Assignment – 3

Abalone Age Prediction

Assignment Date	30 September 2022
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Maximum Marks	2 Marks

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import LabelEncoder
from sklearn.preprocessing import scale
from sklearn.linear_model import LinearRegression
from sklearn.metrics import mean_squared_error
```

Task 1 & 2 - Downloading and Loading the Dataset

```
[3] path = '/content/drive/MyDrive/IBM/Assignment 3/abalone.csv'

    df = pd.read_csv(path)
```

```
[4] df.head()
```

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
0	M	0.455	0.365	0.095	0.5140	0.2245	0.1010	0.150	15
1	M	0.350	0.265	0.090	0.2255	0.0995	0.0485	0.070	7
2	F	0.530	0.420	0.135	0.6770	0.2565	0.1415	0.210	9
3	M	0.440	0.365	0.125	0.5160	0.2155	0.1140	0.155	10
4	I	0.330	0.255	0.080	0.2050	0.0895	0.0395	0.055	7

```
[5] df.shape

    (4177, 9)
```

```
[6]  df.info()
```

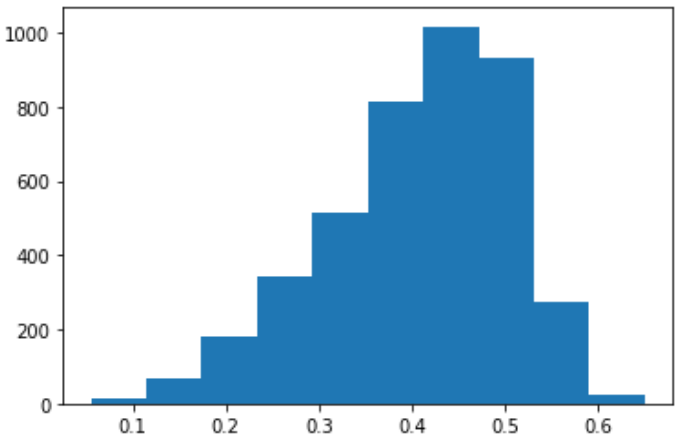
```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 4177 entries, 0 to 4176
Data columns (total 9 columns):
 #   Column          Non-Null Count  Dtype  
---  ------          --------------  -----  
 0   Sex             4177 non-null   object 
 1   Length          4177 non-null   float64
 2   Diameter        4177 non-null   float64
 3   Height          4177 non-null   float64
 4   Whole weight    4177 non-null   float64
 5   Shucked weight  4177 non-null   float64
 6   Viscera weight  4177 non-null   float64
 7   Shell weight    4177 non-null   float64
 8   Rings           4177 non-null   int64  
dtypes: float64(7), int64(1), object(1)
memory usage: 293.8+ KB
```

Task - 3 Visualizing the Analysis

3.1 Univariate Analysis

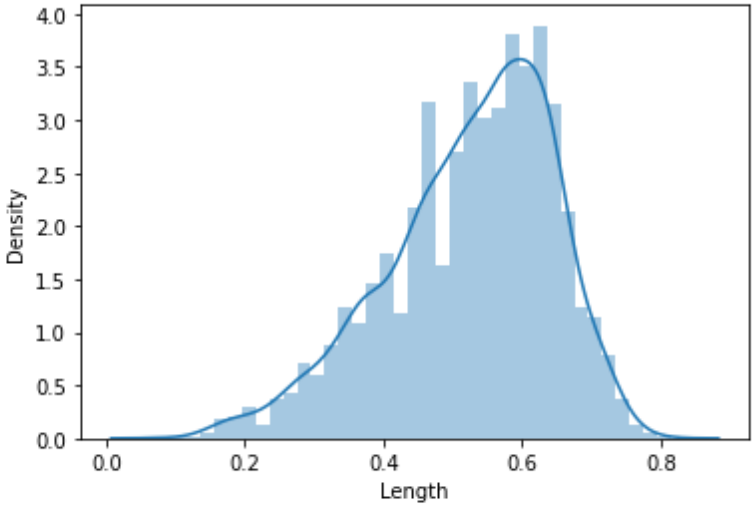
```
[7]  plt.hist(df['Diameter'])
```

```
(array([  13.,   66.,  180.,  344.,  513.,  812., 1017.,  934.,  275.,
         23.]),
 array([0.055 , 0.1145, 0.174 , 0.2335, 0.293 , 0.3525, 0.412 , 0.4715,
        0.531 , 0.5905, 0.65  ]),
 <a list of 10 Patch objects>)
```

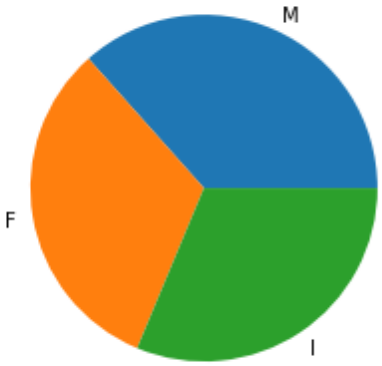


[8] `sns.distplot(df['Length'])`

```
/usr/local/lib/python3.7/dist-packages/seaborn/distributions.py:2619:
  warnings.warn(msg, FutureWarning)
<matplotlib.axes._subplots.AxesSubplot at 0x7fa744495750>
```



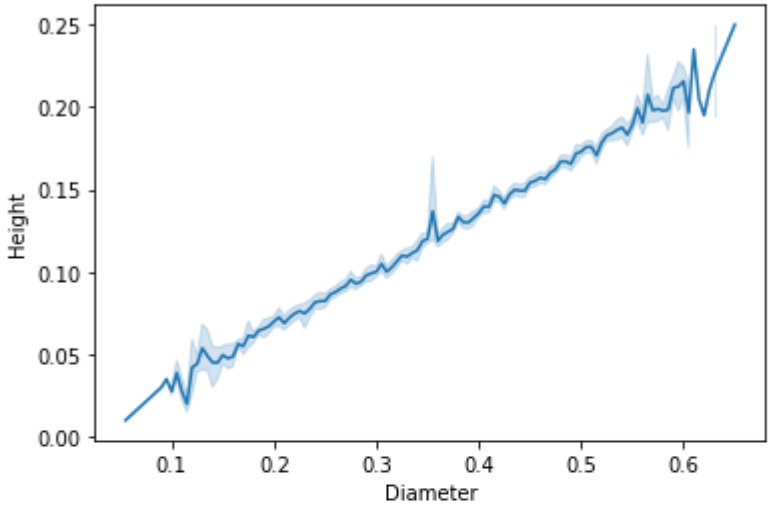
[9] `plt.pie(df['Sex'].value_counts(), labels=df['Sex'].unique())`
`plt.show()`



3.2 Bi - Variate Analysis

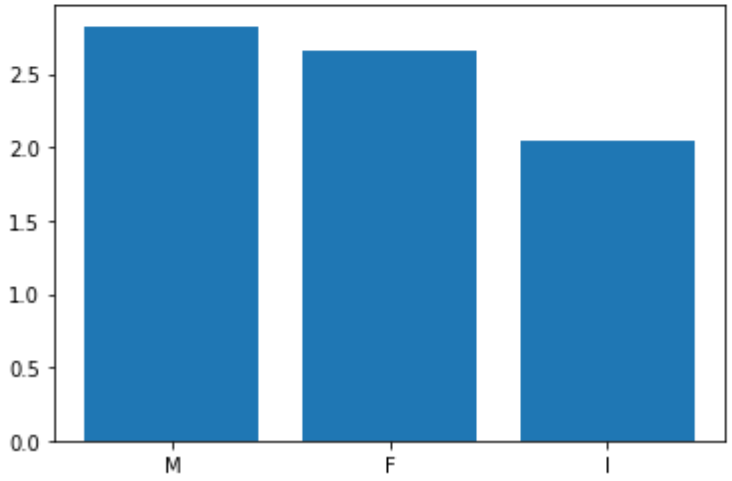
[10] `sns.lineplot(x=df.Diameter,y=df.Height)`

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fa7443800d0>
```



[11] `plt.bar(df.Sex, df['Whole weight'])`

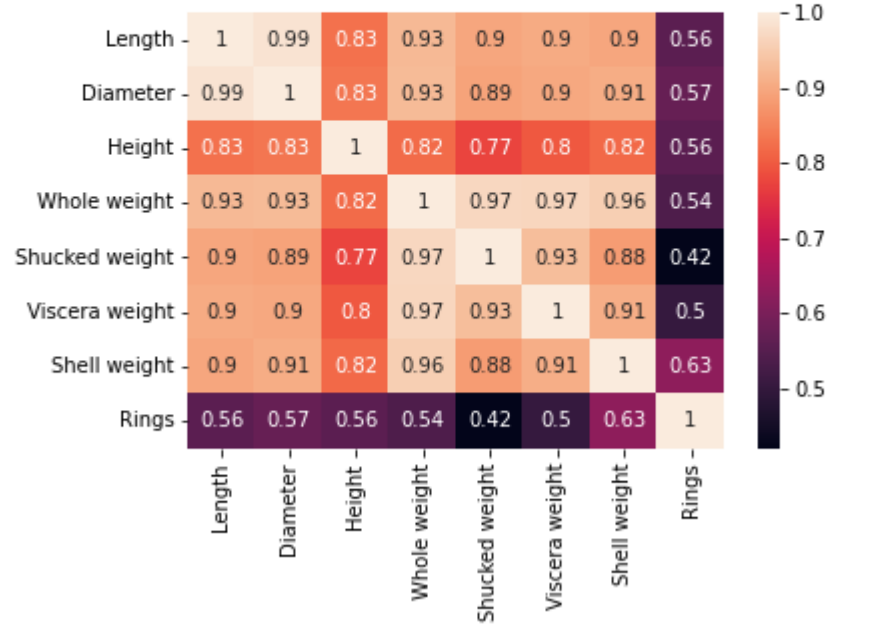
```
<BarContainer object of 4177 artists>
```



3.3 Multi - Variate Analysis

```
[12] sns.heatmap(df.corr(),annot=True)
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fa743ceaad0>
```



Task 4 - Descriptive Statistics

```
[13] df.describe()
```

	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
count	4177.000000	4177.000000	4177.000000	4177.000000	4177.000000	4177.000000	4177.000000	4177.000000
mean	0.523992	0.407881	0.139516	0.828742	0.359367	0.180594	0.238831	9.933684
std	0.120093	0.099240	0.041827	0.490389	0.221963	0.109614	0.139203	3.224169
min	0.075000	0.055000	0.000000	0.002000	0.001000	0.000500	0.001500	1.000000
25%	0.450000	0.350000	0.115000	0.441500	0.186000	0.093500	0.130000	8.000000
50%	0.545000	0.425000	0.140000	0.799500	0.336000	0.171000	0.234000	9.000000
75%	0.615000	0.480000	0.165000	1.153000	0.502000	0.253000	0.329000	11.000000
max	0.815000	0.650000	1.130000	2.825500	1.488000	0.760000	1.005000	29.000000

Task 5 - Handle Missing Values

```
[14] df.isnull().any()
```

```
Sex               False
Length            False
Diameter          False
Height            False
Whole weight      False
Shucked weight    False
Viscera weight    False
Shell weight      False
Rings             False
dtype: bool
```

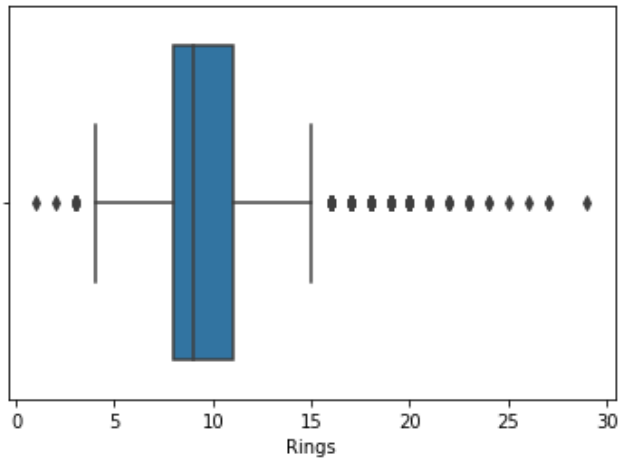
```
[15] df.isnull().sum()
```

```
Sex               0
Length            0
Diameter          0
Height            0
Whole weight      0
Shucked weight    0
Viscera weight    0
Shell weight      0
Rings             0
dtype: int64
```

Task 6 - Find Outliers and Replacing

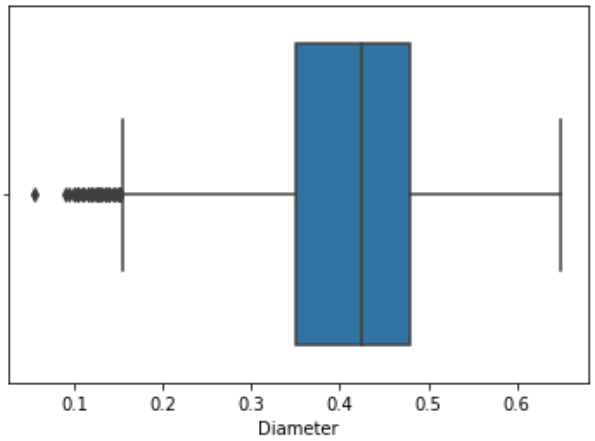
```
[16] sns.boxplot(x=df['Rings'])
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fa73e668a10>
```



```
[17] sns.boxplot(x=df['Diameter'])
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fa73e668a50>
```




```
[18] for col in df.columns:
       if (((df[col].dtype)=='float64') | ((df[col].dtype)=='int64')):

         q2 = df[col].quantile(0.25)
         q3 = df[col].quantile(0.75)
         IQR = q3 - q2
         upper_limit = q3 + 1.5*IQR
         lower_limit = q2 - 1.5*IQR

         df[col] = np.where(df[col] < lower_limit, lower_limit, df[col])
         df[col] = np.where(df[col] > upper_limit, upper_limit, df[col])
```

Task - 7 Categorical Columns and Perform Encoding

```
[19] df.head()
```

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
0	M	0.455	0.365	0.095	0.5140	0.2245	0.1010	0.150	15.0
1	M	0.350	0.265	0.090	0.2255	0.0995	0.0485	0.070	7.0
2	F	0.530	0.420	0.135	0.6770	0.2565	0.1415	0.210	9.0
3	M	0.440	0.365	0.125	0.5160	0.2155	0.1140	0.155	10.0
4	I	0.330	0.255	0.080	0.2050	0.0895	0.0395	0.055	7.0

```
[20] print(df.Sex.unique())
```

```
['M' 'F' 'I']
```

```
[21] le = LabelEncoder()
     df.Sex = le.fit_transform(df.Sex)
```

```
[22] df.head()
```

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
0	2	0.455	0.365	0.095	0.5140	0.2245	0.1010	0.150	15.0
1	2	0.350	0.265	0.090	0.2255	0.0995	0.0485	0.070	7.0
2	0	0.530	0.420	0.135	0.6770	0.2565	0.1415	0.210	9.0
3	2	0.440	0.365	0.125	0.5160	0.2155	0.1140	0.155	10.0
4	1	0.330	0.255	0.080	0.2050	0.0895	0.0395	0.055	7.0

Task - 8 Split the Data into Dependent and Independent Variables

```
[23] y = df['Rings']
     X = df.drop('Rings', axis=1)
```

```
[24] y
```

```
0       15.0
1        7.0
2        9.0
3       10.0
4        7.0
        ...
4172    11.0
4173    10.0
4174     9.0
4175    10.0
4176    12.0
Name: Rings, Length: 4177, dtype: float64
```

```
[25] X
```

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight
0	2	0.455	0.365	0.095	0.5140	0.2245	0.1010	0.1500
1	2	0.350	0.265	0.090	0.2255	0.0995	0.0485	0.0700
2	0	0.530	0.420	0.135	0.6770	0.2565	0.1415	0.2100
3	2	0.440	0.365	0.125	0.5160	0.2155	0.1140	0.1550
4	1	0.330	0.255	0.080	0.2050	0.0895	0.0395	0.0550
...	...	...	...	...	...	...	...	...
4172	0	0.565	0.450	0.165	0.8870	0.3700	0.2390	0.2490
4173	2	0.590	0.440	0.135	0.9660	0.4390	0.2145	0.2605
4174	2	0.600	0.475	0.205	1.1760	0.5255	0.2875	0.3080
4175	0	0.625	0.485	0.150	1.0945	0.5310	0.2610	0.2960
4176	2	0.710	0.555	0.195	1.9485	0.9455	0.3765	0.4950

4177 rows × 8 columns

Task - 9 Scale the Independent Variables

```
[26] scaled_X = pd.DataFrame(scale(X), columns=X.columns)
     scaled_X
```

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight
0	1.151980	-0.583117	-0.440884	-1.158093	-0.644740	-0.614985	-0.730304	-0.645184
1	1.151980	-1.465694	-1.459762	-1.288751	-1.238208	-1.191637	-1.213890	-1.231390
2	-1.280690	0.047295	0.119499	-0.112828	-0.309436	-0.467362	-0.357253	-0.205531
3	1.151980	-0.709200	-0.440884	-0.374145	-0.640626	-0.656504	-0.610559	-0.608547
4	-0.064355	-1.633804	-1.561650	-1.550067	-1.280378	-1.237770	-1.296790	-1.341303
...	...	...	...	...	...	...	...	...
4172	-1.280690	0.341487	0.425163	0.671120	0.122550	0.056238	0.540835	0.080244
4173	1.151980	0.551624	0.323275	-0.112828	0.285059	0.374550	0.315162	0.164511
4174	1.151980	0.635679	0.679882	1.716385	0.717046	0.773593	0.987576	0.512571
4175	-1.280690	0.845817	0.781770	0.279146	0.549394	0.798966	0.743480	0.424640
4176	1.151980	1.560284	1.494985	1.455069	2.306139	2.711144	1.807369	1.882825

4177 rows × 8 columns

Task - 10 Split the Data into Training and Testing

```
[27] x_train, x_test, y_train, y_test = train_test_split(scaled_X, y, test_size=0.3, random_state=0)
```

```
[28] print(x_train.shape, x_test.shape, y_train.shape, y_test.shape)
```

```
(2923, 8) (1254, 8) (2923,) (1254,)
```

Task - 11 Build the Model

```
[29] lr = LinearRegression()
```

Task - 12 Train the Model

```
[30] lr.fit(x_train, y_train)
```

```
LinearRegression()
```

Task - 13 Test the Model

```
y_pred = lr.predict(x_test)
y_pred
```

```
array([12.55446979,  9.47758181, 10.25463091, ...,  7.9886076 ,
       17.03108659, 11.51225618])
```