

IE 529 Fall 2016 Assignment 2

Jifu Zhao

Date: 09/29/2016

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.

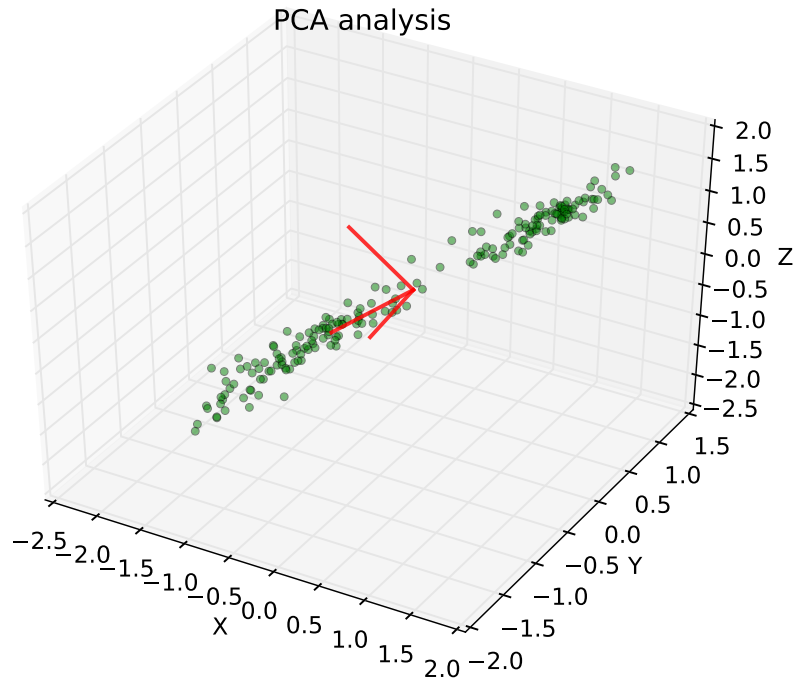


Figure 1: PCA eigenvector and scatter plot

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

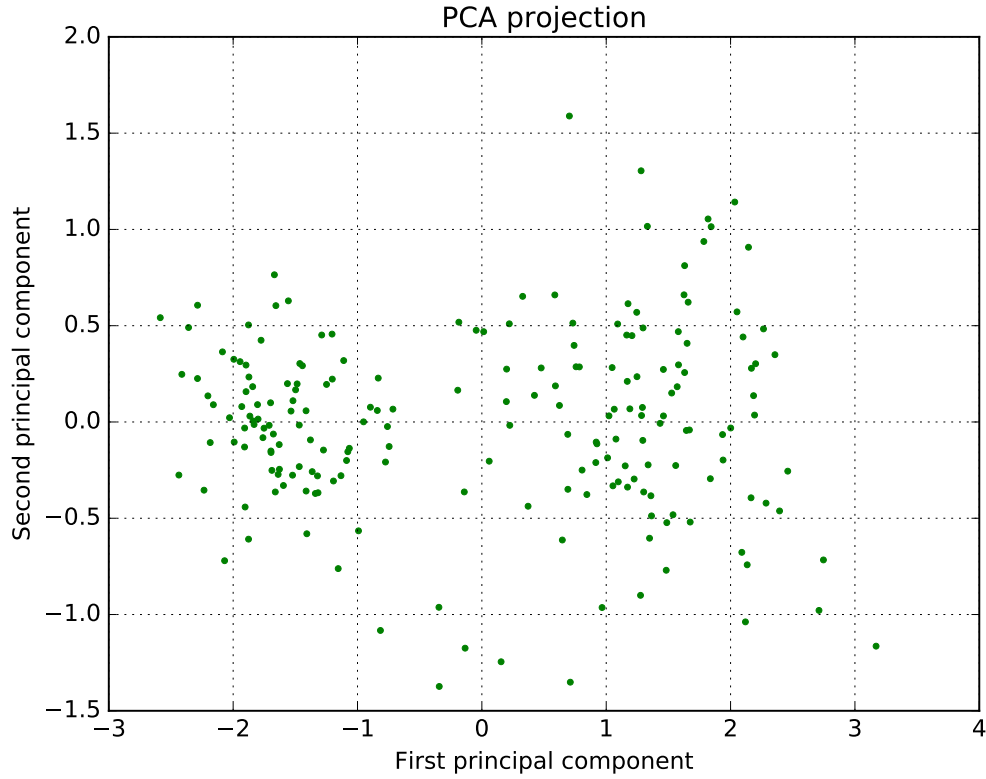


Figure 2: PCA Projection

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:

$$\begin{aligned} U &= U' \\ S &= S'^2 \end{aligned}$$

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