Statistical Machine Learning Winter 2022 Assignment - 3 Deadline : 5^{th} *Apr* 2022, 11:59PM

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1 Instructions

- You are free to use either python or MATLAB for this assignment.
- You can use inbuilt libraries for Math, plotting, and handling the data (eg. NumPy, Pandas, Matplotlib).
- Usage instructions for other libraries can be found in the question.
- Only (*.py) and (*.m) files should be submitted for code.
- Create a (*.pdf) report explaining your assumptions, approach, results, and any further detail asked in the question.
- You should be able to replicate your results if required.

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2 Question-1[2 Marks]

Use cifar-10 dataset for this questions and perform following tasks.

- Visualize 5 samples from each class in the form of images.
- Apply LDA(use sklearn) on the given dataset.
- Report accuracy and class-wise accuracy for testing dataset.

3 Question-2[2 Marks]

Use MNISTdataset for this questions and perform following tasks. • Apply PCA(use sklearn) on the given data and set the hyperparameter *n components* = 15.

- Apply LDA(use sklearn) on the transformed data.

- Repeat step-1 and step-2 by keeping *n components* = 8 and 3.
- Plot accuracy of all three experiments on testing dataset and report which experiments give better result and why?.

4 Question-3[2 Marks]

Use FMNIST(Fashion MNIST)dataset for this questions and perform following tasks.

- Implement FDA on given data for multiple classes from scratch, and find the coefficient vector W.(Note: computation of W will use training samples only.)
- Project the training data (X) using W, and call the projection Y.
- Use the projected data Y to classify the testing samples using LDA (use sklearn).
- Report accuracy and class-wise accuracy.

5 Question-4[2 Marks]

Use MNISTdataset for this questions and perform following tasks.

- Apply PCA(using sklearn) on given data and set *n components* = the best value that you reported from Question-2. • Apply FDA(Reuse FDA implementation from question-3) on the transformed data which is received from step-1.
- Use the projected data received from step-2 and apply the classifier LDA to classify all testing samples.
- Report accuracy and class-wise accuracy from all testing samples.