

## Assignment - 2

<b>PROJECT NAME:</b>	CAR RESALE VALUE PREDICTION
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# Data Visualization and Pre-processing

```
In [2]: from google.colab import drive
drive.mount('/content/drive')
```

Mounted at /content/drive

```
In [3]: import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

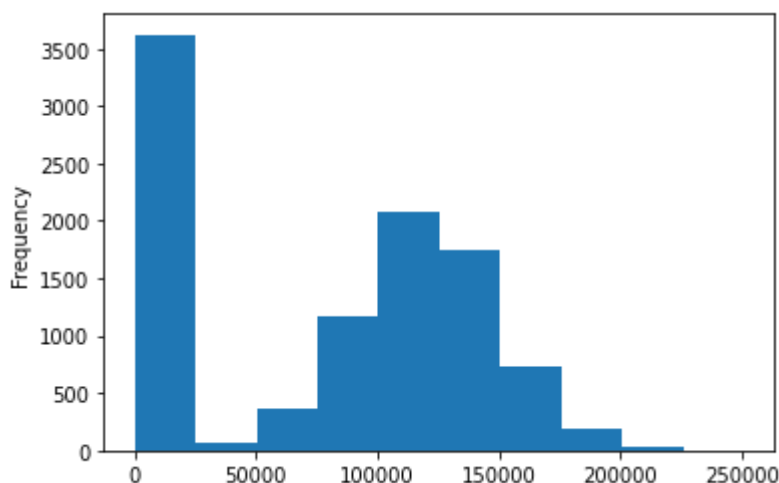
```
In [7]: df=pd.read_csv("/Churn_Modelling.csv")
```

```
In [9]: df.head()
```

```
Out[9]:
```

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Bala
0	1	15634602	Hargrave	619	France	Female	42	2	C
1	2	15647311	Hill	608	Spain	Female	41	1	83807
2	3	15619304	Onio	502	France	Female	42	8	159660
3	4	15701354	Boni	699	France	Female	39	1	C
4	5	15737888	Mitchell	850	Spain	Female	43	2	125510

```
In [ ]: #Univariate Analysis
df["Balance"].plot(kind='hist');
```



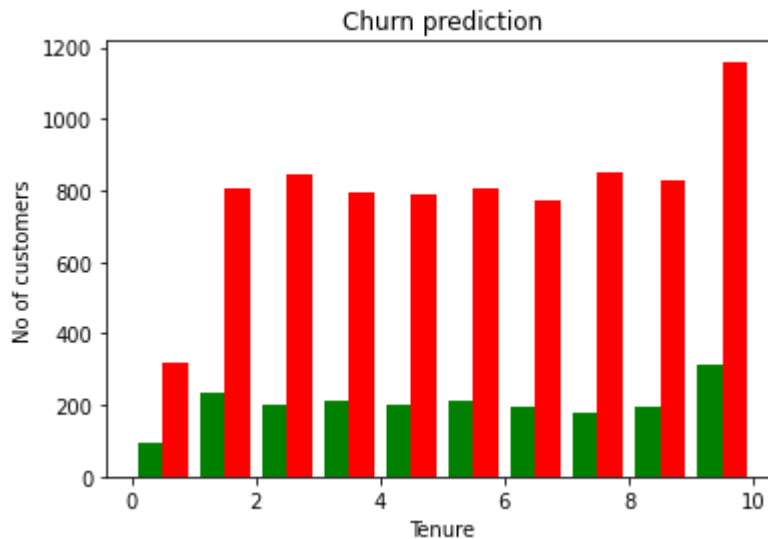
```
In [ ]: #Bi-Variate Analysis
cy=df[df.Exited==1].Tenure
cn=df[df.Exited==0].Tenure
plt.title("Churn prediction")
plt.xlabel("Tenure")
plt.ylabel("No of customers")
plt.hist([cy,cn],color=['green','red'],label=["churn=yes"])
plt.show()
```

```
/usr/local/lib/python3.7/dist-packages/numpy/core/fromnumeric.py:3208: Visible
DeprecationWarning: Creating an ndarray from ragged nested sequences (which is
a list-or-tuple of lists-or-tuples-or ndarrays with different lengths or shape
s) is deprecated. If you meant to do this, you must specify 'dtype=object' whe
n creating the ndarray.
```

```
    return asarray(a).size
```

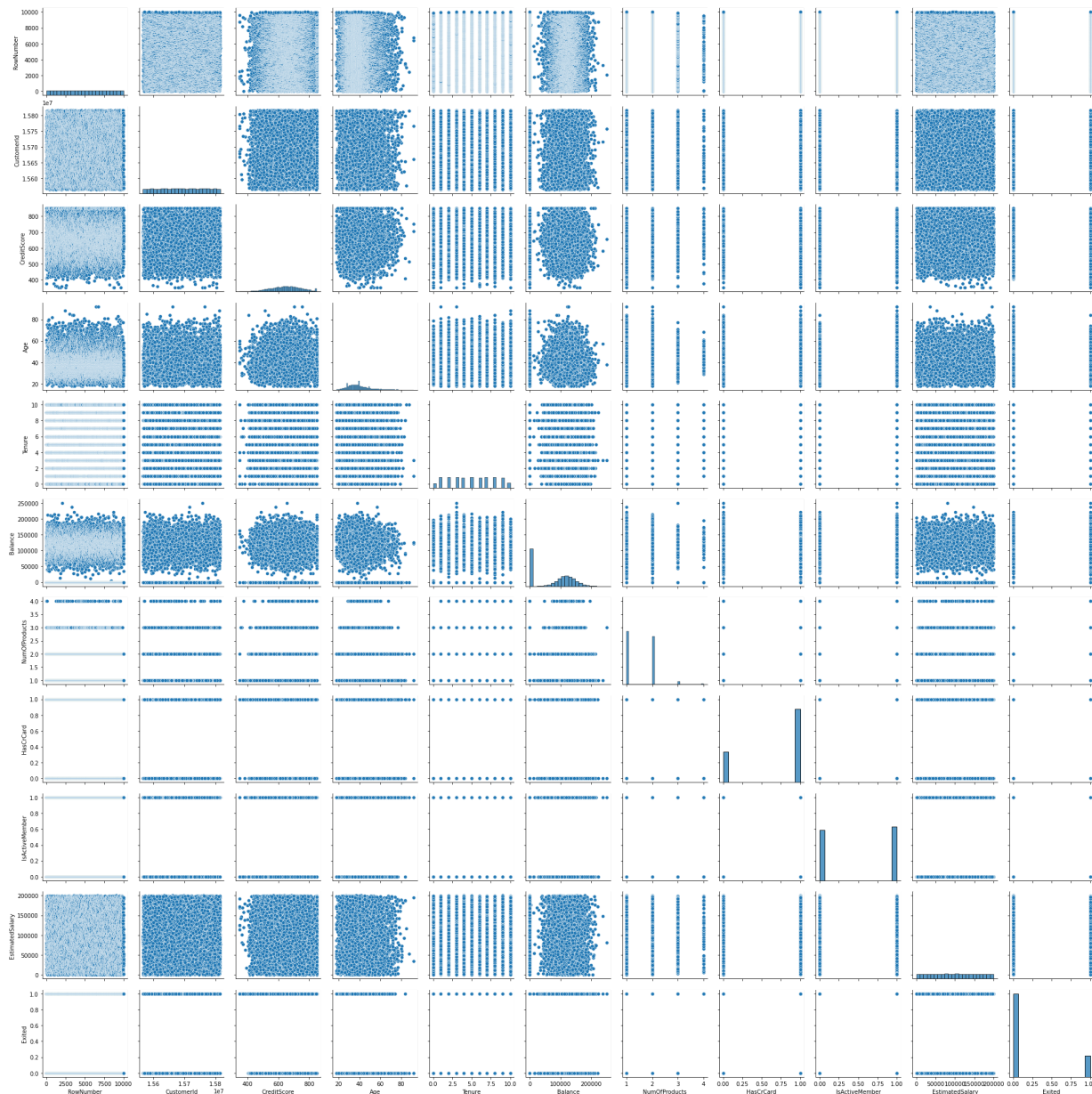
```
/usr/local/lib/python3.7/dist-packages/matplotlib/cbook/__init__.py:1376: Visi
bleDeprecationWarning: Creating an ndarray from ragged nested sequences (which
is a list-or-tuple of lists-or-tuples-or ndarrays with different lengths or sh
apes) is deprecated. If you meant to do this, you must specify 'dtype=object'
when creating the ndarray.
```

```
X = np.atleast_1d(X.T if isinstance(X, np.ndarray) else np.asarray(X))
```



```
In [ ]: #Multi-variate Analysis
sns.pairplot(df)
```

```
Out[ ]: <seaborn.axisgrid.PairGrid at 0x7f54396e8e10>
```



```
In [ ]: #Descriptive statistics
df.describe()
```

Out[ ]:	RowNumber	CustomerId	CreditScore	Age	Tenure	Balance
count	10000.00000	1.000000e+04	10000.000000	10000.000000	10000.000000	10000.000000
mean	5000.50000	1.569094e+07	650.528800	38.921800	5.012800	76485.889288
std	2886.89568	7.193619e+04	96.653299	10.487806	2.892174	62397.405200
min	1.00000	1.556570e+07	350.000000	18.000000	0.000000	0.000000
25%	2500.75000	1.562853e+07	584.000000	32.000000	3.000000	0.000000
50%	5000.50000	1.569074e+07	652.000000	37.000000	5.000000	97198.540000
75%	7500.25000	1.575323e+07	718.000000	44.000000	7.000000	127644.240000
max	10000.00000	1.581569e+07	850.000000	92.000000	10.000000	250898.090000

```
In [ ]: #Handle The Missing values
df.isnull().any()
```

```
Out[ ]: 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
```

```
In [ ]: df.isnull().sum()
```

```
Out[ ]: 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
```

```
In [ ]: #Find the outliers
        df.skew()
```

/usr/local/lib/python3.7/dist-packages/ipykernel\_launcher.py:2: FutureWarning: Dropping of nuisance columns in DataFrame reductions (with 'numeric\_only=None') is deprecated; in a future version this will raise TypeError. Select only valid columns before calling the reduction.

```
Out[ ]: RowNumber      0.000000
        CustomerId     0.001149
        CreditScore    -0.071607
        Age            1.011320
        Tenure          0.010991
        Balance        -0.141109
        NumOfProducts   0.745568
        HasCrCard       -0.901812
        IsActiveMember -0.060437
        EstimatedSalary 0.002085
        Exited          1.471611
        dtype: float64
```

```
In [ ]: #Split data into dependent and independent variables
        x=df.iloc[:,3:13].values
        y=df.iloc[:,13:14].values
        x.shape
```

```
Out[ ]: (10000, 10)
```

```
In [ ]: y.shape
```

Out[ ]: (10000, 1)

```
In [ ]: #Categorical columns and encoding
from sklearn.compose import ColumnTransformer
from sklearn.preprocessing import OneHotEncoder
ct=ColumnTransformer([("oh",OneHotEncoder(),[1,2])],remainder="passthrough")
x=ct.fit_transform(x)
x.shape
```

Out[ ]: (10000, 13)

```
In [ ]: df["Gender"].unique()
```

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

```
In [ ]: #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,y,test_size=0.2,random_state=42)
x_train.shape
```

Out[ ]: (8000, 13)

```
In [ ]: x_test.shape
```

Out[ ]: (2000, 13)

```
In [ ]: #Scale the independent variables
from sklearn.preprocessing import StandardScaler
sc=StandardScaler()
x_train=sc.fit_transform(x_train)
x_test=sc.transform(x_test)
```

```
In [ ]: import joblib
joblib.dump(ct,"churn.pkl")
```

Out[ ]: ['churn.pkl']

```
In [ ]: joblib.dump(sc,"churnsc.pkl")
```

Out[ ]: ['churnsc.pkl']