Rayan Hassan
4511021

Homework 6 – report – ECE 1395

Part 0

The size of X_train_1, X_train_2 and X_train_3 is shown below

```
In [67]: runfile( C:/Users/RAYAN/OneDrive/Desktop/
Desktop')
Part 1

Size of X_train_1: (40, 4)
Size of X_train_2: (42, 4)
Size of X_train_3: (43, 4)
```

Part 1

   a) The values of the mean and standard deviation for every class is shown below. Each vector
      contains 4 values (one for each feature: value at index 0 corresponds to feature 1, etc.).

```
Mean vector for class 1: [-0.9550364477104598, 0.9008879104372444, -1.2833525561383219,
-1.235616359157304]


Mean vector for class 2: [0.019552153678853698, -0.7105717886834635, 0.25173137547441066,
0.14143819992072879]


Mean vector for class 3: [0.9222009994751631, -0.1635520437552989, 1.0342280391124206,
1.0900789329127567]


Standard Deviation vector for class 1: [0.3770712038571205, 0.8781435899215762,
0.0899142075843057, 0.1403439751574892]


Standard Deviation vector for class 2: [0.585160508180799, 0.701340204568421,
0.26411130681320044, 0.2350211135793735]


Standard Deviation vector for class 3: [0.7661662694238203, 0.7674648836864802,
0.314555002318794, 0.37592882790527266]
```

   b) The value of the accuracy for my classifier is 84%

```
Accuracy of classifier: 84.0 %
```

Rayan Hassan
4511021

Part 2

    a)   Each covariance matrix and its size are shown below

```
Part2

Covariance matrix 1:
Shape: (4, 4)

[[0.1458284  0.26818473 0.00325823 0.01093794]
 [0.26818473 0.79090889 0.01216345 0.03357229]
 [0.00325823 0.01216345 0.00829186 0.0035682 ]
 [0.01093794 0.03357229 0.0035682  0.02020147]]

Covariance matrix 2:
Shape: (4, 4)

[[0.35076435 0.21090408 0.12086883 0.07852627]
 [0.21090408 0.50387511 0.0974818  0.10099519]
 [0.12086883 0.0974818  0.07145612 0.04965294]
 [0.07852627 0.10099519 0.04965294 0.05658212]]

Covariance matrix 2:
Shape: (4, 4)

[[0.6009872  0.27536213 0.21410379 0.08415526]
 [0.27536213 0.60302621 0.09624368 0.15322974]
 [0.21410379 0.09624368 0.10130068 0.03788715]
 [0.08415526 0.15322974 0.03788715 0.1446873 ]]
```

Rayan Hassan
4511021

b) Each mean vector and its size is shown below

```
Mean vector 1:
Shape: (4, 1)

[[-0.95503645]
 [ 0.90088791]
 [-1.28335256]
 [-1.23561636]]

Mean vector 2:
Shape: (4, 1)

[[ 0.01955215]
 [-0.71057179]
 [ 0.25173138]
 [ 0.1414382 ]]

Mean vector 3:
Shape: (4, 1)

[[ 0.922201  ]
 [-0.16355204]
 [ 1.03422804]
 [ 1.09007893]]
```

c) The accuracy of my classifier is 96 %

```
Accuracy of classifier: 96.0 %
```

We can tell that MLE based classifier is more accurate than the naïve based one.