Assignment4

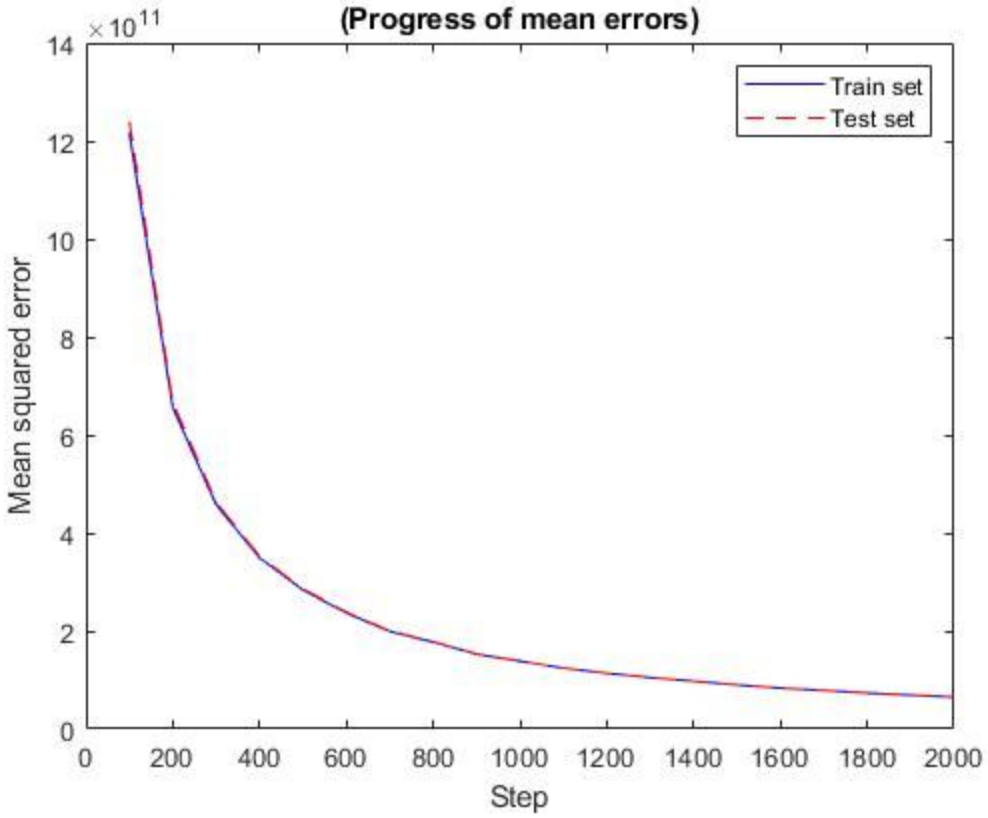
swa12@pitt.edu
Swapnil Asawa

Code submitted in hw4.m hw4.m is the main file.

Part 1.a See hw4.
Part 1.b,c,d main1.m submitted.

```
C =
   332     7
   193     7
C2 =
   157     4
    67     1
```

misclassificationErrorTraining = 0.3711
misclassificationErrorTesting = 0.3100
sensitivity = 0.5000
specificity = 0.9794



Part1. e)

Change 1:

Dividing alpha by batch size gave a bit better results: alpha = 2/sqrt(k)/size(Xtest,1);

```
C =
   326    13
   186    14
C2 =
   156     5
    65     3
misclassificationErrorTraining =0.3692
misclassificationErrorTesting =    0.3057
```

Change 2:

Random W initialization gave same error as with W initialized to 0:

```
misclassificationErrorTraining =    0.3711
misclassificationErrorTesting =    0.3100
sensetivity =    0.5000
specificity =0.9794
```

Change 3:

By increasing the no. of epoches to 3000, the results are slightly better.

```
misclassificationErrorTraining =0.3692
misclassificationErrorTesting = 0.3100
```

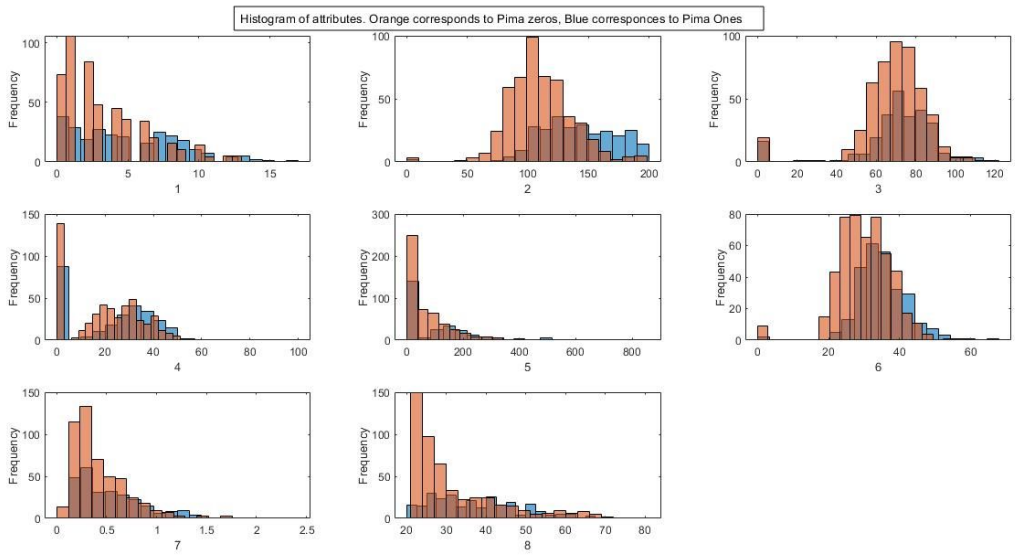
Change 4:

Combining the effect of division by alpha as well as increased no. of epoches:

```
misclassificationErrorTraining =  0.3655
misclassificationErrorTesting =  0.3057
```

This gives the least misclassification error. Increasing epoches beyond this leads to overfitting with this learning rate and reducing it increases both the errors.

Part 2.1.a code submitted.



Part 2.1.b

Attribute 2nd, 3rd and 6th I would say normal distribution as it seems to follow more the normal distribution over others from the histogram

Attribute 5 is following exponential.

Attribute 1,4, 7, 8 looks more like Gamma distributions.

Part 2.2.a Code submitted

Part 2.2.b

exp_0_1,exp_1_1 =3.2980 4.8657
exp_0_5,exp_1_5 = 68.7920 100.3358
exp_0_7,exp_1_7 =0.4297 0.5505
exp_0_8,exp_1_8 = 31.1900 37.0672

norm_mu_0_2, norm_mu_1_2= 109.9800 141.2575
norm_mu_0_3, norm_mu_1_3= 68.1840 70.8246
norm_mu_0_4, norm_mu_1_4=19.6640 22.1642
norm_mu_0_6, norm_mu_1_6= 30.3042 35.1425

norm_sigma_0_2, norm_sigma_1_2= 26.1412 31.9396
norm_sigma_0_3, norm_sigma_1_3=18.0631 21.4918
norm_sigma_0_4, norm_sigma_1_4= 14.8899 17.6797
norm_sigma_0_6, norm_sigma_1_6= 7.6899 7.2630

priories =
Pima_zero: 0.4640
Pima_ones: 0.5360

Part2.3.a code submitted
Part2.3.b
Naive Bayes:
C =

256	83
56	144

C2 =

121	40
16	52

misclassificationErrorTraining =0.2579
misclassificationErrorTesting = 0.2445
sensitivity = 0.6344
specificity = 0.7552

Part 2.3.c
Mean misclassification error over many trials of best case regression was
misclassificationErrorTraining = 0.3655
misclassificationErrorTesting =0.3057
Mean misclassification error of NaiveBayes is :
misclassificationErrorTraining =0.2579
misclassificationErrorTesting = 0.2445

As the value of misclassfication error is lesser for both training as well as testing data, Naive Bayes is better than regression model