Experiment No.:

Title: Write a program to implement Multiple Linear Regression

Objectives: To learn Multiple linear regression

Theory:

Hypothesis Function

- Hypothesis Function for multiple linear regression is,

$$h_\theta(x) = \theta_0 + \theta_1 x_1 + \theta_2 x_2 + \theta_3 x_3 + \cdots + \theta_n x_n$$

Cost Function

Cost Function for multiple linear regression is

$$J(\theta_0, \theta_1, \ldots, \theta_n) = \frac{1}{2m} \sum_{i=1}^{m} \left(h_\theta(x^{(i)}) - y^{(i)} \right)^2$$

Gradient Descent

Gradient Descent Function for multiple linear regression is

Repeat $\{$

$\quad \theta_j := \theta_j - \alpha \frac{\partial}{\partial \theta_j} J(\theta_0, \ldots, \theta_n)$

$\quad \}$ $\qquad$ (simultaneously update for every $j = 0, \ldots, n$)

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Case Study:

In this part, you will implement linear regression with multiple variables to predict the prices of houses. Suppose you are selling your house and you want to know what a good market price would be. One way to do this is to first collect information on recent houses sold and make a model of housing prices. The file ex4dataset.txt contains a training set of housing prices. The first column is the size of the house (in square feet), the second column is the number of bedrooms, and the third column is the price of the house.

Algorithm:

1. load the data from ex4dataset.txt
   data = load('ex4dataset.txt');

   X = data(:,
   1:2); y = data(:,
   3); m =
   length(y);
2. Normalize features
   Note that house sizes are about 1000 times the number of bedrooms. When features differ by orders of magnitude, first performing feature scaling can make gradient descent converge much more quickly.
   To Normalize features use following procedure
   Subtract the mean value of each feature from the dataset.
   After subtracting the mean, additionally scale (divide) the feature values by their respective "standard deviations."
3. Add X_0 to X matrix
   X = [ones(m, 1) X];
4. Calculate initial Cost Function
5. Calculate Gradient Descent upto 400 iterations (consider alpha=0.01)
6. Predict price for 1650 sq ft house size and 3 number of rooms

Keywords: Multiple linear regression, cost function, gradient descent.

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