# In the name of God

Shiraz University



Pattern Recognition

# Mini project 3

Principal Component Analysis and

Fisher Linear Discriminat

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Due Date   **9** <sup>th</sup> **Dey**

Fashion-MNIST is a dataset of Zalando's article images consisting of a training set of 60,000 examples and a test set of 10,000 examples. Each example is a 28×28 grayscale image, associated with a label from 10 classes. Fashion-MNIST is intended to serve as a direct drop-in replacement of the original MNIST dataset for benchmarking machine learning algorithms.



####################################################
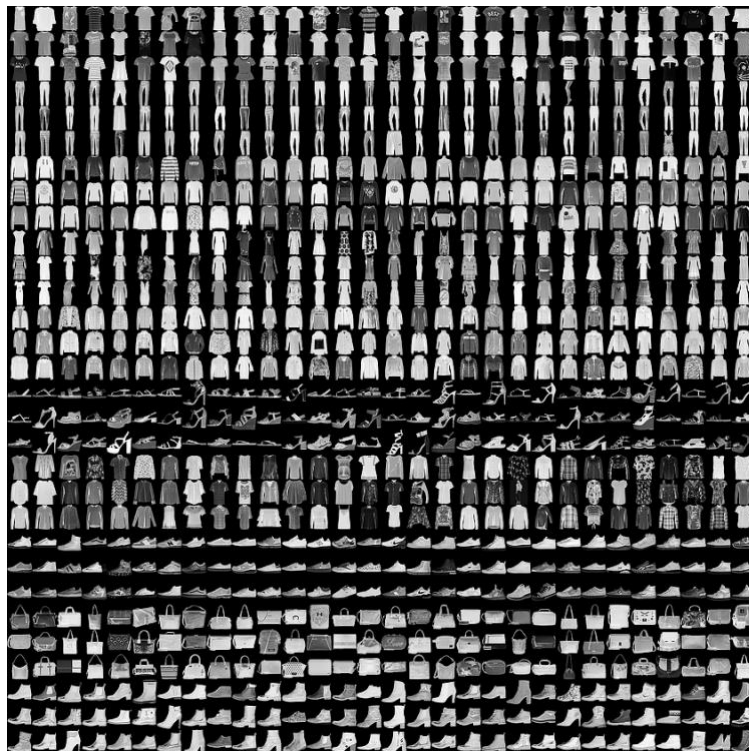
# Problem #1

Implement PCA method from scratch (You're not allowed to use available functions in sklearn or other similar libraries for PCA)

a) Plot the Eigen-values of Covariance matrix in descending order.

b) Choose appropriate number of features (based on the result of part a). After projecting the data into new subspaces. Next, apply Bayes classifier, with Gaussian parametric estimate of pdf's and report the Accuracy.

# Problem #2

Without considering class labels, Implement Fisher Linear Discriminant Analysis from scratch (At first whiten the data and then compute between scatter matrix (SB) and within scatter matrix (SW)).

a) Plot the Eigen-values of Separability matrix in descending order.

b) Plot the Separability measure vs. number of components.

c) Choose appropriate number of features (based on the result of part a and After projecting the data into new subspaces. Next, apply Bayes classifier, with Gaussian parametric estimate of pdf's and report the Accuracy. Explain the result.