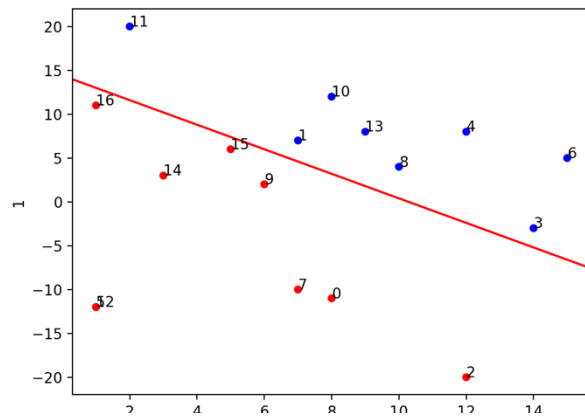


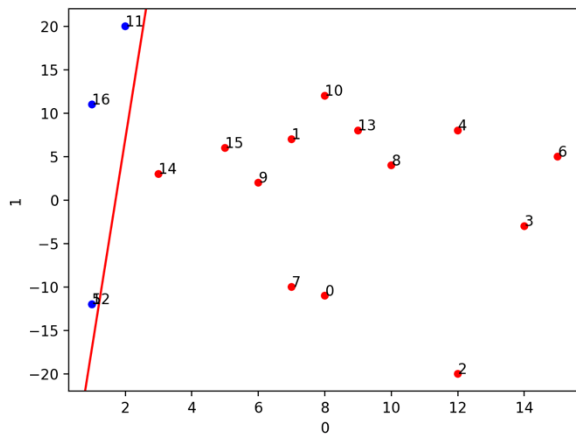
README – Homework 4

Part 1 – Perceptron



Here is a screenshot of the graphed boundary line when running my perceptron on the provided dataset1.

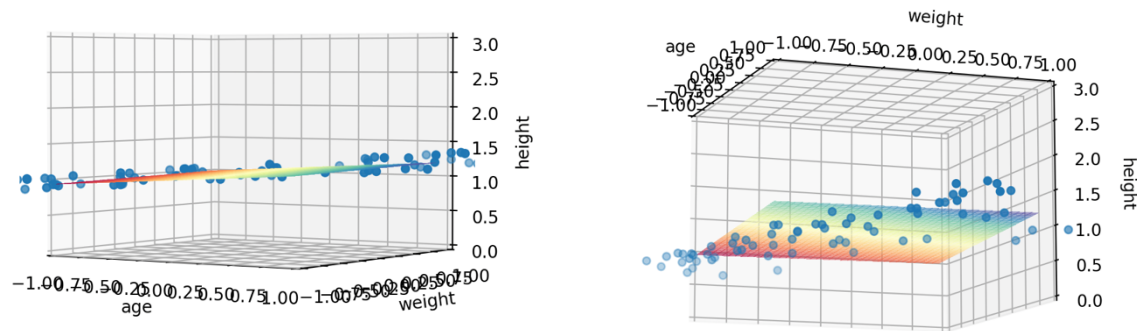
Final weights: 72.0, -7.0, -5.0



I also ran my perceptron on the same dataset with some altered labels to see if it would converge on a different boundary. It did! 🤖
Here is a screenshot of the new boundary line for the altered dataset1.

Final weights: -41.0, 24.0, -1.0

Part 2 – Linear Regression with Gradient Descent

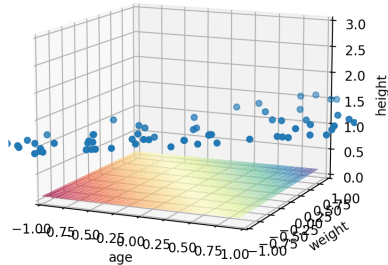


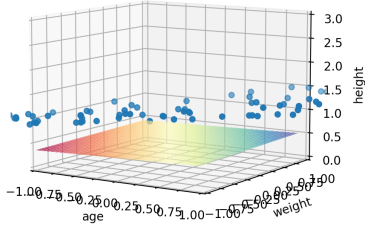
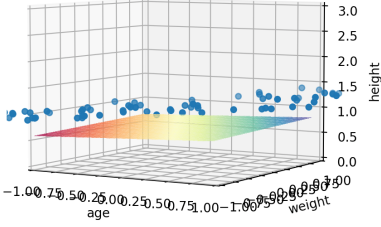
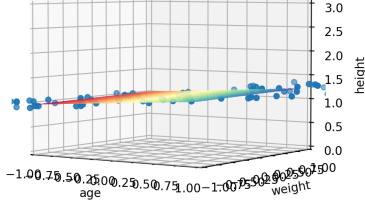
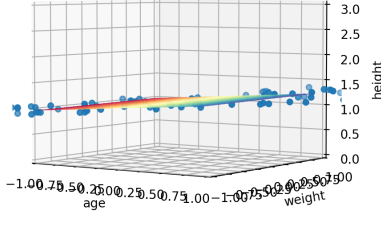
I chose a learning rate of 0.1 and 50 as my number of iterations.

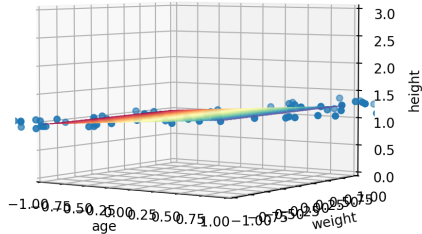
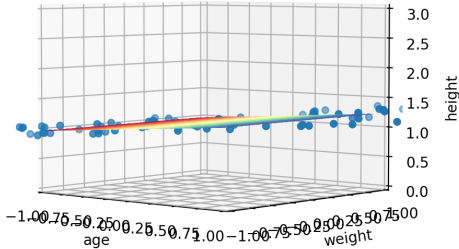
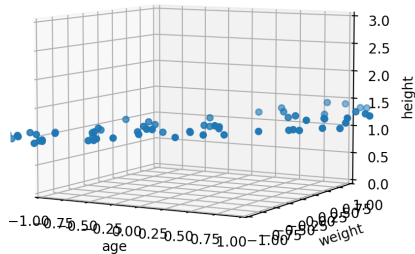
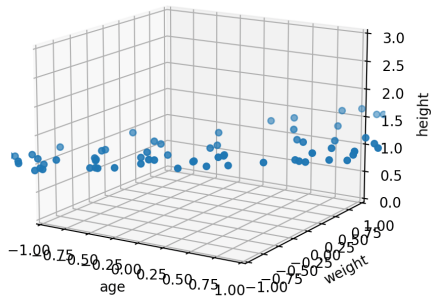
I decided this would be good because of the even tradeoff between accuracy and time complexity. This made it so that it didn't skip over the optimal line but still worked in an efficient, fast way.

Based on the previous runs, I knew that learning rates greater than 0.05 and less than 1.0 seemed to converge well within the 100 iterations and seemed very precise. This runs in half the iterations of the default specifications we were given, which I think is great! I didn't want to go too large, as the data points include 2 decimal places, but I also didn't want it to be too sensitive to the data's noise.

All plots:

Alpha	Image	Observations
0.001	<p>LinReg Height with Alpha 0.001000</p> 	Not enough iterations to converge, too slow

0.005	<p>LinReg Height with Alpha 0.005000</p> 	Not enough iterations to converge, too slow, but slightly better than previous round
0.01	<p>LinReg Height with Alpha 0.010000</p> 	Getting closer to the data points, but still too slow
0.05	<p>LinReg Height with Alpha 0.050000</p> 	Very accurate!
0.1	<p>LinReg Height with Alpha 0.100000</p> 	Very accurate, hard to distinguish from previous

0.5	<p>LinReg Height with Alpha 0.500000</p> 	Very accurate, hard to distinguish from previous
1.0	<p>LinReg Height with Alpha 1.000000</p> 	Very accurate, hard to distinguish from previous
5.0	<p>LinReg Height with Alpha 5.000000</p> 	Not on the graph anymore!! It completely skipped over the data because the learning rate is too big
10.0	<p>LinReg Height with Alpha 10.000000</p> 	Not on the graph anymore!! It completely skipped over the data because the learning rate is too big