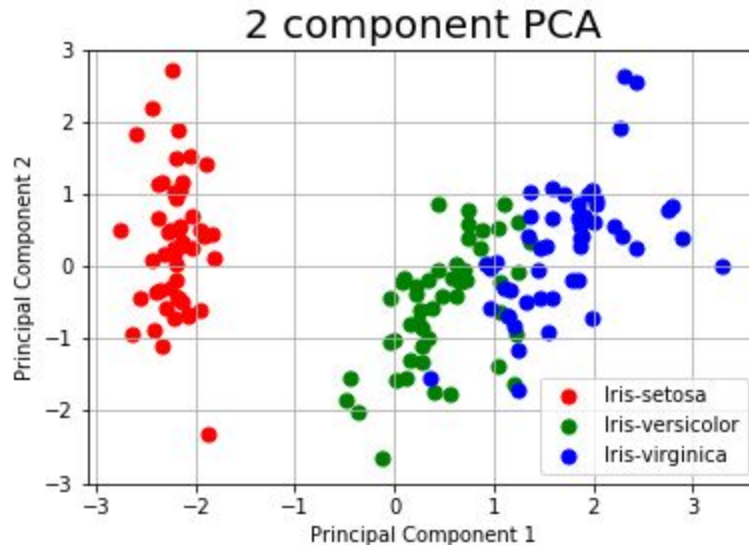


Que-4 (Dimensionality Reduction)

a)

- **PCA on iris dataset**
- I applied PCA after normalising the dataset
- Reducing the dimension from four to two

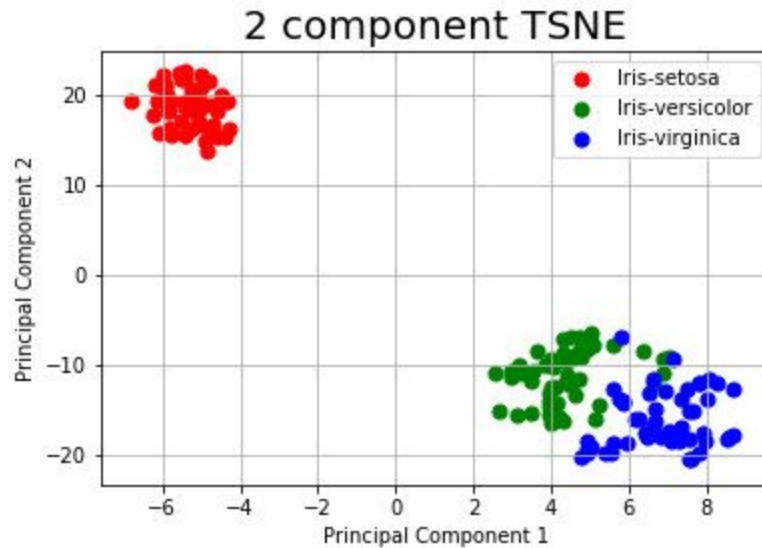


Observations -

Clusters are clearly visible but they are not well separated
Out of four dimensions it choose those principal components which has high variance (i.e the direction in which data is well separated)
PCA is a linear feature extraction technique

b)

- **t-SNE on iris dataset**
- I applied PCA after normalising the dataset
- Reducing the dimension from four to two

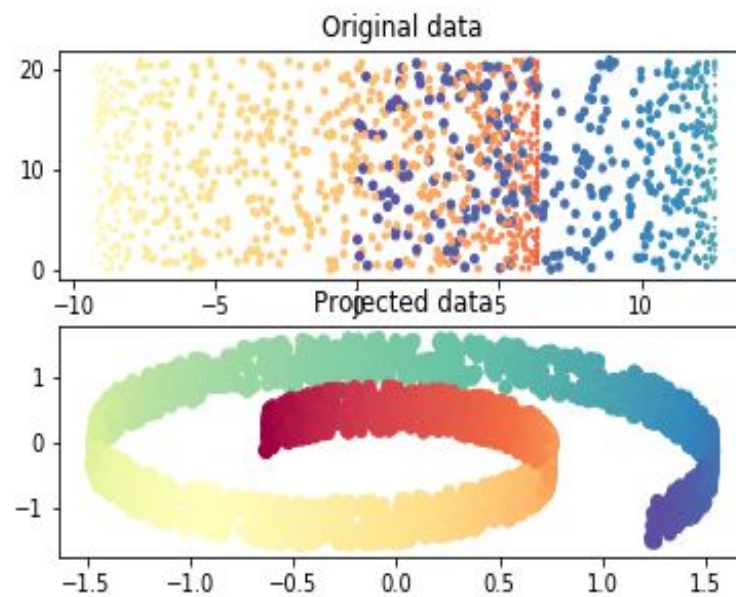


Differences and Similarities -

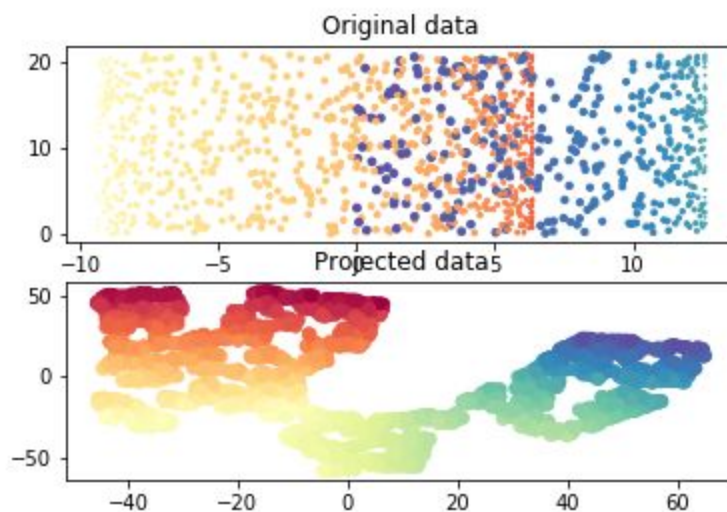
- Clusters of t-SNE are clearly visible and they are well separated also, if we compare them with the clusters that we get from the PCA reduction
- t-SNE is a non- linear feature extraction technique, whereas PCA is a linear feature reduction technique
- t-SNE is slower than the PCA, as i observed while applying t-sne and PCA
- t-SNE every time changing its output, i.e every time the plot is somewhat different
- They both uses some correlation for finding the relation between the features like PCA project the points in the direction of higher variance whereas the t-SNE uses the KL divergence

c) PCA and t-SNE on swiss roll dataset

- **Plot for PCA projection**



- **Plot for t-SNE on swiss roll dataset**



Observations and Inferences

- t-SNE is slower than the PCA, as i observed while applying t-SNE and PCA
- t-SNE is a non- linear feature extraction technique, whereas PCA is a linear feature reduction technique

- Clusters of t-SNE are clearly visible and they are well separated also, if we compare them with the clusters that we get from the PCA reduction
- t-SNE every time changing its output, i.e every time the plot is somewhat different