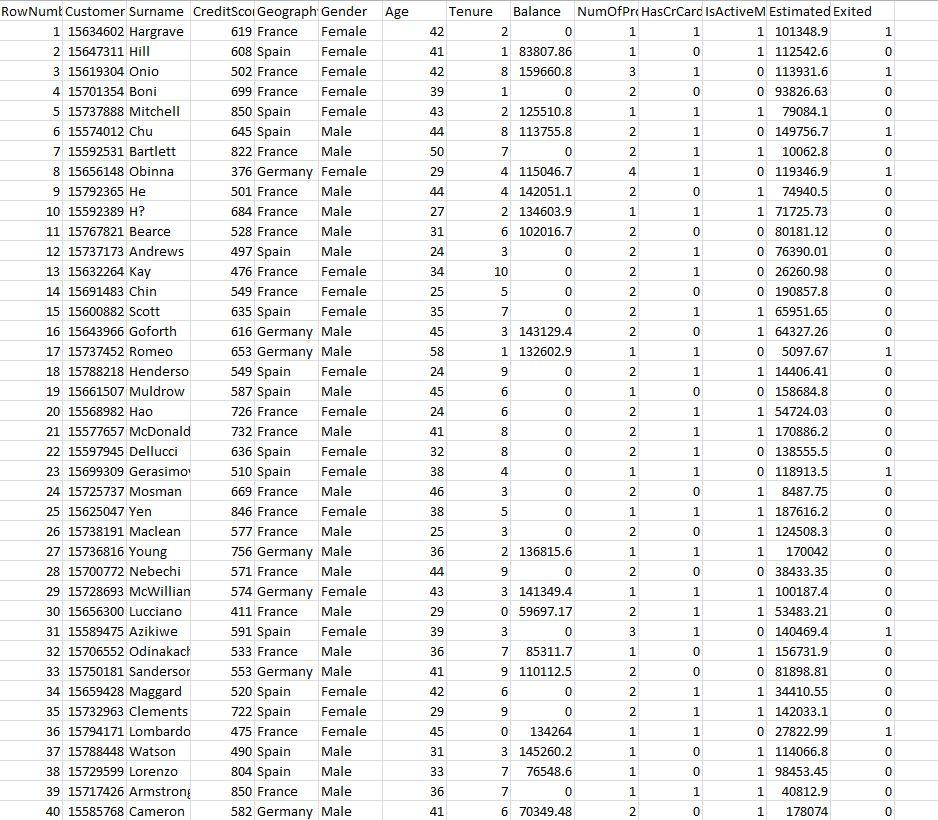
**Data Visualization and Pre-processing**

**Assignment -2**

| Assignment Date | 26 September 2022 |
| --- | --- |
| Team ID | PNT2022TMID27812 |
| Project Name | Smart Lender - Applicant Credibility Prediction for Loan Approval |
| Student Name | S.G.Mydhrayan |
| Student Roll Number | 311519104036 |
| Maximum Marks | 2 Marks |

**Question-1.**Download dataset

**Solution:**



**Question-2.**Load the dataset

**Solution:**

**import numpy as np**

**import pandas as pd**

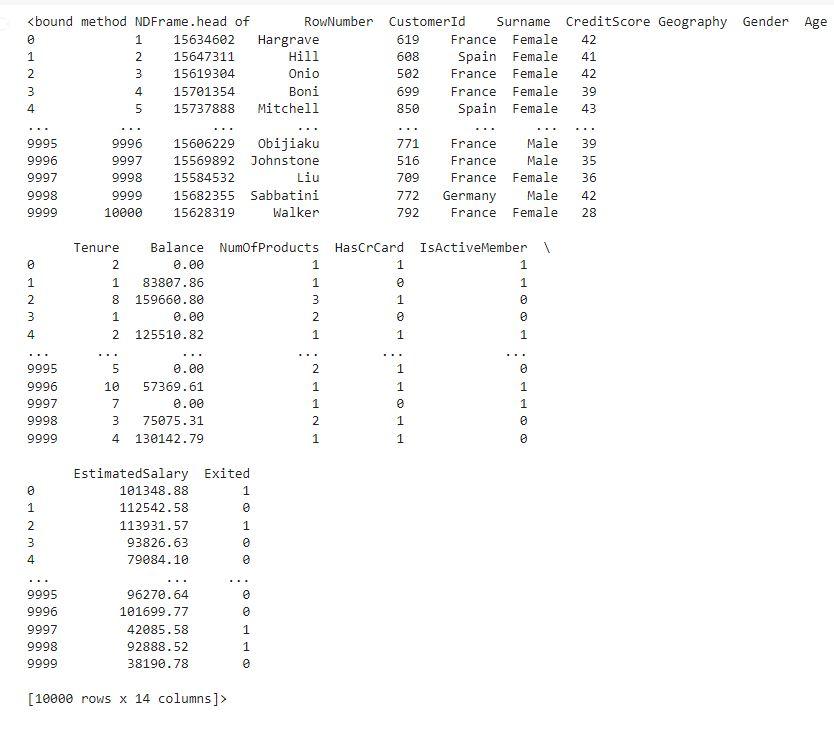
**import seaborn as sns**

**importmatplotlib.pyplot as plt**

**import sklearn**

**data = pd.read\_csv(r'Churn\_Modelling.csv')**

**df.head**

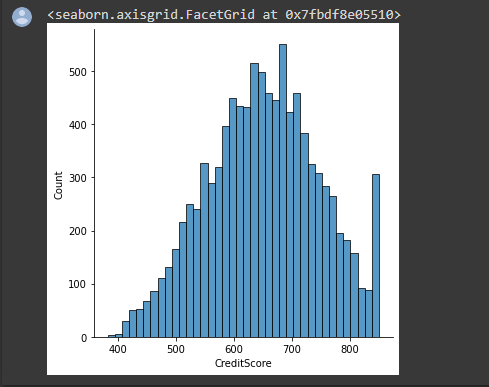
****

**Question-3.**Perform Below Visualizations.

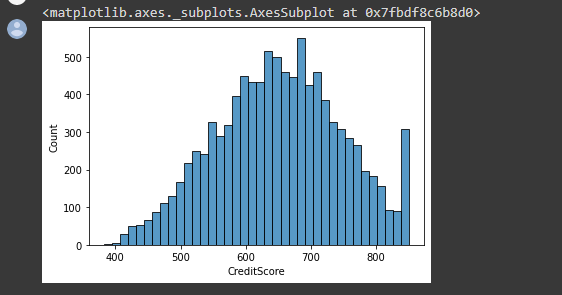
***3.1 Univariate Analysis***

**Solution:**

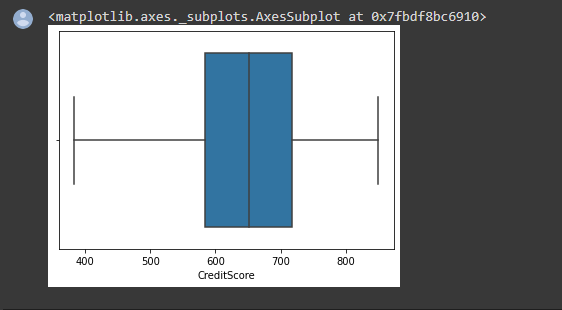
**sns.displot(data['CreditScore'])**

****

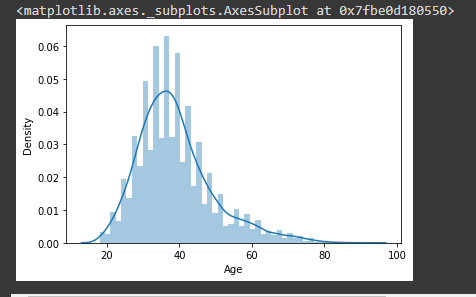
**sns.histplot(data['CreditScore'])**

****

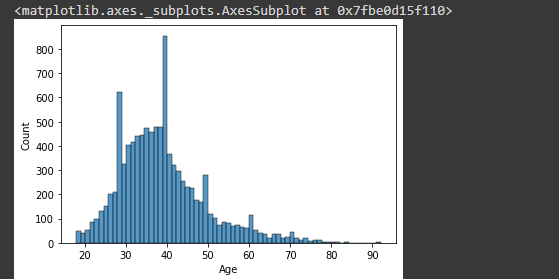
**sns.boxplot(x = data['CreditScore'])**

****

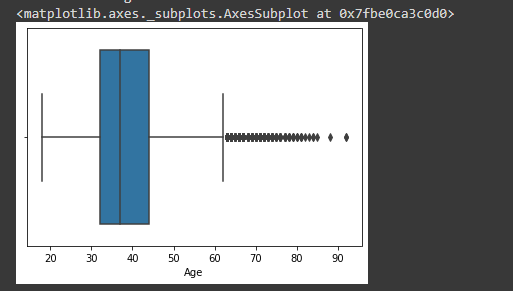
**sns.distplot(data['Age'])**

****

**sns.histplot(data['Age'])**

****

**sns.boxplot(data['Age'])**

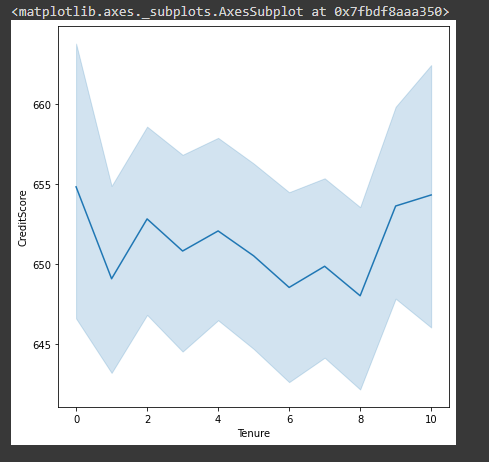
****

***3.2 Bivariate Analysis***

**Solution:**

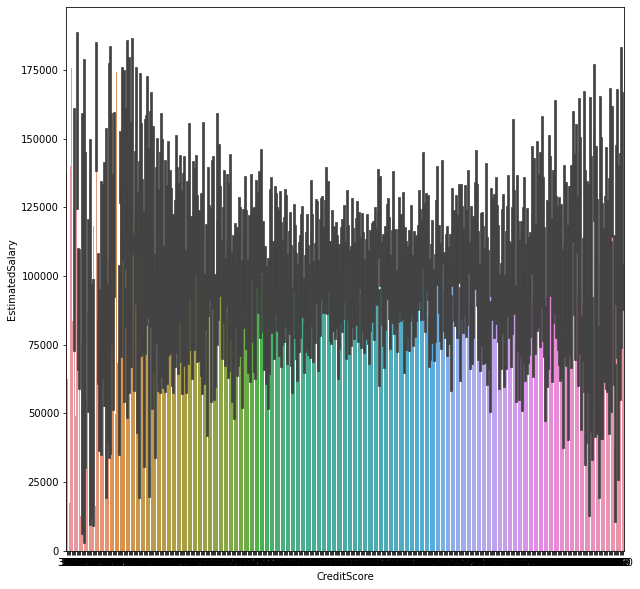
**plt.figure(figsize=(7,7))**

**sns.lineplot(data = data, x = 'Tenure', y = 'CreditScore')**

****

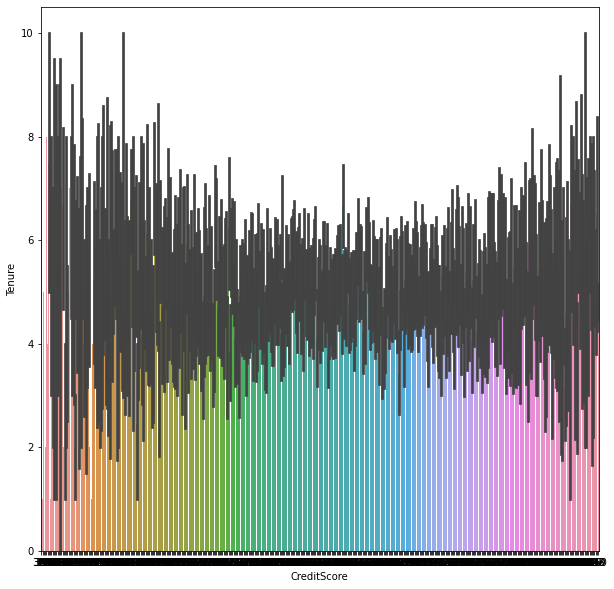
**plt.figure(figsize=(10,10))**

**sns.barplot(data = data, x = 'CreditScore', y ='EstimatedSalary')**



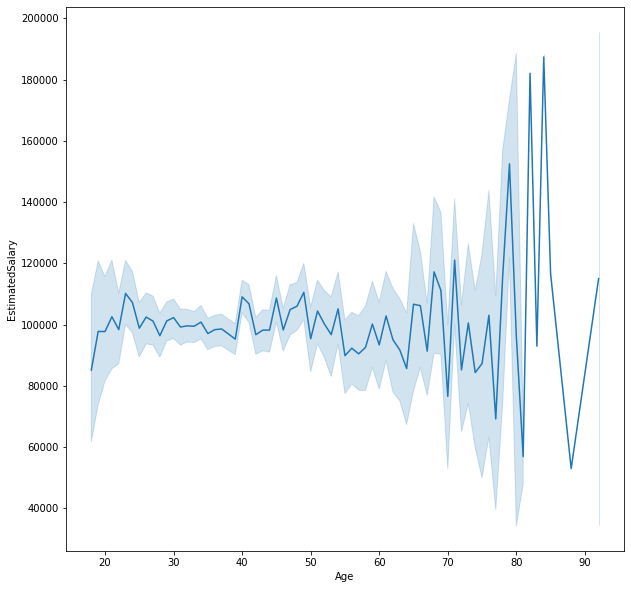
**plt.figure(figsize=(10,10))**

**sns.barplot(data = data, x = 'CreditScore', y = 'Tenure')**



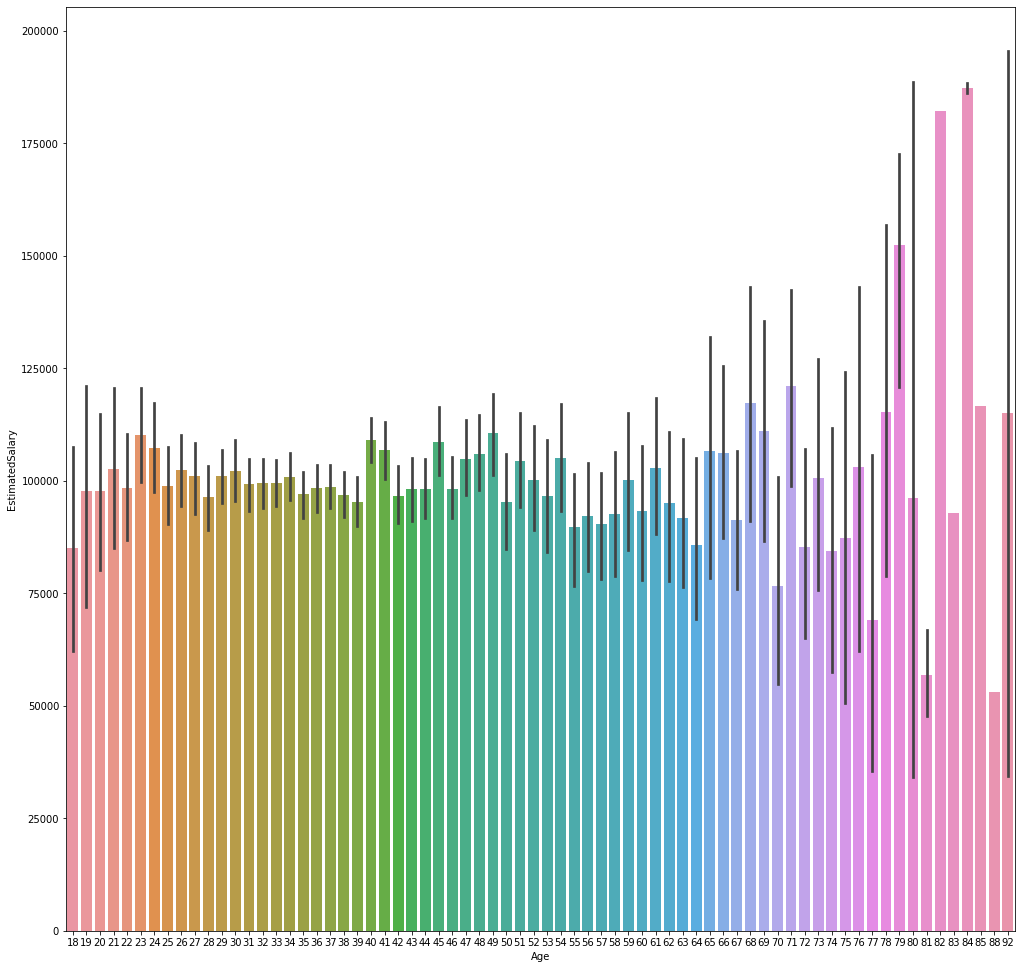
**plt.figure(figsize=(10,10))**

**sns.lineplot(data['Age'], data['EstimatedSalary'])**

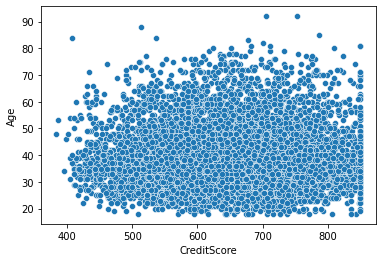


**plt.figure(figsize=(17,17))**

**sns.barplot(data['Age'], data['EstimatedSalary'])**



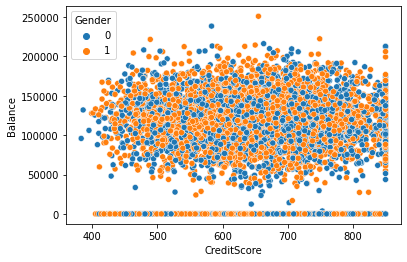
**sns.scatterplot(data = data, x = 'CreditScore', y = 'Age')**



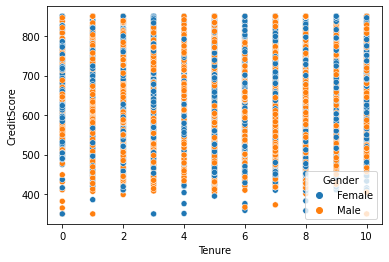
***3.3 Multivariate Analysis***

**Solution:**

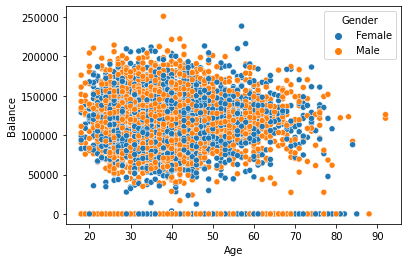
**sns.scatterplot(data = data, x = 'CreditScore', y = 'Balance', hue = 'Gender')**

****

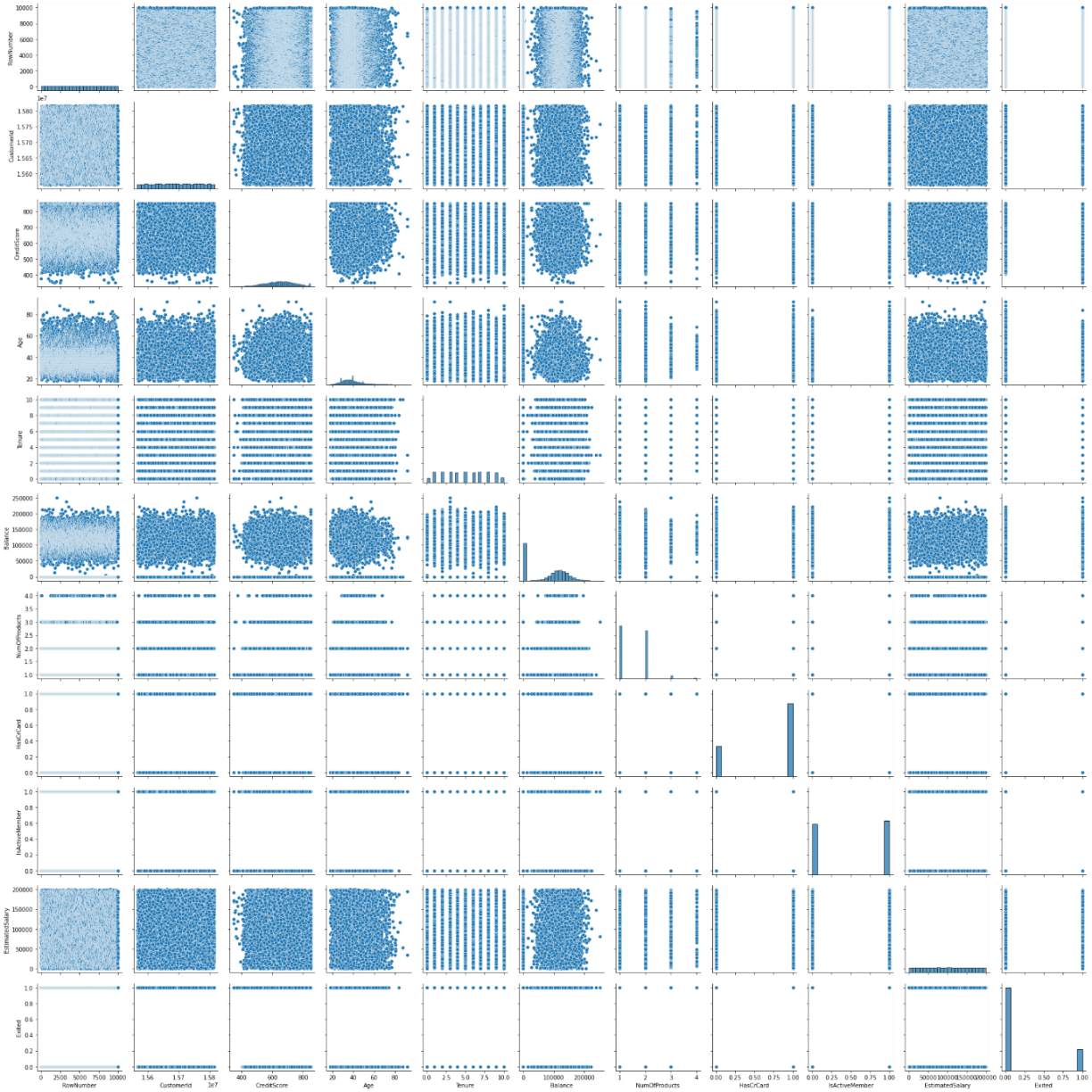
**sns.scatterplot(data['Tenure'], data['CreditScore'], hue = data['Gender'])**

****

**sns.scatterplot(data['Age'], data['Balance'], hue = data['Gender'])**

****

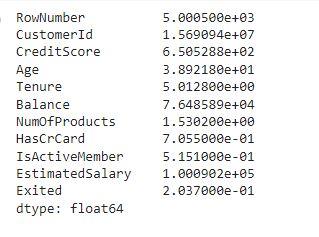
**sns.pairplot(data)**

****

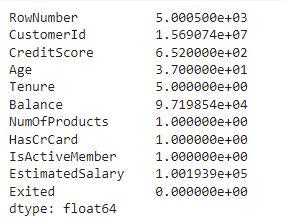
**Question-4.**Perform descriptive statistics on the dataset.

**Solution:**

**data.mean(numeric\_only = True)**



**data.median(numeric\_only = True)**

****

**data['CreditScore'].mode()**

****

**data['EstimatedSalary'].mode()**

****

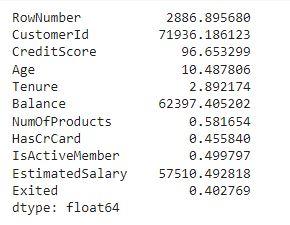
**data['HasCrCard'].unique()**

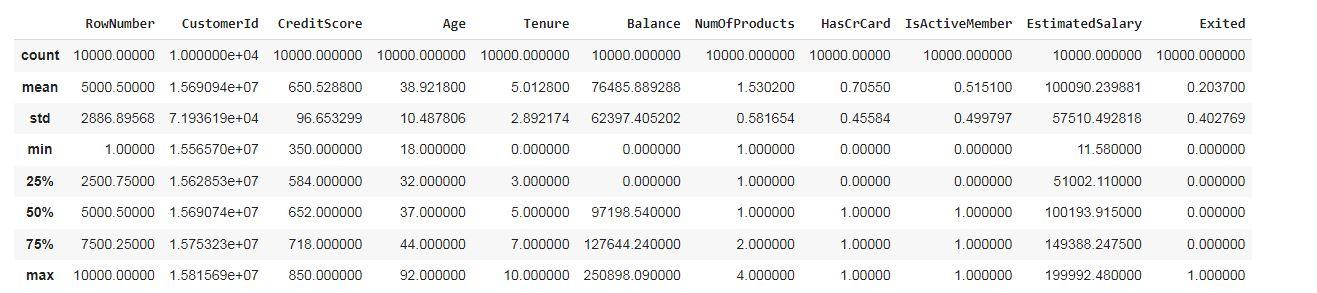
****

**data['Tenure'].unique()**

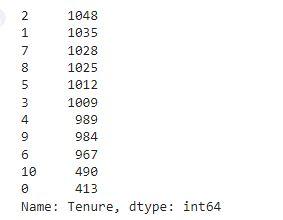
****

**data.std(numeric\_only=True)**

****

**data.describe()**

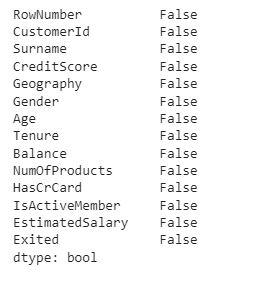
**data['Tenure'].value\_counts()**



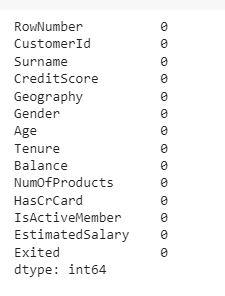
**Question-5.**Handle the Missing values.

**Solution:**

**data.isnull().any()**



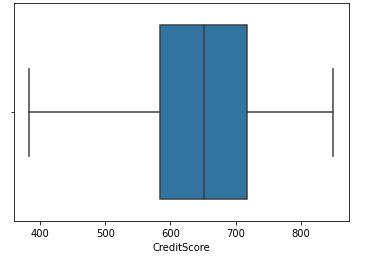
**data.isnull().sum()**



**Question-6.**Find the outliers and replace the outliers

**Solution:**

**sns.boxplot(data['CreditScore'])#Outlier detection - box plot**

****

**fig, ax = plt.subplots(figsize = (5,3)) #Outlier detection - Scatter plot**

**ax.scatter(data['Balance'], data['Exited'])**

**# x-axis label**

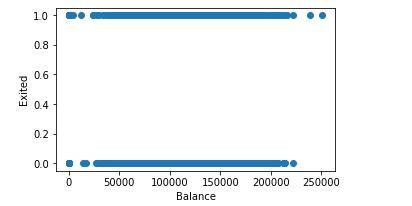
**ax.set\_xlabel('Balance')**

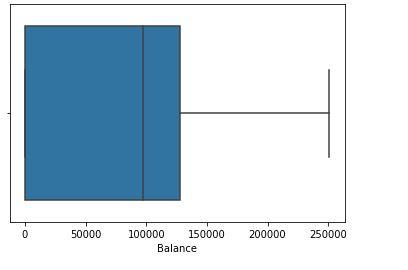
**# y-axis label**

**ax.set\_ylabel('Exited')**

**plt.show()**

**sns.boxplot(x=data['Balance'])**

****

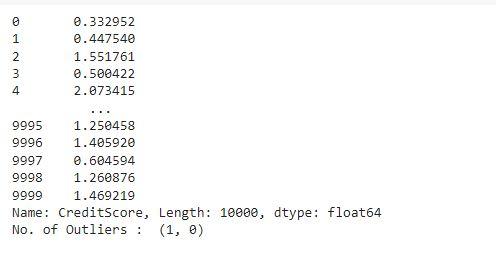
****

**from scipy import stats #Outlier detection – zscore**

**zscore = np.abs(stats.zscore(data['CreditScore']))**

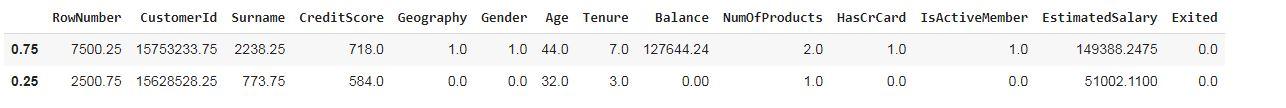
**print(zscore)**

**print('No. of Outliers : ', np.shape(np.where(zscore>3)))**

****

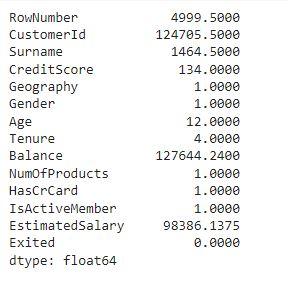
**q = data.quantile([0.75,0.25])**

**q**

****

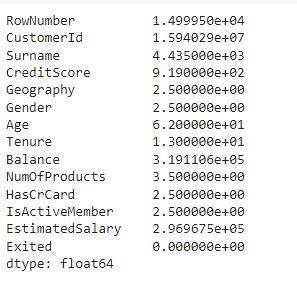
**iqr =  q.iloc[0] - q.iloc[1]**

**iqr**

****

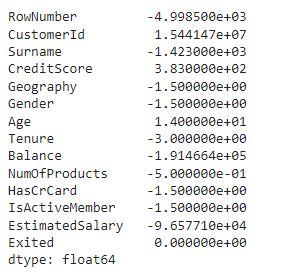
**u = q.iloc[0] + (1.5\*iqr)**

**u**

****

**l = q.iloc[1] - (1.5\*iqr)**

**l**



**Q1 = data['EstimatedSalary'].quantile(0.25) #Outlier detection - IQR**

**Q3 = data['EstimatedSalary'].quantile(0.75)**

**iqr = Q3 - Q1**

**print(iqr)**

**upper=Q3 + 1.5 \* iqr**

**lower=Q1 - 1.5 \* iqr**

**count = np.size(np.where(data['EstimatedSalary'] >upper))**

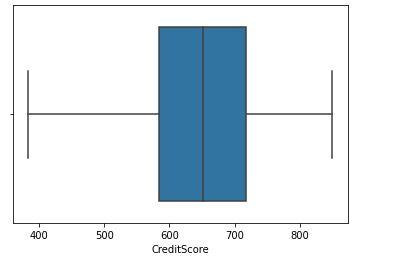
**count = count + np.size(np.where(data['EstimatedSalary'] <lower))**

**print('No. of outliers : ', count)**



**data['CreditScore'] = np.where(np.logical\_or(data['CreditScore']>900, data['CreditScore']<383), 650, data['CreditScore'])**

**sns.boxplot(data['CreditScore'])**

****

**upper = data.Age.mean() + (3 \* data.Age.std()) #Outlier detection - 3 sigma**

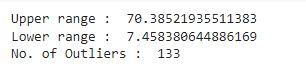
**lower = data.Age.mean() - (3 \* data.Age.std())**

**columns = data[ ( data['Age'] > upper ) | ( data['Age']<lower ) ]**

**print('Upper range : ', upper)**

**print('Lower range : ', lower)**

**print('No. of Outliers : ', len(columns))**

****

**columns = ['EstimatedSalary', 'Age', 'Balance', 'NumOfProducts', 'Tenure', 'CreditScore'] #After outlier removal**

**for i in columns:**

**Q1 = data[i].quantile(0.25)**

**Q3 = data[i].quantile(0.75)**

**iqr = Q3 - Q1**

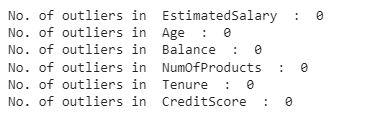
**upper=Q3 + 1.5 \* iqr**

**lower=Q1 - 1.5 \* iqr**

**count = np.size(np.where(data[i] >upper))**

**count = count + np.size(np.where(data[i] <lower))**

**print('No. of outliers in ', i, ' : ', count)**

****

**Question-7.** Check for Categorical columns and perform encoding

**Solution:**

**from sklearn.preprocessing import LabelEncoder, OneHotEncoder**

**le = LabelEncoder()**

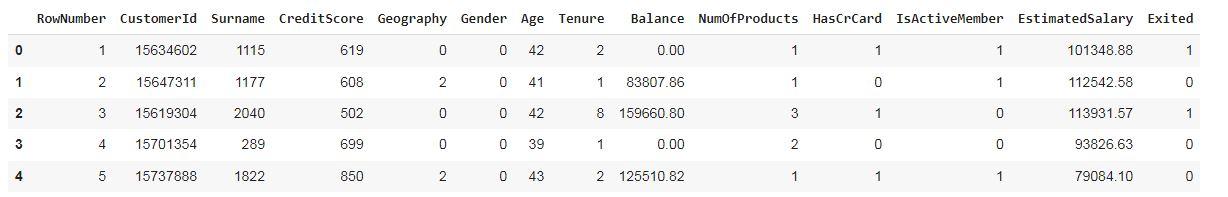
**oneh = OneHotEncoder()**

**data['Surname'] = le.fit\_transform(data['Surname'])**

**data['Gender'] = le.fit\_transform(data['Gender'])**

**data['Geography'] = le.fit\_transform(data['Geography'])**

**data.head()**

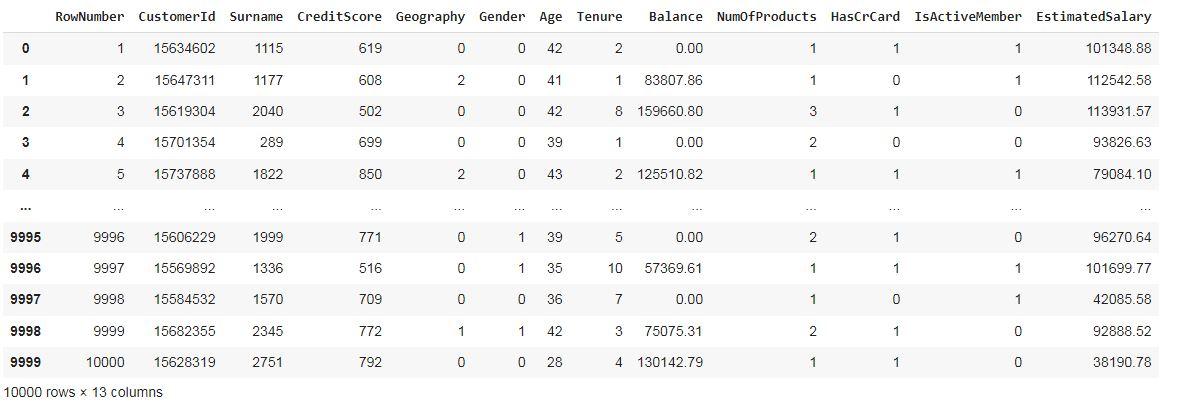


**Question-8.**Split the data into dependent and independent variables split the data in X and Y

**Solution:**

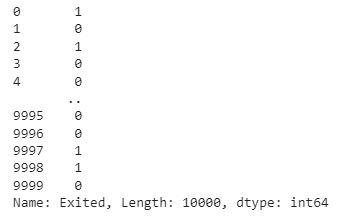
**x # independent values ( inputs)**

**x = data.iloc[:, 0:13]**

****

**y # dependent values (output)**

**y = data['Exited']**



**Question-9.**Scale the independent variables

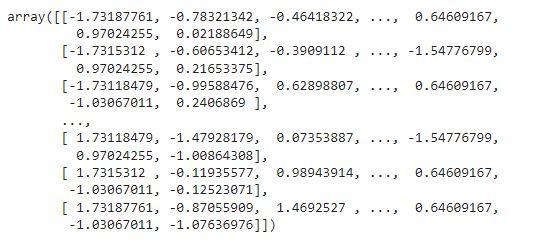
**Solution:**

**from sklearn.preprocessing import StandardScaler, MinMaxScaler**

**sc = StandardScaler()**

**x\_scaled = sc.fit\_transform(x)**

**x\_scaled**

****

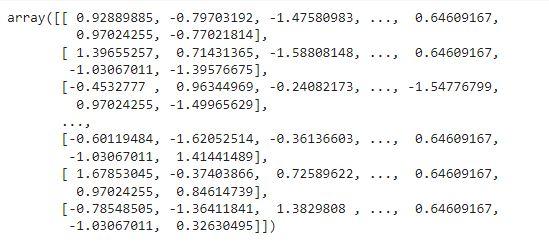
**Question-10.**Split x and y into Training and Testing

**Solution:**

**from sklearn.model\_selection import train\_test\_split**

**x\_train, x\_test, y\_train, y\_test = train\_test\_split(x\_scaled, y, test\_size = 0.3, random\_state = 0)**

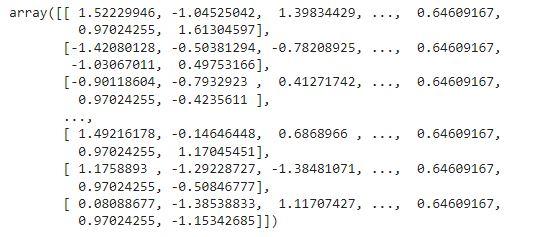
**x\_train**

****

**x\_train.shape**

****

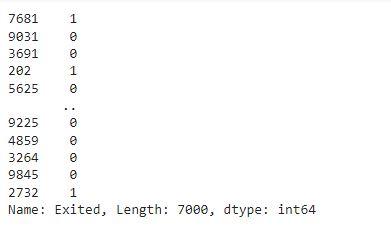
**x\_test**

****

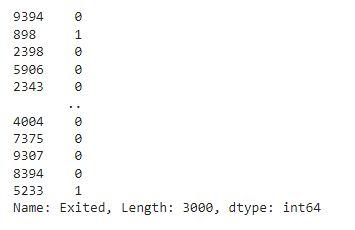
**x\_test.shape**

****

**y\_train**

****

**y\_test**

****