Assignment 1 - Linear Regression & Logistic Regression

Part A:

The attached dataset ***"house_data.csv"*** contains 21613 records of house sale prices. It includes homes sold between May 2014 and May 2015.

1- Apply Simple Linear regression with gradient descent to predict the **price** based on **sqft_living** (Square footage of the apartments interior living space).

Given the hypothesis function: $\mathbf{Y = C_1 + C_2 X}$
Y (target variable) = Price, X (predictor) = sqft_living, C_1 and C_2 are the parameters of the function.

2- Apply Multiple Linear regression with gradient descent to predict **price** based on **5 predictors (grade, bathrooms, lat, sqft_living, view)**.

Given the hypothesis function: $\mathbf{Y = C_1 + C_2 X_2 + C_3 X_3 + C_4 X_4 + C_5 X_5 + C_6 X_6}$
Y (target variable) = Price, X (predictor) = (grade, bathrooms, lat, sqft_living, view), C_1, C_2, C_3, C_4, C_5 and C_6 are the parameters of the function.

a) Implement the gradient descent function to optimize parameters of the function.
b) Calculate error function to see how the error of the hypothesis function changes with every iteration of gradient descent (hint: you will need to calculate error in every iteration) .

$$\mathbf{MSE} = \frac{1}{n}\sum_{i=1}^{n}(Y_i - \hat{Y}_i)^2$$

$\mathbf{MSE}$ = mean squared error
n = number of data points
Y_i = observed values
$\hat{Y}_i$ = predicted values

c) Use optimized hypothesis function to make predictions on new data.
d) Try different values of learning rate and see how this changes the accuracy of the model.

Part B:

The attached dataset **"heart.csv"** contain 303 records of patients have heart disease or not according to features in it. You are required to build **Logistic Regression** model using **gradient descent** to predict whether patient have heart disease or not **(target) based on 4 predictors (trestbps, chol, thalach, oldpeak).**

a) Implement the gradient descent function to optimize parameters of the function.
b) Calculate error function to see how the error of the hypothesis function changes with every iteration of gradient descent(hint: you will need to calculate error in every iteration).
c) Use optimized hypothesis function to make predictions on new data.
d) Try different values of learning rate and see how this changes the accuracy of the model.

Important Notes:

- You can only use “pandas”, “numpy” and “matplotlib” libraries. ***(Don’t use “sklearn”)***
- The maximum number of students in a team is 3 and the minimum is 2.
- No late submission is allowed.
- Cheating students will take negative grades and no excuses will be accepted.