IE 529 Fall 2016 Assignment 2

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1 PCA

Following the procedures of PCA, the mean value is:

$$\vec{m} = [1.87275,\ 1.48783,\ 1.87275]$$

And the variance is:

$$variance = [2.38297,\ 0.234668,\ 2.54 \times 10^{-16}]$$

And the corresponding eigenvector is:

$$eig1 = [-0.6694\ \ -0.3220\ \ -0.6694]^T$$

$$eig2 = [0.2277\ \ -0.9467\ 0.2277]^T$$

$$eig3 = [-0.7071\ \ -1.4140 \times 10^{-15}\ 0.7071]^T$$

The de-biased dataset and corresponding eigenvectors are plotted in Figure 1.

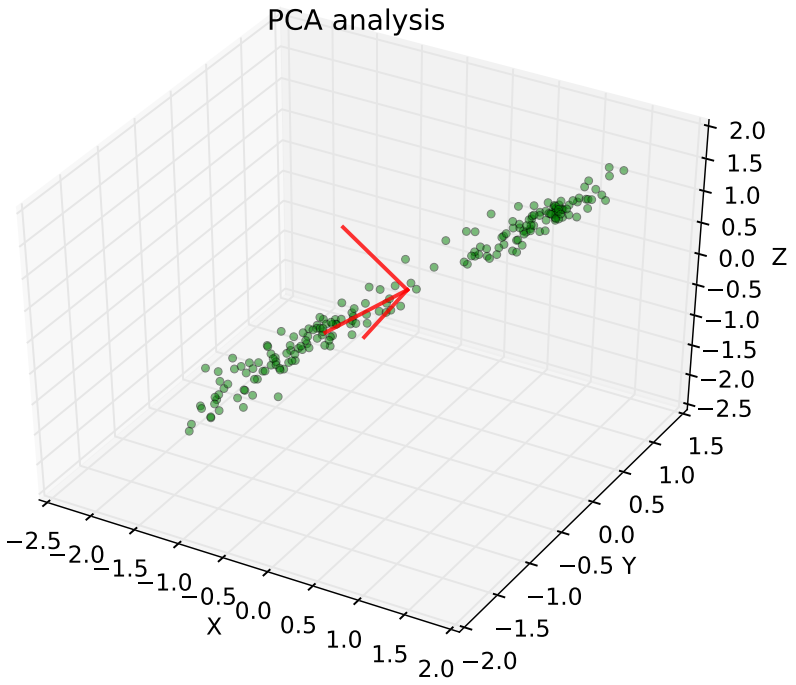

Figure 1: PCA eigenvector and scatter plot

The original dataset can be projected onto the first two principal components, the result is shown in Figure 2.

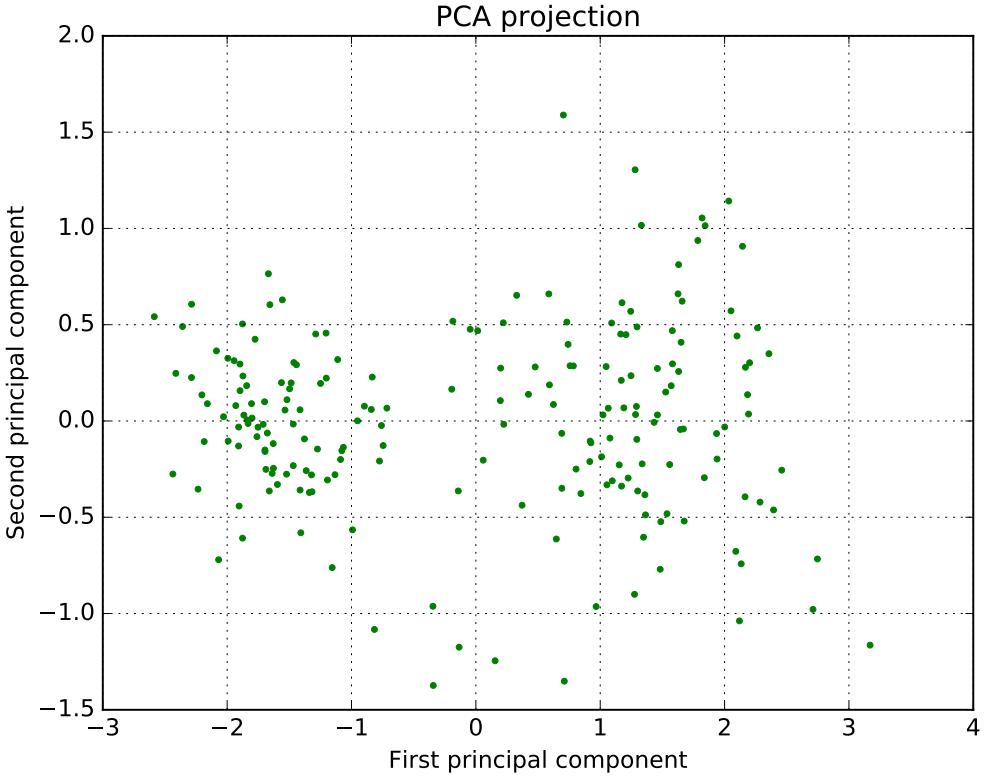

Figure 2: PCA Projection

2 Discussion

Currently the PCA is conducted through

$$[U, S, V] = SVD(A * A^T)$$

In fact this process can be simplified to:

$$[U', S', V'] = SVD(A)$$

Then, we can get that:

$$U = U'$$

$$S = S'^2$$

In this way, this process can be directly performed on the original data, rather than the new data.