Assignment -2

Python Programming

Assignment Date	23 september 2022
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Student Roll Number	311419205021
Maximum Marks	2 Marks

Data Visualization and Pre-processing

Question-1: 1.

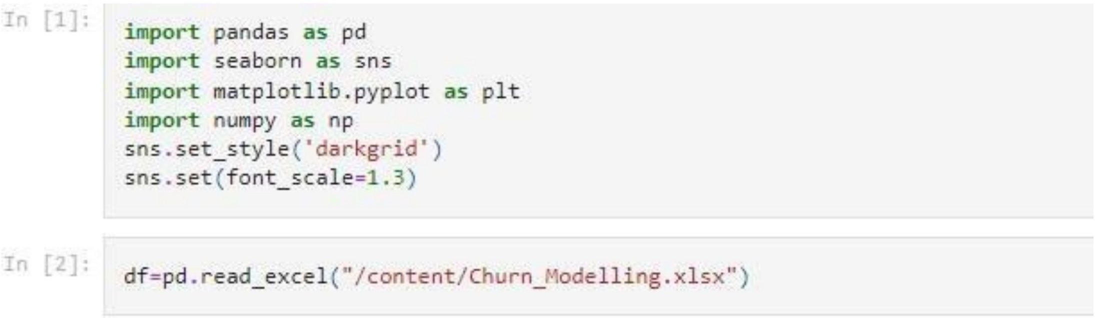
Load the dataset

Solution:

```
import pandas as pd import
seaborn as sns import
matplotlib.pyplot as plt import numpy
as np sns.set_style('darkgrid')
sns.set(font_scale=1.3)
```

In [2]:

```
df=pd.read_excel("/content/Churn_Modelling.xlsx")
```



```
In [1]: import pandas as pd
        import seaborn as sns
        import matplotlib.pyplot as plt
        import numpy as np
        sns.set_style('darkgrid')
        sns.set(font_scale=1.3)

In [2]: df=pd.read_excel("/content/Churn_Modelling.xlsx")
```

Question-2:

2. Perform Below Visualizations.

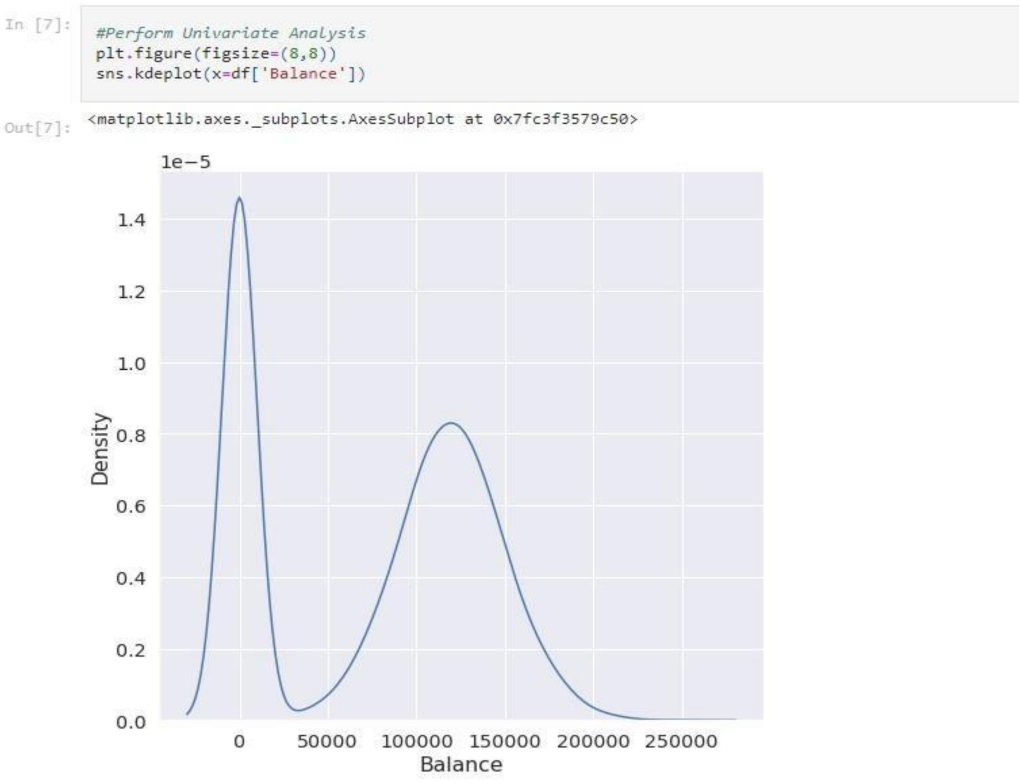
● Univariate Analysis

● Bi - Variate Analysis ●
Multi - Variate Analysis

Solution:

.

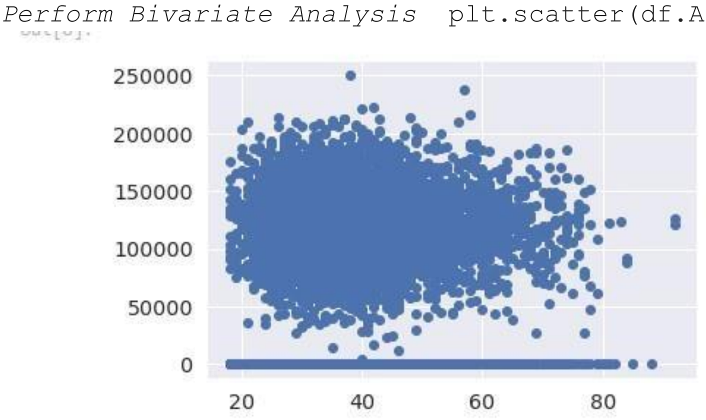
```
#Perform Univariate Analysis
plt.figure(figsize=(8,8))
sns.kdeplot(x=df['Balance'])
```



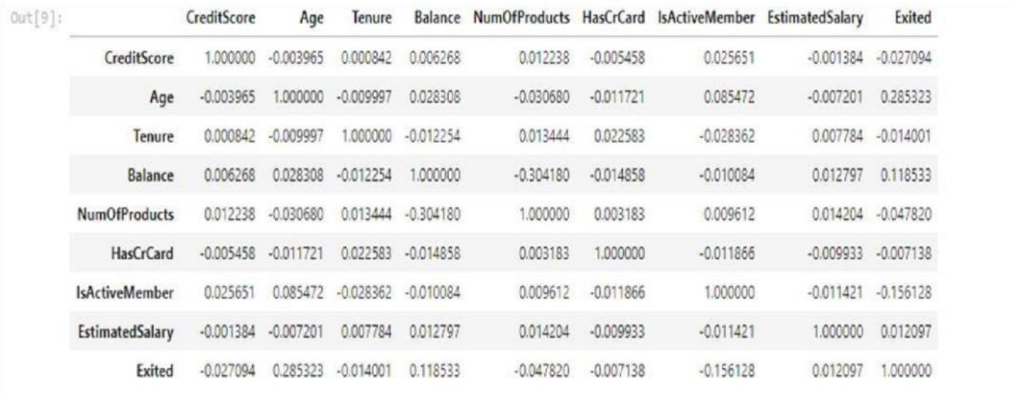
```
In [7]:  #Perform Univariate Analysis
         plt.figure(figsize=(8,8))
         sns.kdeplot(x=df['Balance'])

Out[7]:  <matplotlib.axes._subplots.AxesSubplot at 0x7fc3f3579c50>
```

```
#Perform Bivariate Analysis  plt.scatter(df.Age,df.Balance)
```



```
#Perform Bivariate Analysis df.corr()
```



Out[9]:

	CreditScore	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSalary	Exited
CreditScore	1.000000	-0.003965	0.000842	0.006268	0.012238	-0.005458	0.025651	-0.001384	-0.027094
Age	-0.003965	1.000000	-0.009997	0.028308	-0.030680	-0.011721	0.085472	-0.007201	0.285323
Tenure	0.000842	-0.009997	1.000000	-0.012254	0.013444	0.022583	-0.028362	0.007784	-0.014001
Balance	0.006268	0.028308	-0.012254	1.000000	-0.304180	-0.014858	-0.010084	0.012797	0.118533
NumOfProducts	0.012238	-0.030680	0.013444	-0.304180	1.000000	0.003183	0.009612	0.014204	-0.047820
HasCrCard	-0.005458	-0.011721	0.022583	-0.014858	0.003183	1.000000	-0.011866	-0.009933	-0.007138
IsActiveMember	0.025651	0.085472	-0.028362	-0.010084	0.009612	-0.011866	1.000000	-0.011421	-0.156128
EstimatedSalary	-0.001384	-0.007201	0.007784	0.012797	0.014204	-0.009933	-0.011421	1.000000	0.012097
Exited	-0.027094	0.285323	-0.014001	0.118533	-0.047820	-0.007138	-0.156128	0.012097	1.000000

```
                                        #Perform Bivariate Analysis
import statsmodels.api as sm
```

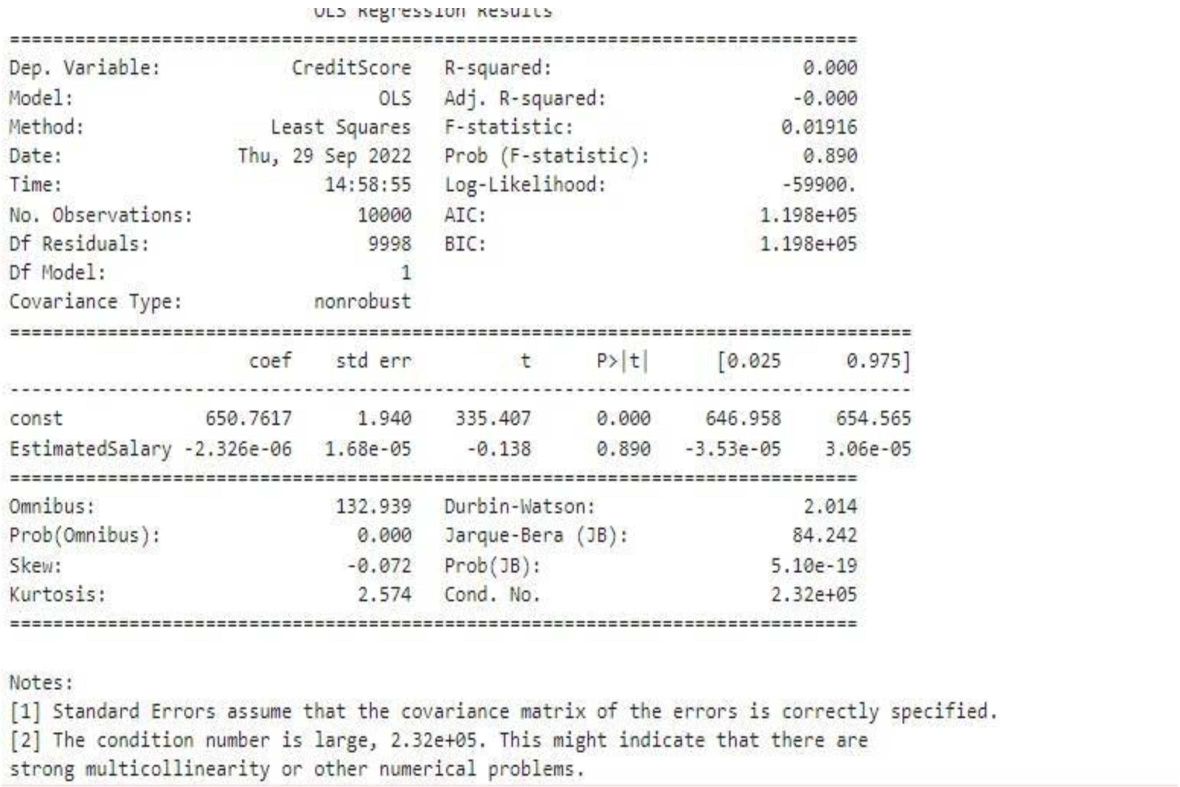
```
#define response variable y
= df['CreditScore']

#define explanatory variable x =
df[['EstimatedSalary']]

#add constant to predictor variables x
= sm.add_constant(x)

#fit linear regression model model
= sm.OLS(y, x).fit()

#view model summary print(model.summary())
```

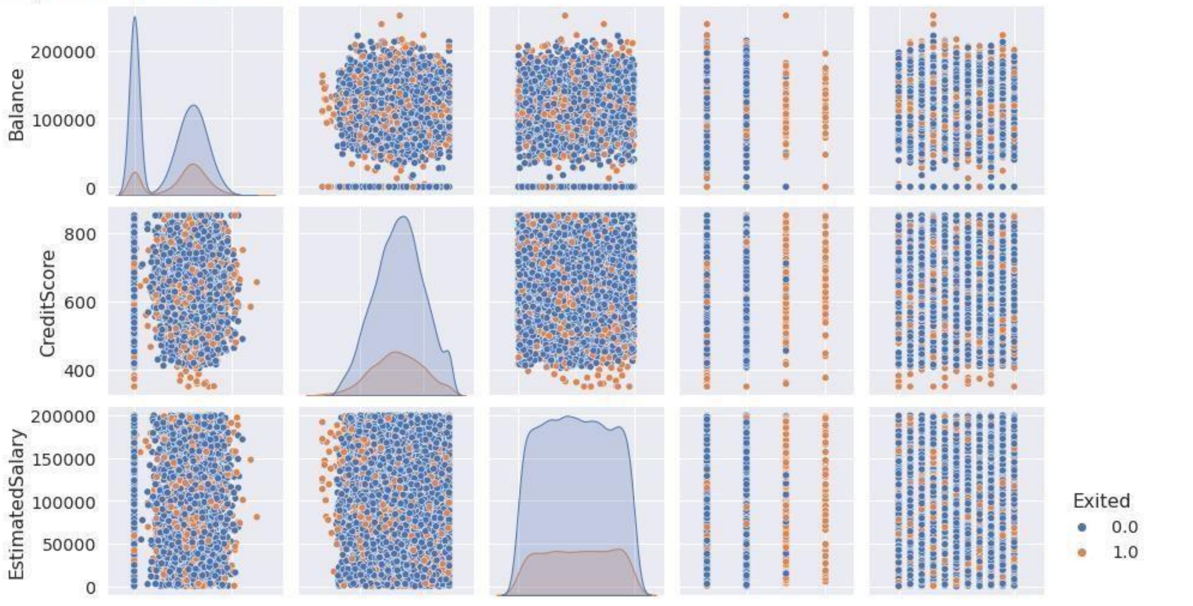


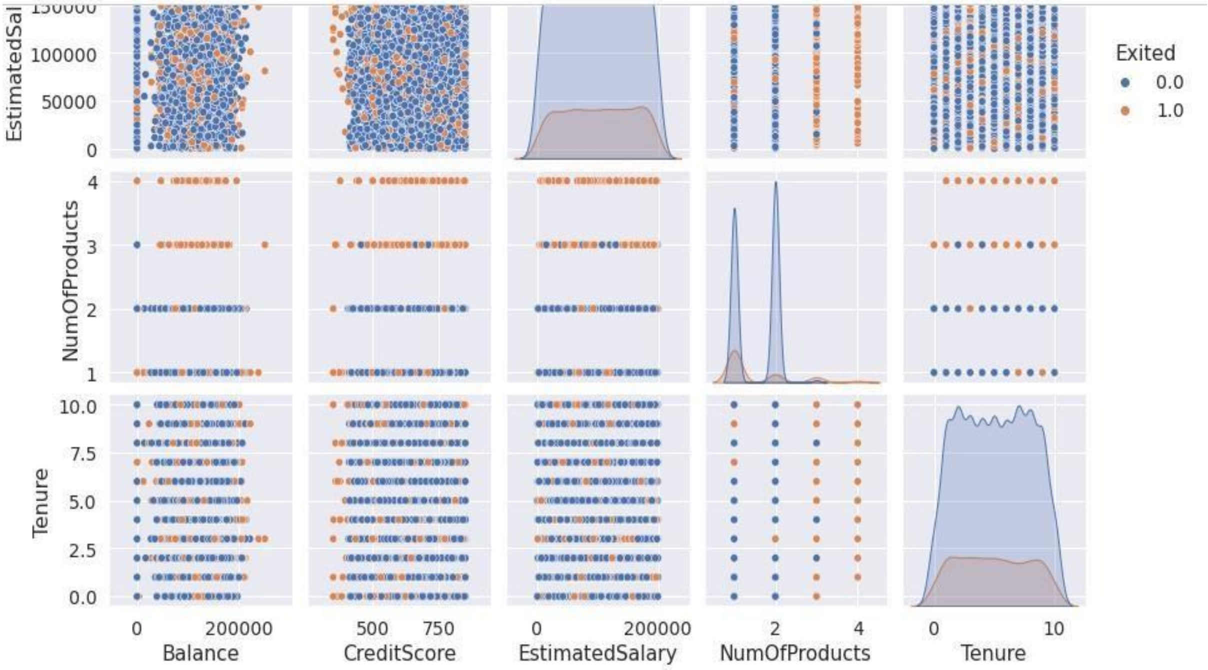
```
                            OLS Regression Results
==============================================================================
Dep. Variable:            CreditScore   R-squared:                       0.000
Model:                            OLS   Adj. R-squared:                 -0.000
Method:                 Least Squares   F-statistic:                   0.01916
Date:                Thu, 29 Sep 2022   Prob (F-statistic):              0.890
Time:                        14:58:55   Log-Likelihood:                -59900.
No. Observations:               10000   AIC:                         1.198e+05
Df Residuals:                    9998   BIC:                         1.198e+05
Df Model:                           1
Covariance Type:            nonrobust
==================================================================================
                      coef    std err          t      P>|t|      [0.025      0.975]
----------------------------------------------------------------------------------
const             650.7617      1.940    335.407      0.000     646.958     654.565
EstimatedSalary -2.326e-06   1.68e-05     -0.138      0.890   -3.53e-05    3.06e-05
==============================================================================
Omnibus:                      132.939   Durbin-Watson:                   2.014
Prob(Omnibus):                  0.000   Jarque-Bera (JB):               84.242
Skew:                          -0.072   Prob(JB):                     5.10e-19
Kurtosis:                       2.574   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.
```

```
#Perform Multivariate Analysis plt.figure(figsize=(4,4))
sns.pairplot(data=df[["Balance","CreditScore","EstimatedSalary","NumOfProdu
cts","Tenure","Exited"]],hue="Exited")
```

```
<Figure size 288x288 with 0 Axes>
```



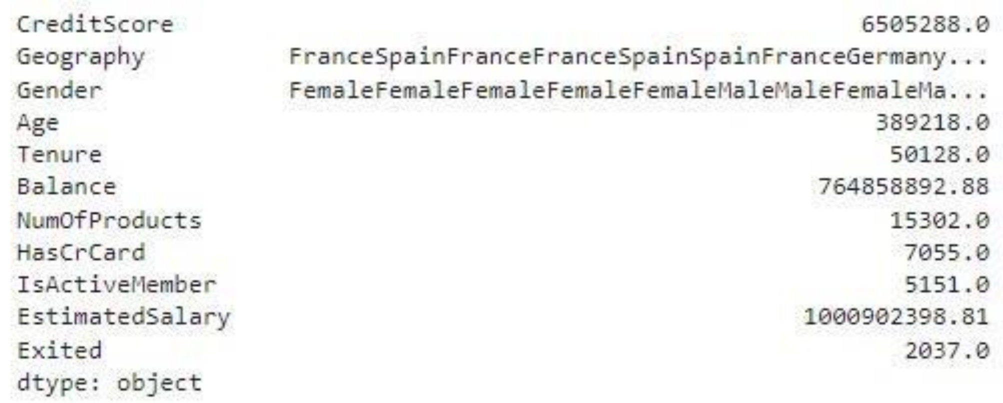


Question-3:

3. Perform descriptive statistics on the dataset.

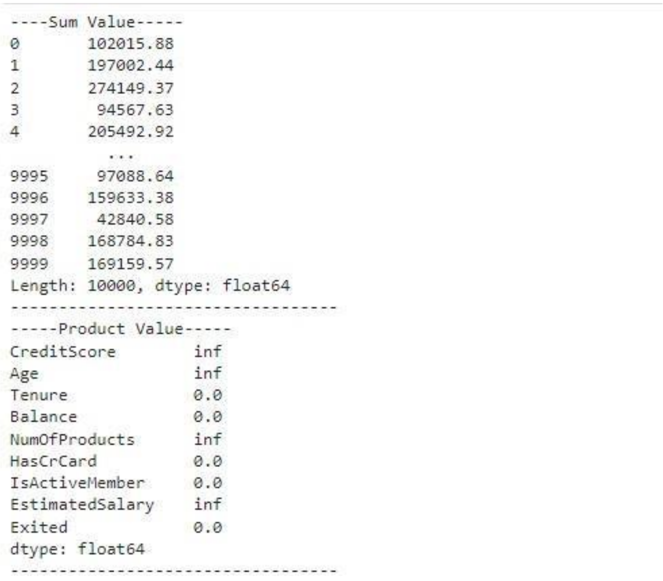
Solution:

```
#Perform Descriptive Statistics
df=pd.DataFrame(df) print(df.sum())
```



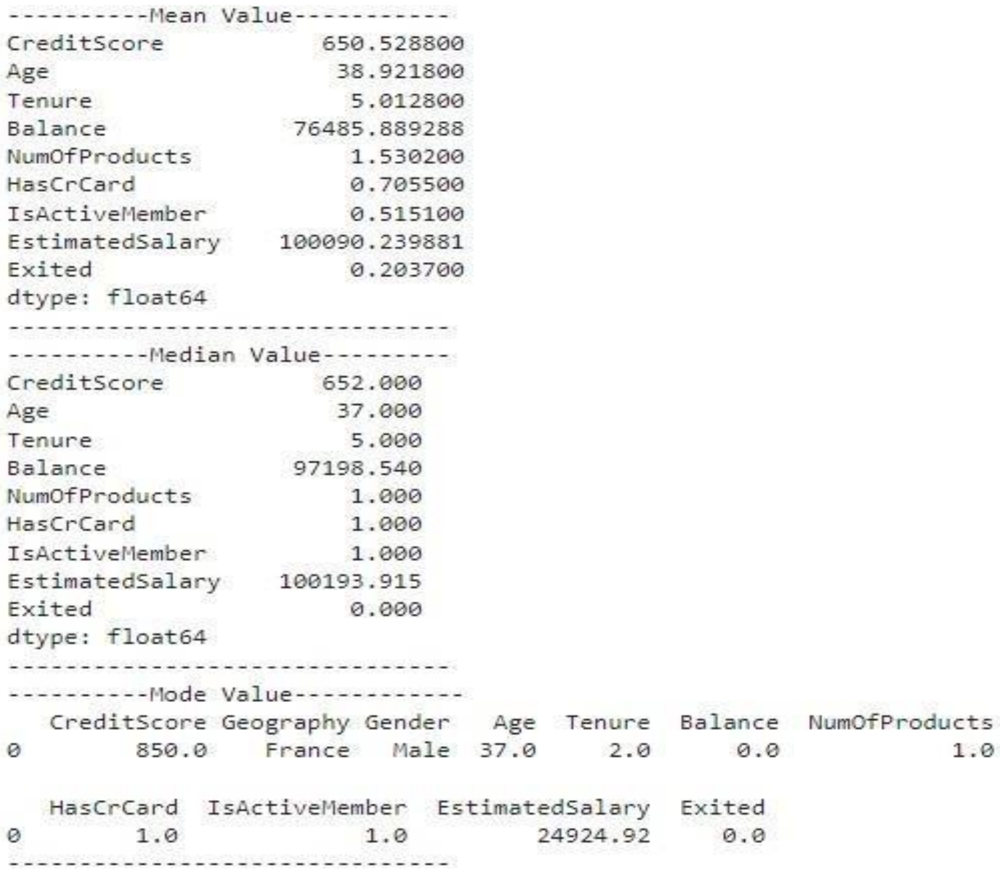
```
CreditScore                                                   6505288.0
Geography          FranceSpainFranceFranceSpainSpainFranceGermany...
Gender             FemaleFemaleFemaleFemaleFemaleMaleMaleFemaleMa...
Age                                                            389218.0
Tenure                                                          50128.0
Balance                                                    764858892.88
NumOfProducts                                                   15302.0
HasCrCard                                                        7055.0
IsActiveMember                                                   5151.0
EstimatedSalary                                           1000902398.81
Exited                                                           2037.0
dtype: object
```

```
#Perform Descriptive Statistics print("----
Sum Value-----") print(df.sum(1)) print("--------
-------------------------") print("----Product
Value-----") print(df.prod())
print("----------------------------------")
```



```
----Sum Value-----
0       102015.88
1       197002.44
2       274149.37
3        94567.63
4       205492.92
          ...
9995     97088.64
9996    159633.38
9997     42840.58
9998    168784.83
9999    169159.57
Length: 10000, dtype: float64
----------------------------------
-----Product Value-----
CreditScore        inf
Age                inf
Tenure             0.0
Balance            0.0
NumOfProducts      inf
HasCrCard          0.0
IsActiveMember     0.0
EstimatedSalary    inf
Exited             0.0
dtype: float64
----------------------------------
```

```
#Perform Descriptive Statistics print("---------
-Mean Value-----------") print(df.mean())
print("-------------------------------") print("-
---------Median Value---------")
print(df.median()) print("-----------------------
-------") print("----------Mode Value---------
---") print(df.mode())  print("------------------
-------------")
```



```
----------Mean Value-----------
CreditScore            650.528800
Age                     38.921800
Tenure                   5.012800
Balance              76485.889288
NumOfProducts            1.530200
HasCrCard                0.705500
IsActiveMember           0.515100
EstimatedSalary     100090.239881
Exited                   0.203700
dtype: float64
-------------------------------
----------Median Value---------
CreditScore            652.000
Age                     37.000
Tenure                   5.000
Balance              97198.540
NumOfProducts            1.000
HasCrCard                1.000
IsActiveMember           1.000
EstimatedSalary     100193.915
Exited                   0.000
dtype: float64
-------------------------------
----------Mode Value------------
   CreditScore Geography Gender   Age  Tenure  Balance  NumOfProducts
0        850.0    France   Male  37.0     2.0      0.0            1.0

   HasCrCard  IsActiveMember  EstimatedSalary  Exited
0        1.0             1.0         24924.92     0.0
-------------------------------
```

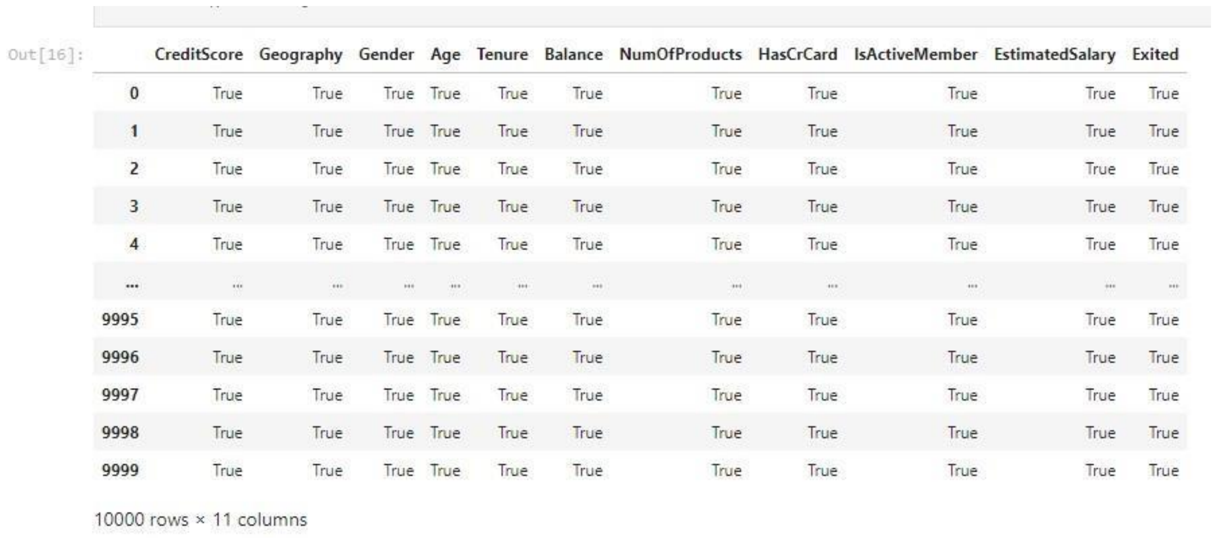
Question-4:

4.Handle the Missing values

Solution:

```
#Handling with missing Values df.isnull().values;
#Checking values are null


#Handling with missing Values df.notnull()#Checking
values are not null
```



Out[16]:

	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSalary	Exited
0	True	True	True	True	True	True	True	True	True	True	True
1	True	True	True	True	True	True	True	True	True	True	True
2	True	True	True	True	True	True	True	True	True	True	True
3	True	True	True	True	True	True	True	True	True	True	True
4	True	True	True	True	True	True	True	True	True	True	True
...	...	...	...	...	...	...	...	...	...	...	...
9995	True	True	True	True	True	True	True	True	True	True	True
9996	True	True	True	True	True	True	True	True	True	True	True
9997	True	True	True	True	True	True	True	True	True	True	True
9998	True	True	True	True	True	True	True	True	True	True	True
9999	True	True	True	True	True	True	True	True	True	True	True

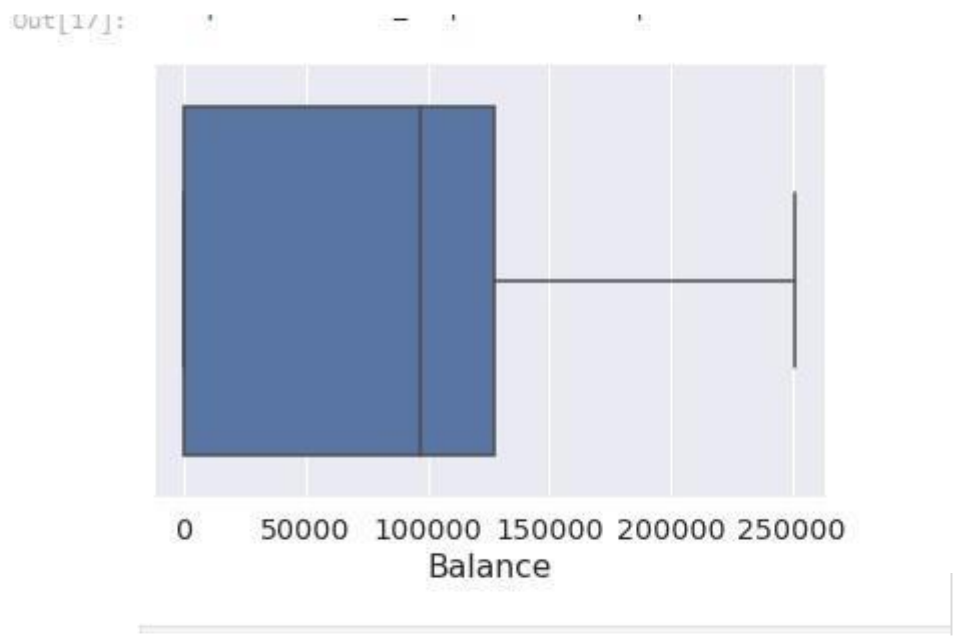
10000 rows × 11 columns

Question-5:

5. Find the outliers and replace the outliers

Solution:

```
#Find outliers & replace the outliers sns.boxplot(df['Balance'])
```

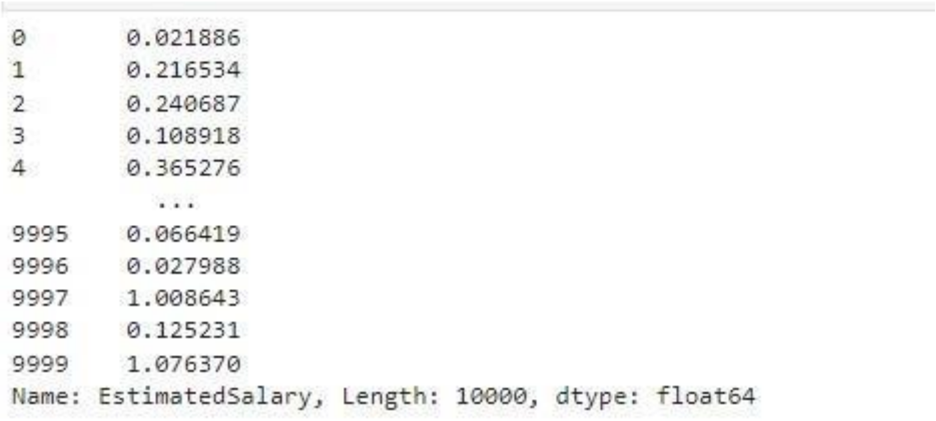


```
#Find outliers & replace the outliers
print(np.where(df['Balance']>100000))
```

```
(array([   2,    4,    5, ..., 9987, 9993, 9999]),)
```

In [19]:

```
#Find outliers & replace the outliers from
scipy import stats import numpy as np    z =
np.abs(stats.zscore(df["EstimatedSalary"]))
print(z)
```



```
0       0.021886
1       0.216534
2       0.240687
3       0.108918
4       0.365276
          ...
9995    0.066419
9996    0.027988
9997    1.008643
9998    0.125231
9999    1.076370
Name: EstimatedSalary, Length: 10000, dtype: float64
```

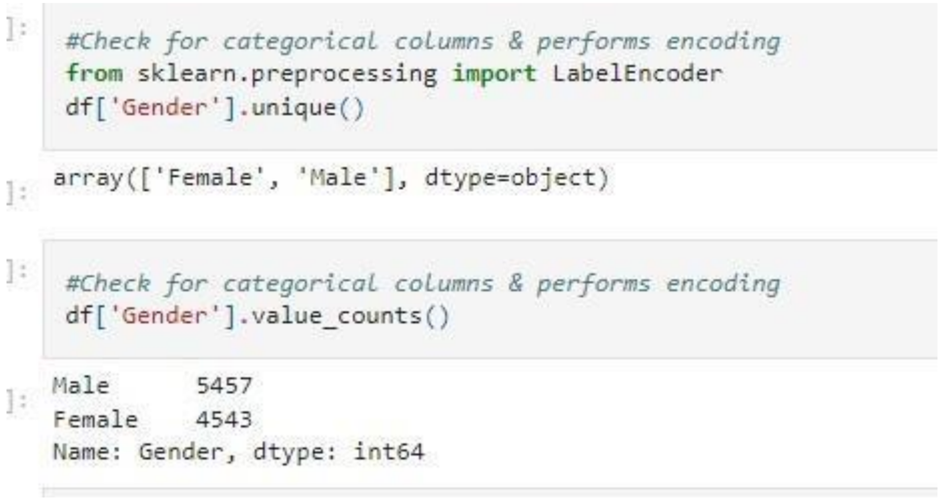
Question-6:

6. Check for Categorical columns and perform encoding

Solution:

```
#Check for categorical columns & performs encoding from
sklearn.preprocessing import LabelEncoder

df['Gender'].unique() df['Gender'].value_counts()
encoding=LabelEncoder()
df["Gender"]=encoding.fit_transform(df.iloc[:,1].values) df
```

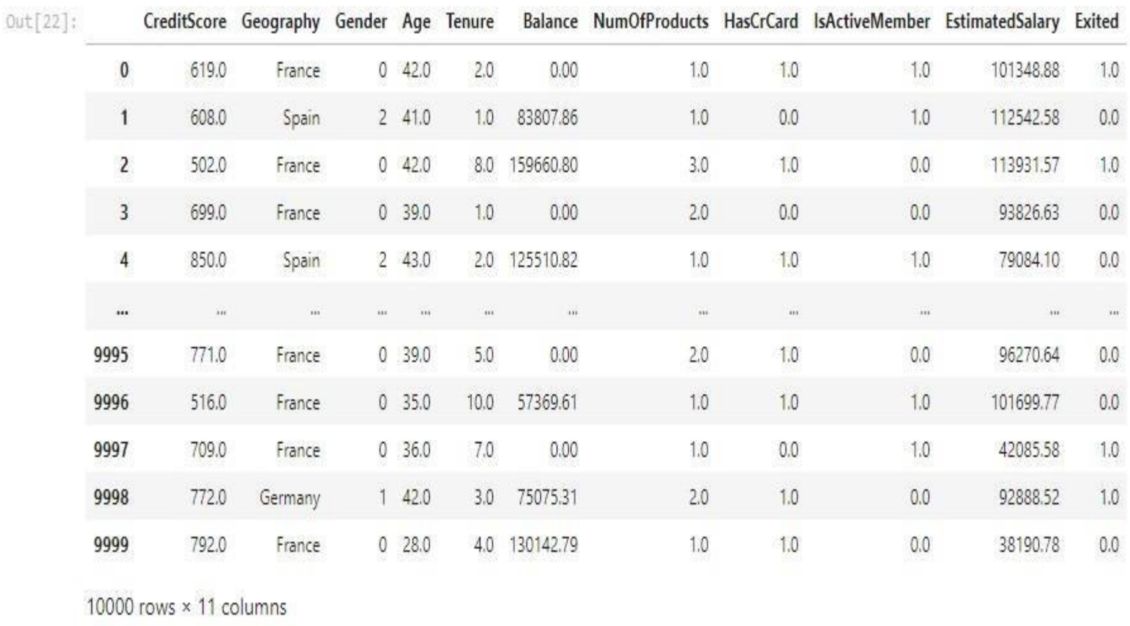


```
]:  #Check for categorical columns & performs encoding
    from sklearn.preprocessing import LabelEncoder
    df['Gender'].unique()

]:  array(['Female', 'Male'], dtype=object)

]:  #Check for categorical columns & performs encoding
    df['Gender'].value_counts()

]:  Male      5457
    Female    4543
    Name: Gender, dtype: int64
```



Out[22]:

	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSalary	Exited
0	619.0	France	0	42.0	2.0	0.00	1.0	1.0	1.0	101348.88	1.0
1	608.0	Spain	2	41.0	1.0	83807.86	1.0	0.0	1.0	112542.58	0.0
2	502.0	France	0	42.0	8.0	159660.80	3.0	1.0	0.0	113931.57	1.0
3	699.0	France	0	39.0	1.0	0.00	2.0	0.0	0.0	93826.63	0.0
4	850.0	Spain	2	43.0	2.0	125510.82	1.0	1.0	1.0	79084.10	0.0
...	...	...	...	...	...	...	...	...	...	...	...
9995	771.0	France	0	39.0	5.0	0.00	2.0	1.0	0.0	96270.64	0.0
9996	516.0	France	0	35.0	10.0	57369.61	1.0	1.0	1.0	101699.77	0.0
9997	709.0	France	0	36.0	7.0	0.00	1.0	0.0	1.0	42085.58	1.0
9998	772.0	Germany	1	42.0	3.0	75075.31	2.0	1.0	0.0	92888.52	1.0
9999	792.0	France	0	28.0	4.0	130142.79	1.0	1.0	0.0	38190.78	0.0

10000 rows × 11 columns

Question-7:

7.Split the data into dependent and independent variables.

Solution:

```
#Split the data into Dependent & Independent Variables print("----------
Dependent Variables----------")
X=df.iloc[:,1:4] print(X) print("---------------------
-------------------") print("---------Independent
Variables---------") Y=df.iloc[:,4] print(Y)
print("---------------------------------------")
```

Question-8:

8. Scale the independent variables

Solution:

```
        #Split the data into Dependent & Independent Variables
print("----------Dependent Variables----------")
X=df.iloc[:,1:4] print(X) print("---------------
------------------------") print("---------
Independent Variables---------") Y=df.iloc[:,4]
print(Y)
print("---------------------------------------")
```

Question-9:

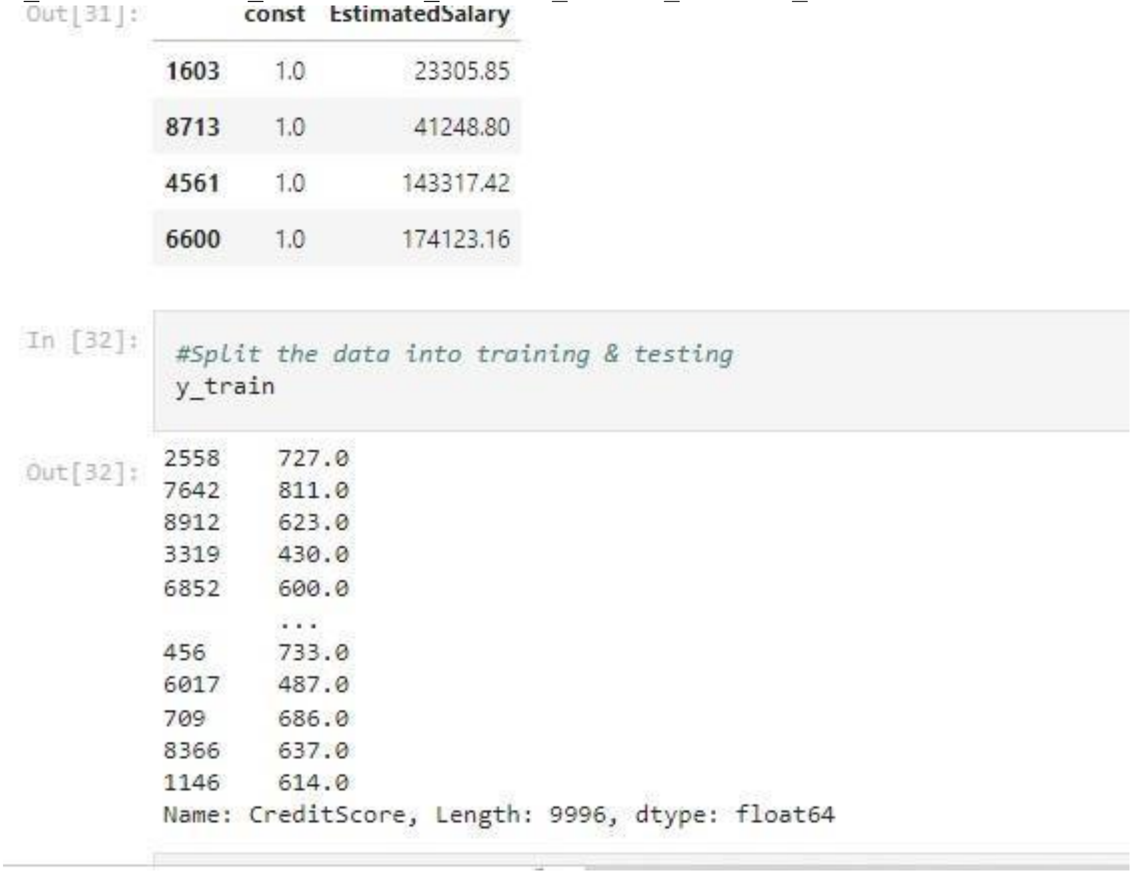
9. Split the data into training and testing

Solution:

```
#Split the data into training & testing from sklearn.model_selection
import train_test_split
```

In [34]:

```
#Split the data into training & testing
x_train, x_test, y_train, y_test = train_test_split(x, y,
test_size=4,random_state=4) x_train x_test y_train y_test
```



Out[31]:

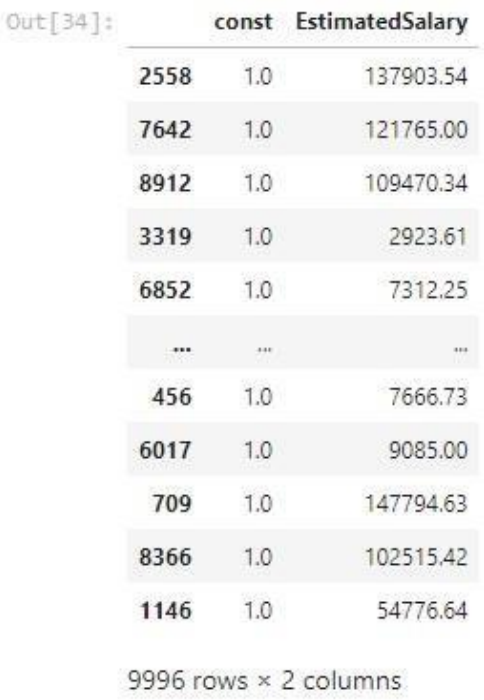
	const	EstimatedSalary
1603	1.0	23305.85
8713	1.0	41248.80
4561	1.0	143317.42
6600	1.0	174123.16

In [32]:

```
#Split the data into training & testing
y_train
```

Out[32]:

```
2558    727.0
7642    811.0
8912    623.0
3319    430.0
6852    600.0
        ...
456     733.0
6017    487.0
709     686.0
8366    637.0
1146    614.0
Name: CreditScore, Length: 9996, dtype: float64
```



Out[34]:

	const	EstimatedSalary
2558	1.0	137903.54
7642	1.0	121765.00
8912	1.0	109470.34
3319	1.0	2923.61
6852	1.0	7312.25
...	...	...
456	1.0	7666.73
6017	1.0	9085.00
709	1.0	147794.63
8366	1.0	102515.42
1146	1.0	54776.64

9996 rows × 2 columns