SCO Assignment 1 - Conclusion

By Group 2

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Overview

We are given a housing price dataset. Using various parameters in the datasets we need to predict the housing price.

Goals

1. Predict housing price using normal equations method.
2. Predict housing price using gradient descent method.
3. Compare the results for both approaches.

Procedure as followed in code

- Take input of whole data.
- Drop unnecessary columns.
- Replace ‘yes’ with 1 and ‘no’ with 0 in the dataset.
- Normalise the whole dataset by subtracting from it the mean of the dataset and dividing by its standard deviation.
- Divide the dataset into target matrix and feature matrix.
- Apply both methods to get parameter matrix([W0,W1,W2….. W11]).

Conclusion

Normal Equations method

We used the equation $W = (X^TX)^{-1}(X^TY)$, where Y is Target matrix, X is feature matrix and W is parameter matrix.

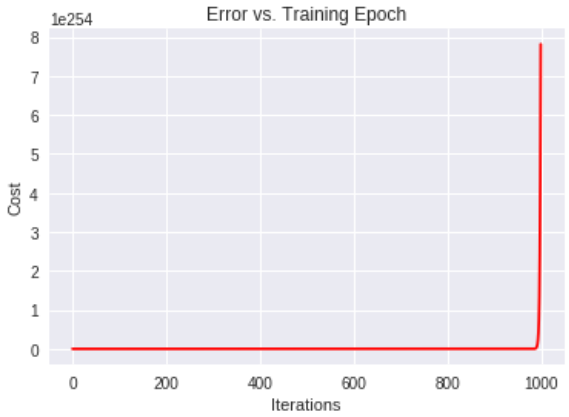
On calculation we get W as :

[1.38777878e-16, 2.87946766e-01, 5.05903420e-02, 2.69587765e-01, 2.13190534e-01, 8.72497947e-02, 6.46338332e-02, 9.74693660e-02, 1.00534204e-01, 2.20308331e-01, 1.36918851e-01, 1.48785592e-01]

The value of cost function using above W comes out to be **0.1631388523355399**

Gradient Descent method

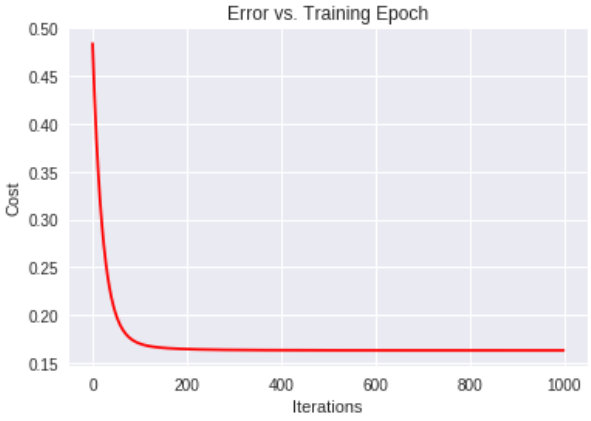
We start with W = [0,0,0,0,0,0,0,0,0,0,0,0,0], and in each iteration we keep on changing the W so as to minimize the value of cost function according to the select alpha(learning rate)



We initially start with lower value of alpha let say 1 and we can see that the cost function is found increasing for this value of alpha as we increase the number of iteration.

We decrease alpha to 0.9 and still find cost function increasing.

Keeping alpha as 0.01 gives a decreasing cost function as shown:



Parameter matrix found for alpha = 0.01 is

[-2.40849262e-16,
2.87429303e-01,
5.14292123e-02, 2.69614207e-01, 2.12183261e-01, 8.76226980e-02,
6.50470680e-02, 9.66986391e-02, 1.00565719e-01, 2.20609813e-01
1.36944201e-01, 1.48936825e-0]

The cost calculated using above parameter matrix comes out to be **0.16313948330145306.**
The absolute difference between cost function of gradient descent and normal equations method comes out to be **6.309659131009671e-07**

We can further decrease this difference in values by increasing alpha such that cost function is still decreasing.

Trying for alpha = 0.5, we get W as :

[-2.39124959e-16, 2.87946766e-01, 5.05903420e-02, 2.69587765e-01,
2.13190534e-01, 8.72497947e-02, 6.46338332e-02, 9.74693660e-02

, 1.00534204e-01, 2.20308331e-01, 1.36918851e-01, 1.48785592e-01]

and cost as 0.16313885233553996

The difference is cost functions of the both method for this alpha is nearly 0.01.