

Assignment Date	21 September 2022
Student Name	G.Harini
Student Roll Number	910619104024
Maximum Marks	2 Marks

Data Visualization and Pre-processing

1. Download the dataset

Dataset successfully downloaded and uploaded in colob

2. Load Data

```
import pandas as pd
import warnings
warnings.filterwarnings('ignore')

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
```

3. Perform Below Visualizations.

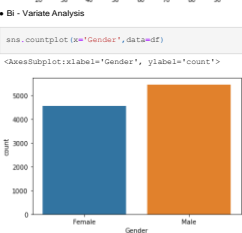
- Univariate Analysis
- Bi - Variate Analysis
- Multi - Variate Analysis

```
import matplotlib.pyplot as plt
import seaborn as sns

# Univariate Analysis
df.hist(column="Age",grid=False,edgecolor="black")

array([[<AxesSubplot:title='center': 'Age'>]], dtype=object)

# Bi - Variate Analysis
sns.countplot(x="Gender",data=df)
<AxesSubplot:xlabel='Gender', ylabel='count'>
```



```
# Multi - Variate Analysis
sns.countplot(x="Tenure",data=df)
<AxesSubplot:xlabel='Tenure', ylabel='count'>
```



4. Perform descriptive statistics on the dataset

```
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 10000.000000 10000.000000 10000.000000 1.000000
mean 5005.500000 1.560994e+07 650.528800 38.321800 5.012800 76485.889288 1.530200 0.70550 0.515100 100090.239881 0.203700
std 2886.895687 1.93619e+04 96.653299 10.487806 2.892174 62397.405202 0.581654 0.45584 0.499797 57510.462818 0.402769
min 1.00000 1.00000 1.56670e+04 350.000000 18.000000 0.000000 0.000000 1.000000 0.000000 0.000000 11.580000 0.000000
25% 2500.75000 1.56285e+07 684.000000 32.000000 3.000000 0.000000 1.000000 0.000000 0.000000 51002.110000 0.000000
50% 5000.50000 1.56074e+07 652.000000 37.000000 5.000000 97198.540000 1.000000 1.00000 1.000000 100193.915000 0.000000
75% 7500.25000 1.57323e+07 718.000000 44.000000 7.000000 127844.240000 2.000000 1.00000 1.000000 149388.247000 0.000000
max 10000.00000 1.58159e+07 850.000000 92.000000 10.000000 250898.090000 4.000000 1.00000 1.000000 199992.480000 1.000000
```

5. Handle the Missing values

```
df.isnull().sum()

RowNumber 0
CustomerId 0
Surname 0
CreditScore 0
Geography 0
Gender 0
Age 0
Tenure 0
Balance 0
NumOfProducts 0
HasCrCard 0
IsActiveMember 0
EstimatedSalary 0
Exited 0
dtype: int64
```

6. Find the outliers and replace the outliers

```
sns.boxplot(x="CreditScore", data=df)
<AxesSubplot:xlabel='CreditScore'>
```

```
import numpy as np
import sklearn
from sklearn.datasets import load_boston

Q1 = np.percentile(df["CreditScore"], 25, interpolation = 'midpoint')
Q3 = np.percentile(df["CreditScore"], 75, interpolation = 'midpoint')
IQR = Q3 - Q1
upper = np.where(df["CreditScore"] >= (Q3+1.5*IQR))
lower = np.where(df["CreditScore"] <= (Q1-1.5*IQR))
df.drop(upper[0], inplace = True)
df.drop(lower[0], inplace = True)
print("New Shape", df.shape)
sns.boxplot(x="CreditScore", data=df)

Old Shape: (9984, 14)
New Shape: (9984, 14)
<AxesSubplot:xlabel='CreditScore'>
```

7. Check for Categorical columns and perform encoding

```
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
```

8. Split the data into dependent and independent variables

```
A = df.iloc[:, :-1].values
print(A)

[[1 15634602 'Hargrave' ... 1 101348.88]
 [2 15647311 'Hill' ... 0 112542.58]
 [3 15619304 'Onio' ... 0 113931.57]
 ...
 [9998 15682355 'Babbatini' ... 1 92888.52]
 [10000 15628319 'Waiker' ... 1 0 38190.78]]

B = df.iloc[:, :-1].values
print(B)

[[1 0 1 ... 1 1 0]]
```

9. Scale the independent variables

```
from sklearn.preprocessing import StandardScaler
from sklearn.preprocessing importMinMaxScaler
scaler = MinMaxScaler()
df[["CustomerId"]] = scaler.fit_transform(df[["CustomerId"]])
print(df)

RowNumber CustomerId Surname CreditScore Geography Gender Age \
0 1 15634602 Hargrave 619 France Female 42
1 2 15647311 Hill 608 Spain Female 41
2 3 15619304 Onio 502 France Female 42
3 4 15701354 Boni 699 France Female 39
4 5 15737888 Mitchell 850 Spain Female 43
... ..
9995 9996 0.162111 Obijaku 771 France Male 39
9996 9997 0.016765 Johnston 516 France Male 35
9997 9998 0.073327 Liu 709 France Female 36
9998 9999 0.466637 Sabbatini 772 Germany Male 42
9999 10000 0.250493 Walker 792 France Female 28

Tenure Balance NumOfProducts HasCrCard IsActiveMember \
0 2 0.00 1 1 1
1 1 83807.86 1 0 1
2 8 159660.80 3 1 0
3 1 0.00 2 0 0
4 2 125510.82 1 1 1
... ..
9995 5 0.00 2 1 1
9996 10 57369.61 1 1 1
9997 7 0.00 1 0 1
9998 3 75075.31 2 1 0
9999 4 130142.79 1 1 0

EstimatedSalary Exited
0 101348.88 1
1 112542.58 0
2 113931.57 1
3 93826.63 0
4 79084.10 0
... ..
9995 96270.64 0
9996 101699.77 0
9997 42085.56 1
9998 92888.52 1
```

9999 38190.78 0
[9984 rows x 14 columns]

10. Split the data into training and testing

```
In [43]: from sklearn.model_selection import train_test_split
training_data, testing_data = train_test_split(df, test_size=0.2, random_state=25)
print(f"Mo. of training examples: {training_data.shape[0]}")
print(f"Mo. of testing examples: {testing_data.shape[0]}")

Mo. of training examples: 7987
Mo. of testing examples: 1997

In [ ]:
```