

Assignment 4 Report

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November 18, 2017

1 Spectral Clustering

(a) The spectral clustering result and keamns result are illustrated as below:

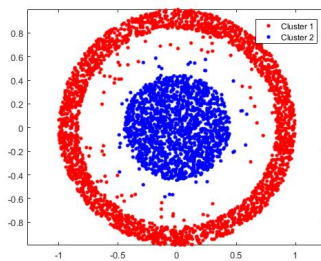


Figure 1: Spectral Clustering

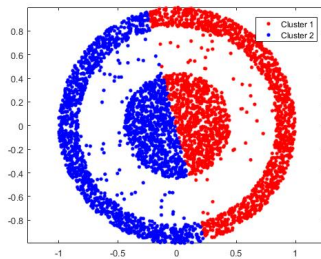


Figure 2: Kmeans

(b) Set the options as below to construct weight matrix: `options.NeighborMode = 'Supervised'` `options.gnd = gnd` `options.bLDA = 1`;

And after 100 iterations:

accuracy of spectral clustering: 0.84

accuracy of kmeans: 0.42

mutual info of spectral clustering: 0.638

mutual info of kmeans: 0.297699

2 Principal Component Analysis

. (a) The original image is as below:

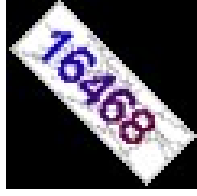


Figure 3: rotated image

After recovery by PCA:



Figure 4: recovered image

(b) (i) The learnt eigenvectors are visualized as below (take the eigenvectors corresponding to 128 largest eigenvalues):



Figure 5: visulaization of learnt eigenvectors

- (ii) The tesing error rate are illustrated as Table 1.
- (iii) The original image is visualized as Figure 6.

The recovered images with different reduced dimensions are illustrated as Figure 7-11. And we can see that there exits information loss.

Table 1: Error Rate (with $k=1$ in knn)

Reduced Dimensionality	Error Rate
8	0.245
16	0.200
32	0.180
64	0.15
128	0.15



Figure 6: original face images



Figure 7: the recovered faces with reduced dimension=8



Figure 8: the recovered faces with reduced dimension=16



Figure 9: the recovered faces with reduced dimension=32



Figure 10: the recovered faces with reduced dimension=64



Figure 11: the recovered faces with reduced dimension=128