Will Woodard
801069657

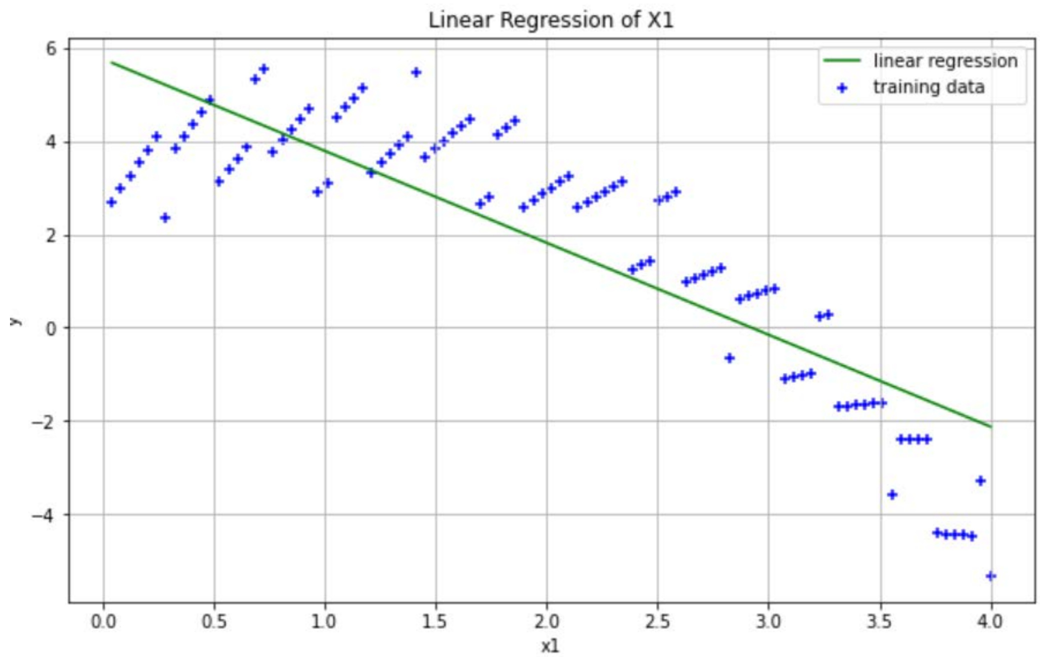
ECGR 4105

Homework 0 Report

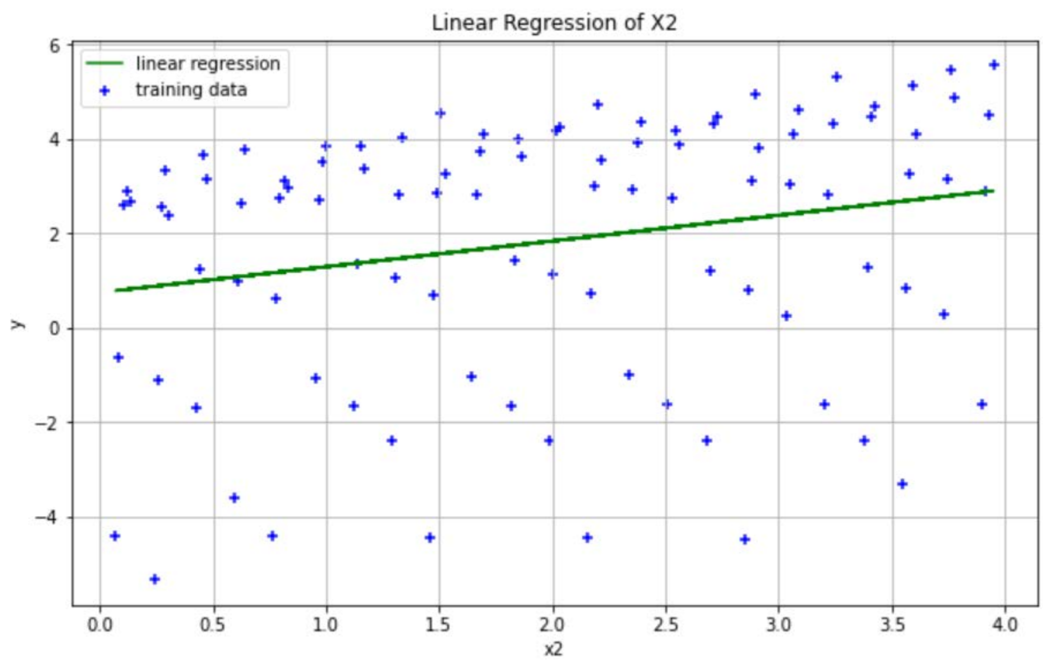
Problem 1

1.

X1:



X2:



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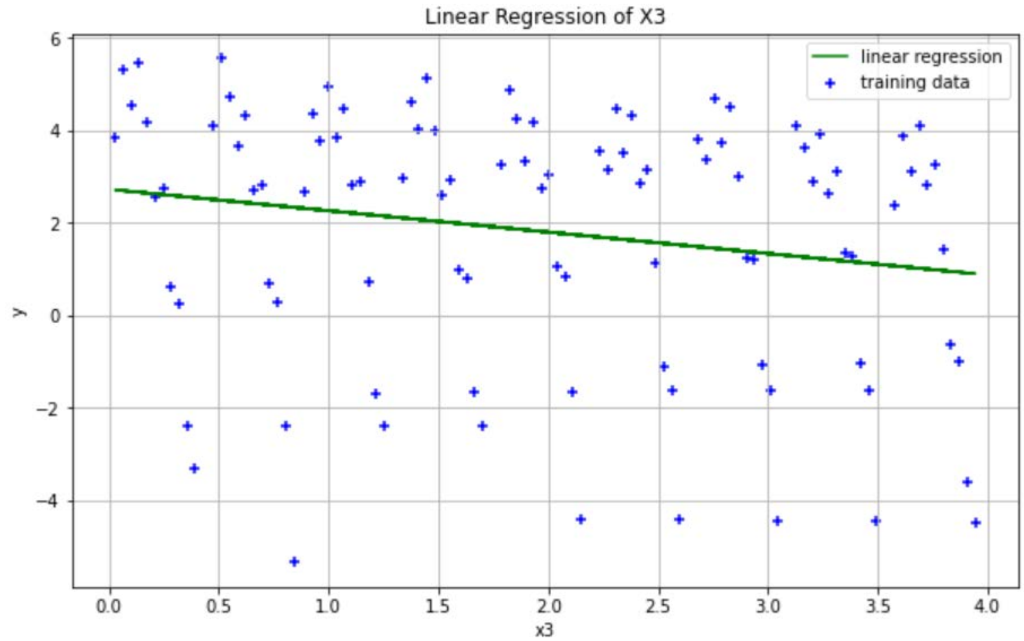
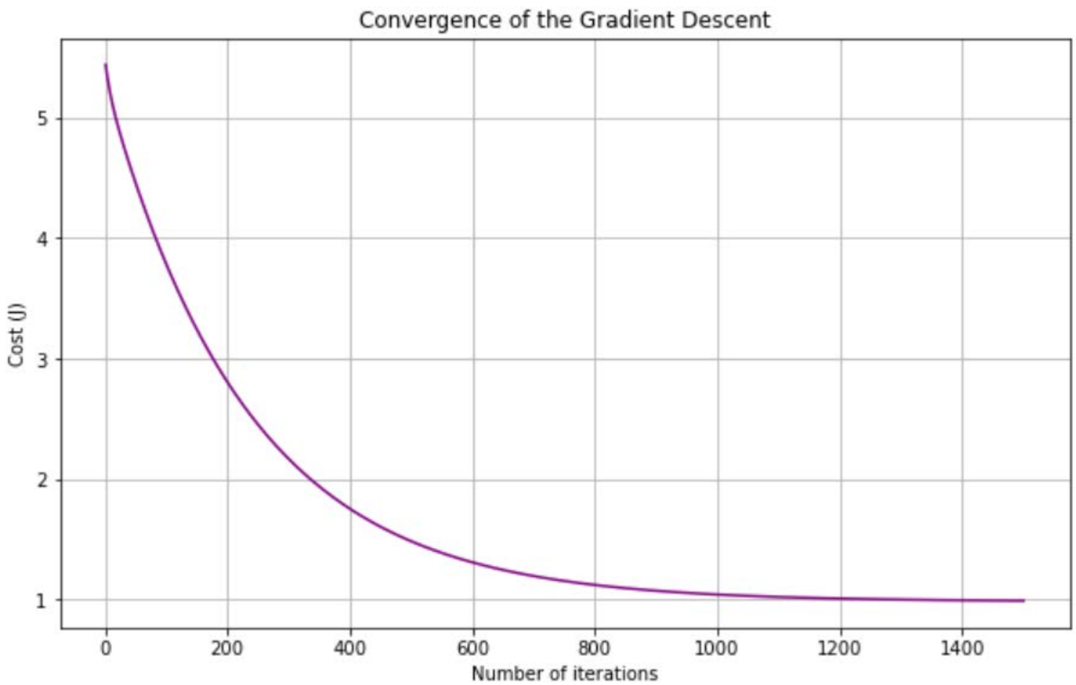
X3:

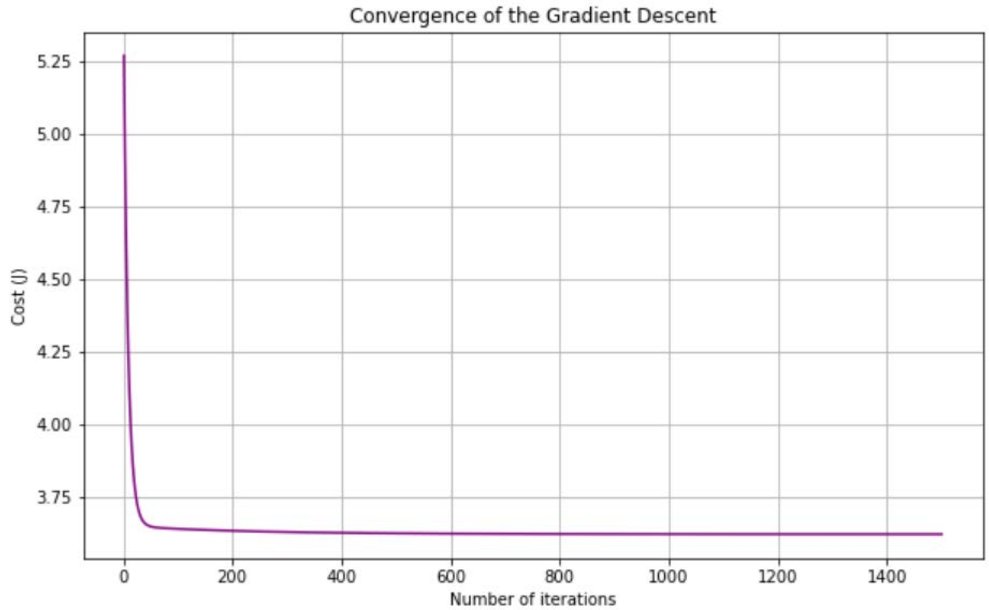


2.

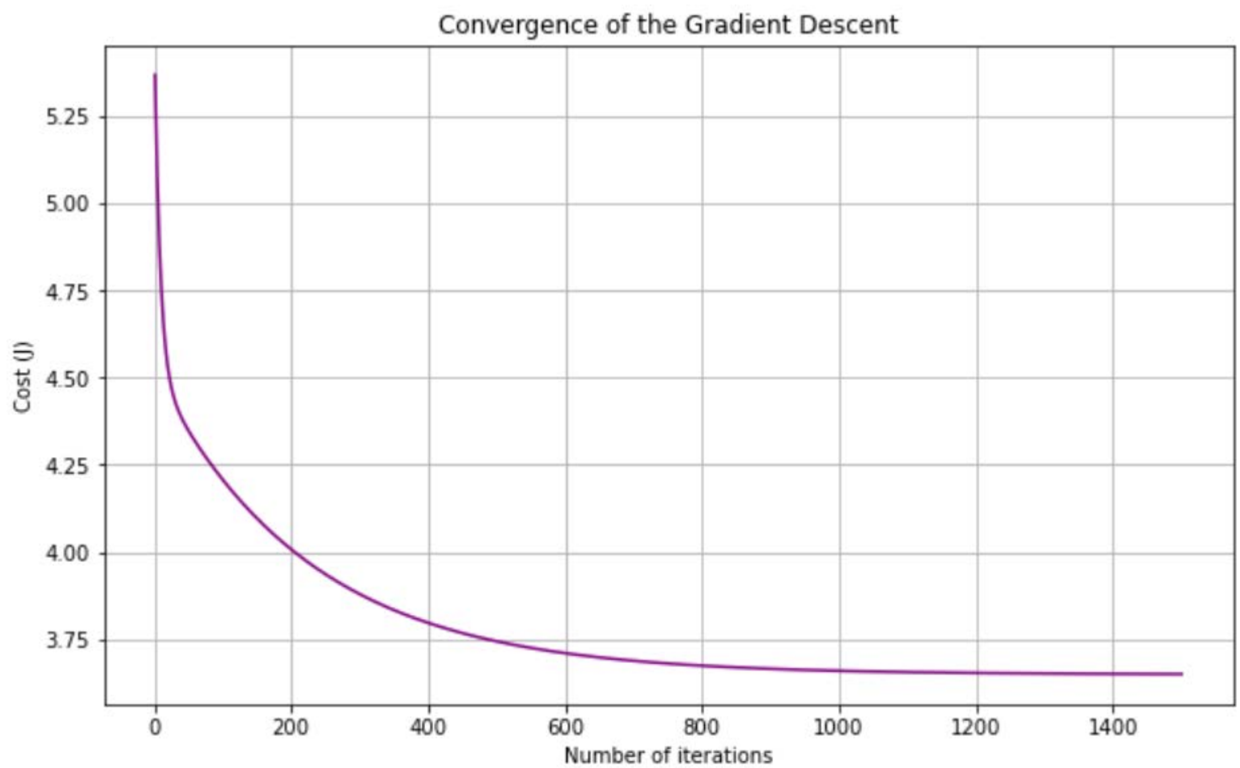
X1:



X2:



X3:



3. Variable x2 has the lowest loss cost for explaining the output y as it regresses the quickest. It can be seen from the convergence graphs that variable x2 has the steepest drop.

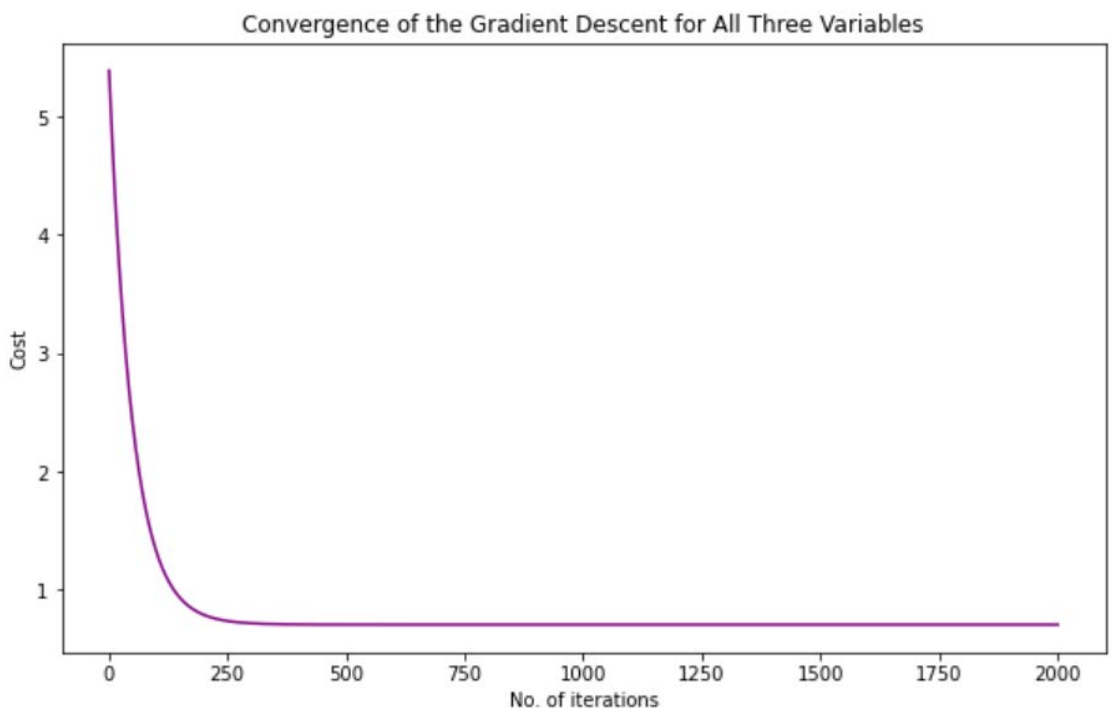
4. For x1 when the learning rate, alpha, was set to 0.01 the values of theta were 5.75752967 for theta 0 and -1.97114532 for theta 1. When alpha was increased to 0.015, theta 0 increased to 5.94478172 and theta 1 decreased to -2.04390178. When alpha was increased again to 0.1, theta 0 increased to 5.99114009 and theta 1 decreased to -2.06191424. Therefore, as the learning rate is increased the value of theta 0 increases while theta 1 decreases.

   For x2 when alpha was set to 0.01, theta 0 was 0.7392744 and theta 1 was 0.5453018. After alpha was increased to 0.015, theta 0 was increased to 0.75281115 and theta 1 decreased 0.54000281. When alpha was increased again to 0.1, theta 0 was increased to 0.75592882 and theta 1 was decreased to 0.53878239. So therefore, as alpha is increased, theta 0 will increase and theta 1 will decrease.

   For x3 when alpha was set to 0.01, theta 0 was 2.71943299 and theta 1 was -0.46300206. After alpha was increased to 0.015, theta 0 was increased to 2.79572447 and theta 1 was decreased to -0.49308308. After alpha was increased again to 0.1, theta 0 was increased to 2.81356727 and theta 1 was decreased to -0.50011833. So therefore, as alpha increases, theta 0 will increase and theta 1 will decrease.

Problem 2

1. The linear model for X2 is the best because it regresses the quickest to the lowest cost.
2.



3. For alpha equals 0.01, theta = [1.82565676 -2.3578133   0.65275329 -0.33677367]. When alpha was increased to 0.015, theta = [1.82565677 -2.35781332 0.65275329 -0.33677366]. Then when alpha was increased again to 0.1, theta = [1.82565677

-2.35781332 0.65275329 -0.33677366]. The number of iterations does not change as it is a set value, and the value of theta doesn't seem to changed much with the change of learn rate.

4. For (X1,X2,X3) = (1,1,1), the value of Y could be estimated to be 11.96021843. As, Y=1*1.82565676^3 + 1*-2.3578133^2 +1*0.65275329 -0.33677367.

   For (X1,X2,X3) = (2,0,4), the value of Y could be estimated to be 14.44414999. As, Y=2*1.82565676^3 + 0*-2.3578133^2 +4*0.65275329 -0.33677367

   For (X1,X2,X3) = (3,2,1), the value of Y could be estimated to be 29.68941249. As, Y=3*1.82565676^3 + 2*-2.3578133^2 +1*0.65275329 -0.33677367

GitHub: https://github.com/willwoodard16/Intro-to-Ml-4105