Lab 6 Report - Dominic Sagers

Tuesday, November 29, 2022 8:03 PM

What happens if the learning rate is to high/low?

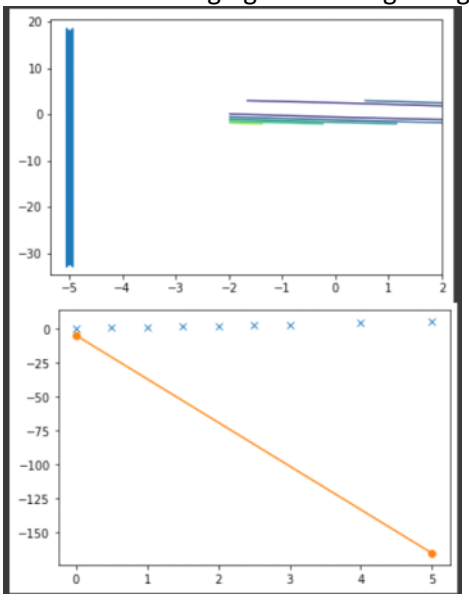
I found that when the learning rate increases, the fitting line becomes unpredictable and often leads to weighing the line down to very negative theta1 range, but when the learning rate is decreased, almost no change is made to the fitted line.

Can Linear Regression really find the absolute global minimum? Explain why/why not.

It's not promised that you will find a local minima, however with a good starting point (initial thetas) you will have a much higher likelihood. This is due to the exploratory nature of the algorithm and to the fact that when trending towards a better state the algorithm has no way of determining that the future minima will be global or local. If we keep running the algorithm while also pruning for previous solutions we could eventually find the global minimum but it is still not guaranteed.

What effect does it have if you change the initial guess for thet0 and thet1 for the gradient descent to something completely off?
Hint: check different values for the theta values and analyze their impact

I found that changing the initial guess gave results much like the one shown below:



It's clear that the initial guess could hinder the ability in being able to find an answer at all and leads the algorithm in a very unclear direction.

What happens if you are not updating thet0 and thet1 “simultaneously” as you should but you are updating
both parameters in separate for-loops (see code)?
Hint: evaluate it empirically by modifying the code accordingly

If you do not simultaneously update the thetas, then you will receive erroneous results as per each iteration theta0 and theta1 are dependent on each other.

How many iterations of the gradient descent algorithm do you have to perform to reach the correct exact values
of theta0 and theta1?
Hint: explain how you calculated it and demonstrate it with experimental results
Around 1000, that is what I had found during my testing.

NOTE: During this lab I could not for the life of me figure out the issue regarding my function fitting incorrectly, it seems to dip into negative values for no reason as I have implemented the algorithm as stated in the slides. I resigned to turning in what I have because it is most likely a mistake in matrix multiplication using numpy which is out of my knowledge level with python.