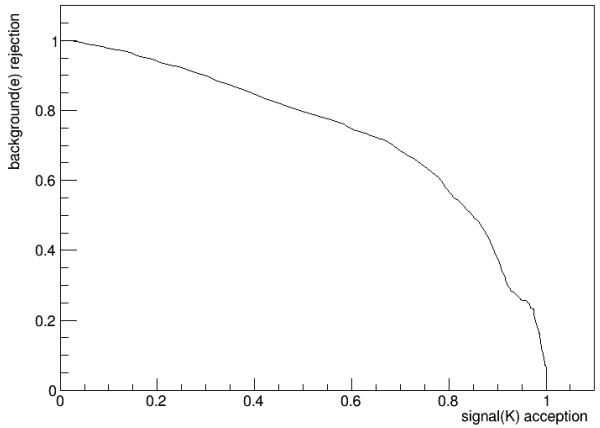


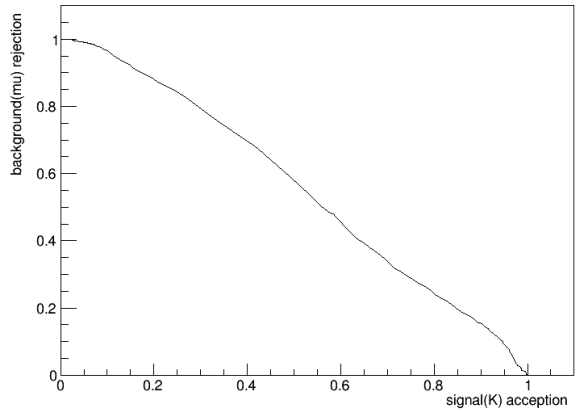

background(e) rejection
signal(pi) acception

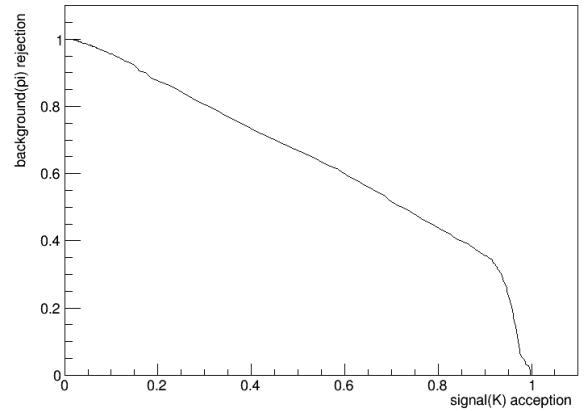

background(mu) rejection
signal(pi) acception

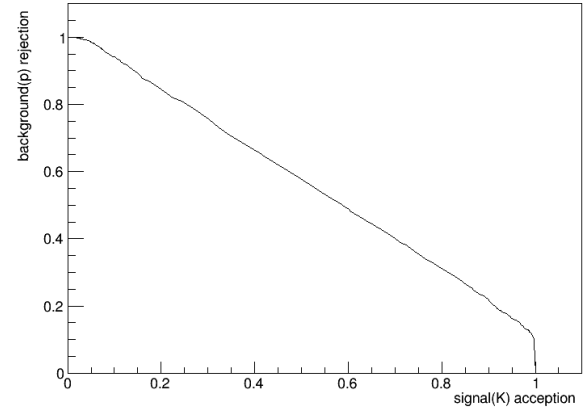

background(K) rejection
signal(pi) acception

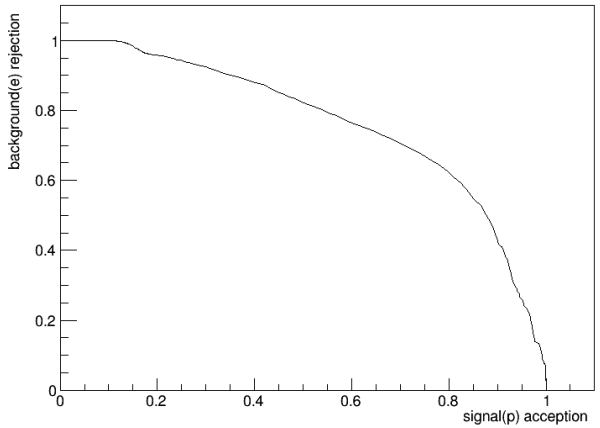

background(p) rejection
signal(pi) acception

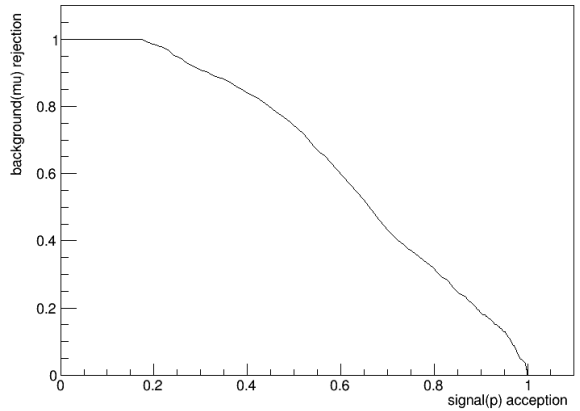

background(e) rejection
signal(K) acception

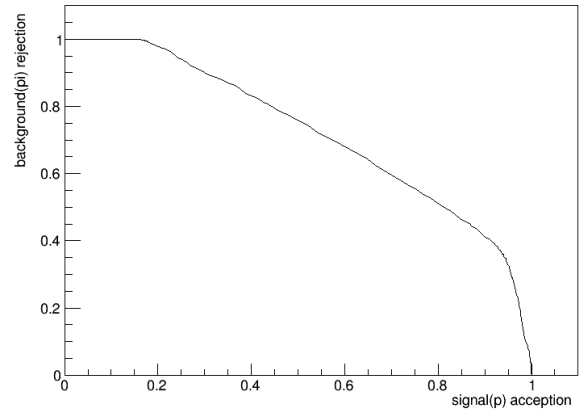

background(mu) rejection
signal(K) acception

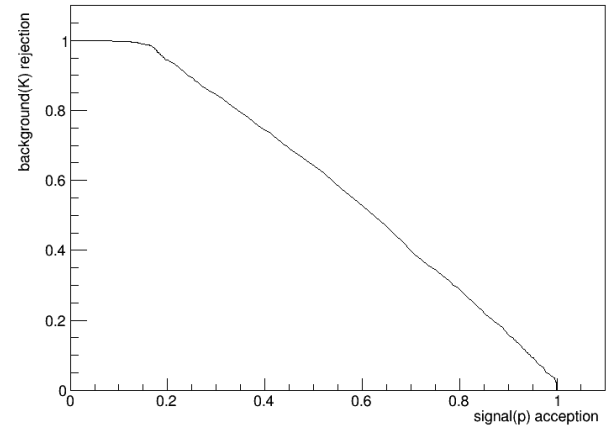

background(pi) rejection
signal(K) acception


background(p) rejection
signal(K) acception

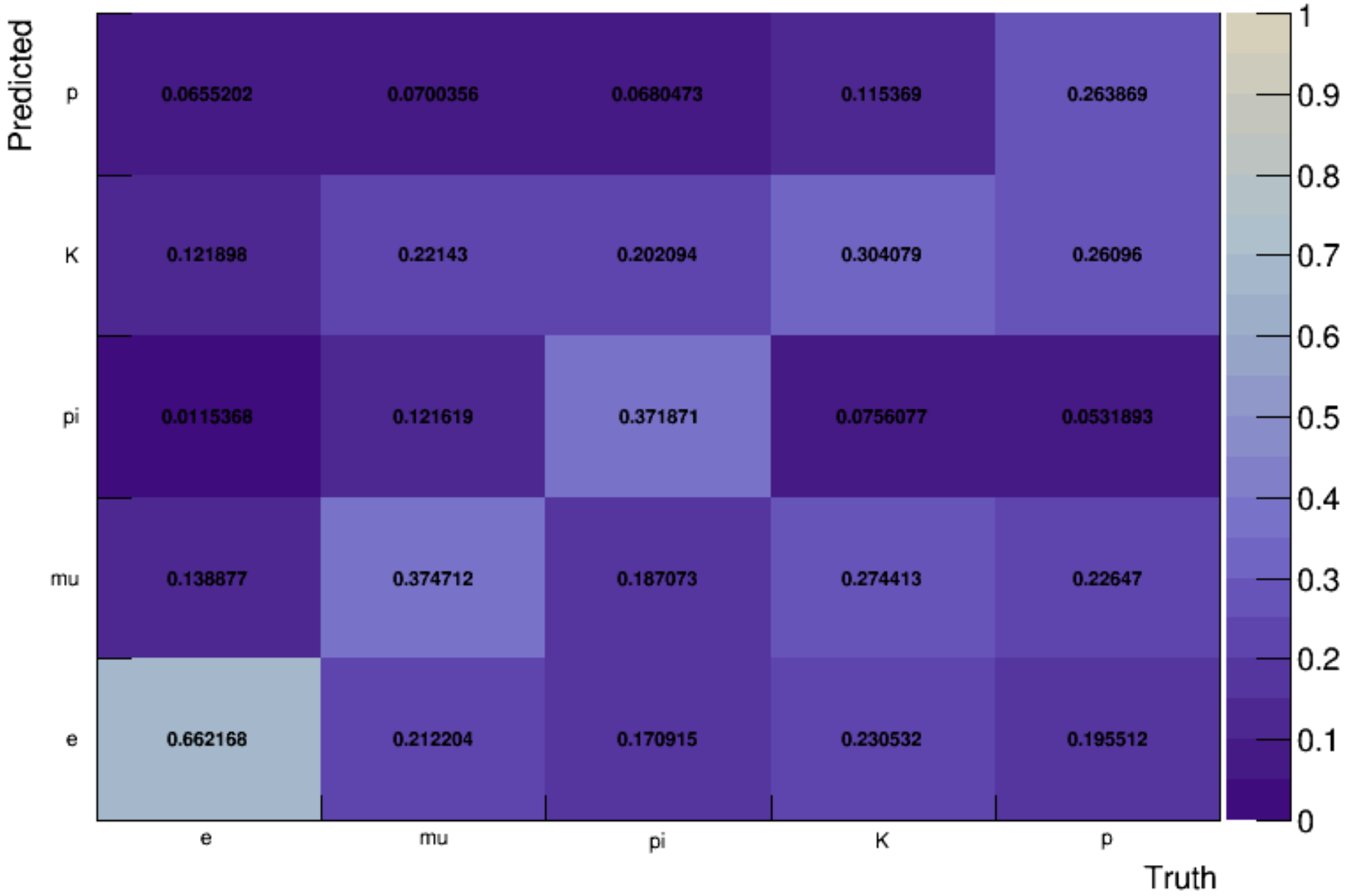

background(e) rejection
signal(p) acception


background(mu) rejection
signal(p) acception


background(pi) rejection
signal(p) acception


background(K) rejection
signal(p) acception

0~1GeV, confusion matrix



Summary

- Work to do:
  - 1. Add statistical measures
  - 2. Try other ways to improve ID performance(0~0.5GeV and 0.5~1GeV)