

CSCE 479/879

Notebook 1 Question solution

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Optimization Problem –

A rectangular garden is to be constructed using a rock wall as one side of the garden and wire fencing for the other three sides. Given 100ft of wire fencing, determine the dimensions that would create a garden of maximum area. What is the maximum area?

Ans. The optimization problem we are solving here is to find the dimensions of a rectangular garden that maximizes its area, given a constraint of 100 feet of wire fencing.

The problem can be formulated mathematically as follows:

Given x and y as the length and width of the garden, respectively, we want to maximize the area of the garden subject to the constraint $2 * x + 2 * y = 100$ the total length of the wire fencing is 100 feet.

We are using an optimization algorithm, specifically the Adam optimizer in TensorFlow, to minimize the squared difference between the perimeter of the garden ($2 * x + 2 * y$) and 100 feet (perimeter - 100).

Q. What will happen if we change the learning rate ?

Ans. As I increased the learning rate from 0.01 to 0.5 slowly the maximum area in the output was increasing. But I noticed that when the made the learning rate incredibly high the output was totally wrong and algorithm was making an error and diverged from the optimal solution.

Learning rate is the step size the algorithm is taking, so making it too large with make the algorithm diverge and overshoot from the optimal solution.

Q. What will happen if we change the number of iterations ?

Ans. As I increased the number of iterations from 10 to 200 slowly the maximum area in the output was increasing. But I noticed that when the made the learning rate incredibly high the output was totally wrong, and algorithm was making an error and diverged from the optimal solution. Also, when I reduced the number of iterations to somewhat like 1 and 2 the algorithm was way off from an optimal solution.

The number of iteration means how many times the algorithm gets to update the variables, so when it is too low the algorithm doesn't really gets to update and the values are off and very small. In the same way when the algorithm is having a higher number of iterations it changes the variable too many times leading to diverging from the optimal solution.