

Data Driven Optimization - Tutorial 4

A.K. Cherukuri

April 25, 2023

1 Stochastic Gradient Descent

This week's tutorial is an extension of last week's gradient descent algorithm. We will use the same dataset: 'startup data.csv'. We will again perform a linear regression exercise, but we will now go into detail regarding how we can use stochastic gradient descent to solve this problem iteratively.

Recall the linear regression equation:

$$h(x, \theta) = \theta_0 + \theta_1 x. \quad (1.1)$$

Before you start coding, please determine the following:

- What is the main difference between (deterministic) gradient descent method and stochastic gradient descent method?
- What do you need to change about the parameter update step?
- What do you expect to be different about the convergence of the cost?

Now, in Matlab:

1. Create a code that will iterate through the dataset (using a while loop). Compute the cost for each parameter update and for each time you went through the entire dataset. Keep going until a convergence of less than 0.0001 has been reached (use the cost over the full dataset for this).
2. Plot: (1) the cost of each iteration, (2) the cost of the full dataset
3. What is the difference you see? Explain the differences between the results observed due to stochastic gradient descent method and the results obtained during the last tutorial.