Assignment Date	28 September 2022
Student Name	M Hari Haran
Student Roll Number	913119104028
Maximum Marks	2 Marks

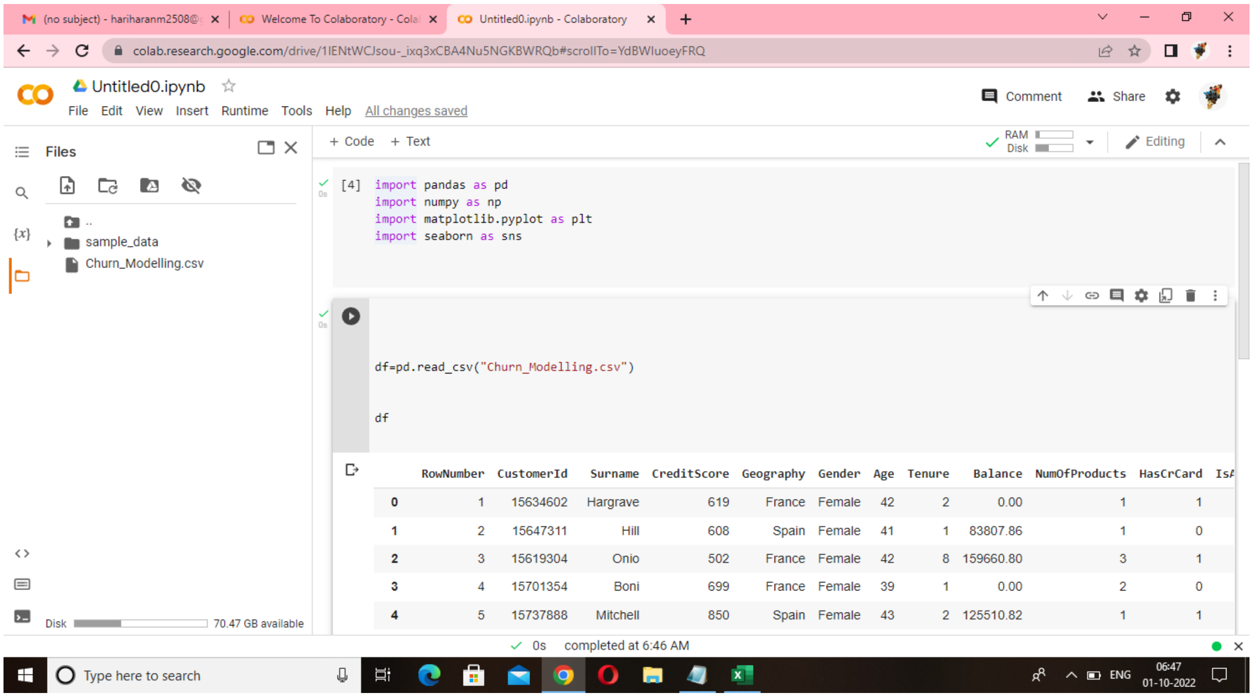
ASSIGNMENT 2

Question-1:

Download the dataset

Question-2:

Load the dataset :



```
[4] import pandas as pd
    import numpy as np
    import matplotlib.pyplot as plt
    import seaborn as sns
```

```
df=pd.read_csv("Churn_Modelling.csv")


df
```

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsA
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	

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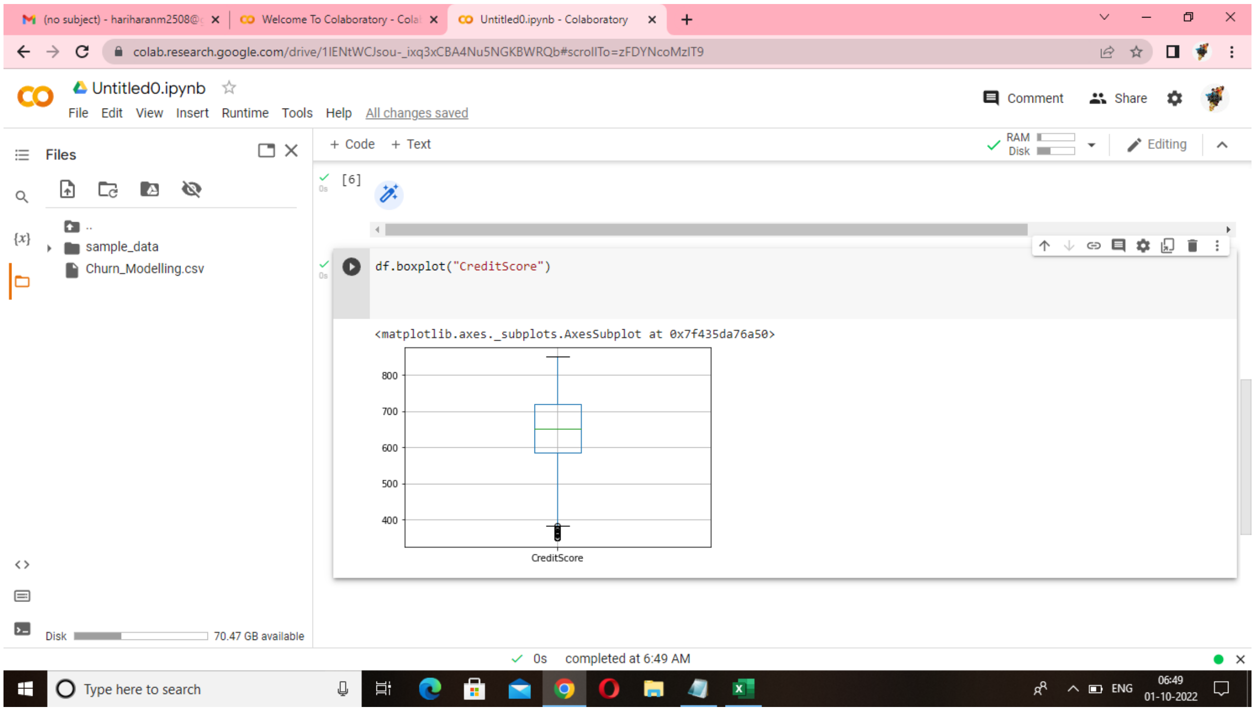
Question-3:

Perform Below Visualizations.

Univariate Analysis

Bi – Variate Analysis

Mult – Variate Analysis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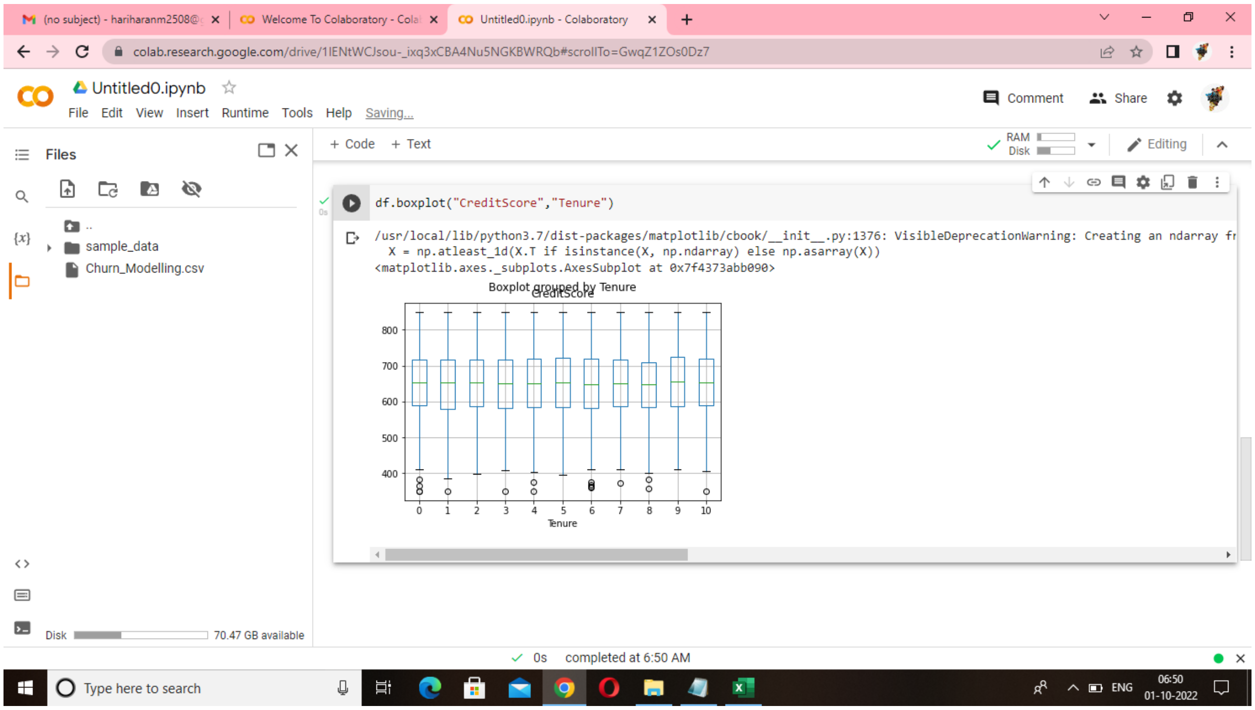
```
df.boxplot("CreditScore")
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f435da76a50>
```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Boxplot grouped by Tenure
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Tenure
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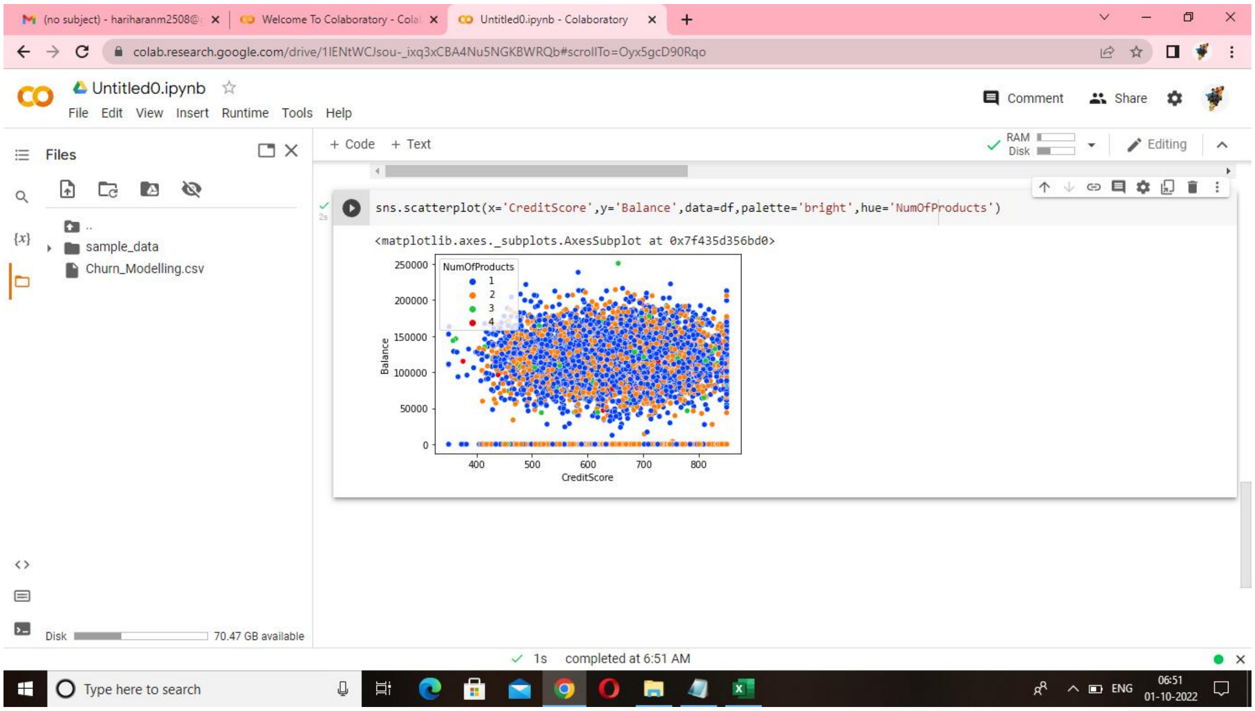
```
df.boxplot("CreditScore","Tenure")
```

```
/usr/local/lib/python3.7/dist-packages/matplotlib/cbook/__init__.py:1376: VisibleDeprecationWarning: Creating an ndarray fr
  X = np.atleast_1d(X.T if isinstance(X, np.ndarray) else np.asarray(X))
<matplotlib.axes._subplots.AxesSubplot at 0x7f4373abb090>
```

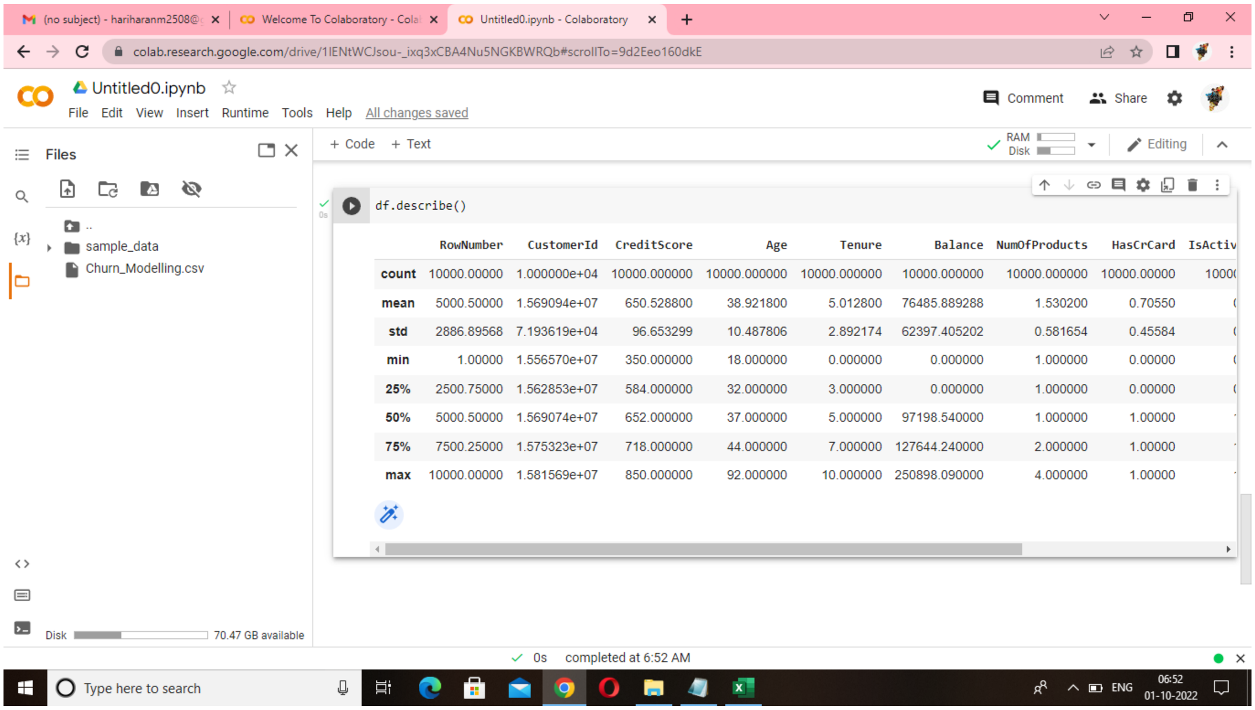


```
sns.scatterplot(x='CreditScore',y='Balance',data=df,palette='bright',hue='NumOfProducts')
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f435d356bd0>
```

Question – 4

Perform descriptive statistics on the dataset

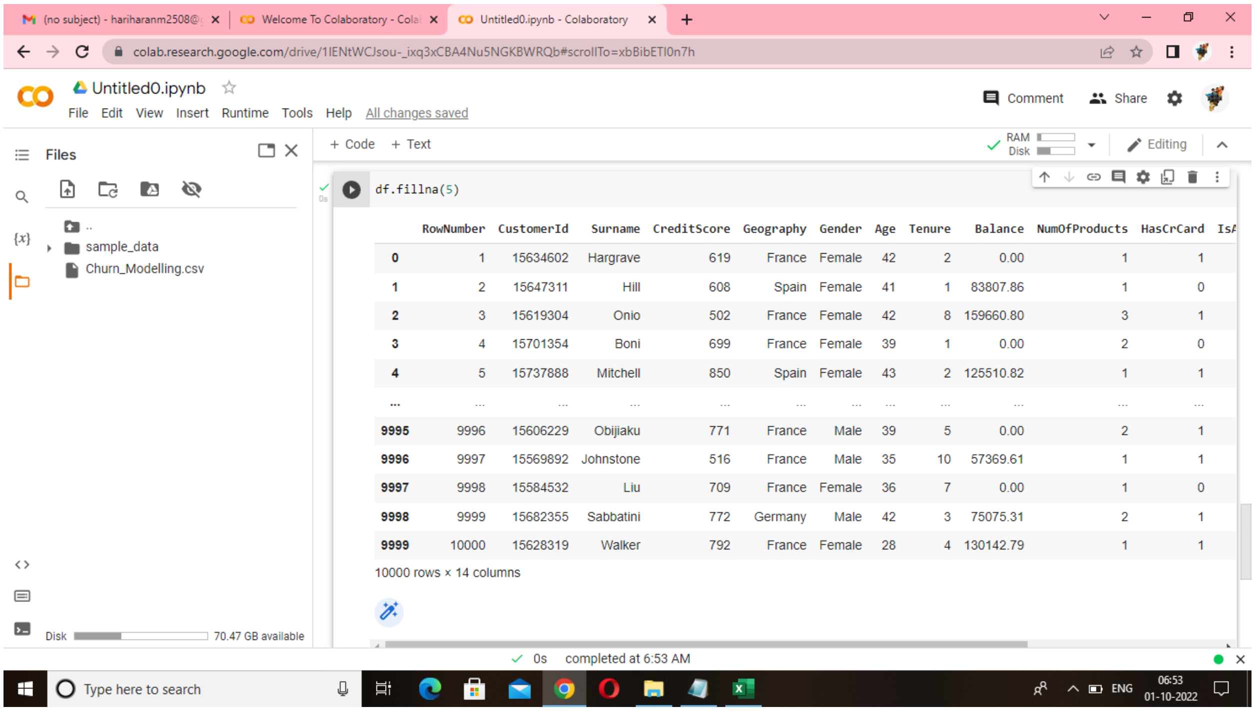


```
df.describe()
```

	RowNumber	CustomerId	CreditScore	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiv
count	10000.00000	1.000000e+04	10000.000000	10000.000000	10000.000000	10000.000000	10000.000000	10000.00000	10000
mean	5000.50000	1.569094e+07	650.528800	38.921800	5.012800	76485.889288	1.530200	0.70550	0
std	2886.89568	7.193619e+04	96.653299	10.487806	2.892174	62397.405202	0.581654	0.45584	0
min	1.00000	1.556570e+07	350.000000	18.000000	0.000000	0.000000	1.000000	0.00000	0
25%	2500.75000	1.562853e+07	584.000000	32.000000	3.000000	0.000000	1.000000	0.00000	0
50%	5000.50000	1.569074e+07	652.000000	37.000000	5.000000	97198.540000	1.000000	1.00000	1
75%	7500.25000	1.575323e+07	718.000000	44.000000	7.000000	127644.240000	2.000000	1.00000	1
max	10000.00000	1.581569e+07	850.000000	92.000000	10.000000	250898.090000	4.000000	1.00000	1

Question-5

Handle the Missing Values



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```
df.fillna(5)
```

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsA
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	
...	...	...	...	...	...	...	...	...	...	...	...	
9995	9996	15606229	Obijiaku	771	France	Male	39	5	0.00	2	1	
9996	9997	15569892	Johnstone	516	France	Male	35	10	57369.61	1	1	
9997	9998	15584532	Liu	709	France	Female	36	7	0.00	1	0	
9998	9999	15682355	Sabbatini	772	Germany	Male	42	3	75075.31	2	1	
9999	10000	15628319	Walker	792	France	Female	28	4	130142.79	1	1	

10000 rows × 14 columns

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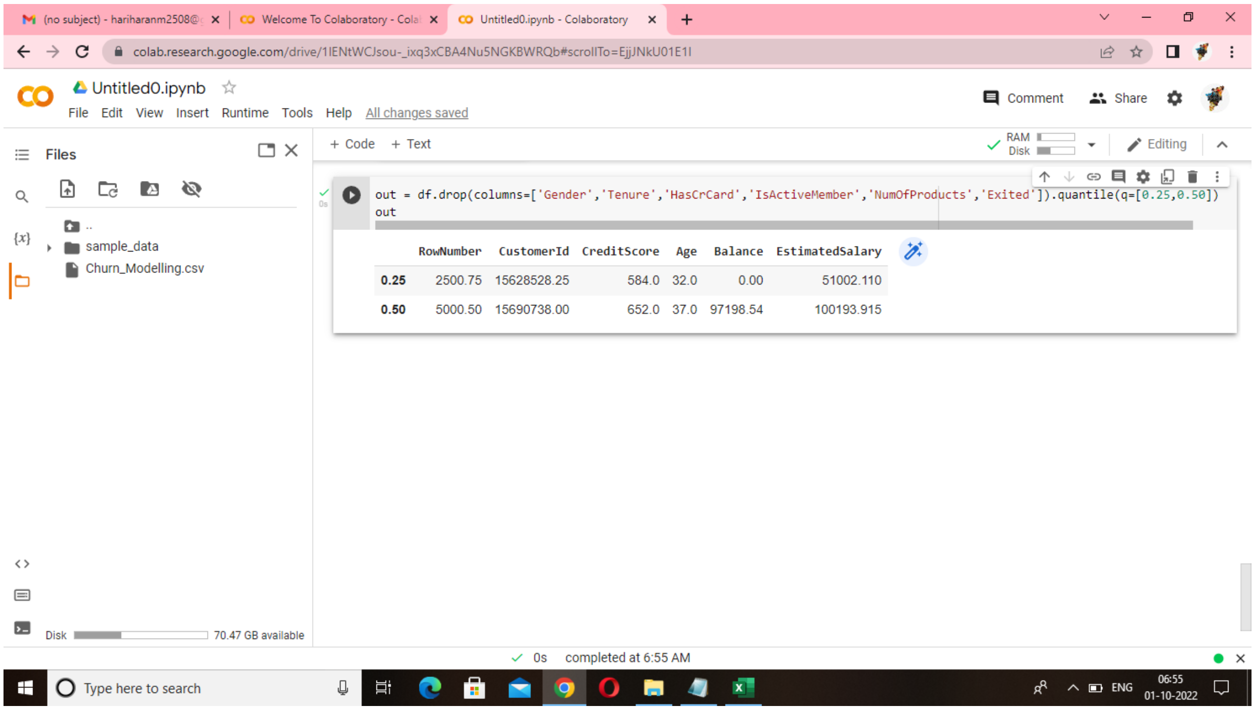
Question-6:

Find the outline & replace the outliners



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```
out = df.drop(columns=['Gender','Tenure','HasCrCard','IsActiveMember','NumOfProducts','Exited']).quantile(q=[0.25,0.50])
out
```

	RowNumber	CustomerId	CreditScore	Age	Balance	EstimatedSalary
0.25	2500.75	15628528.25	584.0	32.0	0.00	51002.110
0.50	5000.50	15690738.00	652.0	37.0	97198.54	100193.915

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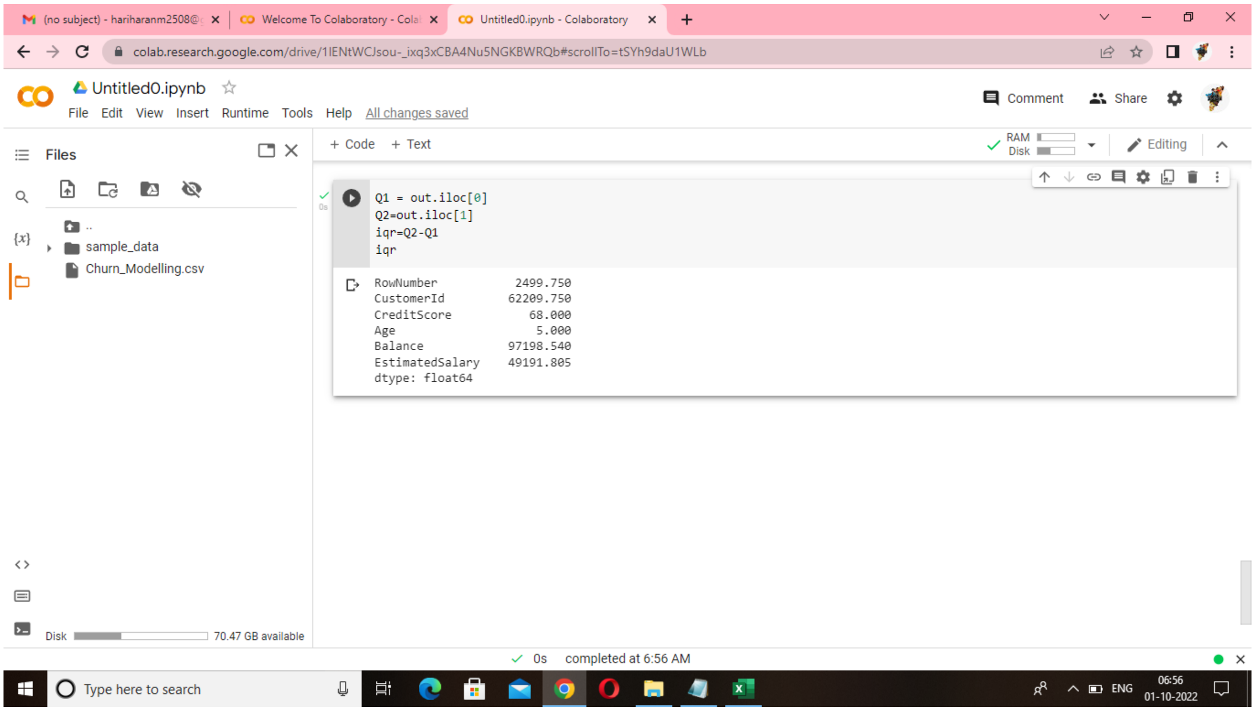
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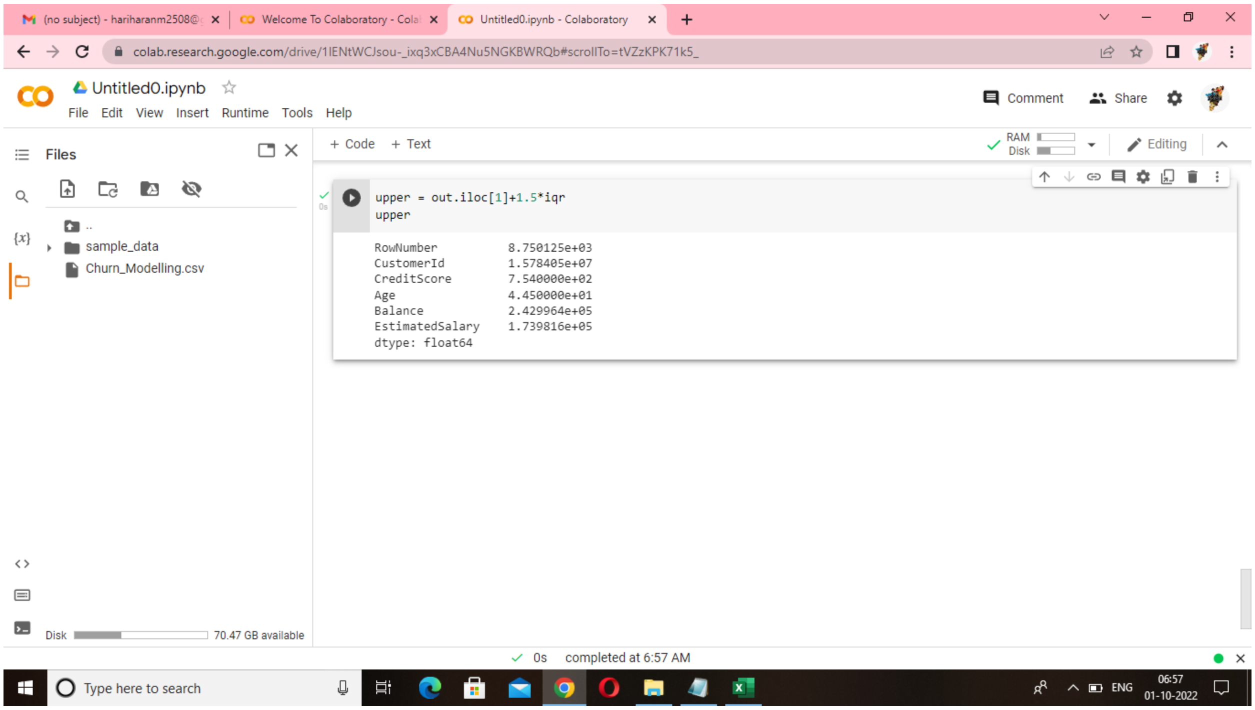
```
Q1 = out.iloc[0]
Q2=out.iloc[1]
iqr=Q2-Q1
iqr
```

```
RowNumber           2499.750
CustomerId         62209.750
CreditScore           68.000
Age                    5.000
Balance            97198.540
EstimatedSalary    49191.805
dtype: float64
```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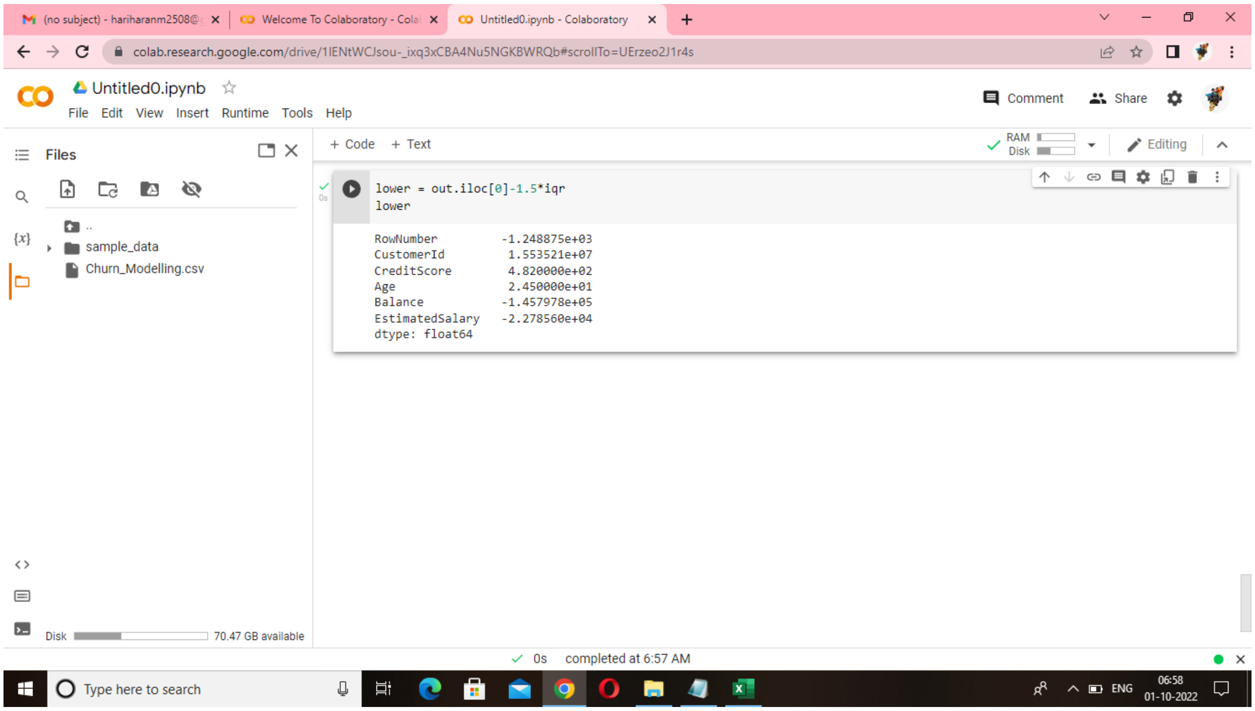
```
upper = out.iloc[1]+1.5*iqr
upper
```

```
RowNumber          8.750125e+03
CustomerId         1.578405e+07
CreditScore        7.540000e+02
Age                4.450000e+01
Balance            2.429964e+05
EstimatedSalary    1.739816e+05
dtype: float64
```



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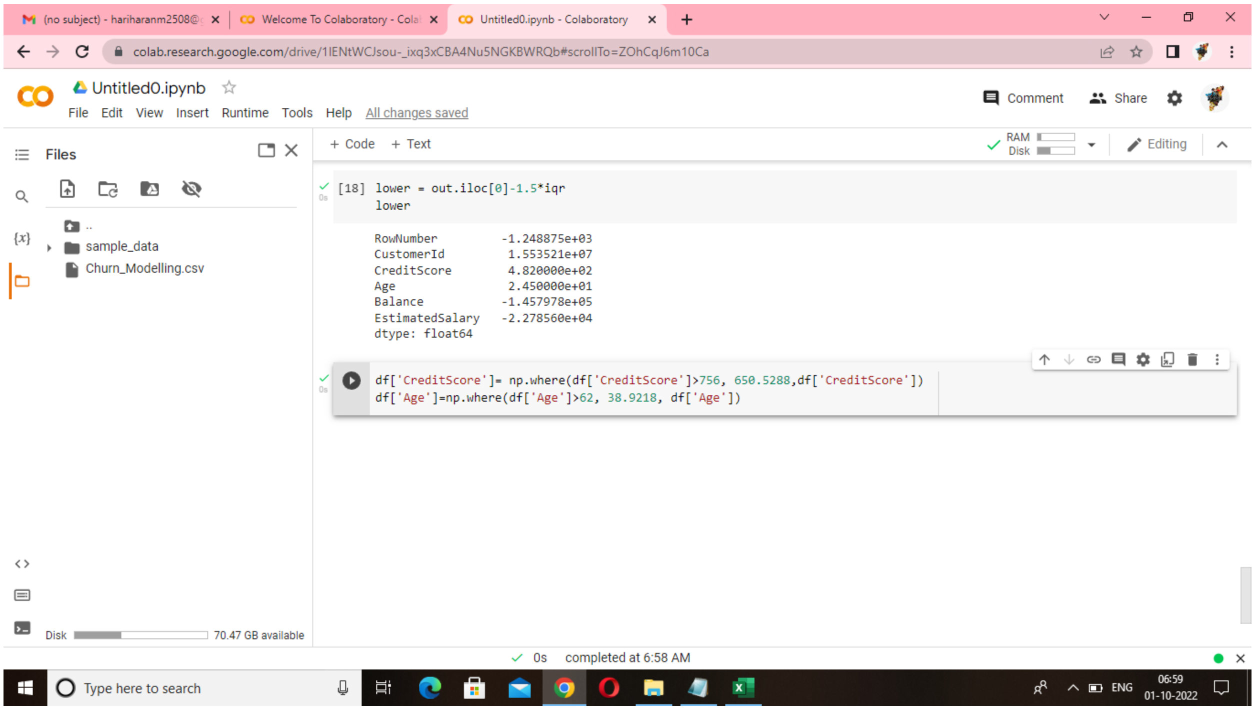
```
lower = out.iloc[0]-1.5*iqr
lower
```

```
RowNumber        -1.248875e+03
CustomerId        1.553521e+07
CreditScore       4.820000e+02
Age               2.450000e+01
Balance          -1.457978e+05
EstimatedSalary  -2.278560e+04
dtype: float64
```



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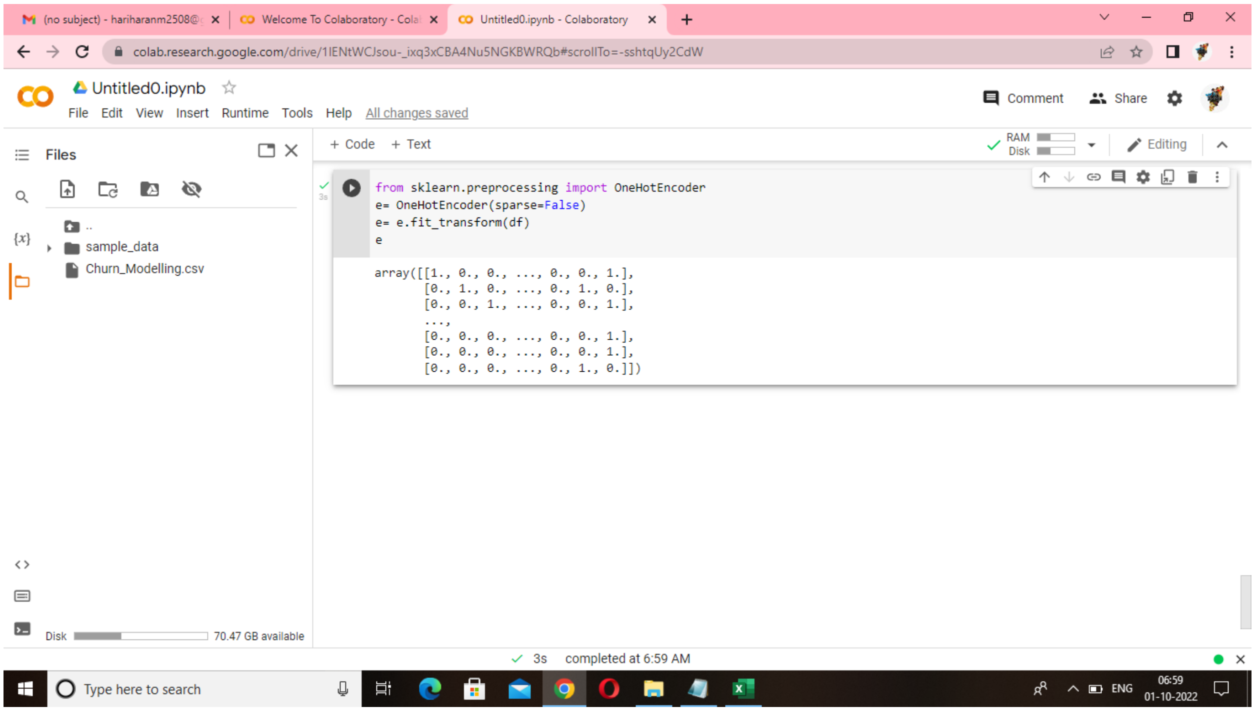
```
[18] lower = out.iloc[0]-1.5*iqr
     lower
```

```
RowNumber        -1.248875e+03
CustomerId        1.553521e+07
CreditScore       4.820000e+02
Age               2.450000e+01
Balance          -1.457978e+05
EstimatedSalary  -2.278560e+04
dtype: float64
```

```
df['CreditScore']= np.where(df['CreditScore']>756, 650.5288,df['CreditScore'])
df['Age']=np.where(df['Age']>62, 38.9218, df['Age'])
```

Question-7:

Check for Categorical columns and Perform encoding

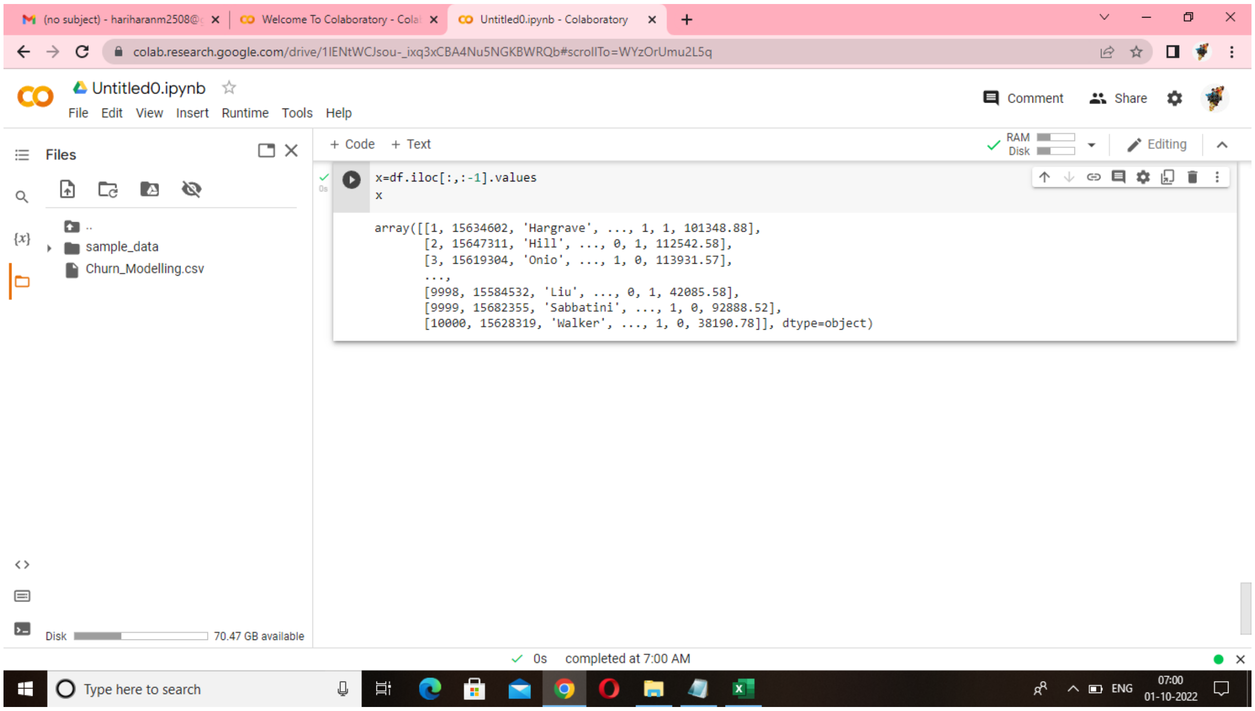


```
from sklearn.preprocessing import OneHotEncoder
e= OneHotEncoder(sparse=False)
e= e.fit_transform(df)
e
```

```
array([[1., 0., 0., ..., 0., 0., 1.],
       [0., 1., 0., ..., 0., 1., 0.],
       [0., 0., 1., ..., 0., 0., 1.],
       ...,
       [0., 0., 0., ..., 0., 0., 1.],
       [0., 0., 0., ..., 0., 0., 1.],
       [0., 0., 0., ..., 0., 1., 0.]])
```

Question-8

Split the data into dependant and independent Variables.

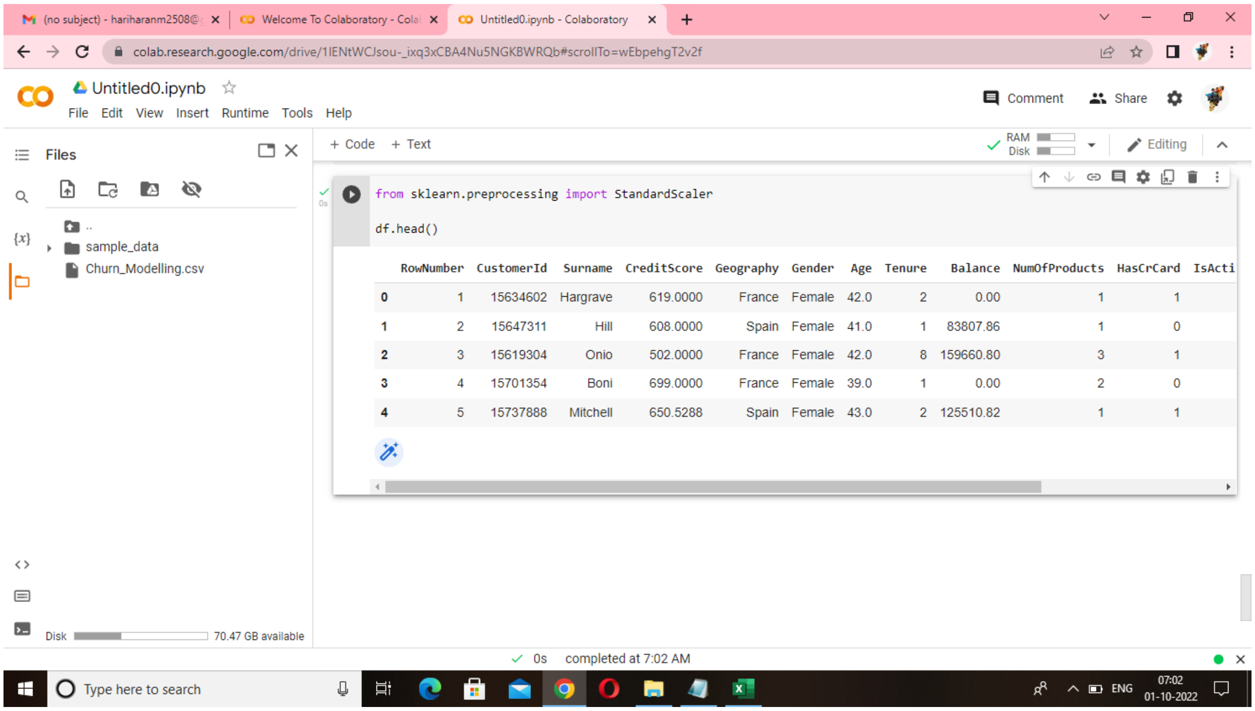


```
x=df.iloc[:,:-1].values
x
```

```
array([[1, 15634602, 'Hargrave', ..., 1, 1, 101348.88],
       [2, 15647311, 'Hill', ..., 0, 1, 112542.58],
       [3, 15619304, 'Onio', ..., 1, 0, 113931.57],
       ...,
       [9998, 15584532, 'Liu', ..., 0, 1, 42085.58],
       [9999, 15682355, 'Sabbatini', ..., 1, 0, 92888.52],
       [10000, 15628319, 'Walker', ..., 1, 0, 38190.78]], dtype=object)
```

Question-9

Scale the independent Variables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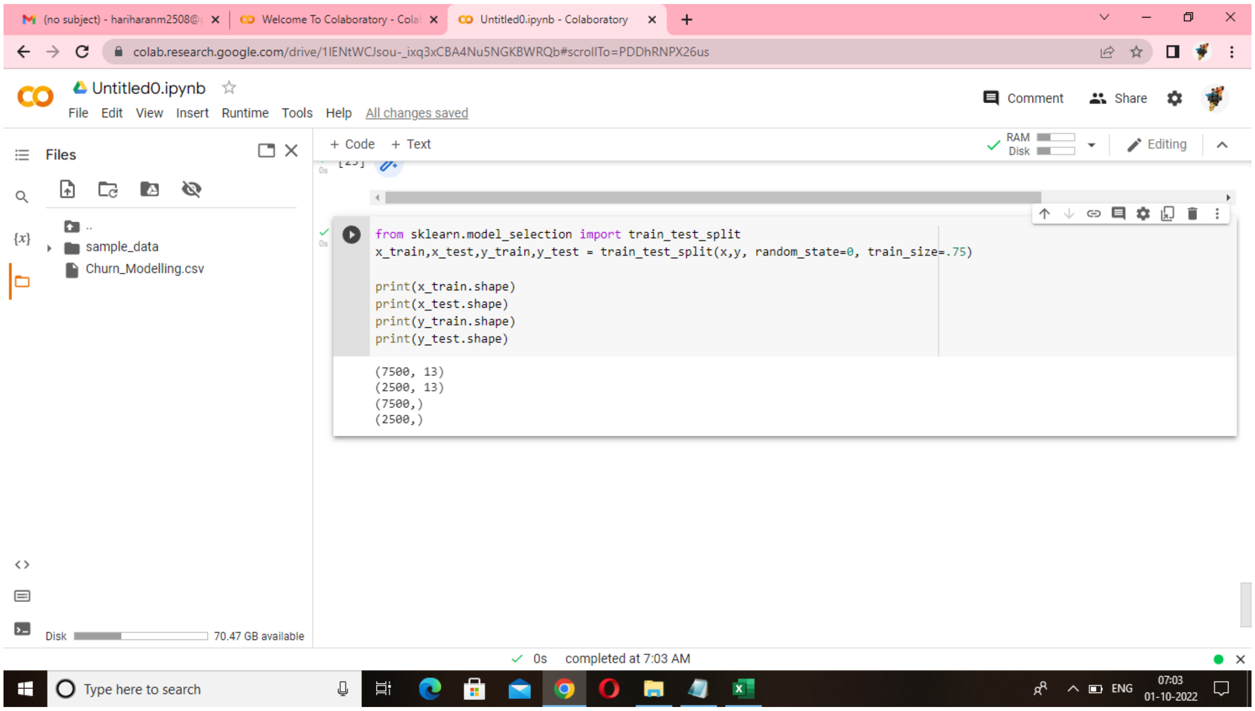
```
from sklearn.preprocessing import StandardScaler

df.head()
```

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActi
0	1	15634602	Hargrave	619.0000	France	Female	42.0	2	0.00	1	1	
1	2	15647311	Hill	608.0000	Spain	Female	41.0	1	83807.86	1	0	
2	3	15619304	Onio	502.0000	France	Female	42.0	8	159660.80	3	1	
3	4	15701354	Boni	699.0000	France	Female	39.0	1	0.00	2	0	
4	5	15737888	Mitchell	650.5288	Spain	Female	43.0	2	125510.82	1	1	

Question-10

Split the data into training & testing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```
from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test = train_test_split(x,y, random_state=0, train_size=.75)

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

```
(7500, 13)
(2500, 13)
(7500,)
(2500,)
```