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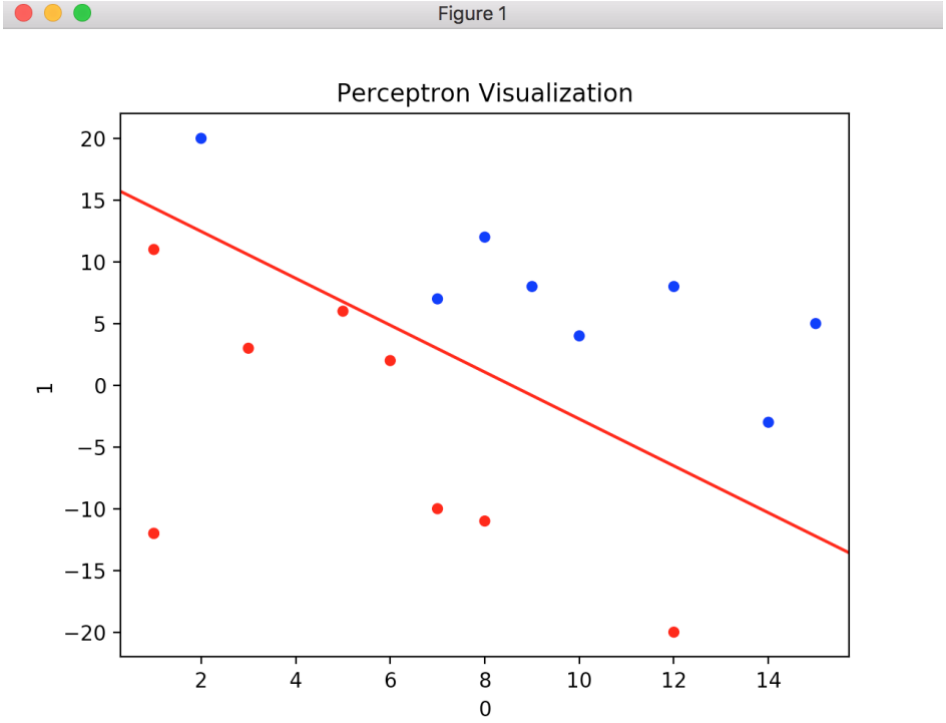
Artificial Intelligence Homework 3 - Programming

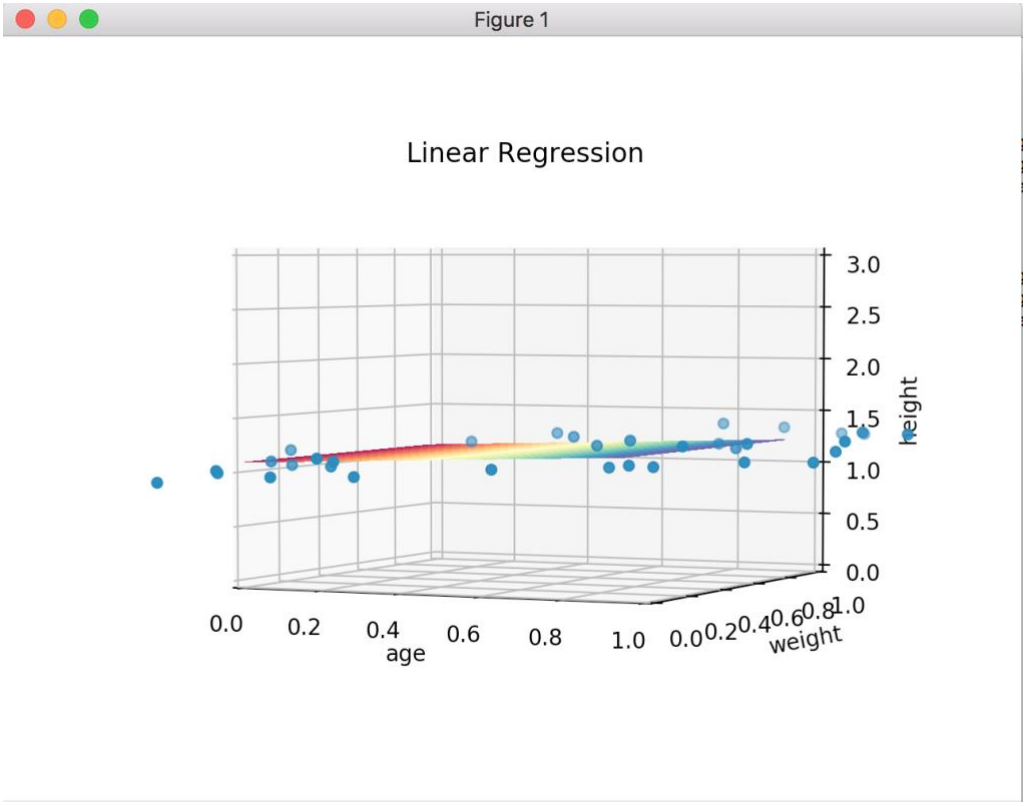
Question 1

Running my perceptron algorithm on the given data(input1.csv) produces this decision boundary:



Question 2

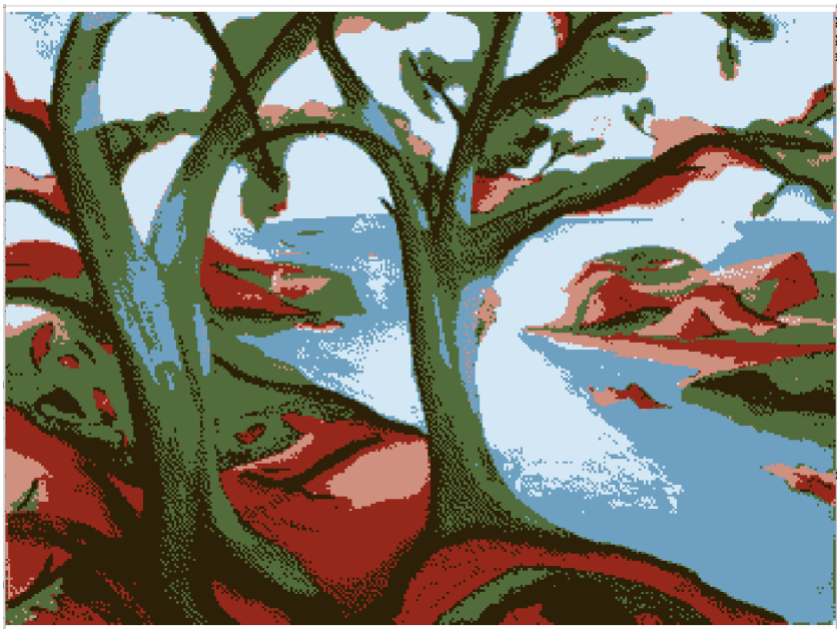
The below regression indicates the weights observed by running alpha = 1.1 and number of iterations = 150. Since I noticed that the weights converged around alpha = 1 and diverged quickly after that, I chose the biggest learning rate possible (1.1) that would lead to similar convergence values. I also increased the number of iterations because the total loss to each data point should reduce with more iterations.



Question 3

For K = 3, we get this image. Since K is fairly small, every pixel will be one of three colors and show “blobs” of color rather than more detailed features. This might be good if the user wants general groups for each point and doesn’t care too much about overall accuracy.

For K = 6, we now see that the edited image resembles the original much closer than for K = 3. In this case, although colors are still slightly skewed the number of groups displays the overall difference between pixels much more clearly than before, so this value of K might be better for clustering. However, this value of K still might be too low for those who want even more similarity within the same clusters.



Finally, for K = 15 we get the following image. Now the image is even closer to the original than it was for K = 6. As we increase K towards the number of distinct pixel colors in the original image, we will see that it resembles the original image more and more. This is good if the user wants very specific, distinct clusters, but if the user wants to be more general in his clustering he should lower his value of K.