IT585 Advanced Machine Learning
Lab8
Gradient and Hessian Methods for Optimization

Instructions:
1. You have to code the solution in Google colab
2. You are supposed to write the iterative code for training and gradient calculations from scratch. However you can use math functions from the library.
3. Your plots, code, any insights, observations written as text should be submitted as one ipynb file to google classroom
4. Deadline : April 15,2024 11:59 PM IST
5. Name of your file should be : yourrollno_lab9.ipynb

This lab is in two parts:

Part 1: Gradient Descent and SGD for Linear Regression

Steps:
1. Generate data. Generate an X as a random number between 0 and 100. Generate y= 4x + random gaussian noise with appropriate magnitude. Fit a linear regression model on this data using analytical method
2. Fit a linear regression model on this data by implementing gradient descent and stochastic gradient descent from scratch. Plot the line of best fit for each iteration. On another graph also plot the loss vs iterations for each of gradient descent and stochastic gradient descent.

Part 2: Gradient Descent and Newton's Method (Hessian Based) For logistic regression

Choose a classification data set of your choice. Train a logistic regression model on this dataset using stochastic gradient descent and Newton's method from scratch. Plot the loss vs iterations for both algorithms.

Note down your observations. Here in the text part of your .ipynb file you can describe the computation of gradient, hessian etc. for both parts 1 and 2.