LDA Assignment

Lab Exercise 1: Introduction to LDA for Dimensionality Reduction

Objective: Understand the basic principles of LDA and apply it to reduce the dimensionality of a simple classification dataset.

Instructions:

1. Load the Dataset:

Use the Iris dataset (available in sklearn or seaborn). The dataset has 4 features and 3 classes.

2. Data Standardization:

O Standardize the data so that it has a mean of 0 and a standard deviation of 1.

3. Apply LDA:

 Implement LDA using sklearn's LinearDiscriminantAnalysis class. Reduce the dimensionality of the dataset to 2 components.

4. Visualization:

O Create a 2D scatter plot of the transformed data, using different colors for each class.

5. Compare LDA with PCA:

 Plot the first two components from PCA (from the previous lab if done) on the same dataset and compare the results with LDA.

Lab Exercise 2: LDA for Classification

Objective: Learn how LDA can be used as a classifier by applying it to a multi-class classification problem.

Instructions:

1. Load the Dataset:

O Use the Wine dataset from sklearn, which contains 13 features and 3 classes.

2. Split the Data:

O Split the data into training and testing sets (e.g., 70% training, 30% testing).

3. Train an LDA Model:

Use LDA as a classifier by training a LinearDiscriminantAnalysis model on the training data.

4. Evaluate the Model:

Predict the labels on the test set and compute the model's accuracy, precision, recall, and confusion matrix.

5. Compare with Logistic Regression:

o Train a logistic regression model on the same dataset, and compare its performance with the LDA classifier.

6. Visualize Decision Boundaries (Optional):

 For an intuitive understanding, visualize the decision boundaries for both the LDA and logistic regression models in a 2D space (you can reduce the dataset to 2 dimensions using LDA or PCA for visualization purposes).