

# CS7015 : Programming Assignment-3

April 26, 2019

## **The task you need to ensure before submission.**

- ✓ We have read all the instructions carefully and followed them to our best ability.
- ✓ We have written the name, roll no in report.
- ✓ We will be submitting only single submission on behalf of our team.
- ✓ We have not included unnecessary text, pages, logos in the assignment.
- ✓ We have not used any high level APIs(Keras, Estimators for e.g.).
- ✓ We have not copied anything for this assignment.

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## **Report:**

### **1 t-SNE plots for hidden representation of test data**

We varied the number of neurons in the hidden layer starting from 16, 32, 128, 256. For 16 and 32 neurons, we observed that the hidden representations of the same class instances were quite far apart from each other. On keeping hidden layer size to 128 and 256, we got more denser t-SNE plot indicating that the instances belonging to the same class are more closer.

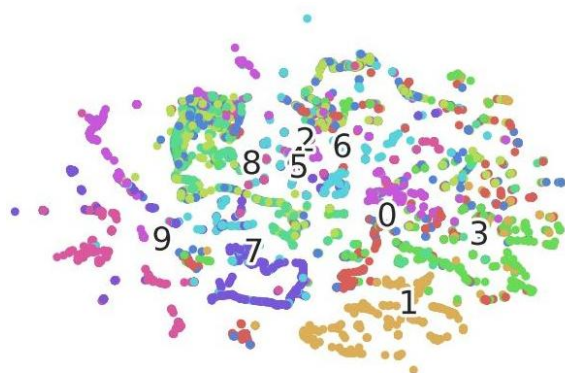


Figure 1: Hidden layer size=16

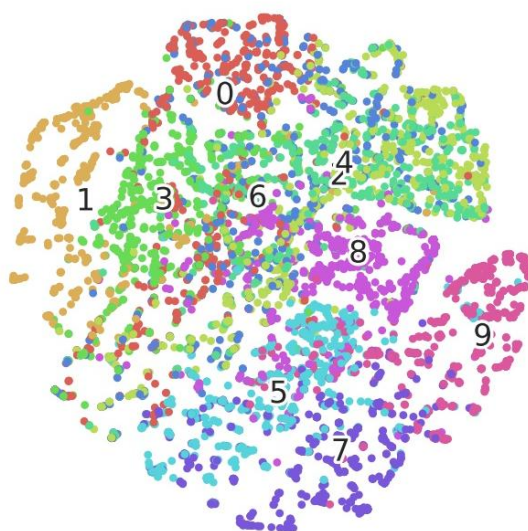


Figure 2: Hidden layer size=32

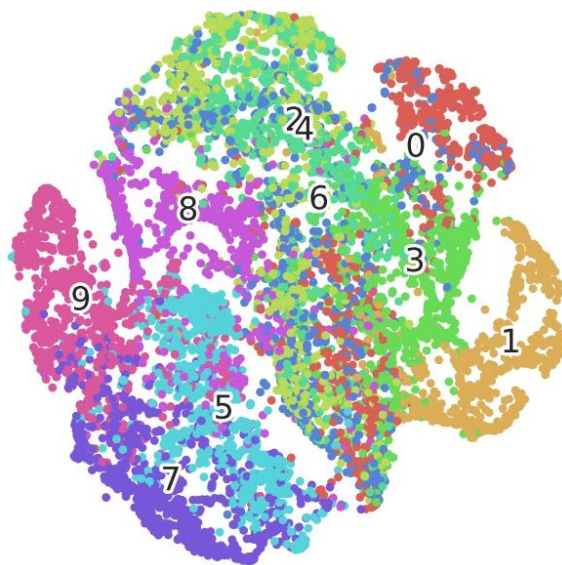


Figure 3: Hidden layer size=128

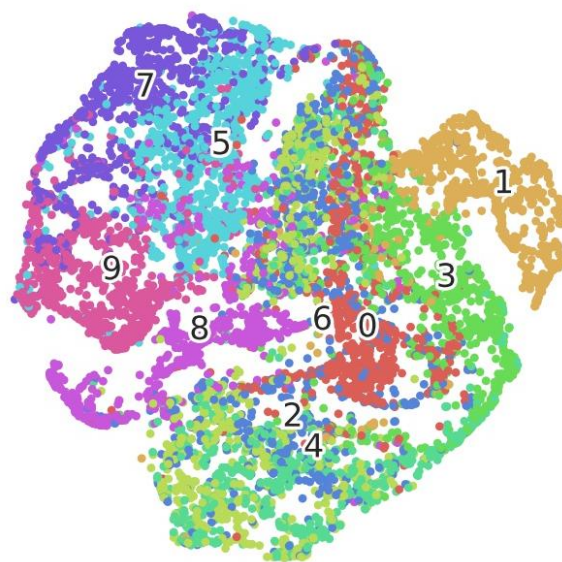


Figure 4: Hidden layer size=256

## 2 Reconstructed samples

We trained the model for 20 epochs and got a good reconstruction for the test images.

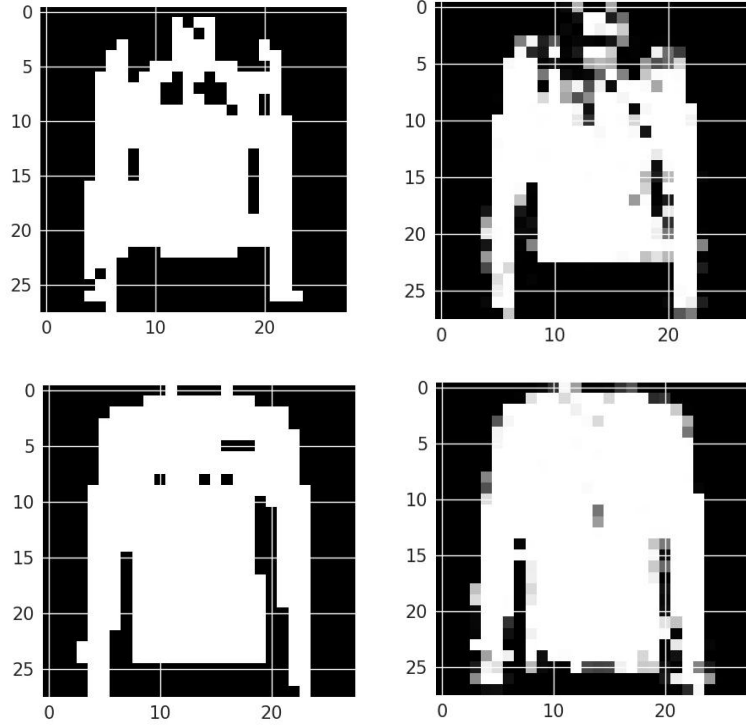


Figure 5: Original test image(Left) and reconstructed image(Right)

## 3 Effect of changing length of Gibbs Chain

We studied the effect of varying the length of Gibbs Chain, and noticed that running for longer steps of Gibbs chain results in a better reconstruction error curve. We analyzed the chains during first 30 epochs. This is clear with the following plot where we compare  $k=1$  with  $k=20$ . The longer gibbs chain curve has overall lower reconstruction error curve.

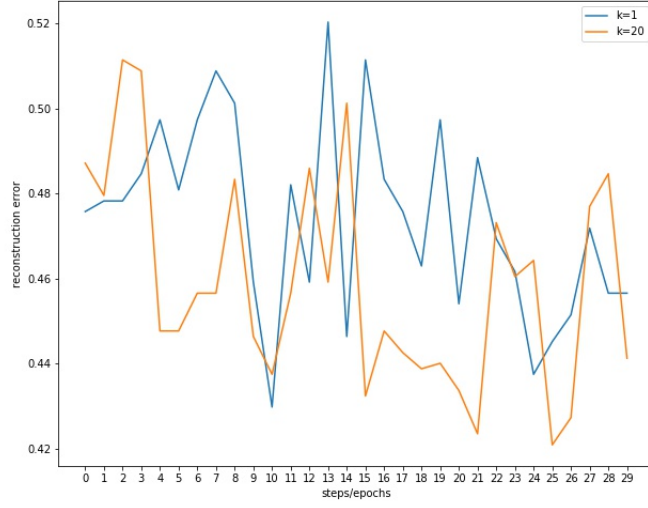


Figure 6: Comparison for two values of Gibbs chain

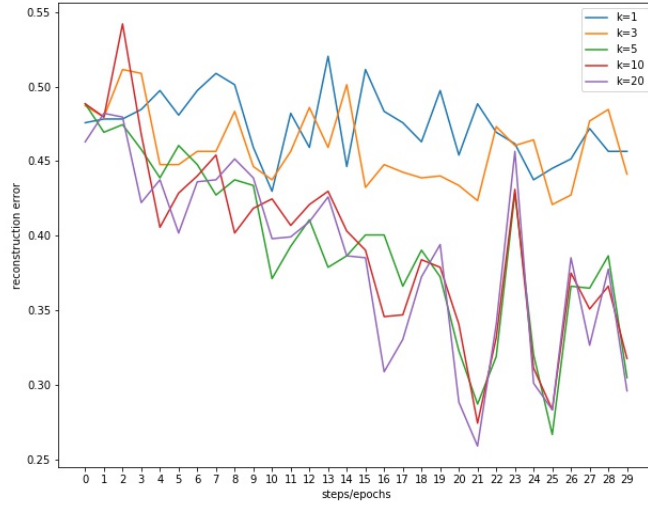


Figure 7: Comparison of five different 'k' values of Gibbs chain

When we plotted the reconstruction error for all values of  $k=1,3,5,10,20$  we concluded that  $k=5,10,20$  had lower reconstruction error than  $k=1,3$  but amongst them they did not have any clear difference in trend. This may be because the Markov chains converged after a certain point, and then the effect of increasing  $k$  further did not result in any noticeable difference.

## 4 Plot of reconstructed samples after every 100 steps

For this plot, we ran the code for 6400 timesteps and plotted the reconstructed image after every 100 timesteps.

To show the exact trend, we have plotted the reconstructed image of the same sample image for all the timesteps.

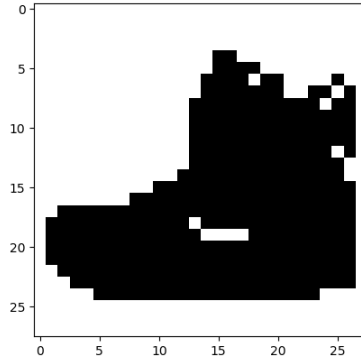


Figure 8: Original image

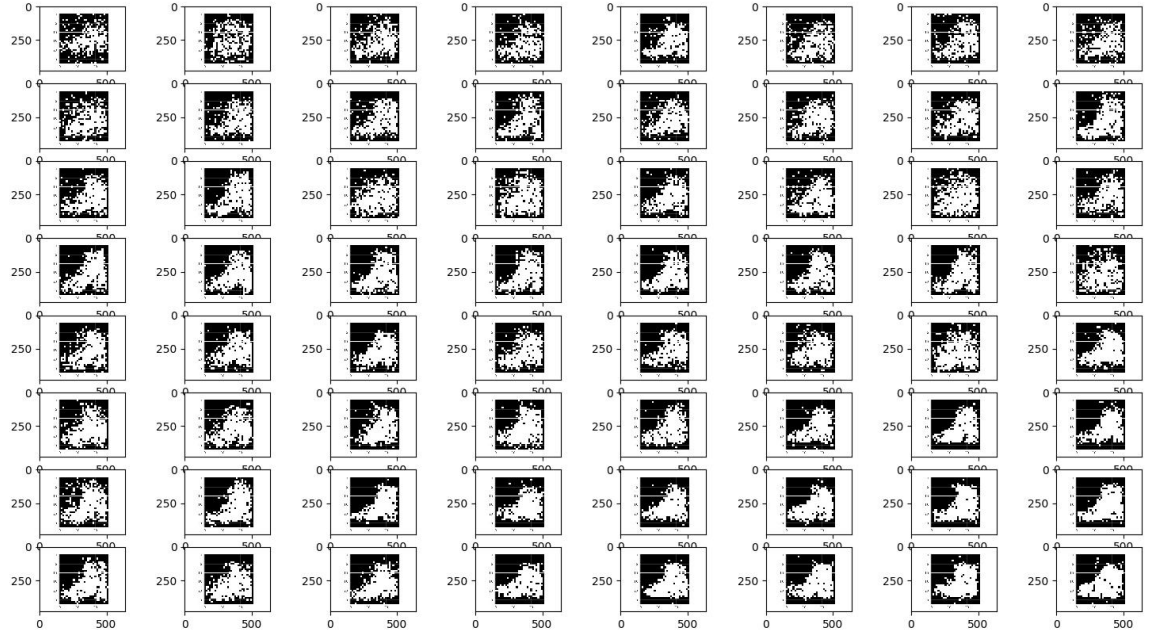


Figure 9: Image reconstruction trend over 6400 timesteps

## 5 References

- <https://www.datacamp.com/community/tutorials/introduction-t-sne>