CMPUT 307 - Lab 6

Principal Component Analysis (PCA)

In this lab you have to implement the Principal Component Analysis (PCA) algorithm and apply it on the provided 3D data (3d_sphere.mat, teapot.mat and bun_zipper.mat).

The skeleton code for this exercise **will not be provided** and you are required to implement the complete code from scratch using matlab satisfying the following requirements:

1. Finish a function "center", which, given N samples of data X in d-dimension, calculates the mean/centroid of data X along the d-axis and returns the centered data X_centered and the centroid.

2. Finish the main "PCA" function which takes data X in shape (N, d). It returns the covariance matrix, eigenvalues and the eigenvectors computed by the PCA.

3. Finish function "plot3d _pca" which plot the data and the principal components in 3D.

4. You should add adequate comments in code files to explain your code.

Notes:

(1) Mark the first, second and the third components with blue, red and green, respectively.

(2) A good practice is to scale the principal component with its variance. Think carefully how you should plot the principal components to achieve a good visualization.

Submit a zip file with all your code files used during this lab, including a .pdf file with a table reporting the eigen values and eigen vectors corresponding to each of the 3D data files. Also, in pdf file, you should include the pca plot results on the synthetic 3D sphere, teapot and bunny used for this exercise.