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CS1567 Introduction to Machine Learning
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Problem Assignment 5

Problem 1:

(a) N/A
(b) N/A
(c) **Misclassification errors**:
Train: 0.2950, Test: 0.4192
Confusion matrix:

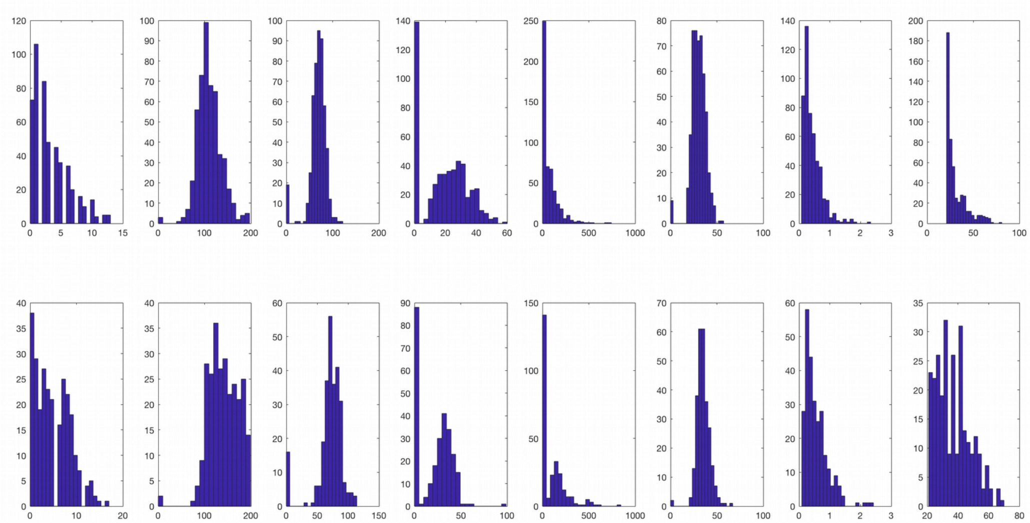
Training		Testing	
273	93	79	52
66	107	55	43

Specificity & Sensitivity:
Sensitivity: 0.5896
Specificity: 0.4526

(d) By experimenting with the learning rate, and the number of iterations I found that the test error seemed to hit a very stable value of .35, and the training error continued to get smaller. For example I tested 20,000 iterations (which is 10x as many as before) with a constant learning rate of .0001. The misclassification error for training was: 0.2356, and testing was 0.3581. Initializing random weights made the results less consistent and often worse than the others.

Problem 2.1:

(a) N/A



(b)

Attribute	Distribution
1	Gamma
2	Normal
3	Normal

4	Normal
5	Gamma
6	Normal
7	Gamma
8	Gamma

Problem 2.2:

(a) Class priors: p(y=0) = .651, p(y=1) = .349

(b) **Class conditional for class 0 (std on right, 0 means none)**

```
3.2980        0
109.9800   26.1412
68.1840   18.0631
19.6640   14.8899
68.7920         0
30.3042    7.6899
0.4297        0
31.1900         0
```

Class conditional for class 1

```
4.8657        0
141.2575   31.9396
70.8246   21.4918
22.1642   17.6797
100.3358         0
35.1425    7.2630
0.5505        0
37.0672         0
```

Problem 2.3:

(a) N/A

(b) The mean misclassification errors were: 0.2319 for training and 0.2052 for testing

Confusion matrices:

Training		Testing	
294	80	142	28
45	120	19	40

The testing set had a sensitivity of .8820 and had a specificity of .5882

(c) It seems that the Naive bayes algorithm is better at classifying this particular set of data than the logistic regression. It has a considerably lower misclassification err than the regression. (.2052 vs .4192)