AMERICAN INTERNATIONAL UNIVERSITY-BANGLADESH

Faculty of Science and Technology

Midterm Report Cover Sheet

Assignment Title:	CVPR Mid Report			
Assignment No:	01		Date of Submission:	30 October 2021
Course Title:	Computer Vision and Pattern Recognition			
Course Code:	01535		Section:	B
Semester:	Fall	2021-22	Course Teacher:	Dr. Debajyoti Karmaker

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1	JOY, ATANU RUDRA	18-38876-3	BSc [CSE]	
2			Choose an item.	
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	Total Marks	

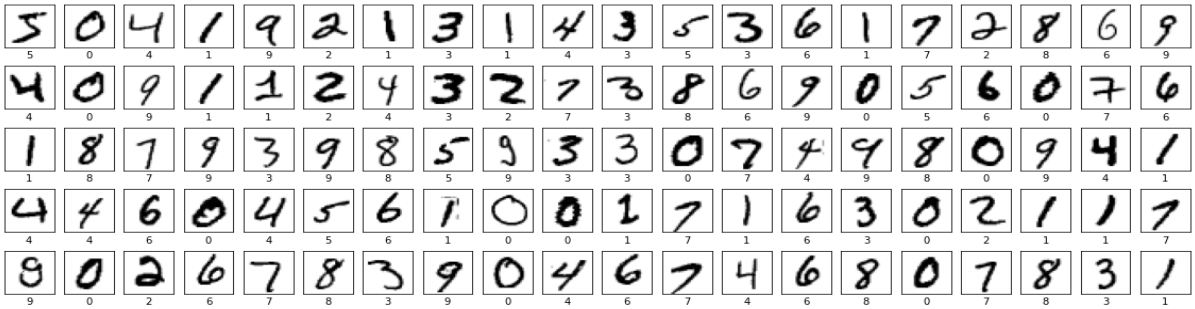
a. Abstract:

A Convolutional Neural Network (CNN) is a form of artificial neural network that is used to interpret visual data. Convolutional neural networks (CNNs) are neural networks that analyze images, classify data, and segment it using one or more convolutional layers. For the project, CNN architecture was used to categorize the MNIST handwriting dataset. For testing different levels of accuracy, three types of optimizers named Adam, SGD and RMSprop were applied.

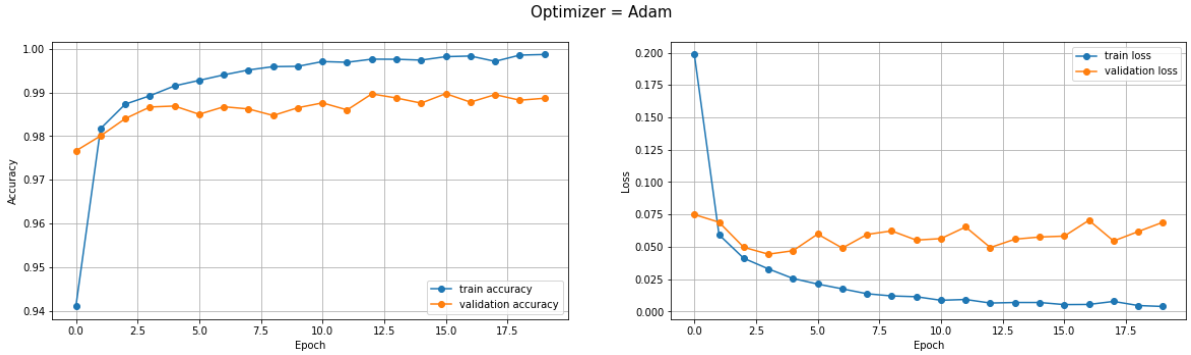
b. Introduction:

Optimizers are techniques or strategies for altering the characteristics of a neural network, such as weights and learning rate, in order to minimize losses. By minimizing the function, optimizers are employed to address optimization problems. Adam is an optimization approach for updating network weights based on training data that replaces the traditional stochastic gradient descent process. As Adam can generate fast and accurate results, it is a popular deep learning method. SGD is a method for determining an objective function's smoothness properties. On the other hand, ADAM is significantly faster than SGD. RMSprop is a gradient-based neural network training optimization method. This normalization reduces the step size for high gradients to avoid bursting and increases it for short gradients to avoid fading.

The MNIST handwritten dataset was used for implementing a CNN architecture for the project.



c. Results:

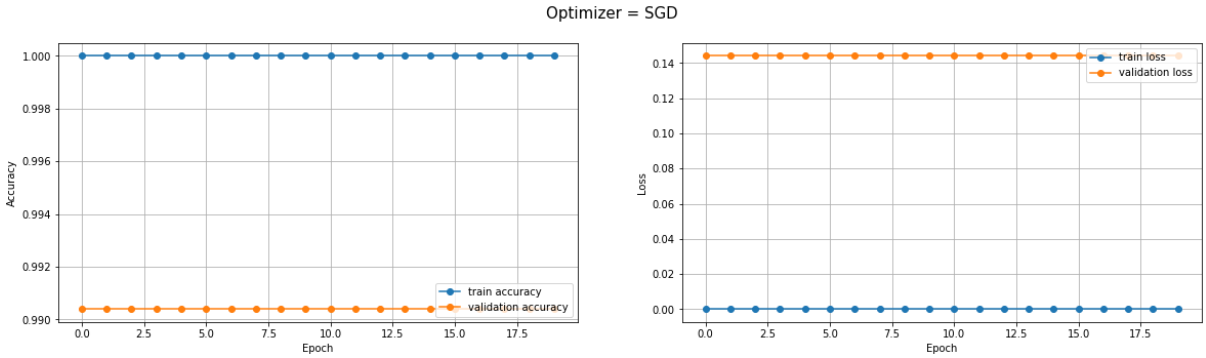



```
#model training
test_loss, test_accuracy = model.evaluate(X_test, Y_test)
print(f'\nTest accuracy: {test_accuracy}')
```

```
313/313 [==============================] - 1s 5ms/step - loss: 0.0455 - accuracy: 0.9919

Test accuracy: 0.9919000267982483
```

For Adam Optimizer, the test accuracy was 99.19% and loss was 4.55%

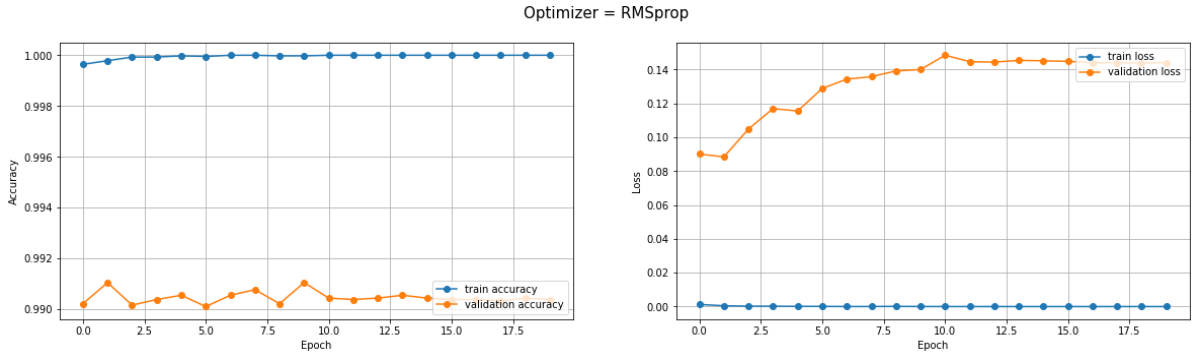



```
#model training
test_loss, test_accuracy = model.evaluate(X_test, Y_test)
print(f'\nTest accuracy: {test_accuracy}')
```

```
313/313 [==============================] - 2s 5ms/step - loss: 0.1010 - accuracy: 0.9935

Test accuracy: 0.9934999942779541
```

For SGD Optimizer, the test accuracy was 99.35% and loss was 10.1%




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

```
313/313 [==============================] - 2s 5ms/step - loss: 0.1010 - accuracy: 0.9935

Test accuracy: 0.9934999942779541
```

For RMSprop Optimizer, the test accuracy was 99.35% and loss was 10.1%

d. Discussion:

For the midterm project, Adam, SGD and RMSprop optimizers were used. There were some differences between the optimizers in terms of accuracy and loss. For the given dataset, the SGD and RMSprop optimizer had the highest accuracy which was 99.35% and their loss rate was also same which was 10.1%. On the other hand, Adam had the lowest loss which was 4.55% only and it had a test accuracy of 99.19%. The accuracy between the optimizers were not as much noticeable. The Adam optimizer work faster. Overall, Adam optimizer is better as its faster than the other optimizers, has low loss rate and the difference of loss is only about 0.16% which is negligible.

Reference:

1. https://searchenterpriseai.techtarget.com/definition/convolutional-neural-network
2. https://medium.com/m/global-identity?redirectUrl=https%3A%2F%2Ftowardsdatascience.com%2Foptimizers-for-training-neural-network-59450d71caf6
3. https://en.wikipedia.org/wiki/Stochastic_gradient_descent