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**UNIVERSITY-BANGLADESH**

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Assignment Title: Implement a CNN architecture to classify the

MNIST handwritten dataset

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| Course Title: | COMPUTER VISION AND PATTERN RECOGNITION |  |
| Course Code: |  | Section:B |
| Semester:20212022,Fall |  | Course Teacher:DEBAJYOTI  KARMAKER |

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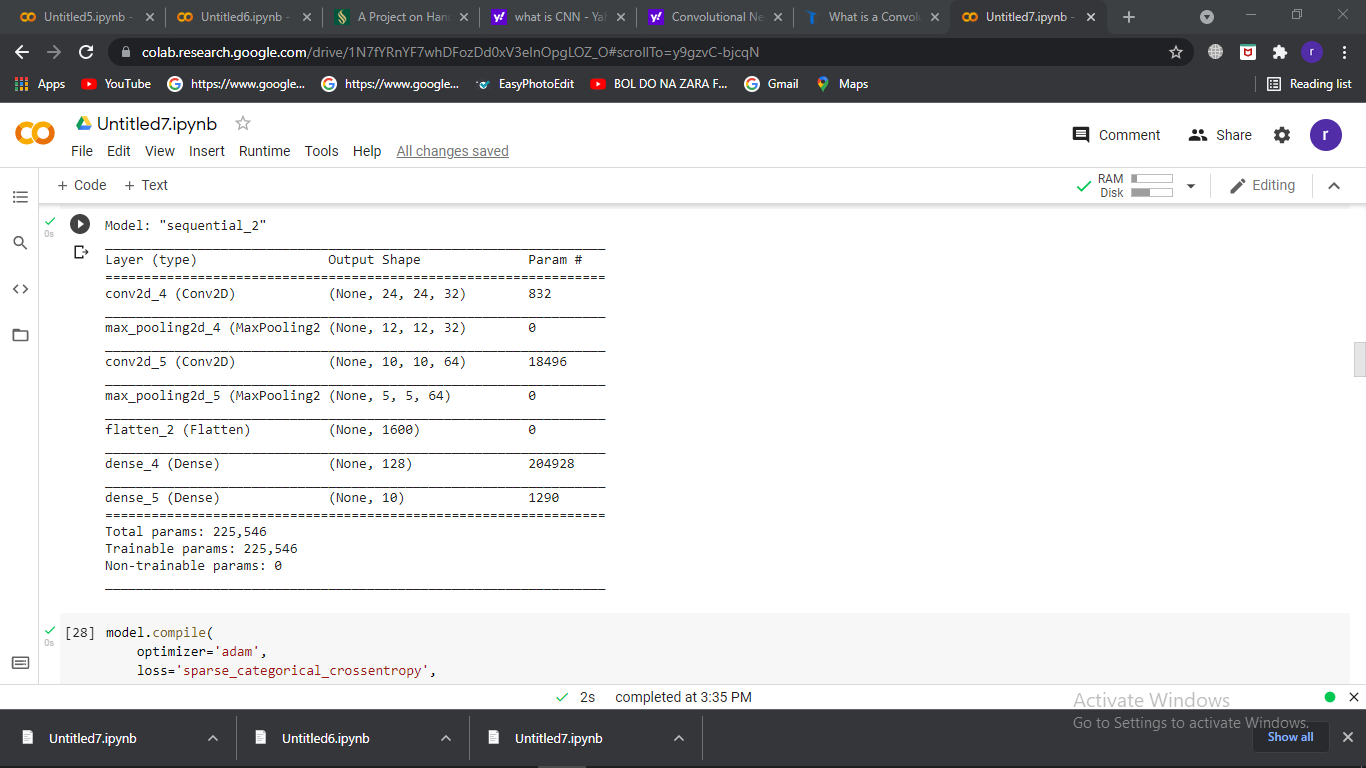
**Title:** Implement a CNN architecture to classify the MNIST handwritten dataset.

**Abstract:**

The MNIST dataset is a large database of handwritten digits. MINIST dataset is widely used dataset in machine learning for handwritten recognition, image classification and many more. It commonly used for training various image processing systems. MNIST is short for Modified National Institute of Standards and Technology database. This dataset is used for training models to recognize handwritten digits

**Introduction:**

A convolutional neural network (CNN) is a specific type of artificial neural network that uses perceptions, a machine learning unit algorithm, for supervised learning, to analyze data. CNNs apply to image processing, natural language processing and other kinds of cognitive tasks. MINIST dataset is widely used dataset in machine learning for handwritten recognition, image classification and many more. It commonly used for training various image processing systems. It is a dataset of 60,000 small square 28×28 pixel grayscale images of handwritten single digits between 0 and 9. Which is quiet incredible to explore and analyze. It is a mostly used and profoundly understood dataset and, for the most part, is “solved.” Top-performing models are deep learning convolutional neural networks that achieve a classification accuracy of above 99%, with an error rate between 0.4 %and 0.2% on the hold out test dataset.



**Fig:1**

It is the hyper-parameter picture. It has an input layer, a two-dimensional convolutional neural network, a maximum pooling layer, a flattening layer, a dense layer, and the output layer.

**Results:**

Result of the different optimizer result are given below,

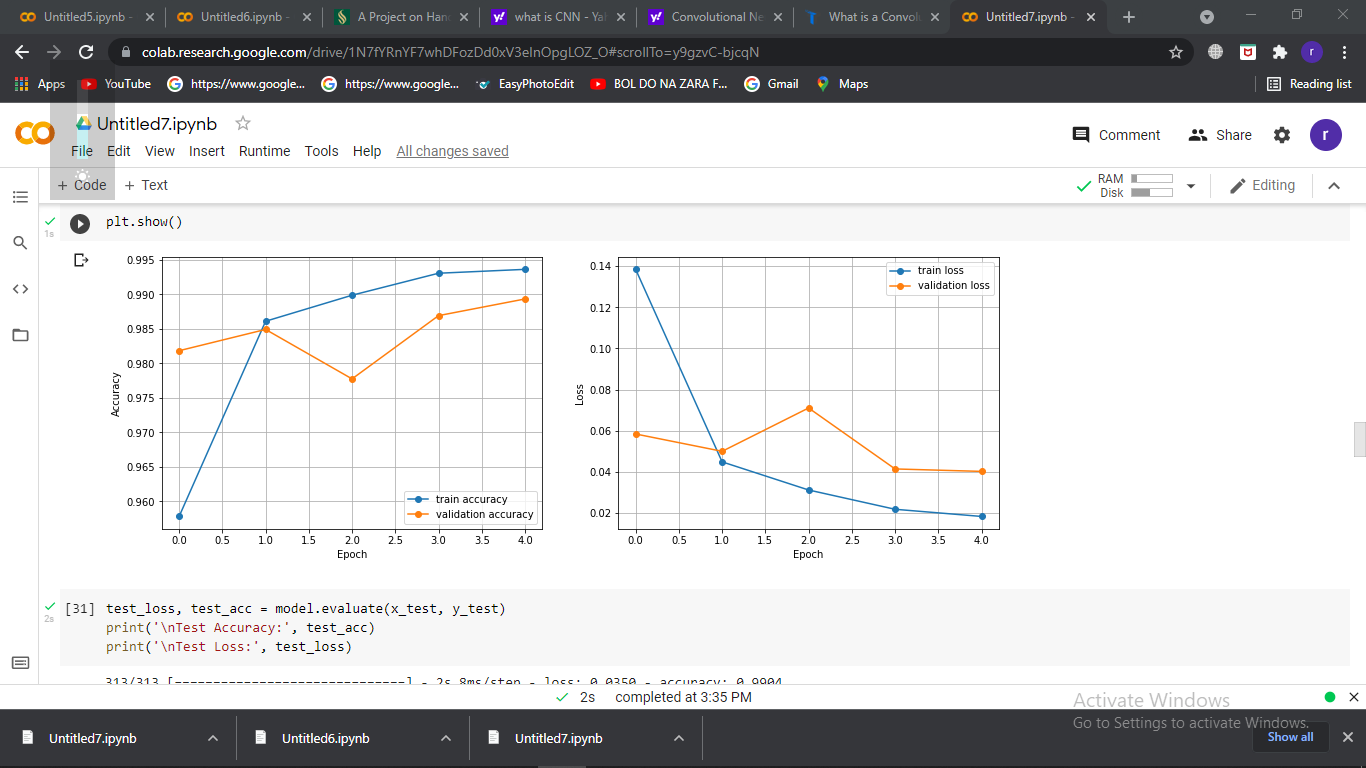


Fig2: Loss of Adam

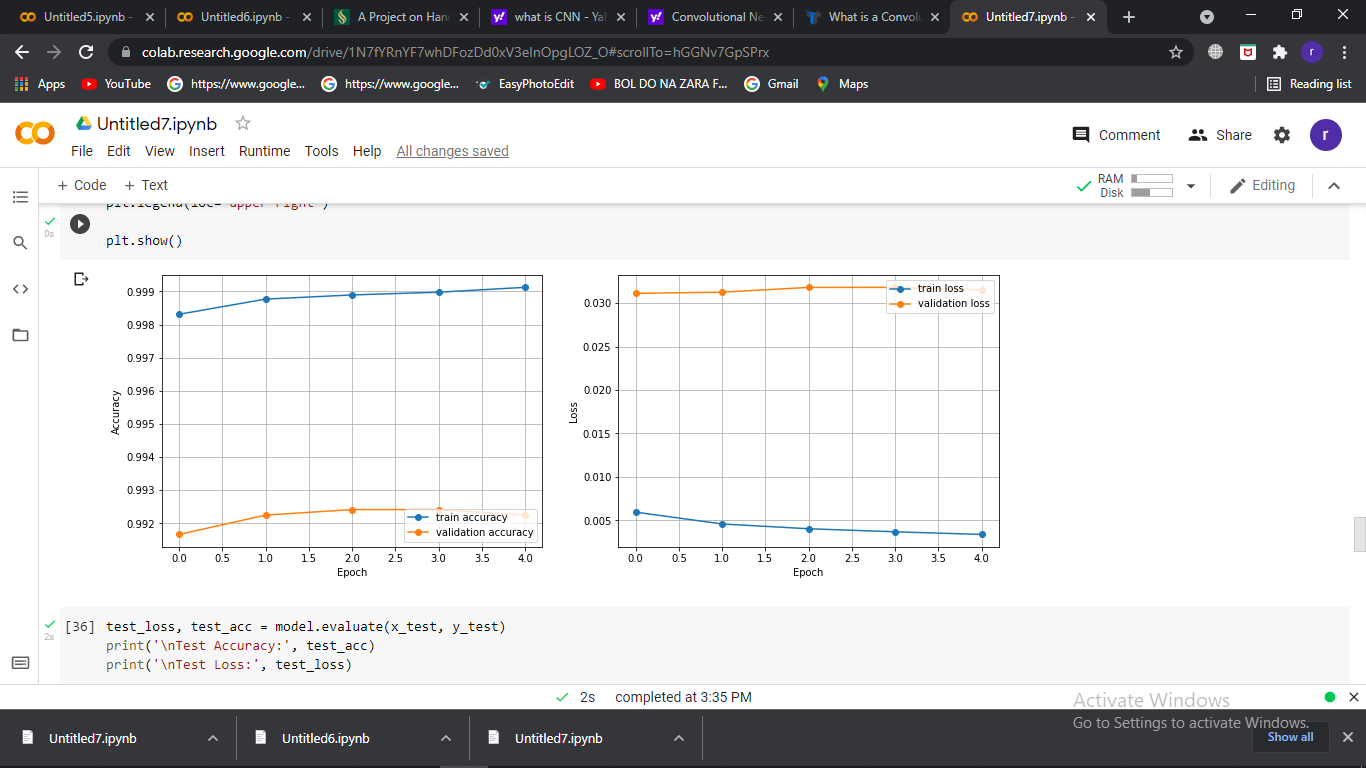


Fig3: Loss of

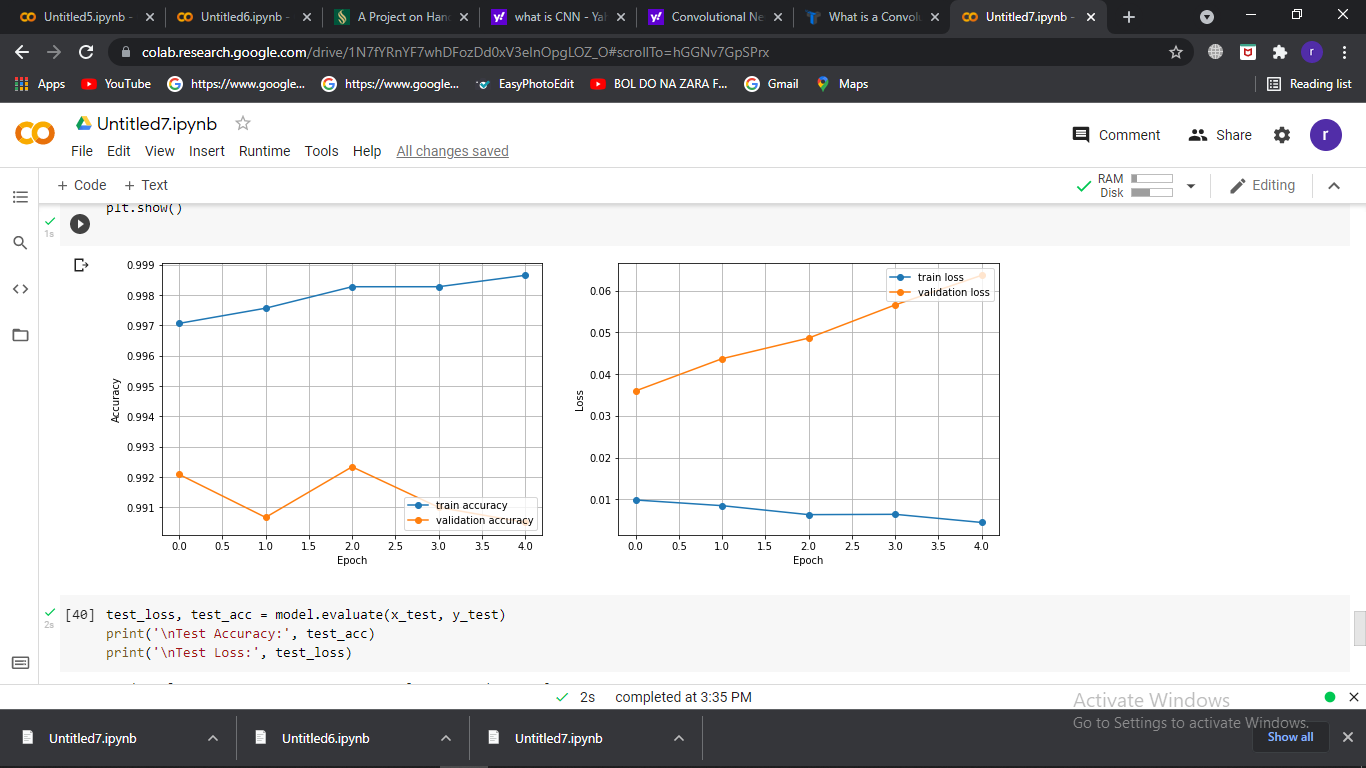


Fig4: Loss of RMSProp

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| --- | --- | --- | --- | --- |
| Optimizer | Accuracy | Validation  Accuracy | Test Accuracy | Test Loss |
| Adam | 99.04% | 98.54% | 98.82% | 3.50% |
| SGD | 99.34% | 99.03% | 99.03% | 2.29% |
| RMSprop | 99.34% | 99.01% | 99.01% | 5.16% |

**Discussion:**

From the result we can see the difference between the accuracy result and test validation results.

We can see the method has the highest test accuracy percent on RMSprop optimizer and the lowest test accuracy percent on Adam optimizer. The graph analysis the difference in the rates of Train and Validation, indicating that the model will not perform consistently in real-world data. The RMSprop optimizer of the graph shows a somewhat comparable rate of Train and Validation accuracy, indicating that the model will perform better on real-life data.