Machine Learning

Week 2

Section 1

Multivariate Linear Regression

Multiple Features / Variables

Notation:

n = number of features

x(i) = input (features) of ith training example

xj(i) = value of feature j in ith training example

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Gradient Descent for Multiple Features / Variables

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Gradient Descent in Practice 1 – Feature Scaling

We don’t want our features to all have different scales. Gradient descent will have a harder time to find the global minimum and might oscillate about.

Make sure the features are on a similar scale -> gradient descent will converge more efficiently (faster?) in less iterations.

We can try to normalize our ranges to have 0 ≤ x ≤ 1 or -1 ≤ x ≤ 1

Getting close to those range scales is fine too.

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Gradient Descent in Practice 2: Learning Rate

Tips for making sure gradient descent is working correctly:

Plot the cost function J over the # of iterations, you should see the cost drop over iterations.

It can be hard to estimate the number of iterations required for gradient descent to converge, but these types of plots are a good start.

If gradient descent is not working, try to decrease the learning rate alpha.

For a sufficiently small alpha, J should decrease on every iteration, but if alpha is too small, gradient descent can be very slow to converge.

Good idea to try alpha in x3 jumps:

0.001 -> 0.003 -> 0.01 -> 0.03 -> 0.1 -> 0.3 -> 1

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Features and Polynomial Regression

You can create different learning algorithms by choosing and defining different features.

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