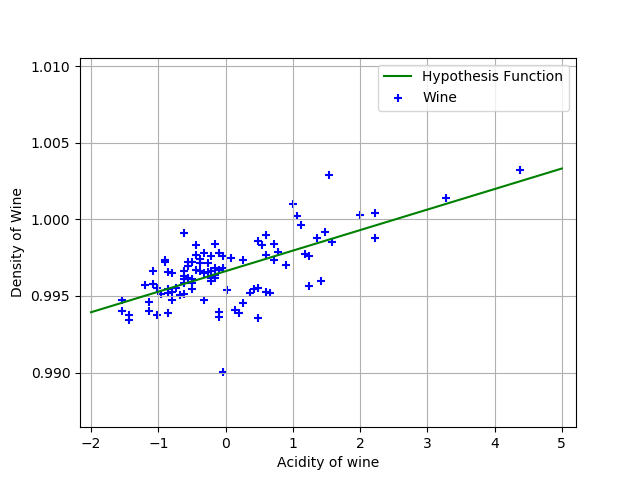
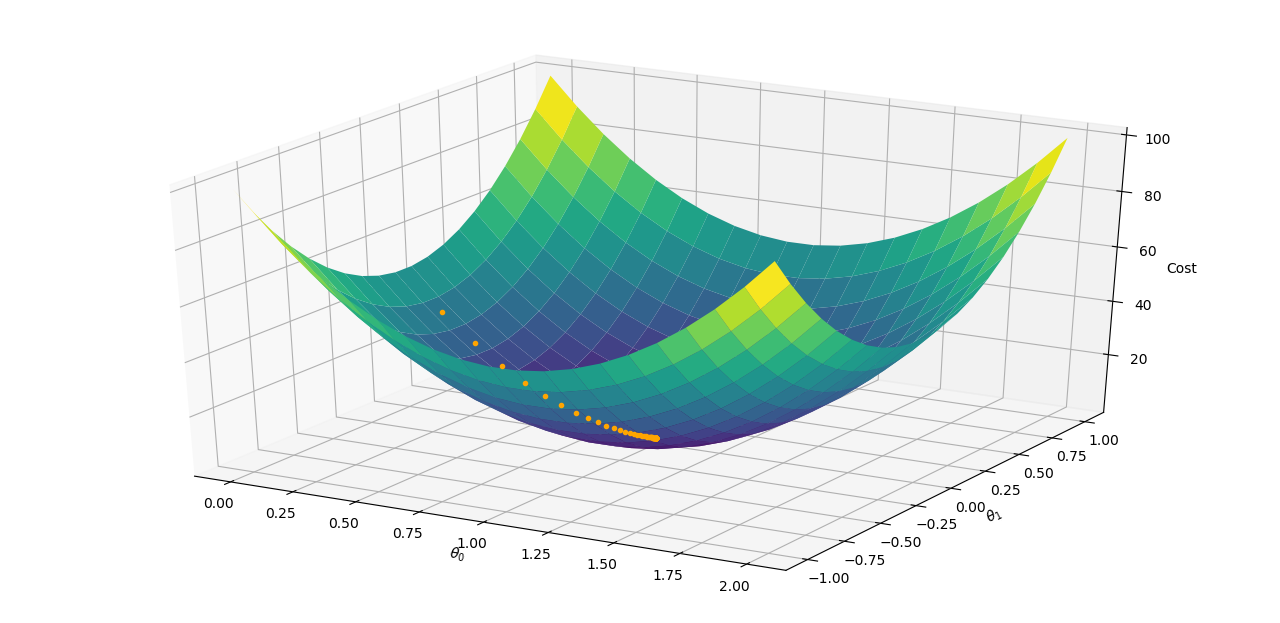
COL 774: Machine Learning. Assignment 1

1. A) Learning rate = 0.0015,

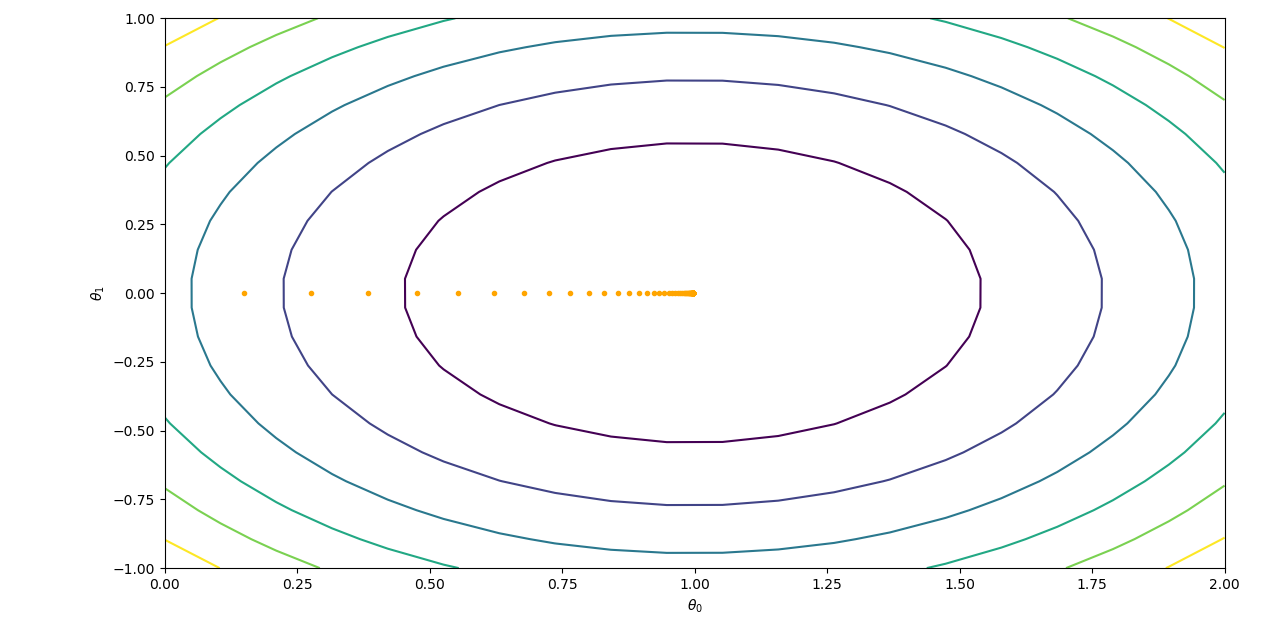
theta =

Convergence Condition: error < 0.001 or # of iterations > 1000

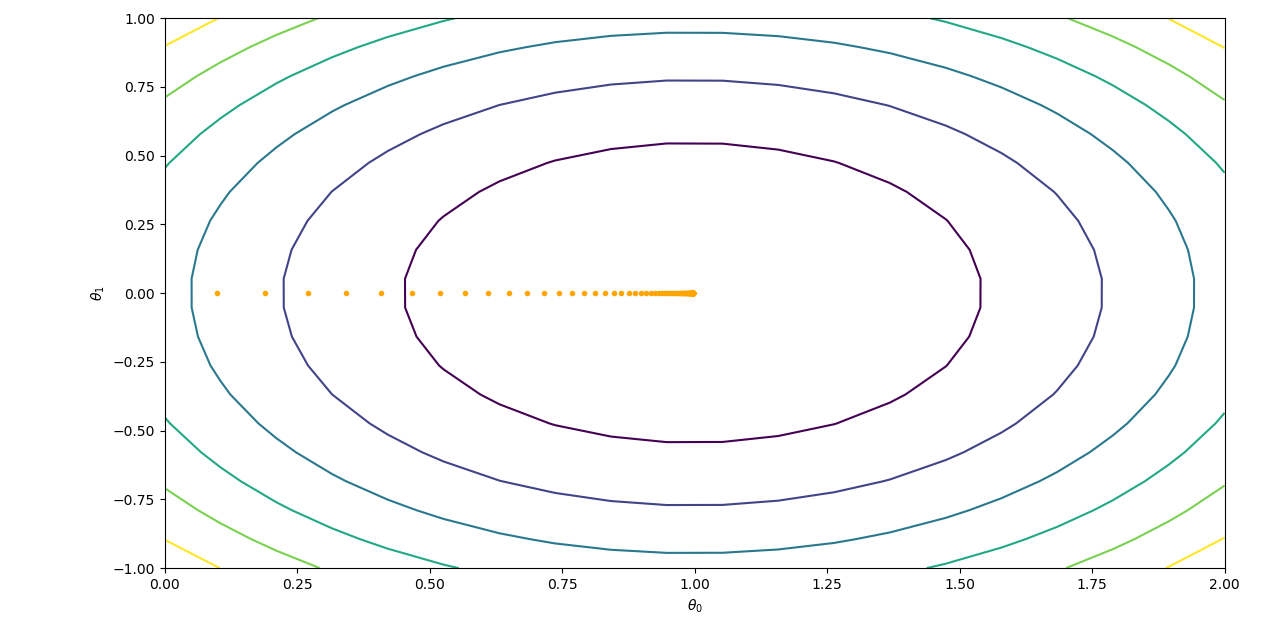
B) 

C) 

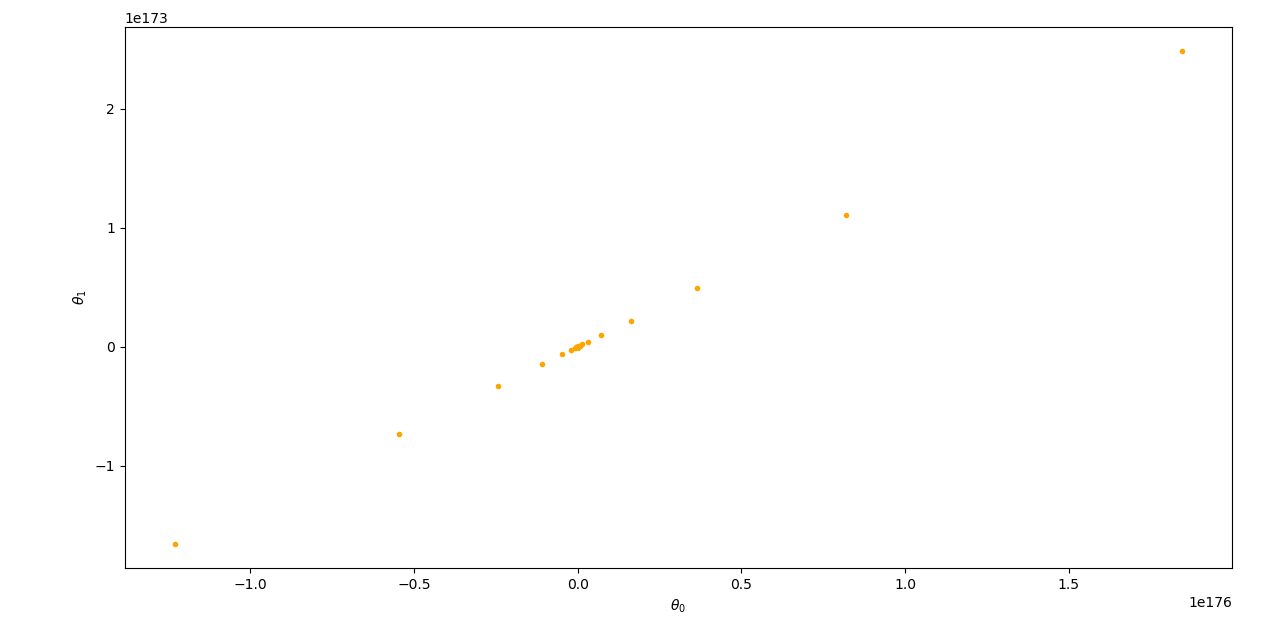
D) η = 0.0015



E) η = 0.001

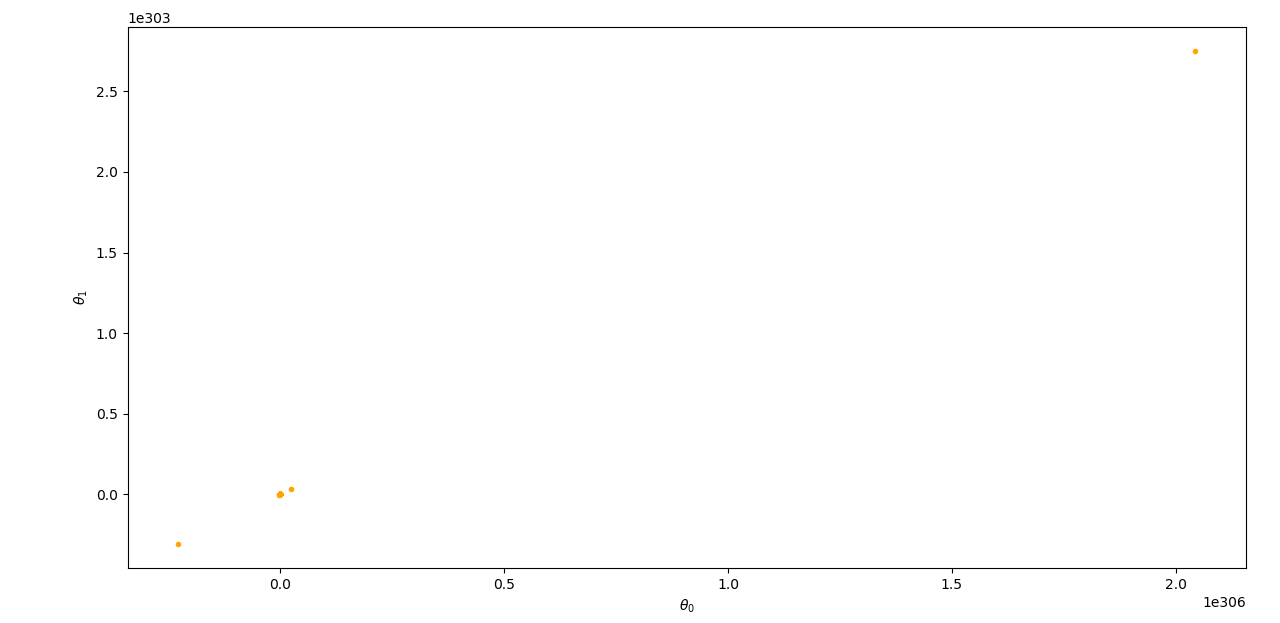


η = 0.025



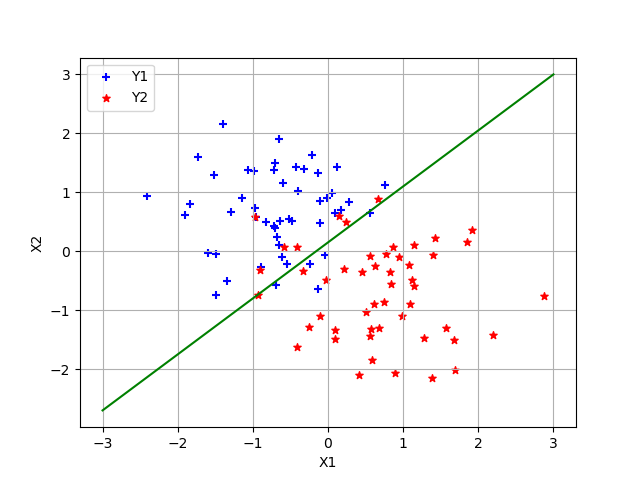
η = 0.1

We observe that as the learning rate increases beyond a point the cost function starts diverging. Like for η = 0.001 its converging but diverging for η = 0.025 , 0.1 . Initially there are small oscillations and the function still converges . As η increases there are more oscillations near the minimum, each time overshooting even more .



3.)

a) theta =

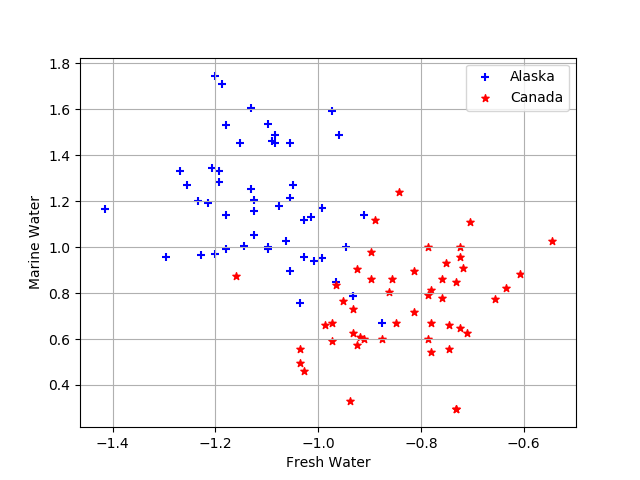
b) 

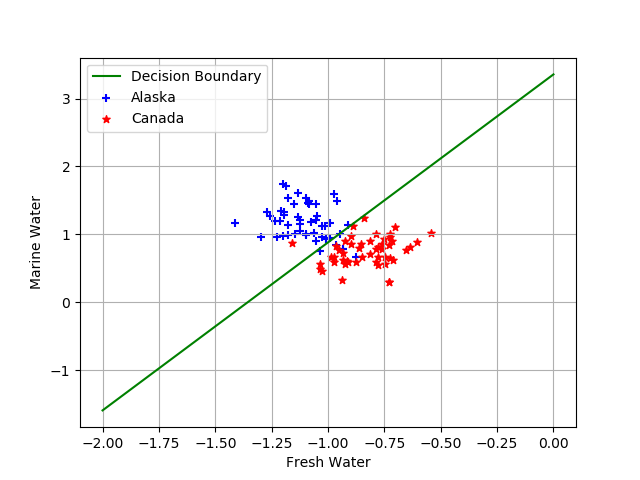
The green line is the decision Boundary

4.)

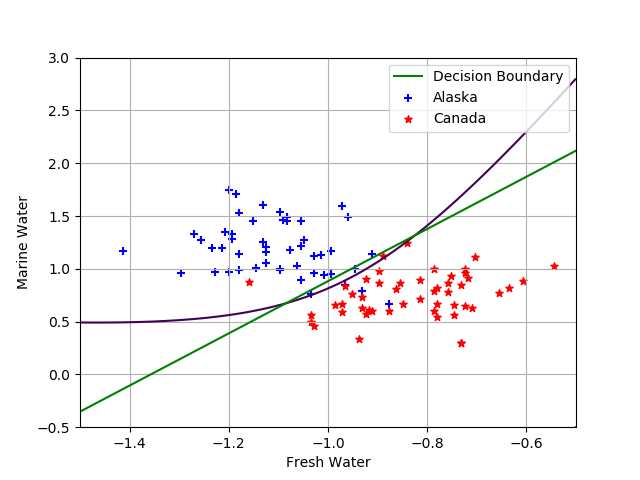
a)

y[i] = 0 corresponds to Alaska

b) 

c) 

d)

e) 

f) Quadratic decision Boundary does a better job than the linear decision boundary (Logistic Regression). The assumption that the underlying data belong to gaussian distribution is valid to a great extent.

2)

b) [3.00371 0.99475 1.9981] 65183 1

[2.999 0.99 1.99] 28455 100

[2.922 1.01 1.99] 13100 10000

[2.983 1.1081 1.99547] 6674 1000000

Theta (# of iteration) r

c)Number of iterations inversely proportional to r

The value of theta very close to the given theta

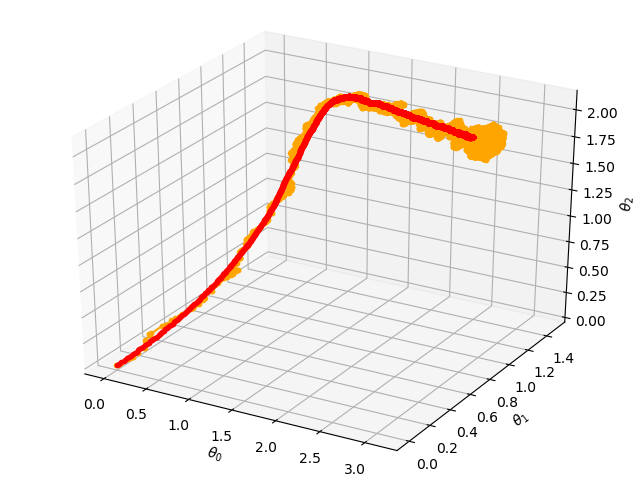
Speed of convergence is inversely proportional to r

0.9850678759592312 – error for r = 1

0.9958009697879703 – error for r = 100

0.98 – error for original Hypothesis

SGD Converges to the original Hypothesis

d)

red corresponds to r = 100

orange corresponds to r = 1

It is noticed that SGD gets theta close to minimum but the parameters keep oscillating near the minimum value.

Report By:

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**2017CS10378**