Mahendra engineering college for women

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assignment -2

```
    #libraries

    import pandas as pd
import numpy as np

    import matplotlib.
pyplot as plt %matplotlib
inline

    #load dataset

    df = pd.read_csv(r"/
content/Churn_Modelling.csv"
) df.head(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 8 4 142051.07

2 0

1 9 2

134603.88 1

1 1

EstimatedSalary

```
Exited  0          101348.88
     1  1          112542.58
     0  2          113931.57
     1
    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'> RangeIndex:
 10000 entries, 0 to 9999
Data columns (total 14
columns):
```

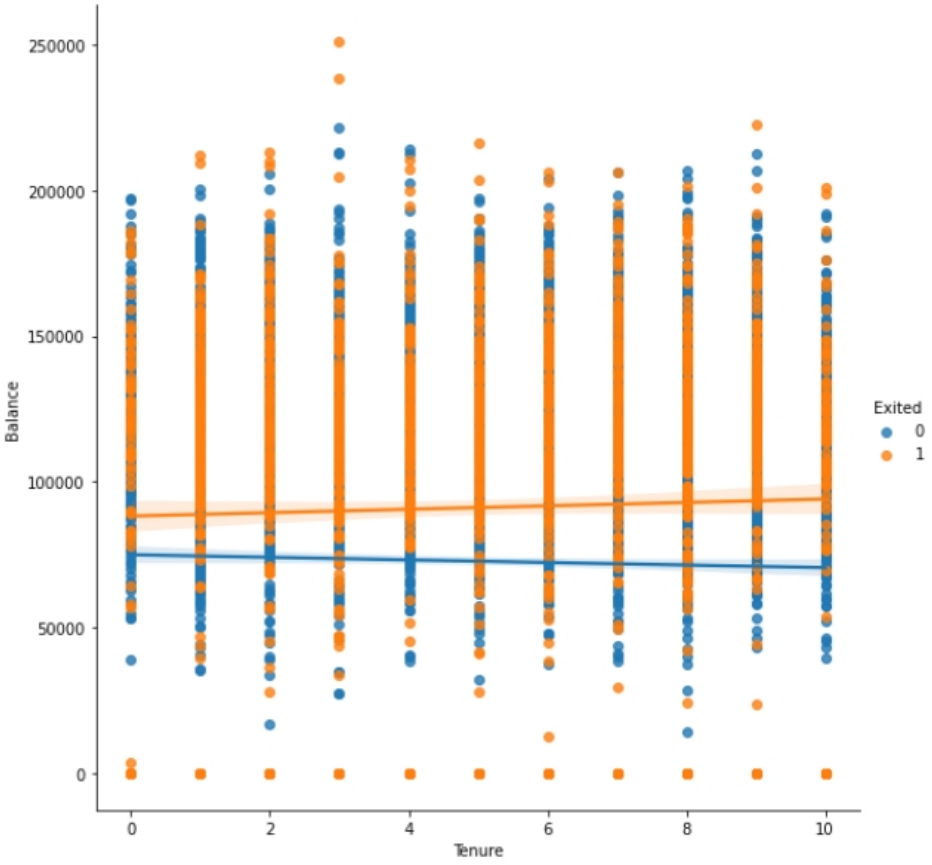
```
     #   Column
Non-Null Count  Dtype

    ---  ------                --
------------  -----   0
RowNumber         10000 non-
null  int64   1
CustomerId        10000 non-
null  int64   2   Surname
       10000 non-null
object  3   CreditScore
 10000 non-null  int64   4
 Geography         10000 non-
null  object  5   Gender
       10000 non-null
object  6   Age
 10000 non-null  int64   7
 Tenure            10000 non-
null  int64   8   Balance
       10000 non-null
```

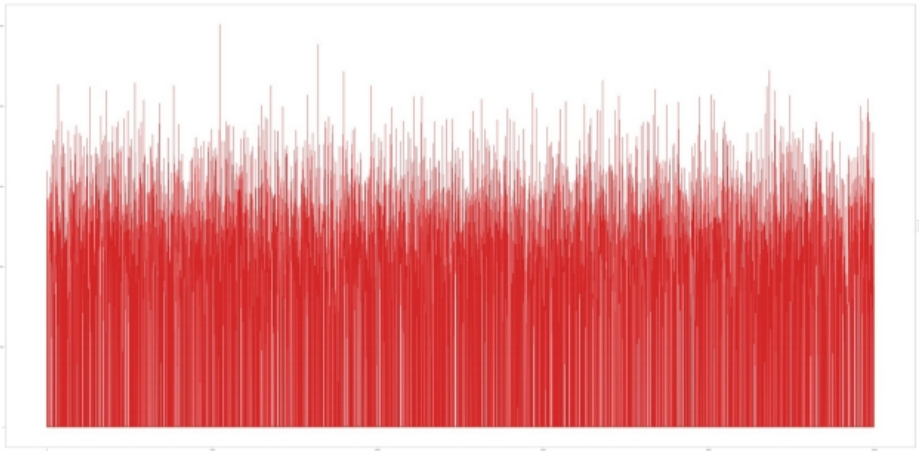

```
    sns.lmplot(x='Tenure',
y='Balance', data=df ,hue='
Exited',size=8) /usr/local/
lib/python3.7/dist-packages/
seaborn/regression.py:581:
UserWarning: The `size`
parameter has been renamed
to `height`; please update
your code.

      warnings.warn(msg,
UserWarning)
```

```
<seaborn.axisgrid.
FacetGrid at 0x7fc4a149e2d0>
```




```
#Multi - Variate
Analysis ax = df[["
CreditScore","Age","Tenure",
"Balance"]].plot(figsize=
(80,40)) ax.legend(loc='
center left', bbox_to_
anchor=(1, 0.5));
```

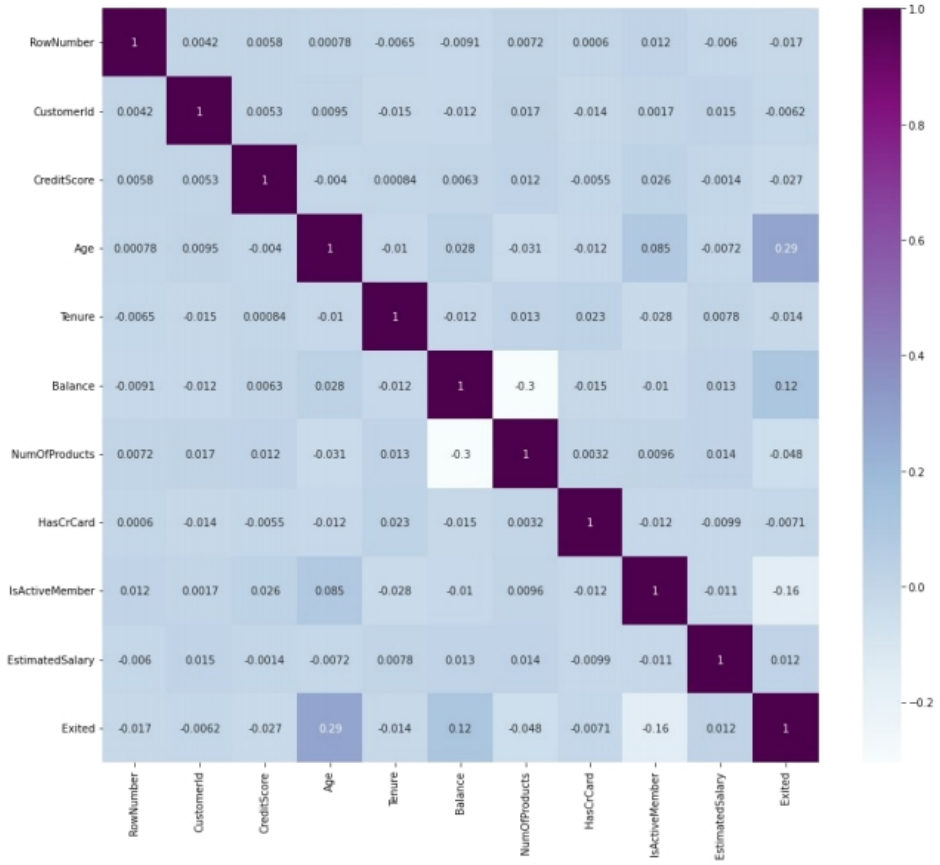


```
df.isnull().sum()
```

```
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(), annot=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

       HasCrCard
```

```
IsActiveMember
EstimatedSalary  Exited  0
        1                1
     101348.88        1
    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'> 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) memory
usage: 859.5+ KB df["
Geography"].unique() array(['
France', 'Spain', 'Germany']
, dtype=object) df["Gender"].
unique() array(['Female', '
Male'], dtype=object) geo=pd.
get_dummies(df["Geography"],
drop_first=False) geo.head()

       France  Germany
Spain 0       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=pd.concat([df, geo,gen],
axis=1)df
```

```
          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

    ...             ...
...      ...   ...      ...
    ...

    ...

    9995           771
France    Male    39        5
      0.00             2

    9996           516
France    Male    35       10
  57369.61             1

    9997           709
France  Female    36        7
```

```
    2                1
       0          113931.57
   1        1        0

    3                0
       0          93826.63
   0        1        0

    4                1
       1          79084.10
   0        0        0

    ...              ...
    ...                   ...
 ...      ...

    ...   9995             1
             0           96270.
64        0        1        0

    9996             1
       1          101699.77
```

```
    ...      ...      ...   ..
.   9995       0        0
1   9996       0        0
1   9997       0        1
0   9998       0        0
1   9999       0        1
0

    [10000 rows x 16
columns]
```

```
    df.drop(["Geography","
Gender"], axis=1, inplace=
True)df.head()
```

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

```
 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
```

```
    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

   ...                  ...
         ...      ...       .
..     ...      ...

   ...

   9995                 0
```

```
random_state=0) x_train.shape
(8000, 13) x_test.shape

    (2000, 13) y_test.shape
(2000,) from sklearn.
preprocessing import
StandardScaler sc =
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  , ...,
```

```
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]])
```