EE595: Machine Intelligence and Smart Systems

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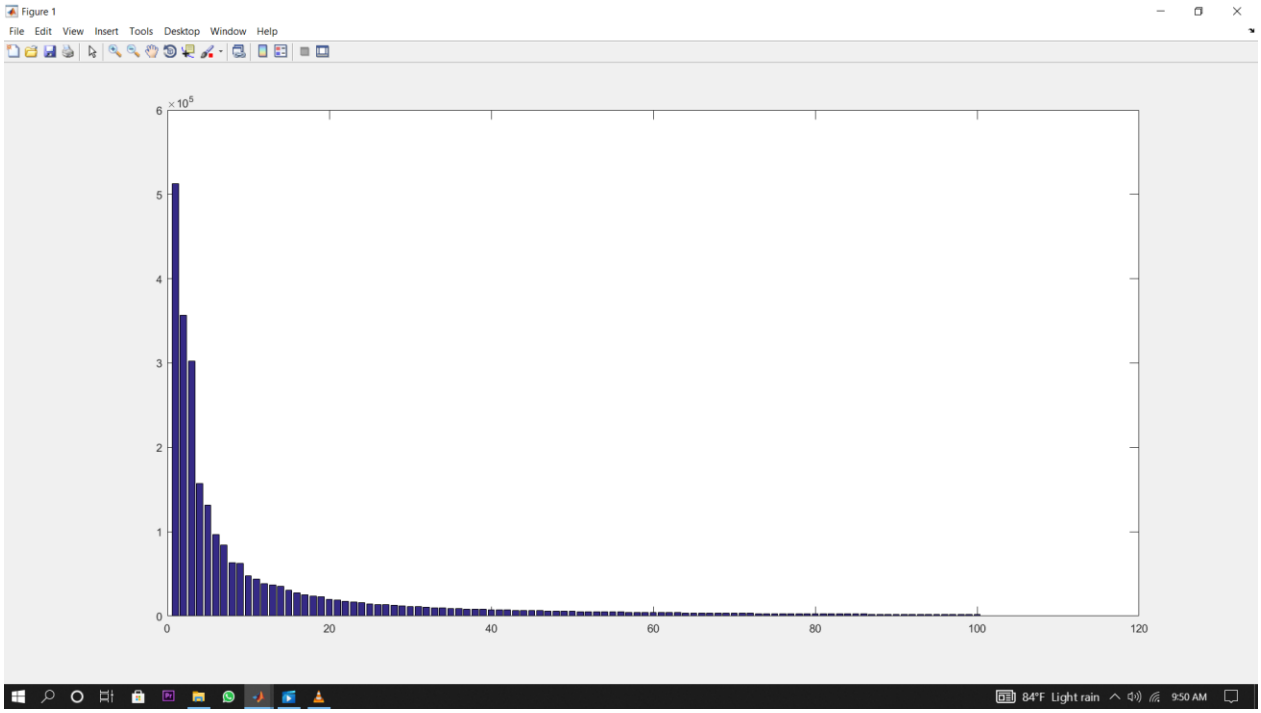
E/16/103

Classification of Yale Data set

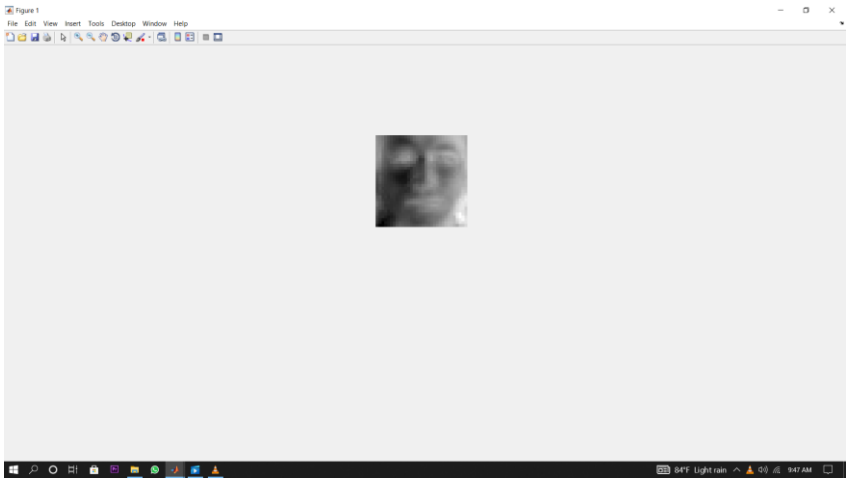
Yala data set consist of 165,32 x 32 pictures of 15 people 11 photos each. By obtaining the principal components we can squeeze out the most prominent features which has the best variance by translating feature vectors in to principal component axis. The obtained vectors are known as eigen faces which are ordered in a hierarchical manner.

Prominence PCA in Yale dataset

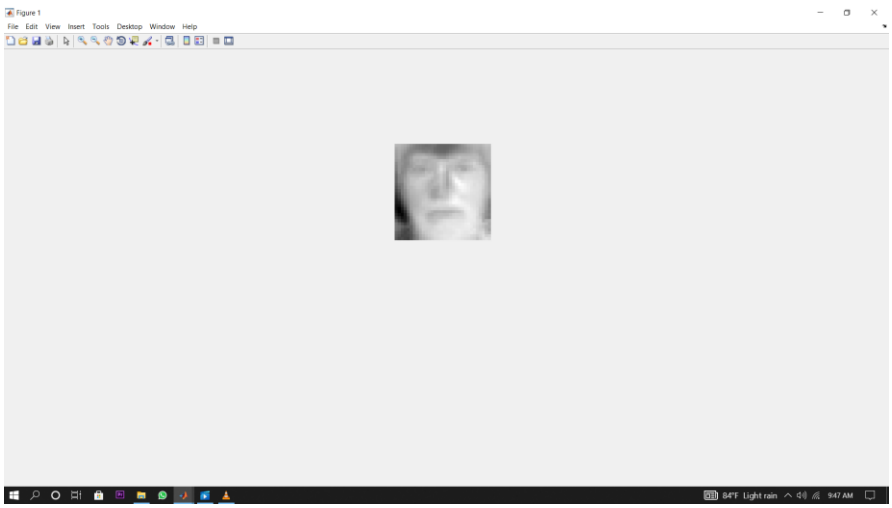


We can see that first PC correlates with the faces more by plotting the Eigan faces

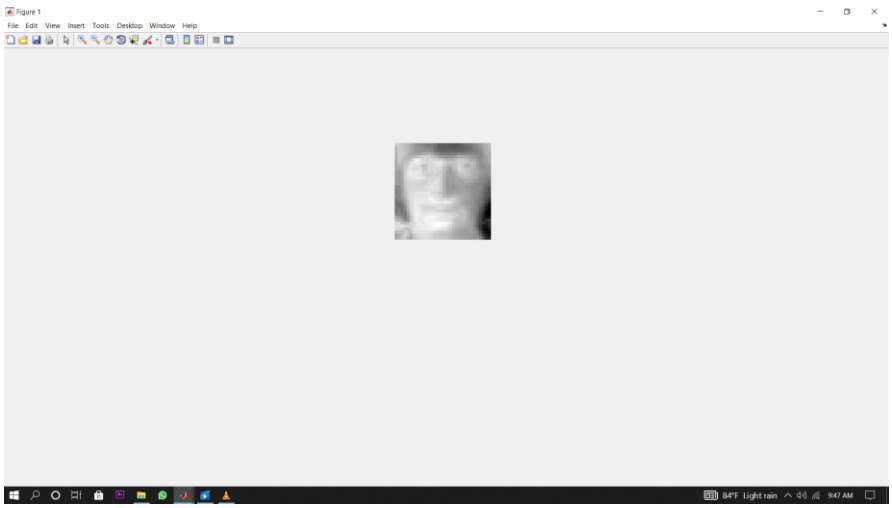
Eigen face obtained from PCA1



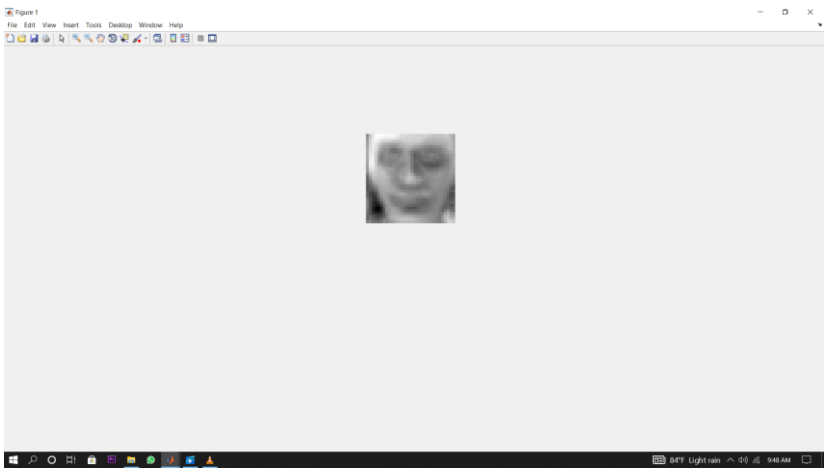
Eigen face obtained from PCA2



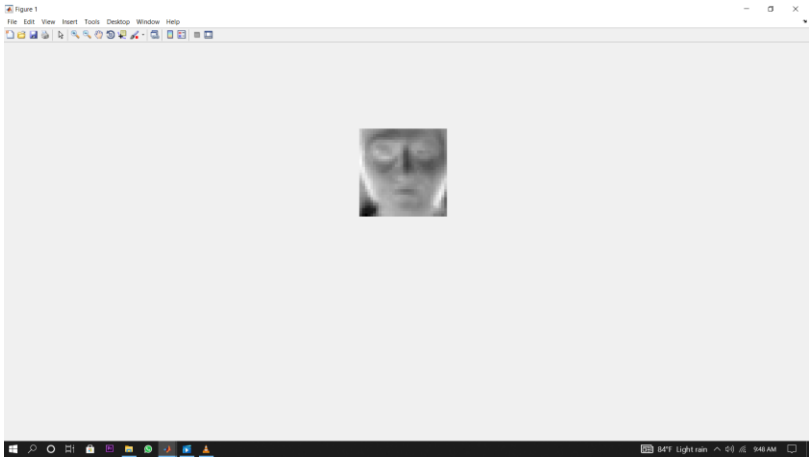
Eigen face obtained from PCA3



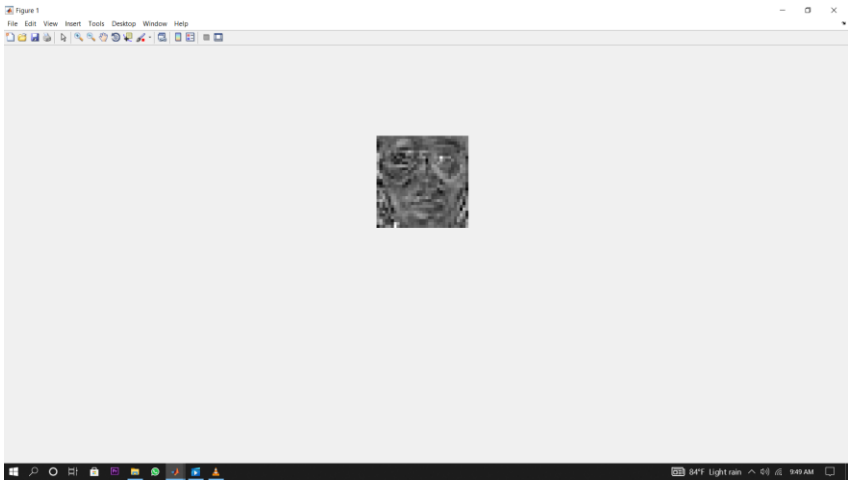
Eigen face obtained from PCA4



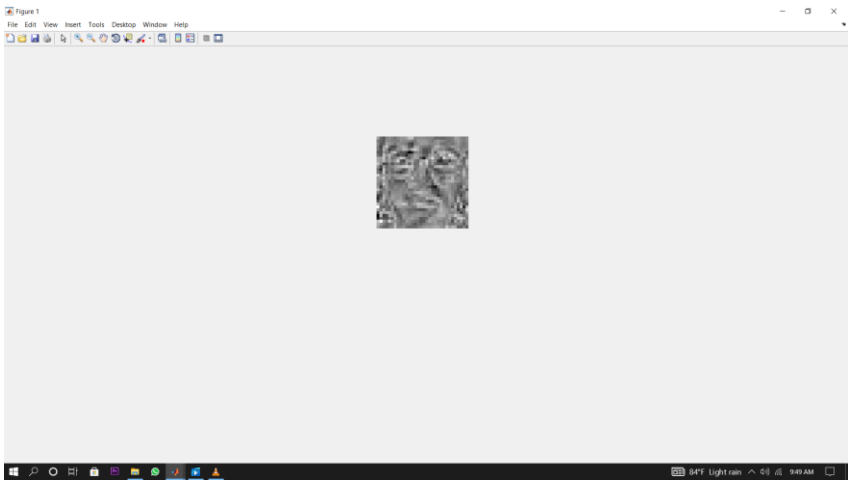
Eigen face obtained from PCA5



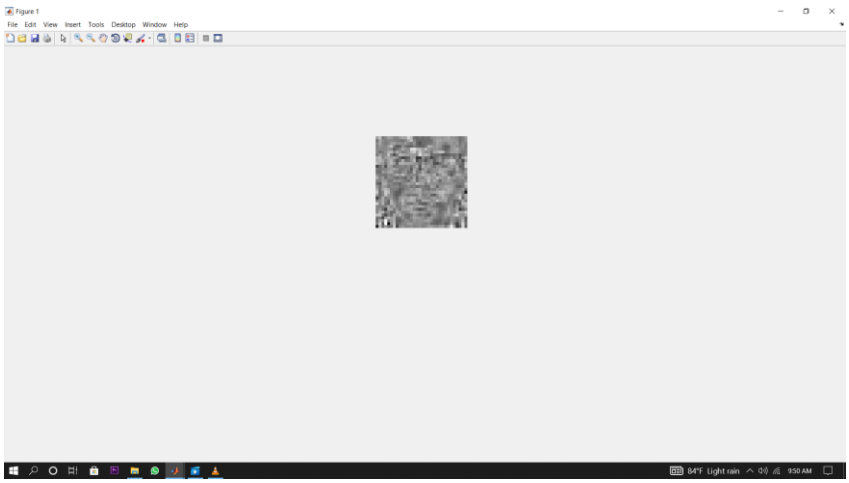
Eigen face obtained from PCA80



Eigen face obtained from PCA90

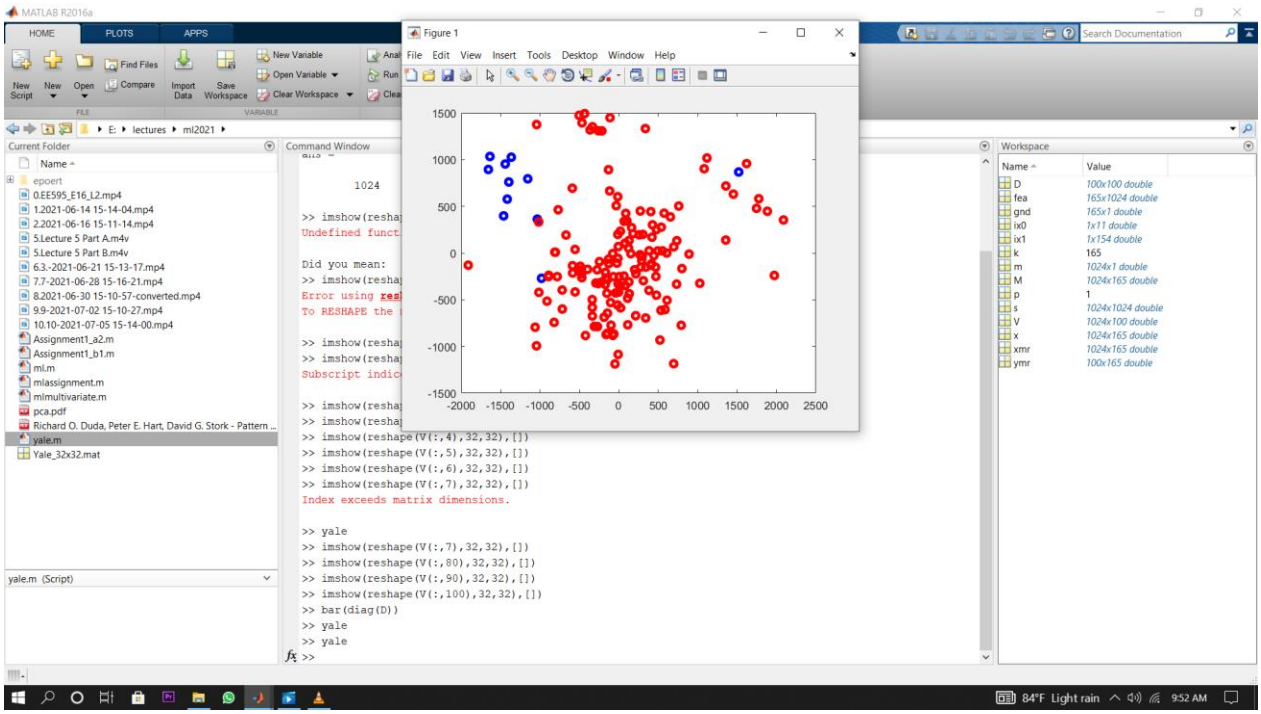


Eigen face obtained from PCA100



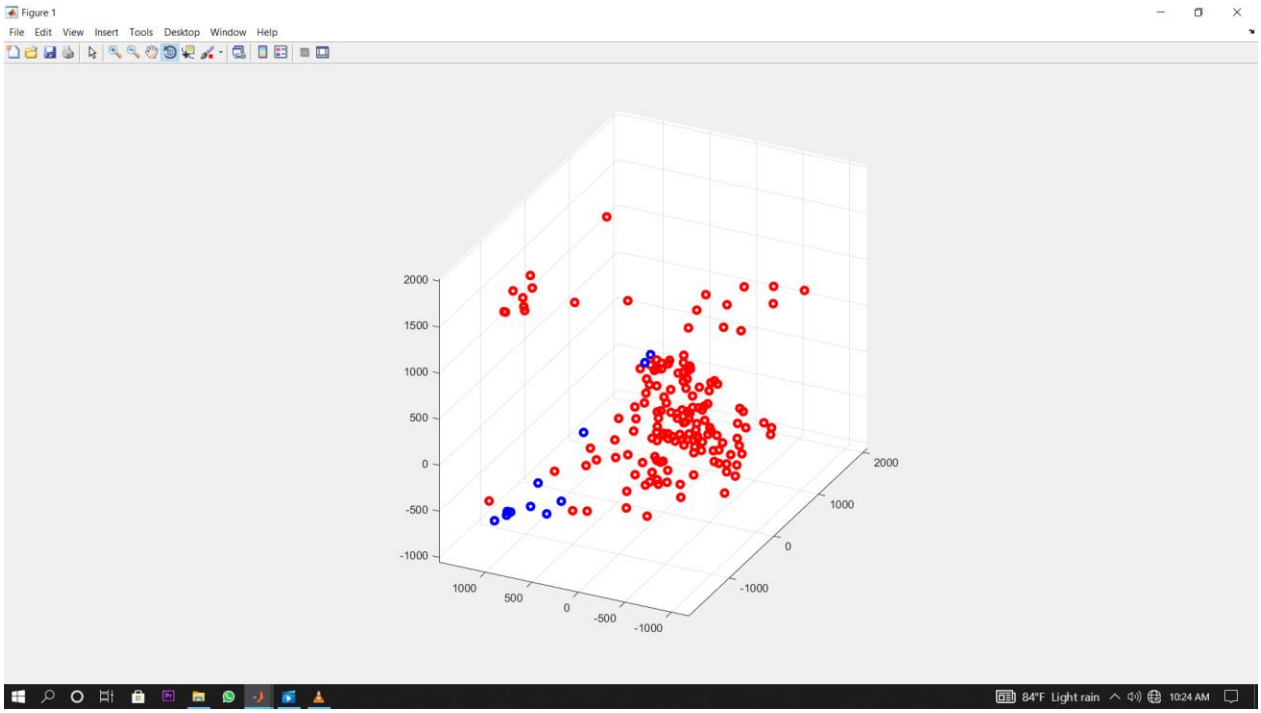
From the plots we can see that only first few eigen faces carries a clear data structure of a face. From the PCA plot we can see that as componant axis advance toward infinity the eigan faces corresponding will make no sense.

2D Plot of the person 1 considering PCA 1 & PCA 2

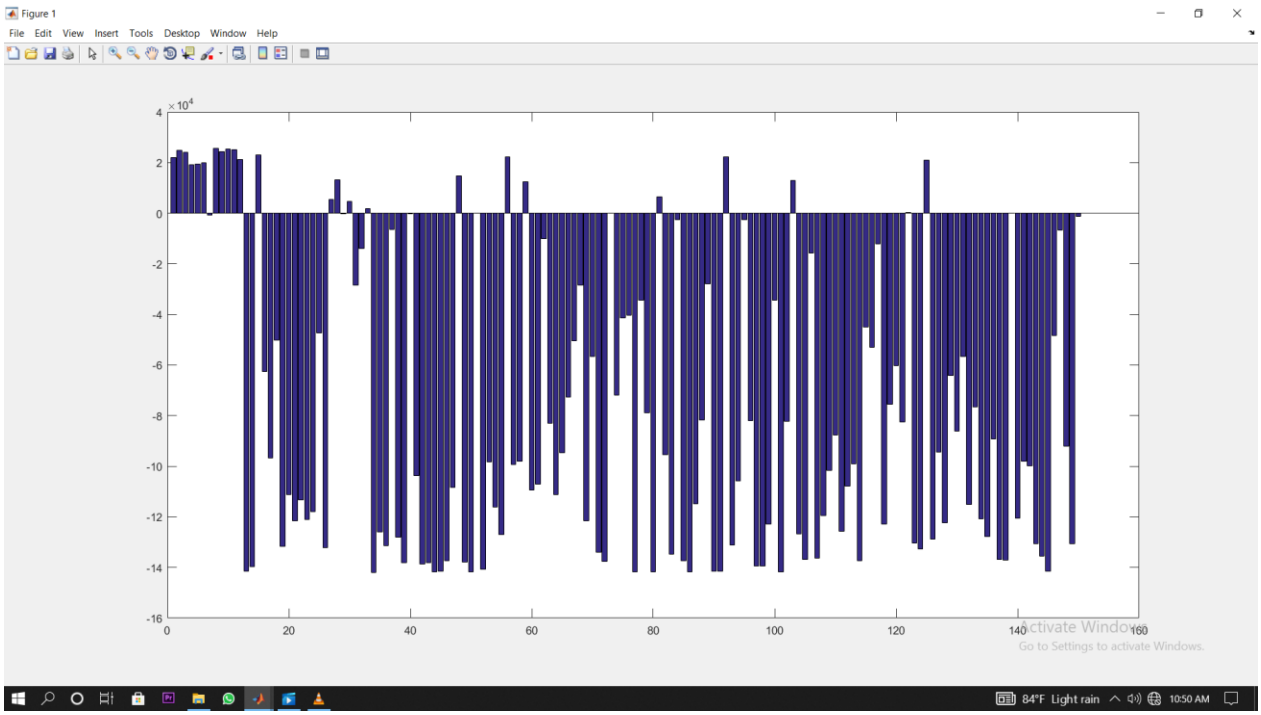


Blue color dots represent person 1 and from considering first 2 PCA We can classify the blue cluster successfully.

But if we consider PCA 1 to PCA 3 this is not the case. Classification becomes complex.



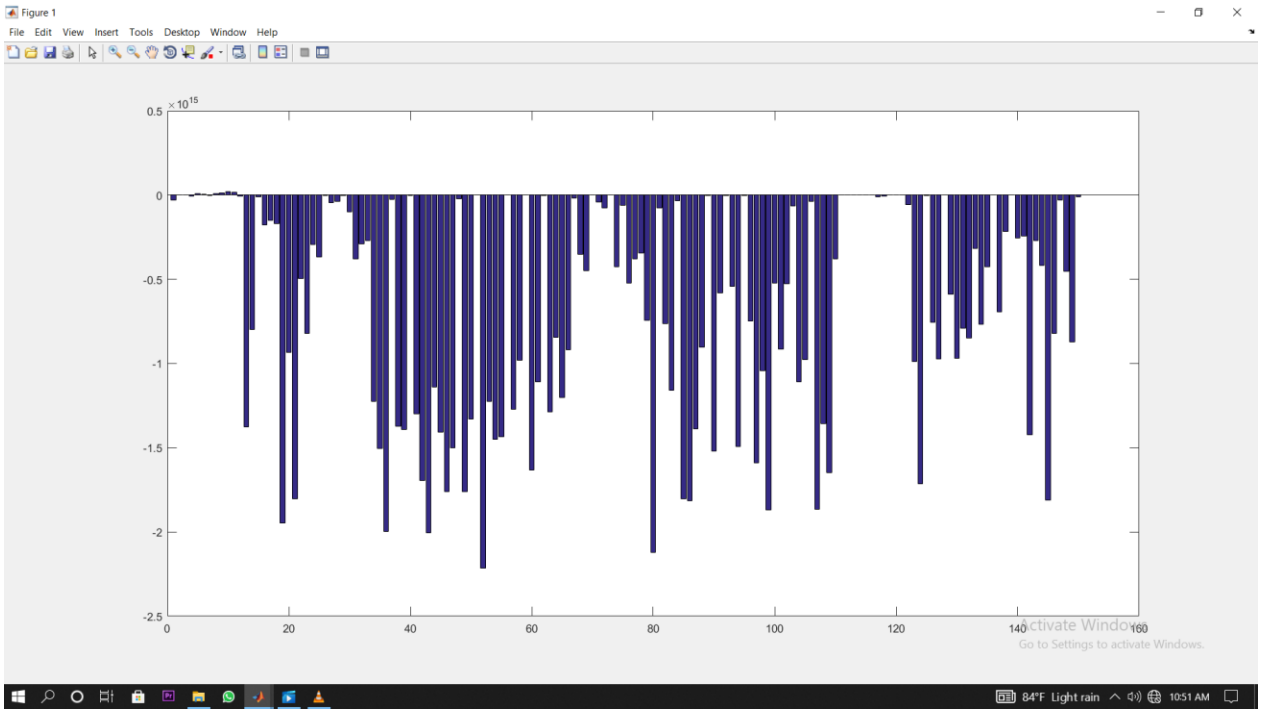
If we classify this data using a multivariate density classifier only using PCA 1



We can obtain a fair classification.

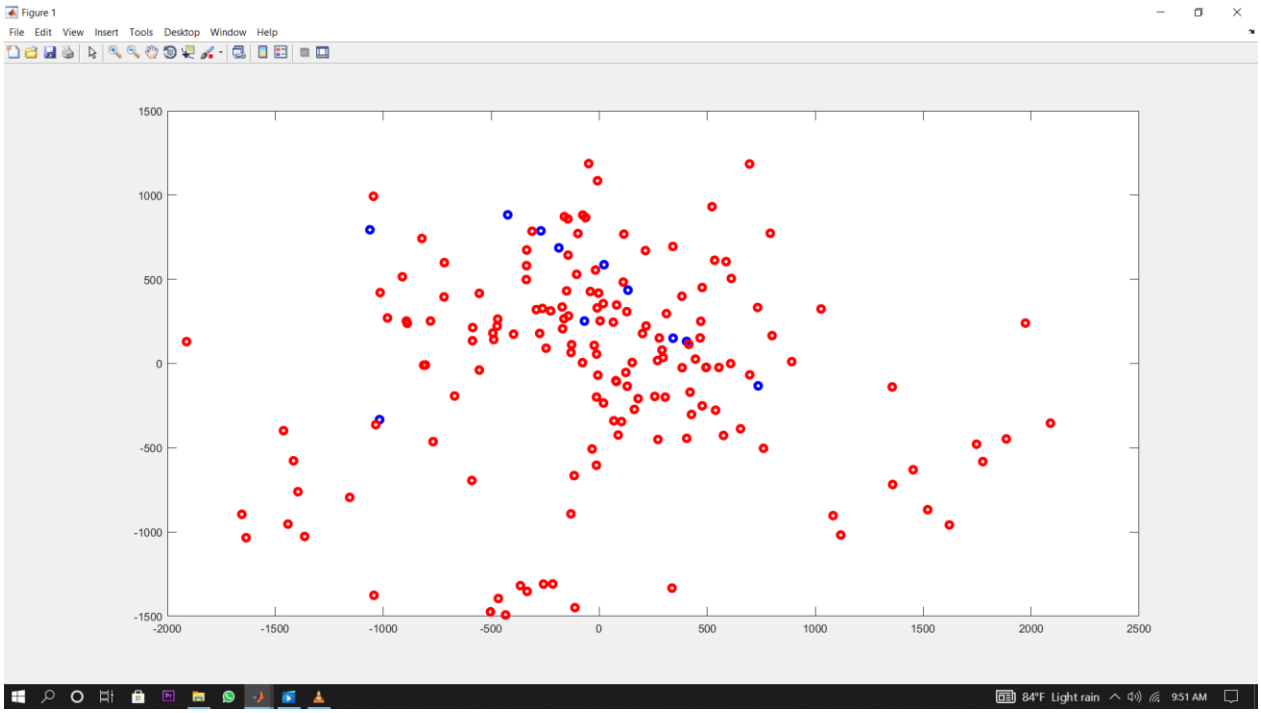
But as discussed above when PCA add up to the classification process it becomes harder.

Classification using PCA 1 to PCA 3



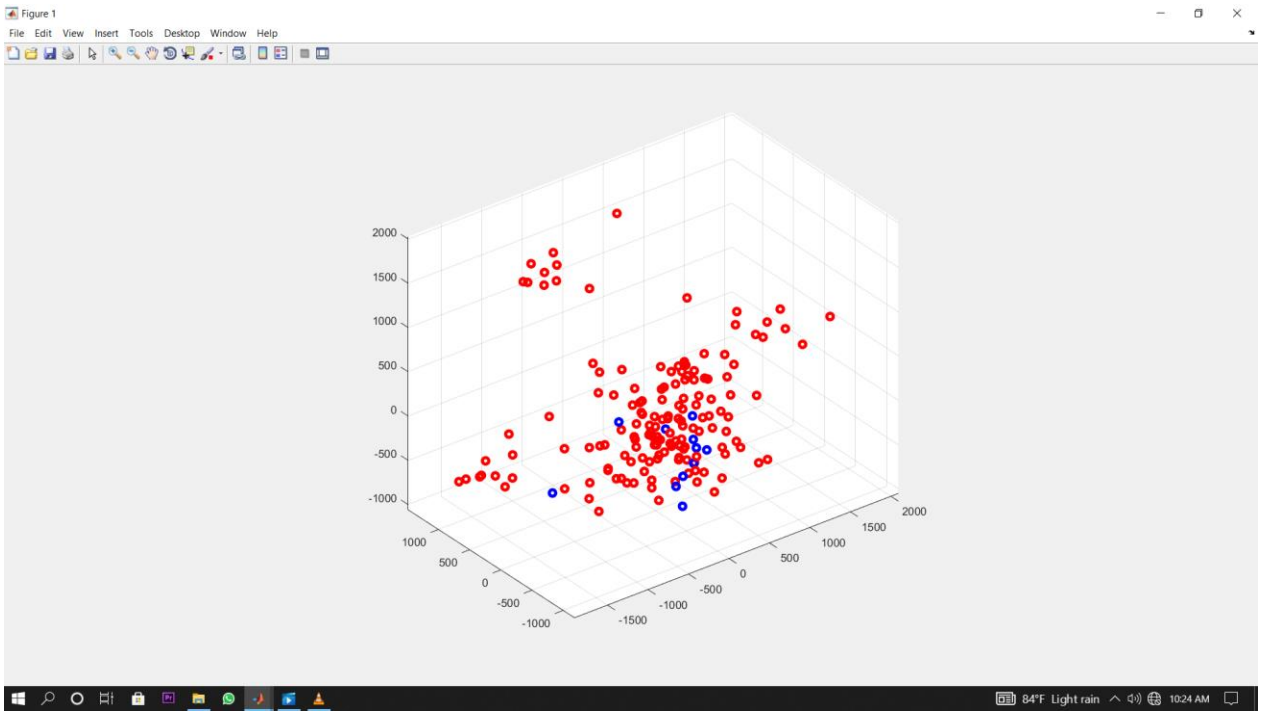
Here the classification is poor due to the fact that adding 3 PCA to the classification requires a complex classifier.

For the person 2 The case is different.



From 2D plot considering PCA 1 & pCA2 acquiring the cluster for person 2 is difficult.

3D plot considering PCA 1-3 of person 2



Classification Done using Multivariate classification considering only PCA1