Assignment Date	21 September 2022
Student Name	A.Aruna
Student Roll Number	910619104007
Maximum Marks	2 Marks

Data Visualization and Pre-processing

In [44]:

1. Download the dataset

Dataset successfully downloaded and uploaded in colob

2. Load Data

In [25]:

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

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

In [26]:

```
df.head()
```

Out[26]:

	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

In [27]:

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

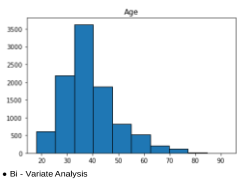
● Univariate Analysis

In [28]:

```
df.hist(column="Age",grid=False,edgecolor='black')
```

Out[28]:

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



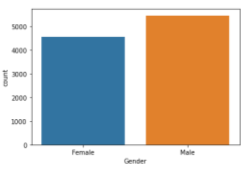
● Bi - Variate Analysis

In [29]:

```
sns.countplot(x='Gender',data=df)
```

Out[29]:

```
<AxesSubplot:xlabel='Gender', ylabel='count'>
```



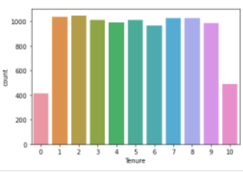
● Multi - Variate Analysis

In [30]:

```
sns.countplot(x="Tenure",data=df)
```

Out[30]:

```
<AxesSubplot:xlabel='Tenure', ylabel='count'>
```

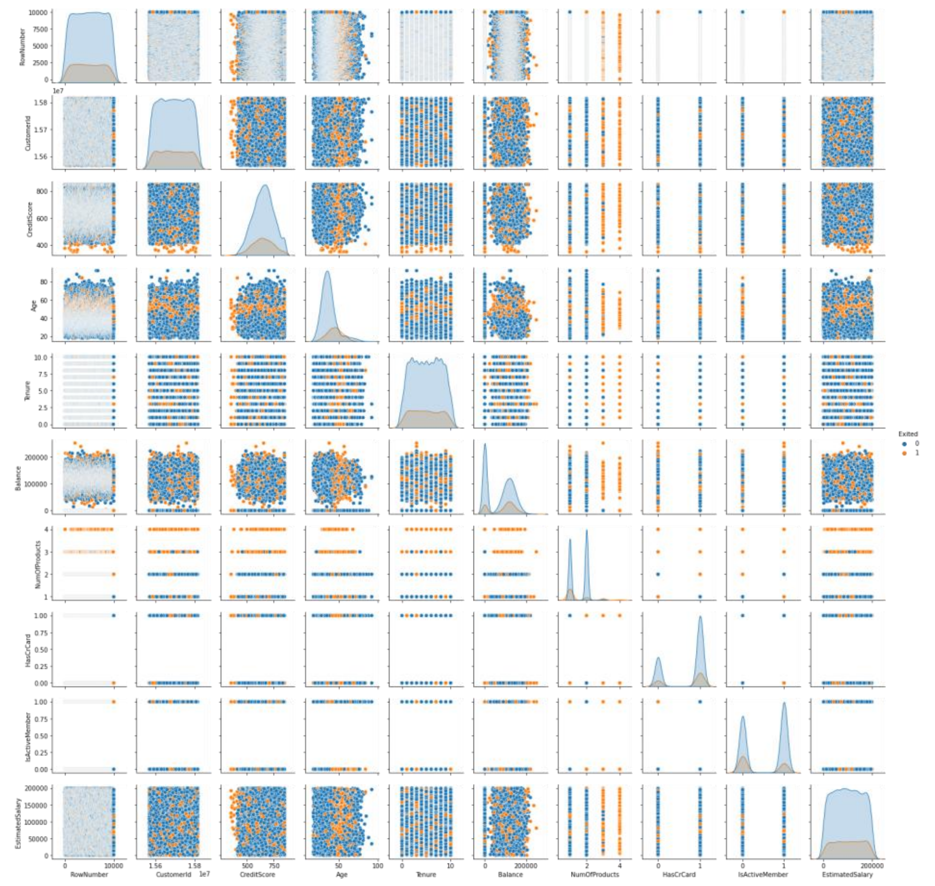


In [32]:

```
sns.pairplot(df, hue='Exited', height=2)
```

Out[32]:

```
<seaborn.axisgrid.PairGrid at 0x180769e67f0>
```



4. Perform descriptive statistics on the dataset

In [33]:

```
df.describe()
```

Out[33]:

	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	10000.0000 00	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

5. Handle the Missing values

In [34]:

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

Out[34]:

```
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
```

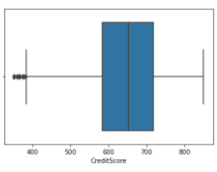
6. Find the outliers and replace the outliers

In [35]:

```
sns.boxplot(x='CreditScore', data=df)
```

Out[35]:

```
<AxesSubplot:xlabel='CreditScore'>
```



In [45]:

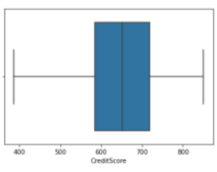
```
import numpy as np
import sklearn
from sklearn.datasets import load_boston

Q1 = np.percentile(df['CreditScore'], 25, interpolation = 'midpoint')
Q3 = np.percentile(df['CreditScore'], 75, interpolation = 'midpoint')
IQR = Q3 - Q1
print("Old Shape: ", df.shape)
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)
```

Out[45]:

```
<AxesSubplot:xlabel='CreditScore'>
```



7. Check for Categorical columns and perform encoding

In [38]:

```
df.head()
```

Out[38]:

	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

In [40]:

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

```
[[1 15634602 'Hargrave' ... 1 1 101348.88]
 [2 15647311 'Hill' ... 0 1 112542.58]
 [3 15619304 'Onio' ... 1 0 113931.57]
 ...
 [9998 15584532 'Liu' ... 0 1 42085.58]
 [9999 15682355 'Sabbatini' ... 1 0 92888.52]
 [10000 15628319 'Walker' ... 1 0 38190.78]]
```

In [41]:

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

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

9. Scale the independent variables

In [42]:

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

```
      RowNumber CustomerId Surname CreditScore Geography Gender Age \
0             1 0.275616      Hargrave         619       France Female 42
1             2 0.326454          Hill         608        Spain Female 41
2             3 0.214421          Onio         502       France Female 42
3             4 0.542636          Boni         699       France Female 39
4             5 0.688778      Mitchell         850        Spain Female 43
...         ...          ...       ...         ...          ... ... ...
9995       9996 0.162119      Obijiaku         771         France Male 39
9996       9997 0.016765     Johnstone         516         France Male 35
9997       9998 0.075327           Liu         709       France Female 36
9998       9999 0.466637     Sabbatini         772        Germany Male 42
9999      10000 0.250483        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              0
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         42085.58       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"No. of training examples: {training_data.shape[0]}")
print(f"No. of testing examples: {testing_data.shape[0]}")
```

```
No. of training examples: 7987
No. of testing examples: 1997
```

```
In [ ]:
```