Computer Vision

Assignment 4 - CNN Classifier for CIFAR100

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Experiments

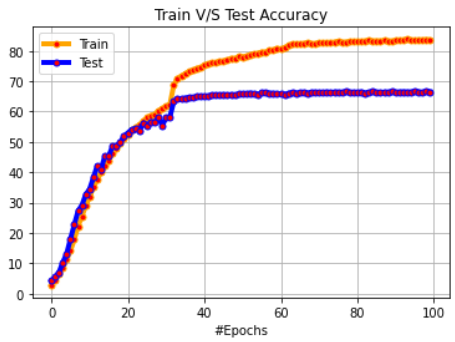
Network Architectures

Model 1

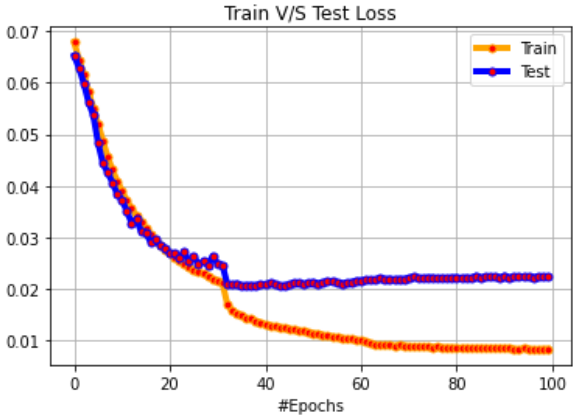
Architecture

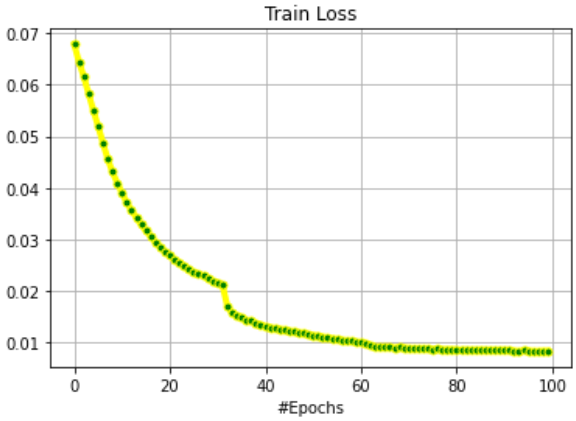
```
ConvLayer(in_channels=3,out_channels=64), BatchNorm, Relu
ConvLayer(in_channels=64,out_channels=64), BatchNorm, Relu
MaxpoolLayer(in_channels=2)
ConvLayer(in_channels=64,out_channels=128), BatchNorm, Relu
ConvLayer(in_channels=128,out_channels=128), BatchNorm, Relu
MaxpoolLayer(in_channels=2)
ConvLayer(in_channels=128,out_channels=256), BatchNorm, Relu
ConvLayer(in_channels=256,out_channels=256), BatchNorm, Relu
MaxpoolLayer(in_channels=2)
ConvLayer(in_channels=256,out_channels=512), BatchNorm, Relu
ConvLayer(in_channels=512,out_channels=512), BatchNorm, Relu
MaxpoolLayer(in_channels=2)
ConvLayer(in_channels=512,out_channels=512), BatchNorm, Relu
ConvLayer(in_channels=512,out_channels=512), BatchNorm, Relu
MaxpoolLayer(in_channels=2)
```

Accuracy Plots



Loss Plots





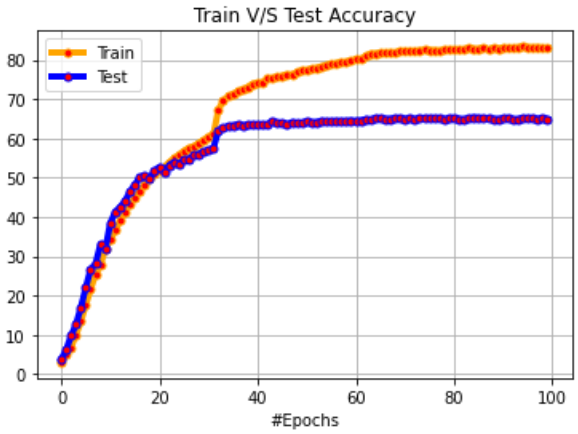
Model 2

Architecture

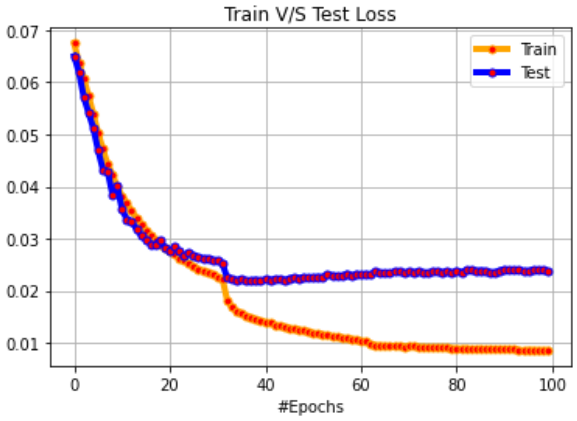
```
ConvLayer(in_channels=3,out_channels=64), BatchNorm, Relu
MaxpoolLayer(in_channels=2)
ConvLayer(in_channels=64,out_channels=128), BatchNorm, Relu
MaxpoolLayer(in_channels=2)
ConvLayer(in_channels=128,out_channels=256), BatchNorm, Relu
ConvLayer(in_channels=256,out_channels=256), BatchNorm, Relu
```

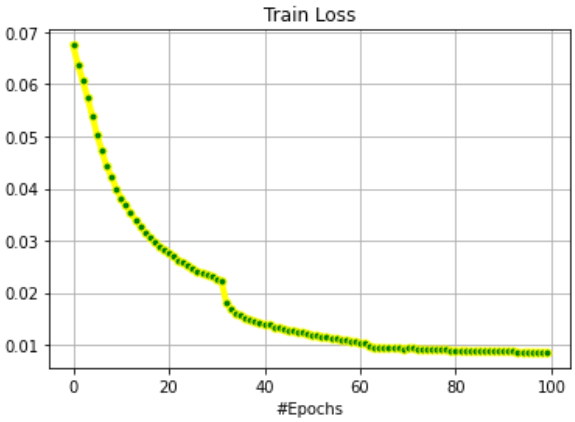
```
MaxpoolLayer(in_channels=2)
ConvLayer(in_channels=256,out_channels=512), BatchNorm, Relu
ConvLayer(in_channels=512,out_channels=512), BatchNorm, Relu
MaxpoolLayer(in_channels=2)
ConvLayer(in_channels=512,out_channels=512), BatchNorm, Relu
ConvLayer(in_channels=512,out_channels=512), BatchNorm, Relu
MaxpoolLayer(in_channels=2)
```

Accuracy Plots



Loss Plots



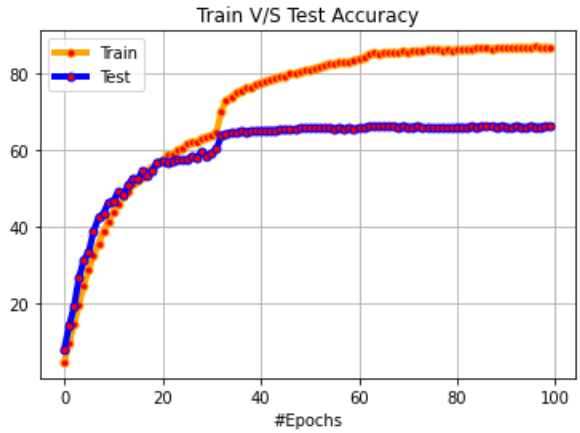


Model 3

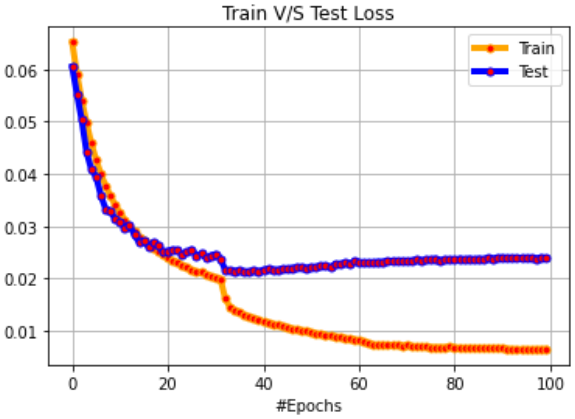
Architecture

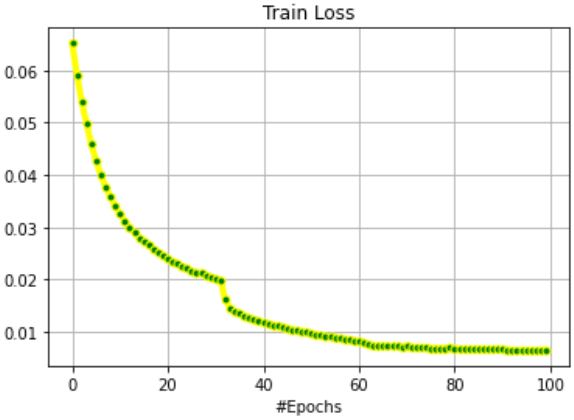
```
ConvLayer(in_channels=3,out_channels=64), BatchNorm, Relu
MaxpoolLayer(in_channels=2)
ConvLayer(in_channels=64,out_channels=128), BatchNorm, Relu
MaxpoolLayer(in_channels=2)
ConvLayer(in_channels=128,out_channels=256), BatchNorm, Relu
MaxpoolLayer(in_channels=2)
ConvLayer(in_channels=256,out_channels=512), BatchNorm, Relu
MaxpoolLayer(in_channels=2)
ConvLayer(in_channels=512,out_channels=512), BatchNorm, Relu
MaxpoolLayer(in_channels=2)
```

Accuracy Plots



Loss Plots

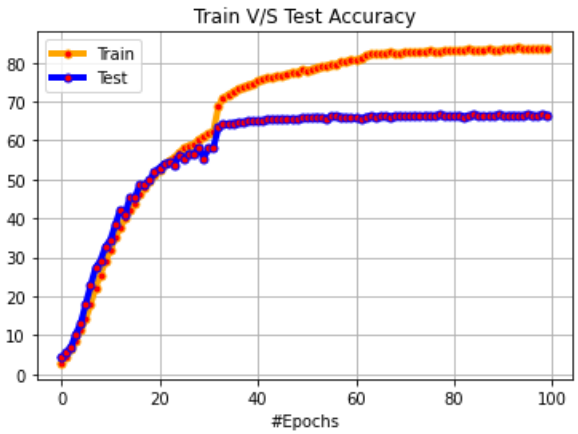

Train V/S Test Loss
Train
Test
0.06
0.05
0.04
0.03
0.02
0.01
0
20
40
60
80
100
#Epochs


Train Loss
0.06
0.05
0.04
0.03
0.02
0.01
0
20
40
60
80
100
#Epochs

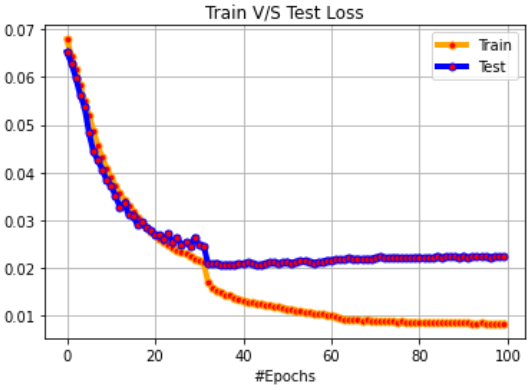
Activation Functions

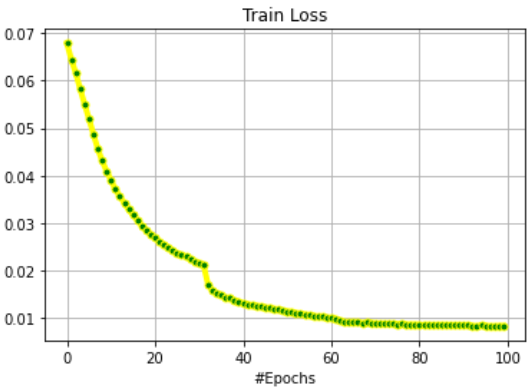
ReLU

Accuracy Plots



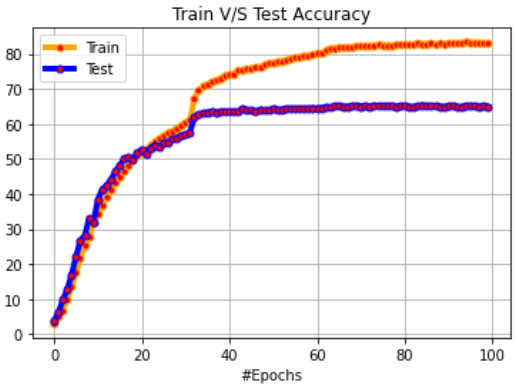
Loss Plots



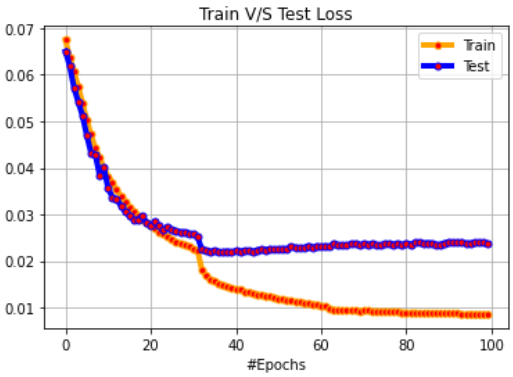


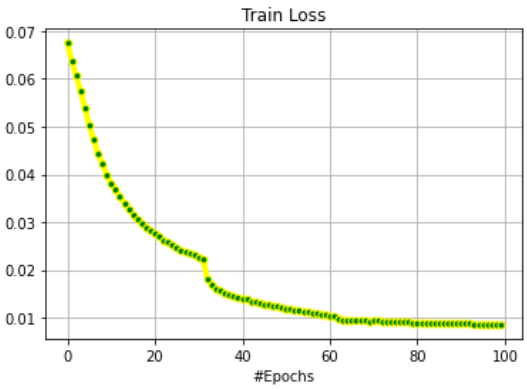
LeakyReLU

Accuracy Plots



Loss Plots

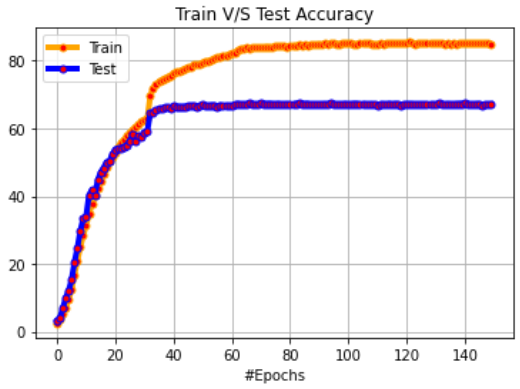




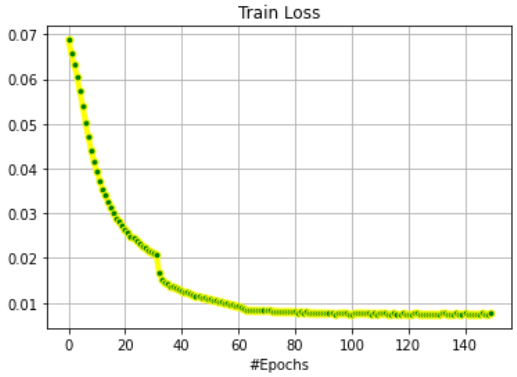
Loss Functions / Criterion

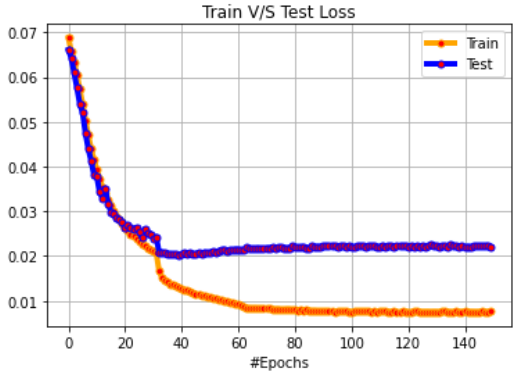
Cross Entropy Loss

Accuracy Plots



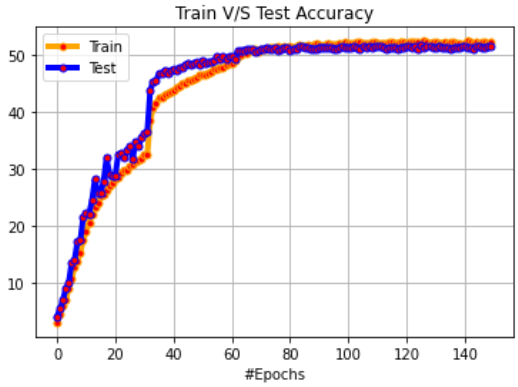
Loss Plots



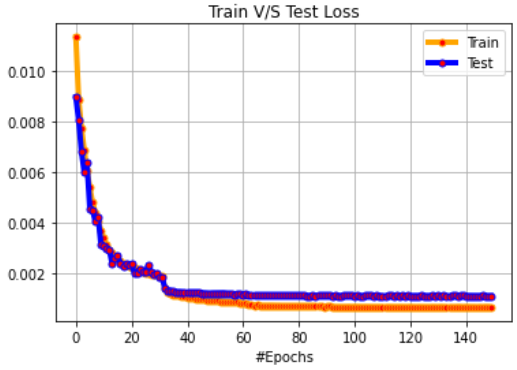


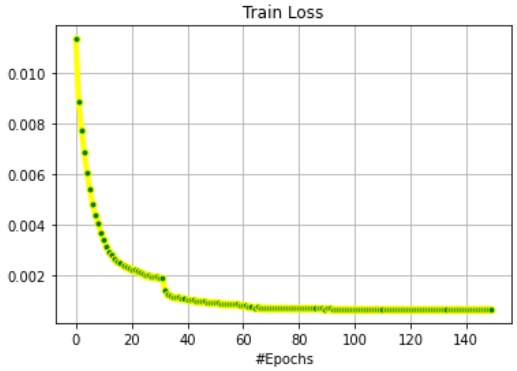
Multi Class Margin Loss

Accuracy Plots



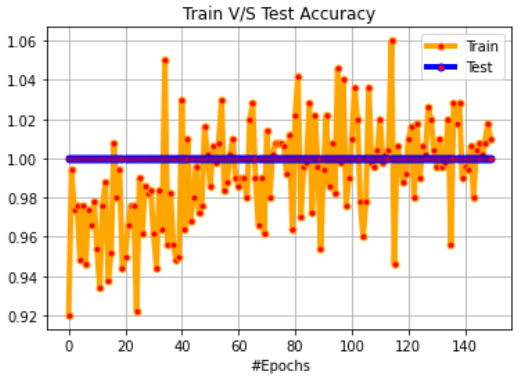
Loss Plots



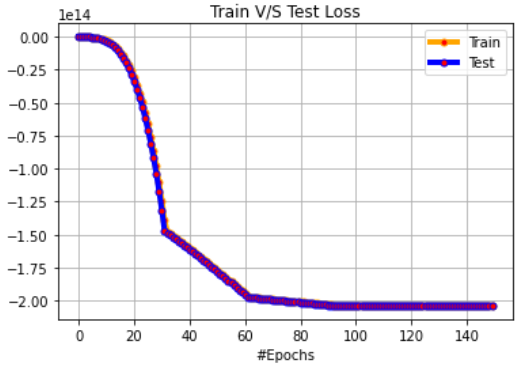


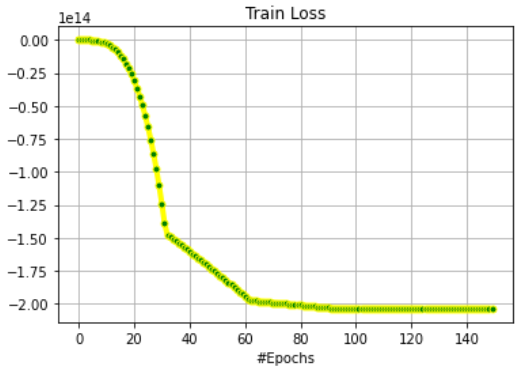
Negative Log Likelihood

Accuracy Plots



Loss Plots

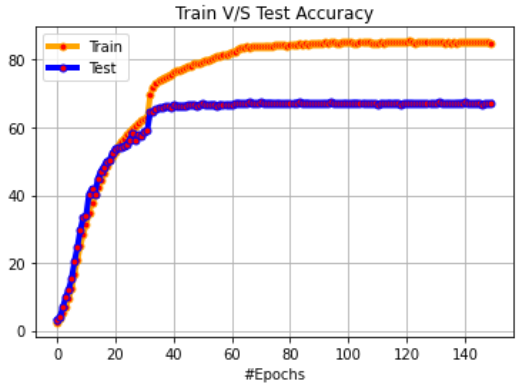




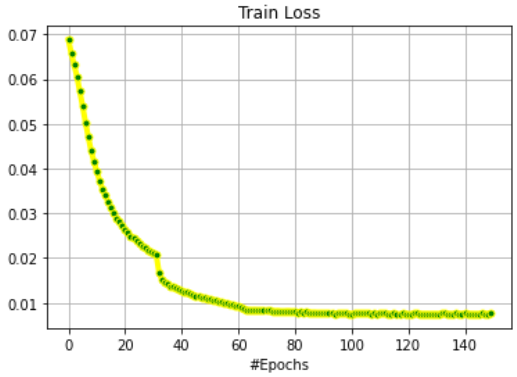
Weight Initializations

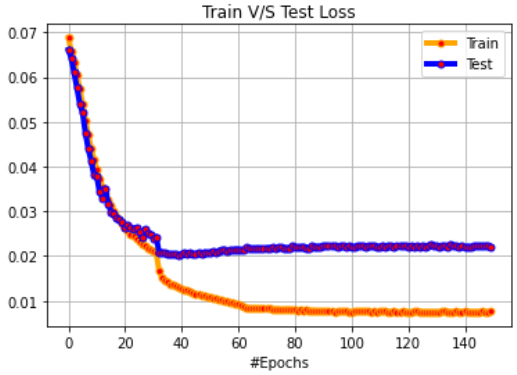
Xavier Uniform Initialization

Accuracy Plots



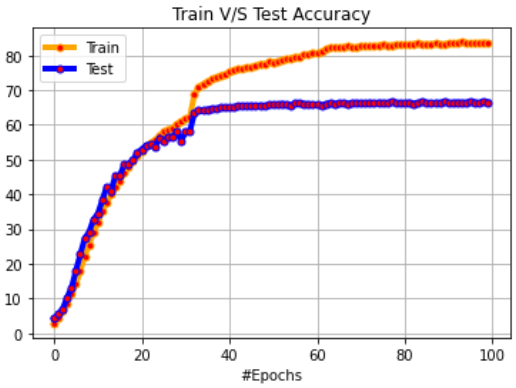
Loss Plots



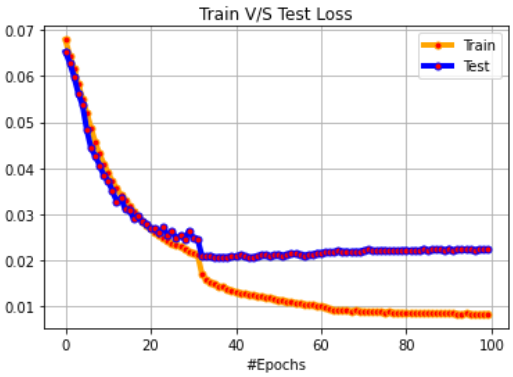


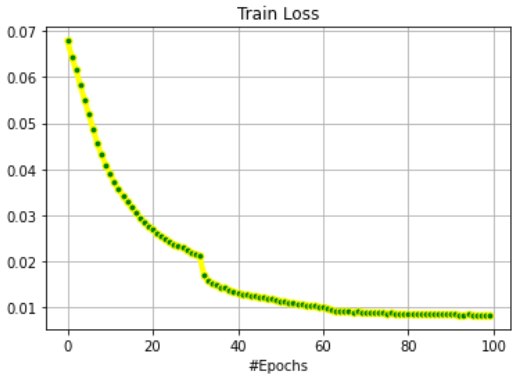
Kaiming Uniform Initialization

Accuracy Plots



Loss Plots

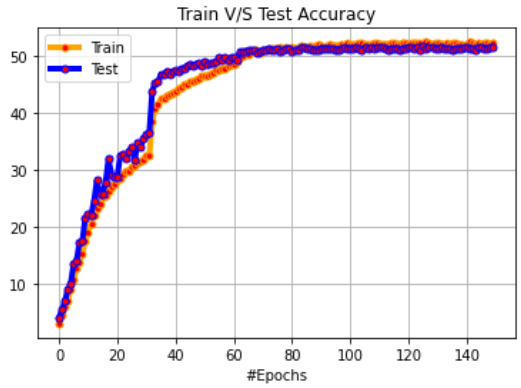




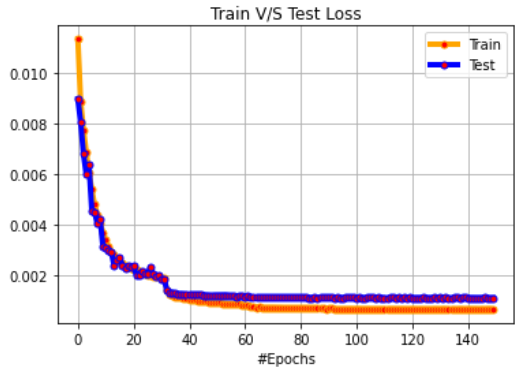
Batch Normalization

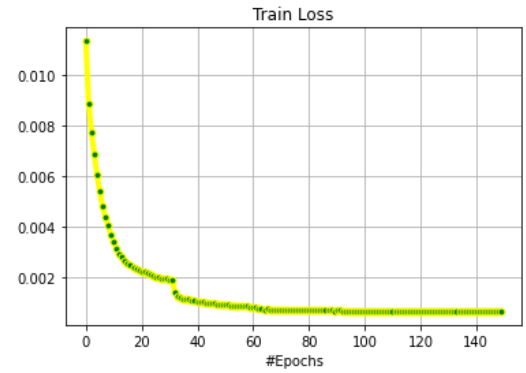
With Batch Normalization

Accuracy Plots



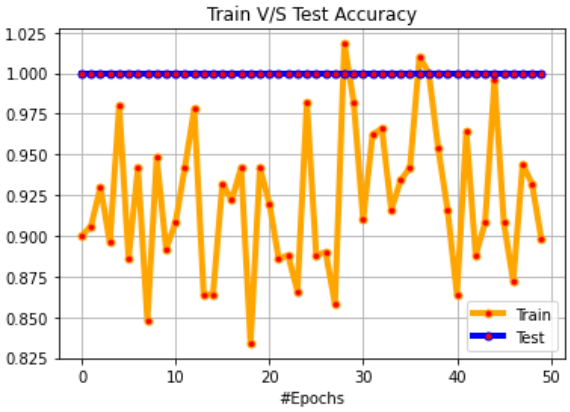
Loss Plots



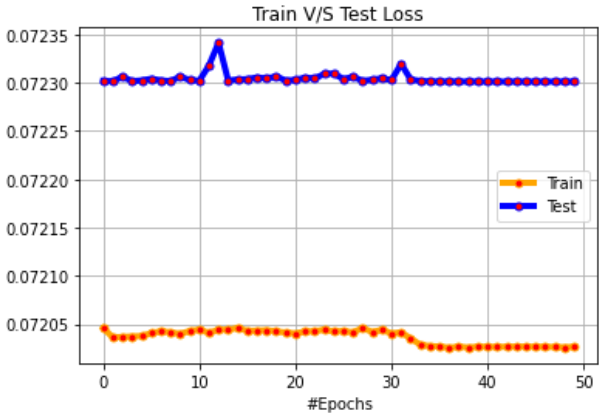


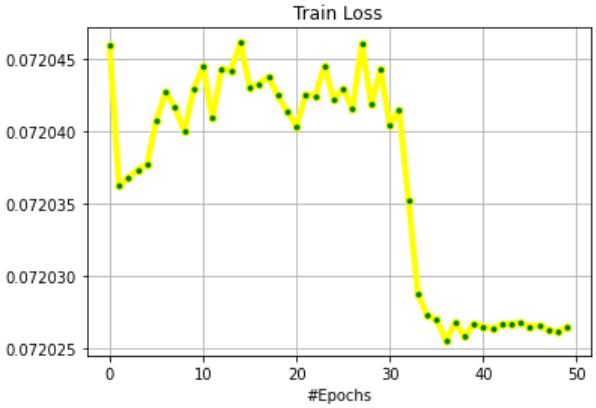
Without Batch Normalization

Accuracy Plots



Loss Plots

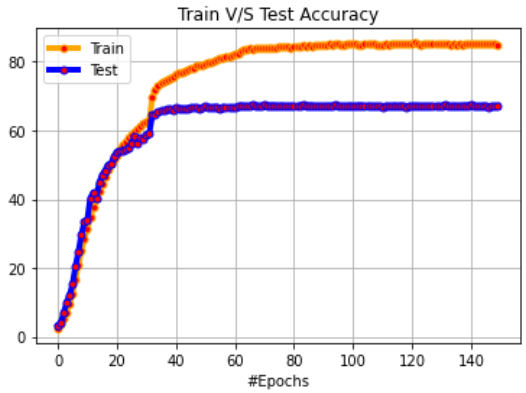




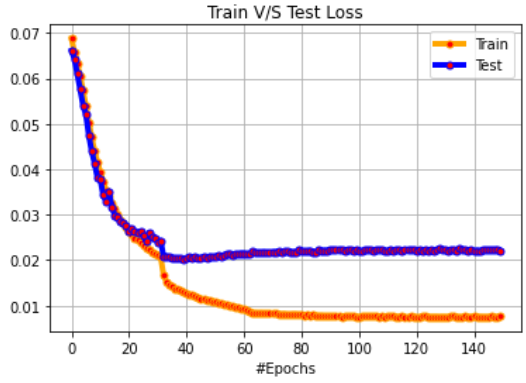
Learning Rate Variation

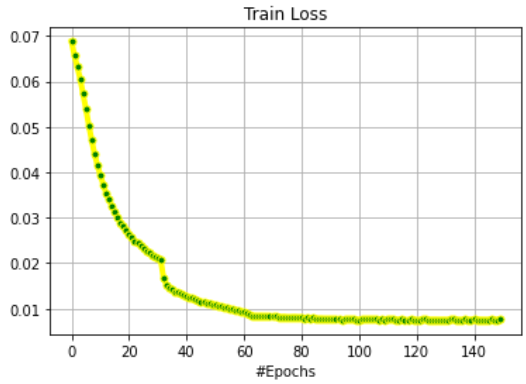
Adaptive Learning Rate

Accuracy Plots



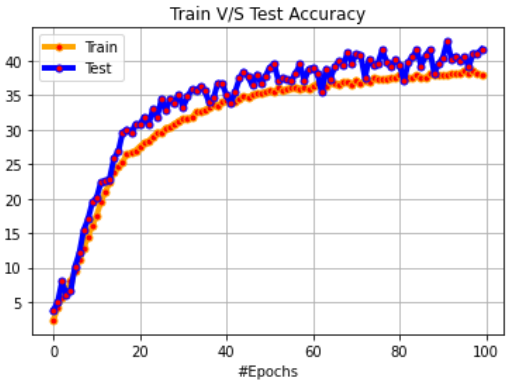
Loss Plots





Fixed Learning Rate

Accuracy Plots



Loss Plots