

CSE255 Homework1 Answer

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Regression

1

The fitted values are $\theta_0 = 3.11521115$, $\theta_1 = 0.10905507$

2

The fitted values are $\theta_0 = 1.40998006e^{+00}$, $\theta_1 = 6.71979699e^{-01}$, $\theta_2 = -5.57829661e^{-02}$, $\theta_3 = 1.95198865e^{-03}$, $\theta_4 = -3.03848616e^{-05}$, $\theta_5 = 1.73376523e^{-07}$

And the mean squared error is: 0.436425509067

3

When the degree is 9, the training MSE goes to the minimum point. After that, the training MSE and testing MSE go up very fast.

So the best model is:

Training MSE: 0.449716240495

Testing MSE: 0.439253459889

Model:

$review/taste = 6.57779065e^{-01} + 7.66518411e^{-01} * beer/ABV + 4.06647965e^{-02} * beer/ABV^2 -$

$$3.84794380e^{-02} * beer/ABV^3 + 6.77043490e^{-03} * beer/ABV^4 - 5.85586427e^{-04} * beer/ABV^5 + 2.71796542e^{-05} * beer/ABV^6 - 6.83946306e^{-07} * beer/ABV^7 + 8.76795980e^{-09} * beer/ABV^8 - 4.47490401e^{-11} * beer/ABV^9$$

Classification

1

The training accuracy is 0.750 while the testing accuracy is 0.738.

2

The better model's feature vector is ['child', 'magic', 'funny', 'kid', 'dog', 'cat', 'education', 'pat', 'grow']

And the testing error is 0.250, which means testing accuracy is 0.750 which is better than the model in question 1.

3

c=0.001, Train Error:0.492, Valid Error:0.509, Test Error:0.507

c=0.01, Train Error:0.252, Valid Error:0.254, Test Error:0.273

c=0.1, Train Error:0.252, Valid Error:0.254, Test Error:0.273

c=1, Train Error:0.250, Valid Error:0.251, Test Error:0.272

c=10, Train Error:0.250, Valid Error:0.251, Test Error:0.272

c=100, Train Error:0.250, Valid Error:0.251, Test Error:0.272

c=1000, Train Error:0.250, Valid Error:0.251, Test Error:0.272

The test error is going down as the c goes up, and the 0.272 best reflects the model's ability to generalize to new data.

Code Snippets:

4

fprime:

The log-likelihood after convergence is: -2297.06998075

The accuracy on test set is: 0.729