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Student Reg Number	960519104032
Assignment Number	02

1 .DownloadDataset:Chrun-Modelling

2.Load the Dataset import numpy as np import pandas as pd import seaborn as sns import matplotlib.pyplot as plt df = d.read_csv('/content/drive/MyDrive/Churn_Modelling.csv')

RowNumber	Customerld	Surname	CreditScore	Geography	Gender	Age
1			619	France	Female	42
			608	Spain	Female	41
			502	France	Female	42
			699	France	Female	39
			850	Spain	Female	43

df.head()

		15634602	Hargrave	
2		15647311	Hill	
2	3	1 5619304	Onio	
3	4	15701354	Boni	
4	5	15737888	Mitchell	

Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember
\ 02	0.00	1		1
1	83807.86	1		1
2 8	159660.80	3	1	0
3 1	0.00	2		0
4 2	125510.82	1		1

EstimatedSalary	Exited
o 101348.88	1
1 1 12542.58	0

2 113931.57 1

3 93826.63

4 79084.10

```
df = df.drop(columns=['RowNumber',Customerld', 'Surname'))
df.head()
```

2	502	Francee Female
	42	
	8159660.80	
3		

3	699	France	Female	39	1	0.00
2						
4	850	S				

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HasCrCard IsActiveMember EstimatedSaIa ry Exited

1 1 101348.88 1

1 1 112542.58 0

2 1 113931.57 1

3 93826.63 0

4 1 1 79084.10 0

df['IsActivemember'] = IsActiveMember' . astype(category)
df['Exited'] = 'Exited'] . astype(•category')
df['HasCrCard' l = 'HasCrCard ' l .astype(• category')

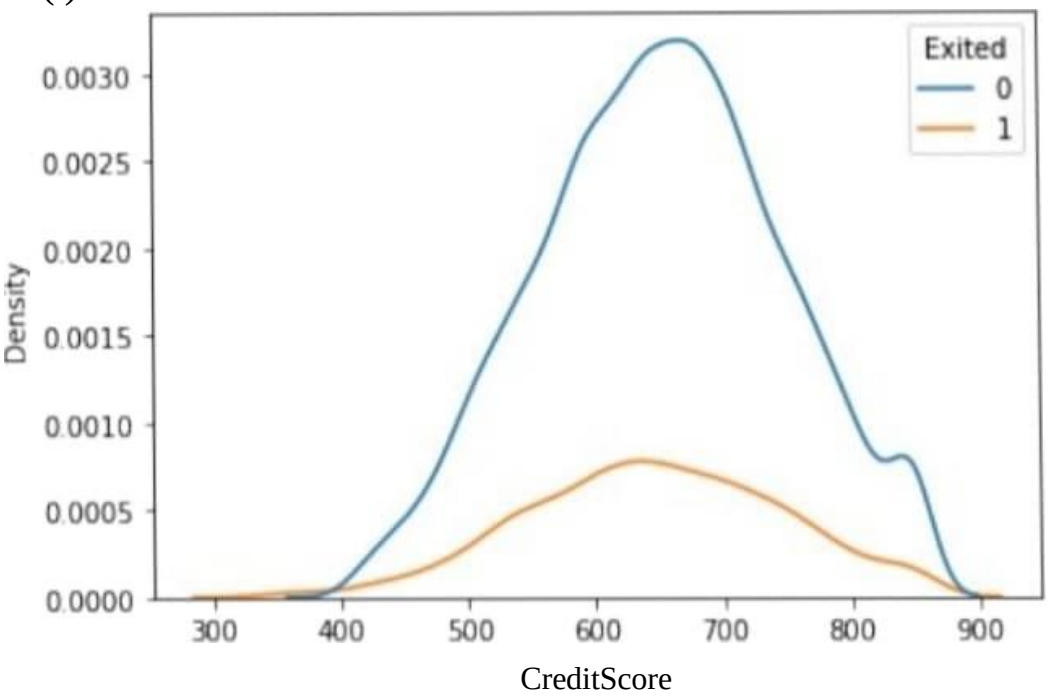
3. Perform

Univariate Analysis

Bi Variate Analysis

Multi • Variate Analysis

sns . deplot(x= CreditScore• , data = df , hue • Exited') pit. show( )

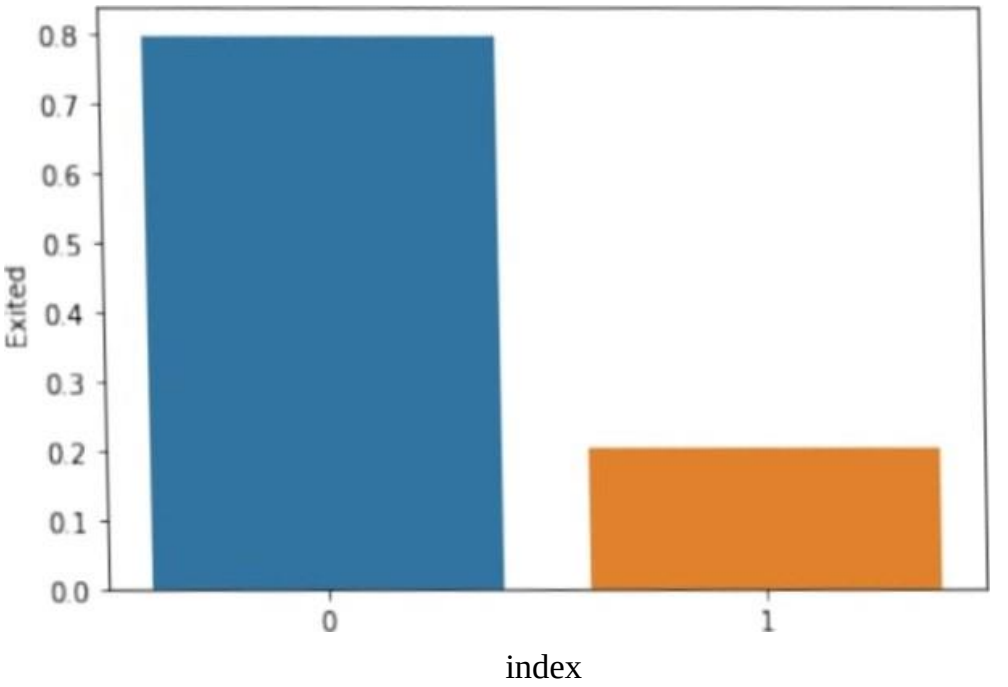


density = 'Exited' I . value_counts (normalize—True) . eset_index( ) sns . index' , ' Exited' ,) density

index Exited

o o o. 7963

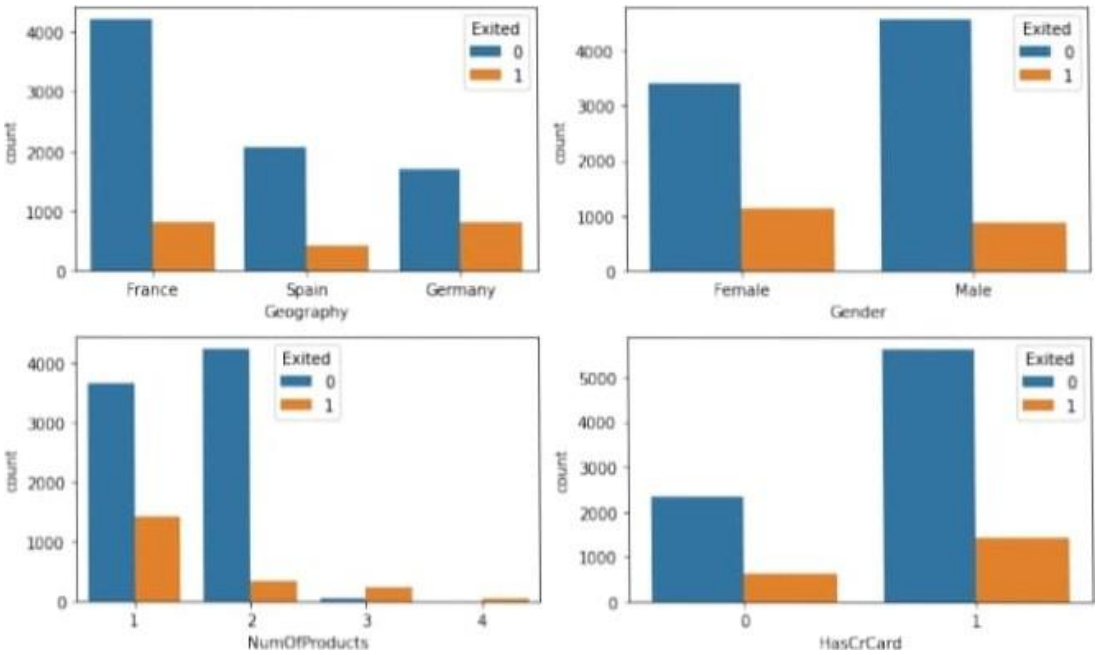
1 1 0.2637



catego ri cal df . drop CreditScore' , Age' , 'Tenure' , • Balance' , 'EstimatedSatary• l) rows - 1 fig, axes = pit . ncols-2, 10 , 6)) axes = axes. flatten()

for row in range(rows):
cols = min (2, categorical. shape[ll
row*2) for cot in range(cots) :
cot_name = categorical. columns[2 * row +
cot] ax = axes(row* 2 + cot]

sns . ountplot(data=categorical, x=col_name, hue="Exited", ax—ax) ; pit.
tight_layout ( )



4. Descriptive statistics bold
text df . info()
<ctass 'pandas. core. frame. DataFrame '>
Rangelndex: 10000 entries, O to 9999
Data columns (total Il columns) :

#	Column	Non-Nutt Count	Dtype
0	C reditScore	10006 non-null	int64
1	Geography	10000 non-nutl	object
2	Gender	10000 non-null	object
3	Age	10000 non-null	int64
4	Tenure	10000 non-null	int64
5	Balance		
6	NumOfProducts		
7	Ha SC rCard		
8	IsActiveMembe r		
9	EstimatedSalary		
10	Exited		

dtypes: category(3) , memory usage: 654.8+ df . describe()

	CreditScore	NumOfProducts
count	10000.000000	10000 .060000
mean	650 .528800	1.530200

10000 non-
null float64
10000 non-null int64
10000 non-null
category
10000 non-null
category
10000 non-
null
float64
10000
non - null
category
float64(2
)
int64(4) ,
object(2)
KB

Age
Tenure
Balance

10000.000000
10000.000000
10000.000000

38.921800
5.012800
76485.889288

std	96 .653299	10.487806	2.892174	62397.405202	0.581654
min	350 .000000 1	18.000000	o .000000	o. 000000	.000000
25%	584.000000	32.000000	3 .000000	o .000000	1 .000000
	652 .000000	37.000000	5 .000000	97198.540000	1.000000
	718 .000000	44.000000	7 .000000	127644.240000	2.000000
max	850 .000000	92.000000	10.000000	250898.090000	4.000000

	EstimatedSa1ary
count	10000.000000 mean
	106090.239881 std
	57510.492818 min
	11.580000 25%
	51002.110000
50%	100193.915000 75%
	149388.247500 max
	199992.480000

5. Handle Missing Values

df .isna() . sum()

CreditScore	0
Geog raphy	0
Gender Age	0
Tenu re	0
Balance	0
NumOfProducts	0
HasCrCard	0
IsActiveMember	0
EstimatedSalary	0
Exited dtype: int64	0

In this dataset there is no missing values

6. Find the outliers and replace the outliers

Finding Outliers

```
def box scatter (data, x, y) :
    fig, _ (axl, ax2) = pit . bplots(nrows=2, ncots=l, figsize=(16 , 6) ) sns
    . x=x, ax=axl) sns .        x=x,y=y,ax=ax2)
```

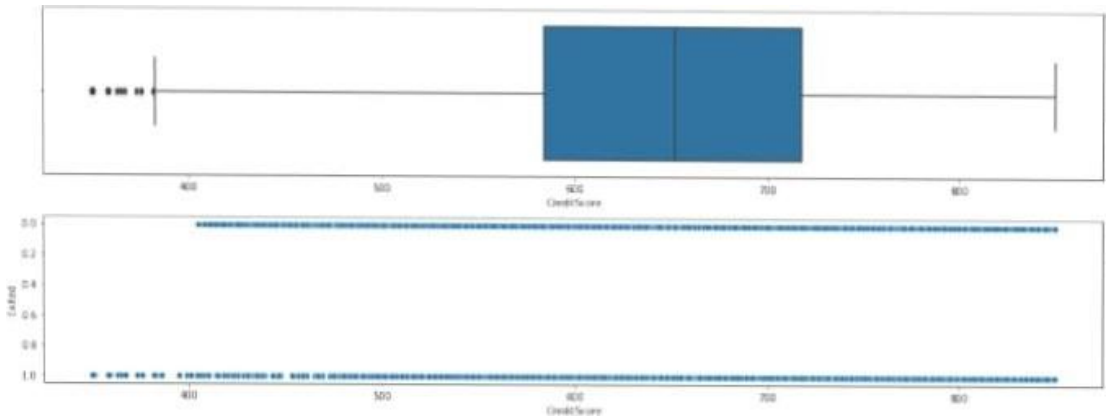
box scatter(df, CreditScore' , 'Exited') ;

```
plt.tight_layout()
print(f"# of Bivar
400])}")
```

Bivariate Outliers: {ten(df. loc [df[' CreditScore '

<

# of Bivariate Outliers: 19

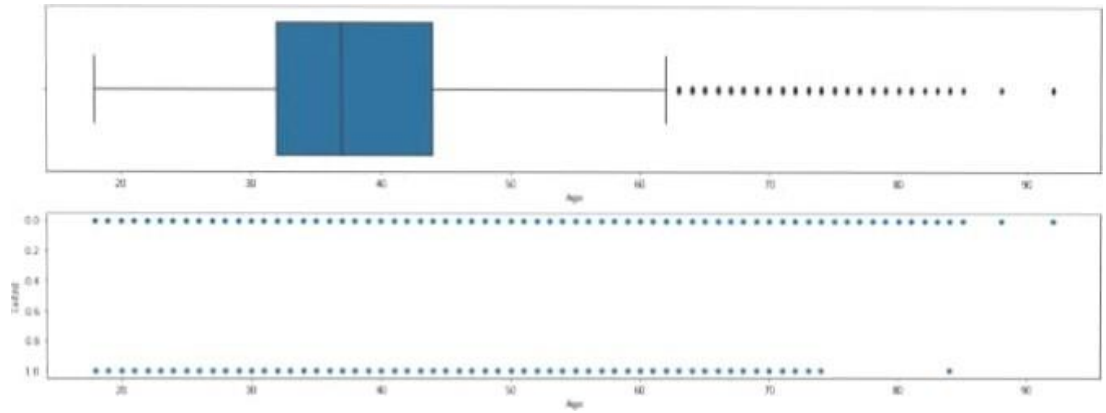


box scatter(df, 'Age' , 'Exited') ;

pttitight_layout ( )

print(f"# of Bivariate Outliers:{len(df.loc[df[i Age') >87])}"

# of Bivariate Outliers: 3

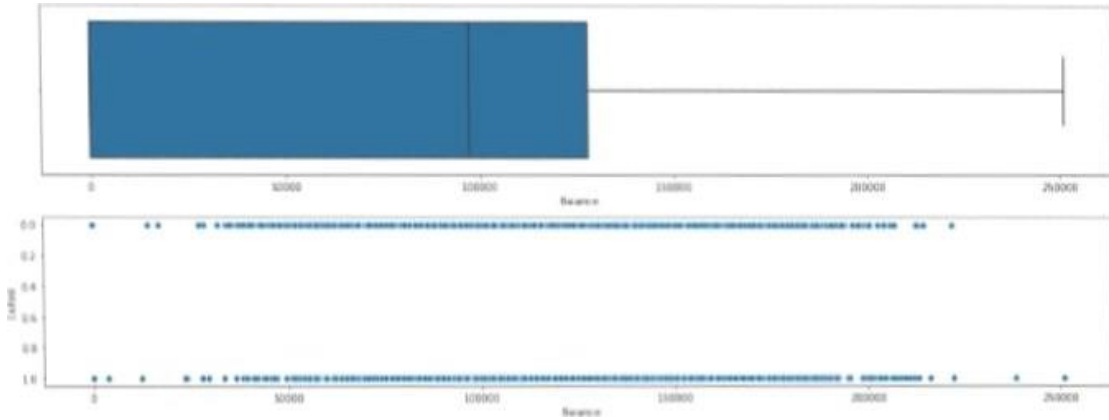


box scatter(df, 'Balance' , 'Exited') ;

```
plt.tight_layout()
```

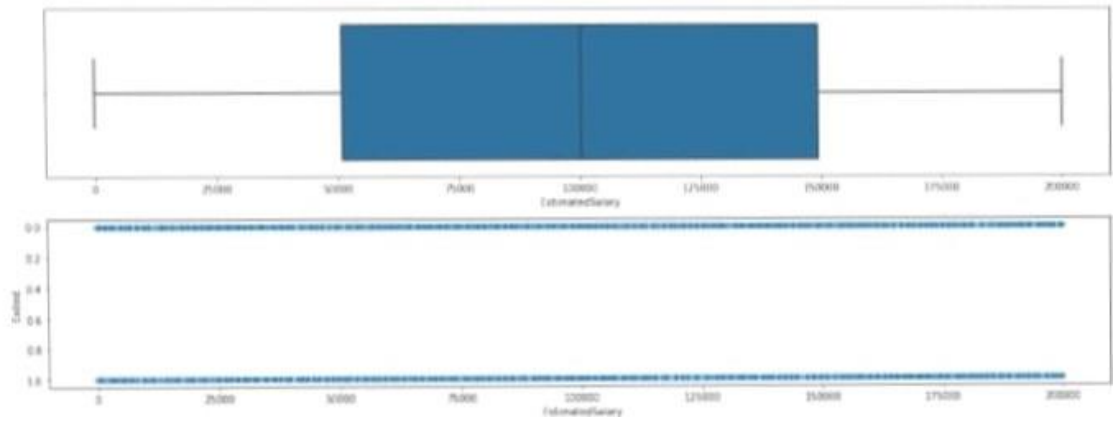
print(f"# of Bivariate Outliers: {len(df . oc[df['Balance •) > 2200001) } ")

# of Bivariate Outliers: 4



box scatter(df , 'EstimatedSaIary' , 'Exited') ;

```
plt.tight_layout()
```



Removing The Outliers

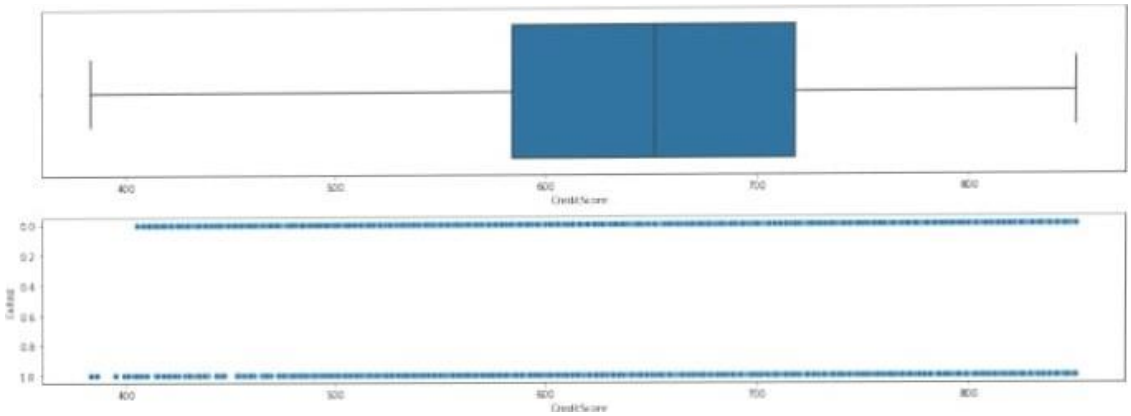
```
for i in df:
    if df[i]                int64' or df(il .dtypes=='flo
                . quantite(0.25
        . quantite(0.75 iqr=q3-
        q1

        lower=ql 1 5*iqr
                . >upper, upper, df[i] ) . <lower, lower,
                df[i] )
box scatter(df, ' CreditScore• , 'Exited' ) •
```

```
plt.tight_layout()
print(f"# of Bivar
400])}")
```

Bivariate Outliers: {len(df.loc[df['CreditScore']

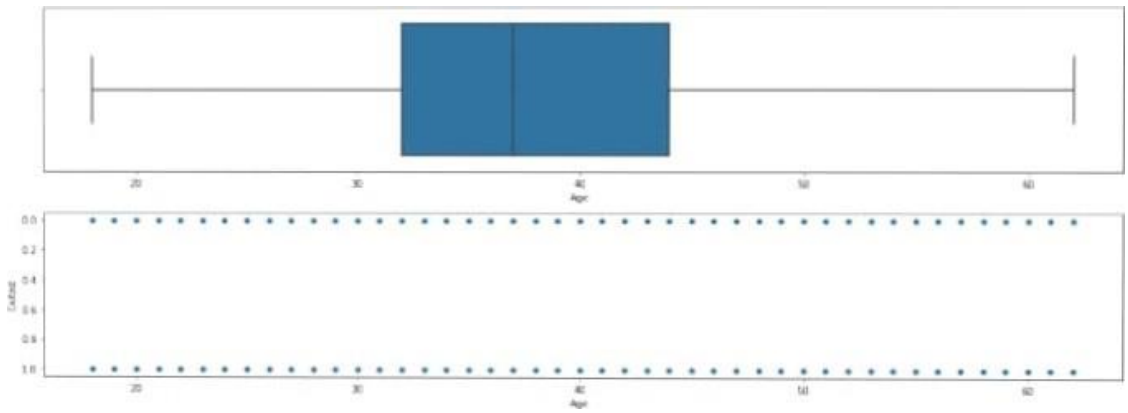
<

# of Bivariate Outliers: 19



box_scatter(df, ' Age' , 'Exited') ; pit . tight_layout( ) print(f"# of Bivariate Outliers:{len(df.loc[df['Age'] > 871)}")

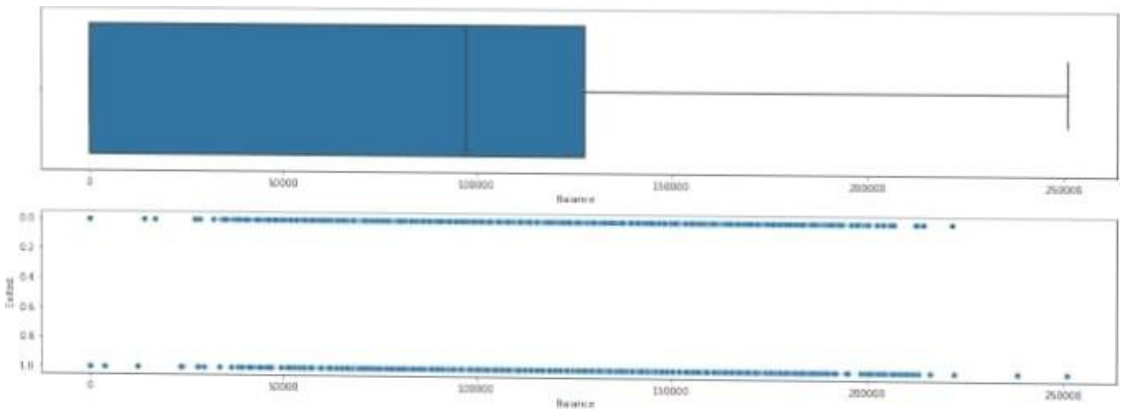
# of Bivariate Outliers: O



box scatter(df, ' Balance' , 'Exited') ; pltitight_layout ( )

print(f"# of Bivariate Outliers: {len(df . locldf(' Balance '] > 2206061)}")

# of Bivariate Outliers: 4



7. Check for Categorical columns and perform encoding.

from sktearn.preprocessing import LabetEncoder encoder-I-abet Encoder( ) for i in df:

if dfti] dtype=='object' or df(il dtype=='category' : df (i)

-encoder. fit_transform(df [i])

8. Split the data into dependent and independent variables.

x=df. iloc(: , : -1]

x. head( )

	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfP roducts	\
0	619.0		0	42.0	2.0	0.00	1.0	
1	608.0	2		41.0	1.0	83867.86	1.0	
2	502.0	o	o	42.0	8.0	159660.80	3.0	
3	699. o		o	39.0	1.0	0.00	2.0	
4	850.0	2		43.0	2.0	125510.82	1.0	

	HasCrCard	IsActiveMember	EstimatedSaIary
1	1	101348.88 1 1	112542.58
2	1	113931.57	

3 93826.63

4 1 1 79084. 10

iloc[:,-11

y. head ( )

o 1

1 0

2 1

3 0

4 0

Name: Exited , dtype: int64

9. Scale the independent variables from sklearn . preprocessing import StandardScater scaler=Standa rdScaIer( ) x=scaler. fit_transfo rm(x) print (x)

[(-0.32687761 -0.90188624 -1.09598752. . .o. 64609167 o .97024255 o. 021886491

[-0.44080365 1.51506738 -1.09598752 . .. -1.54776799 o .97024255 o. 21653375]
[-1.53863634 -o .90188624 -1.09598752 . . . o. 64609167-1.03067011 0.2406869
[O. 60524449 -o .90188624 -1.09598752 . .. -1.54776799 o .97024255 -1.008643081
[1.25772996 0.30659057 0.91241915 . . o .64609167-1.03067011 -o. 125230711
t 1.4648682 -o .90188624 -1.09598752 . . o. 64609167-1.03067011 -1.07636976M

10. Split the data into training and testing.

```
from sklearn . model_selection import train_test_split
x_t rain , x_test , rain, _ t es t __train_t e s t_ siz e =0. 20 )
                          _s plit (x , y , es
print (x_train . shape)
print (x_test. shape)
```

(8000, 10)
(2000, 10)

```
print (y_train. shape)
print (y_test . shape)
```

(8000 ,)
(2000,)