Assignment 1

Due on August 31, 2016

For all programs, use a subset of the following data as specified.

X_1	X_2	X_3	Y_1	Y_2	Y_3
2.0	100	0.001	5.1	102.1	4.1
2.5	200	0.002	6.1	202.4	6.0
3.0	300	0.003	6.9	303	9.2
3.5	400	0.004	7.8	403.4	12.0
4.0	500	0.005	9.2	504.2	17
4.5	600	0.006	9.9	604.8	20
5.0	700	0.007	11.5	704.8	25.5
5.5	800	0.008	12.0	805.7	31
6.0	900	0.009	12.8	905.7	36.4

1. Do the following.
   a. Model Y_1 as a linear function of X_1. Use linear regression to learn the model parameters.
   b. Predict output for $X_1 = 4.10$ and $X_1 = 6.5$.
   c. Repeat gradient descent learning for $\alpha = 0.01, 0.1, 1.0$, and 100. Plot J for the learning duration.
   d. Interpret the results in c.
2. Do the following.
   a. Model Y_2 as a linear function of X_1 and X_2. Use linear regression to learn the model parameters without scaling features. Use an appropriate value for α.
   b. Plot J for the learning duration.
   c. Repeat a and b by scaling features.
   d. Find parameter vector using standard mathematical approach.
3. Do the following.
   a. Model Y_3 as a quadratic function of X_1. Use regression to learn the model parameters.
   b. Plot J for the learning duration.

You must submit the following

1. Source code
2. Output (predicted values, plot, etc.)
3. Your observations and conclusions if relevant

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   a. Model Y_2 as a linear function of X_1 and X_2. Use linear regression to learn the model parameters without scaling features. Use an appropriate value for α.
   b. Plot J for the learning duration.
   c. Repeat a and b by scaling features.
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3. Do the following.
   a. Model Y_3 as a quadratic function of X_1. Use regression to learn the model parameters.
   b. Plot J for the learning duration.

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