**Assignment -2**

Python Programming

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|---|---|
| Assignment Date | 22 September 2022 |
| Student Name | Mr. S. MANIMARAN |
| Student Roll Number | 19BCS048 |
| Maximum Marks | 2 Marks |

**Question-1:**

Downloading the dataset

**Question-2:**

Load the dataset:

Solution:

```
import pandas as pd

df=pd.read_csv("/content/Churn_Modelling.csv")
```

**Question-3:**

Perform Below Visualizations-Univariate Analysis, Bi - Variate Analysis and Multi - Variate Analysis

Solution:

**Univariate Analysis:**

1.Summary Statistics

```
df['EstimatedSalary'].mean()

df['EstimatedSalary'].median()

df['EstimatedSalary'].std()
```

```
[5] df['EstimatedSalary'].mean()

    100090.239881

[7] df['EstimatedSalary'].median()

    100193.915

[8] df['EstimatedSalary'].std()

    57510.49281769816
```

2.Frequency Statistics

df['EstimatedSalary'].value_counts()

Frequency Statistics

```
df['EstimatedSalary'].value_counts()

24924.92      2
101348.88     1
55313.44      1
72500.68      1
182692.80     1
             ..
120893.07     1
188377.21     1
55902.93      1
4523.74       1
38190.78      1
Name: EstimatedSalary, Length: 9999, dtype: int64
```

3.Charts

import matplotlib.pyplot as plt

df.boxplot(column='EstimatedSalary',color='black',grid=False)

Charts

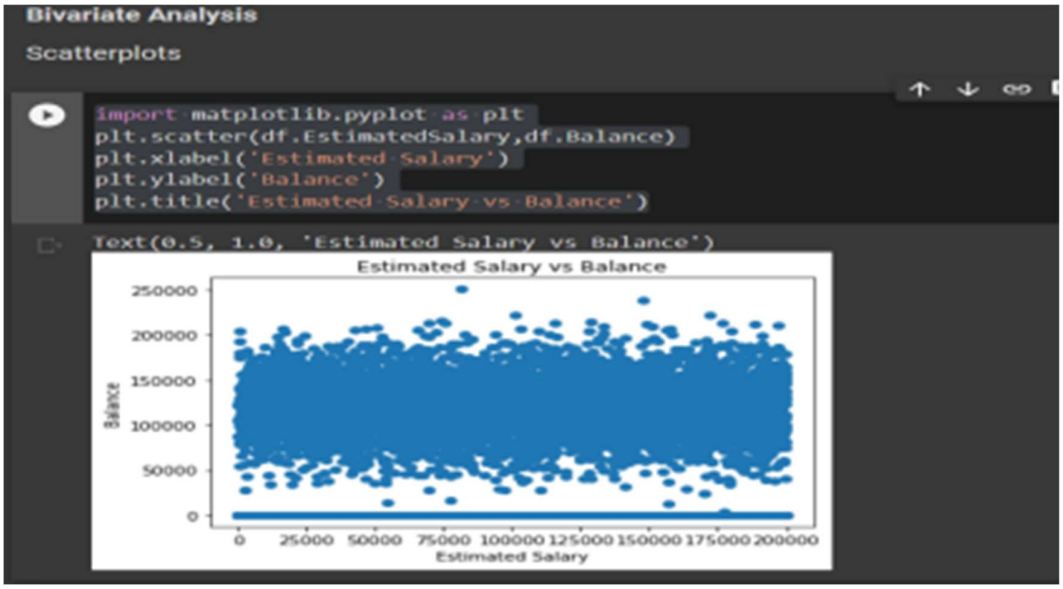
```
import matplotlib.pyplot as plt
df.boxplot(column='EstimatedSalary',color='black',grid=False)

<matplotlib.axes._subplots.AxesSubplot at 0x7f9edd813a50>
```


**Bivariate Analysis:**

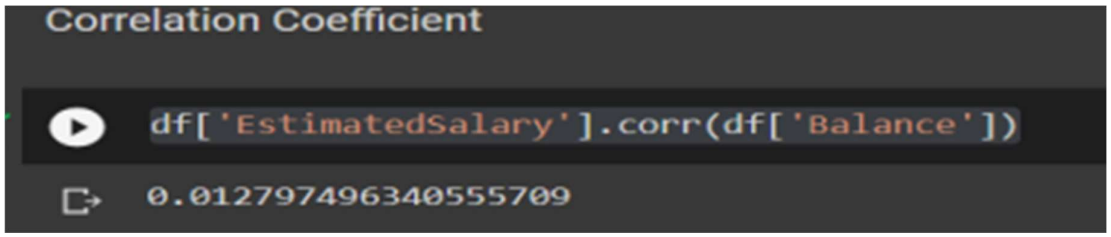
1.Scatterplot

```
import matplotlib.pyplot as plt
plt.scatter(df.EstimatedSalary,df.Balance)
plt.xlabel('Estimated Salary')
plt.ylabel('Balance')
plt.title('Estimated Salary vs Balance')
```




2. Correlation Coefficient

```
df['EstimatedSalary'].corr(df['Balance'])
```




3. Simple Linear Regression

```
import statsmodels.api as sm
y=df['Balance']
x=df['EstimatedSalary']
x=sm.add_constant(x)
model=sm.OLS(y,x).fit()
print(model.summary())
```

```
import statsmodels.api as sm
y=df['Balance']
x=df['EstimatedSalary']
x=sm.add_constant(x)
model=sm.OLS(y,x).fit()
print(model.summary())
```

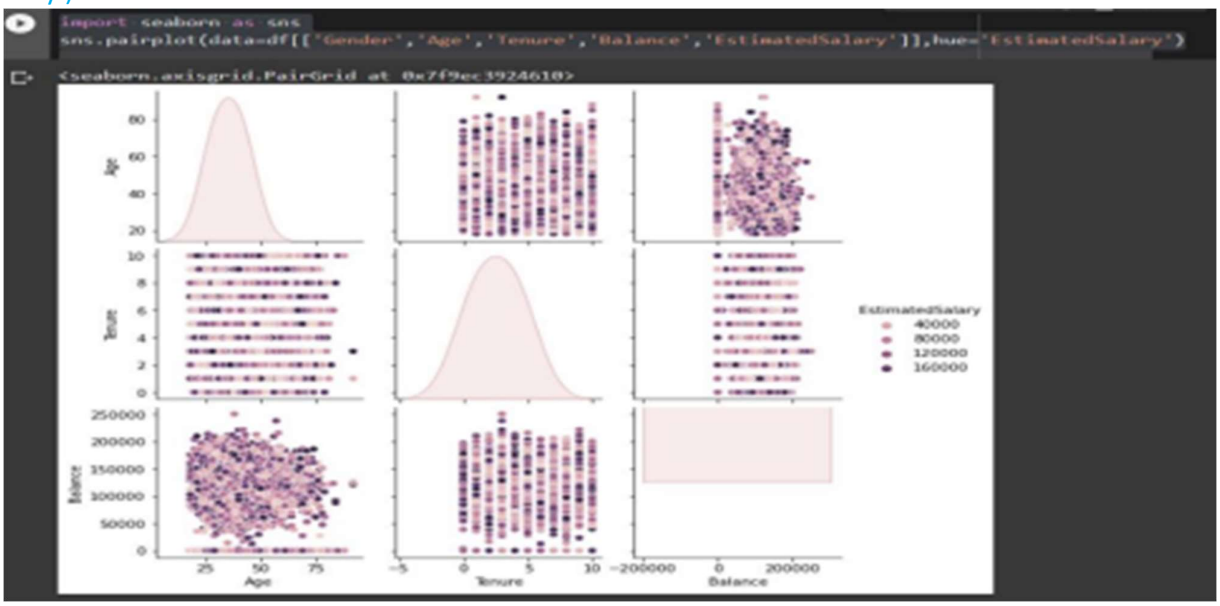
```
                            OLS Regression Results
==============================================================================
Dep. Variable:                Balance   R-squared:                       0.000
Model:                            OLS   Adj. R-squared:                  0.000
Method:                 Least Squares   F-statistic:                     1.638
Date:                Thu, 06 Oct 2022   Prob (F-statistic):              0.201
Time:                        10:07:10   Log-Likelihood:            -1.2460e+05
No. Observations:               10000   AIC:                         2.492e+05
Df Residuals:                    9998   BIC:                         2.492e+05
Df Model:                           1
Covariance Type:            nonrobust
==============================================================================
                 coef    std err          t      P>|t|      [0.025      0.975]
------------------------------------------------------------------------------
const          7.51e+04   1252.460     59.959      0.000    7.26e+04    7.76e+04
EstimatedSalary   0.0139      0.011      1.280      0.201      -0.007       0.035
==============================================================================
Omnibus:                    63068.386   Durbin-Watson:                   1.980
Prob(Omnibus):                  0.000   Jarque-Bera (JB):              956.592
Skew:                          -0.141   Prob(JB):                    1.90e-208
Kurtosis:                       1.511   Cond. No.                     2.32e+05
==============================================================================

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.
[2] The condition number is large, 2.32e+05. This might indicate that there are
strong multicollinearity or other numerical problems.
```

**Multivariate Analysis:**

import seaborn as sns

sns.pairplot(data=df[['Gender','Age','Tenure','Balance','EstimatedSalary']],hue='EstimatedSa l ary')

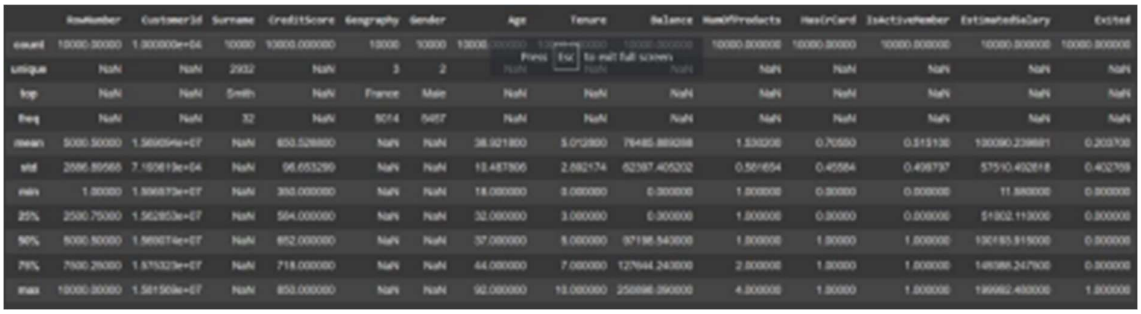



**Question-4:**

Perform descriptive statistics on the dataset.

Solution:

df.describe(include='all')



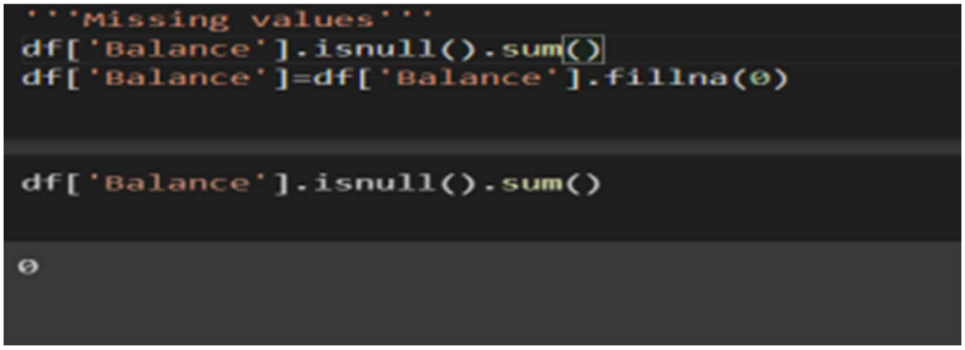
**Question-5:**

Handle the Missing values.

Solution:

df['Balance'].isnull().sum()

df['Balance']=df['Balance'].fillna(0)




**Question-6:**

Find the outliers and replace the outliers

Solution:

```
# IQR
Q1 = np.percentile(df['Age'], 25,interpolation = 'midpoint')
Q3 = np.percentile(df['Age'], 75,interpolation = 'midpoint')
IQR = Q3 - Q1
print("Old Shape: ", df.shape)
# Upper bound
upper = np.where(df['Age'] >= (Q3+1.5*IQR))
# Lower bound
lower = np.where(df['Age'] <= (Q1-1.5*IQR))
''' Removing the Outliers '''
df.drop(upper[0], inplace = True)
df.drop(lower[0], inplace = True)

print("New Shape: ", df.shape)
```

```
# IQR
Q1 = np.percentile(df['Age'], 25,
        interpolation = 'midpoint')

Q3 = np.percentile(df['Age'], 75,
        interpolation = 'midpoint')
IQR = Q3 - Q1

print("Old Shape: ", df.shape)

# Upper bound
upper = np.where(df['Age'] >= (Q3+1.5*IQR))
# Lower bound
lower = np.where(df['Age'] <= (Q1-1.5*IQR))

''' Removing the Outliers '''
df.drop(upper[0], inplace = True)
df.drop(lower[0], inplace = True)

print("New Shape: ", df.shape)
```

```
Old Shape:  (10000, 14)
New Shape:  (9589, 14)
```

**Question-7:**

Check for Categorical columns and perform encoding

Solution:

```
from sklearn.preprocessing import OneHotEncoder
import numpy as np
en=OneHotEncoder()
geo_reshaped=np.array(df['Geography']).reshape(-1,1)
val=en.fit_transform(geo_reshaped)
print(df['Geography'][:8])
print(val.toarray()[:8])
```

```
from sklearn.preprocessing import OneHotEncoder
import numpy as np
en=OneHotEncoder()
geo_reshaped=np.array(df['Geography']).reshape(-1,1)
val=en.fit_transform(geo_reshaped)
print(df['Geography'][:8])
print(val.toarray()[:8])
```

```
0     France
1      Spain
2     France
3     France
4      Spain
5      Spain
6     France
7    Germany
Name: Geography, dtype: object
[[1. 0. 0.]
 [0. 0. 1.]
 [1. 0. 0.]
 [1. 0. 0.]
 [0. 0. 1.]
 [0. 0. 1.]
 [1. 0. 0.]
 [0. 1. 0.]]
```

**Question-8:**

Split the data into dependent and independent variables.

Solution:

x=df['Balance']

x

```
x=df['Balance']
x
```

```
0            0.00
1        83807.86
2       159660.80
3            0.00
4       125510.82
           ...
9995         0.00
9996     57369.61
9997         0.00
9998     75075.31
9999    130142.79
Name: Balance, Length: 9589, dtype: float64
```

y=df['Exited']

y

```
y=df['Exited']
y
```

```
0       1
1       0
2       1
3       0
4       0
       ..
9995    0
9996    0
9997    1
9998    1
9999    0
Name: Exited, Length: 9589, dtype: int64
```

**Question-9:**
Scale the independent variables

Solution:

```
from sklearn.preprocessing import StandardScaler
x = df['Balance']
scaler=StandardScaler()
x=scaler.fit_transform(x)
```

**Question-10:**

Split the data into training and testing

Solution:

```
from sklearn.model_selection import train_test_split
traindata,testdata=train_test_split(df,test_size=0.2,random_state=25
) print(f"Number of training samples:{traindata.shape[0]}")
print(f"Number of testing samples:{testdata.shape[0]}")
```

```
from sklearn.model_selection import train_test_split
traindata,testdata=train_test_split(df,test_size=0.2,random_state=25)
print(f"Number of training samples:{traindata.shape[0]}")
print(f"Number of testing samples:{testdata.shape[0]}")
```

```
Number of training samples:7671
Number of testing samples:1918
```