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BATCH: DA-B7-1A-3E Team ID:PNT2022TMID05132

Problem Statement: Abalone Age Prediction

Description:- Predicting the age of abalone from physical measurements. The age of abalone is determined by cutting the shell through the cone, staining it, and counting the number of rings through a microscope – a boring and time-consuming task. Other measurements, which are easier to obtain, are used to predict age. Further information, such as weather patterns and location (hence food availability) may be required to solve the problem.

Building a Regression Model

1. Download the dataset
2. Load the dataset into the tool.
3. Perform Below Visualizations.
 - Univariate Analysis
 - Bi-Variate Analysis
 - Multi-Variate Analysis
4. Perform descriptive statistics on the dataset.
5. Check for Missing values and deal with them.
6. Find the outliers and replace them outliers
7. Check for Categorical columns and perform encoding.
8. Split the data into dependent and independent variables.
9. Scale the independent variables
10. Split the data into training and testing
11. Build the Model
12. Train the Model
13. Test the Model
14. Measure the performance using Metrics.

```
#import libraries
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
```

```
import matplotlib.pyplot as plt
import seaborn as sb
import plotly.express as px
```

▼ 2. Load the dataset into the tool

```
data = pd.read_csv('/content/drive/My Drive/abalone.csv')
data
```

	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	0.1500	15
1	M	0.350	0.265	0.090	0.2255	0.0995	0.0485	0.0700	7
2	F	0.530	0.420	0.135	0.6770	0.2565	0.1415	0.2100	9
3	M	0.440	0.365	0.125	0.5160	0.2155	0.1140	0.1550	10
4	I	0.330	0.255	0.080	0.2050	0.0895	0.0395	0.0550	7
...
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

4177 rows × 9 columns

```
from google.colab import drive
drive.mount('/content/drive')
```

Drive already mounted at /content/drive; to attempt to forcibly remount, call drive.

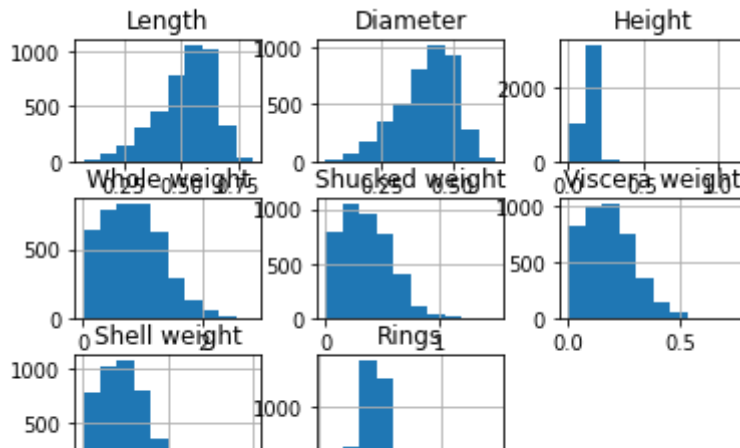


▼ 3. Perform Below Visualizations.

· Univariate Analysis

```
data['Rings'].value_counts()
data.hist()
```

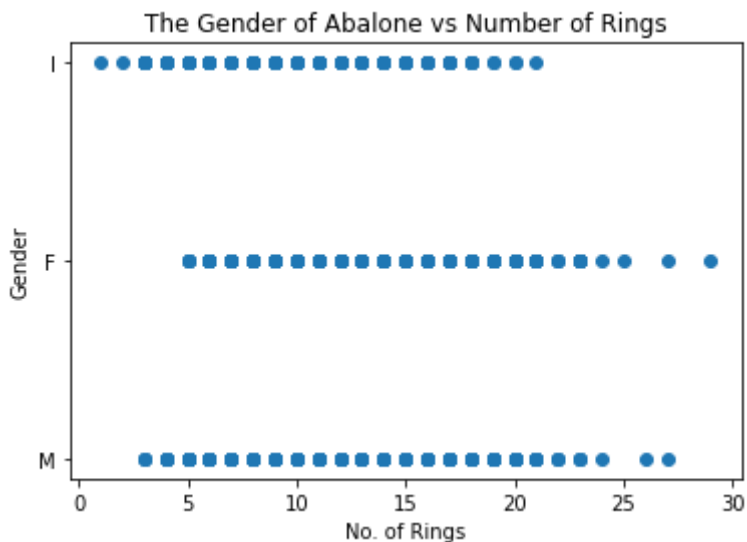
```
array([[<matplotlib.axes._subplots.AxesSubplot object at 0x7f7741368090>,
      <matplotlib.axes._subplots.AxesSubplot object at 0x7f774028b950>,
      <matplotlib.axes._subplots.AxesSubplot object at 0x7f7740243f50>],
      [<matplotlib.axes._subplots.AxesSubplot object at 0x7f7740209590>,
      <matplotlib.axes._subplots.AxesSubplot object at 0x7f77401bbc10>,
      <matplotlib.axes._subplots.AxesSubplot object at 0x7f774017c250>],
      [<matplotlib.axes._subplots.AxesSubplot object at 0x7f77401328d0>,
      <matplotlib.axes._subplots.AxesSubplot object at 0x7f77400e8e10>,
      <matplotlib.axes._subplots.AxesSubplot object at 0x7f77400e8e50>]],
      dtype=object)
```



· Bi-Variate Analysis

```
plt.scatter(data.Rings, data.Sex)
plt.title('The Gender of Abalone vs Number of Rings')
plt.xlabel('No. of Rings')
plt.ylabel('Gender')
```

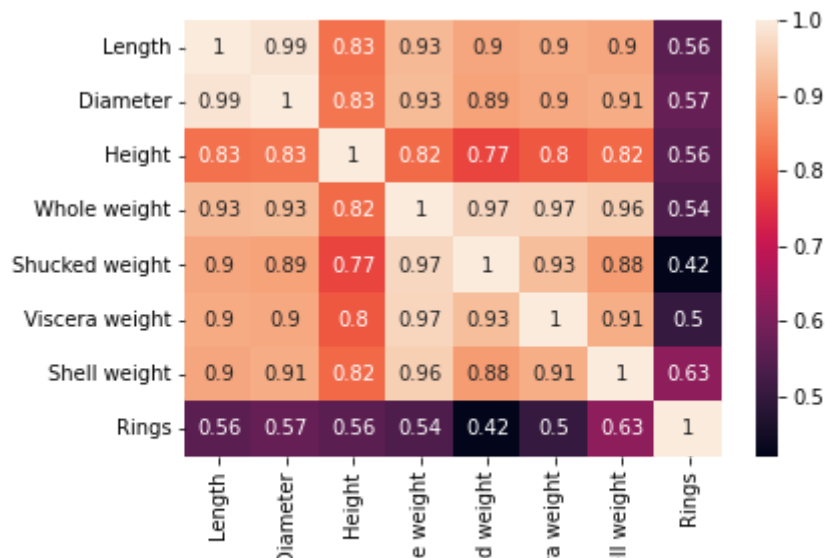
```
Text(0, 0.5, 'Gender')
```



· Multi-Variate Analysis

```
sb.heatmap(data.corr(),annot=True)
```

<matplotlib.axes._subplots.AxesSubplot at 0x7f773f9f8d10>



4. Perform descriptive statistics on the dataset.

```
data.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
```

```
data.describe()
```

Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight
--------	----------	--------	--------------	----------------	----------------

▼ 5. Check for Missing values and deal with them.

There is no missing values

```
data.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	

▼ 6. Find the outliers and replace them outliers

The dataset does not have a outliers

```
fig = px.histogram(data, x='Whole weight')  
fig.show()
```

▼ 7. Check for Categorical columns and perform encoding.

There is one Categorical column SEX is replaced by an Integer

```
120
from sklearn.preprocessing import LabelEncoder
le = LabelEncoder()
data["Sex"] = le.fit_transform(data["Sex"])
data["Sex"]
```

```
0      2
1      2
2      0
3      2
4      1
..
4172   0
4173   2
4174   2
4175   0
4176   2
Name: Sex, Length: 4177, dtype: int64
```

▼ 8. Split the data into dependent and independent variables.

```
x=data.iloc[:,0:8].values
y=data.iloc[:,8:9].values
```

x

```
array([[2.    , 0.455 , 0.365 , ..., 0.2245, 0.101 , 0.15  ],
       [2.    , 0.35  , 0.265 , ..., 0.0995, 0.0485, 0.07  ],
       [0.    , 0.53  , 0.42  , ..., 0.2565, 0.1415, 0.21  ],
       ...,
       [2.    , 0.6   , 0.475 , ..., 0.5255, 0.2875, 0.308 ],
       [0.    , 0.625 , 0.485 , ..., 0.531 , 0.261 , 0.296 ],
       [2.    , 0.71  , 0.555 , ..., 0.9455, 0.3765, 0.495 ]])
```

y

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

9. Scale the independent variables

```
x=data.iloc[:,0:8]
print(x.head())
```

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	\
0	2	0.455	0.365	0.095	0.5140	0.2245	
1	2	0.350	0.265	0.090	0.2255	0.0995	
2	0	0.530	0.420	0.135	0.6770	0.2565	
3	2	0.440	0.365	0.125	0.5160	0.2155	
4	1	0.330	0.255	0.080	0.2050	0.0895	

	Viscera weight	Shell weight
0	0.1010	0.150
1	0.0485	0.070
2	0.1415	0.210
3	0.1140	0.155
4	0.0395	0.055

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=0.3,random_state=0)
```

```
x_train.shape
```

```
(2923, 8)
```

```
x_test.shape
```

```
(1254, 8)
```

11. Build the Model

```
from sklearn.linear_model import LinearRegression
lr = LinearRegression()
```

12. Train the Model

```
lr.fit(x_train, y_train)
```

```
LinearRegression()
```

▼ 13. Test the Model

```
y_pred = lr.predict(x_test)
print((y_test)[0:6])
print((y_pred)[0:6])
```

```
[[13]
 [ 8]
 [11]
 [ 5]
 [12]
 [11]]
[[13.11640829]
 [ 9.65691091]
 [10.35350972]
 [ 5.63648715]
 [10.67436485]
 [11.95341338]]
```

▼ 14. Measure the performance using Metrics.

```
# RMSE(Root Mean Square Error)

from sklearn.metrics import mean_squared_error
mse = mean_squared_error(y_test, y_pred)
rmse = np.sqrt(mse)
print("RMSE value : {:.2f}".format(rmse))
```

```
RMSE value : 2.26
```

```
from sklearn.model_selection import cross_val_score
cv_scores = cross_val_score(lr, x, y, cv=5)
sco=cv_scores.round(4)
print(cv_scores.round(4))
print("Average",sco.sum()/5)
```

```
[0.4113 0.1574 0.4807 0.5046 0.4362]
Average 0.39803999999999995
```


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