

Assignment-2

Python Programming

Assignment Date	19 September 2022
Student Name	T.Sivamartin
Student Roll Number	962719106033
Maximum Marks	2Marks

Question-1:

Download the dataset

Link:- https://drive.google.com/file/d/15dFx93Pnri_PIPTMGyrs_9d8jcqKPuzF/view?usp=sharing

Question-2:

Load the dataset

Solution:

```
df=pd.read_csv("/content/Churn_Modelling.csv")
print(df)
df.info()
df.describe()
import matplotlib.pyplot as plt
import seaborn as sns
import math
df.isna().sum()
df.isnull().sum()
```



Welcome To Colaboratory

File Edit View Insert Runtime Tools Help [Cannot save changes](#)

Share

Files



{x}
 sample_data
 Churn_Modelling.csv

+ Code + Text Copy to Drive

Connecting Edit

2. Load the dataset

```
df=pd.read_csv("/content/Churn_Modelling.csv")  
print(df)
```

```
   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  
...      ...      ...      ...      ...      ...      ...      ...  
9995      9996    15606229  Obijaku         771     France   Male   39  
9996      9997    15569892  Johnstone    516     France   Male   35  
9997      9998    15584532     Liu         709     France  Female   36  
9998      9999    15682355  Sabbatini    772     Germany   Male   42  
9999     10000    15628319   Walker         792     France  Female   28
```

```
   Tenure  Balance  NumOfProducts  HasCrCard  IsActiveMember  \  
0         2      0.00              1           1              1  
1         1  83807.86              1           0              1  
2         8  159660.00              3           1              0  
3         1      0.00              2           0              0  
4         2  125510.82              1           1              1  
...      ...      ...      ...      ...      ...  
9995      5      0.00              2           1              0  
9996     10  57369.61              1           1              1  
9997      7      0.00              1           0              1
```

✓ 1m 3s completed at 9:46 PM

Files

sample_data

Churn_Modelling.csv

RAM

Disk

70.51 GB available

+ Code + Text Copy to Drive

4

5

15737888

Mitchell

850

Spain

Female

43

...

...

...

...

...

...

...

9995

9996

15606229

Obijaku

771

France

Male

39

9996

9997

15569892

Johnstone

516

France

Male

35

9997

9998

15584532

Liu

700

France

Female

36

9998

9999

15682355

Sabbatini

772

Germany

Male

42

9999

10000

15628319

Walker

792

France

Female

28

Tenure

Balance

NumOfProducts

HasCrCard

IsActiveMember

\

0

2

0.00

1

1

1

1

1

83807.06

1

0

1

2

8

159660.00

3

1

0

3

1

0.00

2

0

0

4

2

125510.82

1

1

1

...

...

...

...

...

...

9995

5

0.00

2

1

0

9996

10

57369.61

1

1

1

9997

7

0.00

1

0

1

9998

3

75075.31

2

1

0

9999

4

130142.79

1

1

0

EstimatedSalary

Exited

0

101348.88

1

1

112542.58

0

2

113931.57

1

3

93826.63

0

4

79084.10

0

...

...

...

9995

96270.64

0

9996

101699.77

0

...

...

...

0s completed at 1:12 PM

Welcome To Colaboratory

File Edit View Insert Runtime Tools Help Cannot save changes

Share

Files

sample_data

Churn_Modelling.csv

RAM

Disk

70.45 GB available

+ Code + Text Copy to Drive

[34]

3

CreditScore

10001

non-null

object

4

Geography

10001

non-null

object

5

Gender

10001

non-null

object

6

Age

10001

non-null

object

7

Tenure

10001

non-null

object

8

Balance

10001

non-null

object

9

NumOfProducts

10001

non-null

object

10

HasCrCard

10001

non-null

object

11

IsActiveMember

10001

non-null

object

12

EstimatedSalary

10001

non-null

object

13

Exited

10001

non-null

object

dtypes: object(14)

memory usage: 1.1+ MB

[33] df.describe()

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProducts	HasCrC
count	10001	10001	10001	10001	10001	10001	10001	10001	10001	10001	10001
unique	10001	10001	2933	461	4	3	71	12	6383	5	10
top	RowNumber	CustomerId	Smith	850	France	Male	37	2	0	1	10
freq	1	1	32	233	5014	5457	478	1048	3617	5084	7

Welcome To Colaboratory

File Edit View Insert Runtime Tools Help Cannot save changes

Files

- sample_data
- Churn_Modelling.csv

```
[31] import math
```

```
df.isna().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	

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

RowNumber	0
CustomerId	0
Surname	0
CreditScore	0
Geography	0
Gender	0
Age	0

70.45 GB available

completed at 7:25 PM

Welcome To Colaboratory

File Edit View Insert Runtime Tools Help Cannot save changes

Files

- sample_data
- Churn_Modelling.csv

```
[32] sns.histplot(df.EstimatedSalary,kde=True)
```

```
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	

3.Perform Below Visualizations

Univariate Analysis

```
[ ] sns.histplot(df.EstimatedSalary,kde=True)
```

70.45 GB available

completed at 7:25 PM

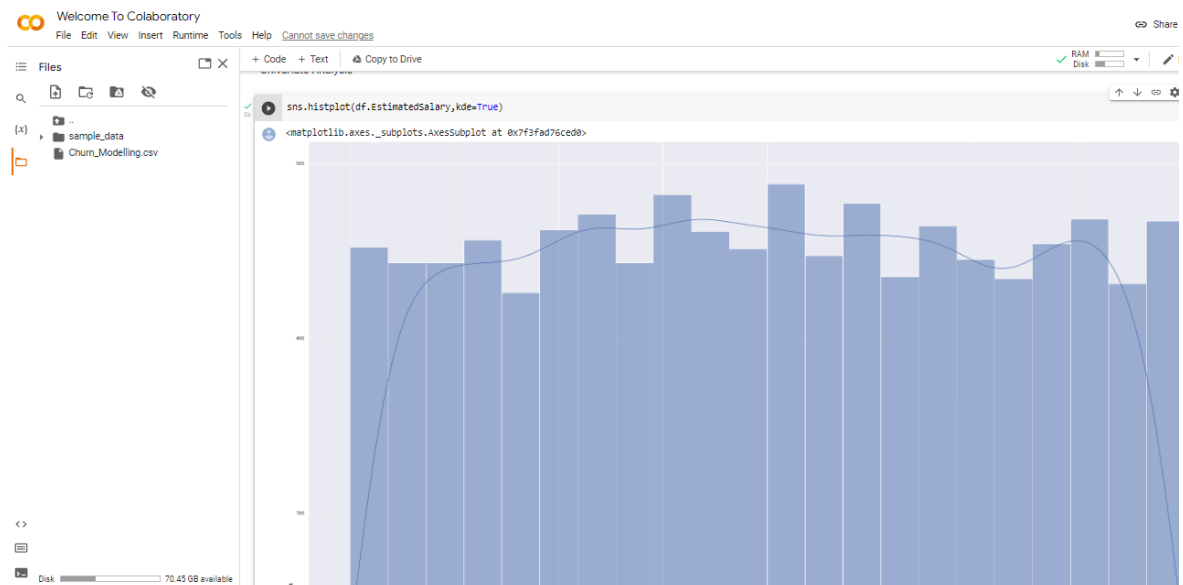
Question-3:

Perform Below Visualizations

*Univariate Analysis

Solution:

```
sns.histplot(df.EstimatedSalary,kde=True)
```

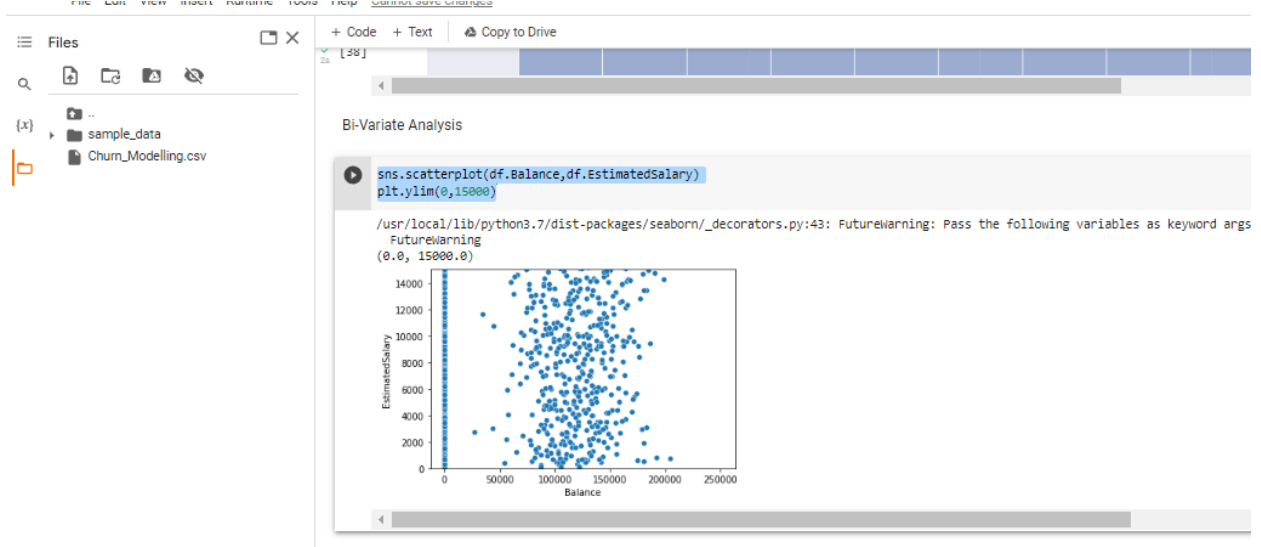


*Bivariate Analysis

Solution:

```
sns.scatterplot(df.Balance,df.EstimatedSalary)
```

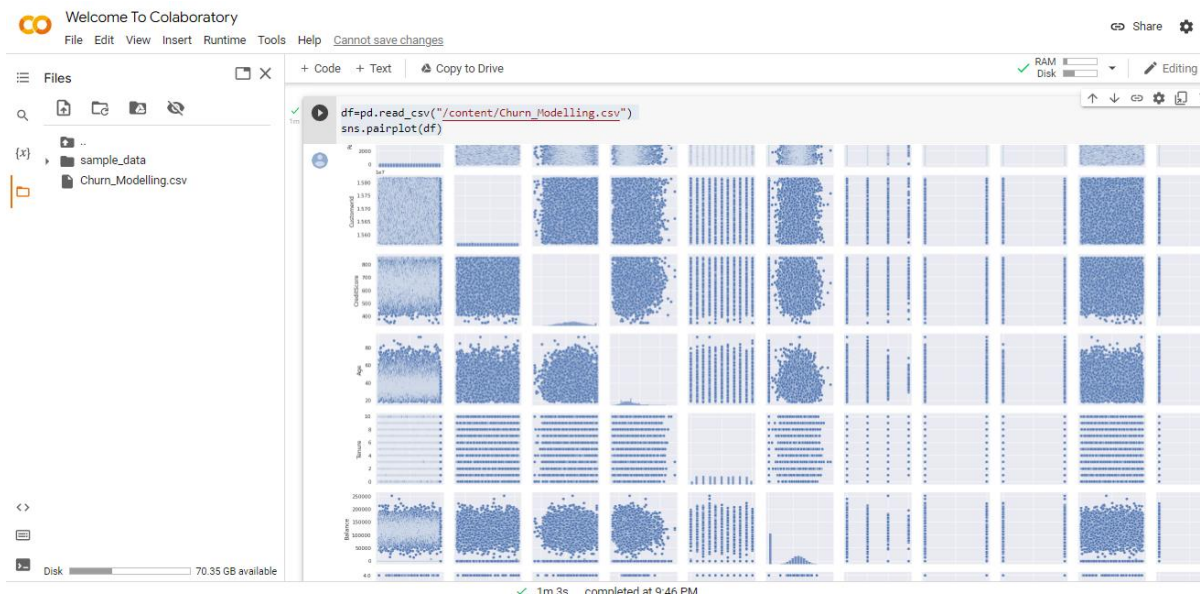
```
plt.ylim(0,15000)
```

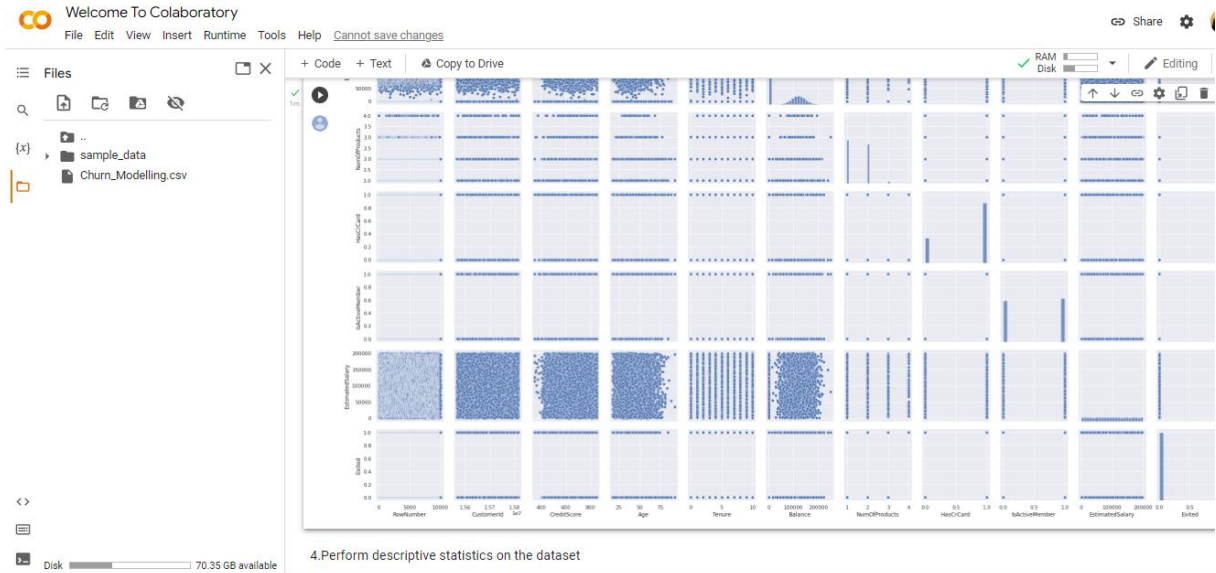


*Multi-Variate Analysis

Solution:

```
df=pd.read_csv("/content/Churn_Modelling.csv")  
  
sns.pairplot(df)
```





Question-4:

Perform descriptive statistics on the dataset

Solution:

```
df=pd.read_csv("/content/Churn_Modelling.csv")
df.describe(include='all')
```

Welcome To Colaboratory

File Edit View Insert Runtime Tools Help Cannot save changes

RAM 100% Disk 100% Editing

Files

sample_data

Churn_Modelling.csv

4. Perform descriptive statistics on the dataset

```
df=pd.read_csv("/content/Churn_Modelling.csv")
df.describe(include='all')
```

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProducts	Has
count	10000.00000	1.000000e+04	10000	10000.000000	10000	10000	10000.000000	10000.000000	10000.000000	10000.000000	10000
unique	NaN	NaN	2932	NaN	3	2	NaN	NaN	NaN	NaN	NaN
top	NaN	NaN	Smith	NaN	France	Male	NaN	NaN	NaN	NaN	NaN
freq	NaN	NaN	32	NaN	5014	5457	NaN	NaN	NaN	NaN	NaN
mean	5000.50000	1.569094e+07	NaN	650.528800	NaN	NaN	38.921800	5.012800	76485.889288	1.530200	NaN
std	2886.89568	7.193619e+04	NaN	96.653299	NaN	NaN	10.487806	2.892174	62397.405202	0.581654	NaN
min	1.00000	1.556570e+07	NaN	350.000000	NaN	NaN	18.000000	0.000000	0.000000	1.000000	NaN
25%	2500.75000	1.562853e+07	NaN	584.000000	NaN	NaN	32.000000	3.000000	0.000000	1.000000	NaN
50%	5000.50000	1.569074e+07	NaN	652.000000	NaN	NaN	37.000000	5.000000	97198.540000	1.000000	NaN
75%	7500.25000	1.575323e+07	NaN	718.000000	NaN	NaN	44.000000	7.000000	127644.240000	2.000000	NaN
max	10000.00000	1.581569e+07	NaN	850.000000	NaN	NaN	92.000000	10.000000	250898.090000	4.000000	NaN

Disk 70.40 GB available

Question-5:

Handle the Missing Values

Solution:

```
from ast import increment_lineno
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
%matplotlib inline
sns.set(color_codes=True)
df=pd.read_csv("/content/Churn_Modelling.csv")
df.head()
```


Welcome To Colaboratory

File Edit View Insert Runtime Tools Help [Cannot save changes](#)

RAM Disk

Share

Files

sample_data

Churn_Modelling.csv

5.Handle the Missing values

```
from ast import increment_lineno
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
%matplotlib inline
sns.set(color_codes=True)
df=pd.read_csv("/content/Churn_Modelling.csv")
df.head()
```

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

Disk 70.45 GB available

Question-6:

Find the outliers and replace the outliers

Solution:

```
import pandas as pd
import matplotlib
from matplotlib import pyplot as pyplot
%matplotlib inline
matplotlib.rcParams['figure.figsize']=(10,6)
df=pd.read_csv("/content/Churn_Modelling.csv")
df.sample(5)
```

Welcome To Colaboratory

File Edit View Insert Runtime Tools Help Cannot save changes

RAM 70.36 GB available Disk 70.36 GB available Editing

Files

- sample_data
- Churn_Modelling.csv

6. Find the outliers and replace the outliers

```
import pandas as pd
import matplotlib
from matplotlib import pyplot as pyplot
%matplotlib inline
matplotlib.rcParams['figure.figsize']=(10,6)
df=pd.read_csv("/content/Churn_Modelling.csv")
df.sample(5)
```

RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSalary
959	960	Wilder	629	France	Female	37	6	129101.30	1	1	1	
9793	9794	Hilton	772	Germany	Female	42	0	101979.16	1	1	0	
8116	8117	Lindell	640	Germany	Female	43	9	94752.49	1	1	0	
2321	2322	Wong	545	Germany	Male	45	6	93796.42	2	1	1	
5451	5452	Andrews	663	France	Male	43	4	87624.03	2	1	0	

7. Check for categorical columns and perform encoding

```
[8] df=pd.read_csv("/content/Churn_Modelling.csv")
```

Question-7:

Check for Categorical columns and perform encoding

Solution:

```
df=pd.read_csv("/content/Churn_Modelling.csv")
df.columns
import pandas as pd
import numpy as np
headers=['RowNumber', 'CustomerId', 'Surname', 'CreditScore', 'Geography',
        'Gender', 'Age', 'Tenure', 'Balance', 'NumOfProducts', 'HasCrCard',
        'IsActiveMember', 'EstimatedSalary', 'Exited']
df=pd.read_csv("/content/Churn_Modelling.csv",header=None,names=headers,na
_values="?")
df.head()
```

Welcome To Colaboratory

File Edit View Insert Runtime Tools Help Cannot save changes

RAM Disk

Files

sample_data

Churn_Modelling.csv

```
[8] df=pd.read_csv("/content/Churn_Modelling.csv")
df.columns

Index(['RowNumber', 'CustomerId', 'Surname', 'CreditScore', 'Geography',
      'Gender', 'Age', 'Tenure', 'Balance', 'NumOfProducts', 'HasCrCard',
      'IsActiveMember', 'EstimatedSalary', 'Exited'],
      dtype='object')
```

```
import pandas as pd
import numpy as np
headers=['RowNumber', 'CustomerId', 'Surname', 'CreditScore', 'Geography',
        'Gender', 'Age', 'Tenure', 'Balance', 'NumOfProducts', 'HasCrCard',
        'IsActiveMember', 'EstimatedSalary', 'Exited']
df=pd.read_csv("/content/Churn_Modelling.csv",header=None,names=headers,na_values="?")
df.head()
```

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard
0	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard
1	1	15634602	Hargrave	619	France	Female	42	2	0	1	1
2	2	15647311	Hill	608	Spain	Female	41	1	83807.86	1	0
3	3	15619304	Onio	502	France	Female	42	8	159660.8	3	1
4	4	15701354	Boni	699	France	Female	39	1	0	2	0

0s completed at 7:19 PM

Question-8:

Split the data into dependent and independent variables

Solution:

```
x=df.iloc[:, :-1].values
print(x)
y=df.iloc[:, -1].values
print(y)
```

Welcome To Colaboratory

File Edit View Insert Runtime Tools Help Cannot save changes

Files

sample_data

Churn_Modelling.csv

8.Split the data into dependent and independent variables

```
x=df.iloc[:, :-1].values
print(x)
y=df.iloc[:, -1].values
print(y)
```

```
[[['RowNumber' 'CustomerId' 'Surname' ... 'HasCrCard' 'IsActiveMember'
  'EstimatedSalary']
 ['1' '15634602' 'Hargrave' ... '1' '1' '101348.88']
 ['2' '15647311' 'Hill' ... '0' '1' '112542.58']
 ...
 ['9998' '15584532' 'Liu' ... '0' '1' '42085.58']
 ['9999' '15682355' 'Sabbatini' ... '1' '0' '92888.52']
 ['10000' '15628319' 'Walker' ... '1' '0' '38190.78']
 ['Exited' '1' '0' ... '1' '1' '0']]]
```

9.Scale the independent variables

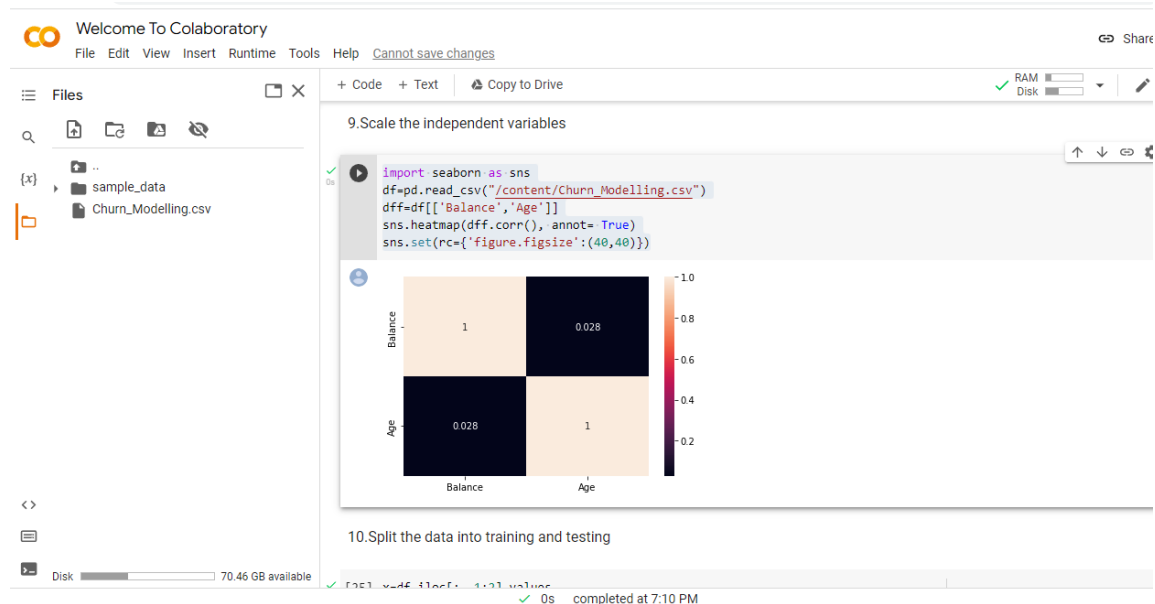
completed at 7:10 PM

Question-9:

Scale the independent variables

Solution:

```
import seaborn as sns
df=pd.read_csv("/content/Churn_Modelling.csv")
dff=df[['Balance', 'Age']]
sns.heatmap(dff.corr(), annot= True)
sns.set(rc={'figure.figsize': (40, 40)})
```



Question-10

Split the data into training and testing

Solution:

```
x=df.iloc[:, 1:2].values
y=df.iloc[:,2].values
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=0)
print('Row count of x_train table'+ '-' +str(f"{len(x_train):,}"))
print('Row count of y_train table'+ '-' +str(f"{len(y_train):,}"))
print('Row count of x_test table'+ '-' +str(f"{len(x_test):,}"))
print('Row count of y_test table'+ '-' +str(f"{len(y_test):,}"))
```

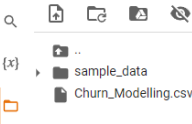


Welcome To Colaboratory

File Edit View Insert Runtime Tools Help [Cannot save changes](#)

Share

Files



+ Code + Text

RAM Disk Editing

```
[19]
<__array_function__ internals> in nanmin(*args, **kwargs)

/usr/local/lib/python3.7/dist-packages/numpy/lib/nanfunctions.py in nanmin(a, axis, out, keepdims)
    317     # Fast, but not safe for subclasses of ndarray, or object arrays,
    318     # which do not implement isnan (gh-9009), or fmin correctly (gh-8975)
--> 319     res = np.fmin.reduce(a, axis=axis, out=out, **kwargs)
    320     if np.isnan(res).any():
    321         warnings.warn("All-NaN slice encountered", RuntimeWarning,

ValueError: zero-size array to reduction operation fmin which has no identity
```

[SEARCH STACK OVERFLOW](#)

10.Split the data into training and testing

```
x=df.iloc[:, 1:2].values
y=df.iloc[:,2].values
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=0)
print('Row count of x_train table'+str(len(x_train)))
print('Row count of y_train table'+str(len(y_train)))
print('Row count of x_test table'+str(len(x_test)))
print('Row count of y_test table'+str(len(y_test)))
```

0s completed at 6:59 PM

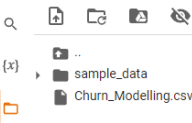


Welcome To Colaboratory

File Edit View Insert Runtime Tools Help [Cannot save changes](#)

Share

Files



+ Code + Text

RAM Disk Ed

```
print('Row count of x_test table'+str(len(x_test)))
print('Row count of y_test table'+str(len(y_test)))
```

```
Row count of x_train table-8,000
Row count of y_train table-8,000
Row count of x_test table-2,001
Row count of y_test table-2,001
```