



# **American International University-Bangladesh (AIUB)**

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**Section: A**

## Abstract

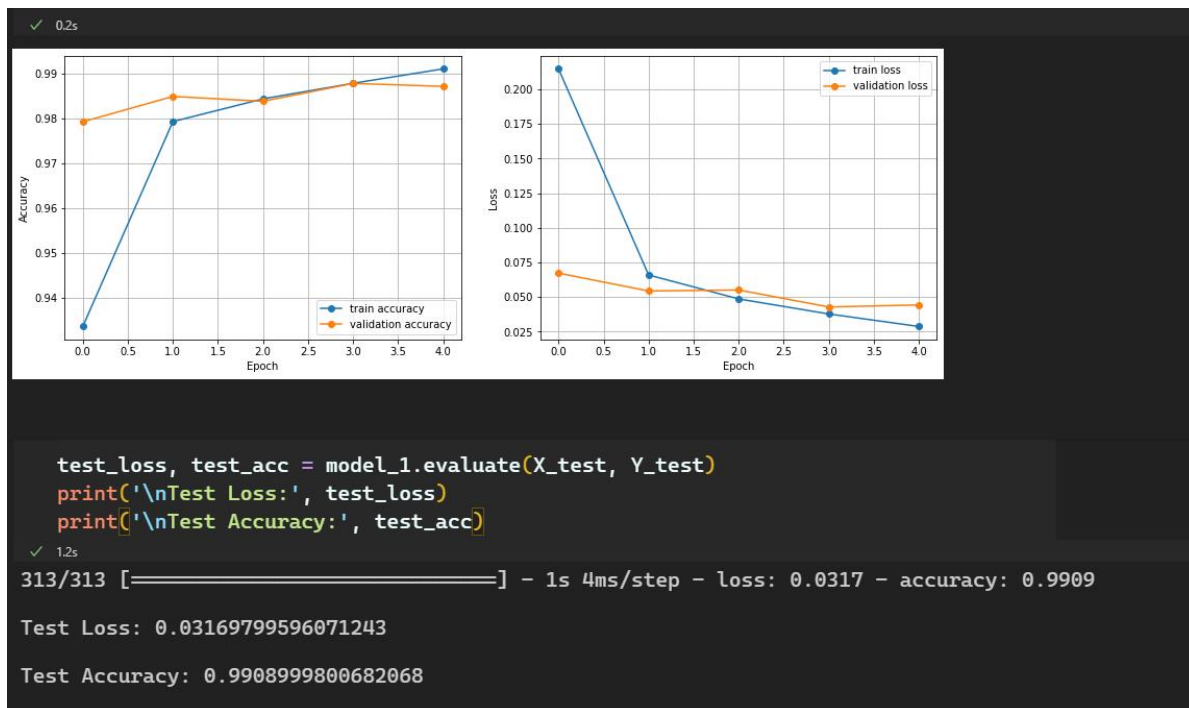
Here Implement a CNN architecture to classify the MNIST handwritten dataset. There are three different optimize **Adam, SGD, RMSProp**. The Convolutional Neural Network gained popularity through its use with image data and is currently the state of the art for detecting what an image is, or what is contained in the image. The primary purpose of a convolutional layer is to detect features such as edges, lines, blobs of color, and other visual elements. The filters can detect these features. The more filters that we give to a convolutional layer, the more features it can detect properly. In this report, I have written details about the implementation of CNN architecture to classify the MNIST handwritten dataset which has been uploaded before. To classify the MNIST dataset, I used 3 types of optimizers ADAM, SGD, RMSProp to check different accuracy levels.

## Introduction

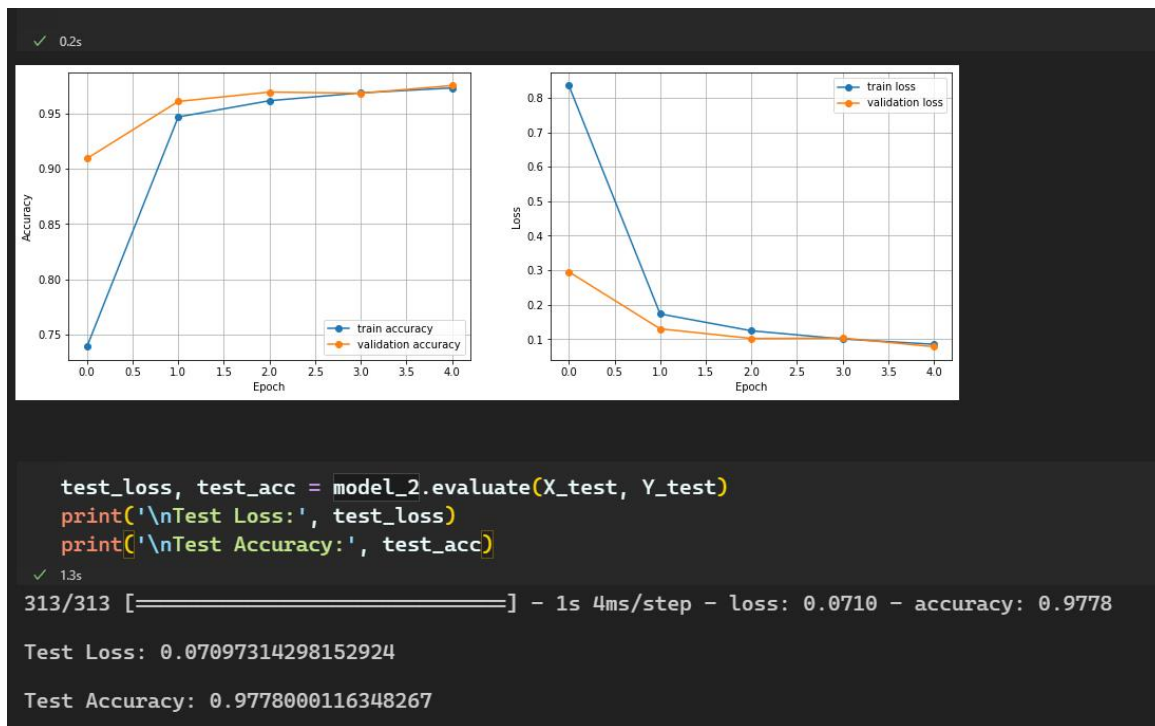
Neural Network(CNN) is a type of artificial neural network which is used in image processing and recognition. In CNN optimizers are the algorithms or methods used to change the attributes of your neural network such as weights and learning rate to reduce the losses. In the mid-project, I had used three types of optimizers. They are Adam, SGD, RMSprop.Their details are given below: Adam is an optimization algorithm that can be used instead of the classical stochastic gradient descent procedure to update network weights iterative based on training data. Adam is a popular algorithm in the field of deep learning because it achieves good results fast. SGD is an iterative method for optimizing an objective function with suitable smoothness properties.

But ADAM is much faster than SGD. RMSprop is a gradient-based optimization technique used in training neural networks. This normalization balances the step size (momentum), decreasing the step for large gradients to avoid exploding and increasing the step for small gradients to avoid vanishing.

## Result



Adam optimize accuracy 99.08% and loss 0.31%



SGD optimize accuracy 97.78% and loss 0.70%



RMSProp optimize accuracy 98.90% and loss 0.41%

## Discussion

In this project report, There are 3 types of an optimizer which are ADAM, SGD, and RMSProp. I found some differences in their accuracy. ADAM is much faster and effective than SGD and RMSProp. Adam optimizer gives much higher performance than the previously used optimizer. **ADAM** optimizer accuracy is 99.08%. Then the second better optimizer is **RMSProp** which is also good and its accuracy is 98.90%. The last one is SGD and the accuracy of **SGD** is 97.78%. which is a little bit less than the accuracy of ADAM and RMSProp. So we can say that the ADAM optimizer is the fastest and highly accurate optimizer.