

Exercise-1 Network Analysis

Baseline Model

Model Specifications

1. Number of epochs: 7
2. Learning Rate: 0.001
3. Train dataset is halved. Since, testing step is interleaved after every 100 minibatch, test dataset consists of 1000 images.

Train Accuracy Plot

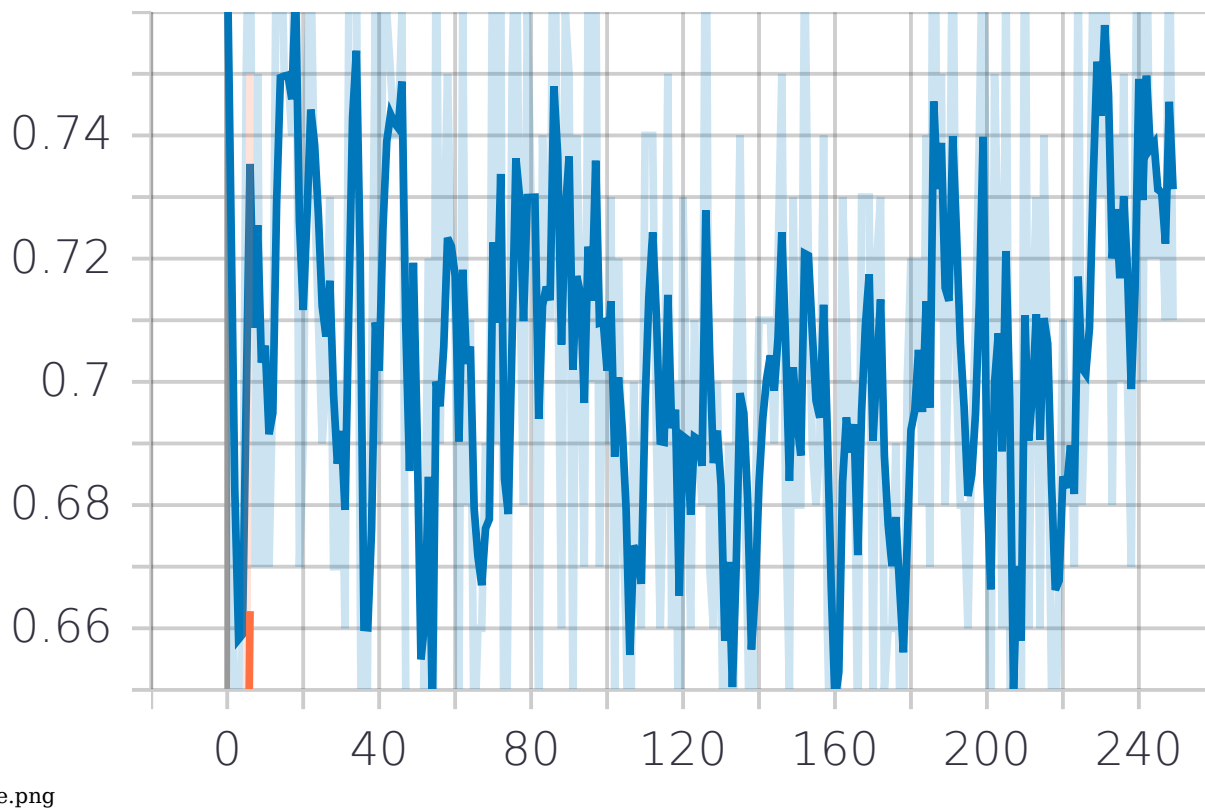


image.png

Train Loss Plot

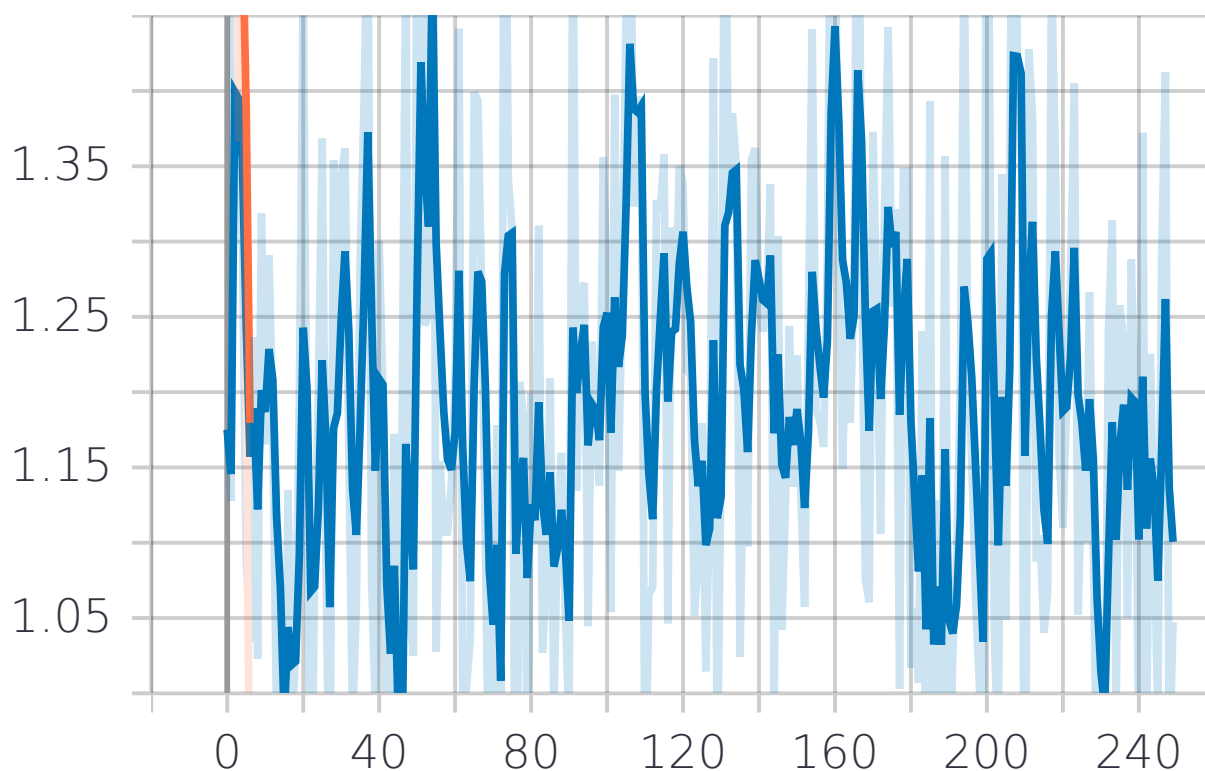


image.png

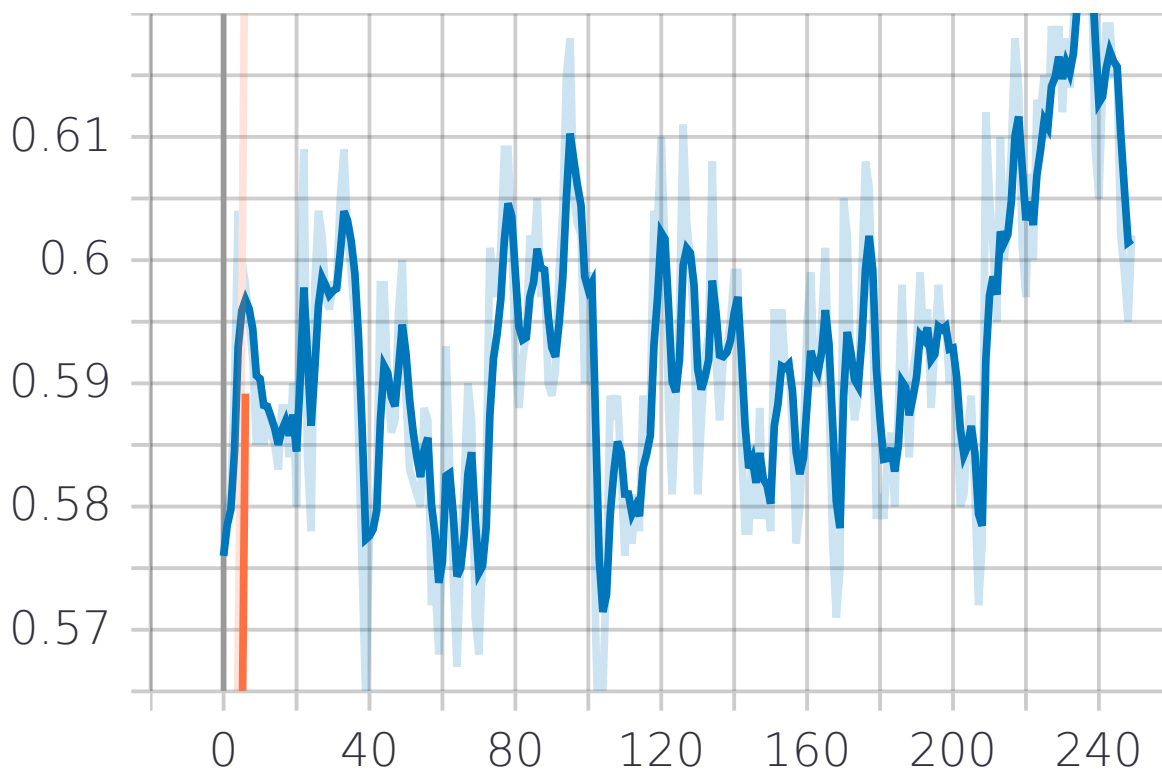
Test Accuracy Plot

image.png

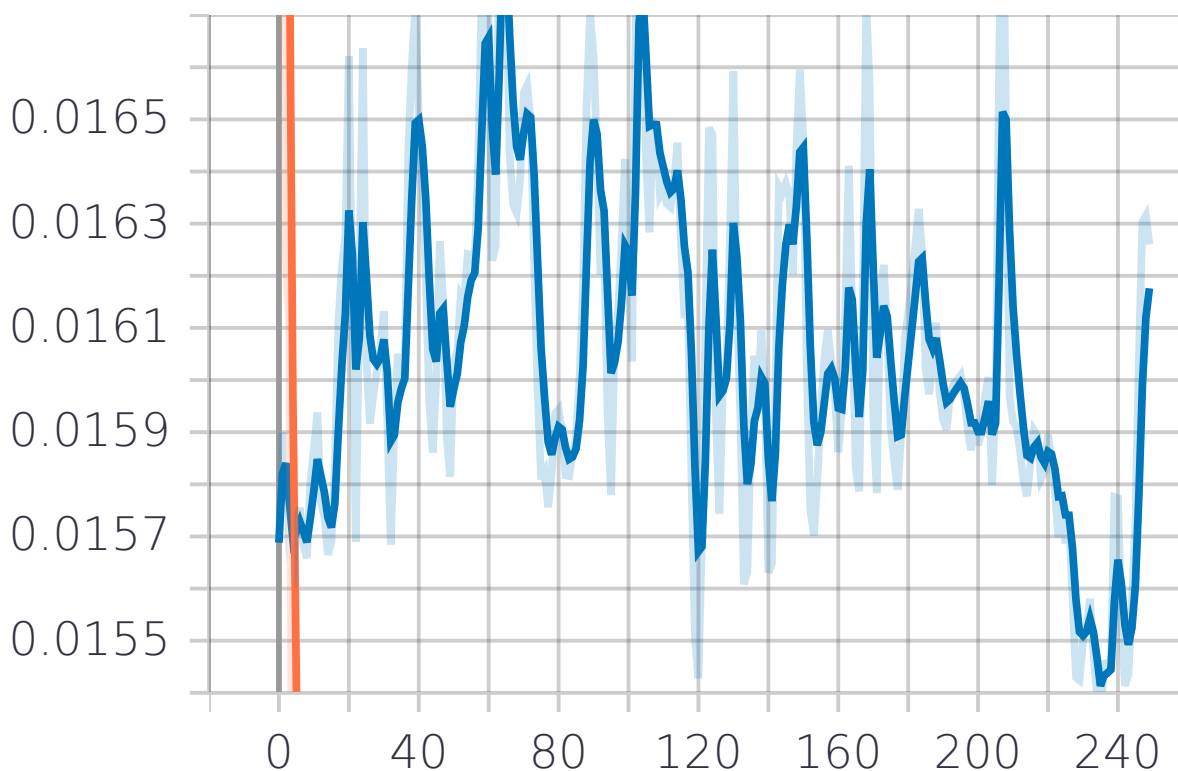
Test Loss Plot

image.png

Exercise-2 Data Augmentation and Normalization

Data Augmentation

Model Specifications

1. Number of epochs: 6
2. Learning Rate: 0.001
3. Train dataset is halved.
4. Model has been evaluated on all test images (10,000 images)
5. To augment the data - vertical flip, horizontal flip and scale transform have been used.

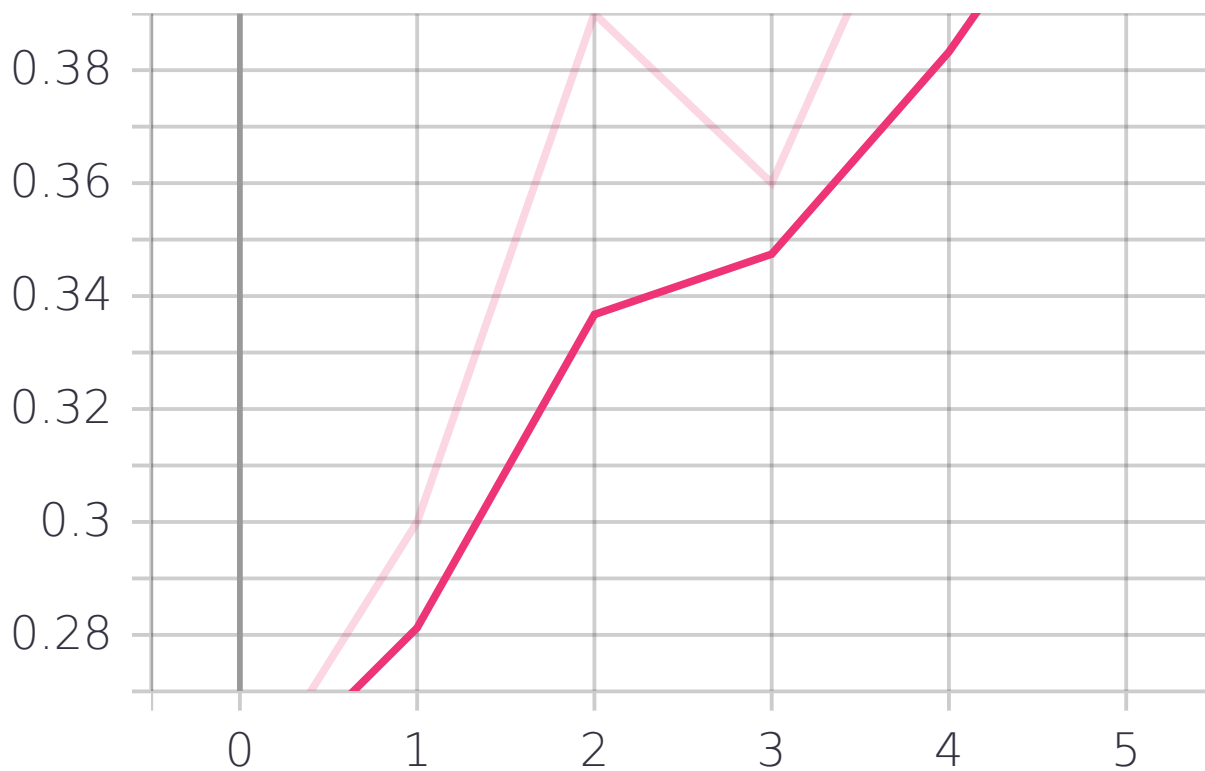
Train Accuracy Plot

image.png

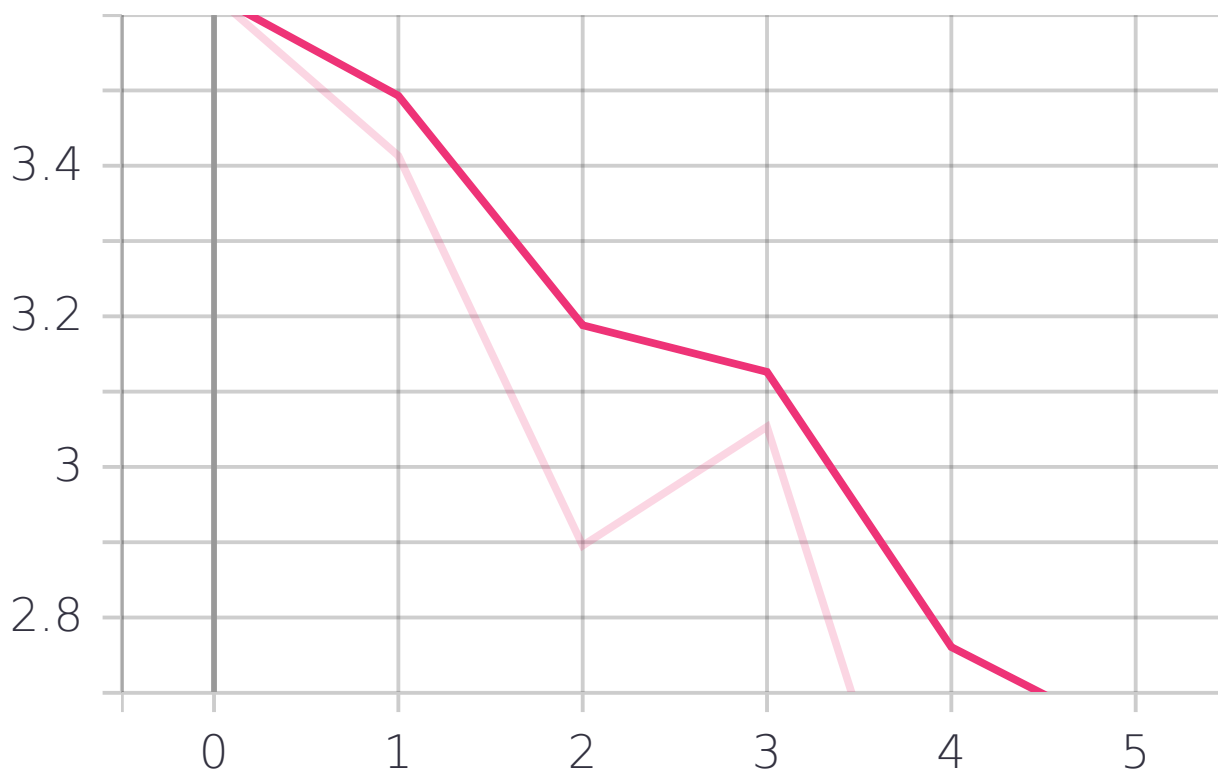
Train Loss Plot

image.png

Test Loss Plot

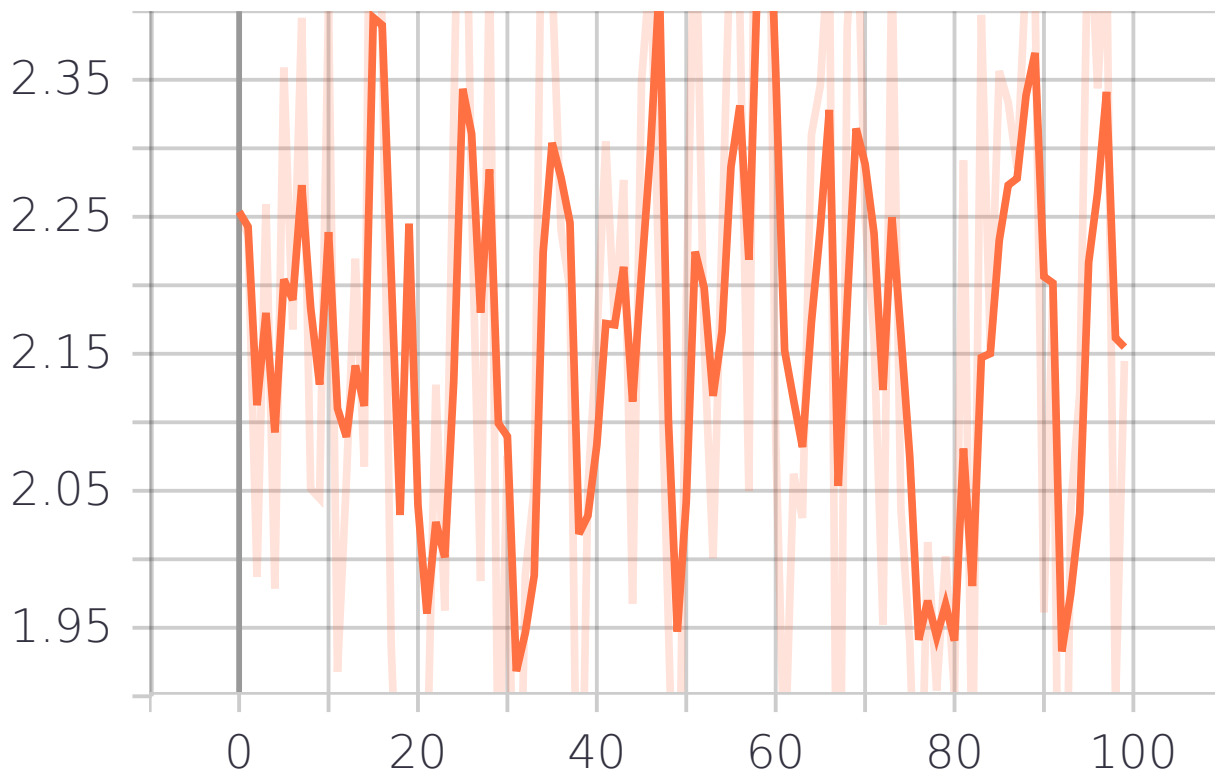


image.png

Test Accuracy - Test Accuracy of the model on all test images: 52.53 % (Only Augmentation)

Normalization

Model Specifications

1. Number of epochs: 6
2. Learning Rate: 0.001
3. Train dataset is halved.
4. Model has been evaluated on all test images (10,000 images)

Train Accuracy Plot

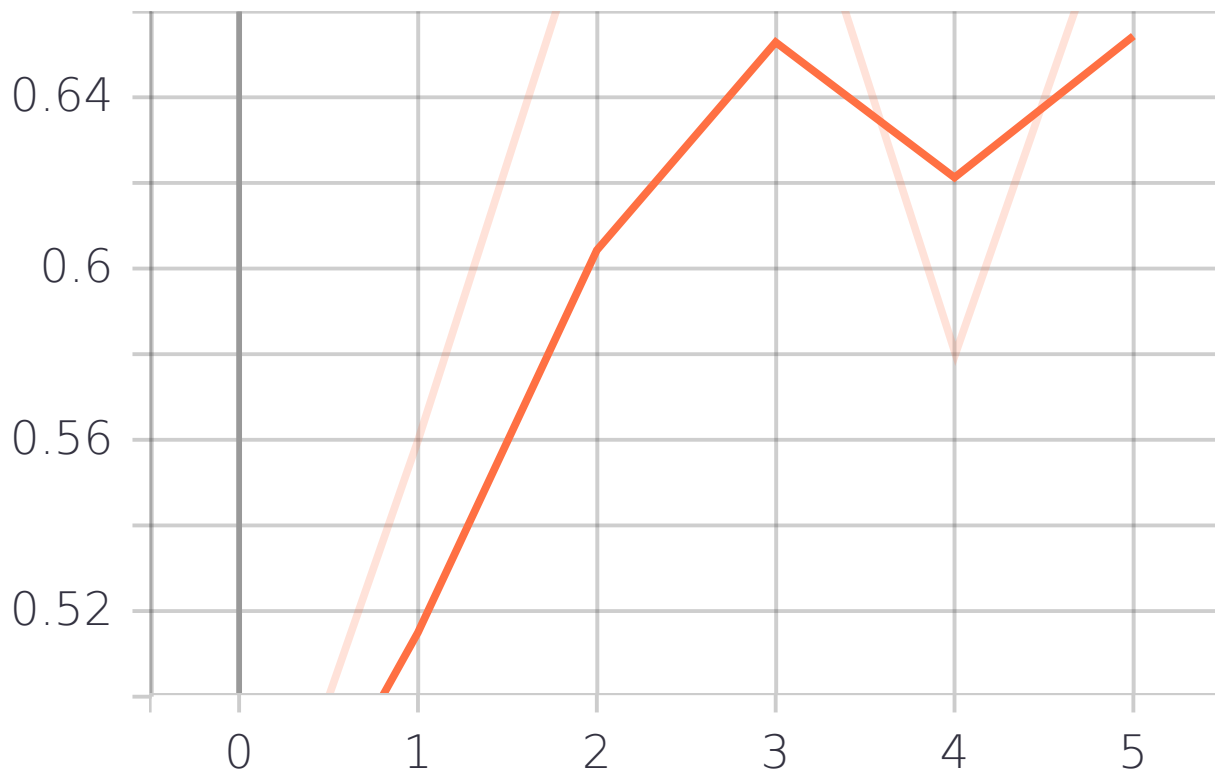


image.png

Train Loss Plot

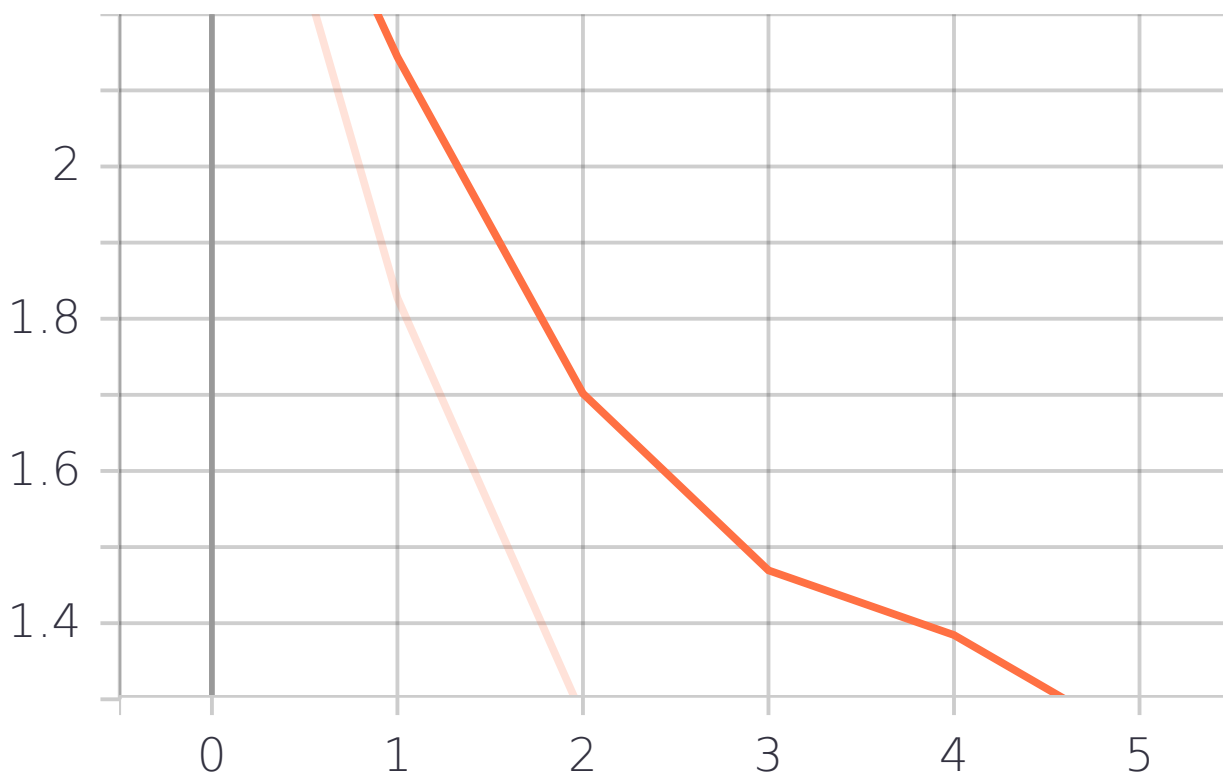


image.png

test loss Plot

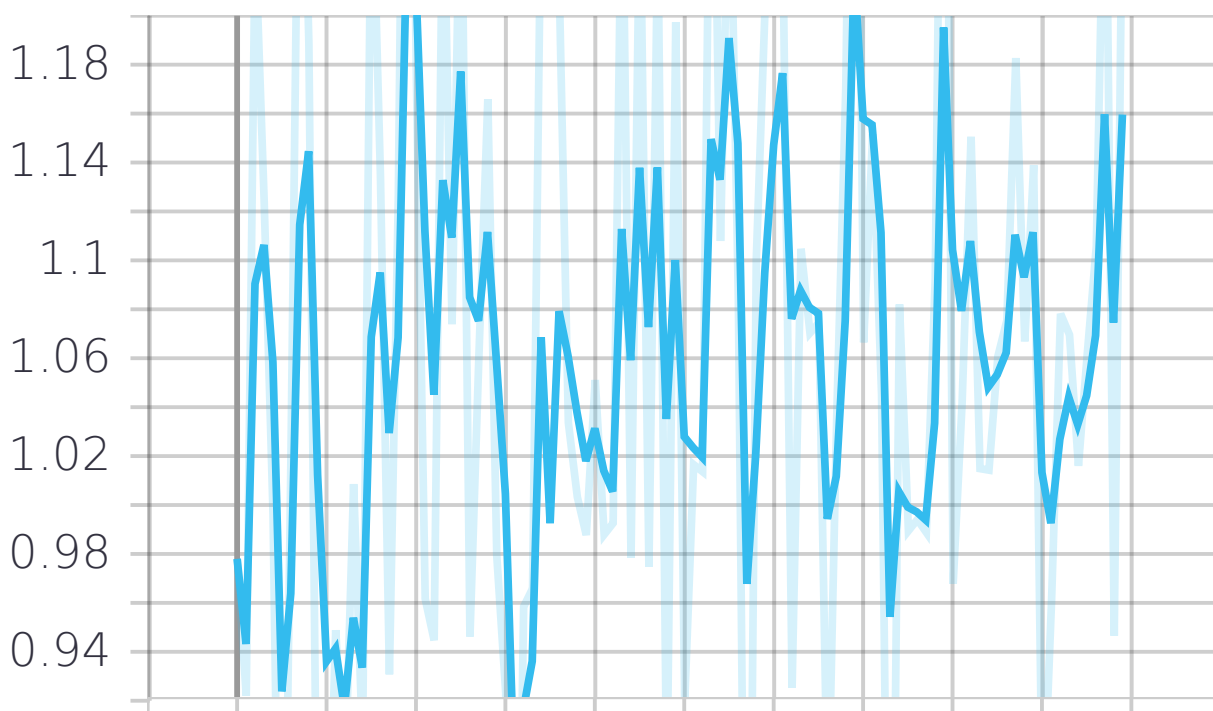


image.png

Test Accuracy of the model on all test images: 61.07 % (NORM)**Comparison with baseline model of train and test accuracies:**

	Baseline	Augmentation	Normalization	Augmentation and Normalization
training Accuracy	70.39%	52.91%	71%	58.06%
test Accuracy	60%	52.53%	61.07%	54.96%

Both Augmentation and normalization**Train Accuracy Plot**

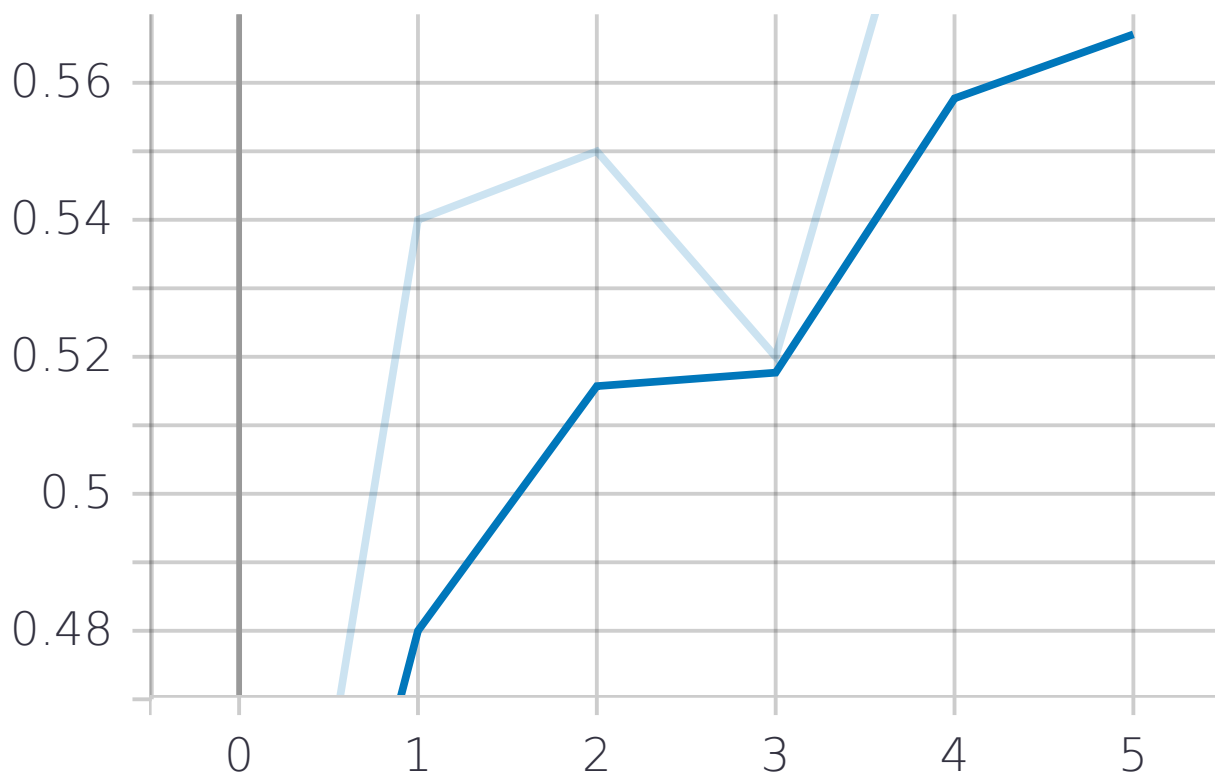


image.png

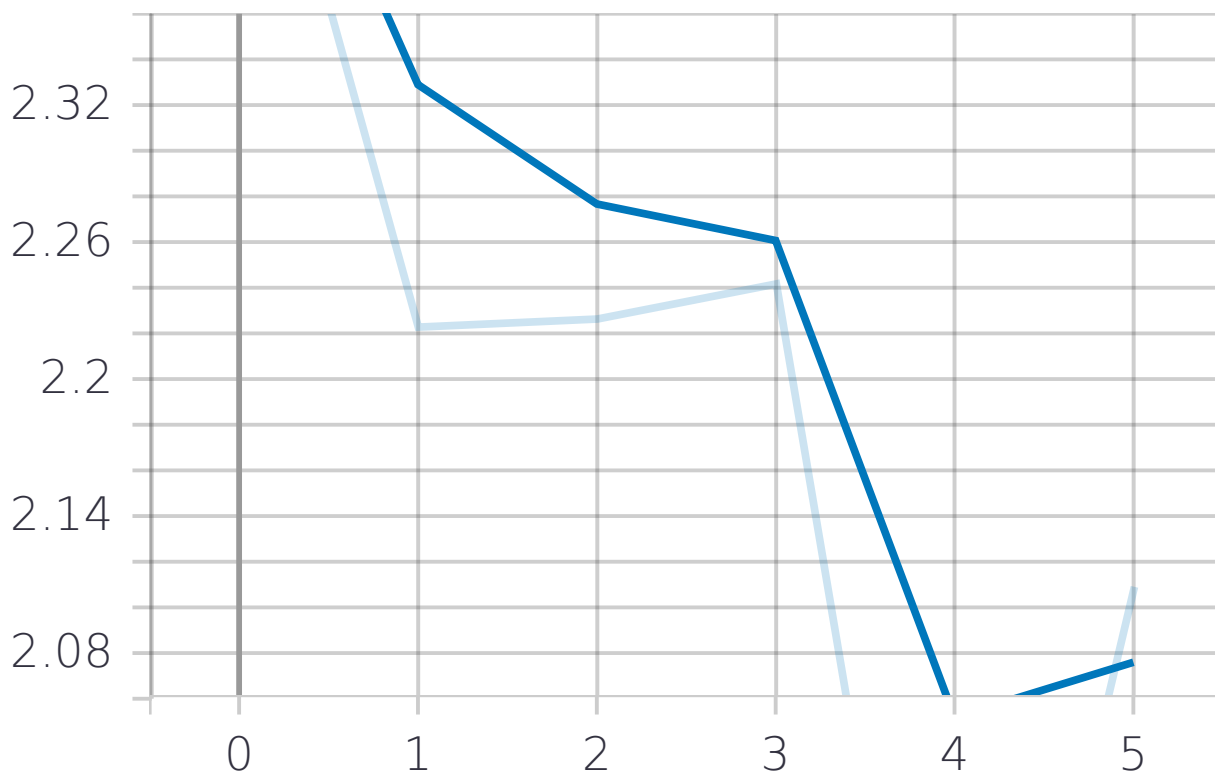
Train Loss Plot

image.png

test loss Plot

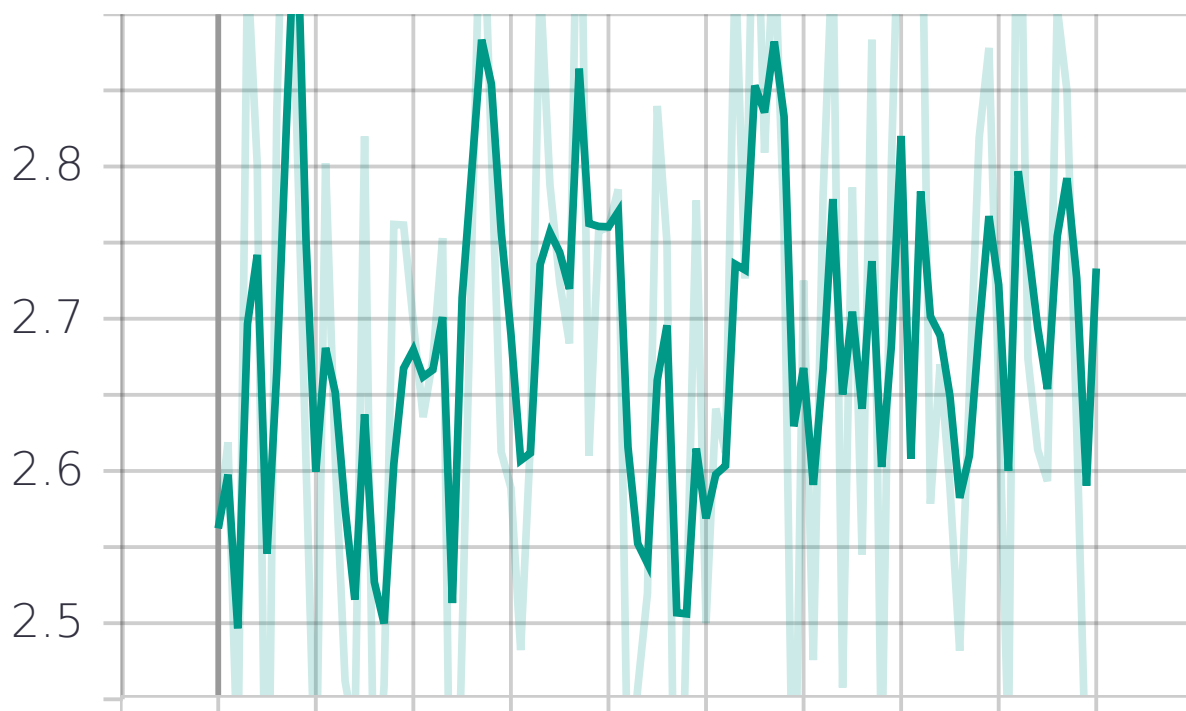


image.png

Test Accuracy on all images: 54.96% (Both AUG and NORM)

Exercise: 3 Regularization

Dropout

- Model Specifications remain same as that of baseline model except Regularization technique.

Train Accuracy Plot

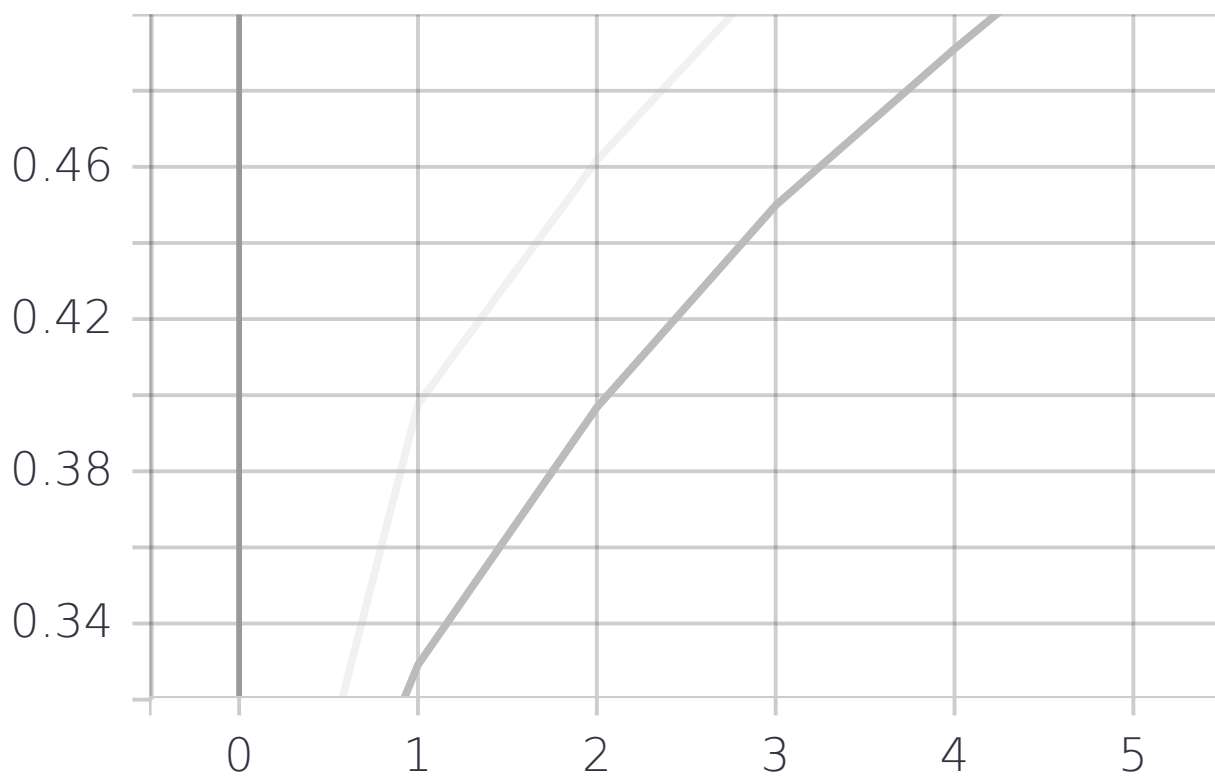


image.png

Train Loss Plot

image.png

image.png

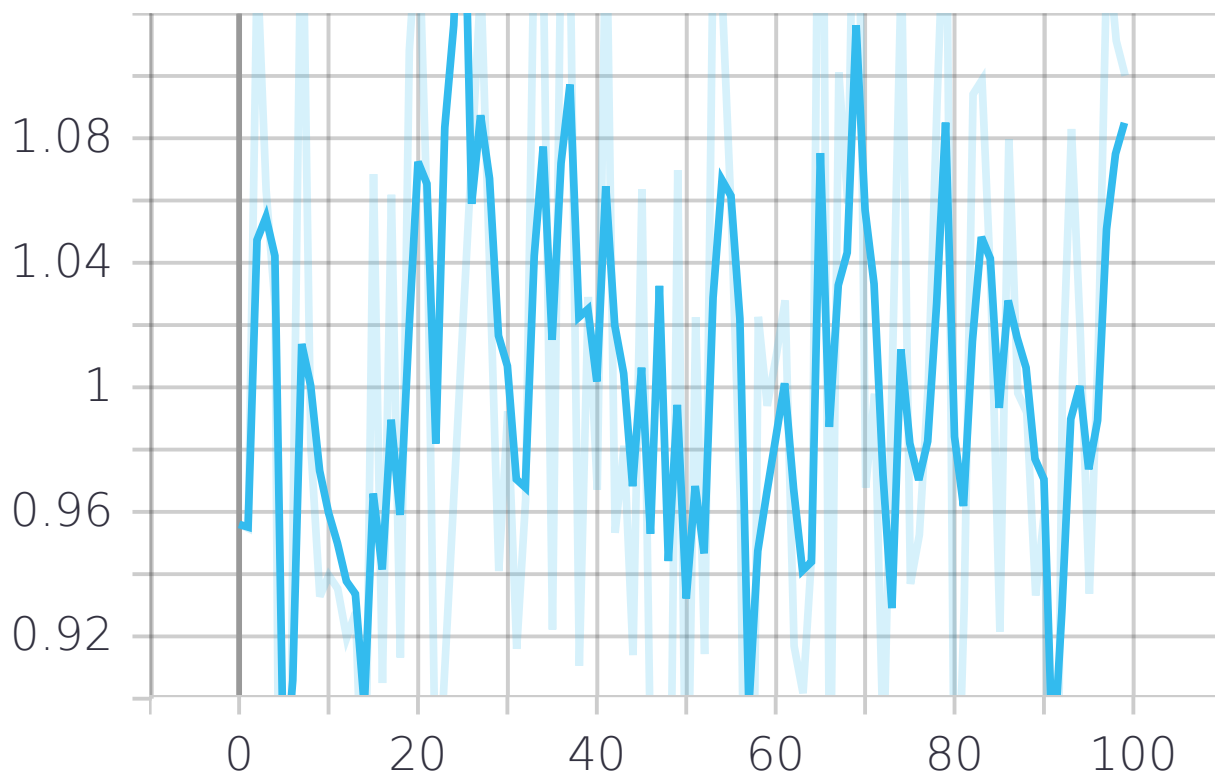
Test Loss Plot

image.png

Test Accuracy for Dropout : 65.93%**Comparison of regularization techniques and baseline model**

	Baseline	Dropout	L1	L2
training Accuracy	70.39%	70.92%	18%	57.52%
test Accuracy	60%	65.93%	19.86%	56.96%

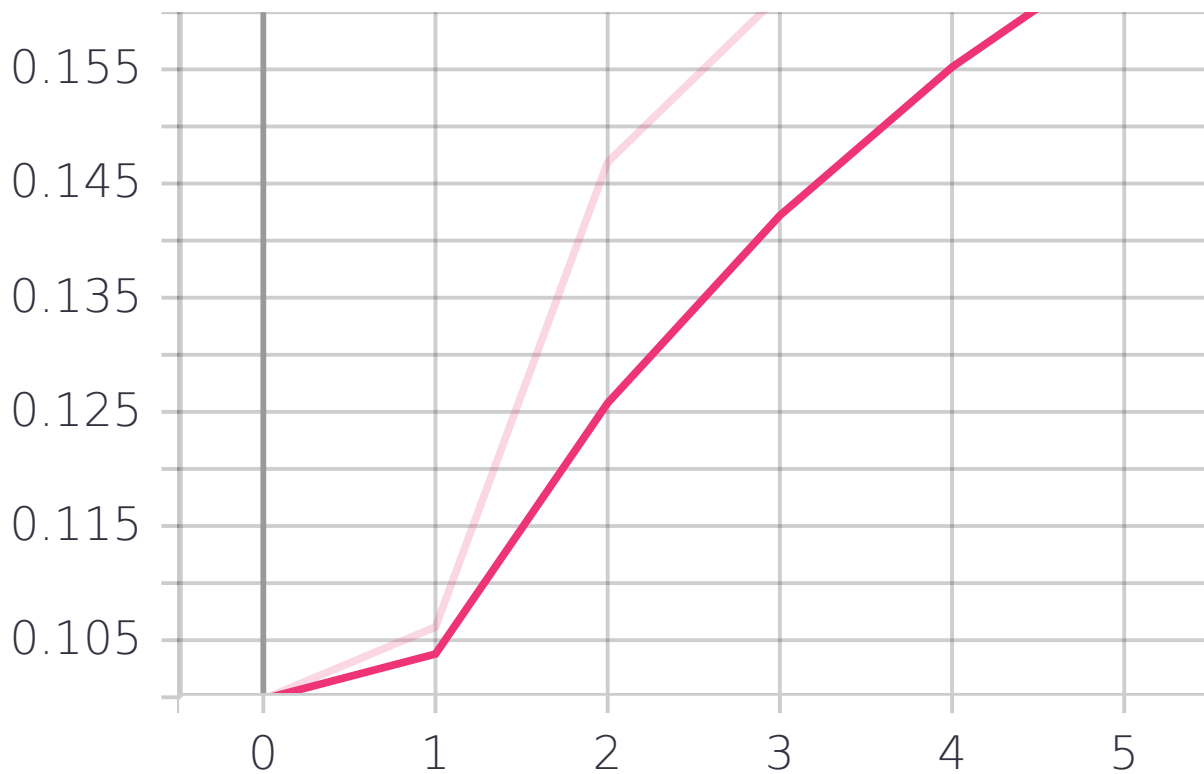
L1 Regularization**Train Accuracy Plot**

image.png

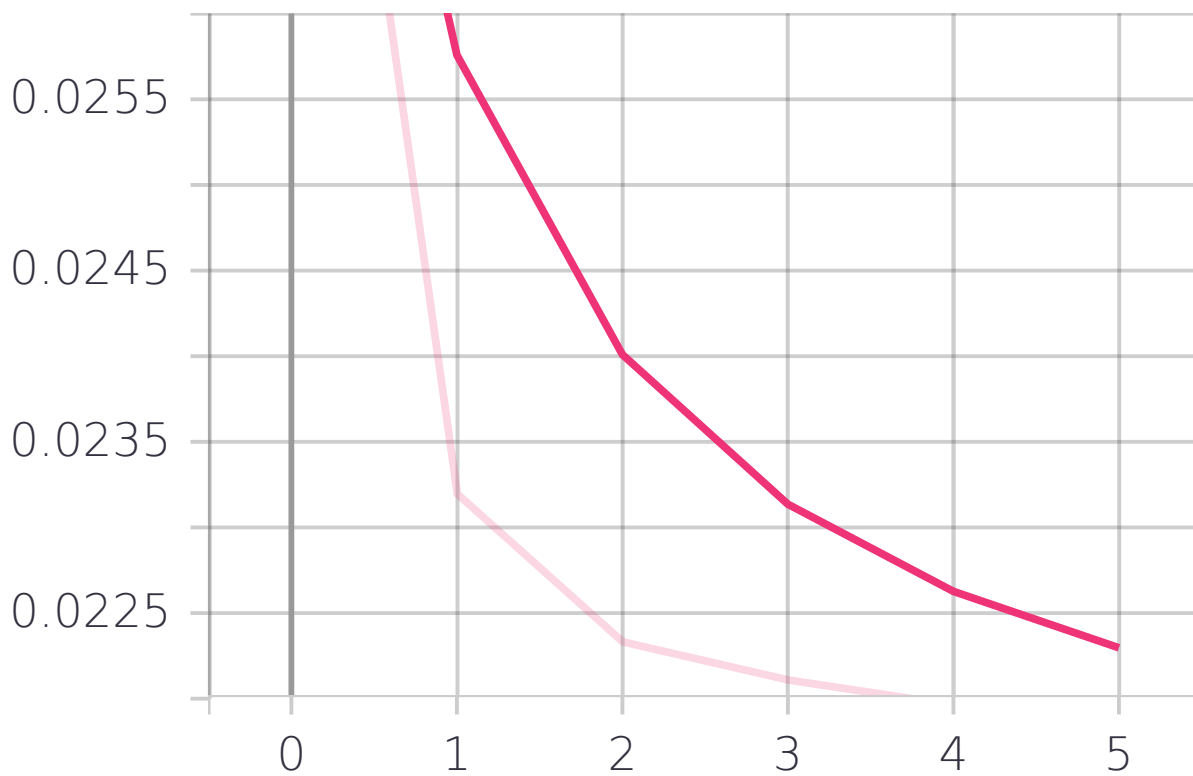
Train Loss Plot

image.png

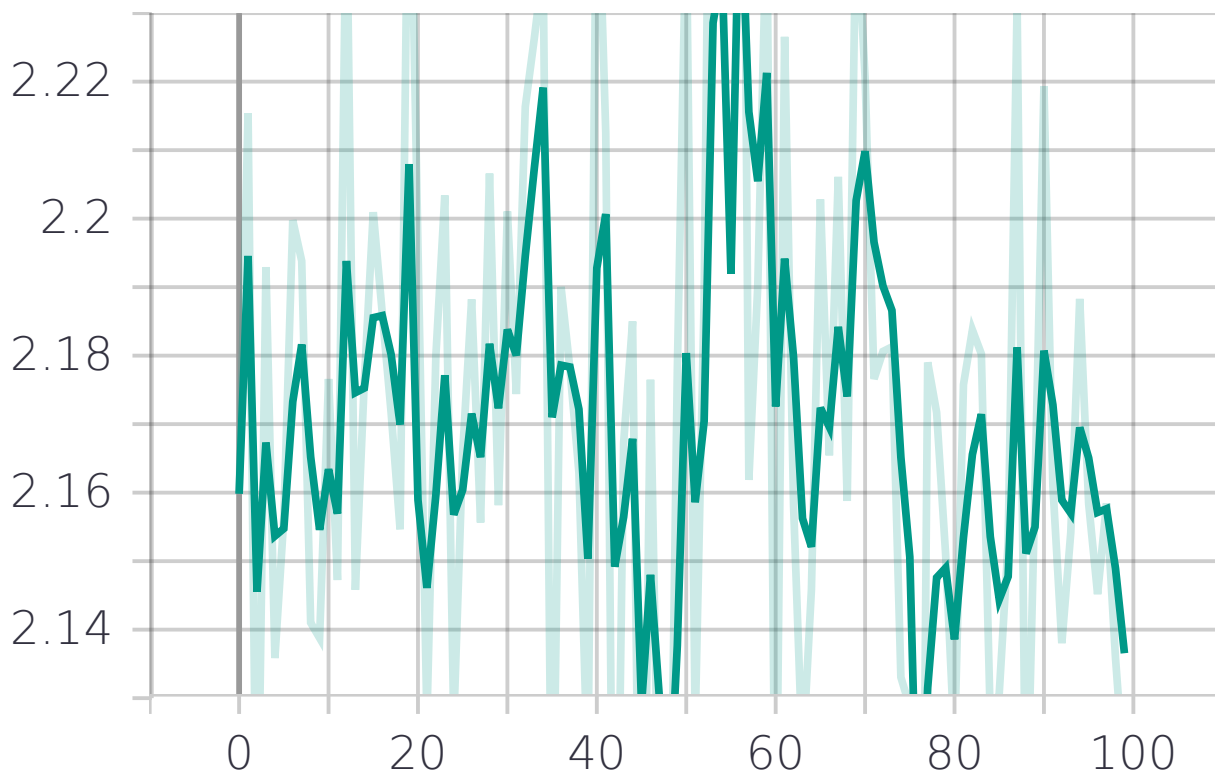
Test Loss Plot

image.png

Test Accuracy for L1 : 19.86%**Test Accuracy Plot**

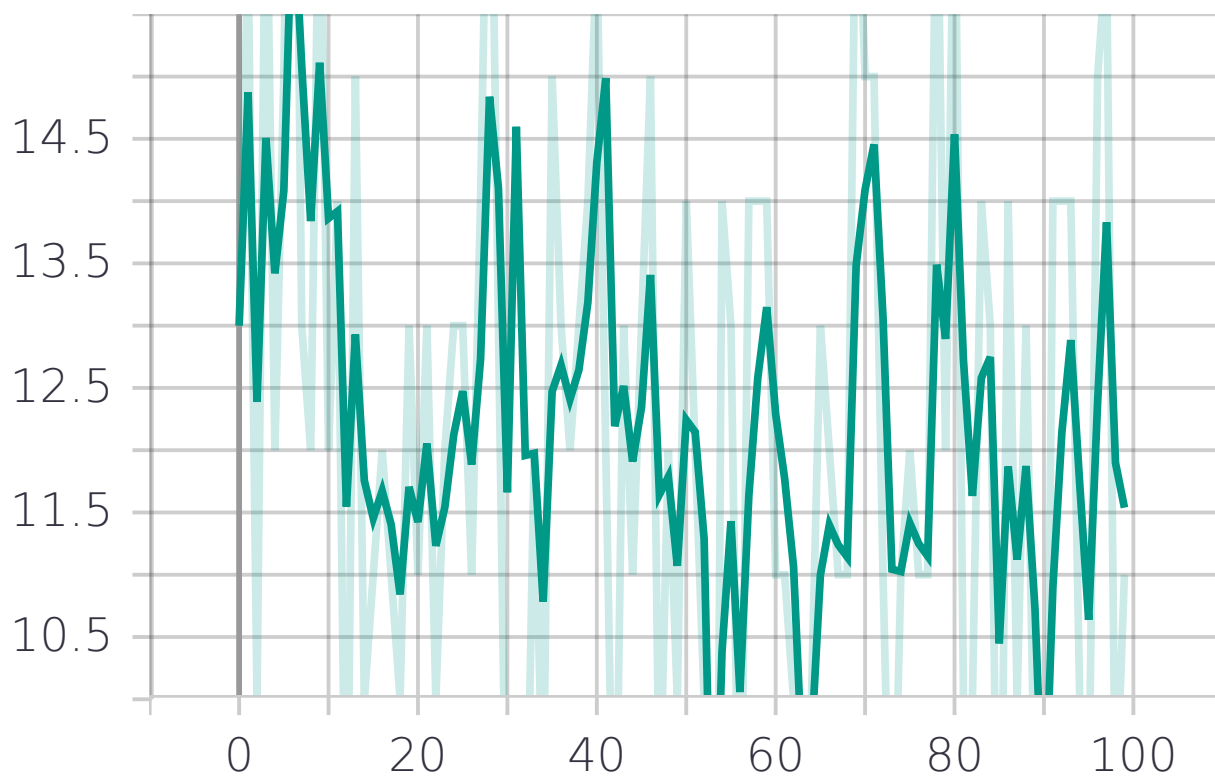


image.png

L2 Regularization

Train Accuracy Plot

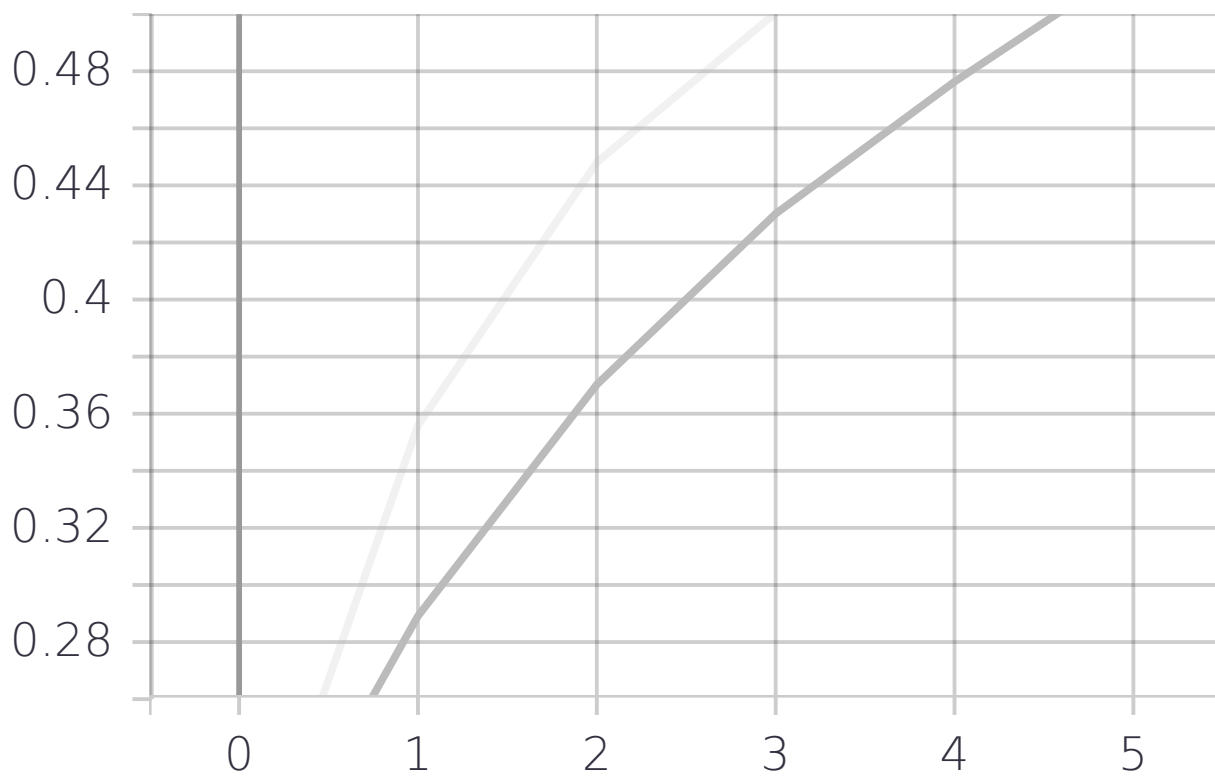


image.png

Train Loss Plot

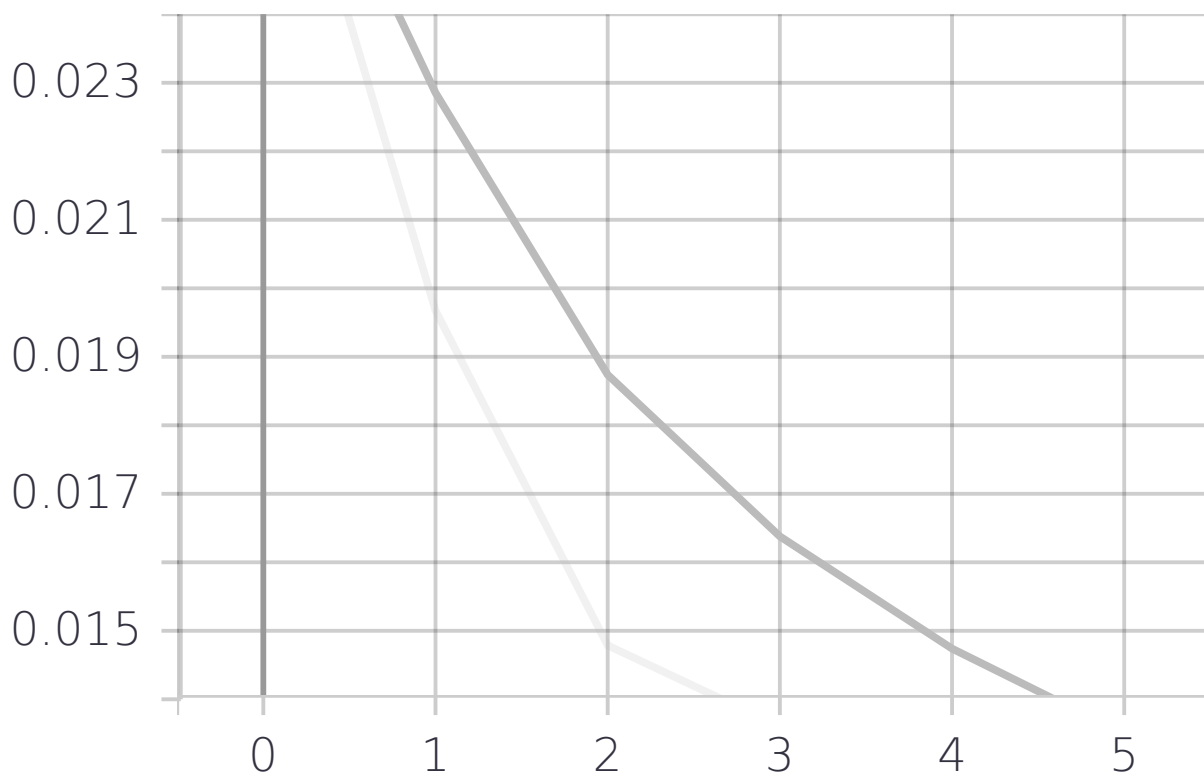


image.png

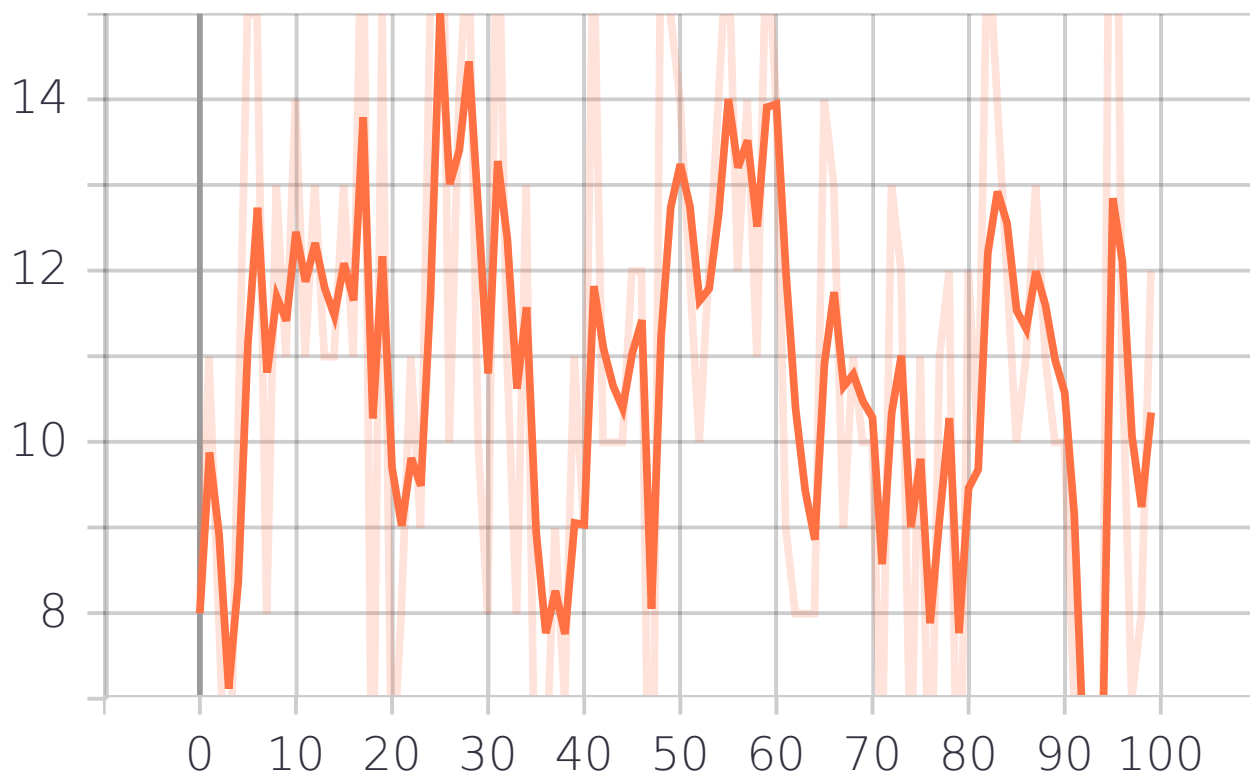
Test Accuracy Plot

image.png

Test Loss Plot

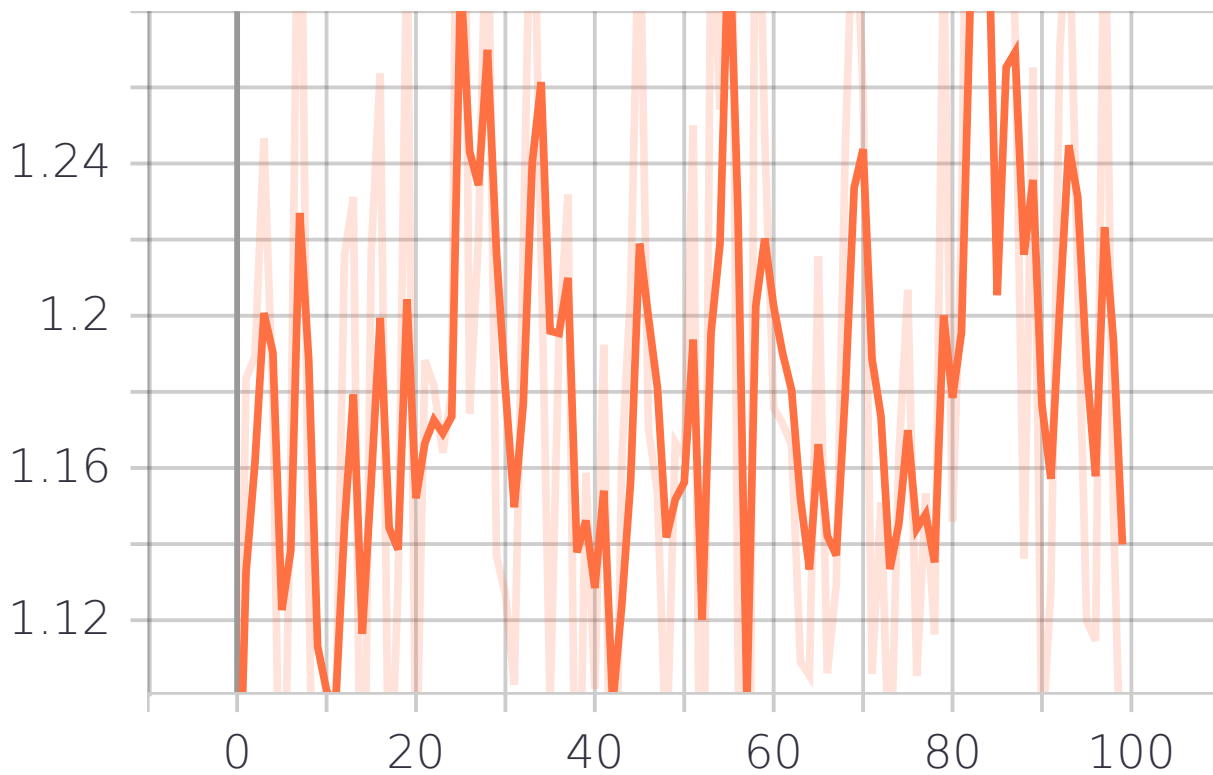


image.png

Exercise: 4 Optimizers

Comparison of Optimizers and baseline model -

	Baseline	lr (0.001), ADAM	lr (0.01), ADAM	lr (0.1), ADAM	lr (0.001) SGD	lr (0.01) SGD	lr (0.1) SGD
training Accuracy	70.39%	56.72%	10.11%	9.9%	23.04%	51.94%	10.06%
test Accuracy	60%	52.53%	10.0%	10.0%	23.58%	52.81%	10.0%

ADAM

Train Accuracy PLOT

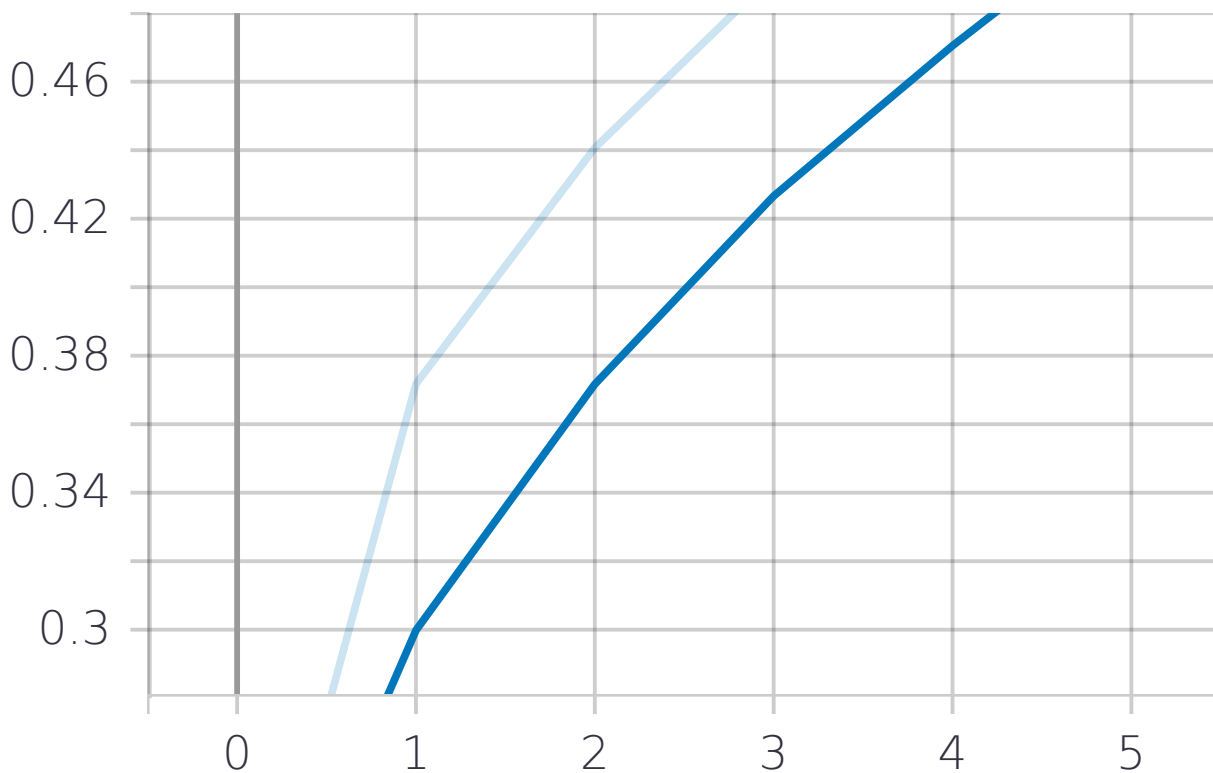


image.png

Train Loss Plot

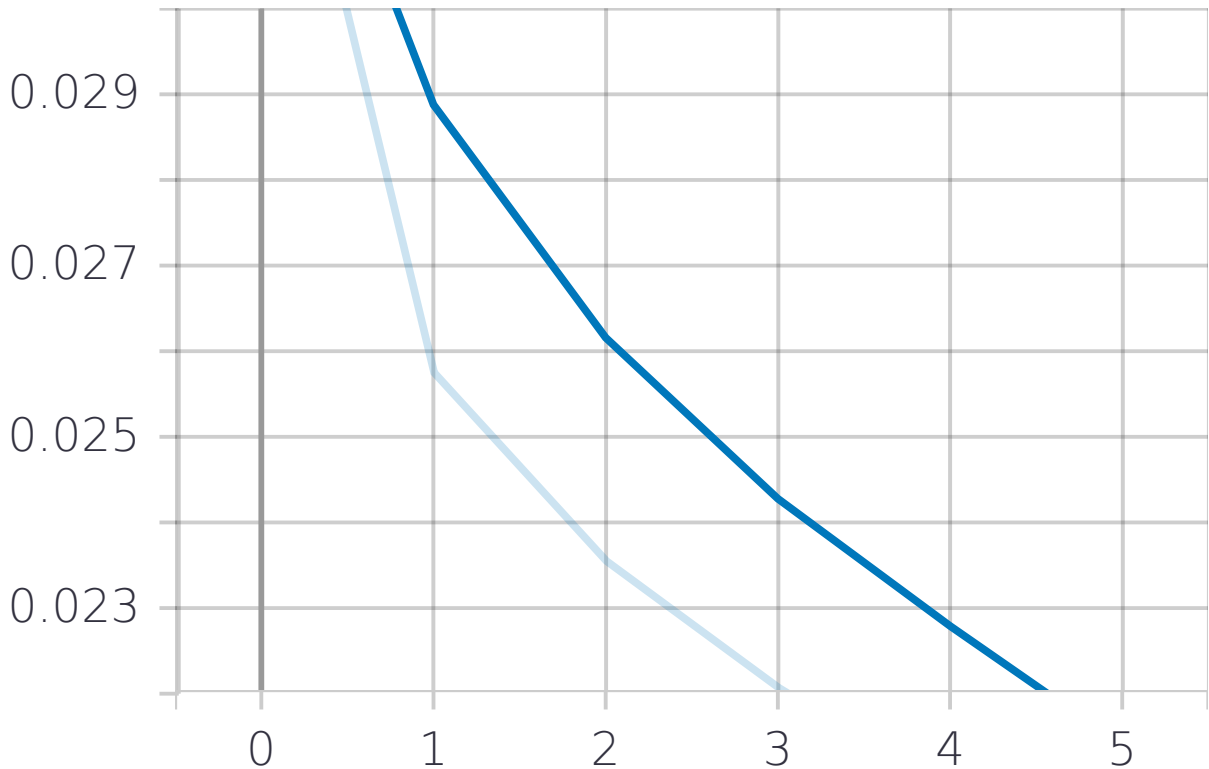


image.png

Test Accuracy Plot

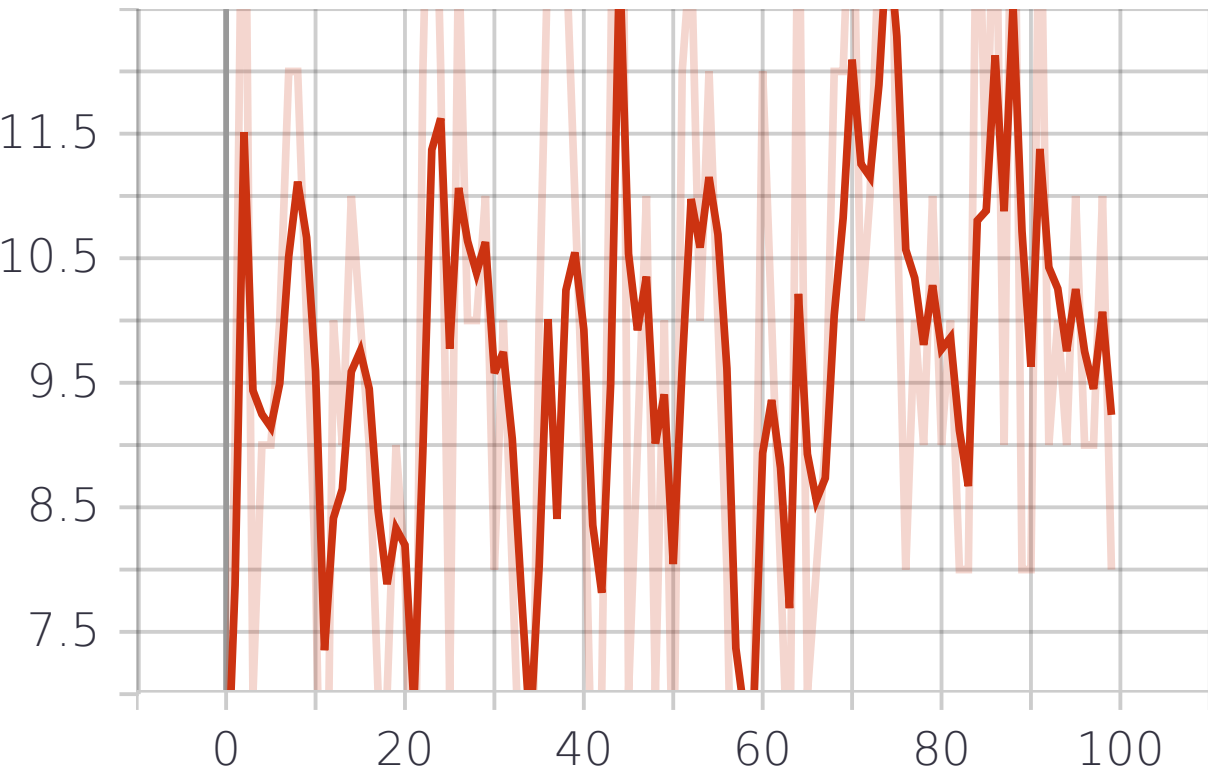


image.png

Test Loss Plot

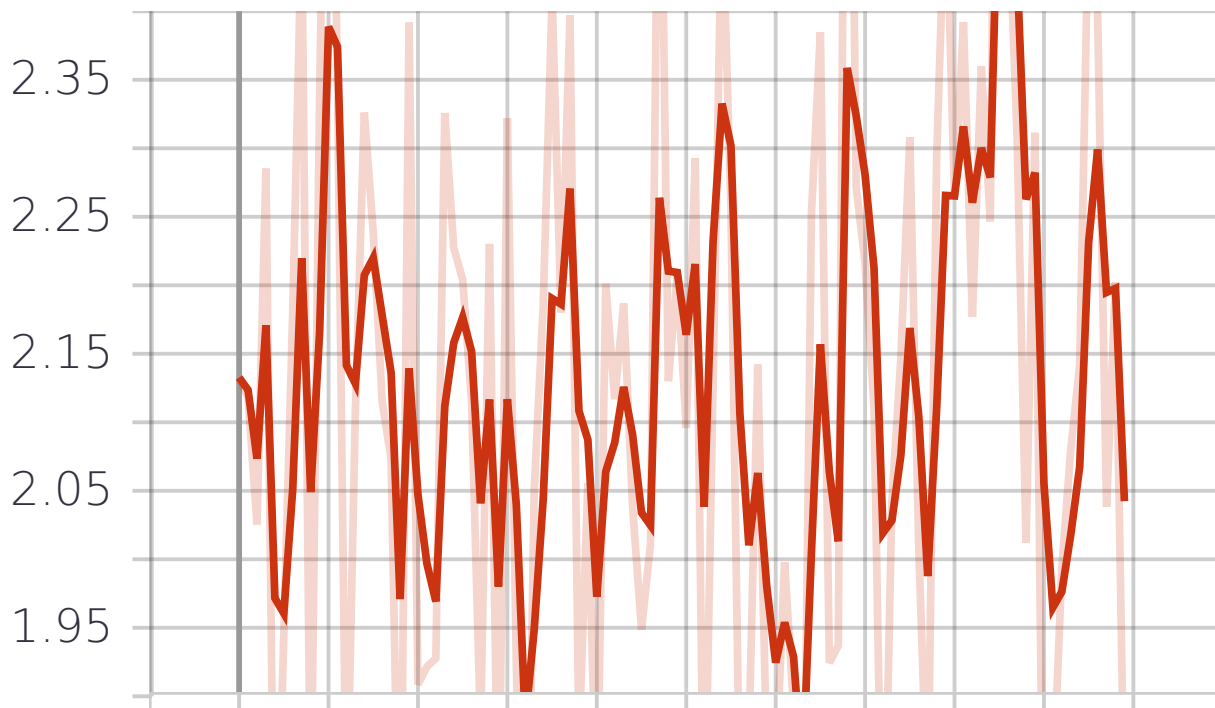


image.png

Accuracy and loss values for different learning rates for ADAM -

lr	accuracy	loss
0.0010000	0.20348	0.069864
0.0010000	0.40492	0.059705
0.0010000	0.47276	0.055181
0.0010000	0.17592	0.035103
0.0010000	0.32536	0.029789
0.0010000	0.42876	0.024277
0.0010000	0.48752	0.022478
0.0010000	0.52764	0.021058
0.0010000	0.56168	0.019815
0.010000	0.097320	0.042004
0.010000	0.10128	0.033013
0.010000	0.10240	0.032744
0.010000	0.10276	0.032709
0.010000	0.10112	0.032688
0.010000	0.10108	0.032675
0.10000	0.099440	4213.2
0.10000	0.10072	0.028628
0.10000	0.098960	0.028600
0.10000	0.098360	0.028612
0.10000	0.099480	0.028592

image.png

SGD Optimizer**Train Accuracy Plot**

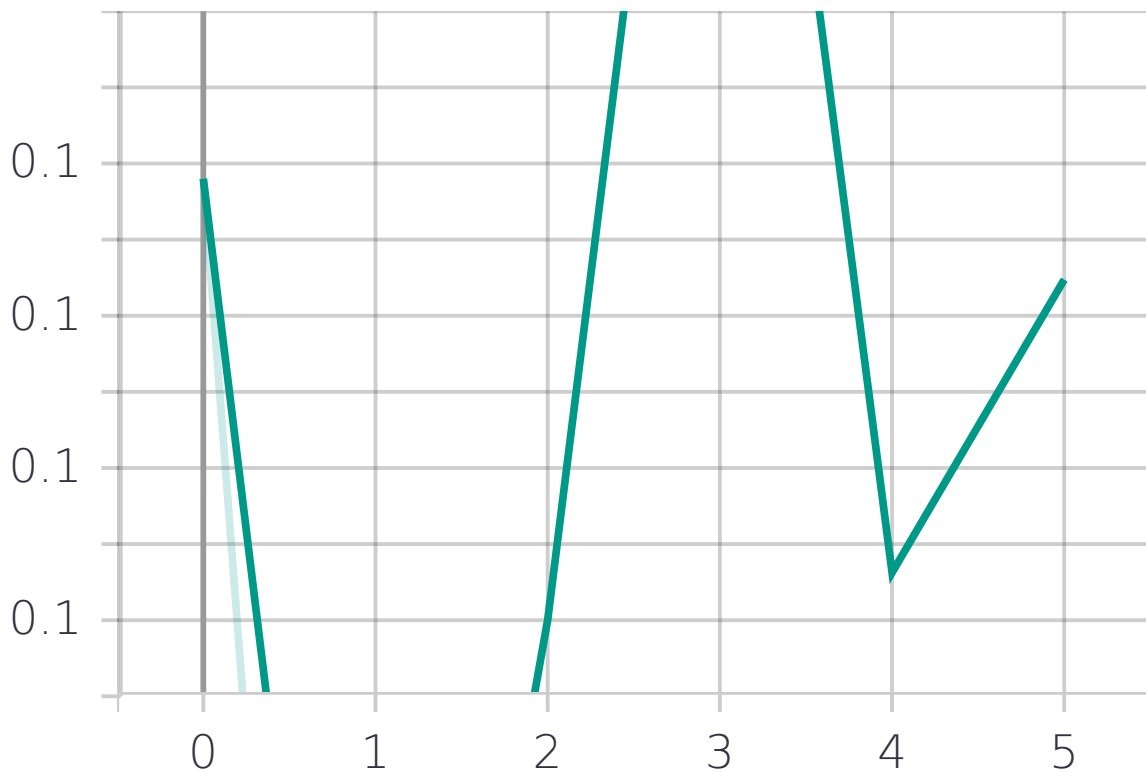


image.png

Train Loss Plot

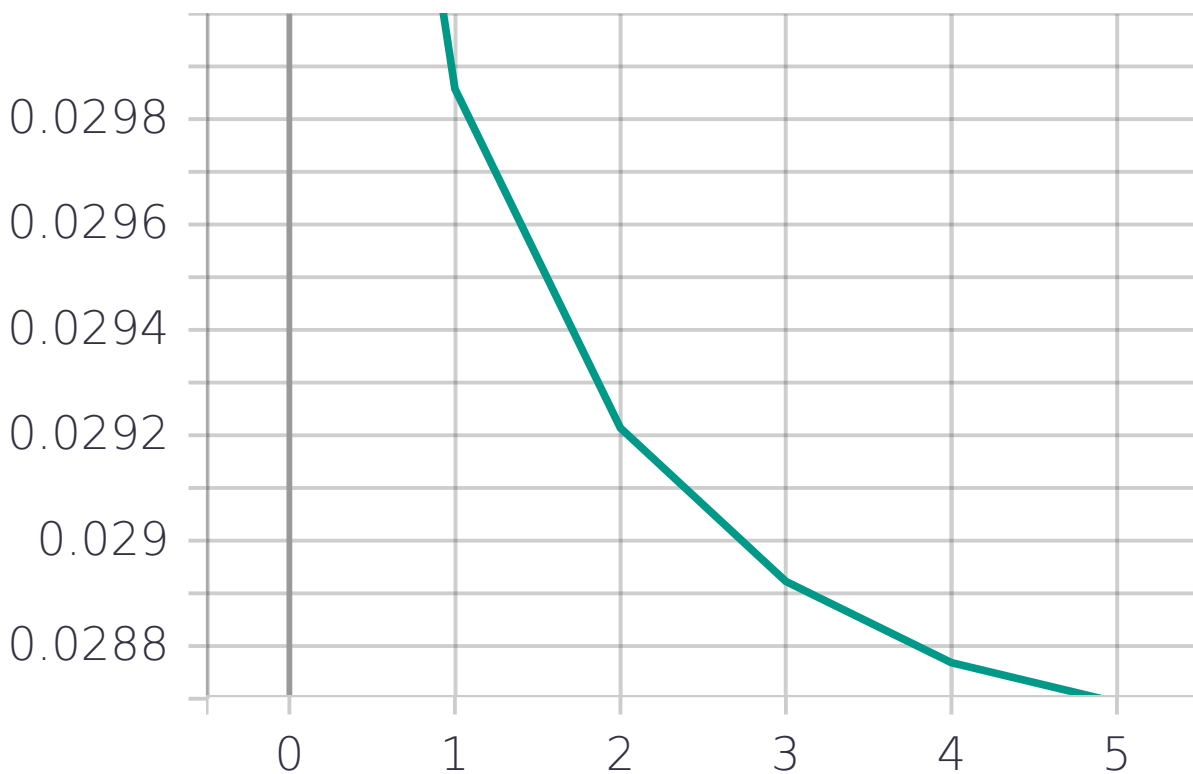


image.png

Accuracy and loss values for different learning rates for SGD -

lr	accuracy	loss
0.10000	0.099480	0.028592
0.10000	0.099000	0.028592
0.0010000	0.096720	0.047369
0.0010000	0.13752	0.037078
0.0010000	0.15688	0.035934
0.0010000	0.16516	0.035706
0.0010000	0.19192	0.035328
0.0010000	0.23036	0.034429
0.010000	0.10172	0.038912
0.010000	0.17672	0.034629
0.010000	0.26364	0.027562
0.010000	0.39276	0.016343
0.010000	0.45684	0.014737
0.010000	0.51936	0.013318
0.10000	0.10044	0.031915
0.10000	0.098960	0.028623
0.10000	0.10076	0.028596
0.10000	0.10212	0.028580
0.10000	0.099040	0.028567
0.10000	0.10064	0.028589

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