Labwork 2: Linear Regression

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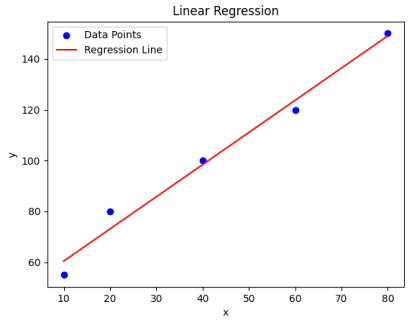
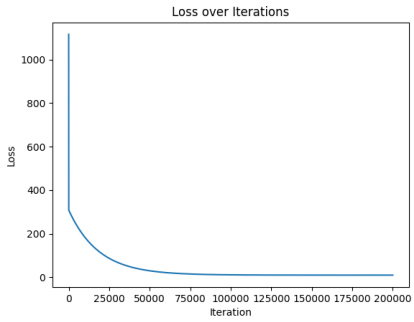
April 2025

1 Implementation

- First, we implement functions to calculate the single loss value, 2 partial derivatives over w_0 and w_1, and a function to calculate the loss of all data points.
- Read the csv file and extract the value of x and y as lists of floats
- Perform gradient descent to optimize the weights w_0 and w_1. It iteratively updates w_0 and w_1 using the gradients (df0 and df1) and the learning rate lr
- After training, the optimized weights w0 and w1 are used to plot the regression line based on the learned weights and a plot shows the loss over iterations
- Here is the result when the gradient descent is run for 200,000 iterations with a learning rate of 0.0001 when the initial value for w_0 and w_1 is 1 and 1 respectively



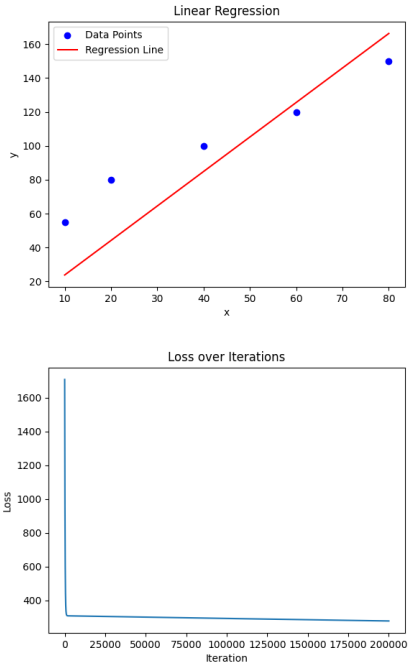


- After updating, the loss is around 9.46

2 The effect of different learning rates for convergence

2.1 Learning rate is too small

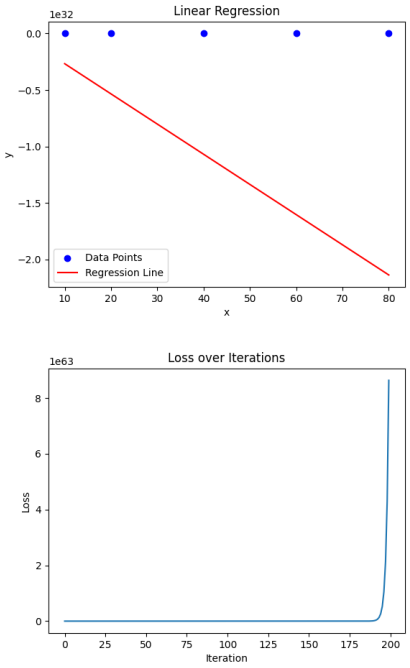
- When the learning rate is too small, it requires many updates before reaching the minimum point



- After updating for 200,000 times, the loss is around 277.74

2.2 Learning rate is too large

- When the learning rate is too large, it could cause drastic updates, which lead to divergent behaviors



- The algorithm overshoot the minimum and lead to divergence