Assignment -3

Problem Statement: Abalone Age Prediction

ASSIGNMENT DATE	19 OCTOBER 2022
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STUDENT ROLL NUMBER	CS19033
MAXIMUM MARKS	2 mark

#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()

Whol

Shucke **Viscer Shell**

Se Lengt Diamete Heigh e Ring x h r t weigh d a weigh s
weight weight t t

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 t he following variables as keyword args: x, y. From version 0.12, the only valid positional arg ument will be `data`, and passing other arguments without an explicit keyword will result in a n error or misinterpretation.

warnings.warn(

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

#4. Perform descriptive statistics on the dataset df**.**describe()

Shucke

Diamet Whole Viscera Shell

Length er Height weight d weight weight Rings weight

cou 4177.00 4177.00 4177.00 4177.00 4177.00 4177.00 4177.00 4177.00 **nt** 0000 0000 0000 0000 0000 0000 0000 0000 **Shucke**

Diamet Whole Viscera Shell Length er Height weight d weight weight Rings

weight

me 0.52399 0.40788 0.13951 0.82874 0.35936 0.18059 0.23883 9.93368 **an** 2 1 6 2 7 4 1 4

0.12009 0.09924 0.04182 0.49038 0.22196 0.10961 0.13920 3.22416

std

3 0 7 9 3 4 3 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 0.35000 0.11500 0.44150 0.18600 0.09350 0.13000 8.00000

% 0 0 0 0 0 0 0 0

50 0.54500 0.42500 0.14000 0.79950 0.33600 0.17100 0.23400 9.00000

% 0 0 0 0 0 0 0 0

75 0.61500 0.48000 0.16500 1.15300 0.50200 0.25300 0.32900 11.0000

% 0 0 0 0 0 0 0 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
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
			0.255	0.080	0.2050	0.0895	0.0395	0.055	7
4	-1	0.330							

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 ,
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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,
12.62516987, 8.07189869, 8.610371 , 7.96393172, 10.52464571,
10.2889487 , 9.77064556, 7.2484293 , 6.75663943, 7.31758214,
6.86054595, 8.3547735 , 8.28097679, 9.20481118, 6.17213238,
7.7808438 , 10.18114547, 8.28582292, 9.34694407, 9.87520219,
7.50494736, 8.88762551, 9.97581207, 11.05621772, 8.42628309,
10.45364784, 13.37825413, 6.81598561, 9.27660382, 9.93844627,
9.48483861, 8.2229326 , 10.77401117, 8.49913631, 9.69420869,
10.1276895 , 9.32434402, 9.03969924, 9.2090436 , 11.16679102,
11.52625517, 9.11519373, 10.26990747, 10.25863036, 9.68179585,
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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])