Introduction to Machine Learning
Assignment Solution 5

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1. Introduction

In this Assignment we were given a set of x and y points. We were asked to fit a linear line to this dataset.

1. First task of the assignment was to use the 2.2 and 2.3 equation to find a analytical Solution to the Problem. Output from this should be the hypothesized values of β.
2. The second task was to create a x-y plane for the given data and fit the analytical solution to the data while also highlighting the errors. These errors are inevitable with a linear function. Figure 2
3. Give the plot of the cost function in each iteration Figure 3
4. Plot the contour of the loss function. Show its convergence to the minimum.Figure 4.
5. Show all the findings to the console Figure 1.

2. Formulas

$$J(h_w) = \frac{1}{2N} \sum_{j=1}^{N} ((W_1 * x_j) + W_0 - y_j)^2 \tag{2.1}$$

$$\hat{\beta_1} = \frac{\sum_{i=1}^{n} (x_i - \bar{x}) * (y_i - \bar{y})}{\sum_{i=1}^{n} (x_i - \bar{x})^2} \tag{2.2}$$

$$\hat{\beta_0} = \bar{y} - \hat{\beta_1} * \bar{x} \tag{2.3}$$

3. Findings

I had to customize to make it converge. This is the reason I chose my alpha level as 0.001 and my terminating condition as 0.000001. I have observed how the cost function quickly decreases at first and its getting slower until convergence.

4. outputs

4.1 Console

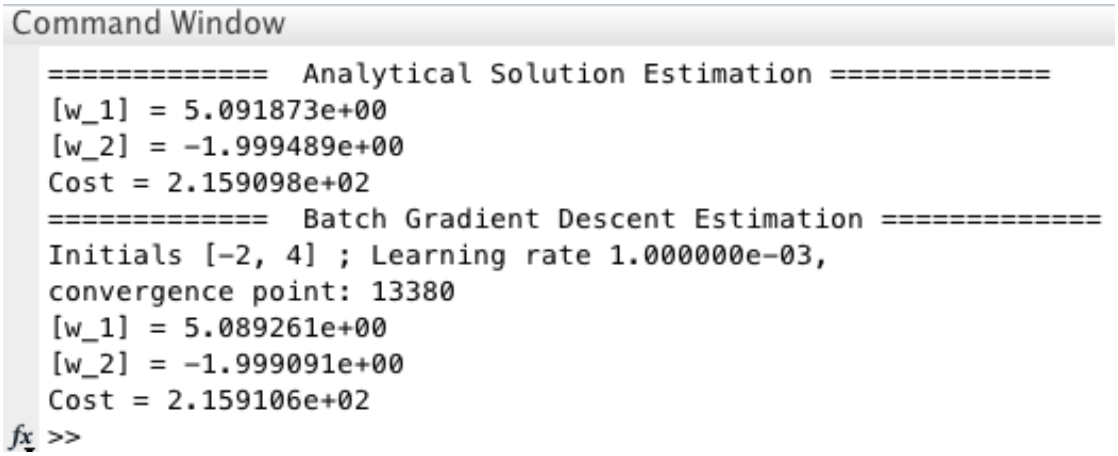

Figure 1: How I used excel for the last part with solver as well as other ones

4.2 Figures

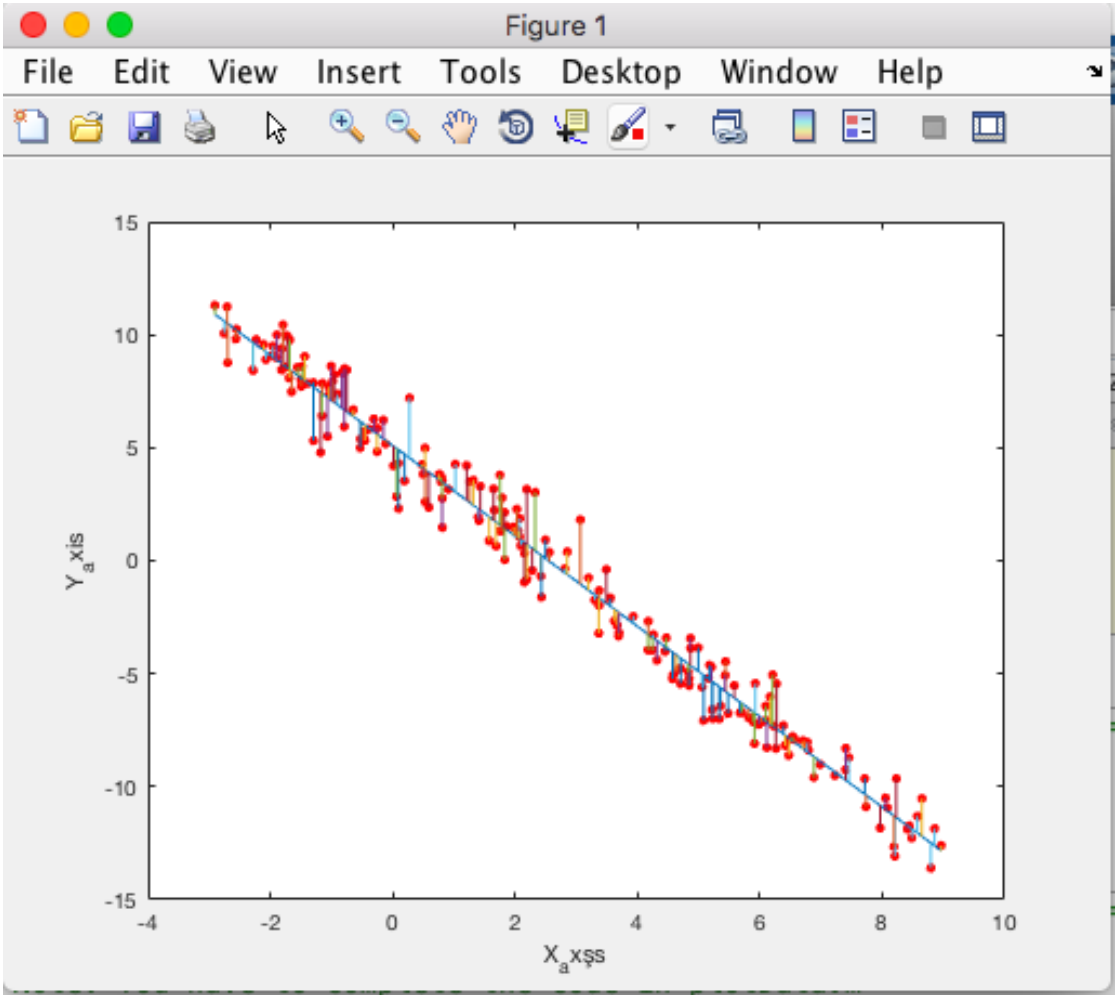

Figure 2: Each data point and its error in each data point

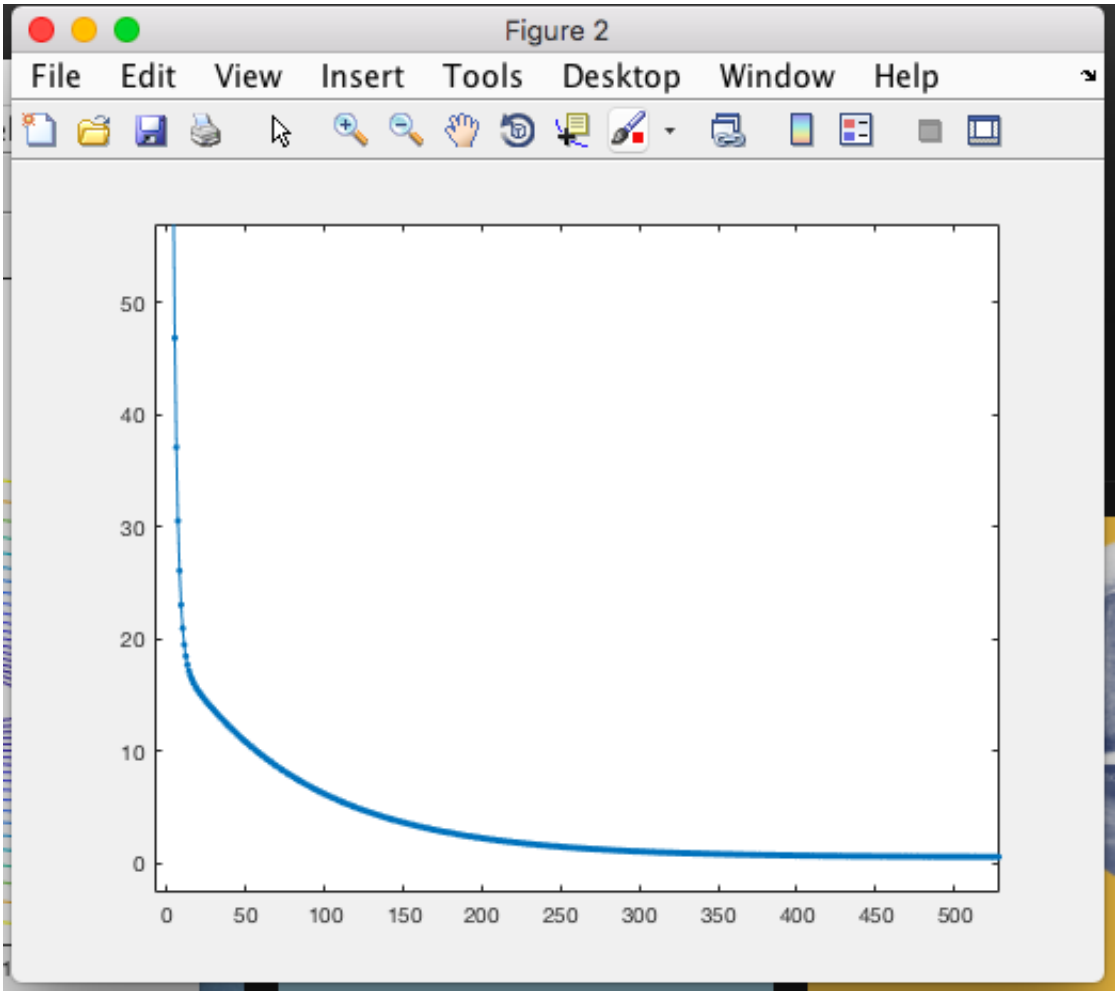

Figure 3: Cost function's value in each iteration

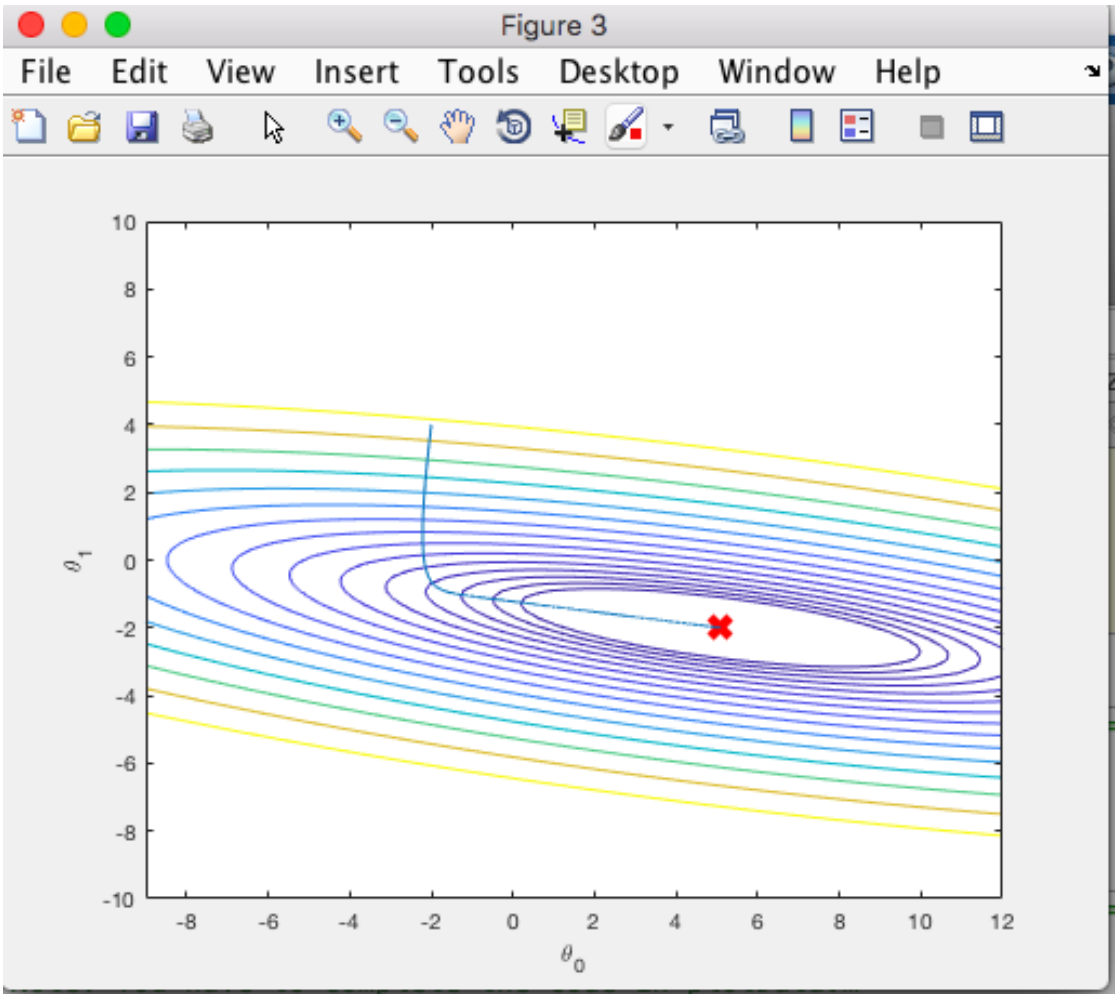

Figure 4: Contour Map for the gradient Descent