

Image Classification

Model Architecture

[32X32X3] : INPUT

[28X28X16] : CONV1 : 16 5X5 filters at stride 1 and padding 0

[14X14X16] : MAXPOOL1 : 2X2 filters at stride 2

[12X12X32] : CONV2 : 32 3X3 filters at stride 1 and padding 0

[10X10X64] : CONV3 : 64 3X3 filters at stride 1 and padding 0

[5X5X64] : MAXPOOL3 : 2X2 filters at stride 2

[1600]: FC4 : 1600 Neurons

[400]: FC5 : 400 Neurons

[10]: FC6 : 10 Neurons (Class scores)

Dataset: CIFAR10

Training Data : 3 batches of 10000 images each with assigned labels

Test Data: 1 batch of 10000 images with assigned labels

Additional Test Data: 1 batch of 10000 images with assigned labels

- * Each batch of train and test dataset contains RGB [32X32] images belonging to one of the 10 specified categories.
- * Number of images belonging to each category are equal in both train and test datasets

Hyperparameters

- ✱ Number of classes : 10
- ✱ Batch Size : 100
- ✱ Number of Epochs : 5/10/15/20
- ✱ Learning Rate : 0.01/0.001/0.0005

- ✱ Loss function: Categorical cross-entropy
- ✱ Optimiser : ADAM

Training Accuracy

Variation of Learning Rate / Fixed Epochs : 10

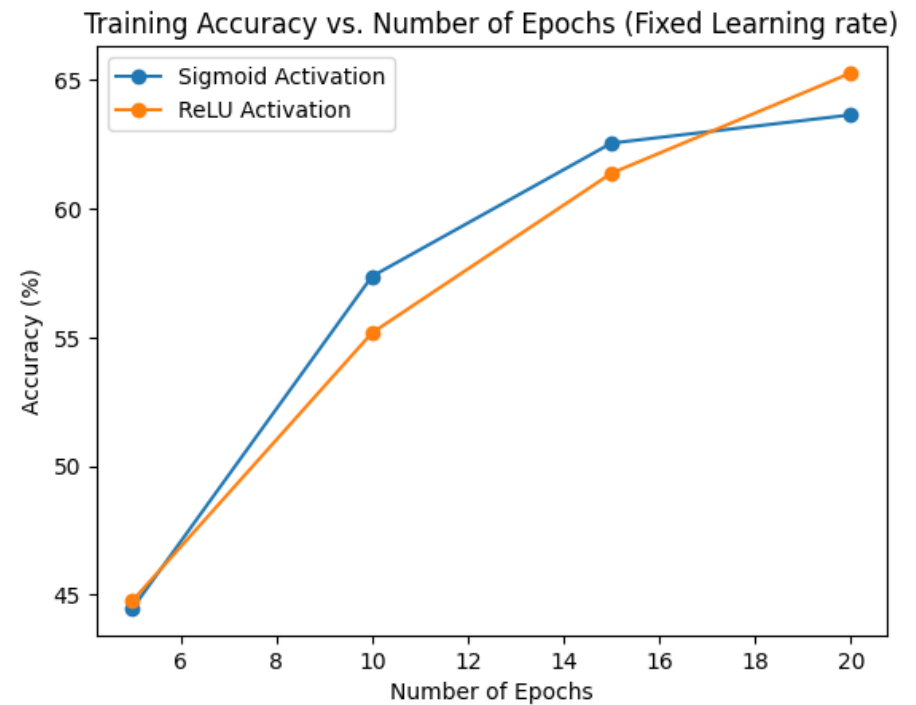
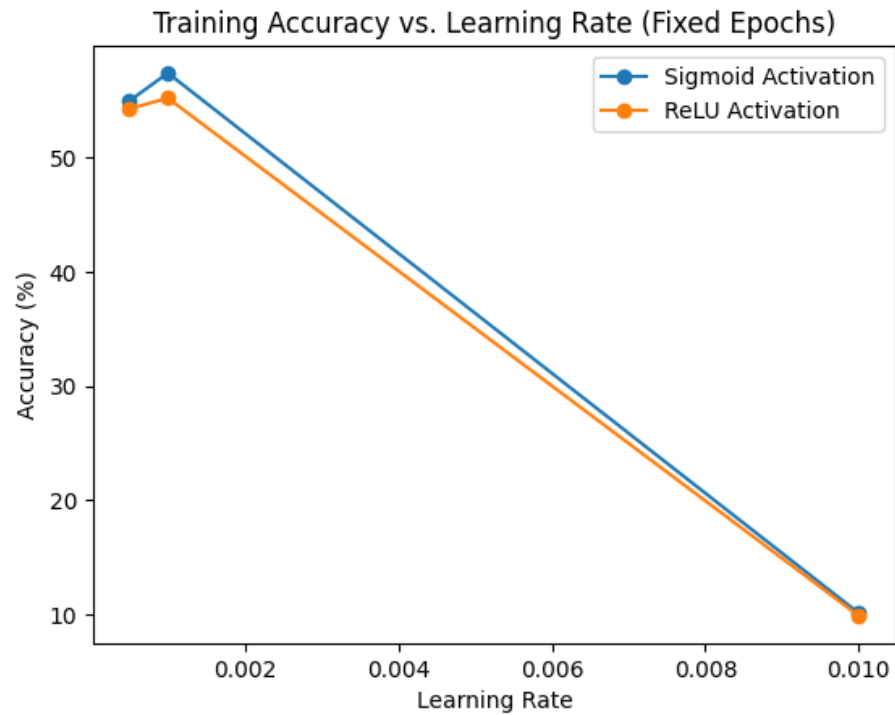
Learning Rate	Sigmoid Activation	ReLU Activation
0.01	10.14%	9.91%
0.001	57.37%	55.17%
0.0005	54.94%	54.25%

Training Accuracy

Variation of Epochs/ Fixed Learning Rate : 0.001

Number of Epochs	Sigmoid Activation	ReLU Activation
5	44.46%	44.76%
10	57.37%	55.17%
15	62.55%	61.38%
20	63.65%	65.28%

Training Accuracy



Testing Accuracy

Variation of Learning Rate / Fixed Epochs : 10

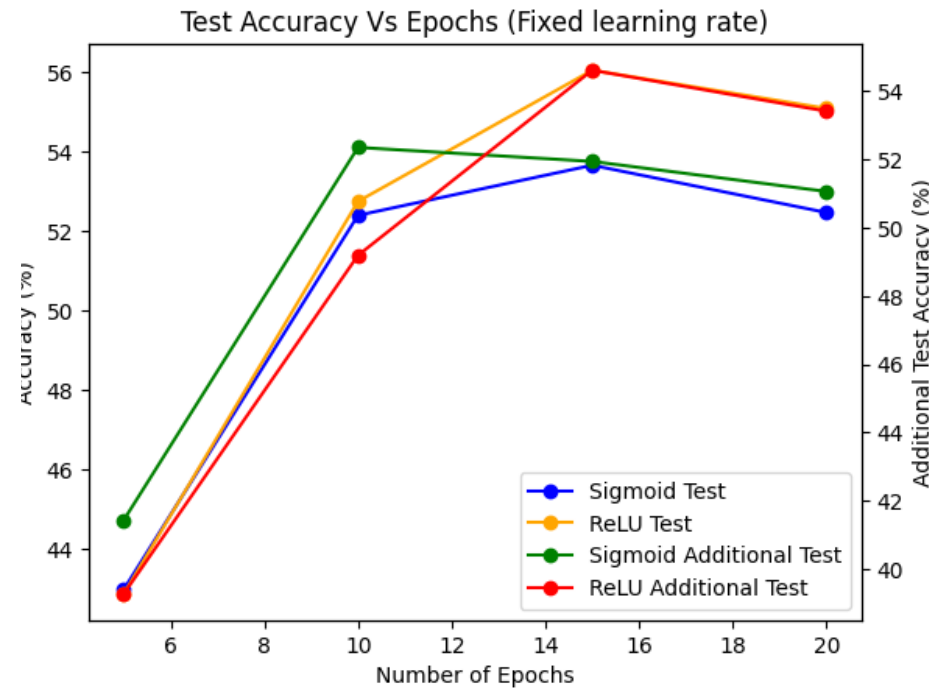
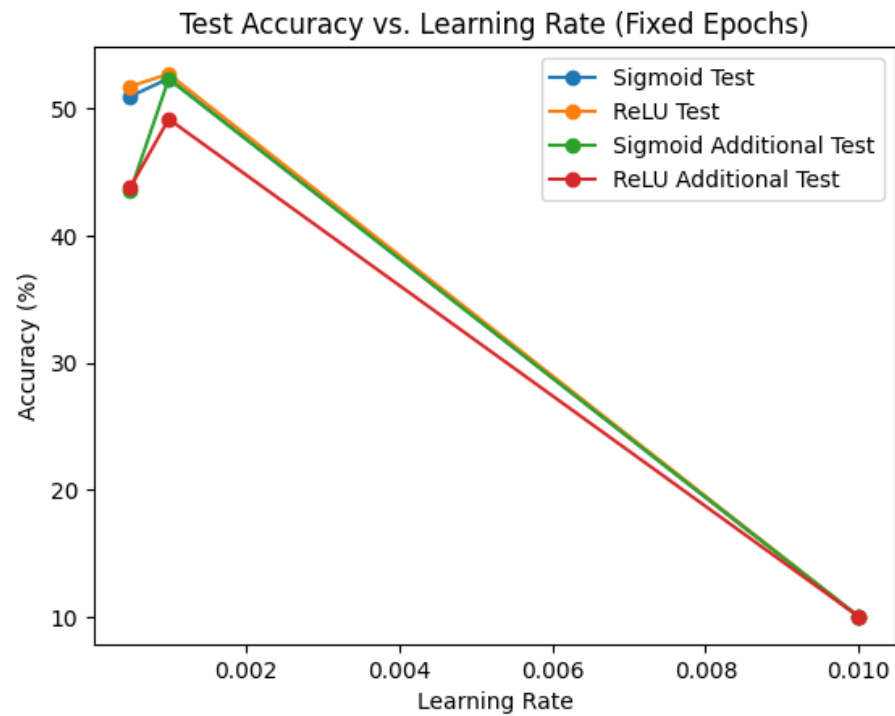
Learning Rate	Sigmoid Activation	ReLU Activation
0.01	Test: 10.0%	Test: 10.0%
	Additional Test: 10.0%	Additional Test: 10.0%
0.001	Test: 52.39%	Test: 52.74%
	Additional Test: 52.35%	Additional Test: 49.19%
0.0005	Test: 50.98%	Test: 51.77%
	Additional Test: 43.52%	Additional Test: 43.82%

Testing Accuracy

Variation of Epochs/ Fixed learning rate : 0.001

Number of Epochs	Sigmoid Activation	ReLU Activation
5	Test: 42.98%	Test: 42.87%
	Additional Test: 41.44%	Additional Test: 39.28%
10	Test: 52.39%	Test: 52.74%
	Additional Test: 52.35%	Additional Test: 49.19%
15	Test:53.65%	Test:56.04%
	Additional Test:51.94%	Additional Test:54.61%
20	Test:52.46%	Test: 55.08%
	Additional Test:51.06%	Additional Test: 53.41%

Testing Accuracy



Takeaways

- ✱ 0.1 Learning rate is too high; model is essentially guessing while 0.0005 learning rate is too slow.
- ✱ 0.001 seems appropriate learning rate
- ✱ For Test accuracy 15 epochs of training is best; however train accuracy is greatest for 20 epochs (possibly due to overfitting).
- ✱ ReLU activation works better than Sigmoid Activation for the specified task.