ME 228 - S1 - Assignment 2

Department of Mechanical Engineering, IIT Bombay
Spring 2024
Due Date: 11:59 PM, Friday, Feb 9, 2024, Marks 20

Assignment Date: 11:00 PM, Saturday, Feb 03, 2024

Objective and Instructions

1. The objective is to use library functions and use PCA for compressing images.

2. Show all the elementary steps as needed to fully understand the problem.

3. This needs to be performed using Google Colab Notebook or Jupyter Notebook only.

4. Total 2 files should be uploaded - Python notebook, Python Notebook PDF. Do not submit a zip file.

5. You are *welcome and are encouraged to discuss* with the students of this class.

Q 1. **[3 points]** Load the MNIST handwritten digit (grayscale, size=28,28) dataset and randomly select any 1000 images from the dataset.

Q 2. **[5 points]** Perform dimensionality reduction of the images using PCA while making sure that the reduced dimensions explain at least 95 % of the variance.

Q 3. **[2 points]** How many number of principal components are required to achieve 95 % of the variance.

Q 4. **[3 points]** Plot 9 actual images in a pattern of 3 ×3.

Q 5. **[3 points]** Plot the above images after dimensionality reduction in the same pattern.

Q 6. **[4 points]** Plot graph between the number of principal components vs cumulative explained variance.

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