ASSIGNMENT 2

MAHENDRA ENGINEERING COLLEGE

FOR WOMEN

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CLASS :4 year ece

SUBJECT:IBM

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```
#libraries
 importpandasas
 pdimportnumpyas np
 importmatplotlib.pyplotasplt
 %matplotlib inline

 #loaddataset
 df=pd.read_csv(r"/content/Churn_Modelling.csv")df.hea

 d(10)
```

	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
5	6	15574012	Chu	645	Spain	Male	44
6	7	15592531	Bartlett	822	France	Male	50
7	8	15656148	Obinna	376	Germany	Female	29
8	9	15792365	He	501	France	Male	44
9	10	15592389	H?	684	France	Male	27

	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	
5	8	113755.78	2	1	0	
6	7	0.00	2	1	1	
7	4	115046.74	4	1	0	

```
3          93826.63       0
4          79084.10       0
5         149756.71       1
6          10062.80       0
7         119346.88       1
8          74940.50       0
9          71725.73       0
```

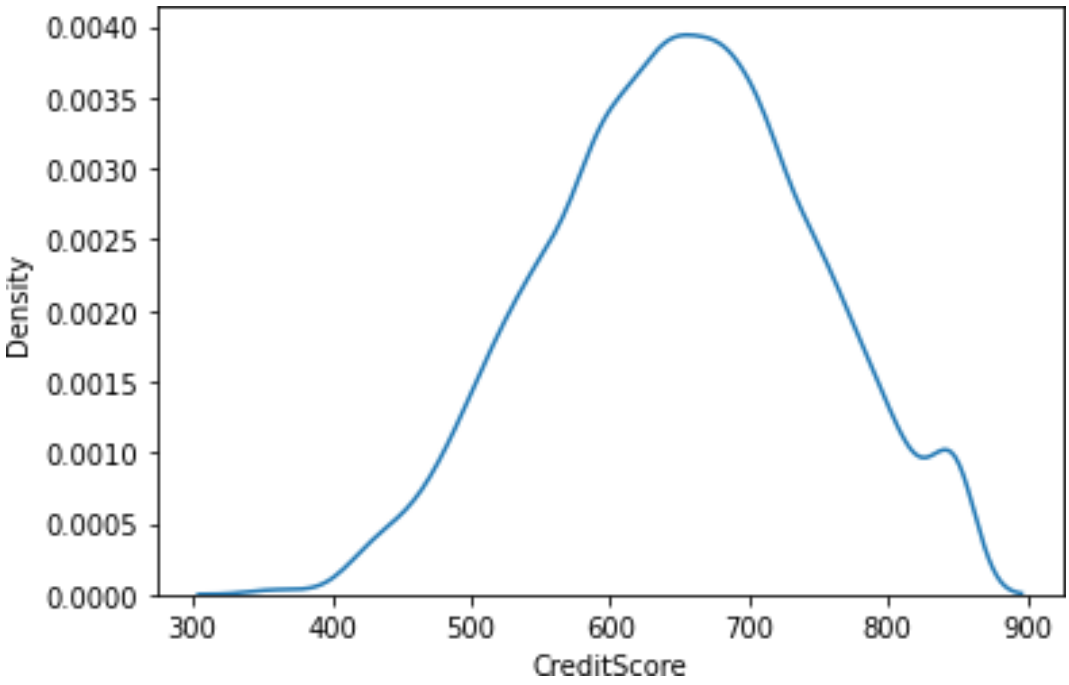
```
df.info()
```

```
<class
'pandas.core.frame.DataFrame'>RangeIn
dex:10000entries,0to9999Datacolumns(t
otal 14 columns):
 #   Column           Non-NullCountDtype
---  -------          --------------  -----
 0   RowNumber        10000non-nullint64
 1   CustomerId       10000non-nullint64
 2   Surname          10000non-null  object
 3   CreditScore      10000non-nullint64
 4   Geography        10000non-nullobject
 5   Gender           10000non-nullobject
 6   Age              10000non-nullint64
 7   Tenure           10000non-nullint64
 8   Balance          10000non-nullfloat64
 9   NumOfProducts    10000non-nullint64
 10  HasCrCard        10000non-nullint64
 11  IsActiveMember   10000non-nullint64
 12  EstimatedSalary10000non-null  float64
 13  Exited           10000 non-
nullint64dtypes: float64(2),
int64(9),object(3)memoryusage:1.1+MB
```

```
#Visualizations#Univa
riate Analysisimport
seabornassns
```

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

```
<matplotlib.axes._subplots.AxesSubplotat0x7fc4a0cd2790>
```



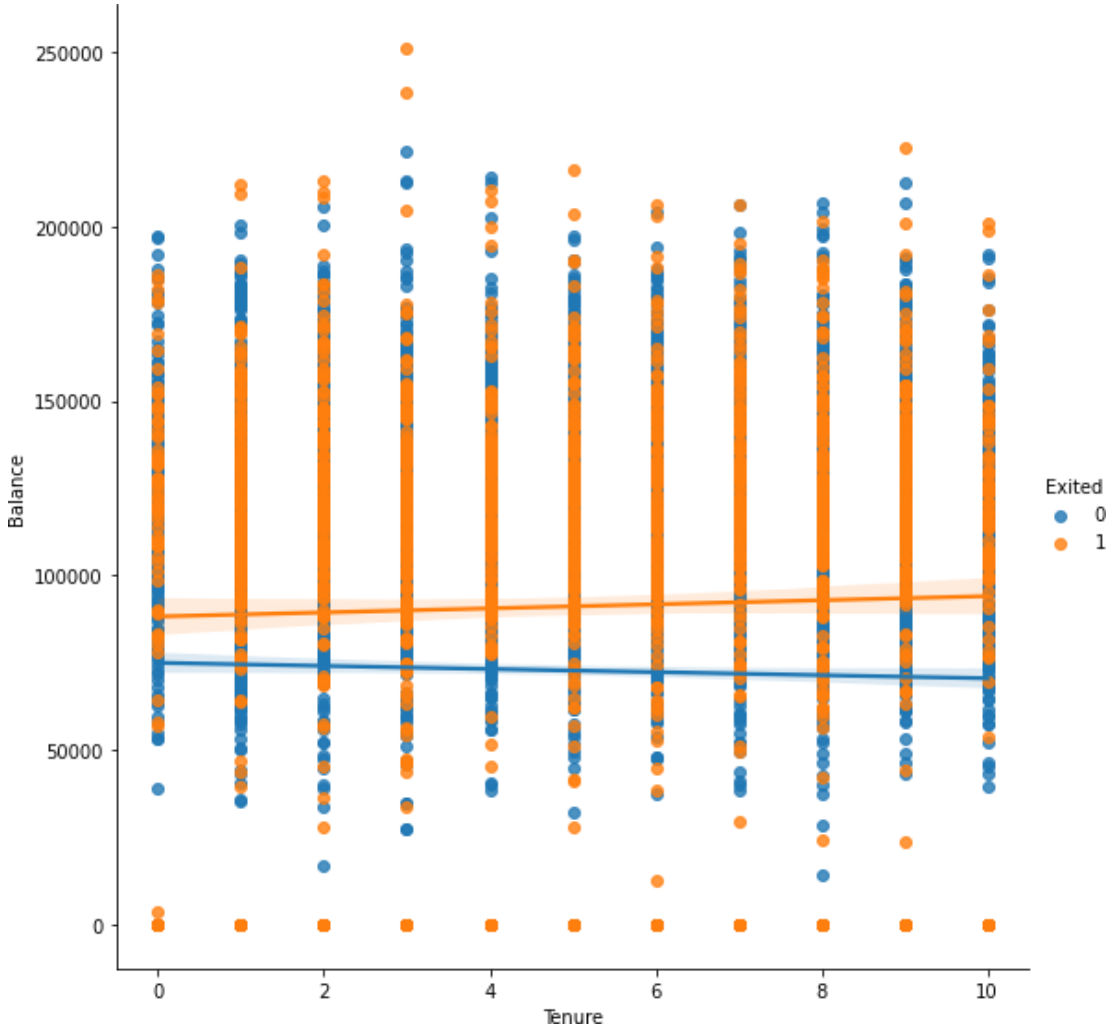

```
#Bi-VariateAnalysis

plt.bar(df.CustomerId,
df.CreditScore)plt.title('CreditScore'
)plt.xlabel('CustomerId')plt.ylabel('C
reditScore')
```

```
Text(0,0.5,'CreditScore')
```

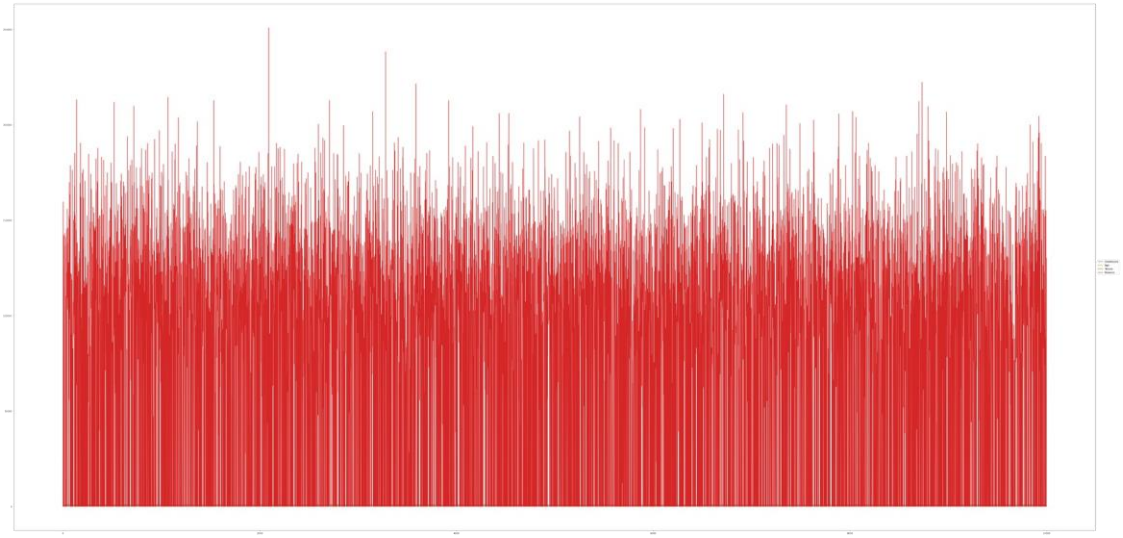

```
sns.lmplot(x='Tenure', y='Balance',data=df,hue='Exited',size=8)
```

```
/usr/local/lib/python3.7/dist-
packages/seaborn/regression.py:581:UserWarning: The `size` parameter
has been renamed to `height`; pleaseupdateyourcode.
  warnings.warn(msg,UserWarning)
```

```
<seaborn.axisgrid.FacetGridat0x7fc4a149e2d0>
```



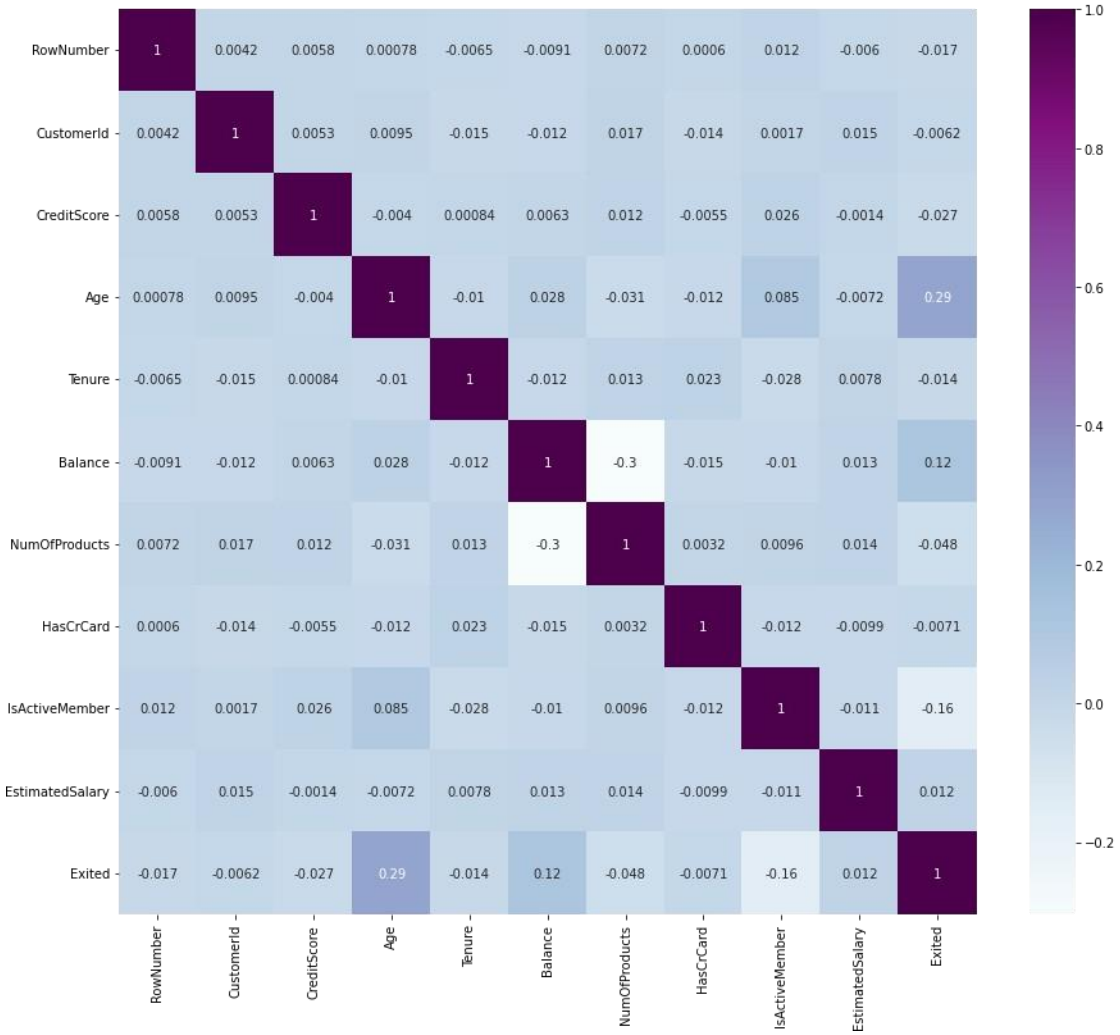

```
#Multi -Variate Analysis
ax=df[["CreditScore","Age","Tenure","Balance"]].plot(figsize=(80,4
0))ax.legend(loc='centerleft',bbox_to_anchor=(1,0.5));
```



```
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
```

```
plt.figure(figsize=(15,13))sns.heatmap(df.corr(),anno
t=True,cmap='BuPu')plt.show()
```




```
df.drop(['RowNumber',

'CustomerId','Surname'],axis=1,inplace=True)df.head()
```

```
   CreditScore Geography  Gender  Age  Tenure    Balance
NumOfProducts  \
0          619    France  Female   42       2       0.00
1
1          608     Spain  Female   41       1   83807.86
1
2          502    France  Female   42       8  159660.80
3
3          699    France  Female   39       1       0.00
2
4          850     Spain  Female   43       2  125510.82
1

   HasCrCardIsActiveMemberEstimatedSalaryExited0    1
         1               101348.881
```

```
1           0               1        112542.58       0
2           1               0        113931.57       1
3           0               0         93826.63       0
4           1               1         79084.10       0
```

```
df.info()
```

```
<class
'pandas.core.frame.DataFrame'>RangeIn
dex:10000entries,0to9999Datacolumns(t
otal 11 columns):
 #   Column           Non-NullCountDtype
---  -------          --------------  -----
 0   CreditScore      10000non-nullint64
 1   Geography        10000non-nullobject
 2   Gender           10000non-nullobject
 3   Age              10000non-nullint64
 4   Tenure           10000non-nullint64
 5   Balance          10000non-nullfloat64
 6   NumOfProducts    10000non-nullint64
 7   HasCrCard        10000non-nullint64
 8   IsActiveMember   10000non-nullint64
 9   EstimatedSalary10000non-null  float64
 10  Exited           10000 non-
nullint64dtypes: float64(2),
int64(7),object(2)memoryusage:859.5+KB
```

```
df["Geography"].unique()
```

```
array(['France', 'Spain', 'Germany'],
```

```
dtype=object)df["Gender"].unique()
```

```
array(['Female','Male'],dtype=object)geo=pd.get_dummi
```

```
es(df["Geography"],drop_first=False)geo.head()
```

```
   FranceGermanySpain0  1
        0        0
1       0        0      1
2       1        0      0
3       1        0      0
4       0        0      1
```

```
gen=pd.get_dummies(df["Gender"],drop_first=False)df=p
```

```
d.concat([df,geo,gen],axis=1)
```

```
df
```

```
      CreditScoreGeographyGenderAgeTenure
                                                    Balance
NumOfProducts\
```

```
0             619    France  Female   42       2       0.00
1
1             608     Spain  Female   41       1   83807.86
1
2             502    France  Female   42       8  159660.80
3
3             699    France  Female   39       1       0.00
2
4             850     Spain  Female   43       2  125510.82
1
...           ...       ...     ...  ...     ...        ...
...
9995          771    France    Male   39       5       0.00
2
9996          516    France    Male   35      10   57369.61
1
9997          709    France  Female   36       7       0.00
1
9998          772   Germany    Male   42       3   75075.31
2
9999          792    France  Female   28       4  130142.79
1

      HasCrCardIsActiveMemberEstimatedSalaryExitedFranceGermany\

0             1               1        101348.88       1       1
0
1             0               1        112542.58       0       0
0
2             1               0        113931.57       1       1
0
3             0               0         93826.63       0       1
0
4             1               1         79084.10       0       0
0
...         ...             ...              ...     ...     ...
...9
995           1               0         96270.64       0       1
0
9996          1               1        101699.77       0       1
0
9997          0               1         42085.58       1       1
0
9998          1               0         92888.52       1       0
1
9999          1               0         38190.78       0       1
0

      Spain  Female  Male
0         0       1     0
```

```
1          1       1     0
2          0       1     0
3          0       1     0
4          1       1     0
...      ...     ...   ...
9995       0       0     1
9996       0       0     1
9997       0       1     0
9998       0       0     1
9999       0       1     0
```

```
[10000rowsx16columns]df.drop(["Geography","Gender"],
```

```
axis=1,inplace=True)df.head()
```

```
   CreditScoreAgeTenure   BalanceNumOfProductsHasCrCard\0    61942
           2              0.00 1  1
1          608   41       1   83807.86              1          0
2          502   42       8159660.80               3          1
3          699   39       1       0.00              2          0
4          850   43       2125510.82                1          1

   IsActiveMemberEstimatedSalaryExitedFranceGermanySpainFemale\
0              1        101348.88       1       1        0      0
1
1              1        112542.58       0       0        0      1
1
2              0        113931.57       1       1        0      0
1
3              0         93826.63       0       1        0      0
1
4              1         79084.10       0       0        0      1
1

   Male
0     0
1     0
2     0
3     0
4     0
```

```
x=df.drop('Exited',axis=1)
```

```
x
```

```
      CreditScore  Age  Tenure    Balance  NumOfProducts  HasCrCard  \
0             619   42       2       0.00              1          1
1             608   41       1   83807.86              1          0
```

```
2             502   42       8  159660.80              3          1
3             699   39       1       0.00              2          0
4             850   43       2  125510.82              1          1
...           ...  ...     ...        ...            ...        ...
9995          771   39       5       0.00              2          1
9996          516   35      10   57369.61              1          1
9997          709   36       7       0.00              1          0
9998          772   42       3   75075.31              2          1
9999          792   28       4  130142.79              1          1

      IsActiveMember  EstimatedSalary  France  Germany  Spain  Female
Male
0                  1        101348.88       1        0      0       1
0
1                  1        112542.58       0        0      1       1
0
2                  0        113931.57       1        0      0       1
0
3                  0         93826.63       1        0      0       1
0
4                  1         79084.10       0        0      1       1
0
...              ...              ...     ...      ...    ...     ...
...9
995                0         96270.64       1        0      0       0
1
9996               1        101699.77       1        0      0       0
1
9997               1         42085.58       1        0      0       1
0
9998               0         92888.52       0        1      0       0
1
9999               0         38190.78       1        0      0       1
0

[10000 rows x 13

columns]y=df['Exited']

y

0       1
1       0
2       1
3       0
4       0
       ..
9995    0
9996    0
9997    1
9998    1
```

```
9999    0
Name: Exited, Length: 10000, dtype:

int64df.shape

(10000,14)

x.shape(10000

,13)

y.shape(

10000,)

fromsklearn.model_selectionimporttrain_test_split

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

x_train.shape

(8000,13)

x_test.shape

(2000,13)

y_test.shape

(2000,)

from sklearn.preprocessing import

StandardScalersc =StandardScaler()

x_train =

sc.fit_transform(x_train)x_train

 array([[0.16958176, -0.46460796,0.00666099,   ...,  1.74309049,
         1.09168714, -1.09168714],
       [-2.30455945,  0.30102557,-1.37744033,  ..., -0.57369368,
        -0.91601335,  0.91601335],
       [-1.19119591, -0.94312892,-1.031415   , ..., -0.57369368,
         1.09168714, -1.09168714],
       ...,
         [0.9015152, -0.36890377,0.00666099,   ..., -0.57369368,
        -0.91601335,  0.91601335],
       [-0.62420521, -0.08179119,1.39076231,   ...,  1.74309049,
         1.09168714, -1.09168714],
       [-0.28401079,  0.87525072,-1.37744033,  ..., -0.57369368,
         1.09168714, -1.09168714]])

x_test=sc.transform(x_test)
```

```
x_test

array([[-0.55204276, -0.36890377,1.04473698, ...,-0.57369368,
         1.09168714,-1.09168714],
       [-1.31490297,  0.10961719,-1.031415   , ..., -0.57369368,
         1.09168714, -1.09168714],
        [0.57162971,  0.30102557,1.04473698,   ...,  1.74309049,
         1.09168714, -1.09168714],
       ...,
       [-0.74791227, -0.27319958,-1.37744033,  ...,  1.74309049,
        -0.91601335,  0.91601335],
       [-0.00566991, -0.46460796,-0.33936434,  ..., -0.57369368,
        -0.91601335,  0.91601335],
       [-0.79945688, -0.84742473,1.04473698,   ..., -0.57369368,
        -0.91601335,  0.91601335]])
```