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Homework 6 Report

Question 0
Part c)

Output:
The shape of X_train_1 is (38, 4)
The shape of X_train_2 is (41, 4)
The shape of X_train_3 is (46, 4)

Question 1
Part a)

Output:
Mean Values:

Feature #	Class 1	Class 2	Class 3
0	5.05526	5.9561	6.59348
1	3.44474	2.77561	3.00435
2	1.46316	4.2439	5.56522
3	0.231579	1.32683	2.04565

Standard Deviation Values:

Feature #	Class 1	Class 2	Class 3
0	0.3537	0.523147	0.623943
1	0.375358	0.296961	0.302135
2	0.152904	0.479354	0.522626
3	0.0891635	0.18744	0.269223

Part c)

Output:
The accuracy of the Naive-Bayes classifier is: 92.0 %

Question 2
Part a)

Output:
The size of covariance matrix 1: (4, 4)
The size of covariance matrix 2: (4, 4)
The size of covariance matrix 3: (4, 4)

Class 1 covariance:
[[0.12848506 0.10827169 0.00803698 0.01334282]
 [0.10827169 0.14470128 0.00682788 0.01449502]
 [0.00803698 0.00682788 0.02401138 0.00254623]
 [0.01334282 0.01449502 0.00254623 0.00816501]]

Class 2 covariance:
[[0.28052439 0.08740244 0.20347561 0.06395732]
 [0.08740244 0.09039024 0.07309756 0.03342073]
 [0.20347561 0.07309756 0.23552439 0.07329268]
 [0.06395732 0.03342073 0.07329268 0.0360122]]

Class 3 covariance:
[[0.39795652 0.09336232 0.28399034 0.0438599]
 [0.09336232 0.09331401 0.06682126 0.04090821]
 [0.28399034 0.06682126 0.27920773 0.04228986]
 [0.0438599 0.04090821 0.04228986 0.07409179]]

Part b)

Output:
The size of mean 1 vector is: (4,)
The size of mean 2 vector is: (4,)
The size of mean 3 vector is: (4,)

Class 1 mean vector:
[5.05526316 3.44473684 1.46315789 0.23157895]

Class 2 mean vector:
[5.95609756 2.77560976 4.24390244 1.32682927]

Class 3 mean vector:
[6.59347826 3.00434783 5.56521739 2.04565217]

Part d)

Output:
The accuracy of using MLE and Discriminant function for classification is: 96.0 %
The accuracy of the naive classifier and the MLE based classifier seem to both be high (88% and above) however no method seems to always perform better.