CSE – 575

Spring 2020

Project 3 – Classification Using Neural Networks and Deep learning

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Introduction

The objective of this project is to implement Convolution Neural Network (CNN) on images from the MNIST dataset.

The MNIST dataset has

- 60000 training samples – 10 handwritten digits; each digit has 6000 training samples
- 10000 validation samples – 10 handwritten digits; each digit has 1000 samples.

The model is trained for 12 epoches.

Baseline Code – STRATEGY 1

Given kernel Size for this strategy is 3*3.

Input Dimension: (28,28,1)

Kernel Size: 3*3

Feature Maps: 6

Stride: 1

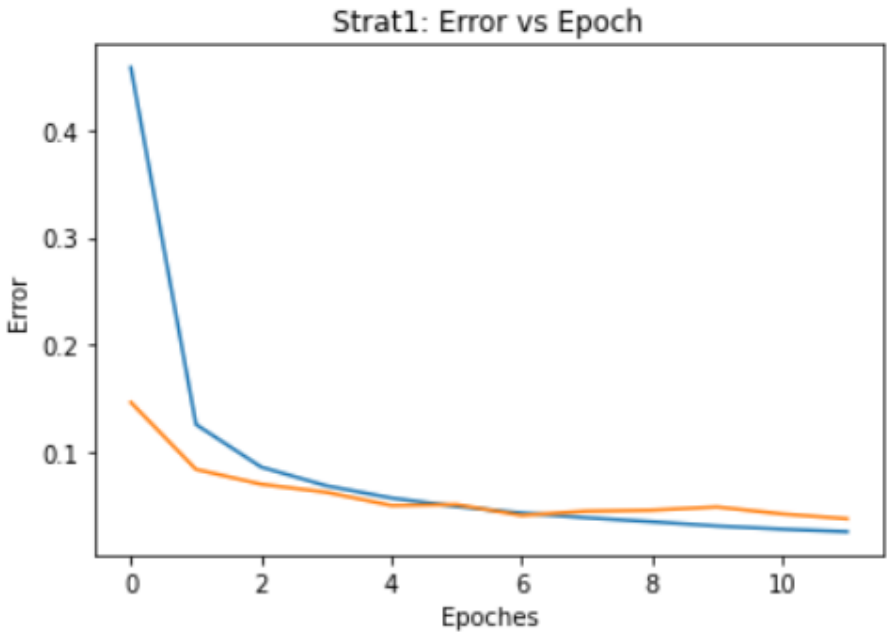
Activation: relU

RESULTS:

- **Test Loss:** `0.043279333824937934`
- **Test Accuracy:** `0.9868999719619751`

PLOT:

*Key: **blue line** is the train data; **orange line** is the text data*



5 * 5 Kernel Size – STRATEGY 2

For this strategy, the kernel size is increased from 3*3 to 5*5

Input Dimension: (28,28,1)

Kernel Size: 5*5

Feature Maps: 6

Stride: 1

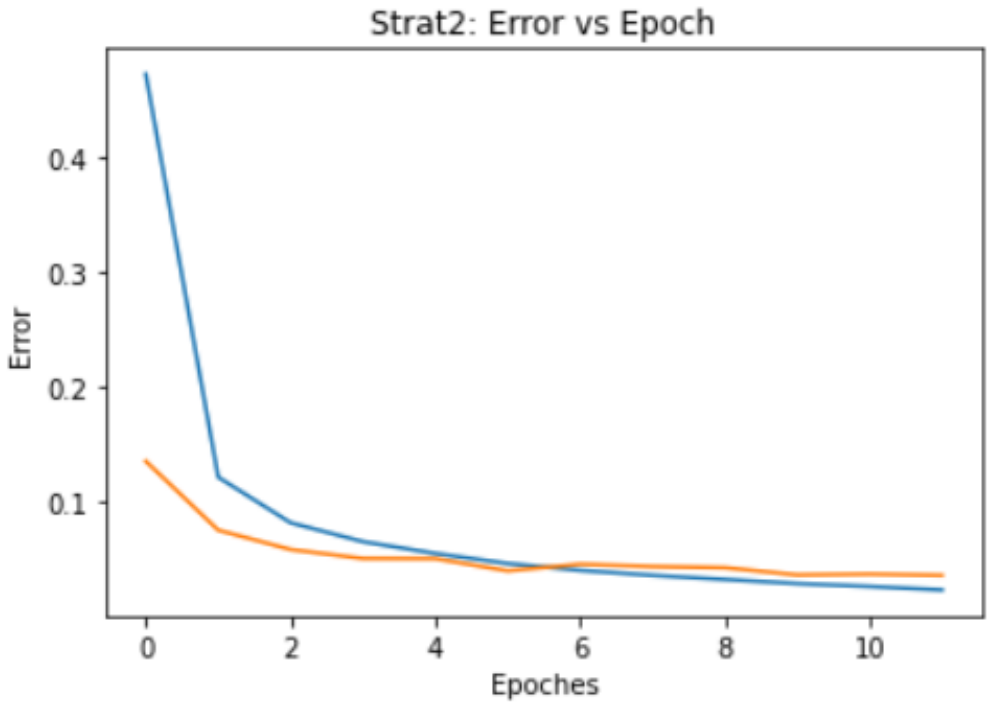
Activation: relU

RESULTS:

- **Test Loss:** `0.036271140560423375`
- **Test Accuracy:** `0.9876999855041504`

PLOT:

*Key: **blue line** is the train data; **orange line** is the text data*



Changing Feature Maps – STRATEGY 3

The kernel size is kept at 5 * 5 and we change the features from to 20.

Input Dimension: (28,28,1)

Kernel Size: 5*5

Feature Maps: 20

Stride: 1

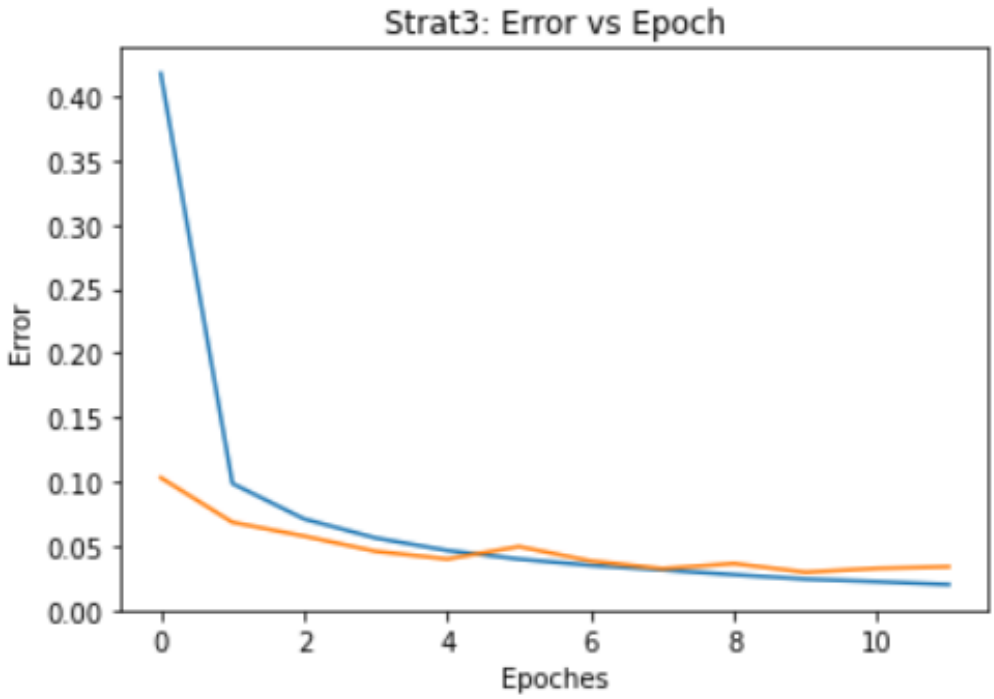
Activation: relU

RESULTS:

- **Test Loss:** `0.0336128990590063`
- **Test Accuracy:** `0.9889000058174133`

PLOT:

*Key: **blue line** is the train data; **orange line** is the text data*



RESULTS

STRATEGY	TEST LOSS	TEST ACCURACY
Strategy1	0.03777911817478889	0.9884999990463257
Strategy2	0.036271140560423375	0.9876999855041504
Strategy3	0.0336128990590063	0.9889000058174133

OBSERVATION

1. From the above table, we can see that the accuracy for **strategy 3** is highest, followed by **strategy 2** and then **strategy1.**
2. Also looking at the plots, the loss plot for train data starts higher than test data. At the end of the 12th epoch, the train data has lower loss than the test data. This is due to the overfitting of the training model.