Assignment -2

Data Visualization and Pre-Processing

Assignment Date	26 September 2022
Student Name	A.Vijayalakshmi
Student Roll Number	9517201906054
Maximum Marks	2 Marks

Question 1 - Load the dataset.

SOLUTION:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
 import seaborn as sns
df=pd.read_csv("/content/Churn_Modelling.csv")
 df.head()
```

output:

```
from google.colab import files
file = files.upload()
```

Choose Files Churn_Modelling.csv

- **Churn_Modelling.csv**(text/csv) - 684858 bytes, last modified: 9/26/2022 - 100% done

```
Saving Churn_Modelling.csv to Churn_Modelling.csv
```

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

```
(10000, 14)
```

```
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

Question 2 - Perform Univariate, Bivariate and Multivariate Analysis

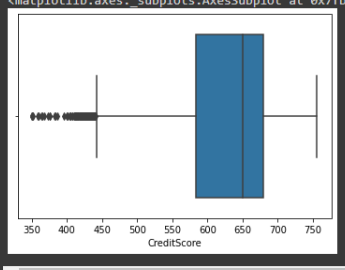
SOLUTION:

```
sns.boxplot(df['CreditScore'])
sns.boxplot(df['Age'])
 sns.boxplot(df['Tenure'])
 sns.boxplot(df['Balance'])
 sns.boxplot(df['EstimatedSalary'])
 sns.heatmap(df.corr(), annot=True)
```

output:

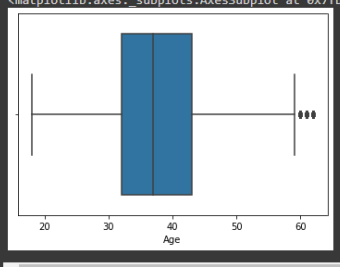
```
sns.boxplot(df['CreditScore'])
```

```
/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 vali
  FutureWarning
<matplotlib.axes._subplots.AxesSubplot at 0x7fbdee6cbb50>
```



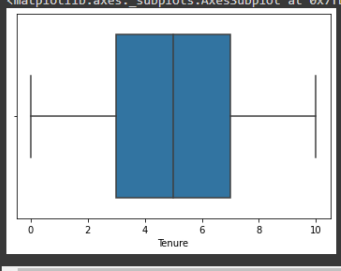
```
sns.boxplot(df['Age'])
```

```
/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 vali
  FutureWarning
<matplotlib.axes._subplots.AxesSubplot at 0x7fbddf6bb890>
```



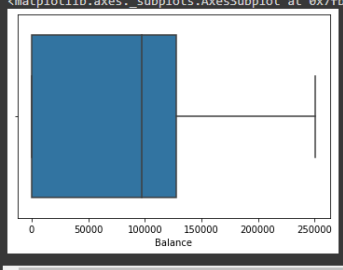

```
sns.boxplot(df['Tenure'])
```

```
/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 vali
  FutureWarning
<matplotlib.axes._subplots.AxesSubplot at 0x7fbddf13b790>
```



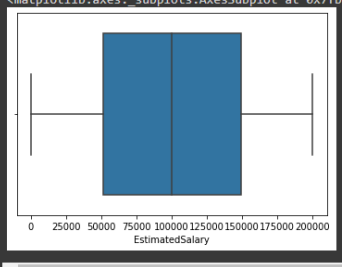

```
sns.boxplot(df['Balance'])
```

```
/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 vali
  FutureWarning
<matplotlib.axes._subplots.AxesSubplot at 0x7fbddf13f610>
```



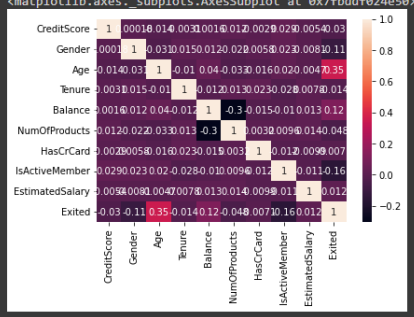

```
sns.boxplot(df['EstimatedSalary'])
```

```
/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 vali
  FutureWarning
<matplotlib.axes._subplots.AxesSubplot at 0x7fbddf09dfd0>
```



```
sns.heatmap(df.corr(), annot=True)
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fbddf024e50>
```



Question 3 - Perform descriptive statistics on the dataset.

SOLUTION:

df.describe()

OUTPUT:

```
df.describe()
```

	CreditScore	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSalary	Exited
count	10000.000000	10000.000000	10000.000000	10000.000000	10000.000000	10000.000000	10000.00000	10000.000000	10000.000000	10000.000000
mean	628.808847	0.545700	37.832293	5.012800	76485.889288	1.530200	0.70550	0.515100	100090.239881	0.203700
std	73.838626	0.497932	8.646205	2.892174	62397.405202	0.581654	0.45584	0.499797	57510.492818	0.402769
min	350.000000	0.000000	18.000000	0.000000	0.000000	1.000000	0.00000	0.000000	11.580000	0.000000
25%	584.000000	0.000000	32.000000	3.000000	0.000000	1.000000	0.00000	0.000000	51002.110000	0.000000
50%	650.528800	1.000000	37.000000	5.000000	97198.540000	1.000000	1.00000	1.000000	100193.915000	0.000000
75%	679.000000	1.000000	43.000000	7.000000	127644.240000	2.000000	1.00000	1.000000	149388.247500	0.000000
max	756.000000	1.000000	62.000000	10.000000	250898.090000	4.000000	1.00000	1.000000	199992.480000	1.000000

Question 4 – Handle the missing values

SOLUTION:

df.duplicated().sum()
df.nunique()
df.info()

OUTPUT:

```
[9] df.duplicated().sum()
```

```
0
```

+ Code + Text

```
df.isna().sum()
```

```
CreditScore        0
Gender             0
Age                0
Tenure             0
Balance            0
NumOfProducts      0
HasCrCard          0
IsActiveMember     0
EstimatedSalary    0
Exited             0
dtype: int64
```

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10000 entries, 0 to 9999
Data columns (total 10 columns):
 #   Column           Non-Null Count  Dtype
---  ------           --------------  -----
 0   CreditScore      10000 non-null  int64
 1   Gender           10000 non-null  int64
 2   Age              10000 non-null  int64
 3   Tenure           10000 non-null  int64
 4   Balance          10000 non-null  float64
 5   NumOfProducts    10000 non-null  int64
 6   HasCrCard        10000 non-null  int64
 7   IsActiveMember   10000 non-null  int64
 8   EstimatedSalary  10000 non-null  float64
 9   Exited           10000 non-null  int64
dtypes: float64(2), int64(8)
memory usage: 781.4 KB
```

Question 5 - Find the outliers and replace the outliers SOLUTION:
out = df.drop(columns=['Gender', 'Tenure', 'HasCrCard', 'IsActiveMember', 'NumOfProducts', 'Exited']).quantile(q=[0.25, 0.50])
qnt

output:

```
[14] qnt = df.drop(columns=['Gender', 'Tenure', 'HasCrCard', 'IsActiveMember', 'NumOfProducts', 'Exited']).quantile(q=[0.25, 0.75])
     qnt
```

	CreditScore	Age	Balance	EstimatedSalary
0.25	584.0	32.0	0.00	51002.1100
0.75	718.0	44.0	127644.24	149388.2475

Q1 = out.iloc[0]

Q3 = out.iloc[1]

iqr = Q3 - Q1 iqr

output:

```
Q1 = qnt.iloc[0]
Q3 = qnt.iloc[1]
iqr = Q3 - Q1
iqr
```

```
CreditScore          134.0000
Age                   12.0000
Balance           127644.2400
EstimatedSalary    98386.1375
dtype: float64
```

upper = out.iloc[1] + 1.5*iqr

upper

```
upper = qnt.iloc[1] + 1.5*iqr
upper
```

```
CreditScore          919.00000
Age                   62.00000
Balance           319110.60000
EstimatedSalary   296967.45375
dtype: float64
```

lower = out.iloc[0] - 1.5*iqr

lower

```
lower = qnt.iloc[0] - 1.5*iqr
lower
```

```
CreditScore          383.00000
Age                   14.00000
Balance           -191466.36000
EstimatedSalary    -96577.09625
dtype: float64
```

Replace outliers

SOLUTION:

df['CreditScore'] = np.where(df['CreditScore']>756, 650.5288, df['CreditScore']) df['Age'] = np.where(df['Age']>62, 38.9218, df['Age'])

Question 6 - Check for Categorical columns and perform encoding.

SOLUTION:

df['Gender'].replace({'Male': 1, 'Female': 0}, inplace=True) df.head(5)

OUTPUT:

```
df['Gender'].replace({'Male': 1, 'Female': 0}, inplace=True)
df.head(5)
```

	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

Question 7 – Split the data into dependent and independent variables.

SOLUTION:

df = df.drop(columns=['RowNumber', 'CustomerId', 'Surname', 'Geography'])

df.head()

output:

```
df = df.drop(columns=['RowNumber', 'CustomerId', 'Surname', 'Geography'])
df.head()
```

	CreditScore	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSalary	Exited
0	619	0	42	2	0.00	1	1	1	101348.88	1
1	608	0	41	1	83807.86	1	0	1	112542.58	0
2	502	0	42	8	159660.80	3	1	0	113931.57	1
3	699	0	39	1	0.00	2	0	0	93826.63	0
4	850	0	43	2	125510.82	1	1	1	79084.10	0

x = df.iloc[:, :-1]

x.head()

```
x = df.iloc[:, :-1]
x.head()
```

	CreditScore	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSalary
0	619.0000	0	42.0	2	0.00	1	1	1	101348.88
1	608.0000	0	41.0	1	83807.86	1	0	1	112542.58
2	502.0000	0	42.0	8	159660.80	3	1	0	113931.57
3	699.0000	0	39.0	1	0.00	2	0	0	93826.63
4	650.5288	0	43.0	2	125510.82	1	1	1	79084.10

y = df.iloc[:, -1]

y.head()

```
y = df.iloc[:, -1]
y.head()
```

```
0    1
1    0
2    1
3    0
4    0
Name: Exited, dtype: int64
```

Question 8 – Scale the independent variables

SOLUTION:

from sklearn.preprocessing import StandardScaler ss = StandardScaler()

x = ss.fit_transform(x)

x

OUTPUT:

```
[27] from sklearn.preprocessing import StandardScaler
     ss = StandardScaler()
     x = ss.fit_transform(x)
```

```
x
```

```
array([[-0.13284832, -1.09598752,  0.48205148, ...,  0.64609167,
         0.97024255,  0.02188649],
       [-0.28182929, -1.09598752,  0.36638802, ..., -1.54776799,
         0.97024255,  0.21653375],
       [-1.71746409, -1.09598752,  0.48205148, ...,  0.64609167,
        -1.03067011,  0.2406869 ],
       ...,
       [ 1.08608688, -1.09598752, -0.21192932, ..., -1.54776799,
         0.97024255, -1.00864308],
       [ 0.29416906,  0.91241915,  0.48205148, ...,  0.64609167,
        -1.03067011, -0.12523071],
       [ 0.29416906, -1.09598752, -1.13723705, ...,  0.64609167,
        -1.03067011, -1.07636976]])
```

Question 9 - Split the data into training and testing

SOLUTION:

```
from sklearn.model_selection import train_test_split

x_train, y_test = train_test_split(x, y, test_size=0.2, random_state=0)

 print(x_train.shape)

print(x_test.shape)

 print(y_train.shape)

 print(y_test.shape)
```

OUTPUT:

```
from sklearn.model_selection import train_test_split
x_train, x_test, y_train, y_test = train_test_split(x, y, test_size=0.2, random_state=0)
```

```
print(x_train.shape)
print(x_test.shape)
print(y_train.shape)
print(y_test.shape)
```

```
(8000, 9)
(2000, 9)
(8000,)
(2000,)
```