

ASSIGNMENT-2
DATA VISUALIZATION AND PREPROCESSING

Assignment Date	24/09/2022
Student Name	NAVEENA D
Student Roll Number	61771921030
Maximum Marks	2 Marks

Task-1

Download the Dataset:

[Churn_Modelling.csv](#)

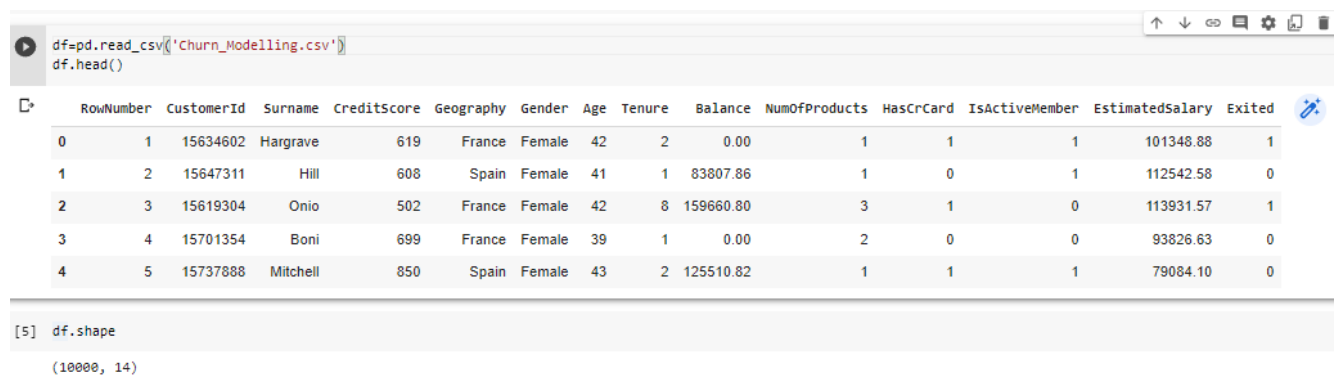
Task-2:

Load the Dataset:

Solution:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import matplotlib as rcParams

df=pd.read_csv('Churn_Modelling.csv')
df.head()
```



```
df=pd.read_csv('Churn_Modelling.csv')
df.head()
```

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSalary	Exited
0	1	15634602	Hargrave	619	France	Female	42	2	0.00	1	1	1	101348.88	1
1	2	15647311	Hill	608	Spain	Female	41	1	83807.86	1	0	1	112542.58	0
2	3	15619304	Onio	502	France	Female	42	8	159660.80	3	1	0	113931.57	1
3	4	15701354	Boni	699	France	Female	39	1	0.00	2	0	0	93826.63	0
4	5	15737888	Mitchell	850	Spain	Female	43	2	125510.82	1	1	1	79084.10	0

```
[5] df.shape

(10000, 14)
```

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```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10000 entries, 0 to 9999
Data columns (total 14 columns):
#   Column              Non-Null Count  Dtype
---  -
0   RowNumber            10000 non-null  int64
1   CustomerId           10000 non-null  int64
2   Surname              10000 non-null  object
3   CreditScore           10000 non-null  int64
4   Geography            10000 non-null  object
5   Gender               10000 non-null  object
6   Age                  10000 non-null  int64
7   Tenure               10000 non-null  int64
8   Balance              10000 non-null  float64
9   NumOfProducts        10000 non-null  int64
10  HasCrCard            10000 non-null  int64
11  IsActiveMember       10000 non-null  int64
12  EstimatedSalary      10000 non-null  float64
13  Exited               10000 non-null  int64
dtypes: float64(2), int64(9), object(3)
memory usage: 1.1+ MB
```

```
[7] df.isnull().any()
```

```
RowNumber      False
CustomerId      False
Surname         False
CreditScore     False
Geography       False
Gender          False
Age             False
Tenure          False
Balance         False
NumOfProducts  False
HasCrCard       False
IsActiveMember  False
EstimatedSalary False
Exited          False
dtype: bool
```

```
df.Geography.unique()
```

```
array(['France', 'Spain', 'Germany'], dtype=object)
```

```
df.Age.unique()
```

```
array([42, 41, 39, 43, 44, 50, 29, 27, 31, 24, 34, 25, 35, 45, 58, 32, 38,
       46, 36, 33, 40, 51, 61, 49, 37, 19, 66, 56, 26, 21, 55, 75, 22, 30,
       28, 65, 48, 52, 57, 73, 47, 54, 72, 20, 67, 79, 62, 53, 80, 59, 68,
       23, 60, 70, 63, 64, 18, 82, 69, 74, 71, 76, 77, 88, 85, 84, 78, 81,
       92, 83])
```

```
[10] df.Tenure.value_counts()
```

```
2    1048
1    1035
7    1028
8    1025
5    1012
3    1009
4     989
9     984
6     967
10    490
0     413
Name: Tenure, dtype: int64
```

```
df.Gender.value_counts()
```

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

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Task-3:

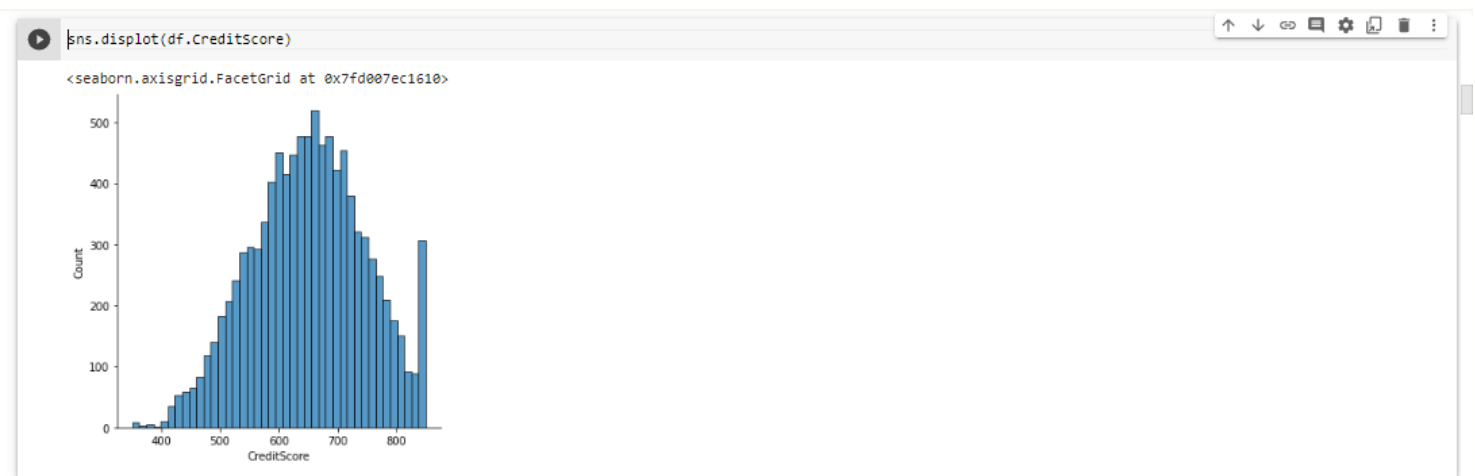
3. Perform Below Visualizations.

- Univariate Analysis
- Bi - Variate Analysis
- Multi - Variate Analysis

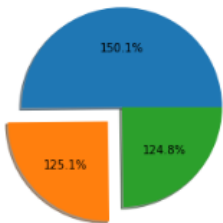
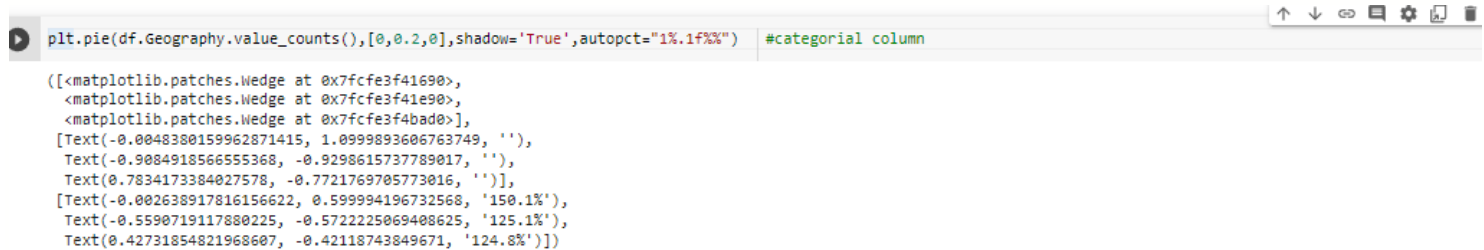
Univariate Analysis:

SOLUTION:

```
sns.displot(df.CreditScore)
```



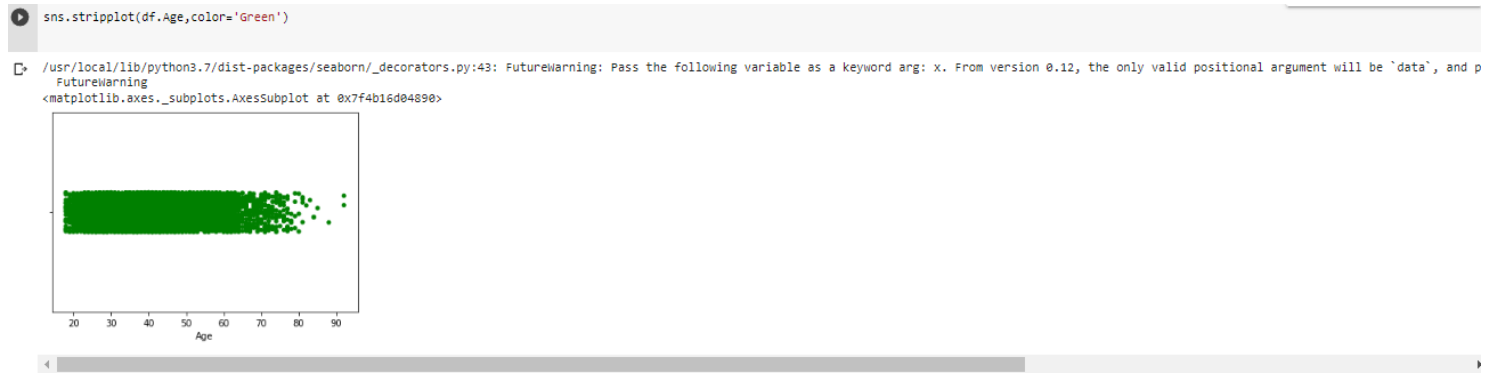
```
plt.pie(df.Geography.value_counts(), [0,0.2,0], shadow='True', autopct="1%.1f%%") #categorical column
```



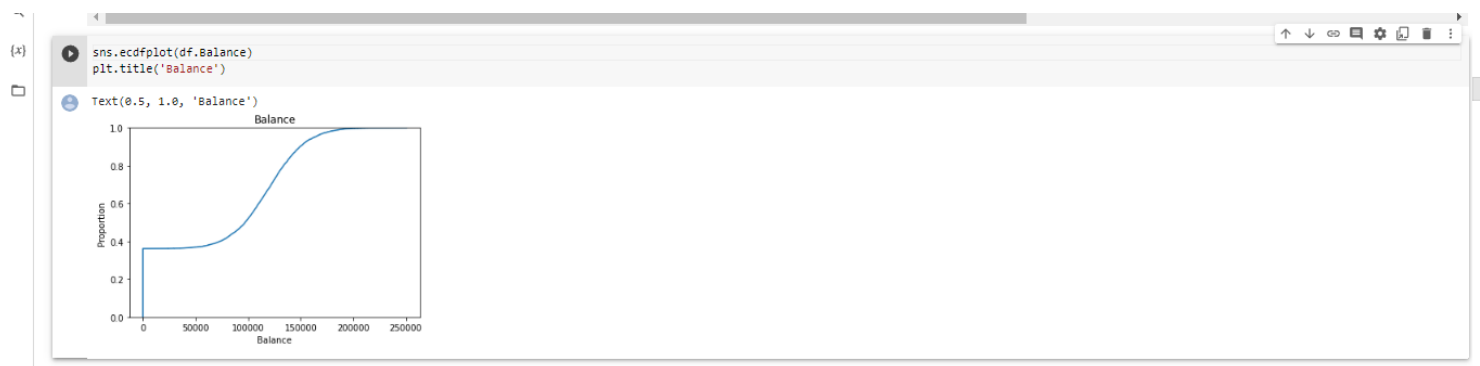
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```
sns.stripplot(df.Age,color='Green')
```



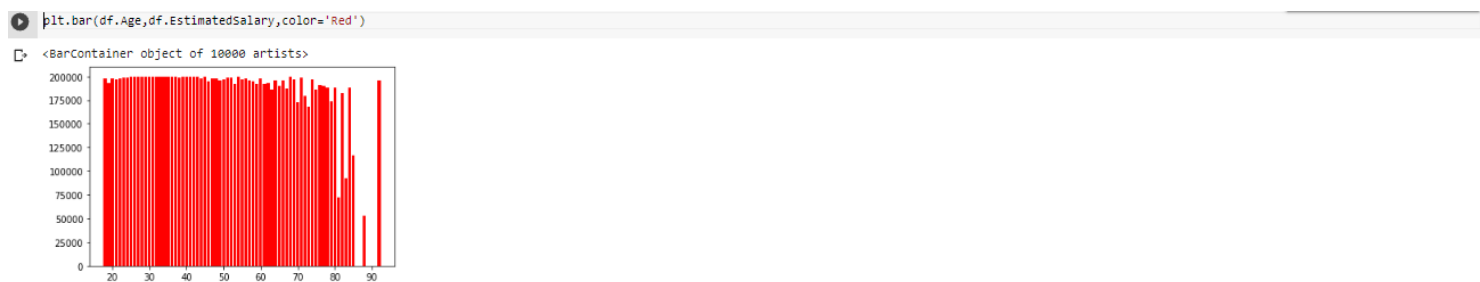
```
sns.ecdfplot(df.Balance)
```



Bi-variate Analysis:

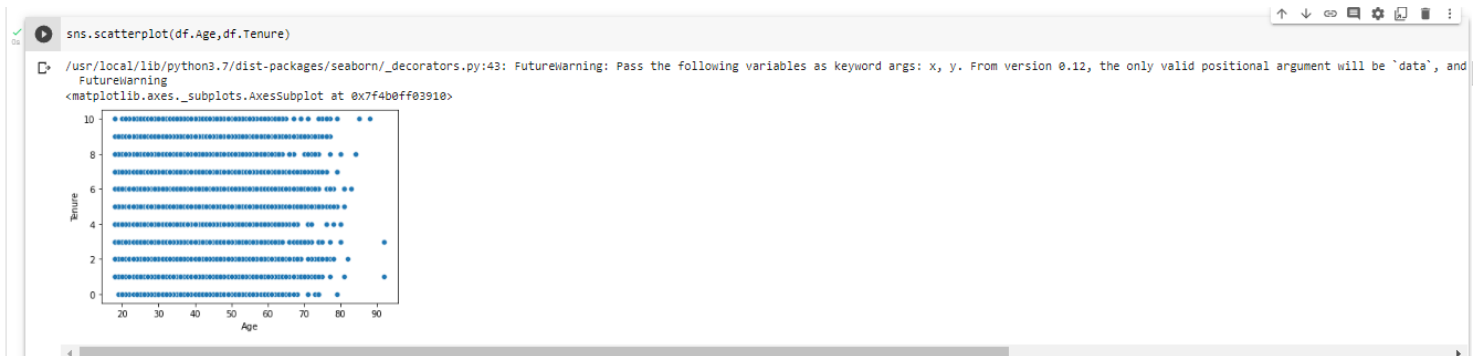
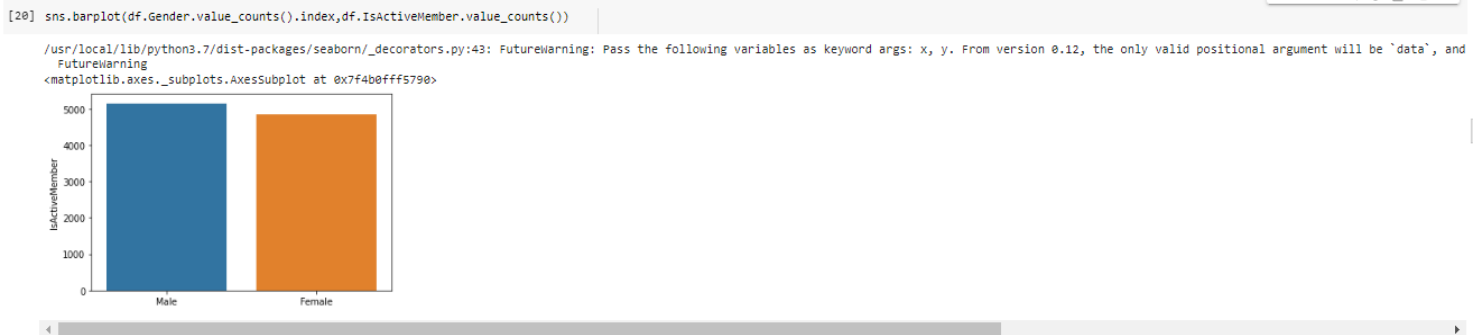
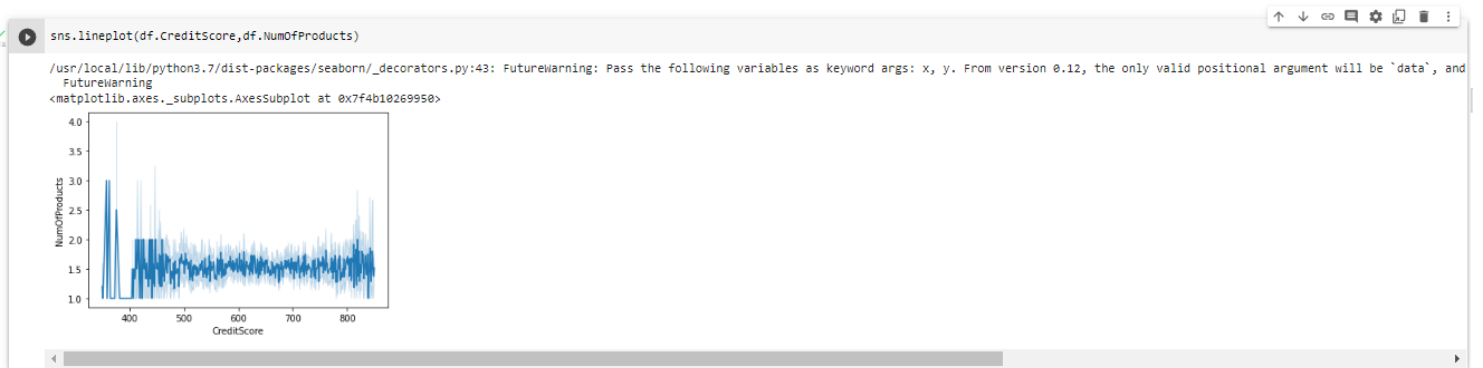
SOLUTION:

```
plt.bar(df.Age,df.EstimatedSalary,color='Red')
```

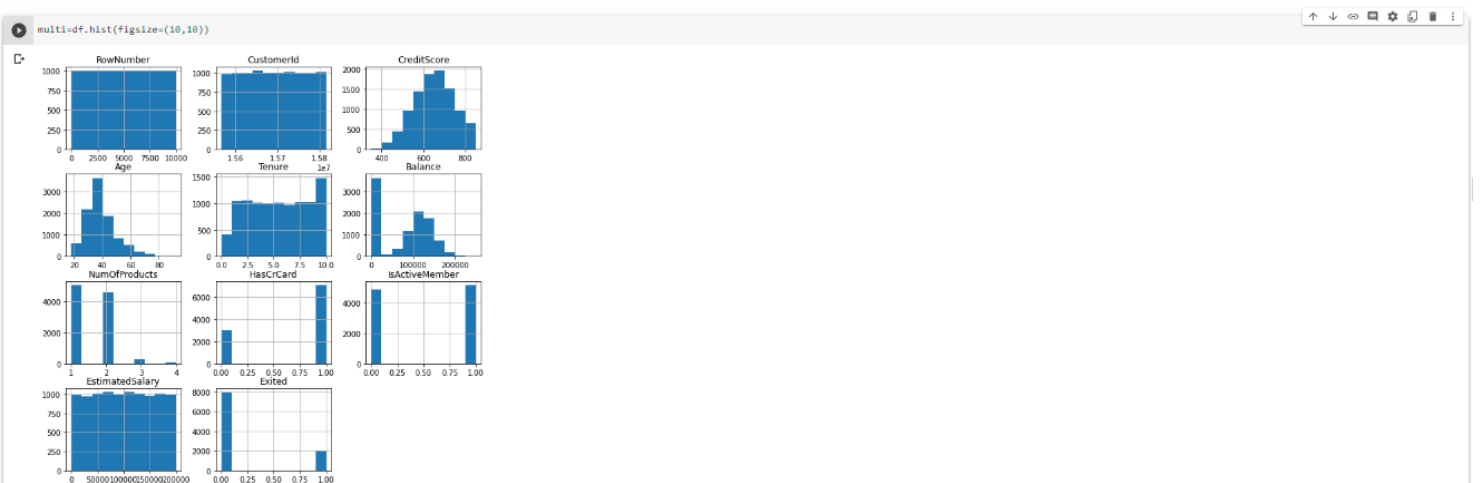


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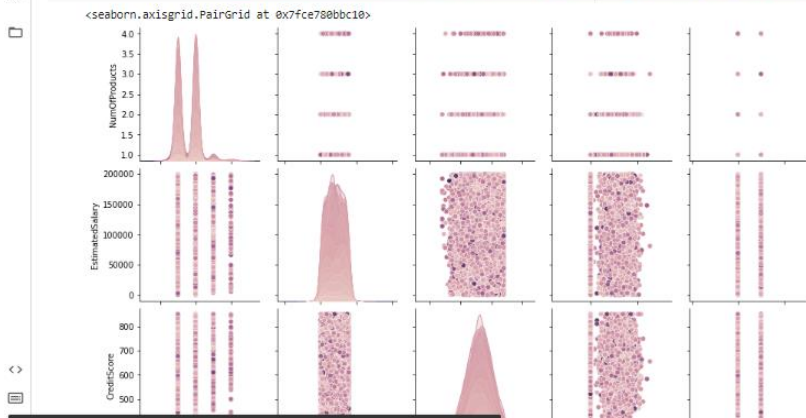
Multi-Variate Analysis:



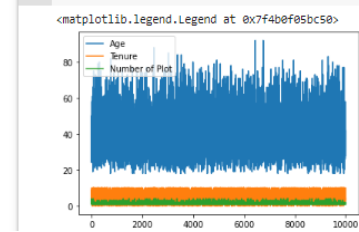
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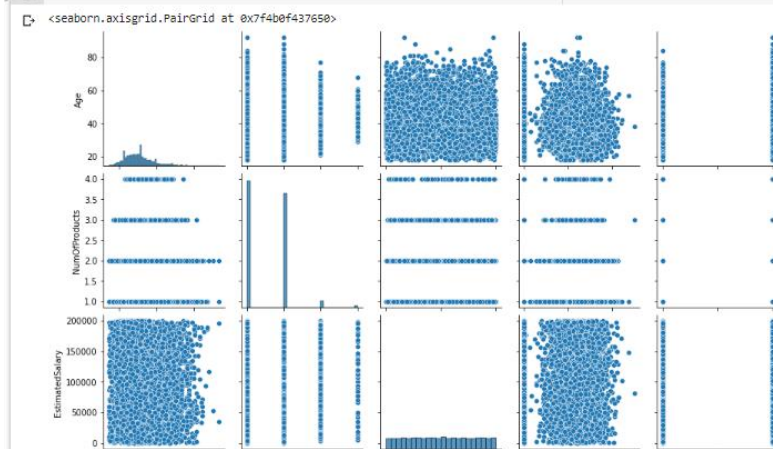
```
[ ] sns.pairplot(data=df[['Geography', 'Age', 'NumOfProducts', 'EstimatedSalary', 'CreditScore', 'Balance', 'IsActiveMember']], hue='Age', kind='scatter')
```



```
[x] df.Age.plot()
df.Tenure.plot()
df.NumOfProducts.plot()
plt.legend(['Age', 'Tenure', 'Number of Plot'])
```

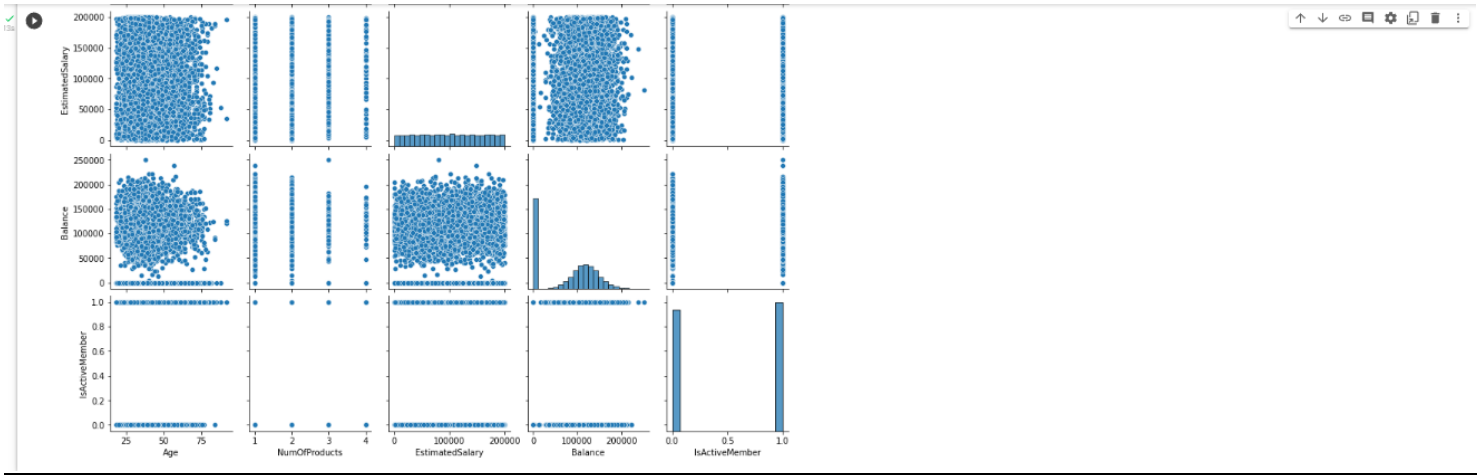


```
[x] sns.pairplot(data=df[['Age', 'NumOfProducts', 'EstimatedSalary', 'Balance', 'IsActiveMember']], diag_kind='hist')
```



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Task-4:

Descriptive Statistic

df.describe()

	RowNumber	CustomerId	Creditscore	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSalary	Exited
count	10000.00000	1.000000e+04	10000.000000	10000.000000	10000.000000	10000.000000	10000.000000	10000.00000	10000.000000	10000.000000	10000.000000
mean	5000.50000	1.569094e+07	650.528800	38.921800	5.012800	76485.889288	1.530200	0.70550	0.515100	100090.239881	0.203700
std	2886.89568	7.193619e+04	96.653299	10.487806	2.892174	62397.405202	0.581654	0.45584	0.499797	57510.492818	0.402769
min	1.00000	1.556570e+07	350.000000	18.000000	0.000000	0.000000	1.000000	0.00000	0.000000	11.580000	0.000000
25%	2500.75000	1.562853e+07	584.000000	32.000000	3.000000	0.000000	1.000000	0.00000	0.000000	51002.110000	0.000000
50%	5000.50000	1.569074e+07	652.000000	37.000000	5.000000	97198.540000	1.000000	1.00000	1.000000	100193.915000	0.000000
75%	7500.25000	1.575323e+07	718.000000	44.000000	7.000000	127644.240000	2.000000	1.00000	1.000000	149388.247500	0.000000
max	10000.00000	1.581569e+07	850.000000	92.000000	10.000000	250898.090000	4.000000	1.00000	1.000000	199992.480000	1.000000

Task-5:

Handle the Missing Data:

```
[27] df1=pd.read_csv('mtcars_missing_data.csv')
df1.head()
```

	model	mpg	cyl	disp	hp	drat	wt	qsec	vs	am	gear	carb
0	Mazda RX4	21.0	6	160.0	110	3.90	2.620	16.46	0	1	4	4
1	Mazda RX4 Wag	21.0	6	160.0	110	3.90	2.875	17.02	0	1	4	4
2	Datsun 710	22.8	4	108.0	93	3.85	2.320	18.61	1	1	4	1
3	Hornet 4 Drive	21.4	6	258.0	110	3.08	NaN	19.44	1	0	3	1
4	Hornet Sportabout	18.7	8	360.0	175	3.15	3.440	17.02	0	0	3	2

```
[ ] df1.shape
(32, 12)

[ ] df1.info()
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 32 entries, 0 to 31
Data columns (total 12 columns):
#   Column      Non-Null Count  Dtype
---  -
0   model      32 non-null    object
1   mpg        30 non-null    float64
2   cyl        32 non-null    int64
3   disp       30 non-null    float64
4   hp         32 non-null    int64
5   drat       30 non-null    float64
6   wt         29 non-null    float64
```

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```
[ ] df1.isnull().any()
```

```
model    False
mpg      True
cyl      False
disp     True
hp       False
drat     True
wt       True
qsec     False
vs       False
am       False
gear     False
carb     False
dtype: bool
```

```
[ ] df1.isnull().sum()
```

```
model    0
mpg      2
cyl      0
disp     2
hp       0
drat     2
wt       3
qsec     0
vs       0
am       0
gear     0
carb     0
dtype: int64
```

```
[ ] df1['mpg'].fillna(df1['mpg'].median(),inplace=True)
df1['disp'].fillna(df1['disp'].median(),inplace=True)
df1['drat'].fillna(df1['drat'].median(),inplace=True)
df1['wt'].fillna(df1['wt'].median(),inplace=True)
```

```
df1.head()
```

	model	mpg	cyl	disp	hp	drat	wt	qsec	vs	am	gear	carb
0	Mazda RX4	21.0	6	160.0	110	3.90	2.620	16.46	0	1	4	4
1	Mazda RX4 Wag	21.0	6	160.0	110	3.90	2.875	17.02	0	1	4	4
2	Datsun 710	22.8	4	108.0	93	3.85	2.320	18.61	1	1	4	1
3	Hornet 4 Drive	21.4	6	258.0	110	3.08	3.435	19.44	1	0	3	1
4	Hornet Sportabout	18.7	8	360.0	175	3.15	3.440	17.02	0	0	3	2

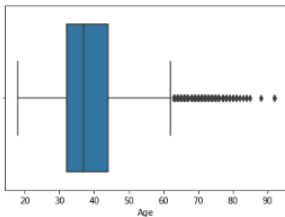
Task-6:

Outliers Replacement:

Outliers Replacement

```
[ ] sns.boxplot(df.Age)
```

```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other a
FutureWarning
<matplotlib.axes._subplots.AxesSubplot at 0x7fcf123b6990>
```



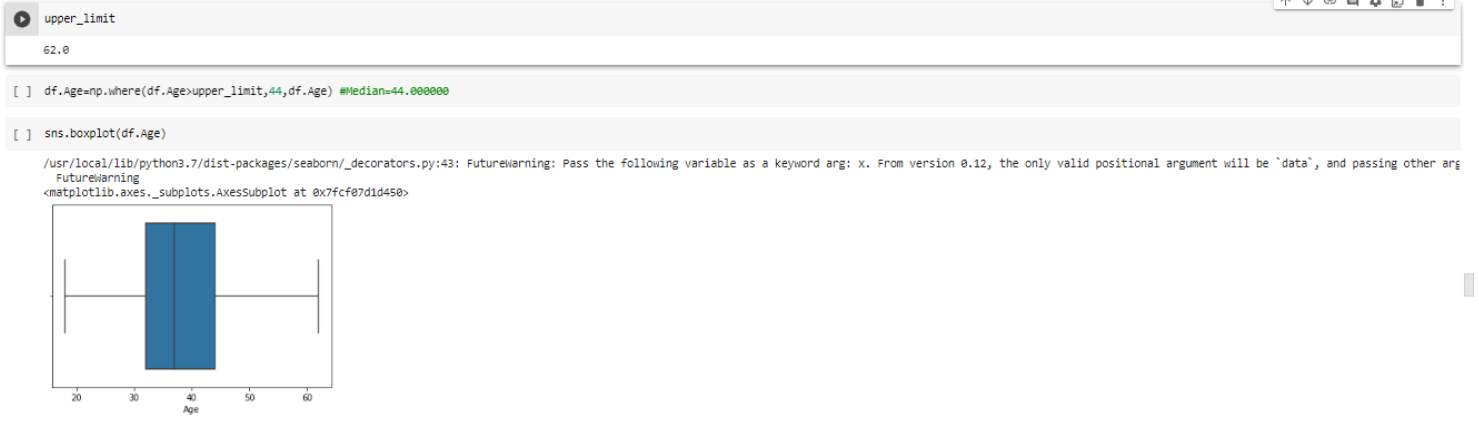
```
[ ] q1=df.Age.quantile(0.25)
q3=df.Age.quantile(0.75)
```

IQR = $q3 - q1$

upper_limit = $q3 + 1.5 * IQR$

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Task-7:

Check for Categorical column and perform encoding:

Check for Categorical column and perform encoding

Label Encoding for Gender column

```
[ ] from sklearn.preprocessing import LabelEncoder
```

```
[ ] le = LabelEncoder()
```

```
[ ] df.Gender=le.fit_transform(df.Gender)
```

```
[ ] df.head()
```

	RowNumber	CustomerId	Surname	Creditscore	Geography	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSalary	Exited
0	1	15634602	Hargrave	619	France	0	42	2	0.00	1	1	1	101348.88	1
1	2	15647311	Hill	608	Spain	0	41	1	83807.86	1	0	1	112542.58	0
2	3	15619304	Onio	502	France	0	42	8	159660.80	3	1	0	113931.57	1
3	4	15701354	Boni	699	France	0	39	1	0.00	2	0	0	93826.63	0
4	5	15737888	Mitchell	850	Spain	0	43	2	125510.82	1	1	1	79084.10	0

One Hot Encoding for Geography column

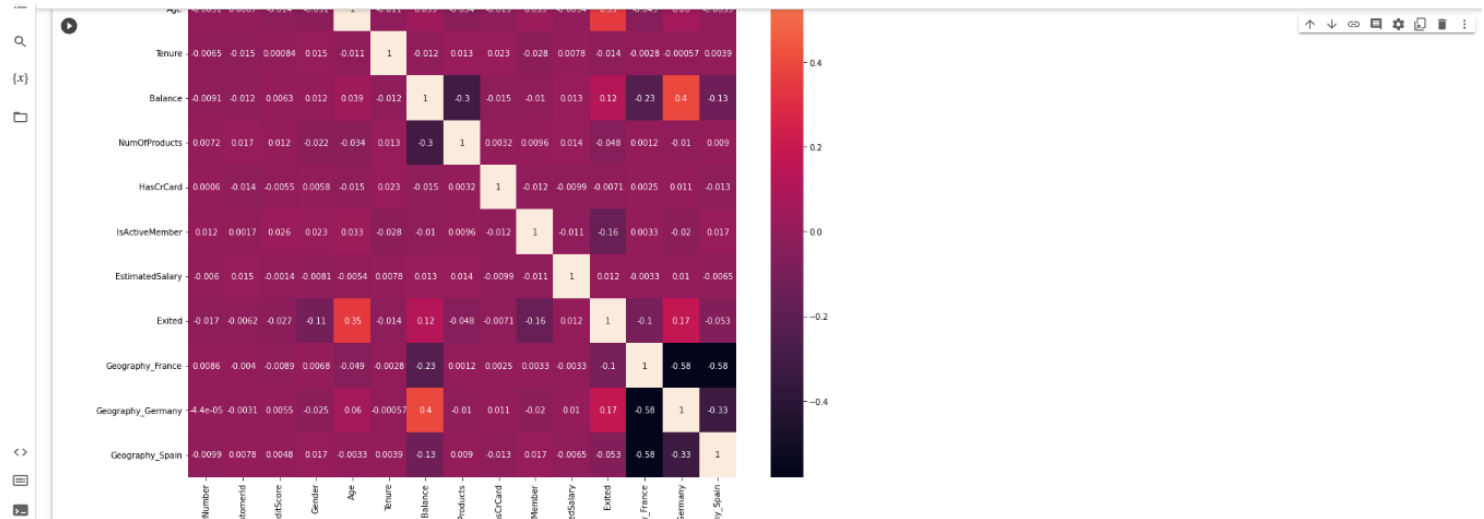
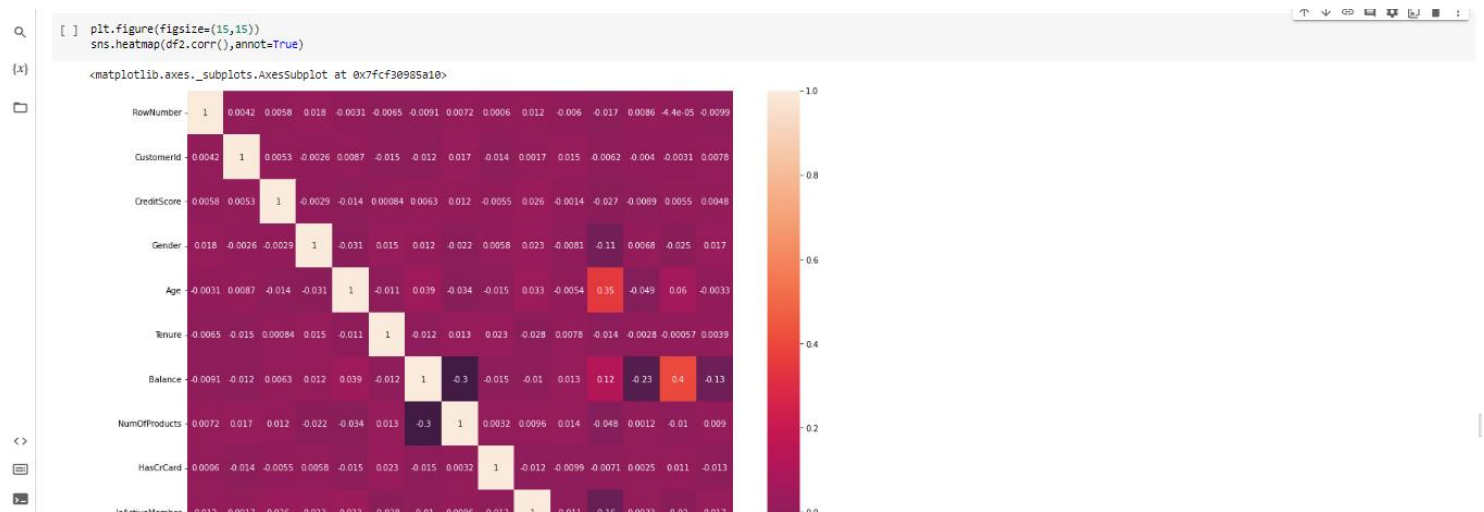
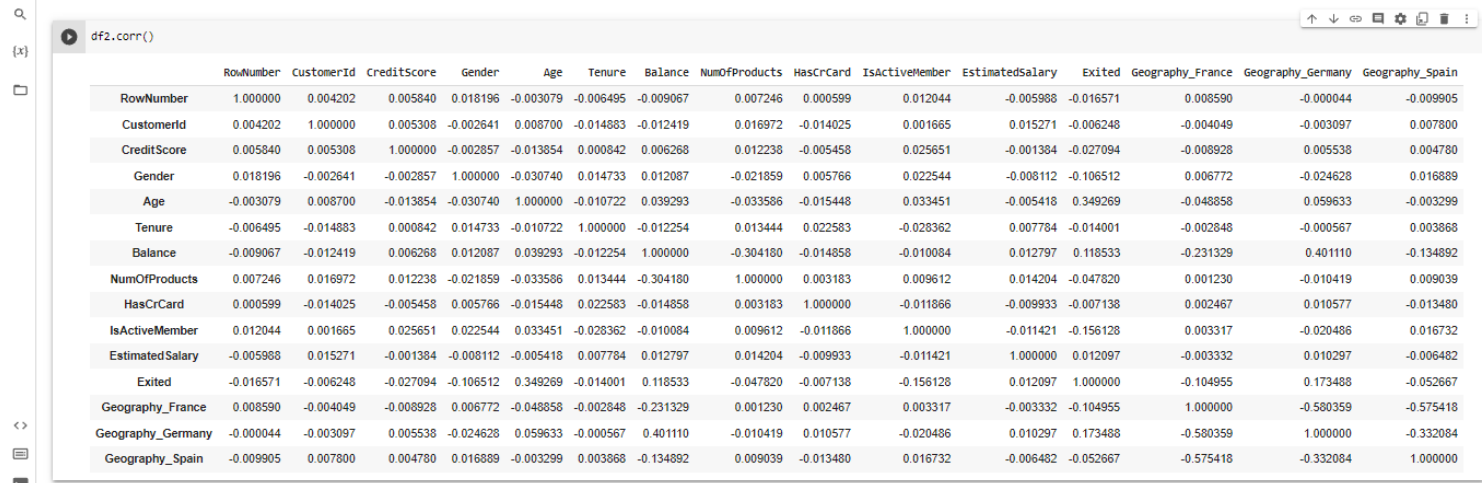
```
[ ] df2=pd.get_dummies(df,columns=['Geography'])  
df2.head()
```

	RowNumber	CustomerId	Surname	Creditscore	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSalary	Exited	Geography_France	Geography_Germany	Geography_Spain
0	1	15634602	Hargrave	619	0	42	2	0.00	1	1	1	101348.88	1	1	0	0
1	2	15647311	Hill	608	0	41	1	83807.86	1	0	1	112542.58	0	0	0	1
2	3	15619304	Onio	502	0	42	8	159660.80	3	1	0	113931.57	1	1	0	0
3	4	15701354	Boni	699	0	39	1	0.00	2	0	0	93826.63	0	1	0	0
4	5	15737888	Mitchell	850	0	43	2	125510.82	1	1	1	79084.10	0	0	0	1

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Task-7:

Correlation:



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Task-8

Split the data into dependent and independent variables:

Split the data into dependent and independent variables

```
[ ] #y - target columns
#X - predicting columns

[ ] y=df2['Surname']
y
0      Hangrave
1      Hill
2      Onio
3      Boni
4      Mitchell
...
9995  Obijaku
9996  Johnstone
9997  Liu
9998  Sabbatini
9999  Walker
Name: Surname, Length: 10000, dtype: object

X=df2.drop(columns=['Surname'],axis=1)
X.head()
```

```
[ ] X=df2.drop(columns=['Surname'],axis=1)
X.head()
```

RowNumber	CustomerId	CreditScore	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSalary	Exited	Geography_France	Geography_Germany	Geography_Spain
0	1	15634602	619	0	42	2	0.00	1	1	1	101348.88	1	1	0
1	2	15647311	608	0	41	1	83807.86	1	0	1	112542.58	0	0	1
2	3	15619304	502	0	42	8	159660.80	3	1	0	113931.57	1	1	0
3	4	15701354	699	0	39	1	0.00	2	0	0	93826.63	0	1	0
4	5	15737888	850	0	43	2	125510.82	1	1	1	79084.10	0	0	1

Task-9:

Scale the independent variables:

Scale the independent variables

```
[ ] from sklearn.preprocessing import scale

[ ] x_scaled=pd.DataFrame(scale(X),columns=X.columns)
x_scaled.head()
```

RowNumber	CustomerId	CreditScore	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSalary	Exited	Geography_France	Geography_Germany	Geography_Spain
0	-1.731878	-0.783213	-0.326221	-1.095988	0.457039	-1.041760	-1.225848	-0.911583	0.646092	0.970243	0.021886	1.977165	0.997204	-0.578736
1	-1.731531	-0.606534	-0.440036	-1.095988	0.342361	-1.387538	0.117350	-0.911583	-1.547768	0.970243	0.216534	-0.505775	-1.002804	1.742740
2	-1.731185	-0.995885	-1.536794	-1.095988	0.457039	1.032908	1.333053	2.527057	0.646092	-1.030670	0.240687	1.977165	0.997204	-0.578736
3	-1.730838	0.144767	0.501521	-1.095988	0.113004	-1.387538	-1.225848	0.807737	-1.547768	-1.030670	-0.108918	-0.505775	0.997204	-0.578736
4	-1.730492	0.652659	2.063884	-1.095988	0.571717	-1.041760	0.785728	-0.911583	0.646092	0.970243	-0.365276	-0.505775	-1.002804	-0.578736

Task-10:

Split the data into training and testing:

Split the data into training and testing

```
[ ] from sklearn.model_selection import train_test_split
X_train,X_test,y_train,y_test=train_test_split(x_scaled,y,test_size=0.3,random_state=0)

[ ] X_train.shape
(7000, 15)

[ ] X_test.shape
(3000, 15)

[ ] y_train.shape
(7000,)

[ ] y_test.shape
(3000,)
```