**Problem 1**

Q1.

The prior of is 0.34125, is 0.33833 and is 0.32042.

A screenshot of a cell phone

Description automatically generated

Q2.

p(x=1|C1) =

=

= 0.34432

p(x=1|C2) =

=

= 0.61207

p(x=1|C2) =

=

= 0.40182

A screenshot of a cell phone

Description automatically generated

Q3.

My discriminant function is for prior and the log likelihood .

A screenshot of a cell phone

Description automatically generated

Confusion matrix is as above and along the row is the number of instances in predicted class i while along the column is the the number of instances in actual class i for 1 i 3.

Q4. Accuracy = 40.5%

As precision = TP/TP+FP,

precision for class 1 = 135 / (135+70+148)

= 0.38244

precision for class 2 = 108 / (70+108+69)

= 0.43725

precision for class 3 = 0 / 0

= undetermined / 0

As recall = TP/TP+FN,

recall for class 1 = 135 / (135+70+0)

= 0.65854

recall for class 2 = 108 / (70+108+0)

= 0.60674

recall for class 3 = 0 / 148+69+0

= 0

As F1 Score = 2\*(Recall \* Precision) / (Recall + Precision),

F1 score for class 1 = 2\*(0.65854 \* 0.38244) / (0.65854 + 0.38244)

= 0.48387

F1 score for class 2 = 2\*(0.60674 \* 0.43725) / (0.60674 + 0.43725)

= 0.50824

F1 score for class 3 = undetermined / 0

Average F1 Score = (0.48387+0.50824+0)/3 = 0.33070 (assumed F1 score for class 3 = 0)

**Problem2**

Q1.

The prior of is 0.34208, is 0.32792 and is 0.33.

A screenshot of a cell phone

Description automatically generated

Q2.

-0.02506; 3.04947; -2.85995;

A screenshot of a cell phone

Description automatically generated

1.06049; 3.92569; 9.70644;

A screenshot of a cell phone

Description automatically generated

Q3.

My discriminant function is for prior and the log likelihood .

A screenshot of a cell phone

Description automatically generated

Confusion matrix is as above and along the row is the number of instances in predicted class i while along the column is the the number of instances in actual class i for 1 i 3.

Q4.

Accuracy = 80%

As precision = TP/TP+FP,

precision for class 1 = 194 / (194+42+27)

= 0.71062

precision for class 2 = 162 / (11+162+13)

= 0.87097

precision for class 3 = 124 / (15+2+124)

= 0.87943

As recall = TP/TP+FN,

recall for class 1 = 194 / (194+11+15)

= 0.88182

recall for class 2 = 162 / (42+162+2)

= 0.78641

recall for class 3 = 124 / (37+13+124)

= 0.71264

As F1 Score = 2\*(Recall \* Precision) / (Recall + Precision),

F1 score for class 1 = 2\*(0.88182 \* 0.71062) / (0.88182 + 0.71062)

= 0.787017

F1 score for class 2 = 2\*(0.78641\* 0.87097) / (0.78641+ 0.87097)

= 0.82653

F1 score for class 3 = 2\*(0. 71264\* 0.87943) / (0.71264+ 0.87943)

= 0.78730

Average F1 Score = (0.787017+0.82653+0.78730)/3 = 0.80028

Appendix:

A screenshot of a social media post

Description automatically generated

Fig.1. Visualization of Feature Distribution

A screenshot of a cell phone

Description automatically generated

Fig.2. Visualization of Feature Distribution in Separated Layers

A picture containing screenshot

Description automatically generated

Fig.3. Visualization of Posterior Probability

A picture containing screenshot

Description automatically generated

Fig.4. Visualization of Discrimination Function

**Problem 3**

Q1.

The prior of is 0.34125, is 0.33833 and is 0.32042.

A screenshot of a cell phone

Description automatically generated

Q2.

0.1; 0.515; 0.77160;

A screenshot of a cell phone

Description automatically generated

1.02467; 4.96953; 9.88860;

A screenshot of a cell phone

Description automatically generated

0.24928; 6.96917; 20.61892;

A screenshot of a cell phone

Description automatically generated

Q3.

My discriminant function is for prior and the log likelihood .

A screenshot of a social media post

Description automatically generated

Confusion matrix is as above and along the row is the number of instances in predicted class i while along the column is the the number of instances in actual class i for 1 i 3.

Q4.

Accuracy = 82.5%

As precision = TP/TP+FP,

precision for class 1 = 204 / (204+15+4)

= 0.91480

precision for class 2 = 144 / (9+144+50)

= 0.70936

precision for class 3 = 147 / (0+27+147)

= 0.84483

As recall = TP/TP+FN,

recall for class 1 = 204 / (204+9+0)

= 0.95775

recall for class 2 = 144 / (15+144+27)

= 0.77419

recall for class 3 = 147 / (4+50+147)

= 0.73134

As F1 Score = 2\*(Recall \* Precision) / (Recall + Precision),

F1 score for class 1 = 2\*(0.95775 \* 0.91480) / (0.95775 + 0.91480)

= 0.93578

F1 score for class 2 = 2\*(0.77419 \* 0.70936) / (0.77419 + 0.70936)

= 0.74036

F1 score for class 3 = 2\*(0.73134 \* 0.84483) / (0.73134 + 0.84483)

= 0.78400

Average F1 Score = (0.93578 +0.74036+0.78400)/3 = 0.82005

Appendix:

A screenshot of a cell phone

Description automatically generated

Fig.5. Visualization of Feature Distribution

A screenshot of a cell phone

Description automatically generated

Fig.6. Visualization of Feature Distribution in Separated Layers