**Assignment # 2**

Construct by hand a Perceptron which correctly classifies the following data; use your knowledge of plane geometry to choose appropriate values for the weights w0, w1 and w2.

Training example x1 x2 class

a. 0 1 -1

b. 2 0 -1

c. 1 0 +1

(i) Draw points on 2-D graph and check Perceptron with

w0 = -5, w1 = 4, w2 = 2 classifies the data into classes.

(ii) Demonstrate the Perceptron Learning Algorithm on the above data, using a learning rate of 1.0 and initial weight values of

w0 = -1.5  
w1 =   0  
w2 =   2

In your answer, you should clearly indicate the new weight values at the end of each training step.

Hint: make a table to show each iterative step.

Q. 2

Given the data

Price Demand

49 124

69 95

89 71

99 45

109 18

1. Fit linear regression (find b and m)
2. Find prediction for all data points and then find error, squared error and sum of squared error.
3. Give estimate of demand if price is 54.
4. For every 1 unit increase in price how much demand falls.

Q. 3 (use excel or pycharm)

The bodyfat dataset from the Statlib data server gives estimates of the percentage of body fat determined by underwater weighing and various body circumference measurements for 252 men. It is of interest to develop an equation to estimate body fat from the circumference measurements.

Get data from

<http://lib.stat.cmu.edu/datasets/bodyfat>

The outcome variable is y, percent bodyfat estimated from Siri’s equation (%), and the predictors of interest are: age (years), weight (pounds), height (inches), and circumferences (all in cm) of neck, chest, abdomen, hip, thigh, knee, ankle, biceps, forearm, and wrist.

1) Use the data to determine a good model for predicting percent bodyfat from the other variables (except body density!).

Q. 3

On given data perform multiple linear regression to predict the travel time in future tasks.

Miles traveled num of deliveries travel time

89 4 7

66 1 5.4

78 3 6.6

111 6 7.4

44 1 4.8

77 3 6.4

80 3 7

66 2 5.6

109 5 7.3

76 3 6.4

Find w0, w1, w2 and w3

Find travel time for 100 miles and 10 deliveries.

In regression a coefficient wi is interpreted as estimated change in output y for corresponding 1 unit change in the variable xi  when all other variables are held constant.

Describe for every 1 mile increase in distance how much time increases

Describe for every 1 more delivery how much travel time increases.

Q 4.

Consider the task of predicting someone’s gender (Male/Female) based on their Weight and Height.

1. Find w’s and predict the gender for height 70 cms and weight 180 lbs.

Data available at

<https://raw.githubusercontent.com/johnmyleswhite/ML_for_Hackers/master/02-Exploration/data/01_heights_weights_genders.csv>

run the code available at <https://gist.githubusercontent.com/gchavez2/366fb3323de925819b3388765146794a/raw/75c8b7219f54b85e47a80f2b46084727b82c5035/LogisticRegression.py>

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| import numpy as np  from sklearn import linear\_model  # Load data  data = np.loadtxt('./heights\_weights.csv', delimiter=',', skiprows=1)  X = data[:,0:2]  y = data[:,2]  # Fit (train) the Logistic Regression classifier  clf = linear\_model.LogisticRegression(C=1e40, solver='newton-cg')  fitted\_model = clf.fit(X, y)  # Predict  prediction\_result = clf.predict([(70,180)]) |
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