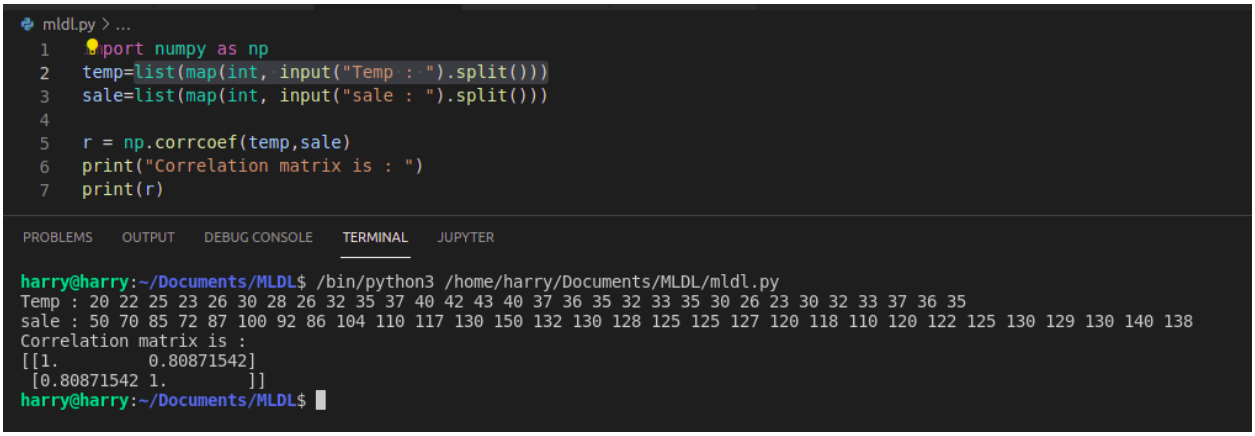
AI PRACTICAL ASSIGNMENT

1. Find the correlation matrix.

Code :-

```
import numpy as np
temp=list(map(int, input("Temp : ").split()))
sale=list(map(int, input("sale : ").split()))

r = np.corrcoef(temp,sale)
print("Correlation matrix is : ")
print(r)
```

Output :

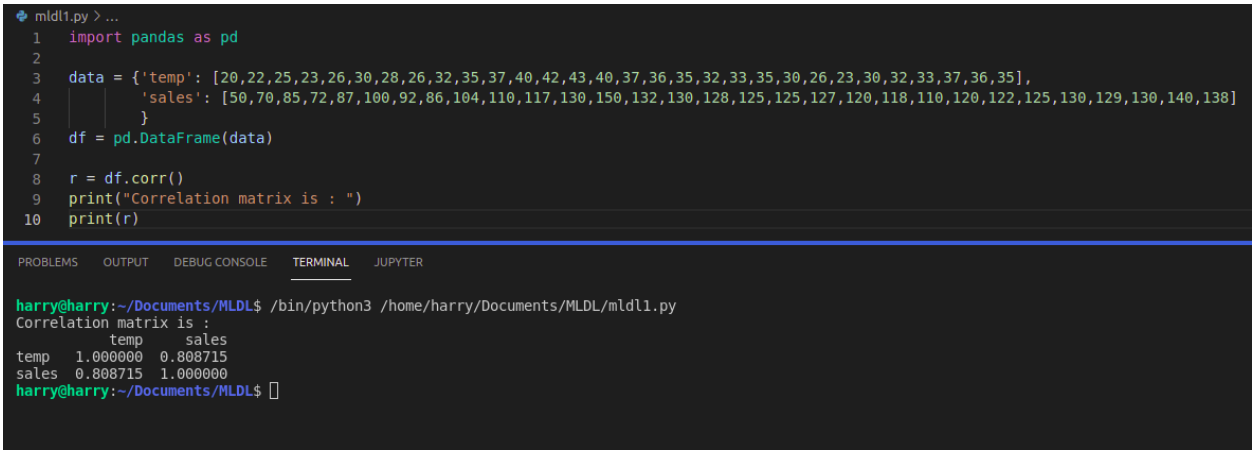


**** Find the correlation matrix using Data frame.**

Code:

```
import pandas as pd

data = {'temp':
[20,22,25,23,26,30,28,26,32,35,37,40,42,43,40,37,36,35,32,33,35,30,26,23,30,32,33,37,36,35
],

    'sales':
[50,70,85,72,87,100,92,86,104,110,117,130,150,132,130,128,125,125,127,120,118,110,120,1
22,125,130,129,130,140,138]

    }

df = pd.DataFrame(data)

r = df.corr()

print("Correlation matrix is : ")

print(r)
```

Output :



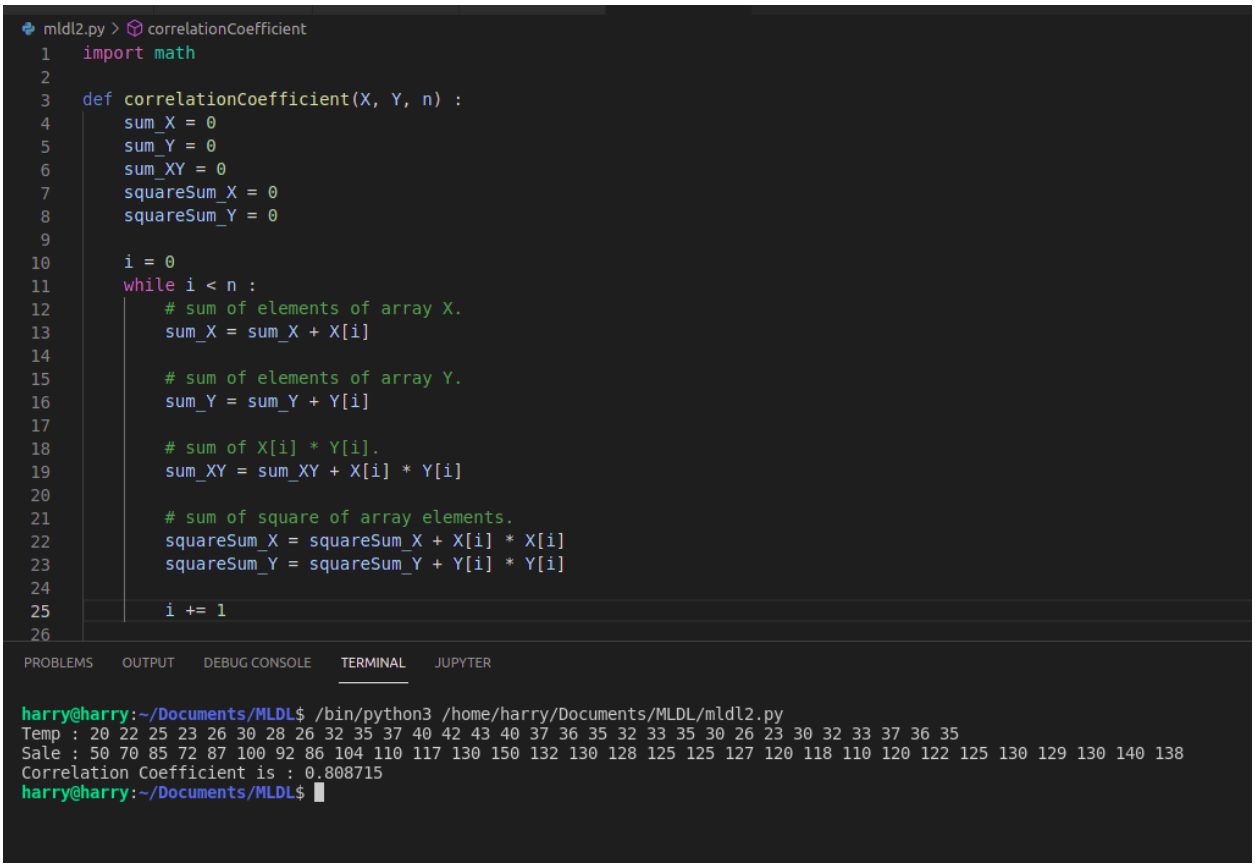
****Find Correlation matrix using Formula .**

Code:

```
import math
def correlationCoefficient(X, Y, n) :
    sum_X = 0
    sum_Y = 0
    sum_XY = 0
    squareSum_X = 0
    squareSum_Y = 0
    i = 0
    while i < n :
        # sum of elements of array X.
        sum_X = sum_X + X[i]
        # sum of elements of array Y.
        sum_Y = sum_Y + Y[i]
        # sum of X[i] * Y[i].
        sum_XY = sum_XY + X[i] * Y[i]
        # sum of square of array elements.
        squareSum_X = squareSum_X + X[i] * X[i]
        squareSum_Y = squareSum_Y + Y[i] * Y[i]
        i += 1
    # use formula for calculating correlation coefficient.
    corr = (float)(n * sum_XY - sum_X * sum_Y)/(float)(math.sqrt((n * squareSum_X - sum_X * sum_X)* (n * squareSum_Y - sum_Y * sum_Y)))
    return corr
```

```
#  function arguments
X = list(map(int, input("Temp : ").split()))
Y = list(map(int, input("Sale : ").split()))
# Find the size of array.
n = len(X)
#Function call .
print("Correlation Coefficient is : "'{0:.6f}'.format(correlationCoefficient(X, Y, n)))
```

Output :



02. Plot the correlation plot on dataset and visualize giving an overview of relationships among data on iris data.

Code :-

#First, start with importing necessary Python packages –

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

#Next, download the iris dataset from its weblink as follows –

```
path = "https://archive.ics.uci.edu/ml/machine-learning-databases/iris/iris.data"
```

#Next, we need to assign column names to the dataset as follows –

```
headernames = ['sepal-length', 'sepal-width', 'petal-length', 'petal-width', 'Class']
```

#Now, we need to read dataset to pandas dataframe as follows –

```
dataset = pd.read_csv(path, names = headernames)
dataset.head()
```

	sepal-length	sepal-width	petal-length	petal-width	Class
0	5.1	3.5	1.4	0.2	Iris-setosa
1	4.9	3.0	1.4	0.2	Iris-setosa
2	4.7	3.2	1.3	0.2	Iris-setosa
3	4.6	3.1	1.5	0.2	Iris-setosa
4	5.0	3.6	1.4	0.2	Iris-setosa

#Data Preprocessing will be done with the help of following script lines.

```
X = dataset.iloc[:, :-1].values
Y = dataset.iloc[:, 4].values
X
Y
```

#Next, we will divide the data into train and test split. The followingcode will split the dataset into 70% training data and 30% of testing data –

```
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(X, Y, test_size = 0.30)
```

#Next, train the model with the help of RandomForestClassifier class of sklearn as follows –

```
from sklearn.ensemble import RandomForestClassifier
classifier = RandomForestClassifier(n_estimators = 50)
classifier.fit(X_train, y_train)
RandomForestClassifier(n_estimators=50)
```

#At last, we need to make prediction. It can be done with the help of following script –

```
y_pred = classifier.predict(X_test)
```

#Next, print the results as follows –

```
from sklearn.metrics import classification_report, confusion_matrix, accuracy_score
result = confusion_matrix(y_test, y_pred)
print("Confusion Matrix:")
print(result)
result1 = classification_report(y_test, y_pred)
print("Classification Report:",)
print (result1)
result2 = accuracy_score(y_test,y_pred)
print("Accuracy:",result2)
```

Output :

```
...  Confusion Matrix:
    [[18  0  0]
     [ 0 13  1]
     [ 0  0 13]]
    Classification Report:
                    precision    recall  f1-score   support

        Iris-setosa       1.00      1.00      1.00        18
    Iris-versicolor       1.00      0.93      0.96        14
     Iris-virginica       0.93      1.00      0.96        13

           accuracy                           0.98        45
          macro avg       0.98      0.98      0.98        45
       weighted avg       0.98      0.98      0.98        45

    Accuracy: 0.9777777777777777
```

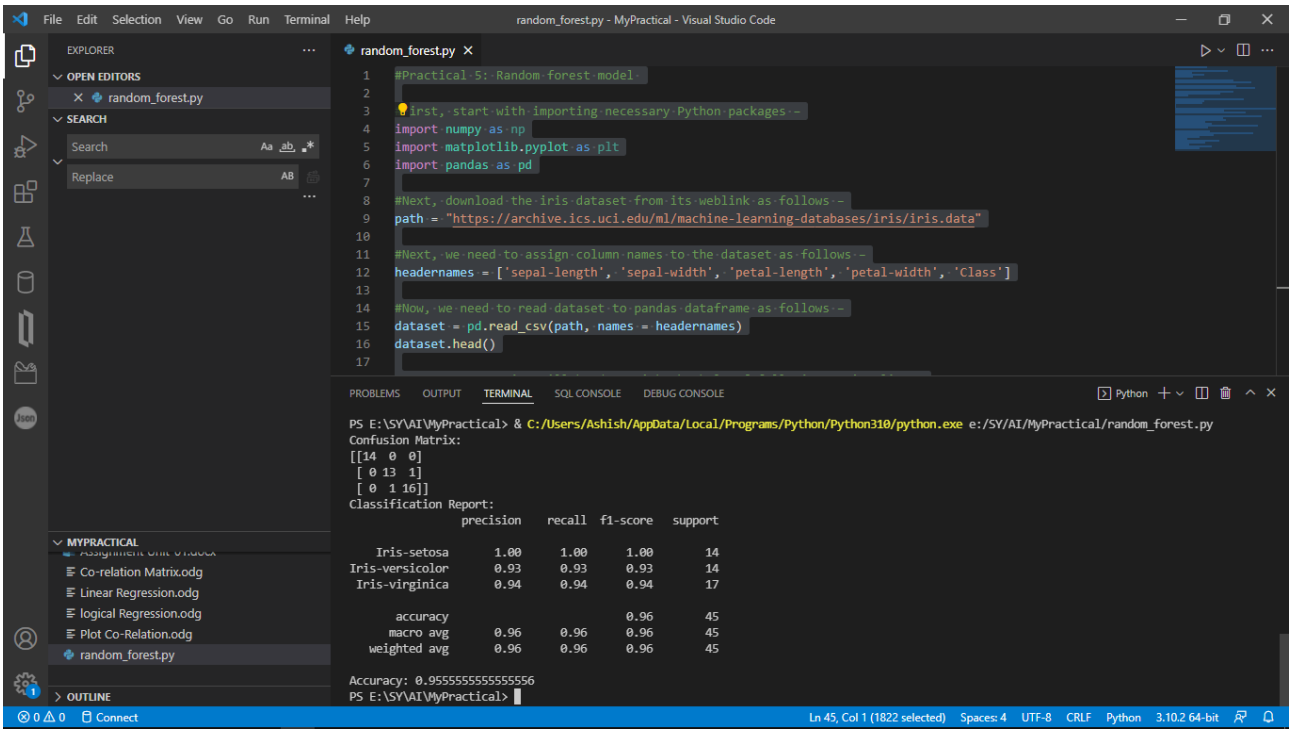
03. Analysis of covariance: variance (ANOVA), if data have categorical variables on iris data.

Code :-

```
#First, start with importing necessary Python packages −
import numpy as np
import matplotlib.pyplot as plt
import pandas as pd

#Next, download the iris dataset from its weblink as follows −
path = "https://archive.ics.uci.edu/ml/machine-learning-databases/iris/iris.data"

#Next, we need to assign column names to the dataset as follows −
headernames = ['sepal-length', 'sepal-width', 'petal-length', 'petal-width', 'Class']

#Now, we need to read dataset to pandas dataframe as follows −
dataset = pd.read_csv(path, names = headernames)
dataset.head()

#Data Preprocessing will be done with the help of following script lines.
X = dataset.iloc[:, :-1].values
Y = dataset.iloc[:, 4].values
X
Y
#Next, we will divide the data into train and test split. The followingcode will split the dataset into
70% training data and 30% of testing data −
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(X, Y, test_size = 0.30)

#Next, train the model with the help of RandomForestClassifier class of sklearn as follows −
from sklearn.ensemble import RandomForestClassifier
classifier = RandomForestClassifier(n_estimators = 50)
classifier.fit(X_train, y_train)
RandomForestClassifier(n_estimators=50)
#At last, we need to make prediction. It can be done with the help of following script −
y_pred = classifier.predict(X_test)

#Next, print the results as follows −
from sklearn.metrics import classification_report, confusion_matrix, accuracy_score
result = confusion_matrix(y_test, y_pred)
print("Confusion Matrix:")
print(result)
result1 = classification_report(y_test, y_pred)
print("Classification Report:",)
print (result1)
result2 = accuracy_score(y_test,y_pred)
```

print("Accuracy:",result2)

Output :-



04. Apply linear regression Model techniques to predict the data on any dataset.

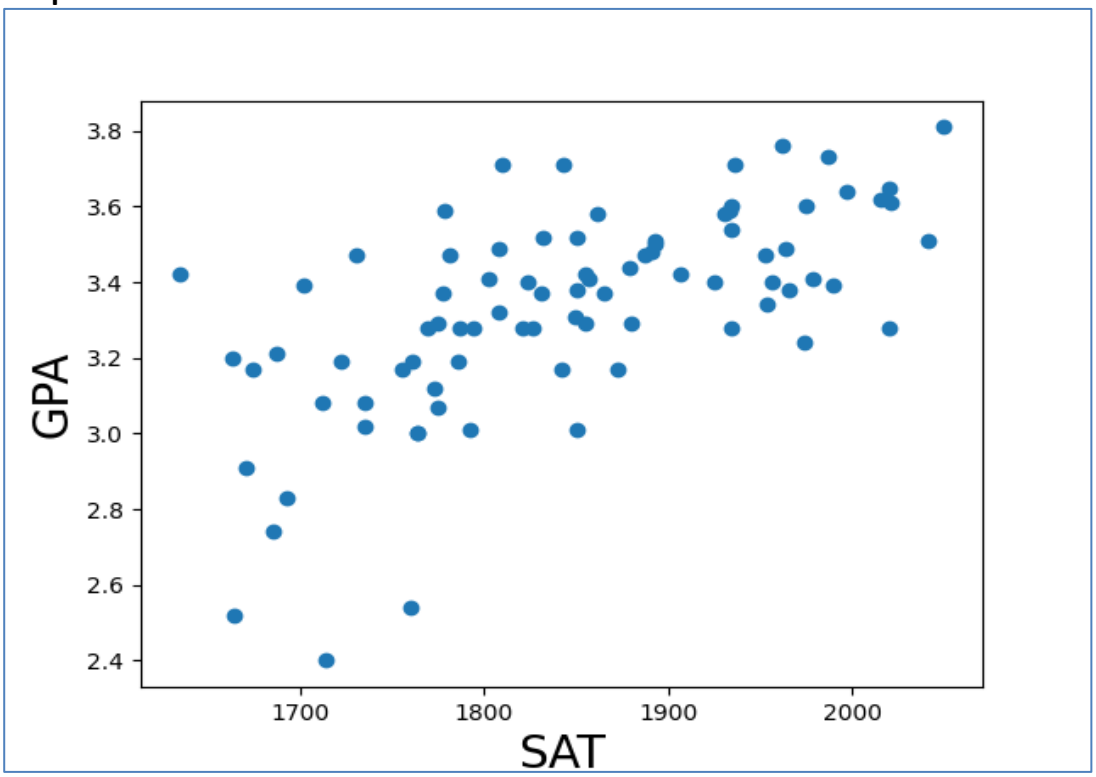
Code :-

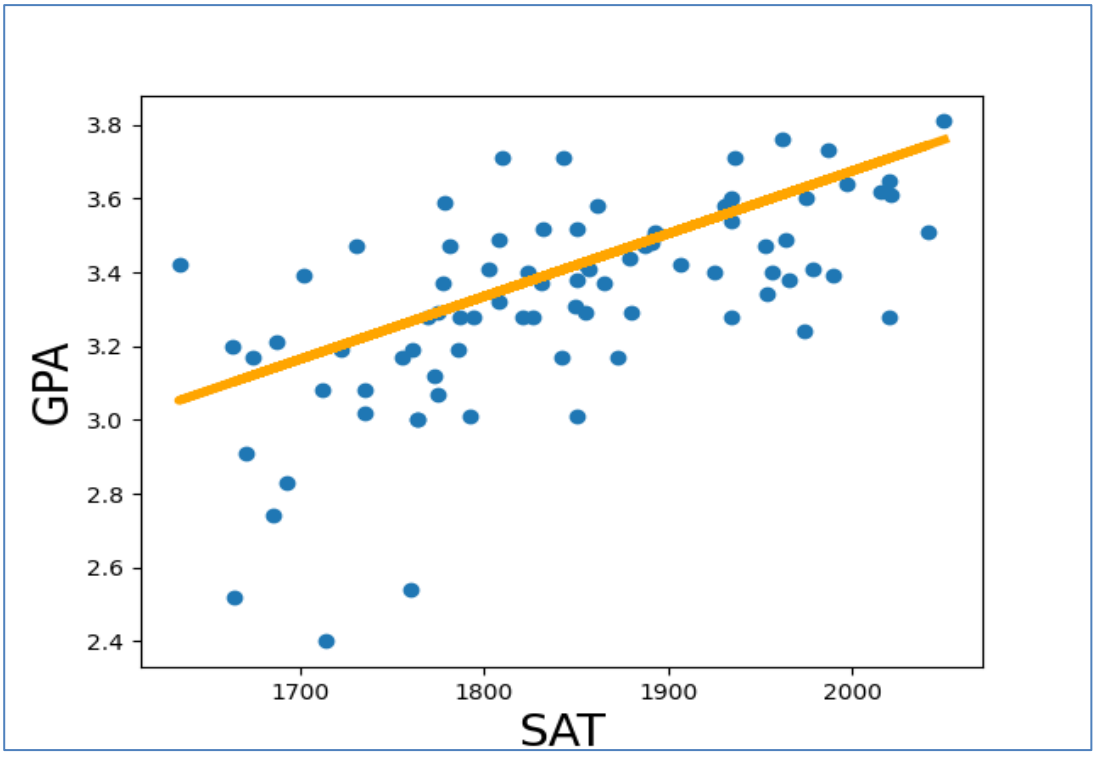
- **Simple Linear Regression.**
  Code:

```
import pandas as pd
import matplotlib.pyplot as plt
import statsmodels.api as sm

data = pd.read_csv('1.01 Simple linear regression.csv')
data

data.describe()

y = data ['GPA']

x1 = data ['SAT']

plt.scatter(x1,y)

plt.xlabel('SAT', fontsize = 20)
plt.ylabel('GPA', fontsize = 20)

plt.show()

x = sm.add_constant(x1)

results = sm.OLS(y,x).fit()

results.summary()

# Create a scatter plot
plt.scatter(x1,y)

# Define the regression equation, so we can plot it later
yhat = 0.0017*x1 + 0.275

# Plot the regression line against the independent variable (SAT)
fig = plt.plot(x1,yhat, lw=4, c='orange', label ='regression line')
```

```
# Label the axes
plt.xlabel('SAT', fontsize = 20)
plt.ylabel('GPA', fontsize = 20)
plt.show()
```

Output:





05. Apply logical regression Model techniques to predict the data on any dataset.

Code :-

Logistic Regression :

Create a logistic regression based on the bank data provided.

The data is based on the marketing campaign efforts of a Portuguese banking institution. The classification goal is to predict if the client will subscribe a term deposit (variable y).

Note that the first column of the dataset is the index.

Import the relevant libraries

```
import pandas as pd

import numpy as np

import statsmodels.api as sm

import matplotlib.pyplot as plt

import seaborn as sns

sns.set()


# this part not be needed after the latests updates of the library

from scipy import stats

stats.chisqprob = lambda chisq, df: stats.chi2.sf(chisq, df)
```

Load the ‘Example_bank_data.csv’ dataset

```
from google.colab import files

uploaded = files.upload()

raw_data = pd.read_csv('Example_bank_data.csv')

raw_data

# Label the axes
plt.xlabel('SAT', fontsize = 20)
plt.ylabel('GPA', fontsize = 20)
plt.show()
```

Output:

	Unnamed: 0	duration	y
0	0	117	no
1	1	274	yes
2	2	167	no
3	3	686	yes
4	4	157	no
...	...	...	...
513	513	204	no
514	514	806	yes
515	515	290	no
516	516	473	yes
517	517	142	no

518 rows × 3 columns

We want to know whether the bank marketing strategy was successful, so we need to transform the outcome variable into 0s and 1s in order to perform a logistic regression.

```
# We make sure to create a copy of the data before we start altering it Note that we
don't change the original data we loaded.
data = raw_data.copy()

# Removes the index column that came with the data
data = data.drop(['Unnamed: 0'], axis = 1)

# We use the map function to change any 'yes' values to 1 and 'no' values to 0.
data['y'] = data['y'].map({'yes':1, 'no':0})
data

# Check the descriptive statistics
data.describe()
```

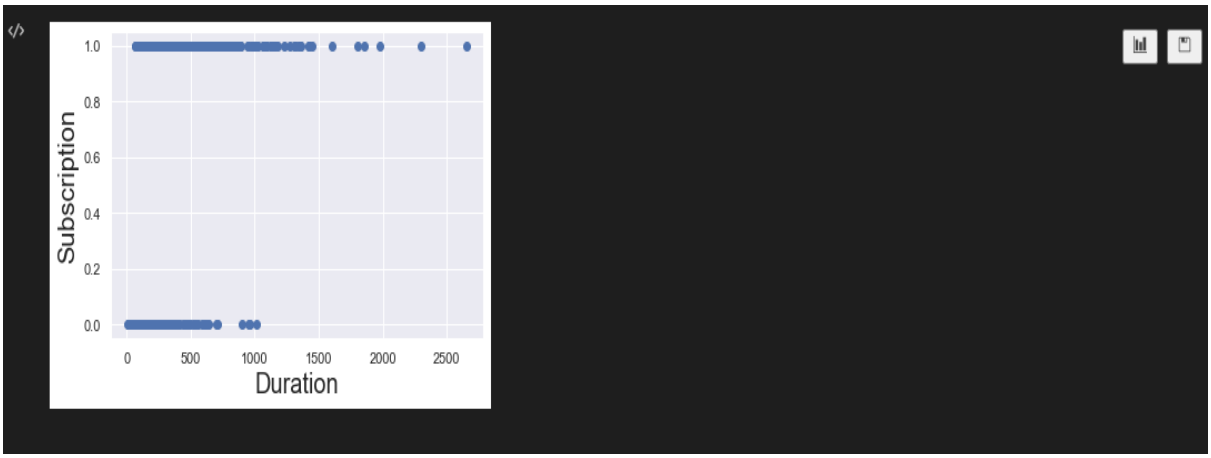
	duration	y
count	518.000000	518.000000
mean	382.177606	0.500000
std	344.295990	0.500483
min	9.000000	0.000000
25%	155.000000	0.000000
50%	266.500000	0.500000
75%	482.750000	1.000000
max	2653.000000	1.000000

Declare the dependent and independent variables

```
y = data['y']
x1 = data['duration']
```

Simple Logistic Regression

```
x = sm.add_constant(x1)
reg_log = sm.Logit(y,x)
results_log = reg_log.fit()

# Get the regression summary
results_log.summary()


# Create a scatter plot of x1 (Duration, no constant) and y (Subs
cribed)
plt.scatter(x1,y,color = 'C0')

# Don't forget to label your axes!
plt.xlabel('Duration', fontsize = 20)
plt.ylabel('Subscription', fontsize = 20)
plt.show()


np.set_printoptions(formatter={'float': lambda x: "{0:0.2f}".form
at(x)})
```



```
#np.set_printoptions(formatter=None)
results_log.predict()

np.array(data['y'])
results_log.pred_table()

cm_df = pd.DataFrame(results_log.pred_table())
cm_df.columns = ['Predicted 0','Predicted 1']
cm_df = cm_df.rename(index={0: 'Actual 0',1:'Actual 1'})
cm_df

cm = np.array(cm_df)
accuracy_train = (cm[0,0]+cm[1,1])/cm.sum()
accuracy_train
```