

# PREDICTING THE ENERGY OUTPUT OF WIND TURBINE BASED ON WEATHER CONDITION

## ASSIGNMENT - 2

Date	26th September 2022
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Domain Name	Education
Project Name	Predicting The Energy Output Of Wind Turbine Based On Weather Condition
Maximum Marks	2 Marks

### 1.)IMPORT THE REQUIRED LIBRARIES

```
In [1]: import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

### 2.)DOWNLOAD AND UPLOAD THE DATASET

#### Download and Upload the Dataset

```
In [2]: df = pd.read_csv('Churn_Modelling.csv')
df.head()
```

Out[2]:

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

### 3.)HANDLE MISSING VALUES IN THE DATASET

#### Handle the Missing Values in the Dataset

```
In [3]: #Removing Unwanted Values  
df = df.drop(columns=['RowNumber', 'CustomerId', 'Surname'])
```

```
In [4]: df.isnull().sum()
```

```
Out[4]: 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 [5]: df.shape
```

```
Out[5]: (10000, 11)
```

### 4.) PERFORM THE DESCRIPTIVE STATISTICS ON THE DATASET

```
In [6]: df.describe()
```

```
Out[6]:
```

	CreditScore	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSalary	Exited
count	10000.000000	10000.000000	10000.000000	10000.000000	10000.000000	10000.000000	10000.000000	10000.000000	10000.000000
mean	650.528800	38.921800	5.012800	76485.889288	1.530200	0.70550	0.515100	100090.239881	0.203700
std	96.653299	10.487806	2.892174	62397.405202	0.581654	0.45584	0.499797	57510.492818	0.402769
min	350.000000	18.000000	0.000000	0.000000	1.000000	0.000000	0.000000	11.580000	0.000000
25%	584.000000	32.000000	3.000000	0.000000	1.000000	0.000000	0.000000	51002.110000	0.000000
50%	652.000000	37.000000	5.000000	97198.540000	1.000000	1.000000	1.000000	100193.915000	0.000000
75%	718.000000	44.000000	7.000000	127644.240000	2.000000	1.000000	1.000000	149388.247500	0.000000
max	850.000000	92.000000	10.000000	250898.090000	4.000000	1.000000	1.000000	199992.480000	1.000000

```
In [7]: df.info()
```

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

## 5.) PERFORM VARIOUS VISUALISATIONS

### a.) UNIVARIANTE ANALYSIS

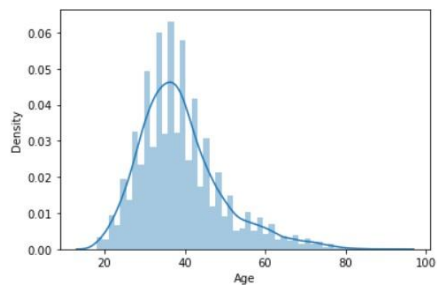
#### Perform Various Visualisations

##### Univariate Analysis

```
In [8]: sns.distplot(df.Age)
```

C:\Users\Prem\anaconda3\lib\site-packages\seaborn\distributions.py:2619: FutureWarning: `distplot` is a deprecated function and will be removed in a future version. Please adapt your code to use either `displot` (a figure-level function with similar flexibility) or `histplot` (an axes-level function for histograms).  
warnings.warn(msg, FutureWarning)

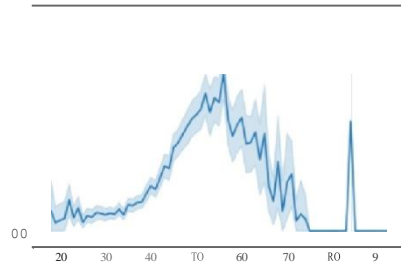
```
Out[8]: <AxesSubplot:xlabel='Age', ylabel='Density'>
```



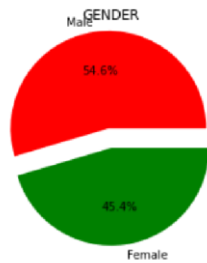
```
In      sns.lineplot(df.Age,df.Exited)

C:\users\Prem\anaconda3\lib\site-packages\seaborn\decorators.py:36:FutureWarning:Passthe*0110w1"@variablesaskeywOrdarg
s:x,y.Fromversion0.12,theonlyvalidpositionalargumentwillbe'data',andpassingotherargumentswithoutanexplicit
keywordwillresultinanerrorormisinterpretation.
```

```
0.J[9] <AxesSubplot:xlabel='Age', ylabel= Exited'>
```



```
In [10]: plt.pie(df.Gender.value_counts(),[0.2,0],colors=['red','green'],labels=['Male','Female'],autopct='%1.1f%%')
plt.title('GENDER')
plt.show()
```

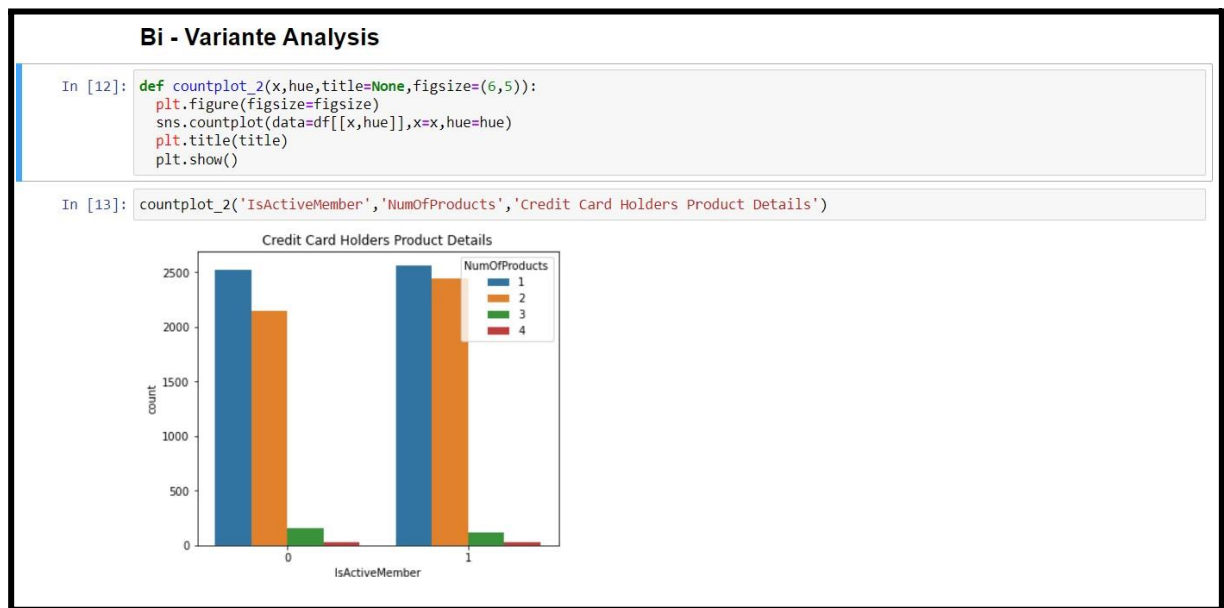


```
n[]:sns.be_cplot(df.NumofProducts.value_counts().index,df.NumOfProducts.value_counts())

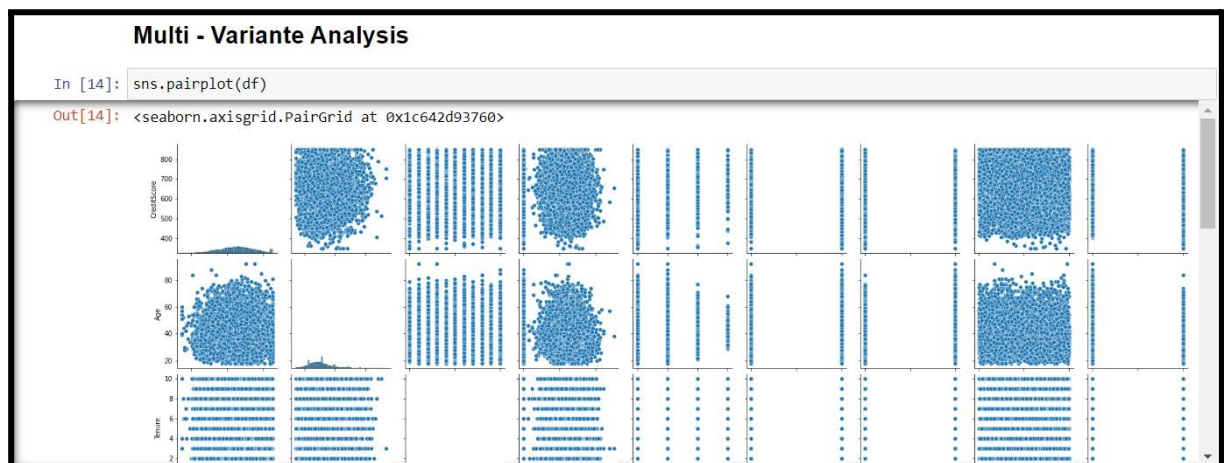
C:\Users\Prem\anaconda3\lib\siteoacleges\seaborn\decorators.py:36:FutureNarning:Passthe*ollowingvariablesaskeywOrdarg
s:x,y.Frow verzl on a.12, The only val id pos it i on al argument will be dad a', and ou ssi ng of der arguments i9i th out an explic it
ma rnings . warn(

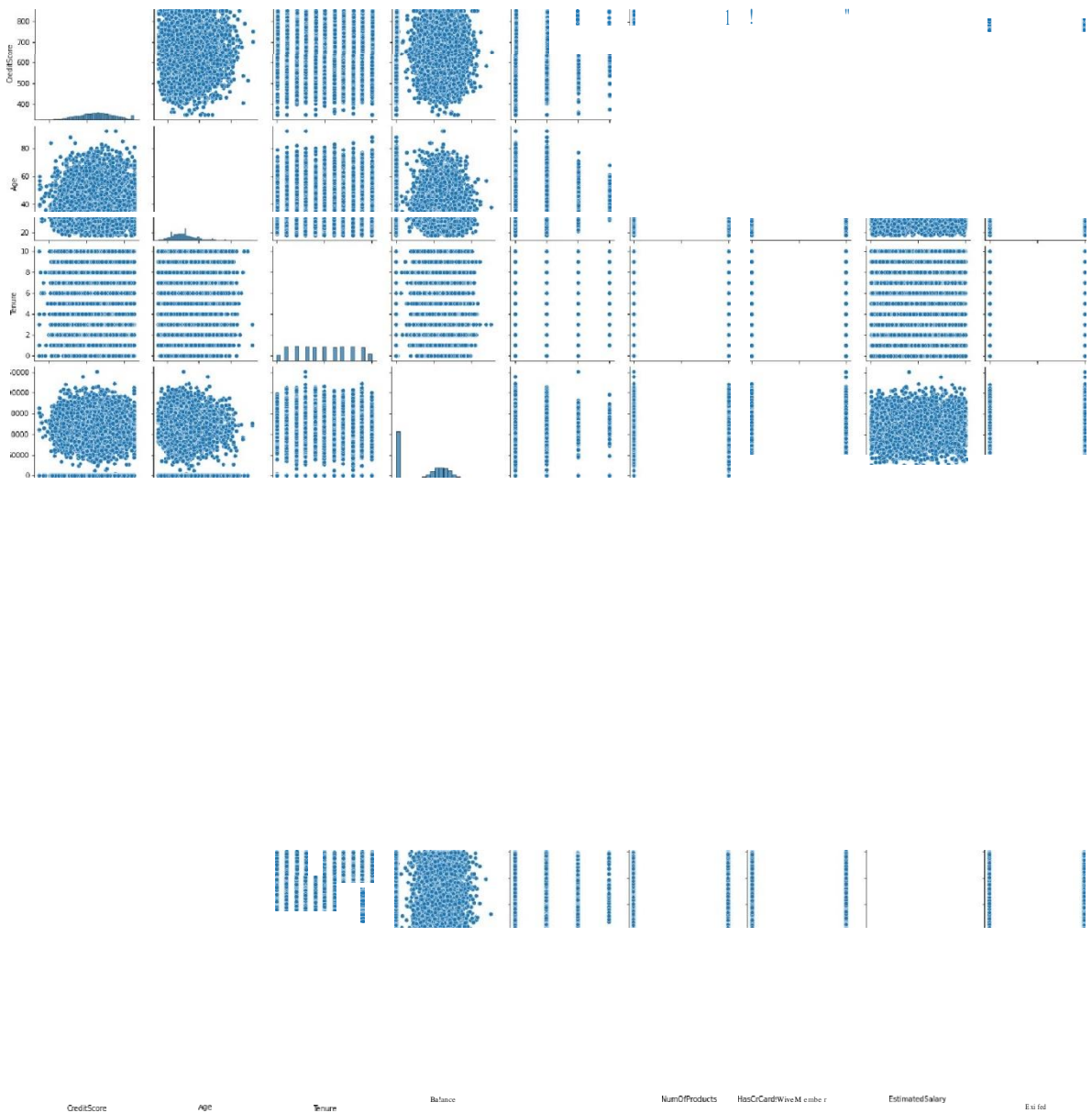
<AxesSublot:ylabel='Num0*Produ<ts'>
```

## b.) BI - VARIANTE ANALYSIS



## c.) MULTI - VARIANTE ANALYSIS





```
In [15]: df.com()
```

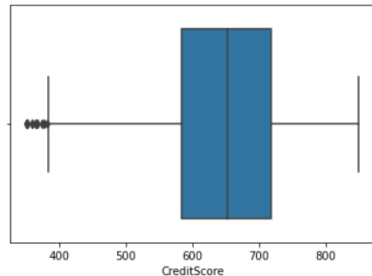
	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSalary	Exited
CreditScore	1.000000 -0.0089b5	0.00D842	0.006268	0.012238	fi 00S45B	0.025654	0.00fi 384	-0.027094
Age	-0.003966 4.0000D0	-0.00999Z	0.028308	-0.030680	-0.0fi 4 724	0.085472	-0.00720fi	0.285323
Tenure	0.000842 -0.009fi9J	fi.00D000	-0.04 2254	0.013^44	0.022583	-0.02B362	0.007Z84	-0.0 4 40D4
Balance	0 00626fi 0.02B3D8	-O 04 2Z54	4 000000	-0.304fi B0	-0.04 485B	-O D084	0 012Z97	4 B538
NumOfProducts	0 012288 -0 0306B0	0 04 344H	-0.304fi 30	1 000000	0 83	0 0098fi 2	0 01^204	-0 0HT820
HasCrCard	-0 005458 0 OU 721	0 022583	-0 04 4858	0 003fi 88	fi 00000D	-0 0fi 4 866	0 009983	-0 38
IsActiveMember	0 025651	0 085472	-0.028362	-0.010084	0.008612	-0.011866	1.000000	-0.011421 -0.156128
EstimatedSalary	-00fi	-00072D1000778H002797		001420A-0009933		-0fi4424	10000000002097	
Exited	-0.027094	0.285323	-0.014001	0.118533	-0.047820	-0.007138	-0.156128	0.012097 1.000000

## 6.) FIND AND REPLACE THE OUTLIERS

### Find the Outliers

```
In [18]: sns.boxplot(df.CreditScore)
keyword will result in an error or misinterpretation.
warnings.warn()
```

```
Out[18]: <AxesSubplot:xlabel='CreditScore'>
```



### Replace the Outliers

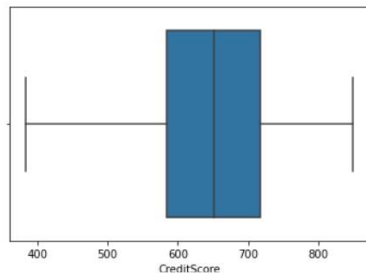
```
In [19]: Q1 = df.CreditScore.quantile(0.25)
Q3 = df.CreditScore.quantile(0.75)
IQR = Q3-Q1
upper_limit = Q3 + (1.5*IQR)
lower_limit = Q1 - (1.5*IQR)
```

```
In [20]: df['CreditScore'] = np.where(df['CreditScore'] < lower_limit, 650, df['CreditScore'])
sns.boxplot(df.CreditScore)
```

C:\Users\Prem\anaconda3\lib\site-packages\seaborn\decorators.py:36: FutureWarning: Pass the following variable as a keyword argument: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit key word will result in an error or misinterpretation.

```
warnings.warn()
```

```
Out[20]: <AxesSubplot:xlabel='CreditScore'>
```



## 7.) CHECK FOR CATEGORICAL COLUMNS AND ENCODE THEM

### Check for Categorical Columns and Perform Encoding

```
In [21]: from sklearn.preprocessing import LabelEncoder
le = LabelEncoder()
df.Geography = le.fit_transform(df.Geography)
df.Gender = le.fit_transform(df.Gender)
```

```
In [22]: df.head()
```

```
Out[22]:
```

	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSalary	Exited
0	619	0	0	42	2	0.00	1	1	1	101348.88	1
1	608	2	0	41	1	83807.86	1	0	1	112542.58	0
2	502	0	0	42	8	159680.80	3	1	0	113931.57	1
3	699	0	0	39	1	0.00	2	0	0	93826.63	0
4	850	2	0	43	2	125510.82	1	1	1	79084.10	0

## 8.) SPLIT DATA INTO DEPENDENT AND INDEPENDENT VARIABLES

### Split the data into Dependent and Independent Variables

```
In [23]: X = df.drop(columns=['Exited'])  
X.head()
```

Out[23]:

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

```
In [24]: Y = df.Exited  
Y.head()
```

Out[24]:

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

## 9.) SCALE THE INDEPENDENT VARIABLES

### Scale the Independent Variables

```
In [25]: from sklearn.preprocessing import MinMaxScaler  
scale = MinMaxScaler()  
X_scaled = pd.DataFrame(scale.fit_transform(X), columns=X.columns)
```

## 10.) SPLIT THE DATA INTO TRAINING AND TESTING

### Split the data into Training and Testing

```
In [26]: from sklearn.model_selection import train_test_split  
x_train, y_train, x_test, y_test = train_test_split(X_scaled, Y, test_size=0.2, random_state=0)
```

```
In [27]: X_scaled.shape
```

Out[27]: (10000, 10)

```
In [28]: x_train.shape
```

Out[28]: (8000, 10)