Systems and Biomedical Engineering
SBE 4032 - Advanced Topics in Medical Informatics (2)
Spring 2024

Assignment 2

For this assignment, you're required to implement and apply **Linear Discriminant Analysis** for a dataset with an arbitrary number of classes to reduce it to an arbitrary number of dimensions.

Please apply the following:

1- Create a function that performs LDA using the steps described in the tutorial file, section "LDA general".
   The function should take n_components and the data matrix and return the sorted eigenvalues, the sorted eigenvectors and the transformed data.
2- Use your function on Iris dataset to reduce its dimensionality to 1 dimension one time and 2 dimensions another time.
   (Please note that LDA can reduce the original number of features to a maximum number of features = n_classes - 1. If the data has 3 classes, its dimensions can be reduced to 1 or 2 dimensions only).
3- Plot the original data (a 4x4-plot figure that plots the data features against each other). Plot the transformed data in both cases (1D and 2D). Comment on the results.
4- Compare the 2D reduced data using LDA with your 2D reduced data using PCA (in the previous assignment).
   What differences do you notice? Does it make sense regarding the definitions of PCA and LDA?

Instructions

1- The assignment is **individual**. Sharing code is not accepted. Cheating will result in a zero grade.
2- Add comments that describe your code.
3- Your conclusions and comments on the results can be included in markdown cells within your code.
4- **Late submissions** will be penalized.
5- **Submission** will be through providing me with a link to your code on Google Colab. The link should be submitted and turned in on Google classroom.
   Please remember to provide me with access to the code as an Editor.
6- Editing your code after the submission deadline is not accepted.