

SMAI-2020-Homework

September 2020

1 Objective Question [1 mark]

What are the objectives of Principal Components Analysis (PCA)? Select all that are correct.

1. Maximize the variance along the new output dimensions
2. Minimize the variance along the new output dimensions
3. Maximizing the orthogonal distance between the data and the new output dimension
4. Minimize the orthogonal distance between the data and the new output dimension

2 Subjective Question [2 markss]

Prove that there exist a relationship between PCA and SVD for a given data matrix X . Explain in one line how will you use the the SVD of the data matrix X to perform dimensionality reduction?

3 Programming Question [3 marks]

Consider the problem of Eigenfaces. Given a dataset of face images, your task is to find a lower dimensional representation by applying PCA. Write a program to output the following:

1. How many principal components are required such that 95% of the variance in the data is preserved?
2. Show the reconstruction of the first 10 face images using only 100 principal components.
3. Show the above two results for a noisy face dataset.