PGP in AI/ML

Regression - Assignment 2

Total Marks: 12 ***Submission Date: 2359hrs on 20-11-2019***

1) Every object in the world has some stress related to it. Residual stresses are the ones which occur on a material even if it isn't loaded with anything. These stresses are derived by photo elasticity. To measure the stress on the material, we need to dig into the object. At certain depth, there is minimum and maximum pressure getting applied. The following table shows the same.

Drilling depth[mm]	Min Pressure [MPa]
0.5	79.4
1	46.33
1.5	44.43
2	44.85
2.5	48.54
3	49.64
3.5	52.44
4	53
4.5	54.1

Fit best regression model on the given training data by minimizing the corresponding error function. You should solve this minimization problem by finding the stationery point of error function (or by equating first derivative of the function to zero). Please solve this programmatically as well as analytically. [2 Marks]

Also predict the Min pressure which will be required at 3.8 mm depth. [2 Marks]

2) Is the function $Y= 6x^2+9x$ convex?
What are the maxima and minima of this function? [4 Marks]

3) Consider the following training set of m=4 training examples:

x	y
1	0.5
2	1
4	2
0	0

Consider the linear regression model $h_\theta(x) = \theta_0 + \theta_1 x$. What are the values of θ_0 and θ_1 that you would expect to obtain upon running gradient descent on this model? Linear regression will be able to fit this data perfectly.

Solve this problem analytically only using gradient descent. [4 Marks]

Submissions:

Solutions or answers to all questions (excepting programming problems) should be submitted in a word document named 'Roll_No.doc' (Roll_No is your identity number of this programme).

All python code should be submitted in a Jupyter notebook named "Roll_No.ipynb".