AMERICAN INTERNATIONAL UNIVERSITY-BANGLADESH

MIDTERM PROJECT

COMPUTER VISION AND PATTERN RECOGNITION

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SECTION : A

Answer To the question no 3

Report based on Question no 2.

Abstract:-

In this report, I implement CNN architecture to classify the MNIST hand written dataset. To classify the MNIST dataset, I use 3 types of optimizer (ADAM, SGD, RMSProp).

In this report, we check different optimizer accuracy (ADAM, SGD & RMSProp).

Introduction:-

Optimizers are algorithms or methods used to change the attributes of your neural network such as weights and learning rate in order to reduce the losses. Optimizers help to get results faster.

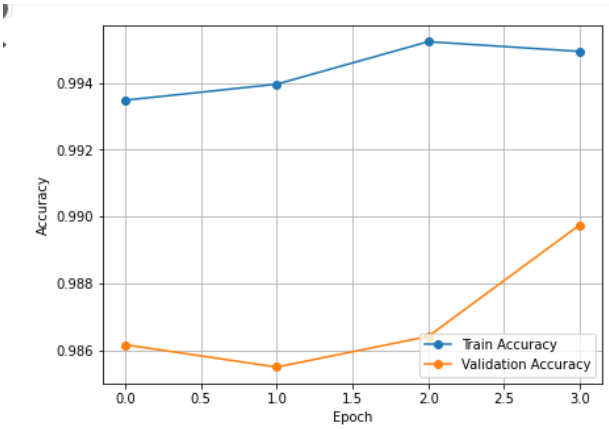
In this report, we use 3 types of optimizer. They are:

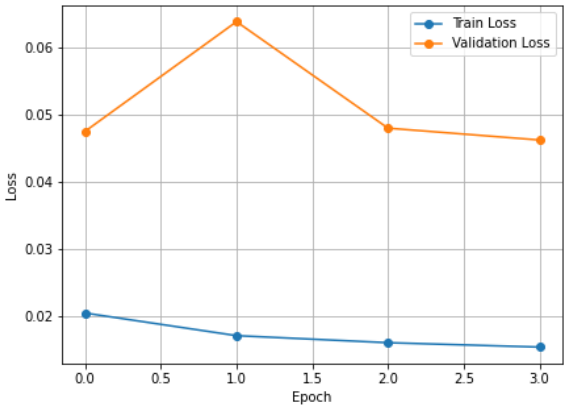
1 . Adam is a replacement optimization algorithm for stochastic gradient descent for training deep learning models. It is an extension to stochastic gradient descent that has recently seen broader adoption for deep learning applications in computer vision and natural language processing.

2 . SGD: Stochastic gradient descent (often abbreviated SGD) is an iterative method for optimizing an objective function with suitable smoothness properties. it's much slower than ADAM.

3 . RMSProp: RMSprop stands for Root Mean Square Propagation. It is an unpublished, yet very widely-known gradient descent optimization algorithm for mini-batch learning of neural networks.RMSprop is a gradient-based optimization technique used in training neural networks.

Result:-



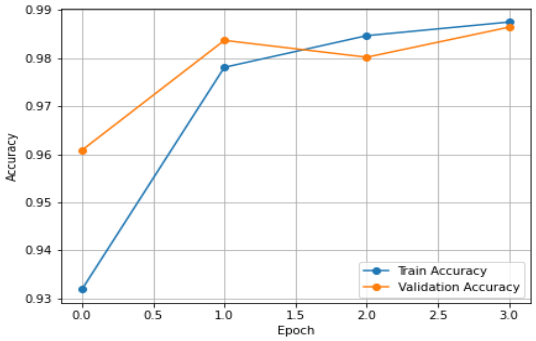


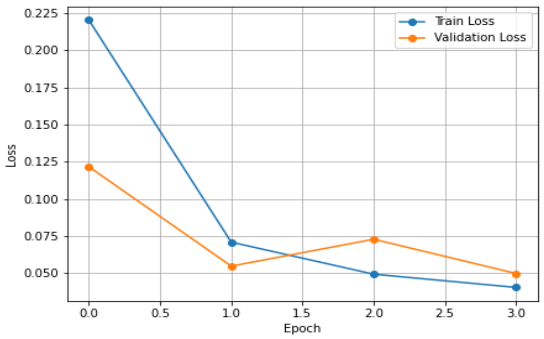

```
test_loss, test_acc = model.evaluate(X_test, Y_test)
print('\nTest Accuracy:', test_acc)
print('\nTest Loss:', test_loss)
```

```
313/313 [==============================] - 3s 9ms/step - loss: 0.0401 - accuracy: 0.9894

Test Accuracy: 0.9894000291824341

Test Loss: 0.040110569447278976
```

Here I use ADAM optimizer and the test accuracy is 0.9894000291824341 that means 98.94%.

The test loss is 0.04011056944728976 that means 0.04% loss.



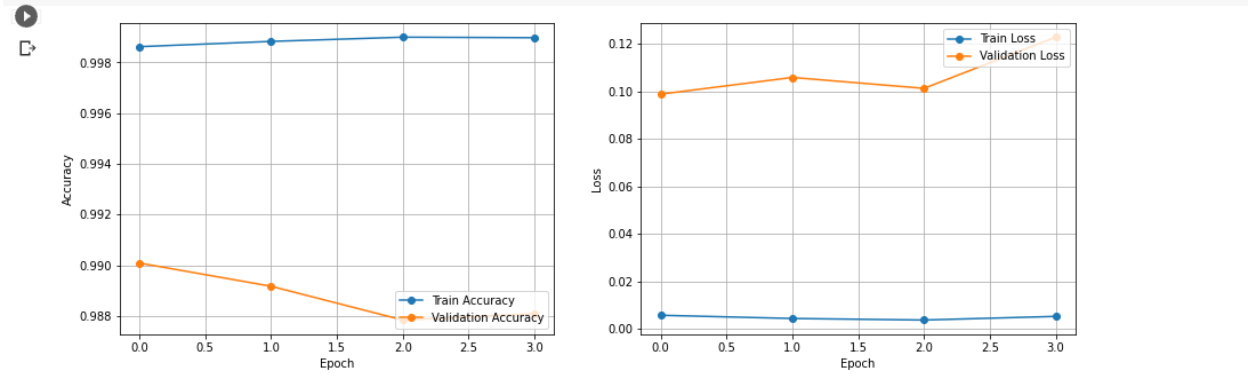



```
test_loss, test_acc = model.evaluate(X_test, Y_test)
print('\nTest Accuracy:', test_acc)
print('\nTest Loss:', test_loss)
```

```
313/313 [==============================] - 2s 6ms/step - loss: 0.0448 - accuracy: 0.9864

Test Accuracy: 0.9864000082015991

Test Loss: 0.044768474996089935
```

Here I use SGD optimizer and the test accuracy is 0.9864000082015991 that means 98.64%.

The test loss is 0.044768474996089935 that means 0.04% loss.




```
test_loss, test_acc = model.evaluate(X_test, Y_test)
print('\nTest Accuracy:', test_acc)
print('\nTest Loss:', test_loss)
```

```
313/313 [==============================] - 3s 9ms/step - loss: 0.1185 - accuracy: 0.9887

Test Accuracy: 0.9886999726295471

Test Loss: 0.11850811541080475
```

Here I use RMSProp optimizer and the test accuracy is 0.9886999726295471 that means 98.88%.

The test loss is 0.11858811541080475 that means 0.11% loss.

Discussion:-

In this report I use 3 types of optimizer and they are ADAM, SGD and RMSProp. So, I found a little difference between their accuracy. ADAM is much faster than SGD and RMSProp. Building upon the strengths of previous models, Adam optimizer gives much higher performance than the previously used and outperforms them by a big margin into giving an optimized gradient descent. My ADAM accuracy is 98.94% .Then cooperatively second better optimizer is SGD which is also good and my SGD accuracy is 98.64%. Last one is RMSProp and my RMSProp is 98..88% which is dropped its little accuracy from ADAM and SGD. So we can say that ADAM optimizer is the fastest optimizer.