Assignment - 3

Problem Statement: Abalone Age Prediction

ASSIGNMENT DATE	19 OCTOBER 2022
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STUDENT ROLL NUMBER	19BEC027
MAXIMUM MARKS	2 MARKS

#1.Download the dataset

import pandas **as** pd **import**
numpy **as** np **import**
matplotlib.pyplot **as** plt **import**
seaborn **as** sns

#2. Load the dataset into the tool

df=pd**.**read_csv("abalone.csv") 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

df**.**tail()

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
4172	F	0.565	0.450	0.165	0.8870	0.3700	0.2390	0.2490	11
4173	M	0.590	0.440	0.135	0.9660	0.4390	0.2145	0.2605	10
4174	M	0.600	0.475	0.205	1.1760	0.5255	0.2875	0.3080	9
4175	F	0.625	0.485	0.150	1.0945	0.5310	0.2610	0.2960	10
4176	M	0.710	0.555	0.195	1.9485	0.9455	0.3765	0.4950	12

df**.**shape

(4177, 9) df**.**info()

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 *#3. Perform Below Visualizations*

#Univariate Analysis sns**.**boxplot(x=df['Height'])

#Bi-Variate Analysis sns**.**lineplot(df['Sex'],df['Length'])

C:\Users\shire\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variables as keyword args: x, y. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

warnings.warn(

#Multi-Variate Analysis sns**.**heatmap(df**.**corr(),annot**=True**)

#4. Perform descriptive statistics on the dataset 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

	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
mean	0.523992	0.407881	0.139516	0.828742	0.359367	0.180594	0.238831	9.933684

std	0.12009 3	0.09924 0	0.04182 7	0.49038 9	0.22196 3	0.10961 4	0.13920 3	3.22416 9
mi	0.07500	0.05500	0.00000	0.00200	0.00100	0.00050	0.00150	1.00000
n	0	0	0	0	0	0	0	0
25 %	0.45000 0	0.35000 0	0.11500 0	0.44150 0	0.18600 0	0.09350 0	0.13000 0	8.00000 0
50 %	0.54500 0	0.42500 0	0.14000 0	0.79950 0	0.33600 0	0.17100 0	0.23400 0	9.00000 0
75 %	0.61500 0	0.48000 0	0.16500 0	1.15300 0	0.50200 0	0.25300 0	0.32900 0	11.0000 00
ma	0.81500	0.65000	1.13000	2.82550	1.48800	0.76000	1.00500	29.0000
x	0	0	0	0	0	0	0	00

df**.**describe()**.**T

	count	**mean**	**std**	**min**	**25%**	**50%**	**75%**	**max**
Length	4177.0	0.523992	0.120093	0.0750	0.4500	0.5450	0.615	0.8150
	count	**mean**	**std**	**min**	**25%**	**50%**	**75%**	**max**
Diameter	4177.0	0.407881	0.099240	0.0550	0.3500	0.4250	0.480	0.6500
Height	4177.0	0.139516	0.041827	0.0000	0.1150	0.1400	0.165	1.1300
Whole weight	4177.0	0.828742	0.490389	0.0020	0.4415	0.7995	1.153	2.8255
Shucked								

	4177.0	0.359367	0.221963	0.0010	0.1860	0.3360	0.502	1.4880
weight Viscera	4177.0	0.180594	0.109614	0.0005	0.0935	0.1710	0.253	0.7600
weight Shell weight	4177.0	0.238831	0.139203	0.0015	0.1300	0.2340	0.329	1.0050
Rings	4177.0	9.933684	3.224169	1.0000	8.0000	9.0000	11.000	29.0000

#5. Check for Missing values and deal with them

df.isna().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

#6. Find the outliers and replace them outliers

df['Sex'].replace({'M':1, 'F':0, 'I':-1},inplace=**True**)

df.head()

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
0	1	0.455	0.365	0.095	0.5140	0.2245	0.1010	0.150	15
1	1	0.350	0.265	0.090	0.2255	0.0995	0.0485	0.070	7

2	0	0.530	0.420	0.135	0.6770	0.2565	0.1415	0.210	9
3	1	0.440	0.365	0.125	0.5160	0.2155	0.1140	0.155	10
4	-1	0.330	0.255	0.080	0.2050	0.0895	0.0395	0.055	7

```
df.Sex.unique()
```

```
array([ 1,  0, -1], dtype=int64)
```

```
sns.boxplot(x=df["Sex"])
```

```
sns.boxplot(x=df["Length"])
```

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

```
sns.boxplot(x=df["Height"])
```

```
sns.boxplot(x=df["Whole weight"])
```

```
sns.boxplot(x=df["Shucked weight"])
```

```
sns.boxplot(x=df["Viscera weight"])
```

```
sns.boxplot(x=df["Shell weight"])
```

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

```
#handle outlier
qnt=df.quantile(q=[0.25,0.75]) qnt
```

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
0.25	-1.0	0.450	0.35	0.115	0.4415	0.186	0.0935	0.130	8.0
0.75	1.0	0.615	0.48	0.165	1.1530	0.502	0.2530	0.329	11.0

iqr=qnt.loc[0.75]-qnt.loc[0.25] iqr

Sex 2.0000
Length 0.1650
Diameter 0.1300
Height 0.0500
Whole weight 0.7115
Shucked weight 0.3160
Viscera weight 0.1595
Shell weight 0.1990 Rings
3.0000 dtype: float64 *#lower limit* lower=qnt.loc[0.25]-(1.5*iqr) lower

Sex -4.00000
Length 0.20250
Diameter 0.15500
Height 0.04000
Whole weight -0.62575
Shucked weight -0.28800
Viscera weight -0.14575
Shell weight -0.16850
Rings 3.50000 dtype:

float64

upper=qnt.loc[0.75]+(1.5*iqr)

upper

Sex 4.00000

Length 0.86250

Diameter 0.67500

Height 0.24000

Whole weight 2.22025

Shucked weight 0.97600

Viscera weight 0.49225

Shell weight 0.62750

Rings 15.50000

dtype: float64 df.mean()

Sex 0.044530

Length 0.523992

Diameter 0.407881

Height 0.139516 Whole weight 0.828742

Shucked weight 0.359367

Viscera weight 0.180594

Shell weight 0.238831 Rings 9.933684 dtype: float64

#replace outlier

df['Length']=np.where(df['Length']<0.22,0.52,df['Length'])

df['Diameter']=np.where(df['Diameter']<0.155,0.407,df['Diameter'])

df['Height']=np.where(df['Height']<0.04,0.13,df['Height'])

df['Height']=np.where(df['Height']>0.24,0.13,df['Height'])

df['Whole weight']=np.where(df['Whole weight']>2.18,0.83,df['Whole weight'])

df['Shucked weight']=np.where(df['Shucked weight']>0.958,0.359367,df['Shucked weight'])

df['Viscera weight']=np.where(df['Viscera weight']>0.478,0.18,df['Viscera weight'])

df['Shell weight']=np.where(df['Shell weight']>0.61,0.238831,df['Shell weight'])

df['Rings']=np.where(df['Rings']<3.5,9.93,df['Rings'])

df['Rings']=np.where(df['Rings']>15.5,9.93,df['Rings']) sns.boxplot(df['Length'])

C:\Users\shire\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass t
he following variable as a keyword arg: x. From version 0.12, the only valid positional argum
ent will be `data`, and passing other arguments without an explicit keyword will result in an e
rror or misinterpretation.
  warnings.warn(

```
sns.boxplot(df['Diameter'])
```

C:\Users\shire\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass t
he following variable as a keyword arg: x. From version 0.12, the only valid positional argum
ent will be `data`, and passing other arguments without an explicit keyword will result in an e
rror or misinterpretation.
  warnings.warn(

```
sns.boxplot(df['Height'])
```

C:\Users\shire\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass t
he following variable as a keyword arg: x. From version 0.12, the only valid positional argum
ent will be `data`, and passing other arguments without an explicit keyword will result in an e
rror or misinterpretation.
  warnings.warn(

```
sns.boxplot(df['Whole weight'])
```

C:\Users\shire\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass t
he following variable as a keyword arg: x. From version 0.12, the only valid positional argum
ent will be `data`, and passing other arguments without an explicit keyword will result in an e
rror or misinterpretation.
  warnings.warn(

```
sns.boxplot(df['Shucked weight'])
```

C:\Users\shire\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass t
he following variable as a keyword arg: x. From version 0.12, the only valid positional argum
ent will be `data`, and passing other arguments without an explicit keyword will result in an e
rror or misinterpretation.
  warnings.warn(

```
sns.boxplot(df['Viscera weight'])
```

```
C:\Users\shire\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass t
he following variable as a keyword arg: x. From version 0.12, the only valid positional argum
ent will be `data`, and passing other arguments without an explicit keyword will result in an e
rror or misinterpretation.
  warnings.warn(
```

```
sns.boxplot(df['Shell weight'])
```

```
C:\Users\shire\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass t
he following variable as a keyword arg: x. From version 0.12, the only valid positional argum
ent will be `data`, and passing other arguments without an explicit keyword will result in an e
rror or misinterpretation.
  warnings.warn(
```

```
sns.boxplot(df['Rings'])
```

```
C:\Users\shire\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass t
he following variable as a keyword arg: x. From version 0.12, the only valid positional argum
ent will be `data`, and passing other arguments without an explicit keyword will result in an e
rror or misinterpretation.
  warnings.warn(
```

#7. Check for Categorical columns and perform encoding

```
df.head()
```

#sex is categorical and encoding is performed

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
0	1	0.455	0.365	0.095	0.5140	0.2245	0.1010	0.150	15.0

1	1	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	1	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

#8. Split the data into dependent and independent variables

#independent variable

x=df**.**drop(columns=['Rings'],axis=1)**.**values x

```
array([[1.    , 0.455 , 0.365 , ..., 0.2245, 0.101 , 0.15  ],
[1.    , 0.35  , 0.265 , ..., 0.0995, 0.0485, 0.07  ],
       [0.    , 0.53  , 0.42  , ..., 0.2565, 0.1415, 0.21  ],
   ...,
       [1.    , 0.6   , 0.475 , ..., 0.5255, 0.2875, 0.308 ],
      [0.    , 0.625 , 0.485 , ..., 0.531 , 0.261 , 0.296 ],
       [1.    , 0.71  , 0.555 , ..., 0.9455, 0.3765, 0.495 ]])
```

#dependent variable

y=df['Rings']**.**values y

```
array([15.,  7.,  9., ...,  9., 10., 12.])
```

#9. Scale the independent variables **from** sklearn.preprocessing **import** scale

x=scale(x) x

```
array([[ 1.15434629, -0.66347373, -0.50167301, ..., -0.61177023,
        -0.73234257, -0.64358992],
       [ 1.15434629, -1.60127264, -1.57291477, ..., -1.21969385,
        -1.23612645, -1.25742425],
       [-0.05379815,  0.00638264,  0.08750996, ..., -0.45614178,
        -0.34370929, -0.18321418],
       ...,
       [ 1.15434629,  0.63158191,  0.67669293, ...,  0.85210986,
```

1.05728969, 0.56873287],
[-0.05379815, 0.85486737, 0.78381711, ..., 0.8788585 ,
0.80299878, 0.47665772],
[1.15434629, 1.61403792, 1.53368634, ..., 2.89473324,
1.91132331, 2.0035706]]) *#10. Split the data into training and testing* **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)

#11. Build the Model

from sklearn.linear_model **import** LinearRegression linreg=LinearRegression()

#12. Train the Model linreg**.**fit(x_train,y_train)

LinearRegression() *#13. Test the Model*

test_pred=linreg**.**predict(x_test)

test_pred

array([10.49406044, 14.63071197, 9.5052661 , 7.12175027, 9.59508595,
9.4343576 , 8.77992046, 10.17130406, 7.45502774, 9.87604313,
10.98645479, 7.5538718 , 8.87927518, 9.7638226 , 8.54256728,
10.42387201, 9.10033819, 9.87903278, 11.42897247, 7.06763663,
10.57223182, 9.76975285, 12.30738965, 8.55382376, 9.52374863,
8.21301289, 6.25183627, 7.12742482, 9.74741373, 10.3017582 ,
9.82726168, 9.84749184, 10.4108395 , 10.3081998 , 10.08572396,
8.30245647, 7.235845 , 6.74452118, 10.42584137, 7.64274971,
7.14405667, 9.16150599, 8.70935569, 10.74880185, 9.86452375,
12.88609365, 6.57858505, 9.5398517 , 6.81250209, 10.60088961,
10.58682023, 10.59758934, 10.63987208, 10.60373354, 9.03578911,
8.62103663, 9.90652623, 7.02963956, 9.84641914, 8.62932278,
7.71223792, 11.69923451, 11.10448696, 8.06123754, 8.55513658,
13.39968976, 8.26727764, 9.52753025, 9.09315656, 12.58339768,
9.99703469, 10.24999324, 9.29384572, 10.84986883, 9.23432613,

7.71248702, 10.82510489, 9.74110842, 10.18617001, 11.15757814,
8.15589364, 7.74042932, 6.90572983, 10.00216891, 12.35623317,
9.2594473 , 9.83903046, 8.79445305, 9.98771476, 10.72074918,
5.76586411, 8.83952495, 7.82141633, 9.27397291, 10.08449131,
7.97368561, 8.13133341, 10.58531402, 8.54116758, 8.87592087,
10.27752815, 9.91826533, 7.35190815, 10.30758392, 7.30769068,
10.3549833 , 10.69101603, 10.1181462 , 10.39559027, 11.9945787 ,
10.05265786, 12.85497306, 11.33865314, 10.6160416 , 10.86643523,
9.98776731, 10.07059534, 7.51087688, 8.81450733, 10.76394848,
9.23449231, 8.9394567 , 11.35528501, 7.02952734, 8.22981655,
7.39038626, 7.16648403, 7.72492669, 6.96924802, 7.78201642,
7.17710403, 9.82222011, 9.56803182, 8.40217156, 8.3040808 ,
9.19097285, 7.27282145, 8.7291546 , 8.02818234, 9.6287928 ,
9.17367559, 10.67429449, 10.83594529, 10.03487667, 7.01082421,
8.22106326, 9.52078398, 12.01200605, 7.0664238 , 7.02545033,
6.38664272, 9.03716991, 9.89980919, 9.54143876, 10.48601031,
7.89737086, 10.57993475, 12.60549688, 8.9722634 , 8.86375281,
10.58737471, 8.23508559, 9.16831774, 11.32643922, 11.72162036,
7.35637849, 7.57148604, 7.1648948 , 10.85620295, 9.55486626,
10.68453461, 10.42003548, 9.94733416, 11.13891581, 9.01364719,
7.82060141, 10.78208786, 7.46904197, 9.32761963, 7.78647994,
10.75827275, 8.09475084, 9.26765508, 9.58812949, 7.26964315,
8.97532078, 8.90396235, 6.62637508, 7.78750708, 8.243058 ,
9.46740388, 8.01654749, 8.84610761, 12.06376478, 11.18458934,
7.95791777, 8.73139889, 7.63438426, 10.19784773, 10.19657975,
9.88547762, 8.18847269, 7.75134569, 7.93222173, 8.53043085,
11.47767482, 11.63701859, 9.67054006, 7.15334679, 11.58254568,
10.91672544, 10.65123953, 11.30462744, 8.01570854, 8.691925 ,
6.99630889, 10.45505798, 11.08400844, 7.84853522, 7.89503444,
10.36775292, 9.29193168, 8.45869519, 9.40891292, 8.71995183,
10.41488943, 9.80584287, 9.40871844, 10.47585472, 6.77413109,
10.07855451, 9.36989613, 12.40825012, 8.71057984, 9.97974427,
9.26533226, 10.63083868, 9.49615866, 10.23657265, 11.25380255,
10.65503119, 7.22469252, 10.23933921, 11.66614343, 7.52501383,

9.78137819, 11.74179743, 10.06569605, 7.59341194, 9.32548854,
9.09407202, 10.37992831, 10.4198217 , 9.20540036, 13.37322348,
7.04827246, 7.30060552, 7.76040817, 8.26405016, 8.37641501,
7.98024139, 8.66106856, 10.29294231, 8.4533951 , 9.1029908 ,
7.6728443 , 9.17493898, 11.3350483 , 8.14113401, 9.57990685,
8.99792287, 7.81308267, 7.88056289, 9.71714644, 8.78928014,
7.48733805, 9.29344547, 8.25005563, 6.32596886, 10.67952799,
10.34988789, 10.61398995, 9.73029599, 10.61124145, 8.10672637,
10.83303256, 10.58983644, 11.56224758, 11.51701776, 7.26264654,
9.17142228, 5.94220242, 8.79721855, 10.20287693, 10.40251293,
7.26467813, 11.44855319, 10.18314512, 11.56865106, 10.08095547,
11.04935475, 8.88901813, 10.06455925, 8.2275154 , 11.38494403,
10.46370124, 8.81517211, 8.07626049, 10.29997579, 10.70159463,
9.52425275, 8.55212551, 11.63567264, 7.01687668, 10.64424025,
11.65796361, 8.03040793, 8.99581481, 5.87918977, 7.22561493,
8.64902765, 8.46282178, 10.26638935, 7.77541642, 10.48666402,
10.97160807, 7.77090259, 6.95097016, 10.66867657, 9.81598811,
8.86175523, 10.14390988, 10.13604128, 7.67979877, 8.32951005,
10.52746288, 11.03253764, 9.72136409, 9.96003508, 10.72896737,
9.69336726, 9.0723992 , 9.28253035, 7.15534276, 10.02260695,
8.39025513, 9.17409245, 8.79400875, 8.03635255, 13.46848816,
11.25697851, 7.00933557, 8.2469982 , 8.44066123, 12.07134675,
7.86611644, 6.91634306, 10.45047036, 9.05831727, 7.61872774,
12.12276476, 12.15336763, 10.21088672, 7.30640948, 11.7712247 ,
8.22309031, 9.00229321, 12.56925984, 9.89227365, 9.12720821,
9.92856998, 6.15308924, 9.65988046, 7.26498527, 8.69157712,
10.66712505, 12.0903993 , 10.00895812, 8.32592796, 10.09475343,
9.9180563 , 7.79788418, 8.227395 , 9.67655999, 8.49861084,
10.68758867, 10.96226694, 9.31583533, 9.88280193, 12.49353697,
9.68406614, 8.39535884, 9.21841136, 8.05640704, 7.73070397,
10.69944854, 6.88662863, 10.44933744, 8.63070059, 9.5300456 ,
7.17288396, 7.23961838, 8.2406796 , 12.33534676, 9.31607714,
8.5199514 , 7.7413676 , 9.75259252, 9.03154513, 8.99602774,
10.86102952, 9.72912372, 11.45369535, 7.73315024, 8.72272879,

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6.75527458])

#14. Measure the performance using Metrics.

from sklearn **import** metrics **from**
sklearn.metrics **import** mean_squared_error
metrics**.**r2_score(y_test,test_pred)

0.4166836799902973

df**.**head()

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
0	1	0.455	0.365	0.095	0.5140	0.2245	0.1010	0.150	15.0
1	1	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	1	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

linreg**.**predict([[0.455,0.365,0.095,0.5140,0.2245,0.1010,0.150,15.0]]) array([21.53400745])