Assignment - 4

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2015105

Neural Networks

Part 1

Accuracy on test set - 88.20 %

Part 2

1. **Increasing number of nodes**

- Hidden layer = [784,286,158,94,10]
- Accuracy on test set = 89.4%

- Hidden layer = [784,316,188,124,10]
- Accuracy on test set = 90.2%

2. **Decreasing number of nodes**

- Hidden layer = [784, 226, 98, 34]
- Accuracy on test set = 86.1%

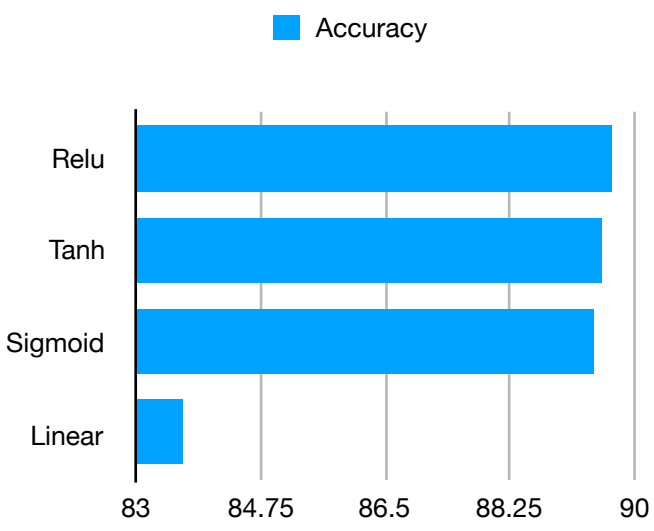
- Hidden layer = [784,196, 68,14]
- Accuracy on test set = 84.20%

Part 3

- Hidden Layer = [784, 256, 128, 64, 128, 10]
- Accuracy on test set = 89.7%

Bonus

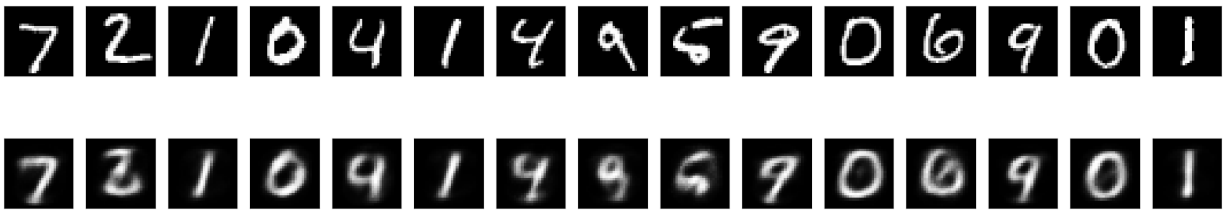
- Accuracy on test set using relu activation = 89.7%
- Accuracy on test set using tanh activation = 89.55%
- Accuracy on test set using sigmoid activation = 89.43%
- Accuracy on test set using linear activation = 83.64%



AutoEncoder

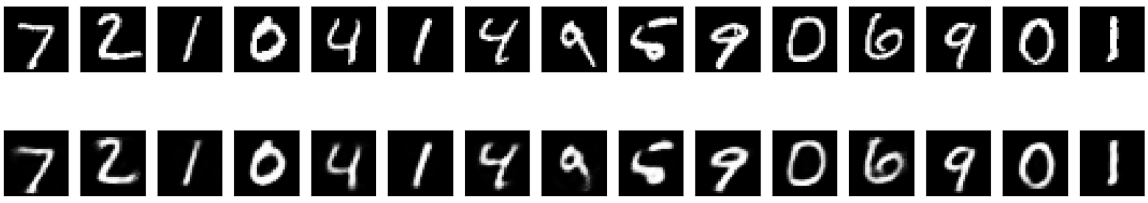
Part A

Encoded Data Visualisation (Sigmoid)



- Train Error = 6.73%
- Test Error = 6.75%

Encoded Data Visualisation (Relu)



- Train Error = 2.3%
- Test Error = 2.9%

Part B

- Accuracy on test set = 95.75%

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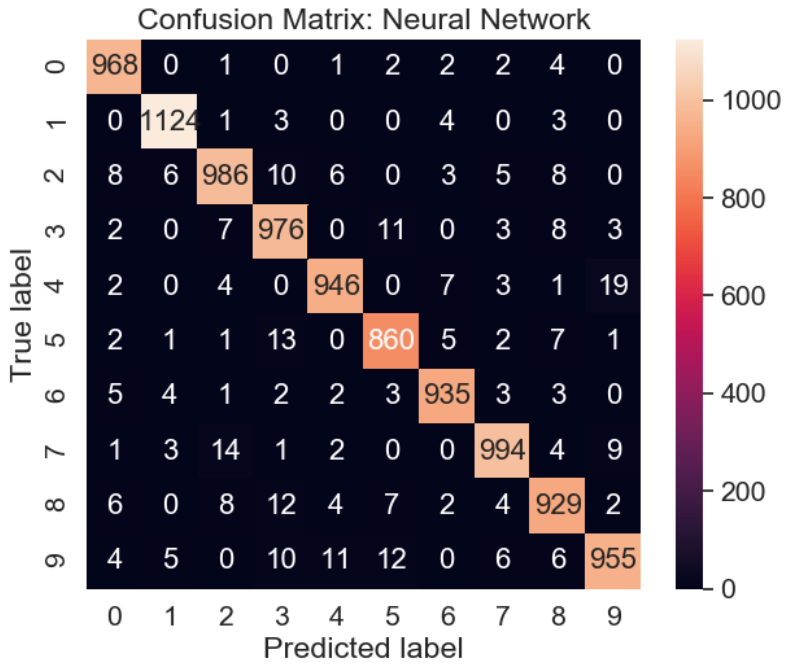
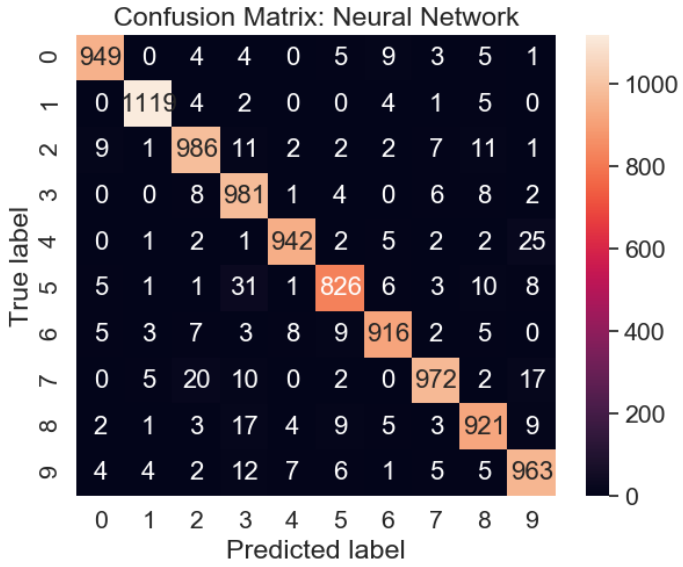


Bonus

- Accuracy on test set = 96.73%



A slight increase can be seen when applying PCA here, specifically in the performance of labels 3 and 8. This can be due to the fact that PCA helps in selecting features that are more important than the rest (for example the corners of images may not be that helpful (completely black pixels) than the pixels in the center (a lot more variance).