AMERICAN INTERNATIONAL UNIVERSITY-BANGLADESH

Faculty of Science and Technology

Mid Report Cover Sheet

Assignment Title:	CVPR Mid Report			
Assignment No:	1		Date of Submission:	30 October 2021
Course Title:	Computer Vision and Pattern Recognition			
Course Code:	01534		Section:	A
Semester:	Fall	2021-22	Course Teacher:	DR. Debajyoti Karmaker

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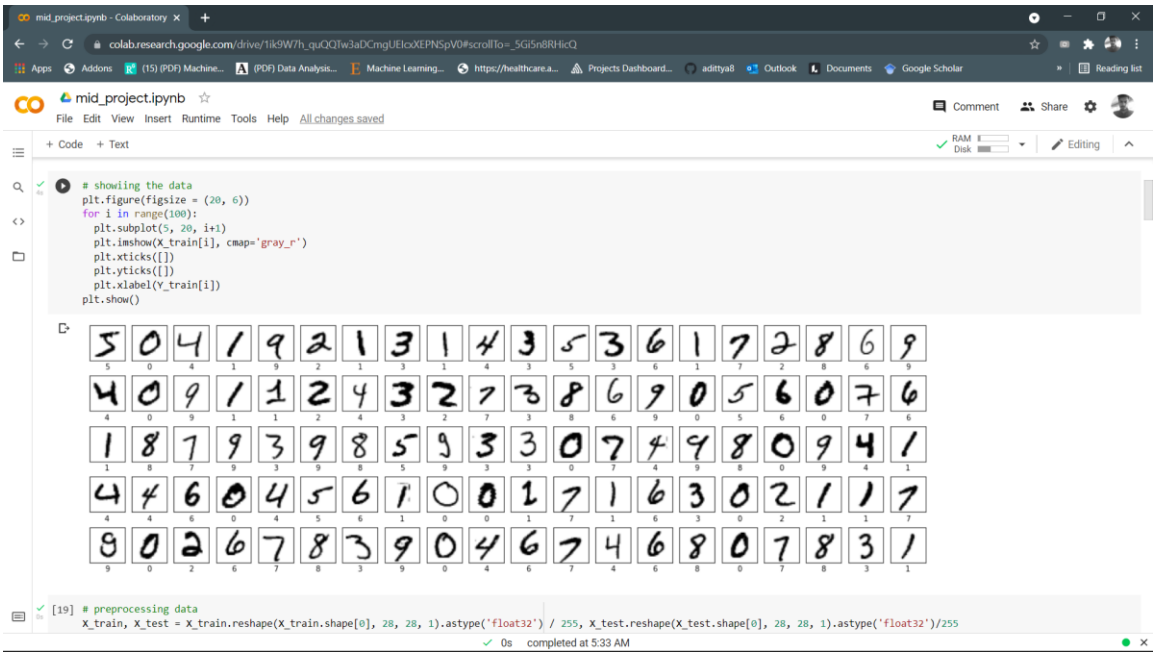
Abstract
A CNN is a type of artificial neural network used to analyze visual information in deep learning. Convolutional neural networks (CNNs) are neural networks containing one or more convolutional layers to analyze images, classify data, and segment it. I used CNN architecture to categorize the MNIST handwritten dataset in this research. To test different levels of accuracy, I applied three types of optimizers: ADAM, SGD, and RMSProp.

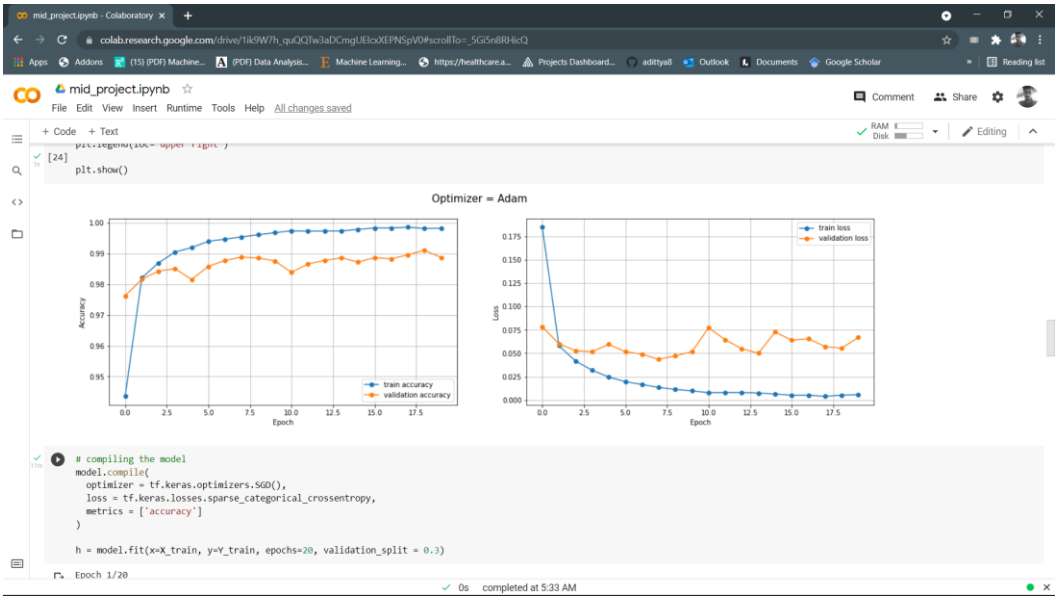
Introduction
Optimizers are methods or techniques for reducing losses by adjusting neural networks' weights and learning rate.
Instead of using the usual stochastic gradient descent process, Adam is an optimization strategy for updating network weights based on training data. Adam is a popular deep learning method because it generates fast and accurate results.
SGD is a method for determining the smoothness properties of an objective function. ADAM, on the other hand, is substantially faster than SGD.
RMSprop is a gradient-based optimization approach for neural network training. This normalization equalizes the step size, reducing it for large gradients to avoid bursting and increasing it for small gradients to avoid fading.

Dataset



Results

For ADAM, I acquired test accuracy of 99% and loss 4.91%.

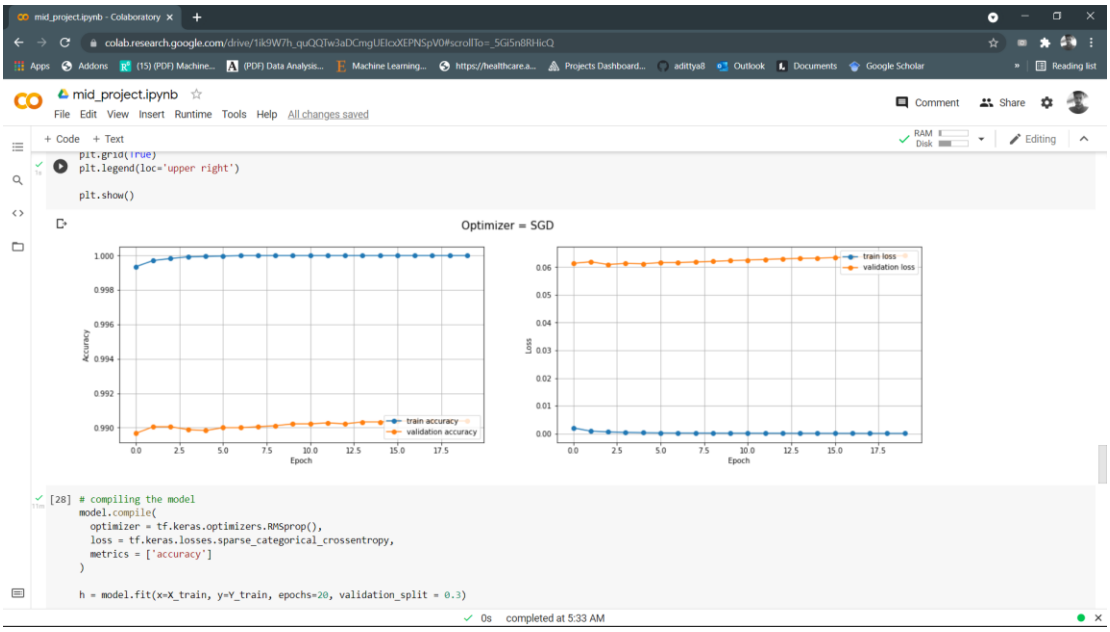



```
[23] #test accuracy
     test_loss, test_accuracy = model.evaluate(X_test, Y_test)
     print(f'\nTest accuracy: {test_accuracy}')

     313/313 [==============================] - 2s 6ms/step - loss: 0.0491 - accuracy: 0.9900

     Test accuracy: 0.9900000095367432
```

For SGD, I acquired test accuracy of 99.23% and loss 4.38%.



```
# training the model
test_loss, test_accuracy = model.evaluate(X_test, Y_test)
print(f'\nTest accuracy: {test_accuracy}')

313/313 [==============================] - 2s 8ms/step - loss: 0.0438 - accuracy: 0.9923

Test accuracy: 0.9922999739646912
```

For RMSprop, I acquired test accuracy of 99.22% and loss 10.04%.


```
[29] # training the model
     test_loss, test_accuracy = model.evaluate(X_test, Y_test)
     print(f'\nTest accuracy: {test_accuracy}')

     313/313 [==============================] - 2s 7ms/step - loss: 0.1004 - accuracy: 0.9922

     Test accuracy: 0.9922000169754028
```

Discussion

I used ADAM, SGD, and RMSProp as optimizers in this mid-project report. I discovered a minor discrepancy in their precision. Compared to ADAM and RMSProp, SGD is faster and more effective. The SGD optimizer outperforms the prior optimizer by a significant margin. The accuracy of my SGD optimizer is 99.23%, and the loss is 4.38 percent. Then there is ADAM, which is also a good optimizer with a 99 percent accuracy and a 4.91 percent loss. The last one is RMSProp, which has a 99.22% accuracy and a loss of 10.04%, which is slightly less than SGD but slightly more than ADAM. So, in my instance, the SGD optimizer is the quickest and most precise optimizer.

References

1. https://keras.io/api/optimizers/
2. https://mlfromscratch.com/optimizers-explained/#/
3. https://medium.com/m/global-identity?redirectUrl=https%3A%2F%2Ftowardsdatascience.com%2Fadam-latest-trends-in-deep-learning-optimization-6be9a291375c