Triforce

Junze

April 6, 2018

Overview

- Plots of Signal Background Accuracy
- **Outputs from GoogLeNet for Pi0 vs. Gamma**
  - 94% test accuracy (Triforce+BatchNorm)
  - Using Batch-Normalization as pre-normalization process
  - Used to be 99% (Feature-Scaling: [0, 1])
- Add Feature-Scaling in triforce.py and analyzer.py
  - 95.95% training accuracy (Triforce)
  - 95.82% test accuracy (Triforce)
  - Not sure why different accuracy

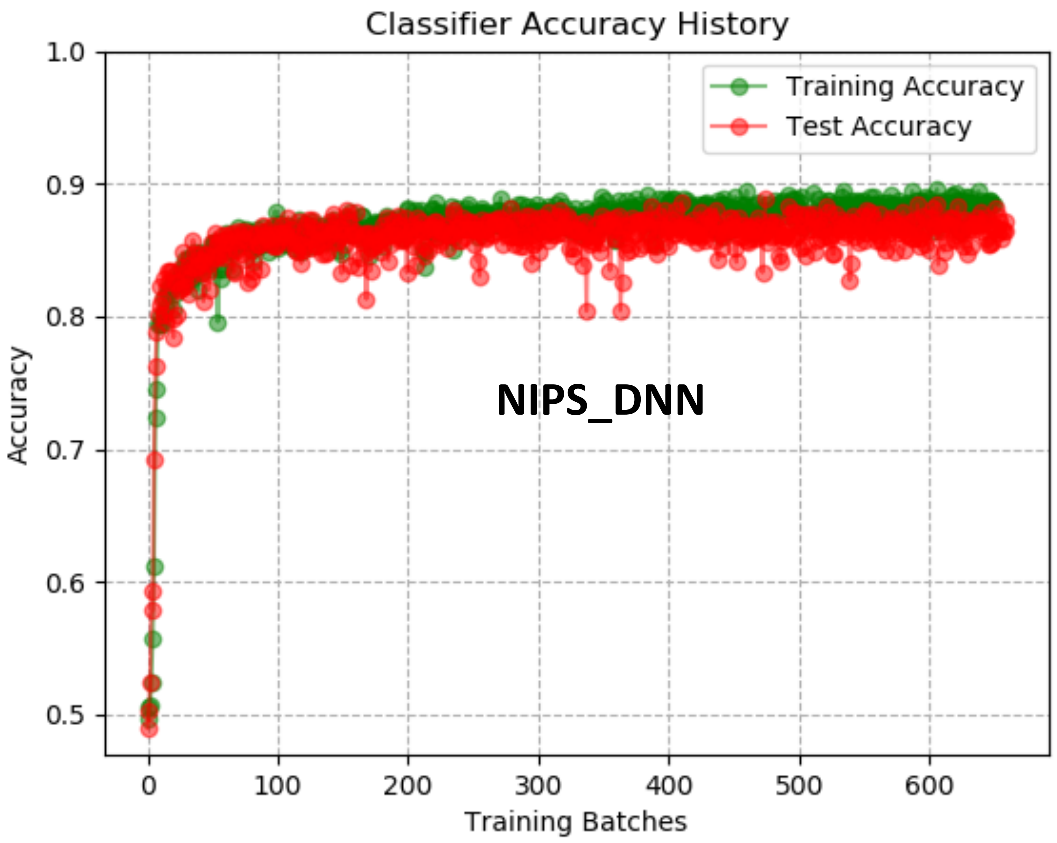
Database

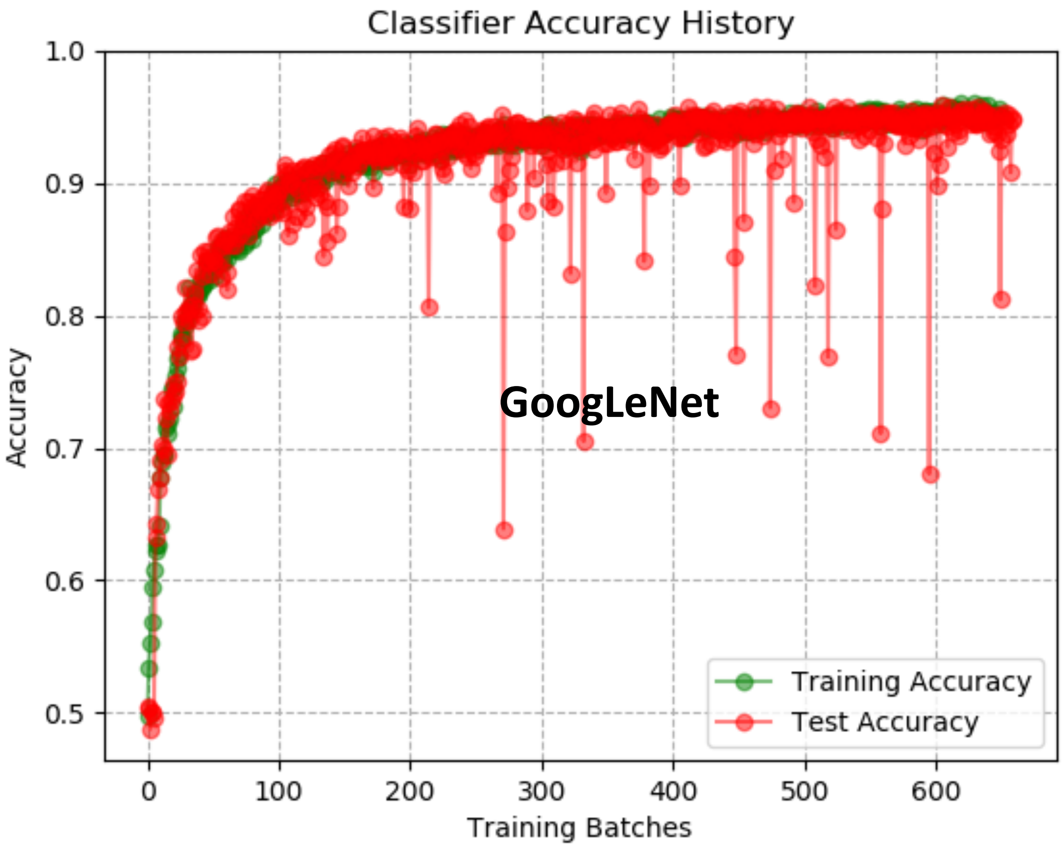
- Source: /data/LCD/V3/
- Particle: ECAL images of **Neutral Pion** and **Photon**
- Size: 20 x 10,000 = 200,000

Numerical Results

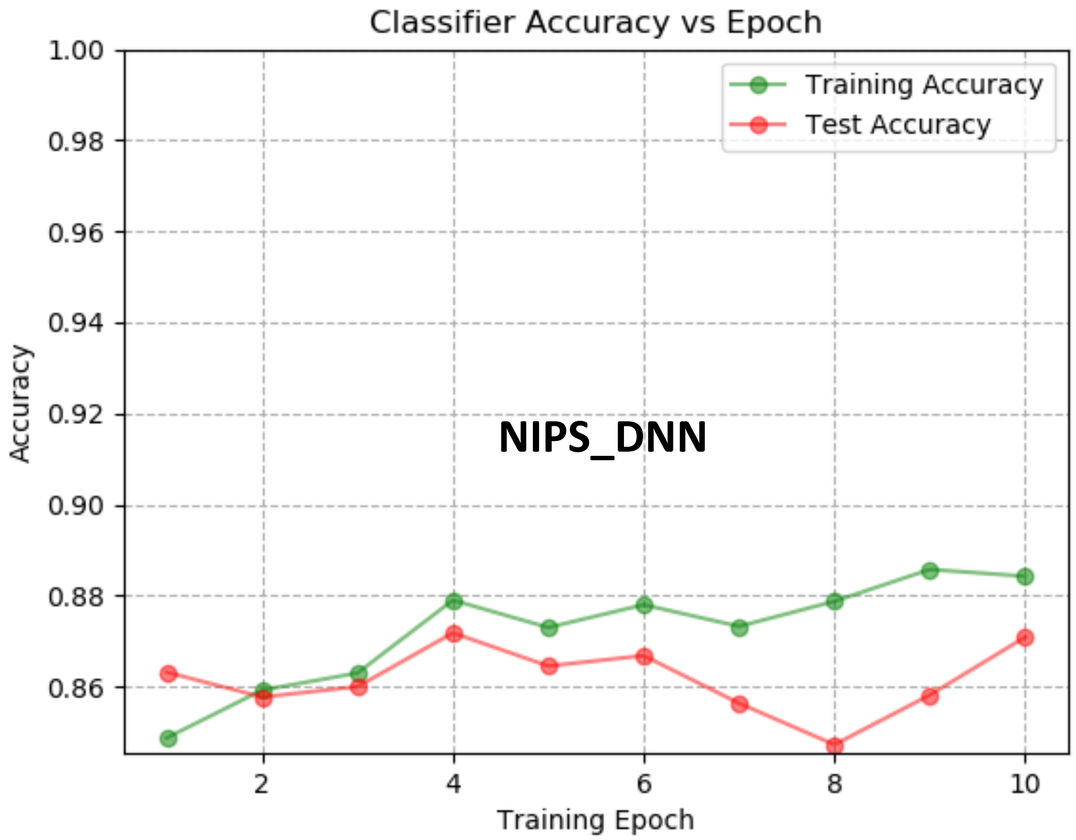
	NIPS_DNN	Batch-Norm GoogLeNet
Training Epochs	10	10
Accuracy	86.85%	93.99%
AUC	0.89	0.97
Signal Accuracy	87.02%	96.23%
Backgroud Accuracy	87.23%	93.51%

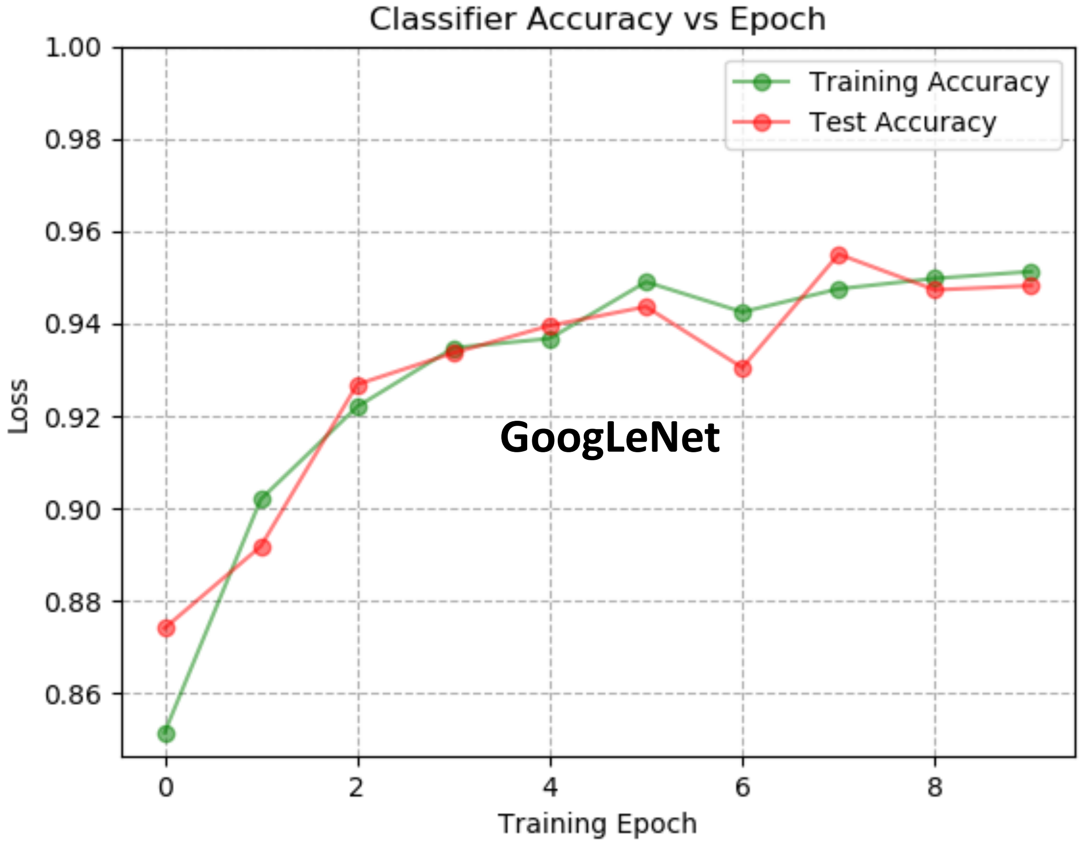
Accuracy vs. Batches



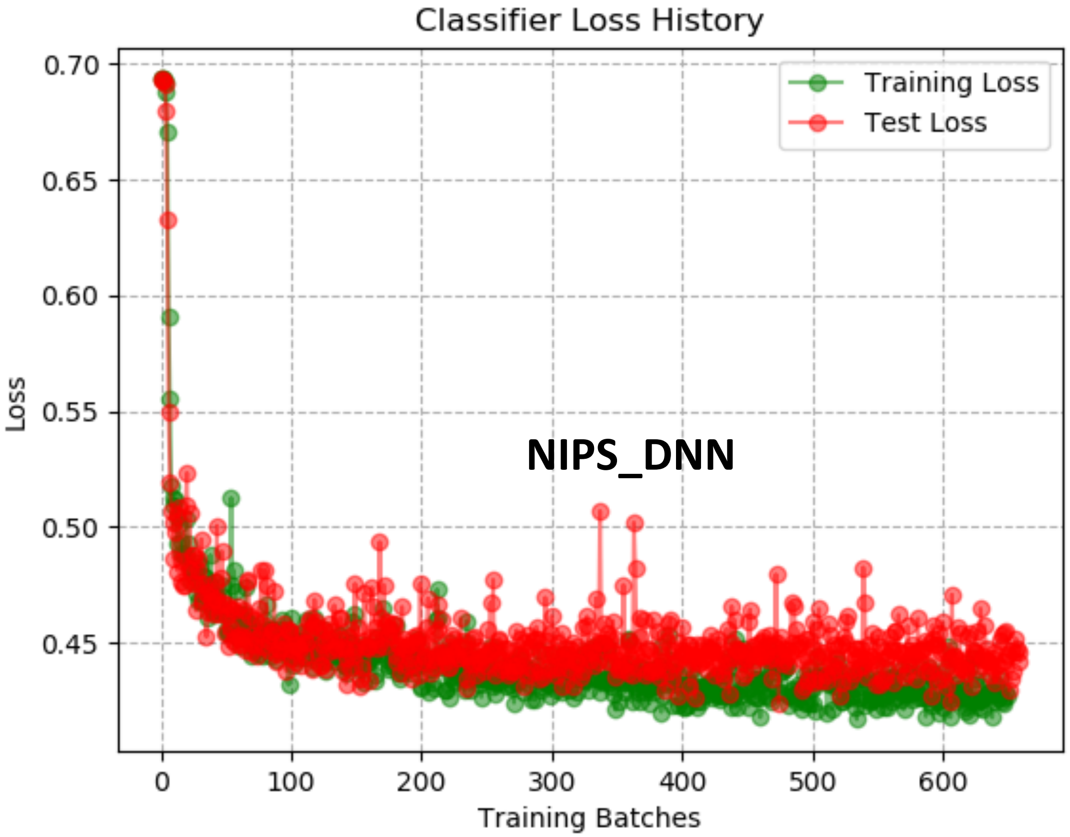


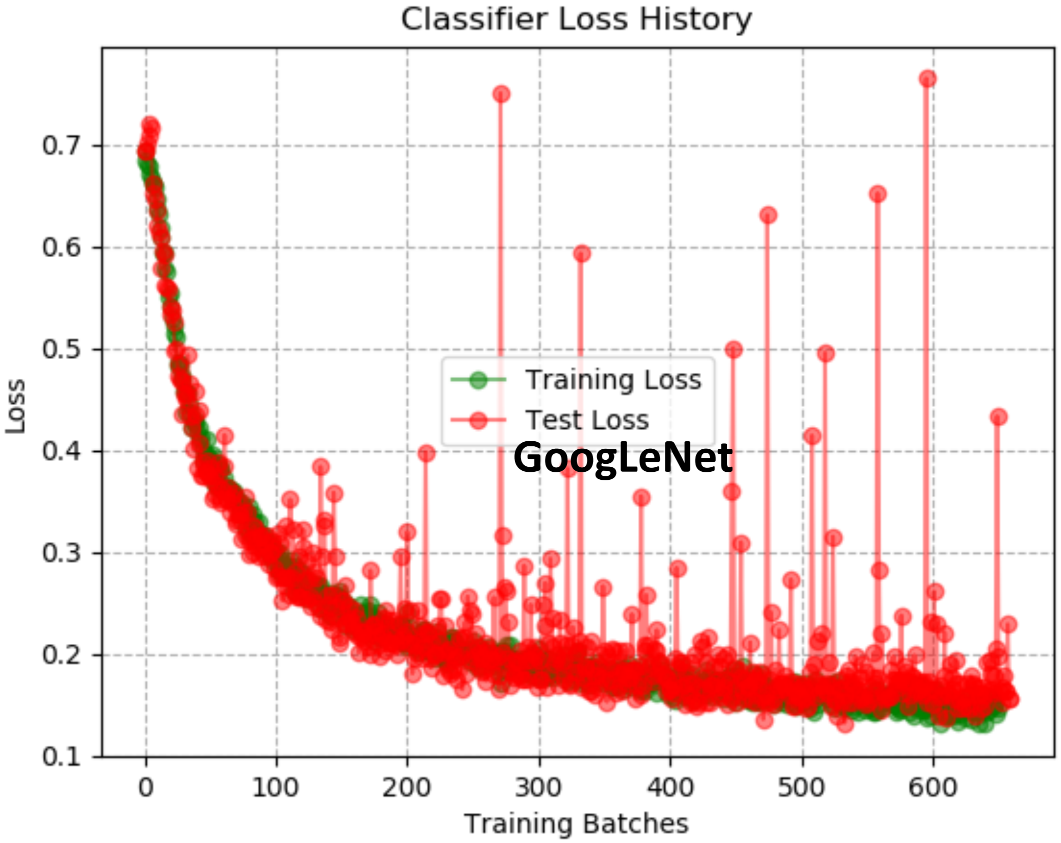
Accuracy vs. Epoch



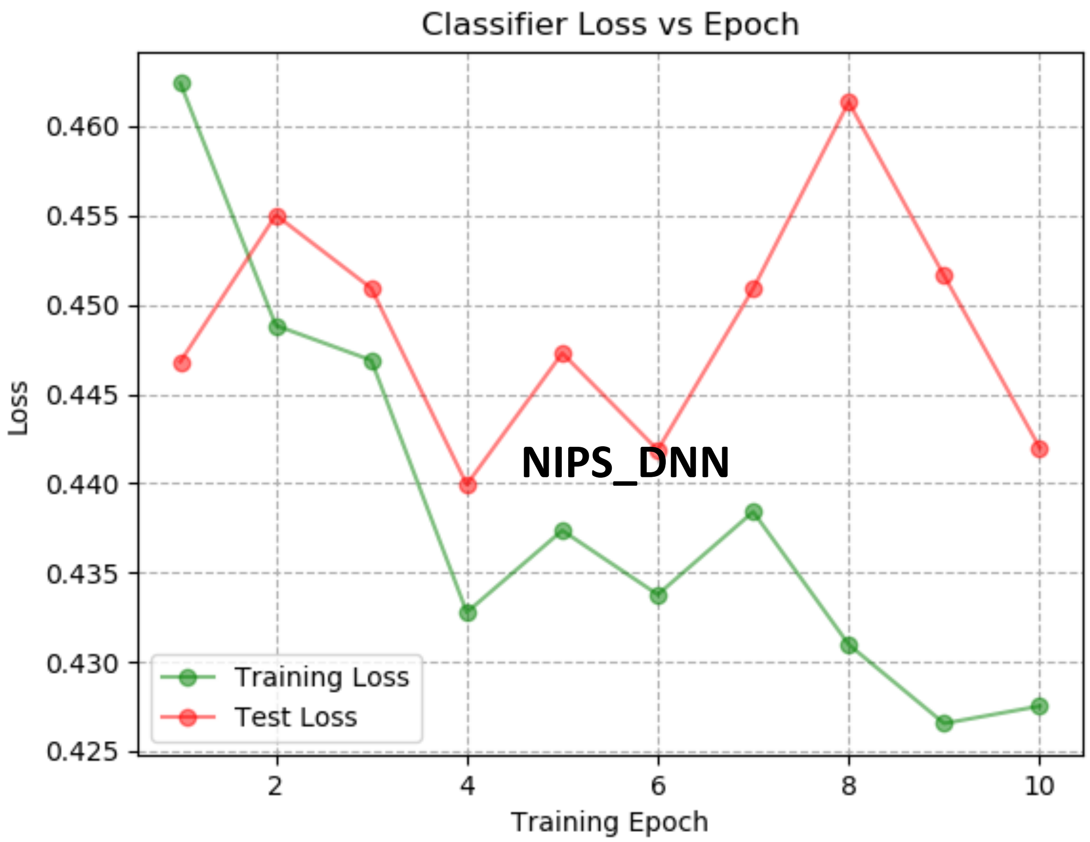


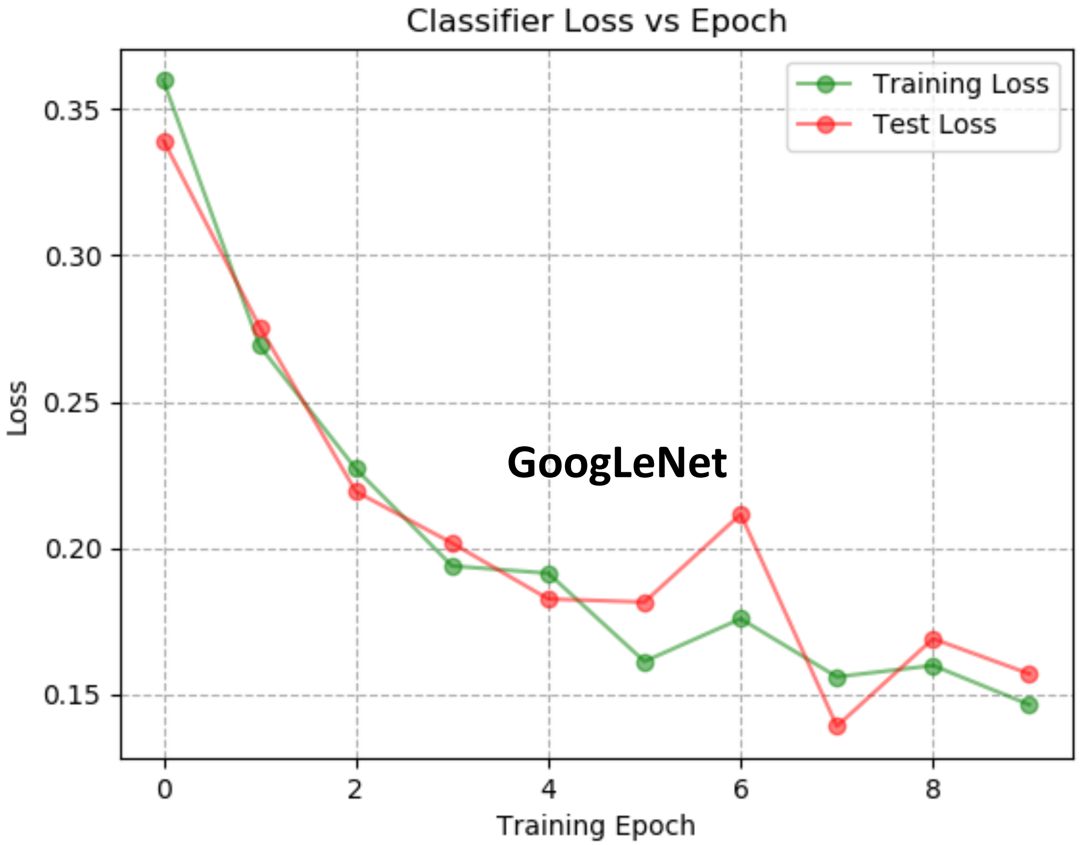
Loss vs. Batches



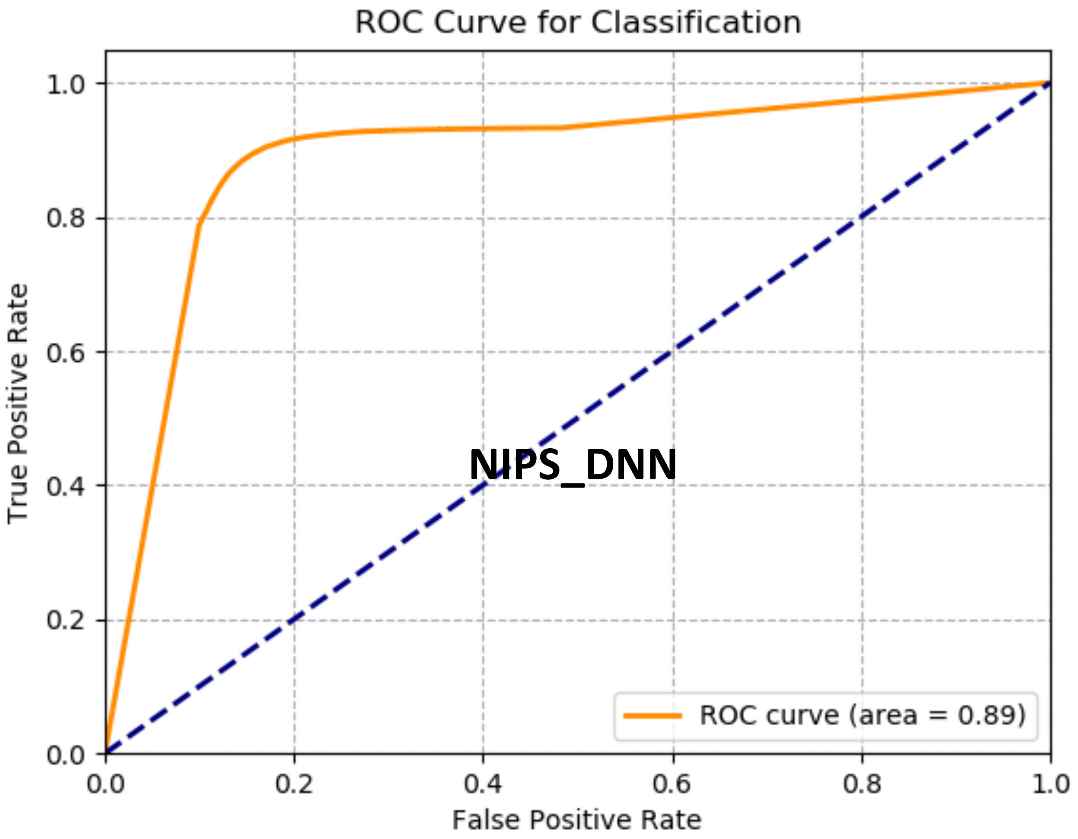


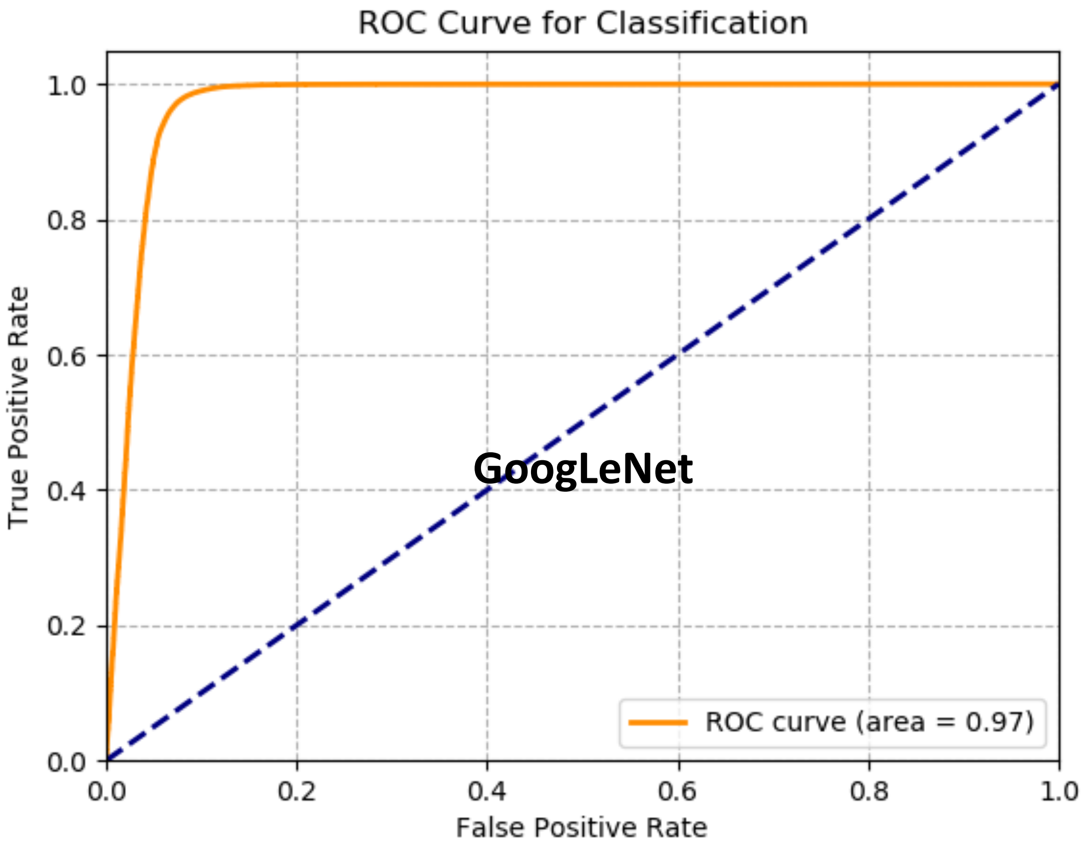
Loss vs. Epoch





ROC Curve


ROC Curve for Classification
True Positive Rate
False Positive Rate
0.0
0.2
0.4
0.6
0.8
1.0
0.0
0.2
0.4
0.6
0.8
1.0
NIPS_DNN
ROC curve (area = 0.89)


ROC Curve for Classification
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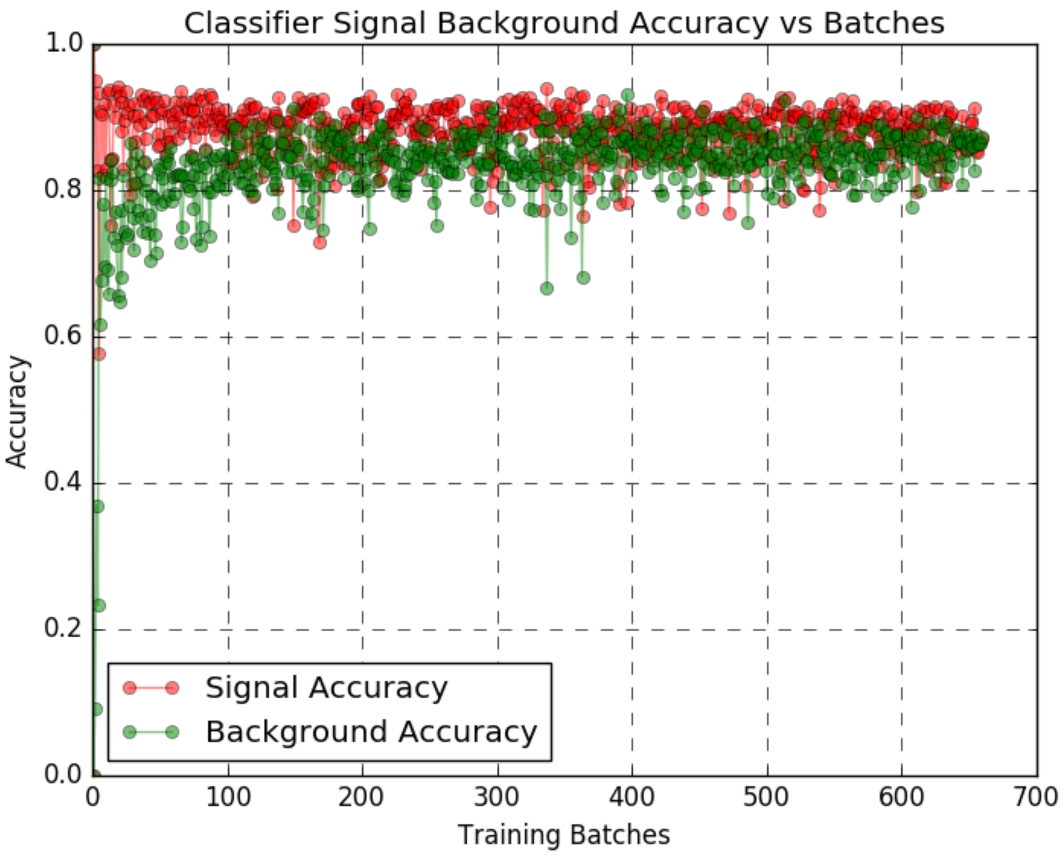
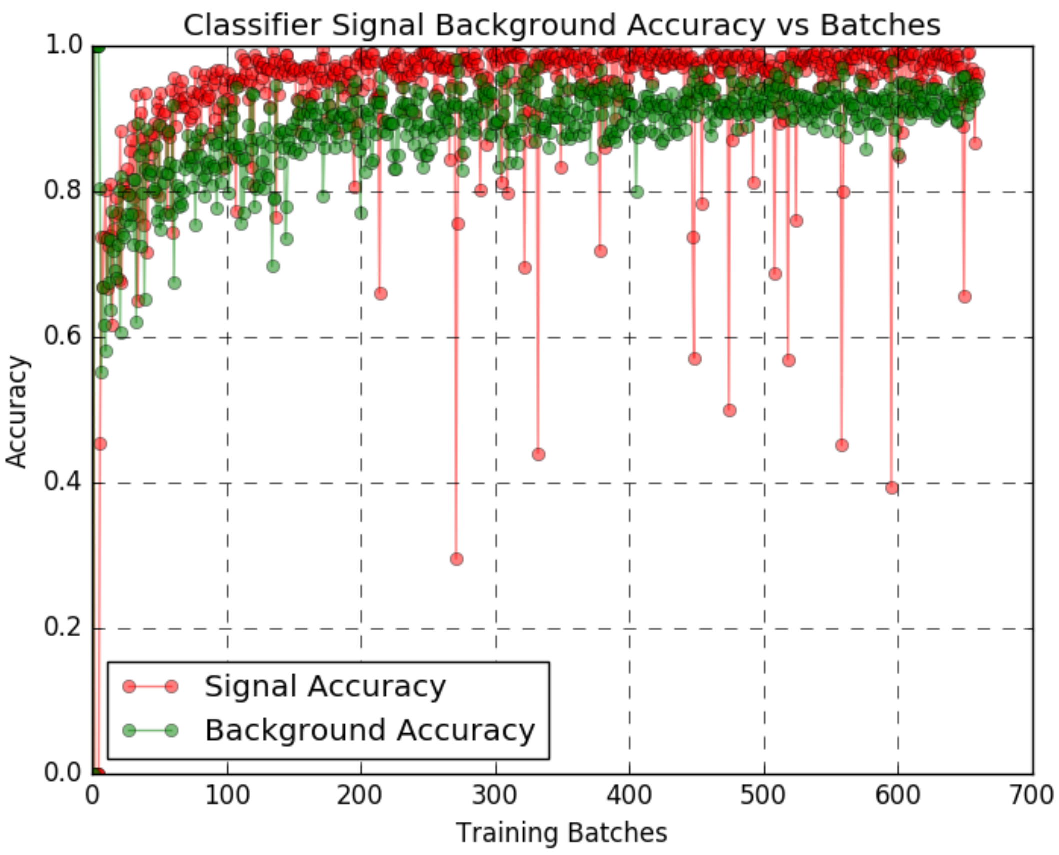
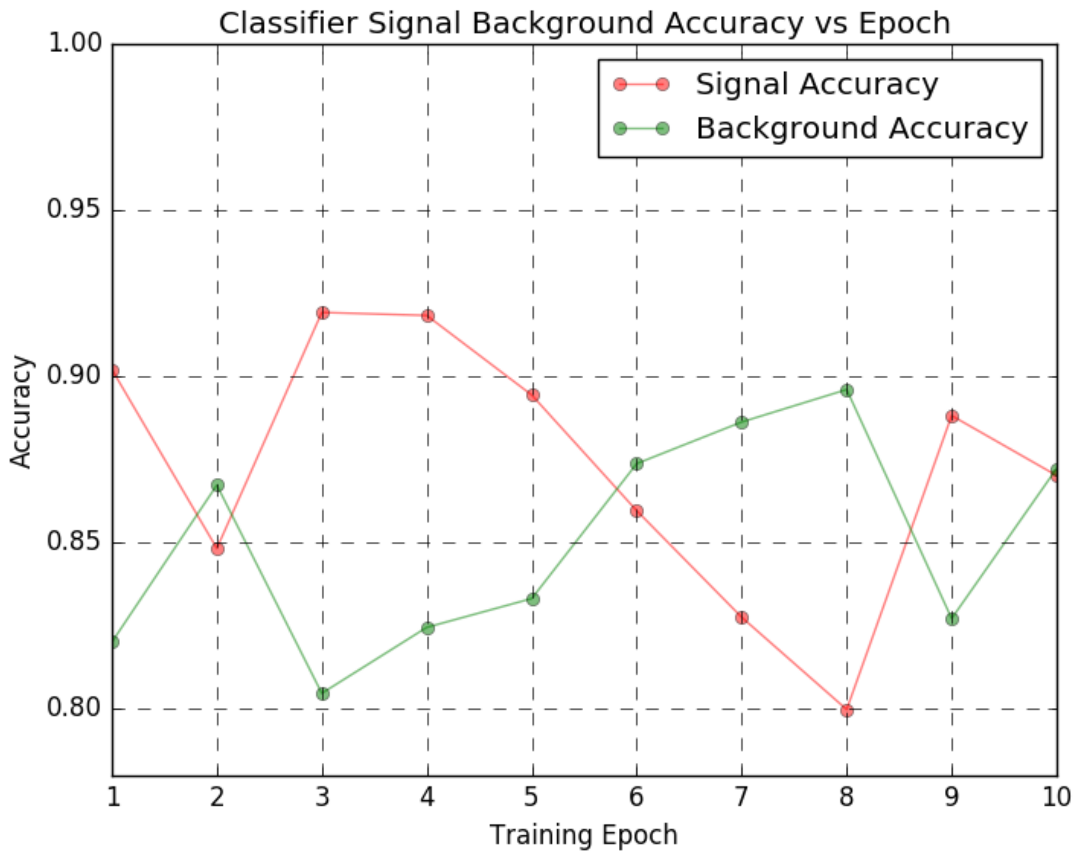
0.4
0.6
0.8
1.0
GoogLeNet
ROC curve (area = 0.97)

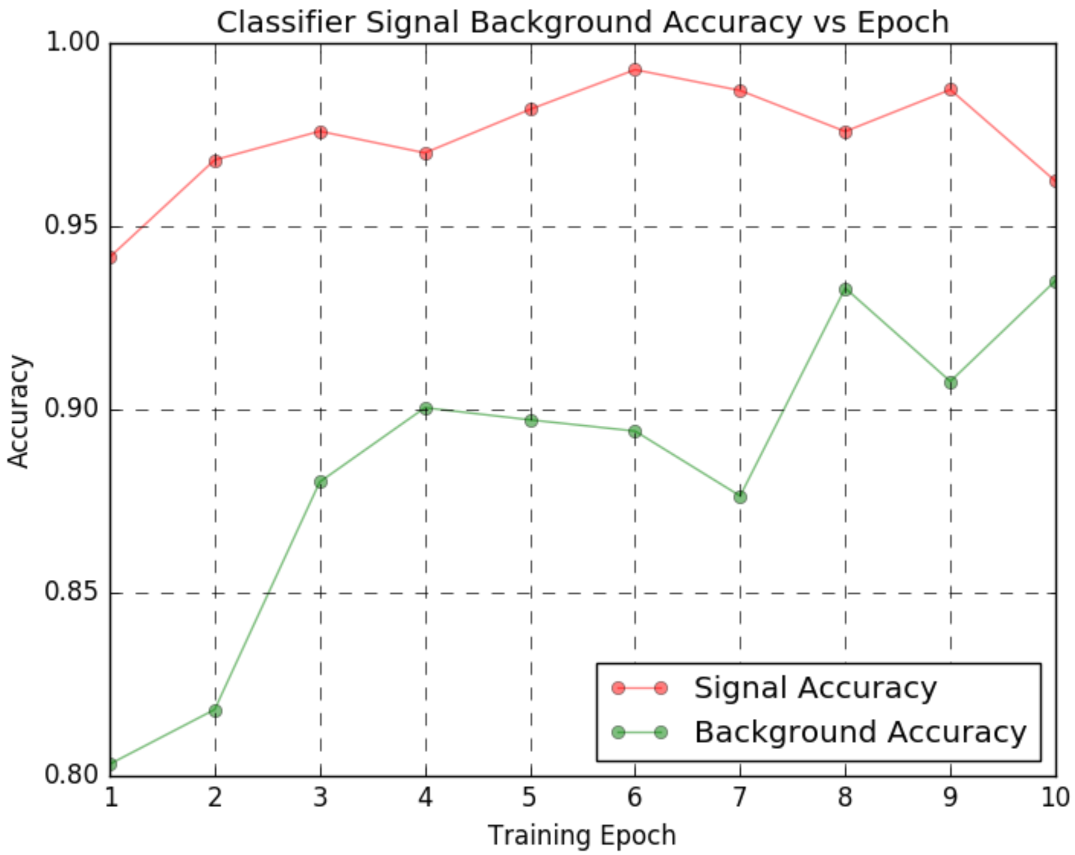
Signal Background Accuracy vs. Batch





Signal Background Accuracy vs. Epoch





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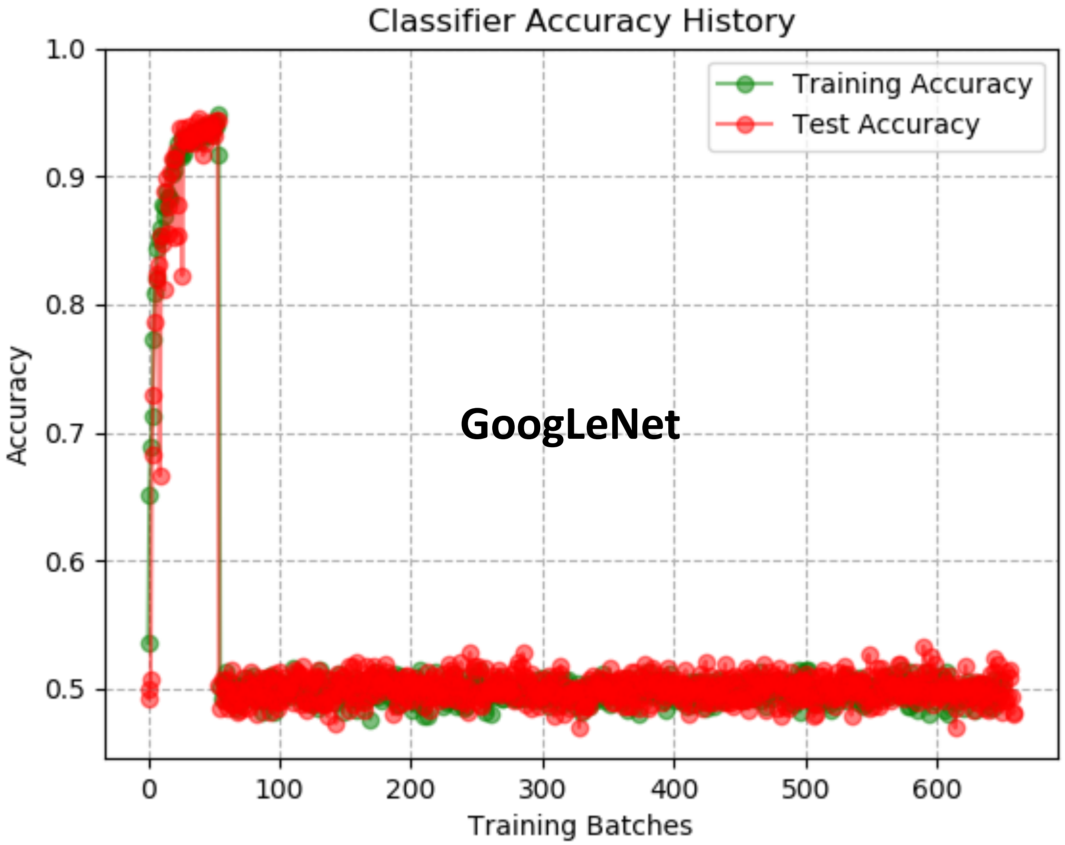
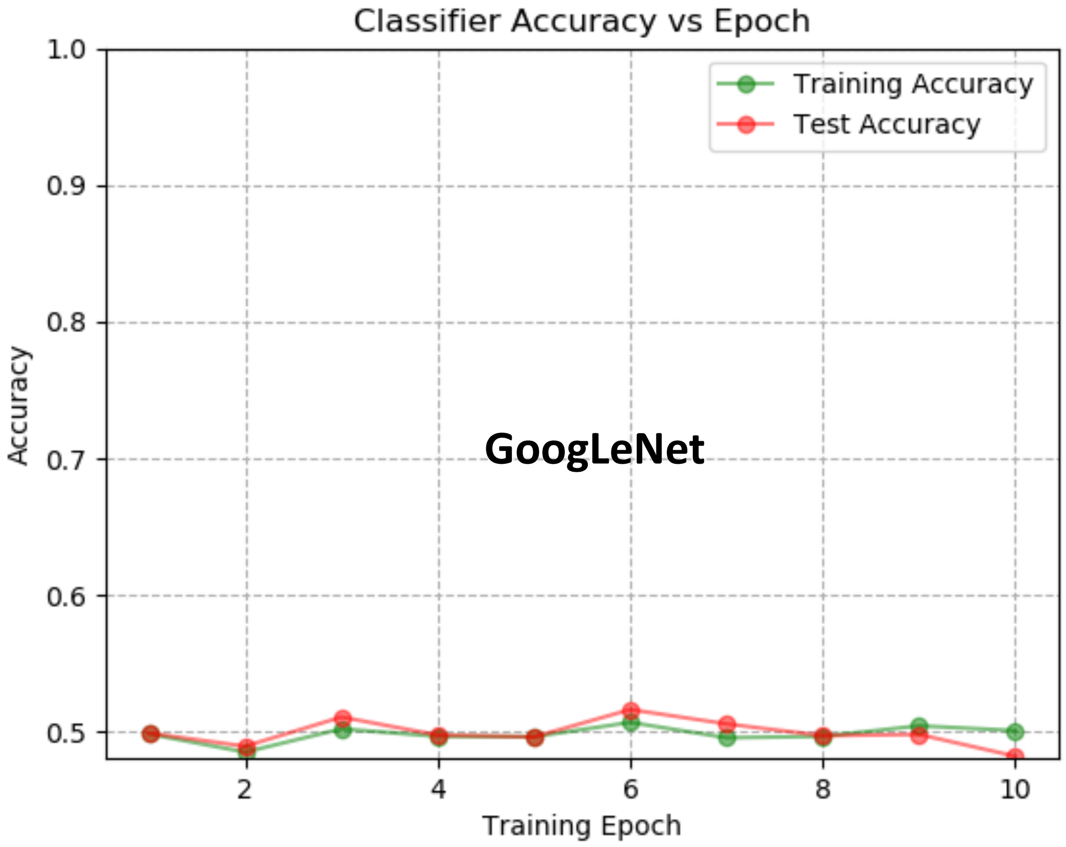
  - 94% test accuracy (Triforce+BatchNorm)
  - Using Batch-Normalization as pre-normalization process
  - Used to be 99% (Feature-Scaling: [0, 1])
- **Add Feature-Scaling in triforce.py and analyzer.py**
  - 94.90% best training accuracy (Triforce)
  - 94.55% best test accuracy (Triforce)
  - Not sure why different accuracy

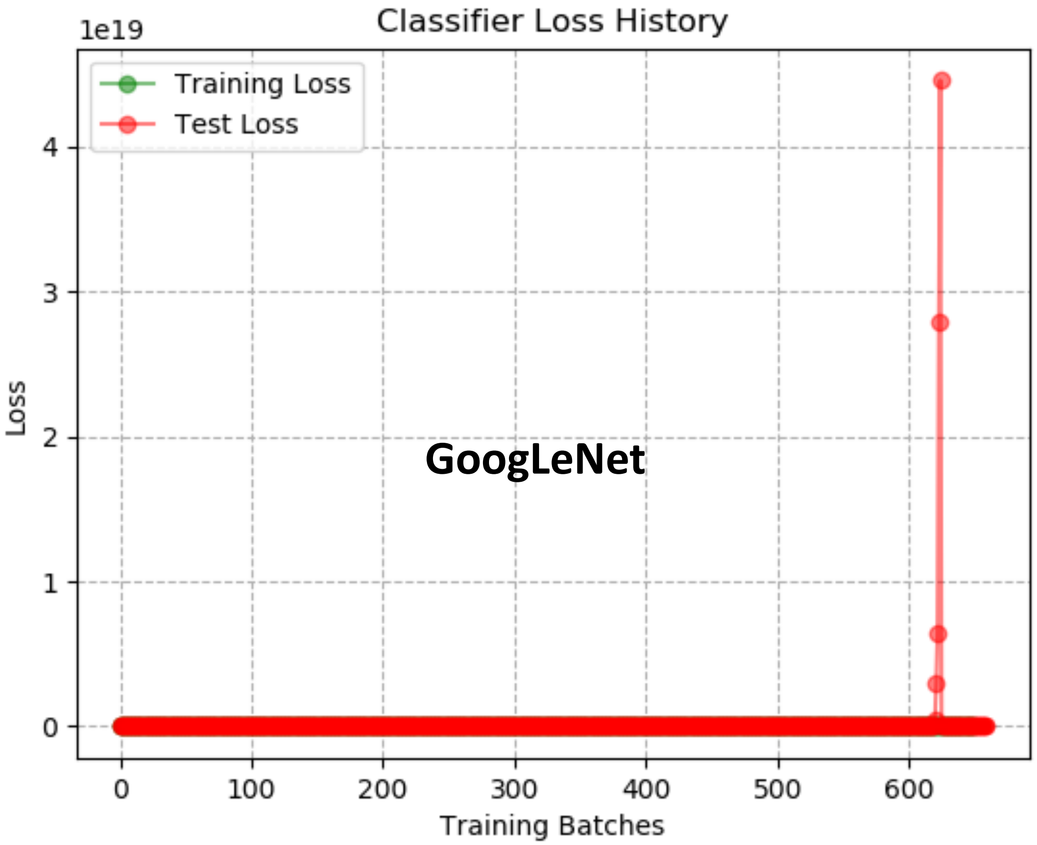
Accuracy vs. Batches



Accuracy vs. Epoch



Loss vs. Batches



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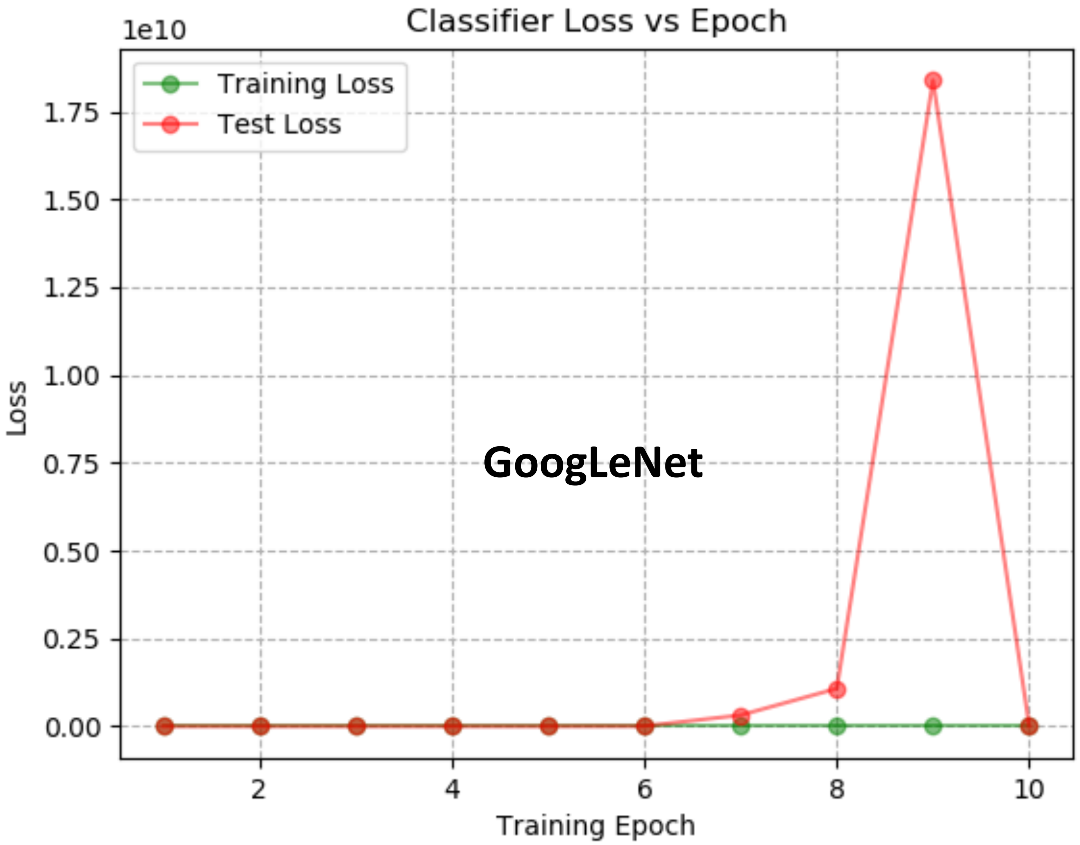

Future Work

- Generating results of NIPS_DNN with different size of window
    - Based on Random-Angle new samples
- Looking into feature-scaling GoogLeNet code