

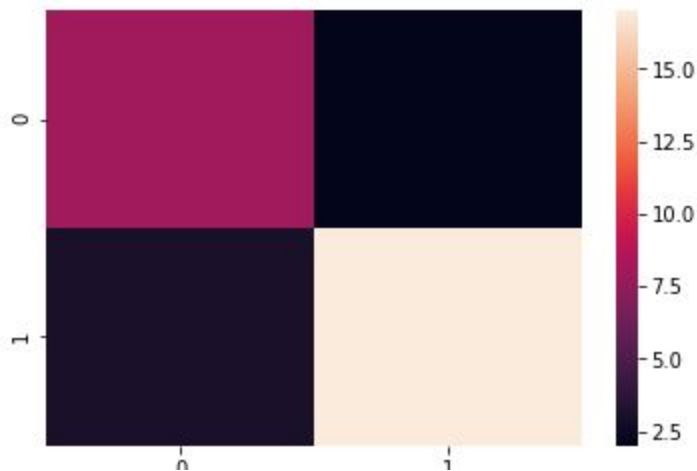
ASSIGNMENT 4

Logistic regression with Delta Learning Rule using Newtons method

In this assignment , the newton method has been used to fit parameters to the data instead of gradient descent or the normal equation method.

Exam Dataset

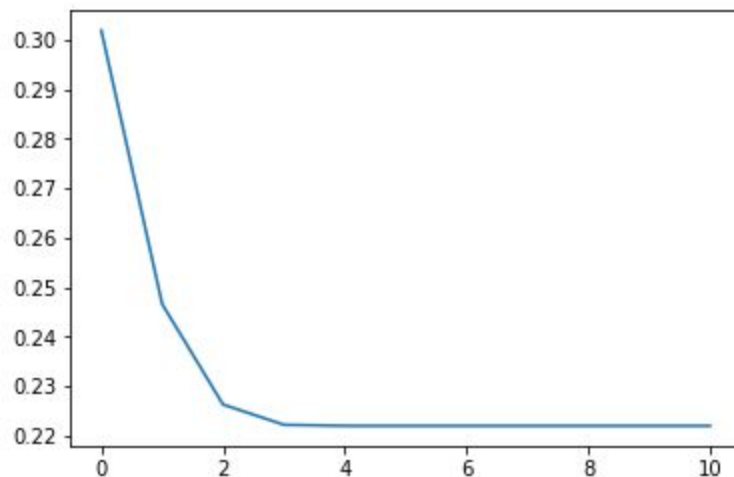
We have calculated the accuracy of the classifier by using the confusion matrix



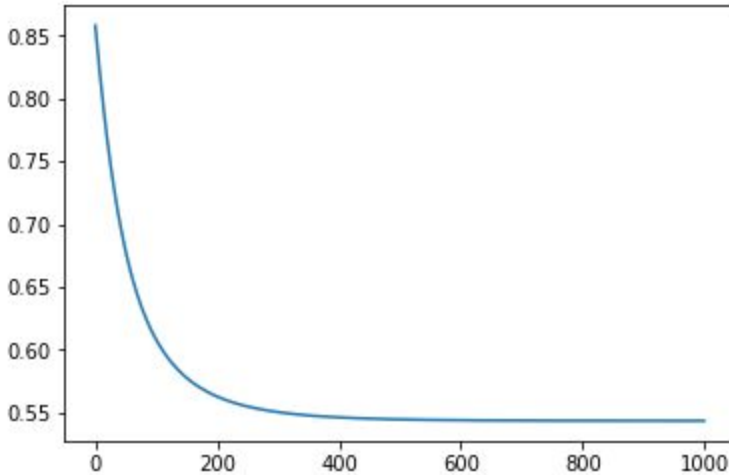
The accuracy obtained is 83.34% when the number of iterations used are just 10. This is a lot better than logistic regression using gradient descent in which the accuracy obtained was 86.67% when the number of iterations were 3000 with the learning rate of 0.05. For 10 iterations, gradient descent given an accuracy of

52.78%. Thus, the convergence in this method is much faster than that in Logistic regression using gradient descent.

We can also observe that with the exam dataset, the accuracy remains almost constant as the number of iterations are increased from 10 to 100 which means that the method converges very quickly and does not need a lot of iterations.



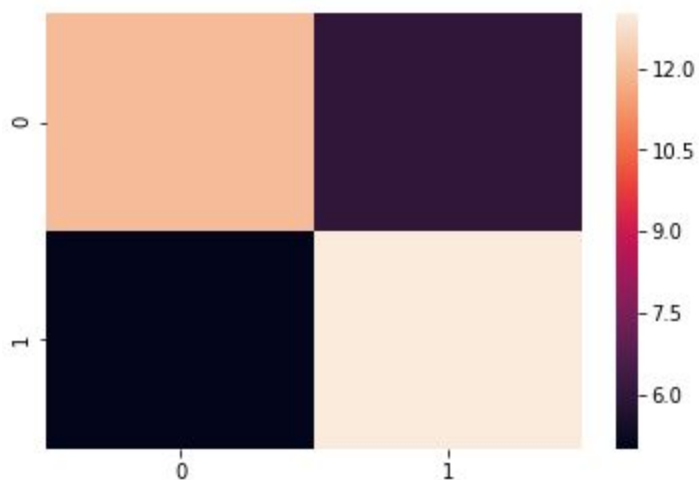
The above graph shows the variation of the value of the cost function with the number of iterations in the algorithm. It can be seen that after 4 iterations the value of the cost function becomes almost constant.



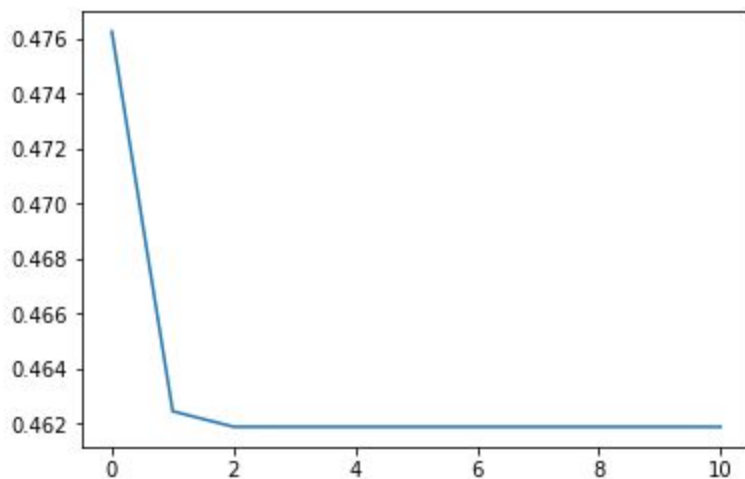
The above graph is the variation of the cost function with the number of iterations in classification using gradient descent. On comparing this with the previous graph we can see that the cost reduces much more quickly in classification using newtons method.

Microchip Dataset

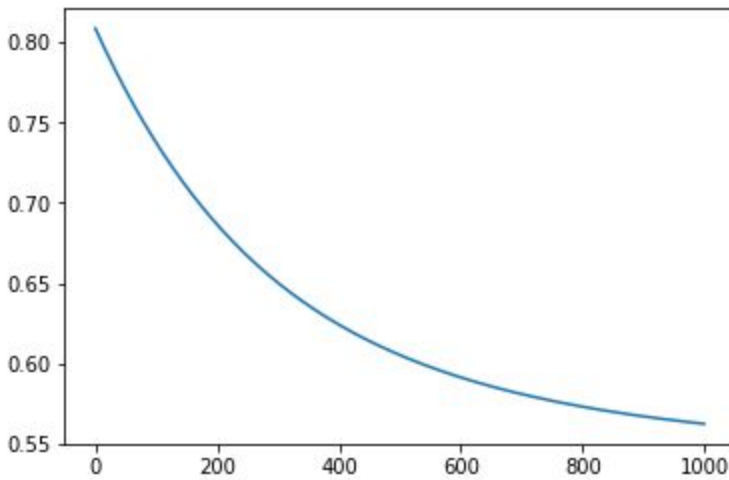
We have calculated the accuracy of the classifier by using the confusion matrix



The accuracy obtained is 68.83% when the number of iterations used are just 10. This is a lot better than logistic regression using gradient descent in which the accuracy obtained was 38.88% when the number of iterations were 10 with the learning rate of 0.05. Thus, the convergence in this method is much faster than that in Logistic regression using gradient descent.



The above graph shows the variation of the value of the cost function with the number of iterations in the algorithm. It can be seen that after 4 iterations the value of the cost function becomes almost constant.



The above graph is the variation of the cost function with the number of iterations in classification using gradient descent. On comparing this with the graph above we can see that that the cost reduces much more quickly in classification using newtons method.