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Homework 4
CSci 5525 Spring 23

2023-04-06

1 PCA

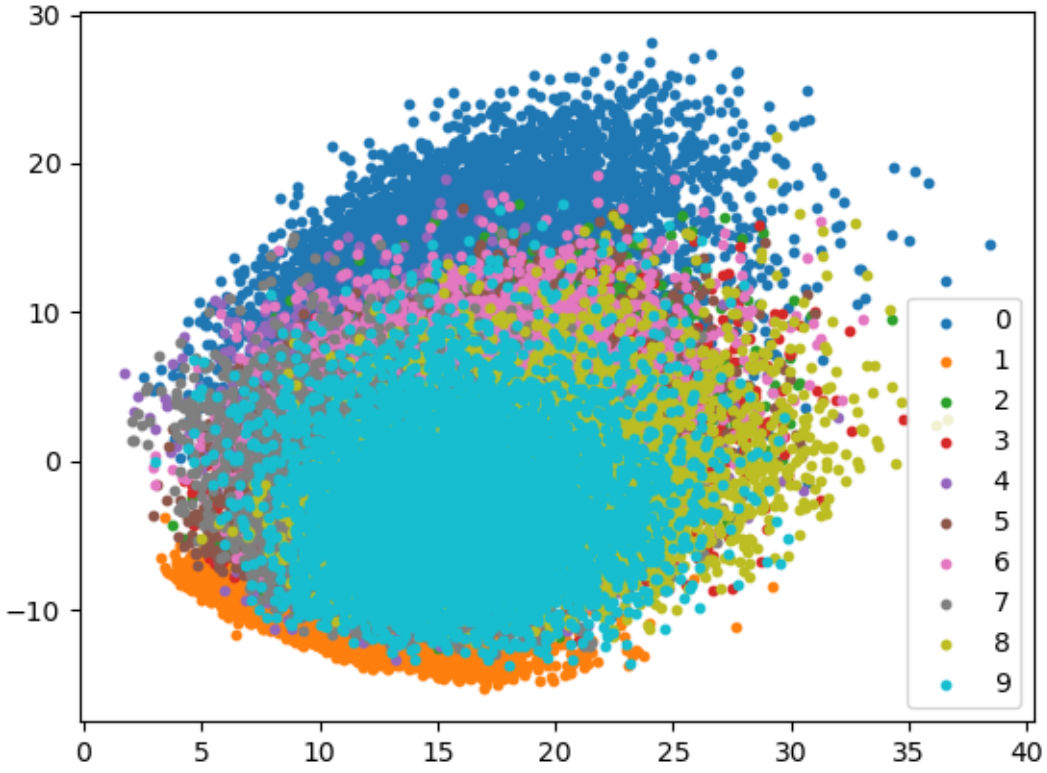

Abbildung 1: PCA Projection of MNIST Data

Overall, it did a good job at distinguishing 0 and 1, but other numbers were not very well differentiated.

2 Autoencoder

For MLP, & the best optimizer was Adagrad with η value of 0.01 without overfitting.

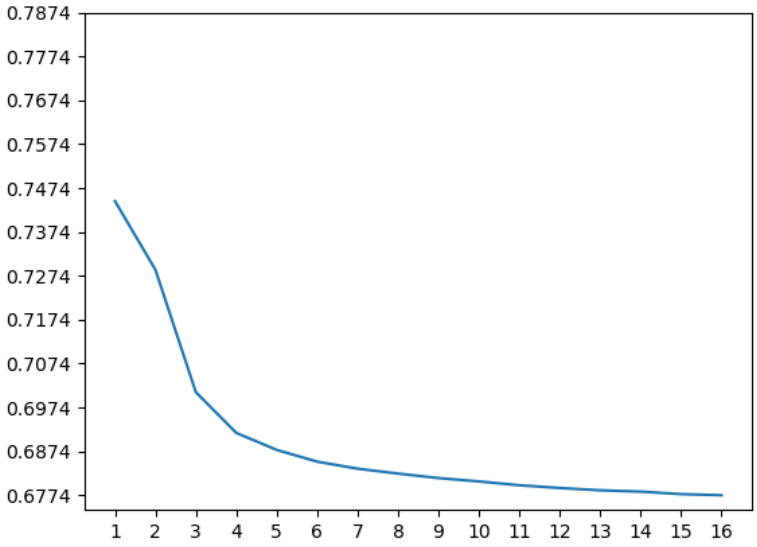

Abbildung 2: Autoencoder Training Loss by Epochs

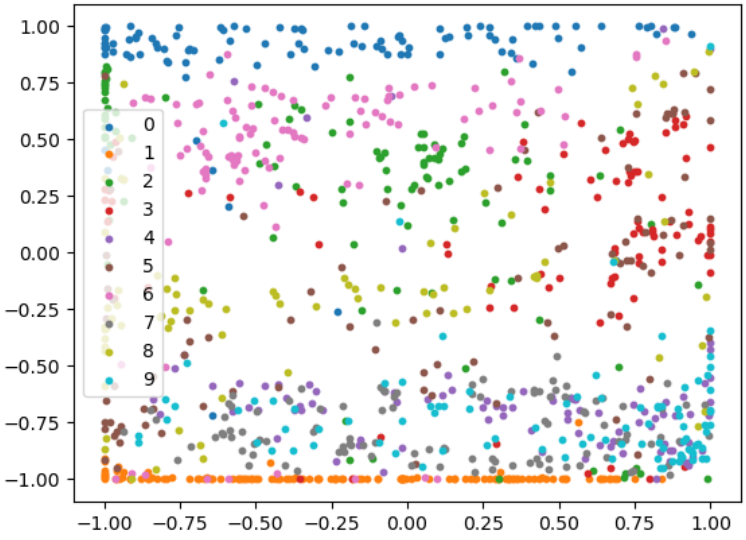

Abbildung 3: Autoencoder Projection of 1000 Data Points

It was even more effective than PCA in distinguishing numbers, especially that are not 0 or 1. It did far better job than PCA for 0 and 1. It is also interesting that numbers are layered vertically. We can see 0, 6, 2 on upper side, 3, and 8 for middle, and 1, 9, 4, and 5 on the lower side.

3 GAN

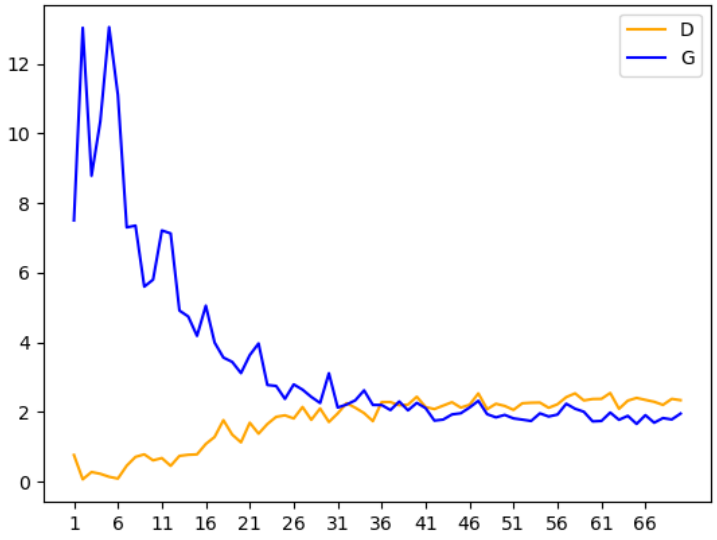

Abbildung 4: Autoencoder Training Loss by Epochs

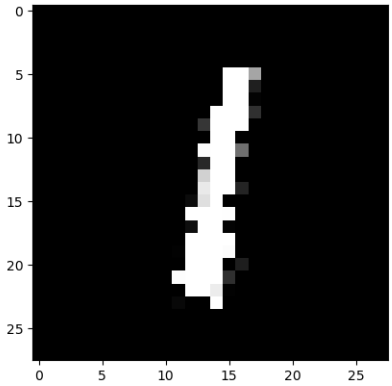

Abbildung 5: Epoch 17, seemingly 1

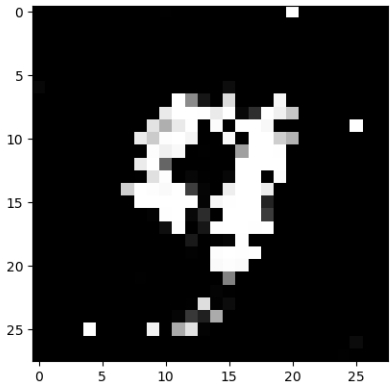

Abbildung 6: Epoch 36, seemingly 9

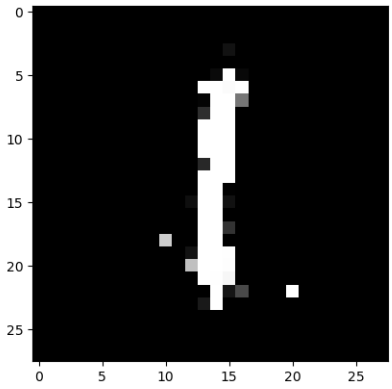

Abbildung 7: Epoch 45, seemingly 1

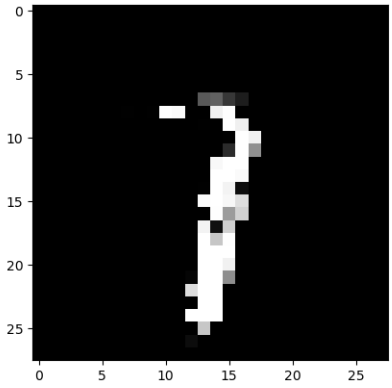

Abbildung 8: Epoch 50, seemingly 1 or 7

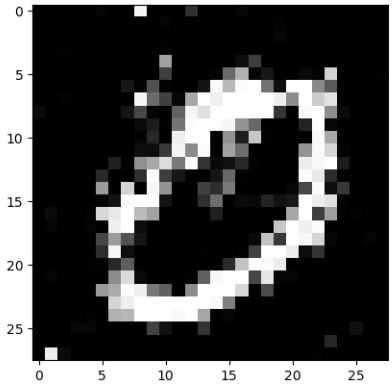

Abbildung 9: Epoch 59, seemingly 0

Overall, generator did a good job depicting numbers. As we can see, as the epoch increases, it is also capable at drawing more complex numbers than 1 with more clear border, as we can see from figure 9. Though, randomly selected numbers are rather easier numbers to draw.