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Homework #0

GitHub Link: https://github.com/Norumai01/Intro_Machine_Learning/tree/main/HW_0

Problem 1:

- Based on all the linear regression line models that was individually plotted for X1, X2, or X3, X1 has a more accurate regression line for the training model. X2 and X3 had many different training data points that can be called outliers, and that results in the odd placement for the regression line on X2 and X3.
- X1 had the lowest cost loss as shown as the loss history goes down to 0.985. The lower the cost loss, a better representation of the linear regression line for the training model.
- From testing different ranges of learning on X1, X2, X3, it is found that the best optimal learning rate range around 0.001 – 0.01 depending on when its finish iterating before its iteration limit. For example, for variable X1, if the learning rate was 0.001, it will result in the plot converging in a steady paste and may not end up finishing iterating as 1600 iterations is the limit. As a result, may end up in an inaccurate value of theta. Higher learning rate than 0.1 would result in an exponentially steep decreases and unintentional increases the loss. As a result, the high learning rate may end up producing inaccurate thetas' values.

Problem 2:

- Variable X1 had a better linear regression model because the regression line is more accurate with the relationship between the X and Y variables.
- A learning rate of 0.01 for the multivariable regression was chosen to have an optimal pacing of the loss over iterations. Any lower would requires more iterations, which is not optimal, and possibly unfinished gradient descend. Any higher would result in exponentially decreases and may output inaccurate of thetas.
- The value from Theta shows an array from left to right that basically belong to X0 to X3. X0 is one because it is a constant. Formula shown at the end of the code in the multivariable regression for the calculation:
 - $H(1,1,1)$ is 3.34279542031987
 - $H(2,0,4)$ is 0.18806109519189196
 - $H(3,2,1)$ is 0.06000797936338653