PRACTICAL NUMBER:4A

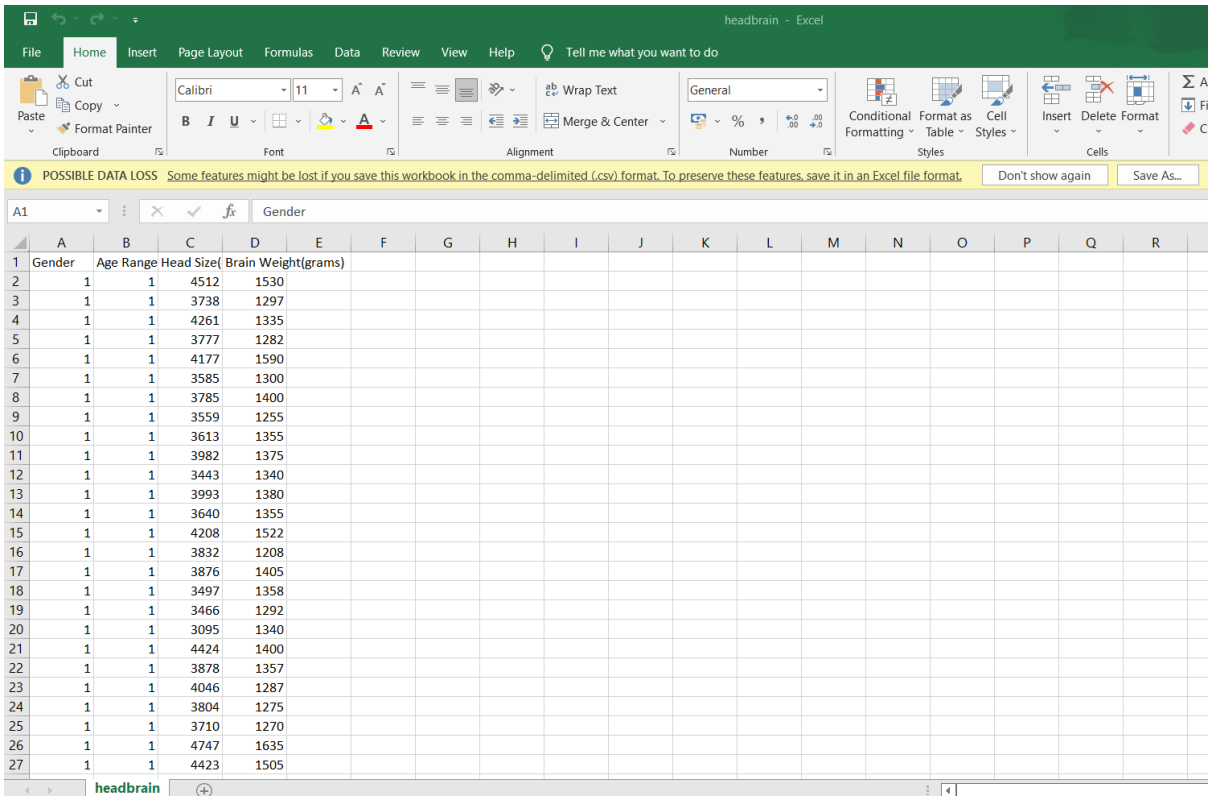
Aim: For a given set of training data examples stored in a .CSV file implement Least Square Regression algorithm.

Code:

```
#Import the required libraries

import numpy as np
import pandas as pd
import matplotlib.pyplot as plt

#Import the data set
#Reading Data
data = pd.read_csv('headbrain.csv')
#With the shape method, comes the flexibility to obtain the dimensions of any Python object.
print("Dimensions:",data.shape)
#The head function in Python displays the first five rows of the dataframe by default.
print("First 5 rows:",data.head())

#Assigning ‘X’ as independent variable and ‘Y’ as dependent variable
# Coomputing X and Y
X = data['Head Size(cm^3)'].values
Y = data['Brain Weight(grams)'].values

#Next, in order to calculate the slope and y-intercept we first need to compute the means of ‘x’ and ‘y’.
#Mean X and Y
mean_x = np.mean(X)
mean_y = np.mean(Y)
# Total number of values
n = len(X)
#Calculate the values of the slope and y-intercept
#Using the formula to calculate 'm' and 'c'
numer = 0
denom = 0
for i in range(n):
   numer += (X[i] - mean_x) * (Y[i] - mean_y)
   denom += (X[i] - mean_x) ** 2
m = numer / denom
c = mean_y - (m * mean_x)

#Printing coefficients
print("Coefficients")
print(m, c)
```

```
#Plotting the line of best fit
#Plotting Values and Regression Line

max_x = np.max(X) + 100
min_x = np.min(X) - 100

#Calculating line values x and y
x = np.linspace(min_x, max_x, 1000)
y = c + m * x

#Ploting Line
plt.plot(x, y, color='#58b970', label='Regression Line')
#Ploting Scatter Points
plt.scatter(X, Y, c='#ef5423', label='Scatter Plot')

plt.xlabel('Head Size in cm3')
plt.ylabel('Brain Weight in grams')
plt.legend()
plt.show()
```

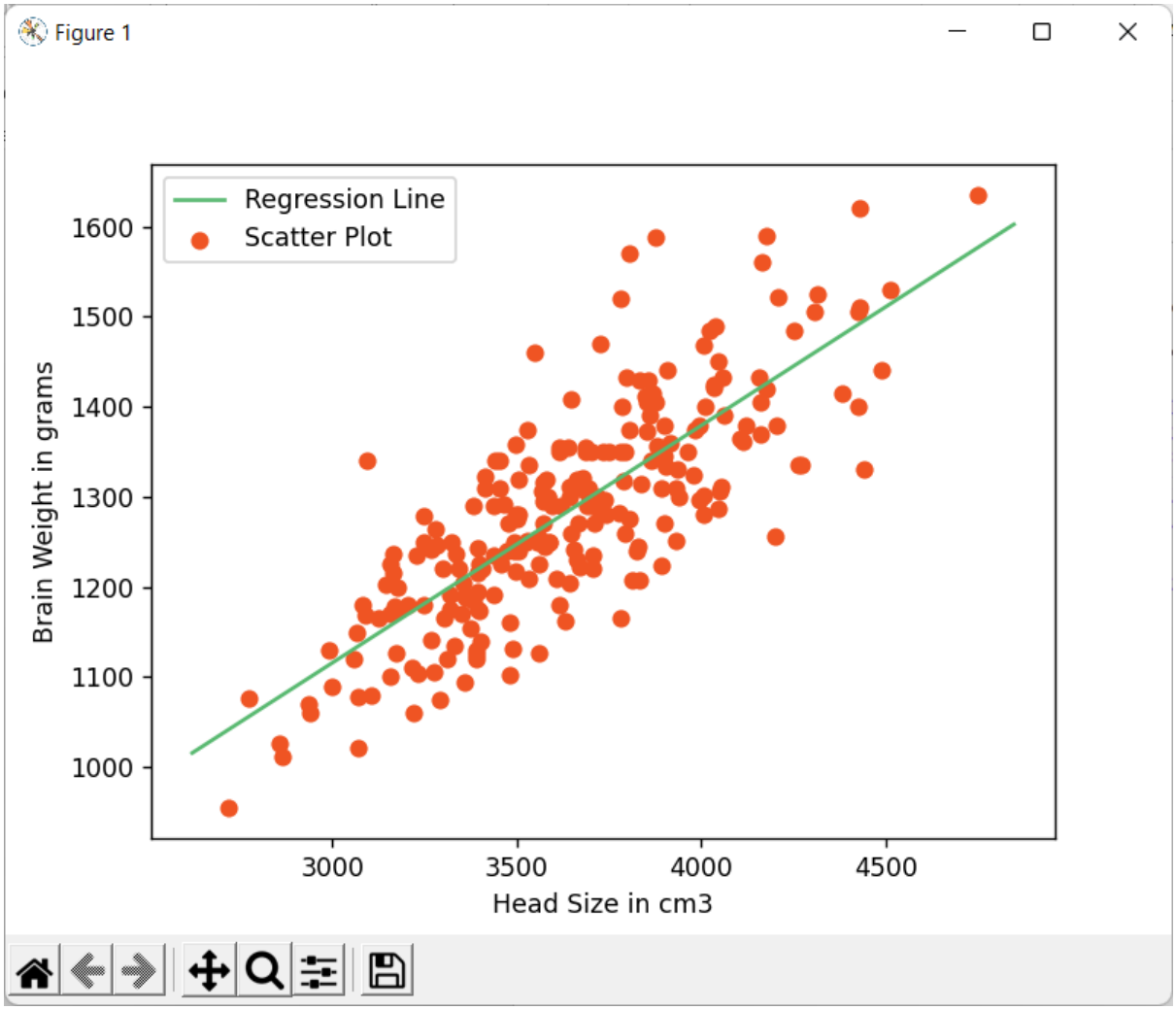
headbrain.csv



	A	B	C	D
1	Gender	Age Range	Head Size(	Brain Weight(grams)
2	1	1	4512	1530
3	1	1	3738	1297
4	1	1	4261	1335
5	1	1	3777	1282
6	1	1	4177	1590
7	1	1	3585	1300
8	1	1	3785	1400
9	1	1	3559	1255
10	1	1	3613	1355
11	1	1	3982	1375
12	1	1	3443	1340
13	1	1	3993	1380
14	1	1	3640	1355
15	1	1	4208	1522
16	1	1	3832	1208
17	1	1	3876	1405
18	1	1	3497	1358
19	1	1	3466	1292
20	1	1	3095	1340
21	1	1	4424	1400
22	1	1	3878	1357
23	1	1	4046	1287
24	1	1	3804	1275
25	1	1	3710	1270
26	1	1	4747	1635
27	1	1	4423	1505

Output:

```
*Python 3.7.9 Shell*
File  Edit  Shell  Debug  Options  Window  Help
Python 3.7.9 (tags/v3.7.9:13c94747c7, Aug 17 2020, 18:58:18) [MSC v.1900 64 bit
(AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
================== RESTART: D:/MSc IT/Sem3/ML Pracs/Prac4A.py ==================
Dimensions: (237, 4)
First 5 rows:    Gender  Age Range  Head Size(cm^3)  Brain Weight(grams)
0       1          1             4512                 1530
1       1          1             3738                 1297
2       1          1             4261                 1335
3       1          1             3777                 1282
4       1          1             4177                 1590
Coefficients
0.26342933948939945 325.57342104944223
```



PRACTICAL NUMBER:4B

Aim: For a given set of training data examples stored in a .CSV file implement Logistic Regression algorithm.

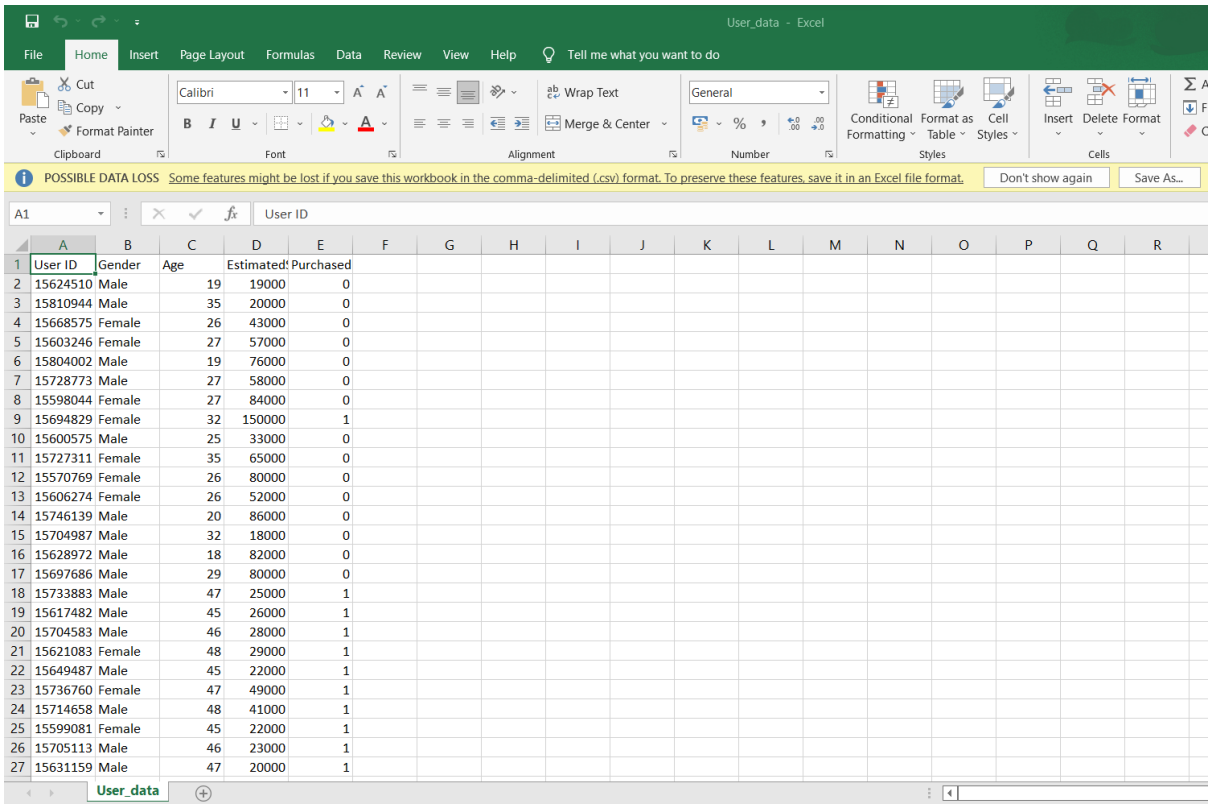
Code:

```
#Importing libraries

import pandas as pd

import numpy as np

import matplotlib.pyplot as plt

from sklearn.model_selection import train_test_split

from sklearn.preprocessing import StandardScaler

from sklearn.linear_model import LogisticRegression

from sklearn.metrics import confusion_matrix

from sklearn.metrics import accuracy_score

from matplotlib.colors import ListedColormap


#Reading the data

dataset = pd.read_csv('User_Data.csv')

#Now, to predict whether a user will purchase the product or not, one needs to find out the relationship between Age and Estimated Salary

# input

x = dataset.iloc[:, [2, 3]].values

# output

y = dataset.iloc[:, 4].values


#Splitting the dataset to train and test. 75% of data is used for training the model and 25% of it is used to test the performance of our model.

xtrain, xtest, ytrain, ytest = train_test_split(x, y, test_size = 0.25, random_state = 0)


#Performing feature scaling

sc_x = StandardScaler()
```

```
xtrain = sc_x.fit_transform(xtrain)
xtest = sc_x.transform(xtest)
print (xtrain[0:10, :])

#Training The Model
classifier = LogisticRegression(random_state = 0)
classifier.fit(xtrain, ytrain)

#Performing predictions on test data
Y_prediction = classifier.predict(xtest)

#Testing the performance of model using confusion matrix
co_mat = confusion_matrix(ytest, Y_prediction)
print ("Confusion Matrix : \n", co_mat)

#Accuracy of model
print ("Accuracy : ", accuracy_score(ytest, Y_prediction))

#Visualizing the performance of our model.
X_set, y_set = xtest, ytest
X1, X2 = np.meshgrid(np.arange(start = X_set[:, 0].min() - 1,
stop = X_set[:, 0].max() + 1, step = 0.01),
np.arange(start = X_set[:, 1].min() - 1,
stop = X_set[:, 1].max() + 1, step = 0.01))

plt.contourf(X1, X2, classifier.predict(
np.array([X1.ravel(), X2.ravel()]).T).reshape(
X1.shape), alpha = 0.75, cmap = ListedColormap(('red', 'green')))
```

```
plt.xlim(X1.min(), X1.max())

plt.ylim(X2.min(), X2.max())

for i, j in enumerate(np.unique(y_set)):

    plt.scatter(X_set[y_set == j, 0], X_set[y_set == j, 1], c = ListedColormap(('red', 'green'))(i), label = j)

plt.title('Classifier (Test set)')

plt.xlabel('Age')

plt.ylabel('Estimated Salary')

plt.legend()

plt.show()
```

User_data.csv



User_data - Excel

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POSSIBLE DATA LOSS Some features might be lost if you save this workbook in the comma-delimited (.csv) format. To preserve these features, save it in an Excel file format. Don't show again Save As...

A1 User ID

	A	B	C	D	E
1	User ID	Gender	Age	Estimated	Purchased
2	15624510	Male	19	19000	0
3	15810944	Male	35	20000	0
4	15668575	Female	26	43000	0
5	15603246	Female	27	57000	0
6	15804002	Male	19	76000	0
7	15728773	Male	27	58000	0
8	15598044	Female	27	84000	0
9	15694829	Female	32	150000	1
10	15600575	Male	25	33000	0
11	15727311	Female	35	65000	0
12	15570769	Female	26	80000	0
13	15606274	Female	26	52000	0
14	15746139	Male	20	86000	0
15	15704987	Male	32	18000	0
16	15628972	Male	18	82000	0
17	15697686	Male	29	80000	0
18	15733883	Male	47	25000	1
19	15617482	Male	45	26000	1
20	15704583	Male	46	28000	1
21	15621083	Female	48	29000	1
22	15649487	Male	45	22000	1
23	15736760	Female	47	49000	1
24	15714658	Male	48	41000	1
25	15599081	Female	45	22000	1
26	15705113	Male	46	23000	1
27	15631159	Male	47	20000	1

User_data

Output:

```
*Python 3.7.9 Shell*
File  Edit  Shell  Debug  Options  Window  Help
Python 3.7.9 (tags/v3.7.9:13c94747c7, Aug 17 2020, 18:58:18) [MSC v.1900 64 bit
(AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
================== RESTART: D:/MSc IT/Sem3/ML Pracs/Prac4b1.py ==================
[[ 0.58164944 -0.88670699]
 [-0.60673761  1.46173768]
 [-0.01254409 -0.5677824 ]
 [-0.60673761  1.89663484]
 [ 1.37390747 -1.40858358]
 [ 1.47293972  0.99784738]
 [ 0.08648817 -0.79972756]
 [-0.01254409 -0.24885782]
 [-0.21060859 -0.5677824 ]
 [-0.21060859 -0.19087153]]
Confusion Matrix :
 [[65  3]
 [ 8 24]]
Accuracy :  0.89
```

1. **Explain Least Square Regression Algorithm**
2. **Explain Logistic Algorithm.**