



Linear Regression

9/15/2021

Lesson Plan

- Linear Regression with One Feature
- Cost Function
- Gradient Descent
- Linear Regression with Multiple Features

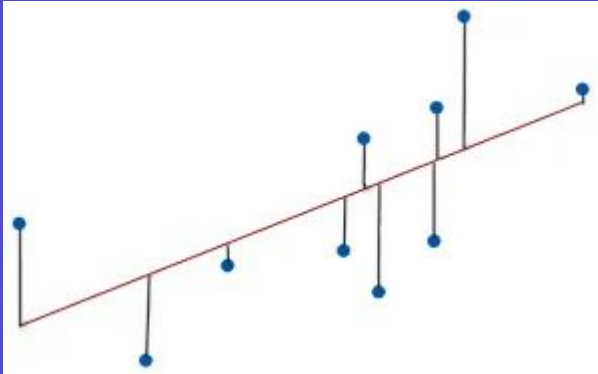
Linear Regression with One Feature

Fuel Consumption	CO2 Emissions
6.7	196
7.7	221
5.8	136
9.1	255
8.7	244

- Hypothesis: $h_{\theta}(x) = \theta_0 + \theta_1 x$
- How should one choose θ_0 and θ_1 ?

Cost Function

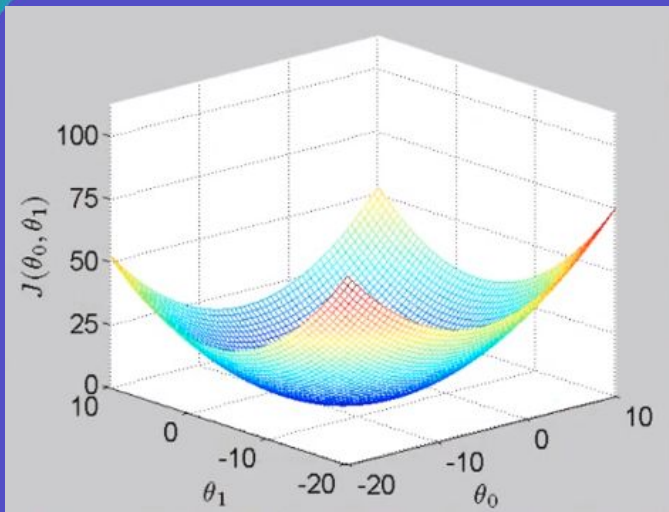
- Ordinary Least Squares Regression
 - Uses the mean squared error cost function



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

- Goal: minimize the cost function

Gradient Descent



$$\theta_j = \theta_j - \alpha \frac{\partial}{\partial \theta_j} J(\theta)$$

- α : learning rate
- Low $\alpha \rightarrow$ slow convergence
- High $\alpha \rightarrow$ may cause divergence

Linear Regression with Multiple Features

Engine Size	Cylinders	City Fuel Consumption	Highway Fuel Consumption	CO2 Emissions
2	4	9.9	6.7	196
2.4	4	11.2	7.7	221
1.5	4	6	5.8	136
3.5	6	12.7	9.1	255
3.5	6	12.1	8.7	244

- Hypothesis: $h_{\theta}(x) = \theta_0 + \theta_1 x_1 + \dots + \theta_n x_n$
- Same cost function & gradient descent as single feature linear regression



Check In:

<https://forms.gle/MXg4oTtn5ciZez3n8>

Word of the Day:
Hypothesis