Home Assignment - 4

Submit soft copy at *https://hello.iitk.ac.in/course/me698asem12324*

Due on or before: 13.09.2024

Samples of solid rocket propellants will be used if their shear strengths are adequate. Shear strength is found to be a function of propellant age and storage temperature. The propellants are accepted or rejected, based on shear strength measurements, as shown below.

Test	Propellant age (Weeks)	Storage temperature (°C)	Pass/fail for application
1	15.5	40	fail
2	23.75	23.25	fail
3	8	17	pass
4	17	21	fail
5	5.5	10	pass
6	19	12	pass
7	24	20	fail
8	2.5	12	pass
9	7.5	15	pass
10	11	26	fail

Write a computer program (preferably in python), **from scratch**, to compute the contour of passing (or failing) probabilities using logistic regression. The computer program must NOT use scikitlearn/scipy/statistics or similar packages/libraries. You can only use packages for vector/matrix/array operations and plotting (numpy, matplotlib etc.).

1. Define a cost function and deduce the gradient of the same.
2. Use gradient descent with an appropriate line search technique to minimize the above cost function.
3. Write the pseudocode of the above procedure.
4. Plot the scatter of data, and probability (of passing or failing) contour in one figure.
5. Put your code, plot, and the written documents in a folder; zip the folder and submit in Mookit.