CS613 - HW2

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1 Theory

i For the function $J = (x_1 w_1 - 5x_2 w_2 - 2)^2$, where $w = [w_1, w_2]$ are our weights to learn:

(a) $\frac{\partial J}{\partial w_1}$ and $\frac{\partial J}{\partial w_2}$

i. For $\frac{\partial J}{\partial w_1}$, x1, x2, w2 are constants :

A. $\frac{d}{d(x_1 w_1)} = x_1$

B. $\frac{d}{d(-2)} = 0$

C. $\frac{d}{d(5x_2 w_2)} = 0$

D. $\frac{d}{d(J)} = 2(x_1 w_1 - 5x_2 w_2 - 2)$

E. $\frac{\partial J}{\partial w_1} = \frac{d}{d(J)} * \frac{d}{d(5x_2 w_2)} = \quad 2x_1(x_1 w_1 - 5x_2 w_2 - 2)$

i. For $\frac{\partial J}{\partial w_2}$, x1, x2, w1 are constants :

A. $\frac{d}{d(x_1 w_1)} = 0$

B. $\frac{d}{d(-2)} = 0$

C. $\frac{d}{d(5x_2 w_2)} = -5x_2$

D. $\frac{d}{d(J)} = 2(x_1 w_1 - 5x_2 w_2 - 2)$

E. $\frac{\partial J}{\partial w_1} = \frac{d}{d(J)} * \frac{d}{d(5x_2 w_2)} = \quad -10x_2(x_1 w_1 - 5x_2 w_2 - 2)$

ii Given current values of $w = [0, 0], x = [1, 1]$

(a) $\frac{\partial J}{\partial w_1} = 2x_1(x_1 w_1 - 5x_2 w_2 - 2)$

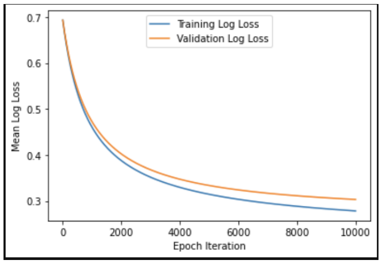
(b) $\frac{\partial J}{\partial w_2} = -10x_2(x_1 w_1 - 5x_2 w_2 - 2)$

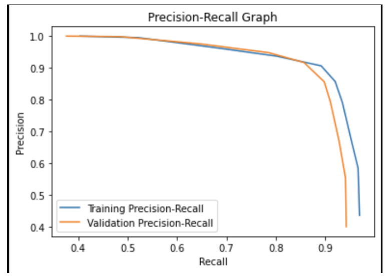
(c) $w = [0, 0], x = [1, 1]$

(d) $\frac{\partial J}{\partial w_1} = -4$

(e) $\frac{\partial J}{\partial w_2} = 20$

2 Spambase Logistic Regression Classier





Training Accuracy: 91.2292142158461
Training Precision: 85.6911883589329
Training Recall: 92.01388888888889
Training F-Measure: 88.74005860192548
Validation Accuracy: 90.93281148075668
Validation Precision: 85.59027777777779
Validation Recall: 89.79963570127505
Validation F-Measure: 87.64444444444445

3 ======Multi Class Logistical Regression======

Ran out of time at hour 46 of this assignment on Classifying Results, Probability Results posted below.

[Invalid] Validation Accuracy: 33.44897959183673

**'probability': array([[0.21660798], [0.07895079], [0.8508251], [0.63097203], [0.57774742], [0.59115804], [0.55571626], [0.49638557], [0.0294972], [0.49879692], [0.03332464], [0.63936515], [0.022737], [0.03207235], [0.08135045], [0.43669762], [0.11993101], [0.05613991], [0.75083936], [0.43912862], [0.04855817], [0.81926188], [0.29203609], [0.08794642], [0.47216023], [0.29327303], [0.83917222], [0.03002327], [0.10996898], [0.7492319], [0.916725]]) Versicolor Probability 'probability': array([[0.97105582], [0.94073442], [0.03261025], [0.96831819], [0.02577813], [0.90375322], [0.95145105], [0.85607933], [0.96655112], [0.8363372], [0.89072976], [0.89068793], [0.88176462], [0.86861005], [0.01585114], [0.80873311], [0.03529648], [0.95029524], [0.02254891], [0.85997843], [0.78031062], [0.78181229], [0.03044833], [0.92107437], [0.98342334], [0.95125453], [0.81824489], [0.86870508], [0.97728048], [0.03594053], [0.97330997], [0.04341367], [0.02257675], [0.95927483], [0.98153375]])
Setosa Probability 'probability': array([[0.0420152], [0.98923983], [0.01254824], [0.98126867], [0.02359751], [0.98308696], [0.25052498],**

[0.0749624], [0.19866861], [0.10247297], [0.97881193], [0.29777793], [0.97277064], [0.98228902], [0.0988518], [0.27539508], [0.98018521], [0.98193003], [0.07985861], [0.99276656], [0.97338267], [0.06201912], [0.10332667], [0.39807116], [0.9703242], [0.09394933], [0.02424857], [0.96856076], [0.9808362], [0.44069987], [0.01932032], [0.06443096]])