

PATTERN REPORT

Face Recognition

Team:

Andrew Botros | 20201322493
Katherine Ashraf | 20201378779
Mazen Mohammed | 20201312620
Ali Ashraf | 2103106

In this project we are going to declare patterns for machine learning by using some functions and algorithms

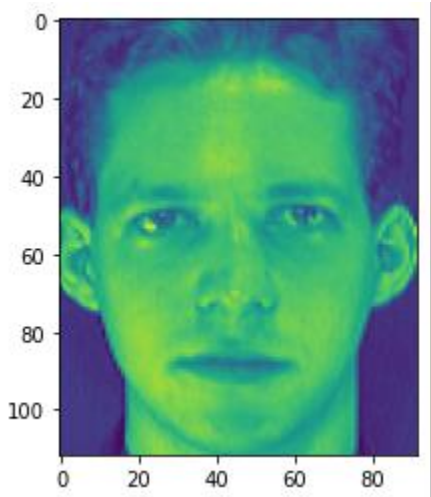
We will use:

`matplotlib.image` for image selection
`numpy` for the mathematical operations and matrices

First of all we import `matplotlib.image` so that we install all the images for testing

`sklearn` for train test splitting

then we have to read the images in order to work on them so we will loop through the image's folder and select them



Starting off by making an empty list to store data and then making a nested loop with the range of our data folders and the data inside each folder and then read them and store them in `data[]` and `y[]`

Next we have to Convert every image into a vector of 10304 (92x112) values corresponding to the Image Size and stack the 400 vectors into a single Data Matrix `D` and generate the label vector `y`

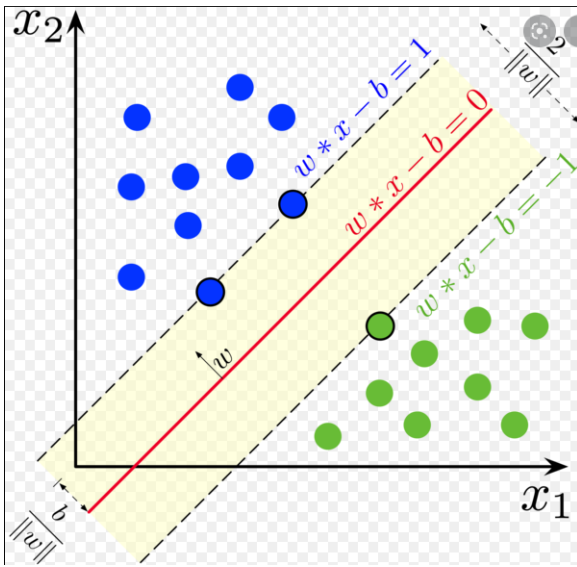
Note : The labels are integers from 1:40 corresponding to the subject id

After that we will have to split our data into testing and training sets *(the odd rows for training and the even rows for testing) to do so we should make 4 lists and store each one in its actual list

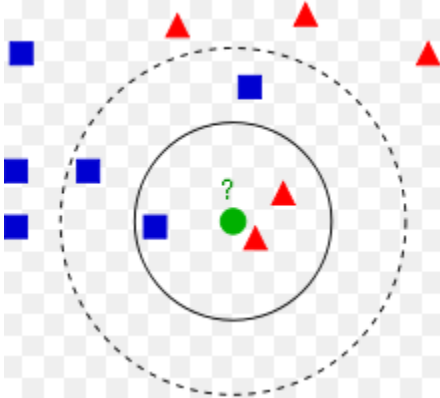
```
odd_rows=[]
even_rows=[]
odd_target =[]
even_target =[]
for i in range(data.shape[0]):
    if i %2 == 1:
        odd_rows.append(data[i,:])
        odd_target.append(y[i])
    else:
        even_rows.append(data[i,:])
        even_target.append(y[i])

odd_rows = np.array(odd_rows)
even_rows = np.array(even_rows)
odd_target = np.array(odd_target)
even_target = np.array(even_target)
```

Now we split the data all we have to do is to make an algorithm to teach the computer we will use SVM - “Support Vector Machine” is **a supervised machine learning algorithm that can be used for both classification or regression challenges-**



After we are done with the SVM we are going to use another algorithm in our case we will use the KNN -“K-Nearest Neighbour”. It is a supervised machine learning algorithm. The algorithm can be used **to solve both classification and regression problem statements- and see which one is more effiecent .**



Moreover we used PCA ALGORITHM - Principal Component Analysis is **an unsupervised learning algorithm that is used for the dimensionality reduction in machine learning**. It is a statistical process that converts the observations of correlated features into a set of linearly uncorrelated features with the help of orthogonal transformation-

But to make an pca model we first need to follow some steps first:

- . compute the mean of the data
- . center our data by subtracting the mean value from every element in the data
- . compute covariance matrix ($1/n(Z.T * Z)$)
- .compute the eigenvalues and eigenvectors
- .sorting our data
- .multiplying eigenvector_large and transpose of Z

After that our data dimentions should be decreased to one raw.