Project Title : Analytics for Hospitals' Health-Care Data

Team ID : PNT2022TMID35335

In [ ]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from pandas.api.types import is_numeric_dtype
sns.set()
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import LabelEncoder
from sklearn.preprocessing import StandardScaler
sns.set_style("darkgrid")
from sklearn.linear_model import LinearRegression
from sklearn.svm import SVR
from sklearn.tree import DecisionTreeRegressor

from sklearn import  metrics
%matplotlib inline
```

LOAD THE DATASET

In [2]:
```
abalone = pd.read_csv('abalone.csv', sep=',')
```

In [3]:
```
abalone.head()
```

Out[3]:

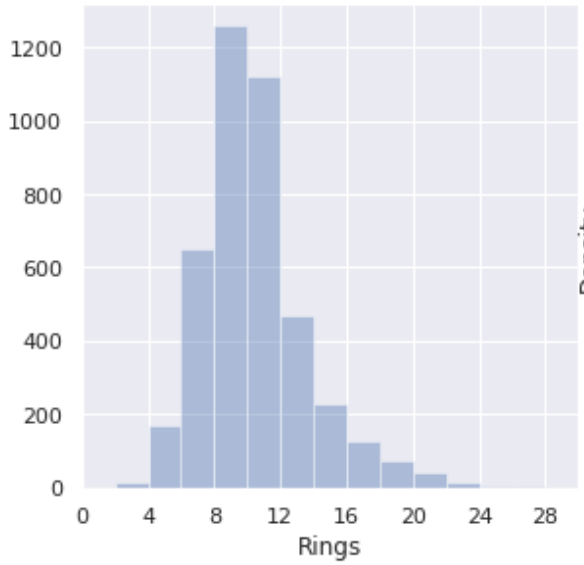
	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
0	M	0.455	0.365	0.095	0.5140	0.2245	0.1010	0.150	15
1	M	0.350	0.265	0.090	0.2255	0.0995	0.0485	0.070	7
2	F	0.530	0.420	0.135	0.6770	0.2565	0.1415	0.210	9
3	M	0.440	0.365	0.125	0.5160	0.2155	0.1140	0.155	10
4	I	0.330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

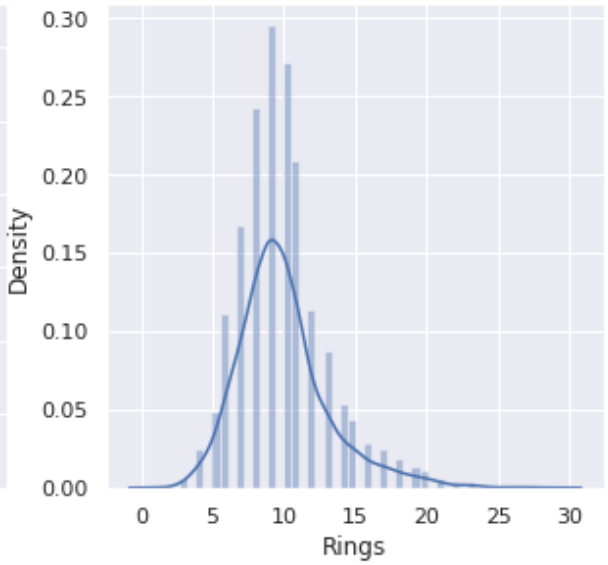
UNIVARIATE ANALYSIS

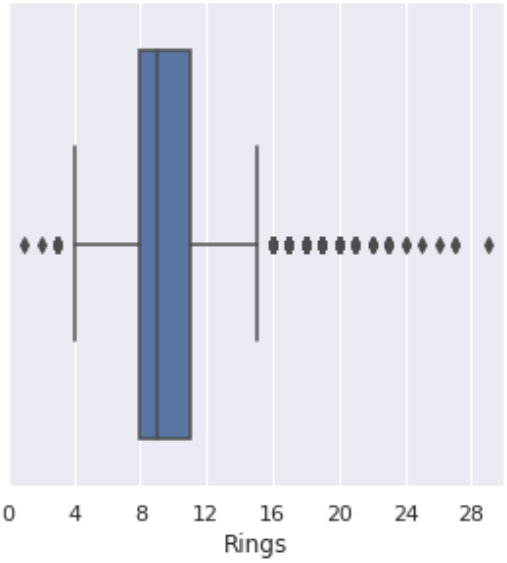
In [4]:

```
rows = 2
cols = 2
i = 0

plt.figure(figsize=(cols * 5, rows * 5))

i += 1
plt.subplot(rows, cols, i)
plt.xticks(range(0, 31, 4))
plt.xlim(0, 30)
_ = sns.distplot(abalone['Rings'], kde=False, bins=range(0, 31, 2))

i += 1
plt.subplot(rows, cols, i)
_ = sns.distplot(abalone['Rings'])

i += 1
plt.subplot(rows, cols, i)
plt.xticks(range(0, 31, 4))
plt.xlim(0, 30)
_ = sns.boxplot(abalone['Rings'])
```

```
/usr/local/lib/python3.7/dist-packages/seaborn/distributions.py:2619:
FutureWar ning: `distplot` is a deprecated function and will be removed in a
future versi on. Please adapt your code to use either `displot` (a figure-
level function wit h similar flexibility) or `histplot` (an axes-level
function for histograms).  warnings.warn(msg, FutureWarning)
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarnin
g: Pass the following variable as a keyword arg: x. From version 0.12, the
only valid positional argument will be `data`, and passing other arguments
without a n explicit keyword will result in an error or misinterpretation.
  FutureWarning
```


1200
1000
800
600
400
200
0
0 4 8 12 16 20 24 28
Rings

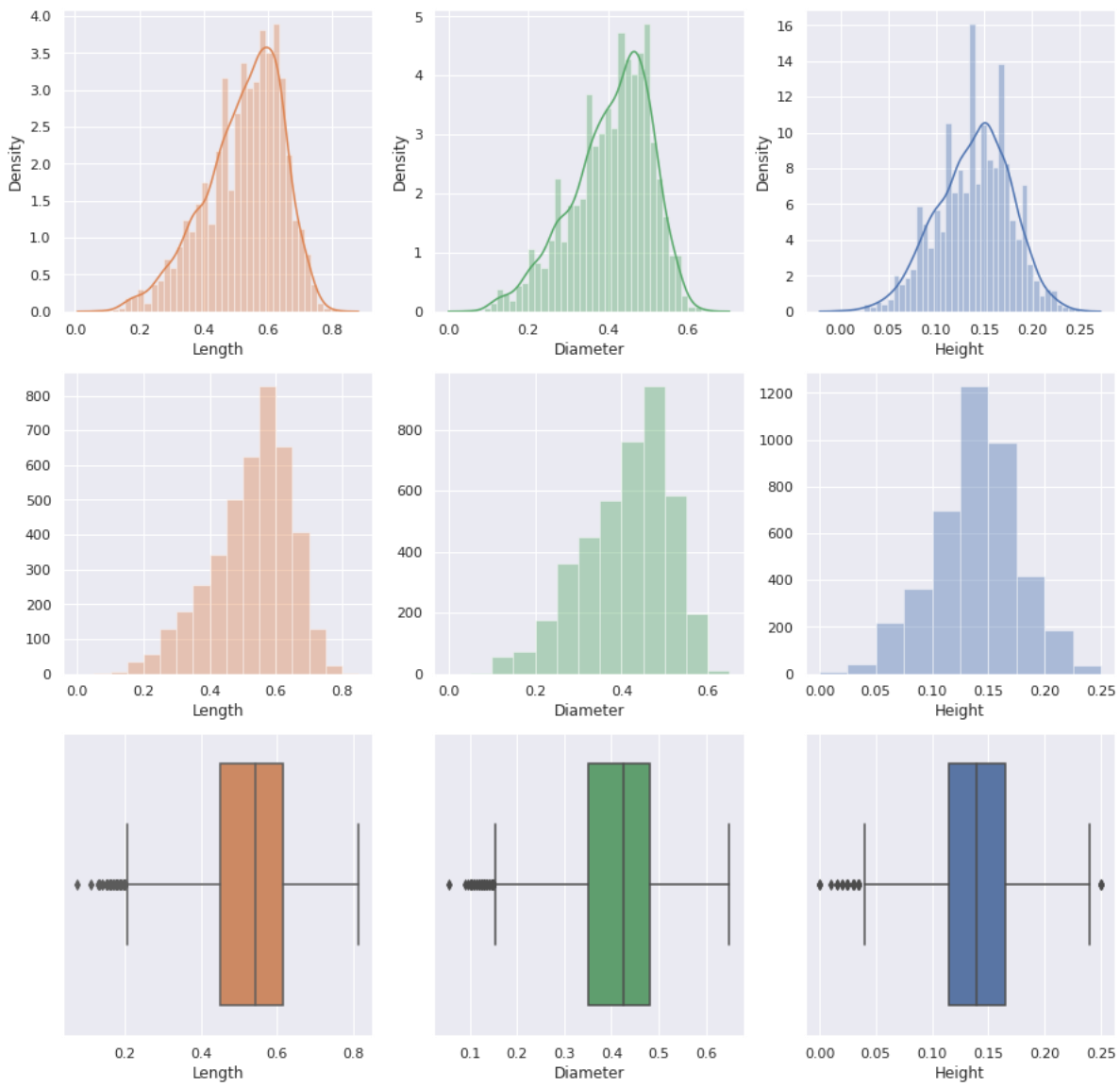

0.30
0.25
0.20
0.15
0.10
0.05
0.00
Density
0 5 10 15 20 25 30
Rings


0 4 8 12 16 20 24 28
Rings

In [5]:
```
abalone = abalone[abalone['Height'] < 0.4]

plt.figure(figsize=(15, 15))

colors = sns.color_palette()

lines = 3
rows = 3
i = 0

i += 1
plt.subplot(lines, rows, i)
_ = sns.distplot(abalone['Length'], color=colors[i % 3])

i += 1
plt.subplot(lines, rows, i)
_ = sns.distplot(abalone['Diameter'], color=colors[i % 3])

i += 1
plt.subplot(lines, rows, i)
_ = sns.distplot(abalone['Height'], color=colors[i % 3])

i += 1
plt.subplot(lines, rows, i)
_ = sns.distplot(abalone['Length'], kde=False, bins=np.arange(0.0, 0.9, 0.05), co

i += 1
plt.subplot(lines, rows, i)
_ = sns.distplot(abalone['Diameter'], kde=False, bins=np.arange(0.0, 0.7, 0.05),

i += 1
plt.subplot(lines, rows, i)
_ = sns.distplot(abalone['Height'], kde=False, bins=10, color=colors[i % 3])

i += 1
plt.subplot(lines, rows, i)
_ = sns.boxplot(abalone['Length'], color=sns.color_palette()[i % 3])

i += 1
plt.subplot(lines, rows, i)
_ = sns.boxplot(abalone['Diameter'], color=colors[i % 3])

i += 1
plt.subplot(lines, rows, i)
_ = sns.boxplot(abalone['Height'], color=colors[i % 3])
```

```
/usr/local/lib/python3.7/dist-packages/seaborn/distributions.py:2619: FutureW
arning: `distplot` is a deprecated function and will be removed in a future v
ersion. Please adapt your code to use either `displot` (a figure-level functi
on with similar flexibility) or `histplot` (an axes-level function for histog
rams).
  warnings.warn(msg, FutureWarning)
/usr/local/lib/python3.7/dist-packages/seaborn/distributions.py:2619: FutureW
arning: `distplot` is a deprecated function and will be removed in a future v
ersion. Please adapt your code to use either `displot` (a figure-level functi
on with similar flexibility) or `histplot` (an axes-level function for histog
```

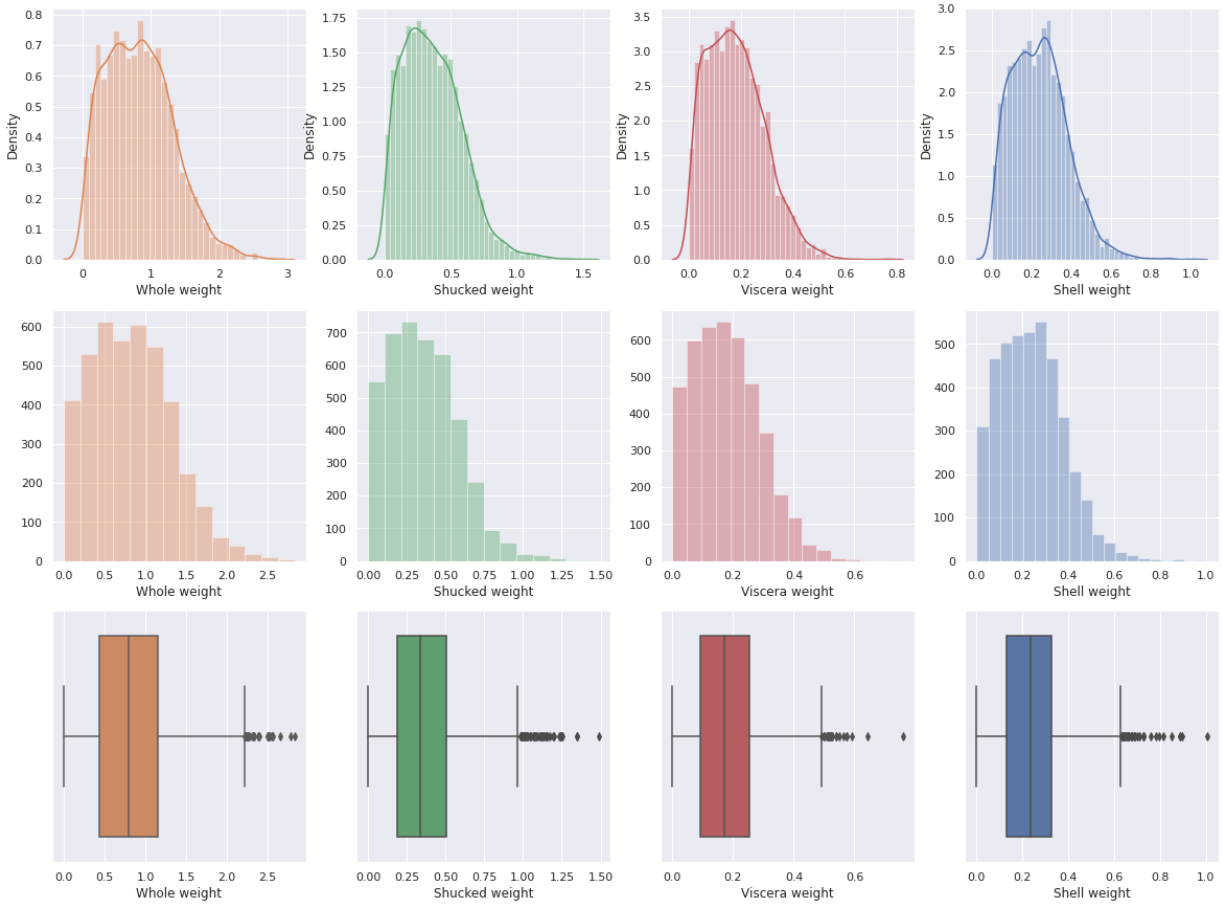
```
rams).  warnings.warn(msg, FutureWarning)usr/local/lib/python3.7/dist-
 packages/seaborn/distributions.py:2619: FutureW arning: `distplot` is a
 deprecated function and will be removed in a future v ersion. Please adapt
 your code to use either `displot` (a figure-level functi on with similar
 flexibility) or `histplot` (an axes-level function for histog rams).
  warnings.warn(msg, FutureWarning)
/usr/local/lib/python3.7/dist-packages/seaborn/distributions.py:2619: FutureW
arning: `distplot` is a deprecated function and will be removed in a future v
ersion. Please adapt your code to use either `displot` (a figure-level functi
on with similar flexibility) or `histplot` (an axes-level function for histog
rams).  warnings.warn(msg, FutureWarning)
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarni
ng: Pass the following variable as a keyword arg: x. From version 0.12, the o
nly valid positional argument will be `data`, and passing other arguments wit
hout an explicit keyword will result in an error or misinterpretation.
FutureWarning
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarni
ng: Pass the following variable as a keyword arg: x. From version 0.12, the o
nly valid positional argument will be `data`, and passing other arguments wit
hout an explicit keyword will result in an error or misinterpretation.
FutureWarning
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarni
ng: Pass the following variable as a keyword arg: x. From version 0.12, the o
nly valid positional argument will be `data`, and passing other arguments wit
hout an explicit keyword will result in an error or misinterpretation.
  FutureWarning
```


Density
Length
Diameter
Height
Density
Length
Diameter
Height
Length
Diameter
Height

In [6]:

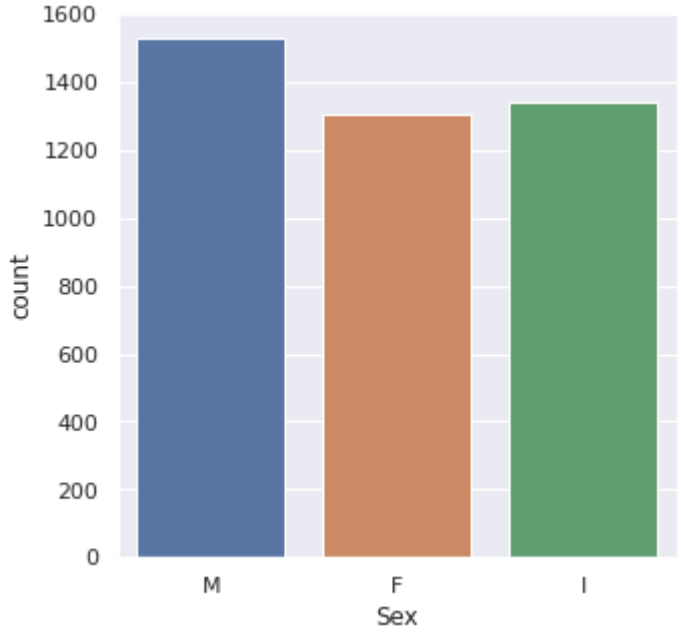
```
plt.figure(figsize=(20, 15))

colors = sns.color_palette()

rows = 3
cols = 4
i = 0

i += 1
plt.subplot(rows, cols, i)
_ = sns.distplot(abalone['Whole weight'], color=colors[i % cols])

i += 1
plt.subplot(rows, cols, i)
_ = sns.distplot(abalone['Shucked weight'], color=colors[i % cols])

i += 1
plt.subplot(rows, cols, i)
_ = sns.distplot(abalone['Viscera weight'], color=colors[i % cols])

i += 1
plt.subplot(rows, cols, i)
_ = sns.distplot(abalone['Shell weight'], color=colors[i % cols])

i += 1
plt.subplot(rows, cols, i)
_ = sns.distplot(abalone['Whole weight'], kde=False, bins=14, color=colors[i % cc

i += 1
plt.subplot(rows, cols, i)
_ = sns.distplot(abalone['Shucked weight'], kde=False, bins=14, color=colors[i %

i += 1
plt.subplot(rows, cols, i)
_ = sns.distplot(abalone['Viscera weight'], kde=False, bins=16, color=colors[i %

i += 1
plt.subplot(rows, cols, i)
_ = sns.distplot(abalone['Shell weight'], kde=False, bins=20, color=colors[i % cc

i += 1
plt.subplot(rows, cols, i)
_ = sns.boxplot(abalone['Whole weight'], color=colors[i % cols])

i += 1
plt.subplot(rows, cols, i)
_ = sns.boxplot(abalone['Shucked weight'], color=colors[i % cols])

i += 1
plt.subplot(rows, cols, i)
_ = sns.boxplot(abalone['Viscera weight'], color=colors[i % cols])

i += 1
plt.subplot(rows, cols, i)
_ = sns.boxplot(abalone['Shell weight'], color=colors[i % cols])
```

```
/usr/local/lib/python3.7/dist-packages/seaborn/distributions.py:2619: FutureW arning: `distplot` is a deprecated function and will be removed in a future v ersion. Please adapt your code to use either `displot` (a figure-level functi on with similar flexibility) or `histplot` (an axes-level function for histog rams).  warnings.warn(msg, FutureWarning)
/usr/local/lib/python3.7/dist-packages/seaborn/distributions.py:2619: FutureW arning: `distplot` is a deprecated function and will be removed in a future v ersion. Please adapt your code to use either `displot` (a figure-level functi on with similar flexibility) or `histplot` (an axes-level function for histog rams).  warnings.warn(msg, FutureWarning)
/usr/local/lib/python3.7/dist-packages/seaborn/distributions.py:2619: FutureW arning: `distplot` is a deprecated function and will be removed in a future v ersion. Please adapt your code to use either `displot` (a figure-level functi on with similar flexibility) or `histplot` (an axes-level function for histog rams).
  warnings.warn(msg, FutureWarning)
/usr/local/lib/python3.7/dist-packages/seaborn/distributions.py:2619: FutureW arning: `distplot` is a deprecated function and will be removed in a future v ersion. Please adapt your code to use either `displot` (a figure-level functi on with similar flexibility) or `histplot` (an axes-level function for histog rams).  warnings.warn(msg, FutureWarning)
/usr/local/lib/python3.7/dist-packages/seaborn/distributions.py:2619: FutureW arning: `distplot` is a deprecated function and will be removed in a future v ersion. Please adapt your code to use either `displot` (a figure-level functi on with similar flexibility) or `histplot` (an axes-level function for histog rams).
  warnings.warn(msg, FutureWarning)
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarni ng: Pass the following variable as a keyword arg: x. From version 0.12, the o nly valid positional argument will be `data`, and passing other arguments wit hout an explicit keyword will result in an error or misinterpretation.  FutureWarning
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarni ng: Pass the following variable as a keyword arg: x. From version 0.12, the o nly valid positional argument will be `data`, and passing other arguments wit hout an explicit keyword will result in an error or misinterpretation.  FutureWarning
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarni ng: Pass the following variable as a keyword arg: x. From version 0.12, the o nly valid positional argument will be `data`, and passing other arguments wit hout an explicit keyword will result in an error or misinterpretation.  FutureWarning
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarni ng: Pass the following variable as a keyword arg: x. From version 0.12, the o nly valid positional argument will be `data`, and passing other arguments wit hout an explicit keyword will result in an error or misinterpretation.
  FutureWarning
```


Density
Whole weight
Shucked weight
Viscera weight
Shell weight

In [7]:
```
plt.figure(figsize=(5,5))
_ = sns.countplot(abalone.Sex)
```

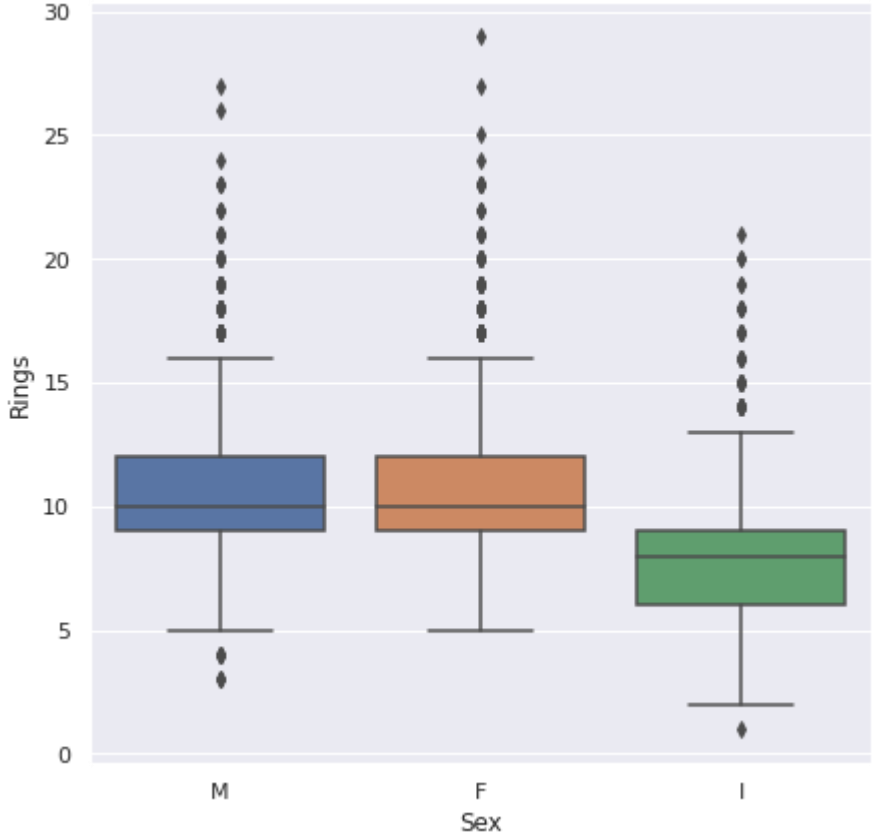
```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarnin
g: Pass the following variable as a keyword arg: x. From version 0.12, the
only valid positional argument will be `data`, and passing other arguments
without a n explicit keyword will result in an error or misinterpretation.
FutureWarning
```



In

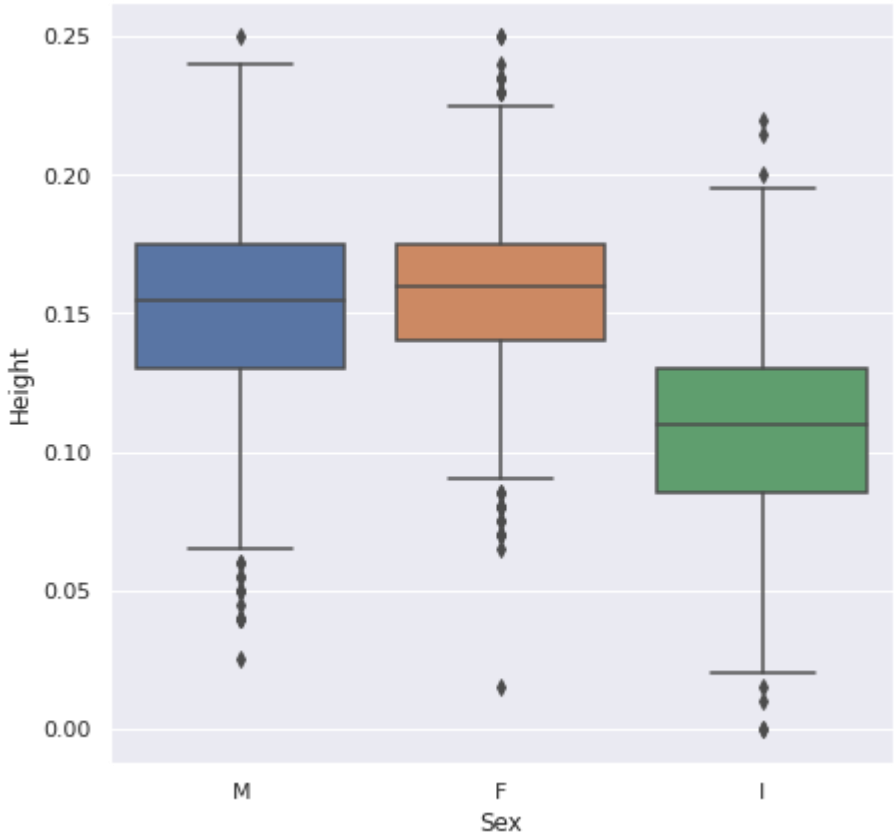
BIVARATE ANALYSIS

[8]:
```
plt.figure(figsize=(7, 7))
_ = sns.boxplot(data=abalone, x='Sex', y='Rings')
```



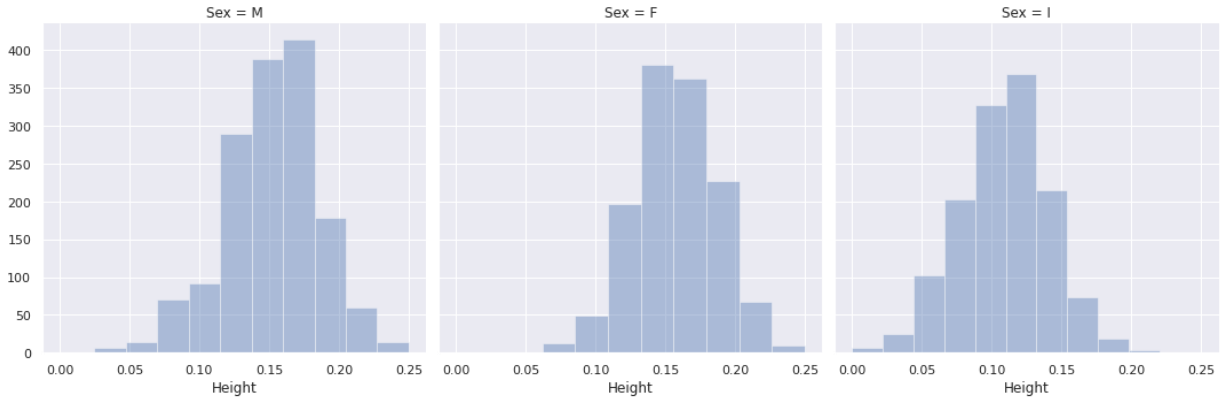
[9]:
```
plt.figure(figsize=(7, 7))
_ = sns.boxplot(data=abalone, x='Sex', y='Height')
```

In

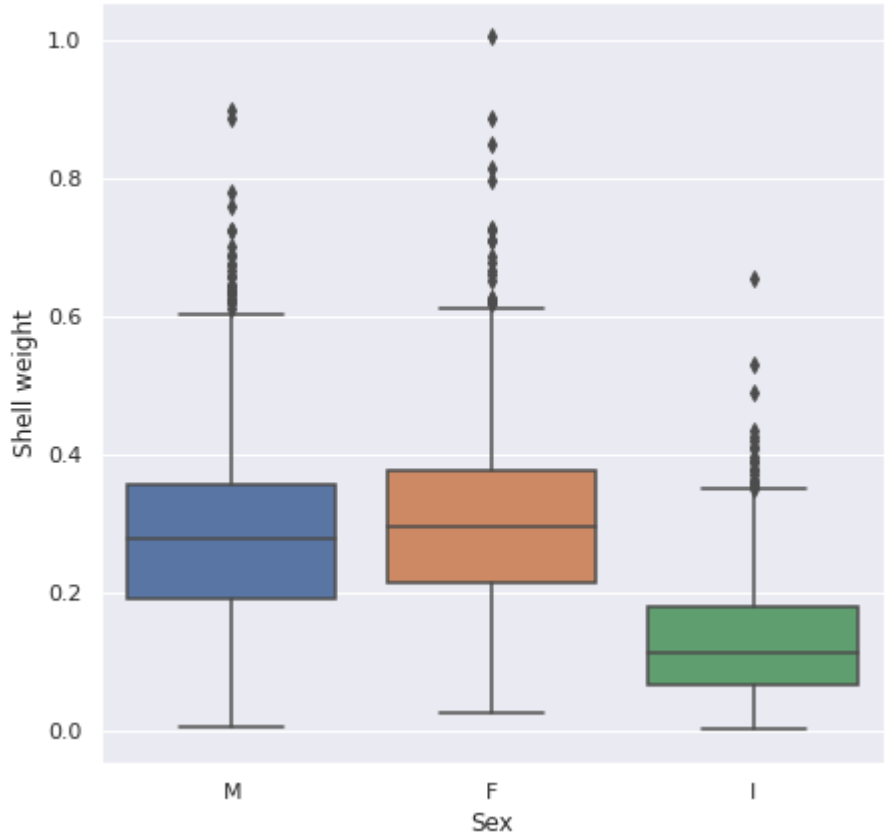


In [10]:
```
g = sns.FacetGrid(abalone, col='Sex', margin_titles=True, size=5)
_ = g.map(sns.distplot, 'Height', kde=False, bins=10)
```

```
/usr/local/lib/python3.7/dist-packages/seaborn/axisgrid.py:337: UserWarning:
Th e `size` parameter has been renamed to `height`; please update your code.
warnings.warn(msg, UserWarning)
/usr/local/lib/python3.7/dist-packages/seaborn/distributions.py:2619:
FutureWar ning: `distplot` is a deprecated function and will be removed in a
future versi on. Please adapt your code to use either `displot` (a figure-
level function wit h similar flexibility) or `histplot` (an axes-level
function for histograms).  warnings.warn(msg, FutureWarning)
```

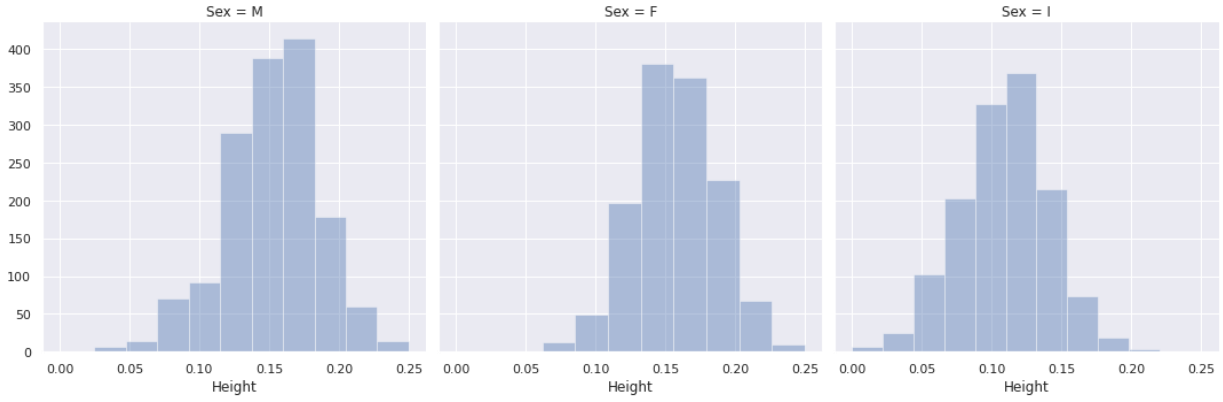


In [11]:
```
plt.figure(figsize=(7, 7))
_ = sns.boxplot(data=abalone, x='Sex', y='Shell weight')
```

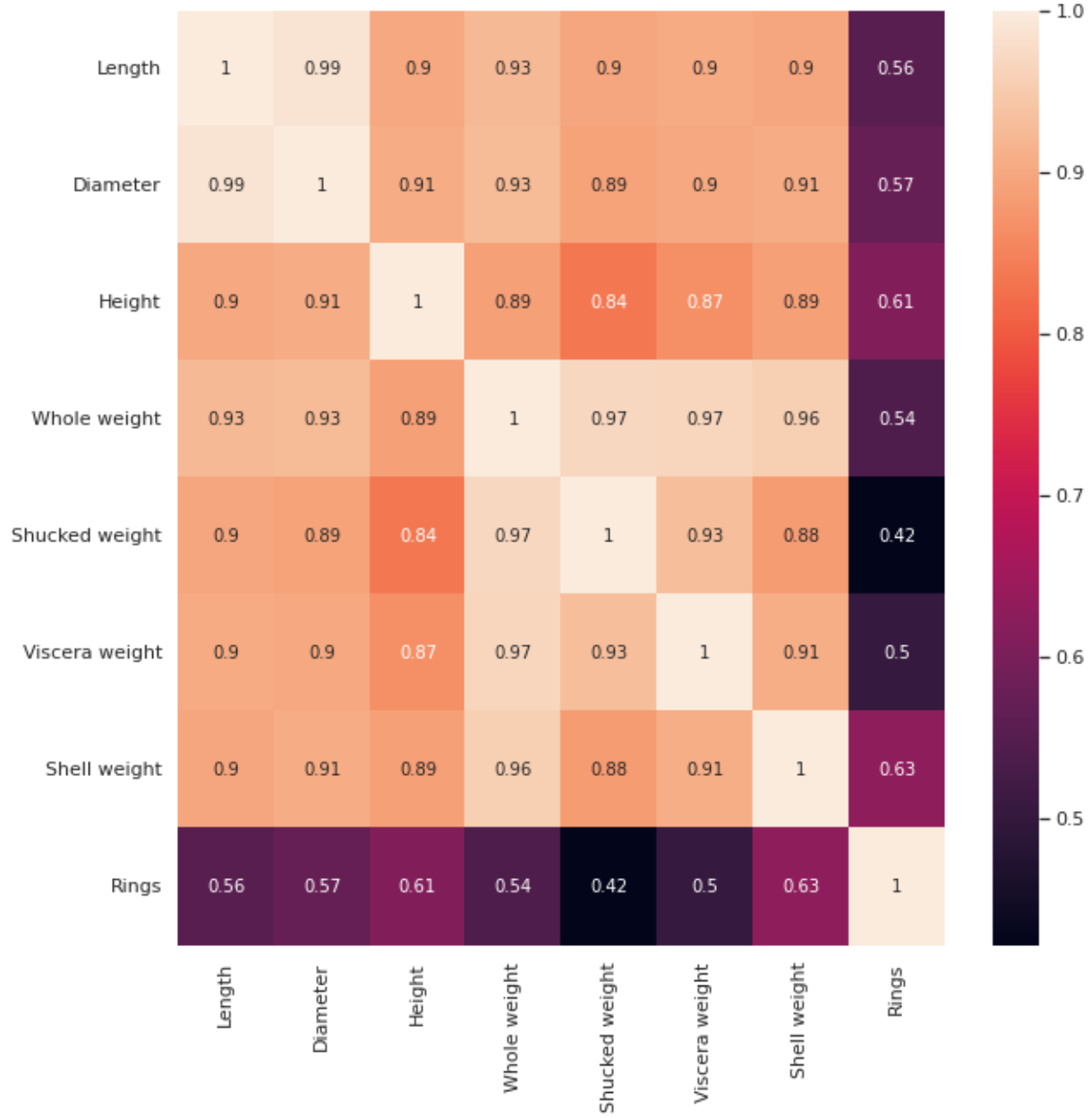


In [12]:
```
g = sns.FacetGrid(abalone, col='Sex', margin_titles=True, size=5)
_ = g.map(sns.distplot, 'Height', kde=False, bins=10)
```

```
/usr/local/lib/python3.7/dist-packages/seaborn/axisgrid.py:337: UserWarning:
Th e `size` parameter has been renamed to `height`; please update your code.
warnings.warn(msg, UserWarning)
/usr/local/lib/python3.7/dist-packages/seaborn/distributions.py:2619:
FutureWar ning: `distplot` is a deprecated function and will be removed in a
future versi on. Please adapt your code to use either `displot` (a figure-
level function wit h similar flexibility) or `histplot` (an axes-level
function for histograms).  warnings.warn(msg, FutureWarning)
```

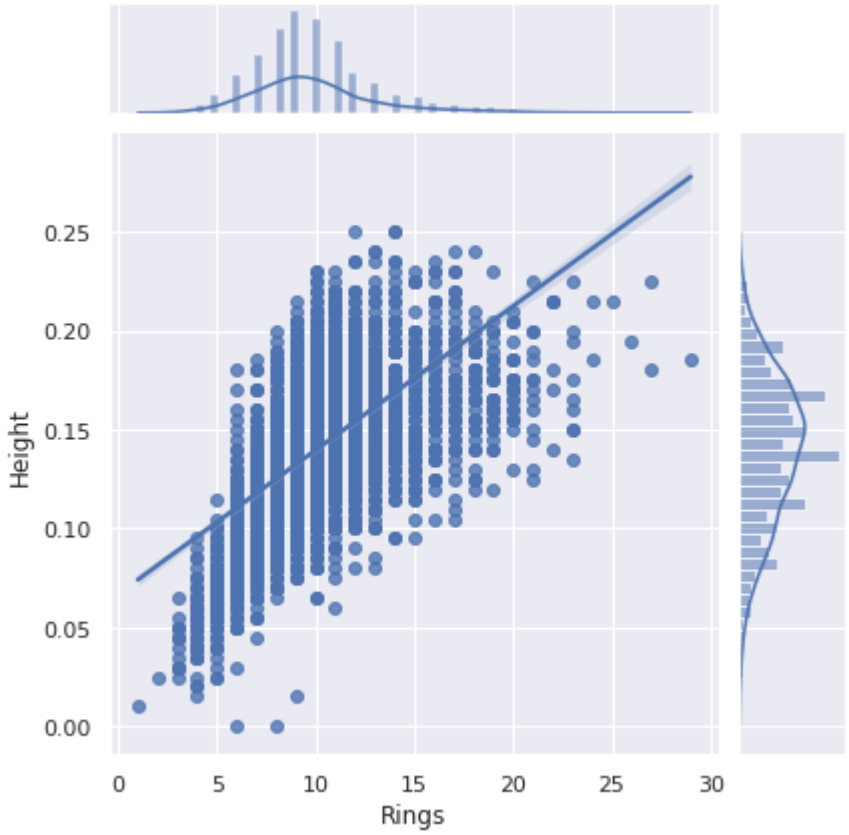


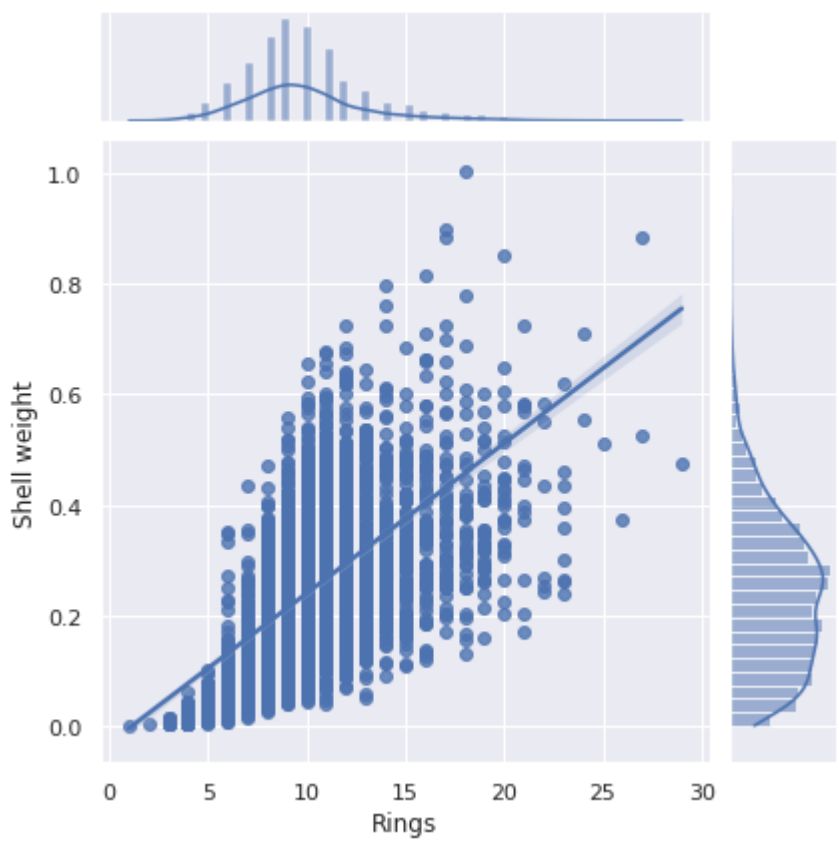
[13]:
```
plt.figure(figsize=(10, 10))
corr = abalone.corr()
_ = sns.heatmap(corr, annot=True)
```



In [14]:
```
plt.figure(figsize=(20, 5))

_ = sns.jointplot(data=abalone, x='Rings', y='Height', kind='reg')
_ = sns.jointplot(data=abalone, x='Rings', y='Shell weight', kind='reg')
```

```
<Figure size 1440x360 with 0 Axes>
```





DESCRIPTIVE STATISTICS

In [15]:
```
abalone.describe().T
```

Out[15]:

	count	mean	std	min	25%	50%	75%	max
Length	4175.0	0.523965	0.120084	0.0750	0.45000	0.5450	0.61500	0.8150
Diameter	4175.0	0.407856	0.099230	0.0550	0.35000	0.4250	0.48000	0.6500
Height	4175.0	0.139189	0.038489	0.0000	0.11500	0.1400	0.16500	0.2500
Whole weight	4175.0	0.828468	0.490027	0.0020	0.44150	0.7995	1.15300	2.8255
Shucked weight	4175.0	0.359195	0.221713	0.0010	0.18600	0.3360	0.50175	1.4880
Viscera weight	4175.0	0.180536	0.109534	0.0005	0.09325	0.1710	0.25275	0.7600
Shell weight	4175.0	0.238791	0.139162	0.0015	0.13000	0.2340	0.32875	1.0050
Rings	4175.0	9.934132	3.224802	1.0000	8.00000	9.0000	11.00000	29.0000

HANDLING WITH MISSING DATA

Out[16]:

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
0	False	False	False	False	False	False	False	False	False
1	False	False	False	False	False	False	False	False	False
2	False	False	False	False	False	False	False	False	False

In [16]:
```
df = pd.DataFrame(abalone)
df.isnull()
```

In [18]:
```
.boxplot(df['Length'],data=df)
```

sus

3	False	False	False	False	False	False	False	False	False
4	False	False	False	False	False	False	False	False	False
...	...	...	...	...	...	...	...	...	...
4172	False	False	False	False	False	False	False	False	False
4173	False	False	False	False	False	False	False	False	False
4174	False	False	False	False	False	False	False	False	False
4175	False	False	False	False	False	False	False	False	False
4176	False	False	False	False	False	False	False	False	False

4175 rows × 9 columns

In [17]:
```
df.fillna(0)
```

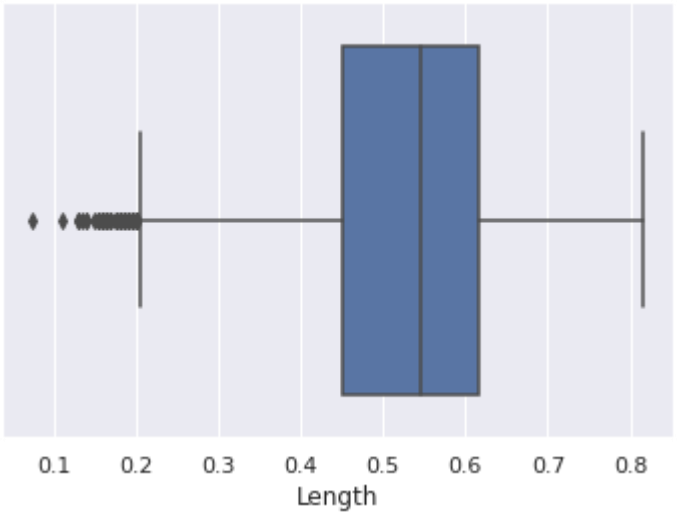
Out[17]:

	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

4175 rows × 9 columns

OUTLIERS IN EACH ATTRIBUTES /usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarnin g: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without a n explicit keyword will result in an error or misinterpretation. FutureWarning

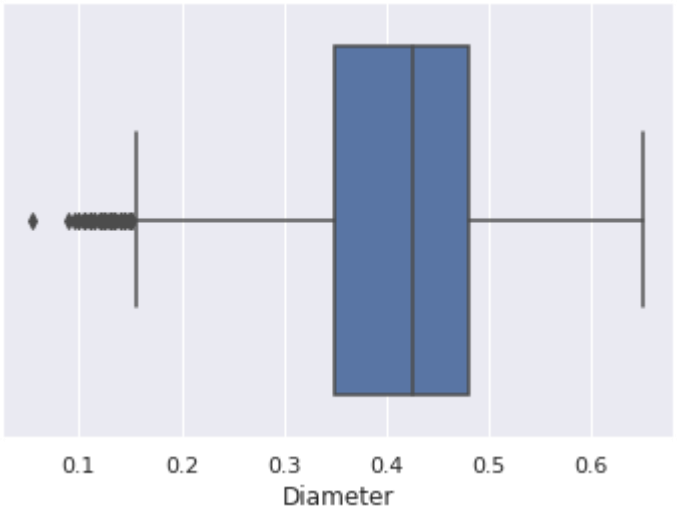
Out[18]: <matplotlib.axes._subplots.AxesSubplot at 0x7efc658ae4d0>



In [19]:
```
sns.boxplot(df['Diameter'],data=df)
```

```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarnin
g: Pass the following variable as a keyword arg: x. From version 0.12, the only
valid positional argument will be `data`, and passing other arguments without a
n explicit keyword will result in an error or misinterpretation.  FutureWarning
```

Out[19]: <matplotlib.axes._subplots.AxesSubplot at 0x7efc63c9f190>



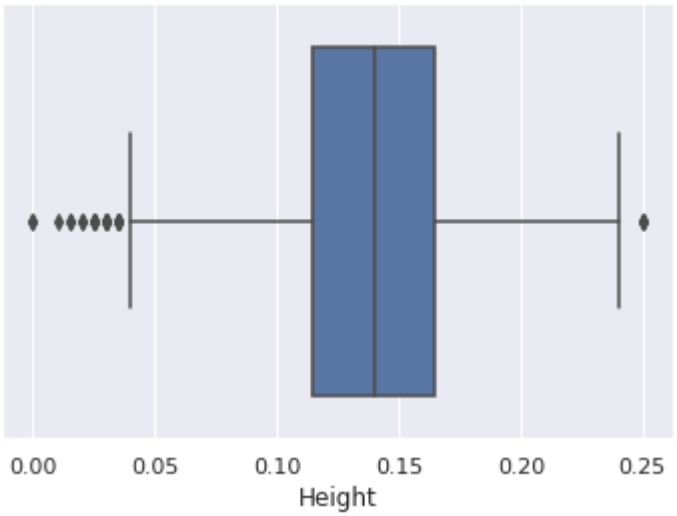
In

```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarnin
g: Pass the following variable as a keyword arg: x. From version 0.12, the only
valid positional argument will be `data`, and passing other arguments without a
```

[20]:
```
sns.boxplot(df['Height'],data=df)
```

```
n explicit keyword will result in an error or misinterpretation.
 FutureWarning
```

Out[20]: <matplotlib.axes._subplots.AxesSubplot at 0x7efc65679450>



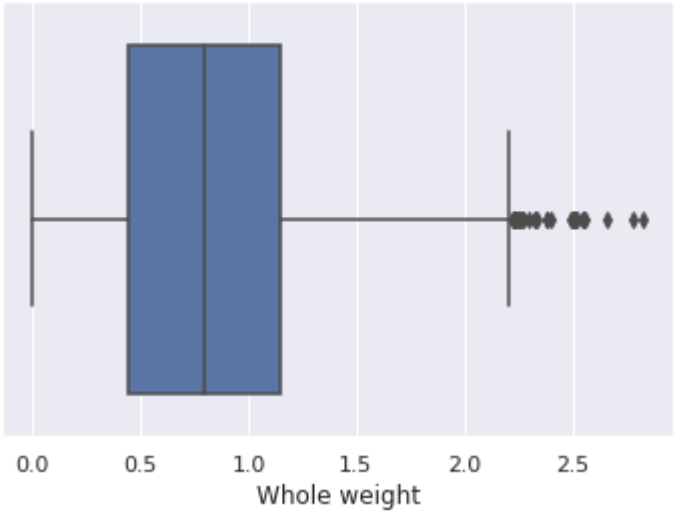
In [21]:
```
sns.boxplot(df['Whole weight'],data=df)
```

```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarnin
g: Pass the following variable as a keyword arg: x. From version 0.12, the only
valid positional argument will be `data`, and passing other arguments without a
n explicit keyword will result in an error or misinterpretation.  FutureWarning
```

Out[21]: <matplotlib.axes._subplots.AxesSubplot at 0x7efc65661610>

In

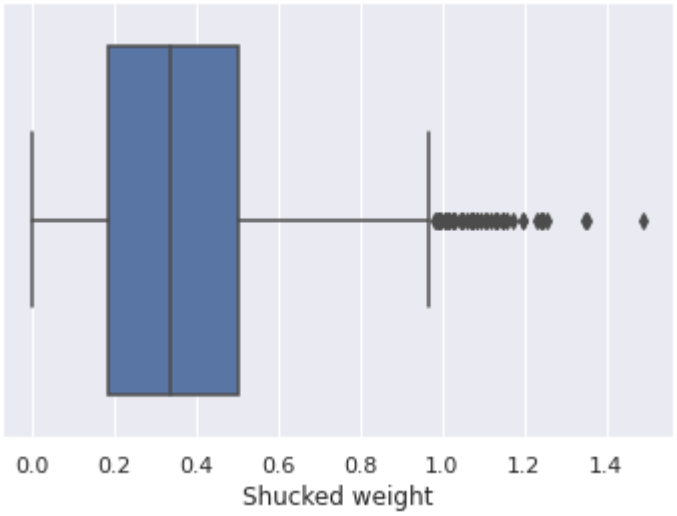
```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarnin
g: Pass the following variable as a keyword arg: x. From version 0.12, the only
valid positional argument will be `data`, and passing other arguments without a
```



[22]:
```
sns.boxplot(df['Shucked weight'],data=df)
```

```
n explicit keyword will result in an error or misinterpretation.
 FutureWarning
```

Out[22]: <matplotlib.axes._subplots.AxesSubplot at 0x7efc6563a350>



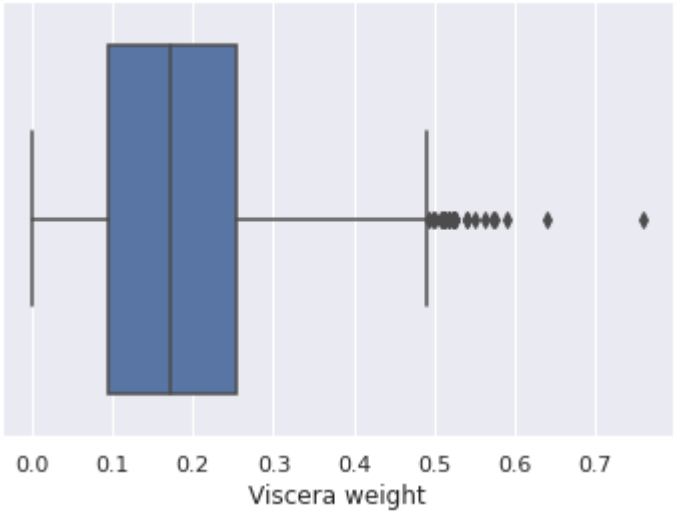
In [23]:
```
sns.boxplot(df['Viscera weight'],data=df)
```

```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarnin
g: Pass the following variable as a keyword arg: x. From version 0.12, the only
valid positional argument will be `data`, and passing other arguments without a
n explicit keyword will result in an error or misinterpretation.  FutureWarning
```

Out[23]: <matplotlib.axes._subplots.AxesSubplot at 0x7efc6565a2d0>

In

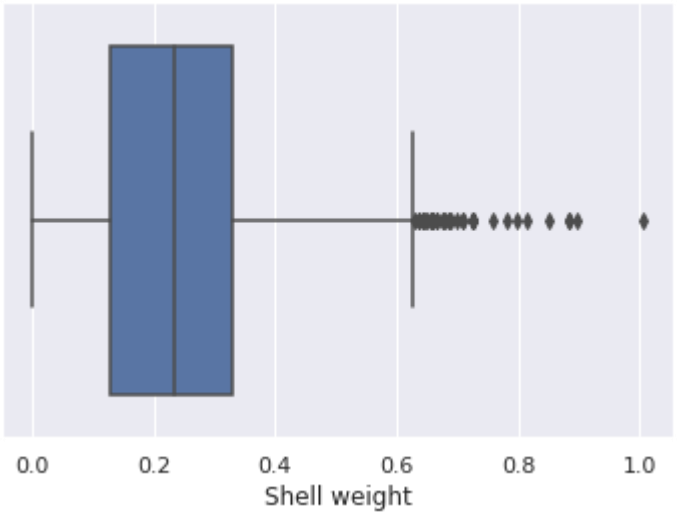
```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarnin
g: Pass the following variable as a keyword arg: x. From version 0.12, the only
valid positional argument will be `data`, and passing other arguments without a
```



[24]:
```
sns.boxplot(df['Shell weight'],data=df)
```

```
n explicit keyword will result in an error or misinterpretation.
  FutureWarning
```

Out[24]: <matplotlib.axes._subplots.AxesSubplot at 0x7efc65a26290>



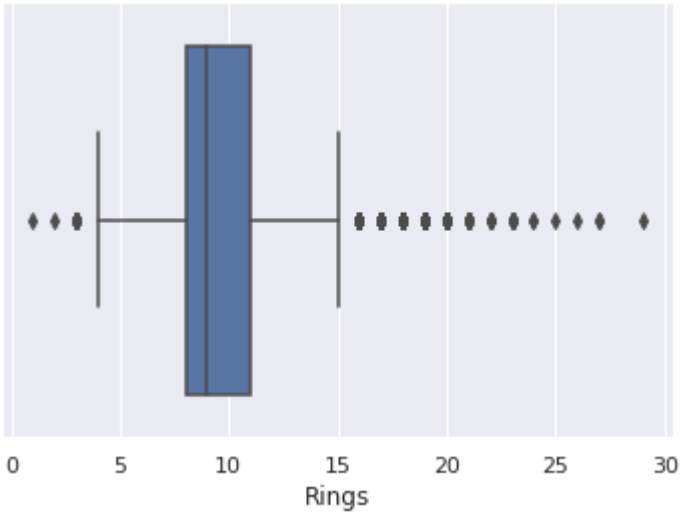
In

```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarnin
g: Pass the following variable as a keyword arg: x. From version 0.12, the only
valid positional argument will be `data`, and passing other arguments without a
```

[25]:
```
sns.boxplot(df['Rings'],data=df)
```

```
n explicit keyword will result in an error or misinterpretation.
  FutureWarning
```

Out[25]: <matplotlib.axes._subplots.AxesSubplot at 0x7efc661856d0>



In [26]:
```
Q1 = abalone.quantile(0.25)
Q3 = abalone.quantile(0.75)
IQR = Q3-Q1
print(IQR)
```

```
Length            0.16500
Diameter          0.13000
Height            0.05000
Whole weight      0.71150
Shucked weight    0.31575
Viscera weight    0.15950
Shell weight      0.19875 Rings
3.00000 dtype: float64
```

In [27]:
```
abalone = abalone[~((abalone < (Q1 - 1.5 * IQR)) |(abalone > (Q3 + 1.5 * IQR))).a
abalone.shape
```

```
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:1: FutureWarning:
Automatic reindexing on DataFrame vs Series comparisons is deprecated and will
raise ValueError in a future version.  Do `left, right = left.align(right, axis
=1, copy=False)` before e.g. `left == right`
  """Entry point for launching an IPython kernel.
```

In

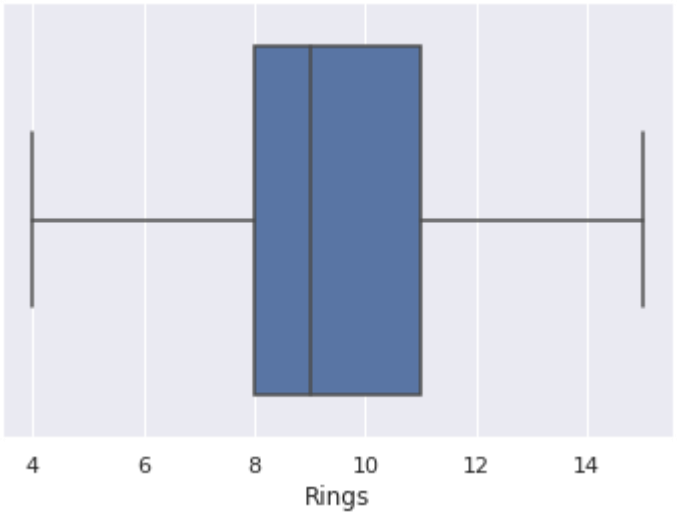
```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarnin
g: Pass the following variable as a keyword arg: x. From version 0.12, the only
valid positional argument will be `data`, and passing other arguments without a
```

Out[27]: (3781, 9)

[28]:
```
sns.boxplot(abalone['Rings'],data=abalone)
```

```
n explicit keyword will result in an error or misinterpretation.
 FutureWarning
```

Out[28]: <matplotlib.axes._subplots.AxesSubplot at 0x7efc6592e290>



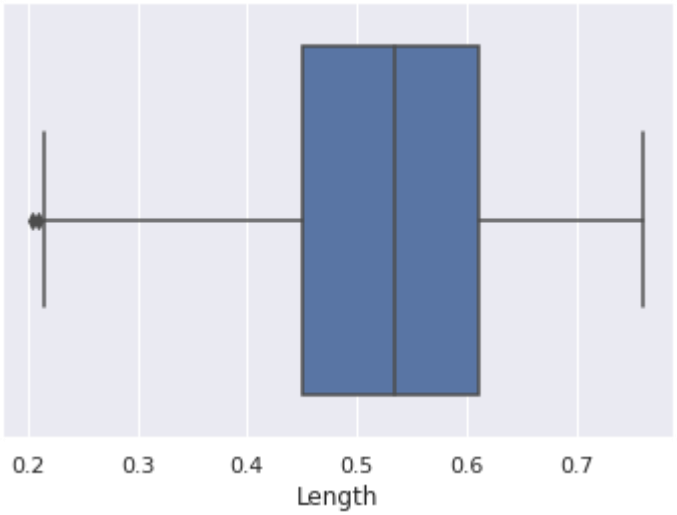
In

```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarnin
g: Pass the following variable as a keyword arg: x. From version 0.12, the only
valid positional argument will be `data`, and passing other arguments without a
```

[29]:
```
sns.boxplot(abalone['Length'],data=abalone)
```

```
n explicit keyword will result in an error or misinterpretation.
  FutureWarning
```

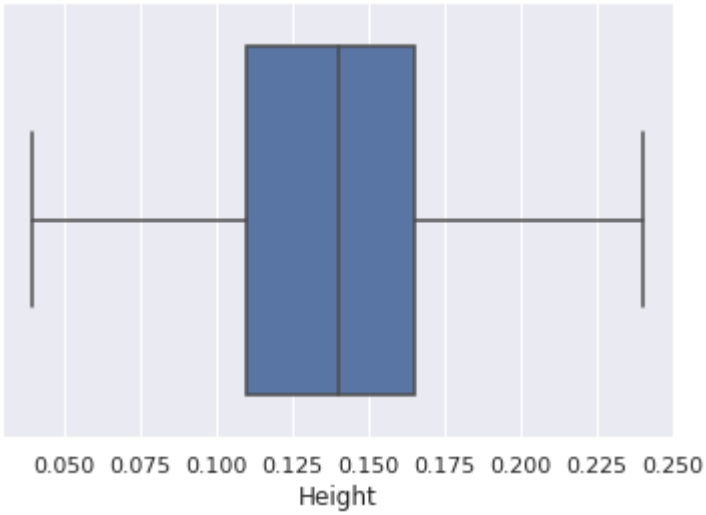
Out[29]: <matplotlib.axes._subplots.AxesSubplot at 0x7efc658a63d0>



In [30]:
```
sns.boxplot(abalone['Height'],data=abalone)
```

```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarnin
g: Pass the following variable as a keyword arg: x. From version 0.12, the only
valid positional argument will be `data`, and passing other arguments without a
n explicit keyword will result in an error or misinterpretation.  FutureWarning
```

Out[30]: <matplotlib.axes._subplots.AxesSubplot at 0x7efc65975710>



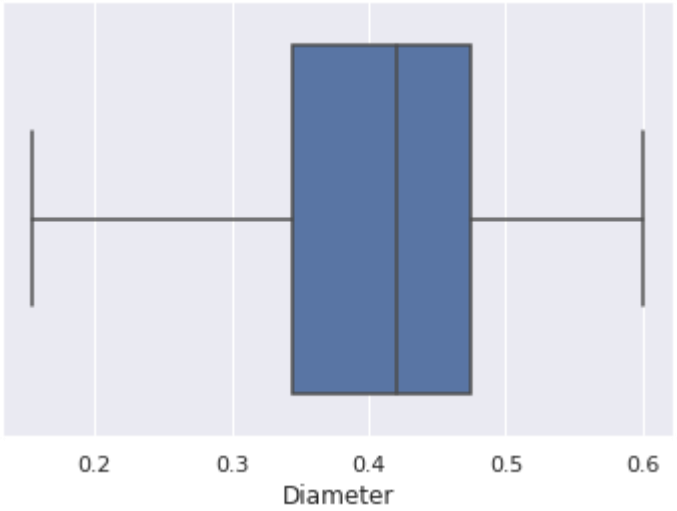
In

```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarnin
g: Pass the following variable as a keyword arg: x. From version 0.12, the only
valid positional argument will be `data`, and passing other arguments without a
```

[31]:
```
sns.boxplot(abalone['Diameter'],data=abalone)
```

```
n explicit keyword will result in an error or misinterpretation.
 FutureWarning
```

Out[31]: <matplotlib.axes._subplots.AxesSubplot at 0x7efc6377bb10>

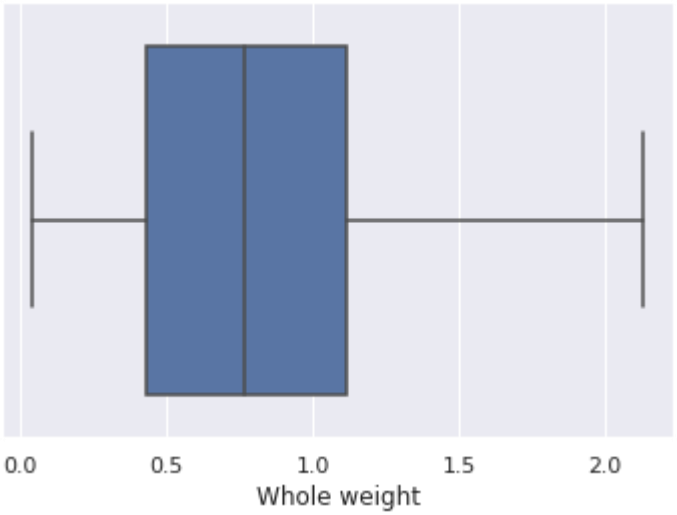


In
```
sns.boxplot(abalone[
```

```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarnin
g: Pass the following variable as a keyword arg: x. From version 0.12, the only
valid positional argument will be `data`, and passing other arguments without a
n explicit keyword will result in an error or misinterpretation.
  FutureWarning
```

[32]:
```
                    'Whole weight'],data=abalone)
```

Out[32]: <matplotlib.axes._subplots.AxesSubplot at 0x7efc6555d210>



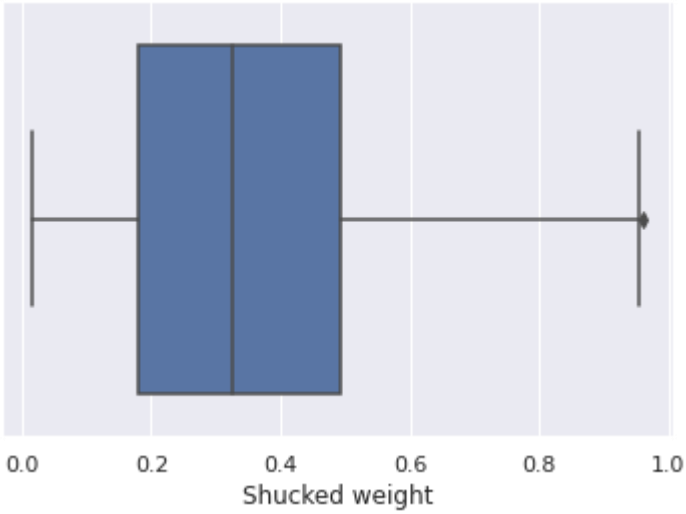
In [33]:
```
sns.boxplot(abalone['Shucked weight'],data=abalone)
```

```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarnin
g: Pass the following variable as a keyword arg: x. From version 0.12, the only
valid positional argument will be `data`, and passing other arguments without a
n explicit keyword will result in an error or misinterpretation.  FutureWarning
```

Out[33]: <matplotlib.axes._subplots.AxesSubplot at 0x7efc63b167d0>

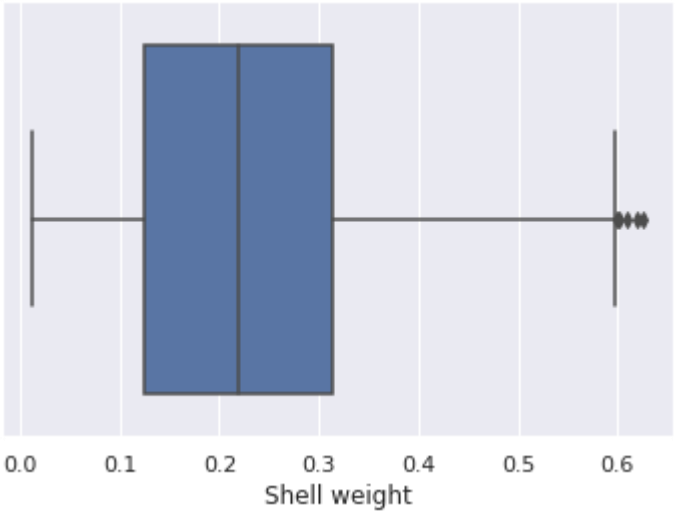
In
```
sns.boxplot(abalone[
```

```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarnin
g: Pass the following variable as a keyword arg: x. From version 0.12, the only
valid positional argument will be `data`, and passing other arguments without a
n explicit keyword will result in an error or misinterpretation.
  FutureWarning
```



[34]:
```
                    'Shell weight'],data=abalone)
```

Out[34]: <matplotlib.axes._subplots.AxesSubplot at 0x7efc6568c250>

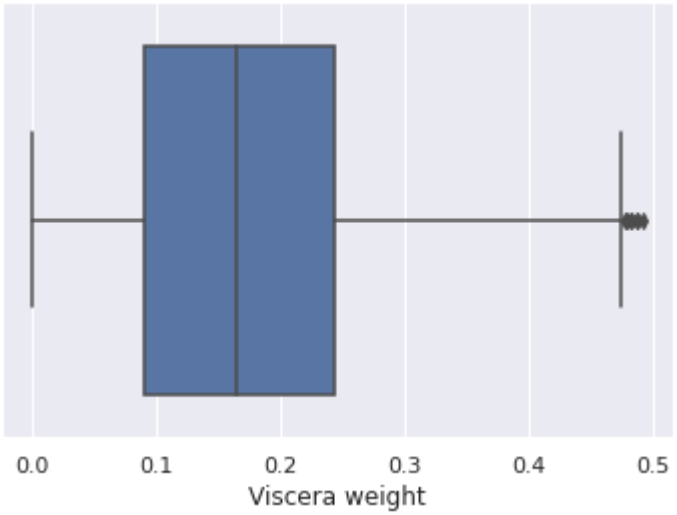


In
```
sns.boxplot(abalone[
```

```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarnin
g: Pass the following variable as a keyword arg: x. From version 0.12, the only
valid positional argument will be `data`, and passing other arguments without a
n explicit keyword will result in an error or misinterpretation.
  FutureWarning
```

[35]:
```
                    'Viscera weight'],data=abalone)
```

Out[35]: <matplotlib.axes._subplots.AxesSubplot at 0x7efc63a00a10>



LABEL ENCODING FOR CATEGORICAL DATA

In [36]:
```
le=LabelEncoder()
abalone['Sex']=le.fit_transform(abalone['Sex'])
```

```
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:2: SettingWithCopy
Warning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/sta
ble/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pyd
ata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-c
opy)
```

In [37]:
```
abalone
```

Out[37]:

	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	0.1500	15
1	2	0.350	0.265	0.090	0.2255	0.0995	0.0485	0.0700	7
2	0	0.530	0.420	0.135	0.6770	0.2565	0.1415	0.2100	9
3	2	0.440	0.365	0.125	0.5160	0.2155	0.1140	0.1550	10
4	1	0.330	0.255	0.080	0.2050	0.0895	0.0395	0.0550	7
...	...	...	...	...	...	...	...	...	...
4172	0	0.565	0.450	0.165	0.8870	0.3700	0.2390	0.2490	11
4173	2	0.590	0.440	0.135	0.9660	0.4390	0.2145	0.2605	10
4174	2	0.600	0.475	0.205	1.1760	0.5255	0.2875	0.3080	9
4175	0	0.625	0.485	0.150	1.0945	0.5310	0.2610	0.2960	10
4176	2	0.710	0.555	0.195	1.9485	0.9455	0.3765	0.4950	12

3781 rows × 9 columns

##Spliting the Data into dependent and Independent Variables

In [38]:
```
X = abalone.iloc[:, :-1].values
y = abalone.iloc[:, -1].values
```

##Scaling independent variables

In [39]:
```
scaler = StandardScaler()
scaler.fit(abalone)
```

Out[39]:
```
StandardScaler()
```

##Spliting training and test data

In [40]:
```
train_X,val_X,train_y,val_y = train_test_split(X, y, test_size = 0.2, random_stat
```

In [41]:
```
print("Shape of Training X :",train_X.shape)
print("Shape of Validation X :",val_X.shape)
```

```
Shape of Training X : (3024, 8)
Shape of Validation X : (757, 8)
```

In [42]:
```
print("Shape of Training y :",train_y.shape)
print("Shape of Validation y :",val_y.shape)
```

```
Shape of Training y : (3024,)
Shape of Validation y : (757,)
```

##**LINEAR REGRESSION**

In [43]:
```
lr = LinearRegression()
lr.fit(train_X,train_y)
```

Out[43]:
```
LinearRegression()
```

In [44]:
```
%%time y_pred_val_lr =
lr.predict(val_X)
print('MAE on Validation set :',metrics.mean_absolute_error(val_y, y_pred_val_lr)
print("\n")
print('MSE on Validation set :',metrics.mean_squared_error(val_y, y_pred_val_lr))
print("\n")
print('RMSE on Validation set :',np.sqrt(metrics.mean_absolute_error(val_y, y_pre
print("\n")
print('R2 Score on Validation set :',metrics.r2_score(val_y, y_pred_val_lr))
print("\n")
```

```
MAE on Validation set : 1.2719689486359298


MSE on Validation set : 2.7606215450501024


RMSE on Validation set : 1.127816008325795


R2 Score on Validation set : 0.5119499107890585


CPU times: user 5.67 ms, sys: 859 µs, total: 6.53 ms Wall
time: 6.14 ms
```

##**SUPPORT VECTOR MACHINE**

In [45]:
```
svm = SVR()
svm.fit(train_X,train_y)
```

Out[45]:
```
SVR()
```

In [46]:
```
%%time y_pred_val_svm =
svm.predict(val_X)
print('MAE on Validation set :',metrics.mean_absolute_error(val_y, y_pred_val_svm
print("\n")
```

In

```
print('MSE on Validation set :',metrics.mean_squared_error(val_y, y_pred_val_svm)
print("\n")
print('RMSE on Validation set :',np.sqrt(metrics.mean_absolute_error(val_y, y_pre
print("\n")
print('R2 Score on Validation set :',metrics.r2_score(val_y, y_pred_val_svm))
print("\n")
```

```
MAE on Validation set : 1.2208952787270895


MSE on Validation set : 2.7012620714060267


RMSE on Validation set : 1.1049413010323623


R2 Score on Validation set : 0.5224440679687887


CPU times: user 146 ms, sys: 0 ns, total: 146 ms
Wall time: 145 ms
```

##**DECISION TREE REGRESSOR**

In [47]:
```
dc = DecisionTreeRegressor(random_state = 0)
dc.fit(train_X,train_y)
```

Out[47]:
```
DecisionTreeRegressor(random_state=0)
```

[48]:
```
%%time y_pred_val_dc =
dc.predict(val_X)
print('MAE on Validation set :',metrics.mean_absolute_error(val_y, y_pred_val_dc)
print("\n")
print('MSE on Validation set :',metrics.mean_squared_error(val_y, y_pred_val_dc))
print("\n")
print('RMSE on Validation set :',np.sqrt(metrics.mean_absolute_error(val_y, y_pre
print("\n")
print('R2 Score on Validation set :',metrics.r2_score(val_y, y_pred_val_dc))
print("\n")
```

```
MAE on Validation set : 1.6393659180977542


MSE on Validation set : 4.88110964332893


RMSE on Validation set : 1.2803772561623212


R2 Score on Validation set : 0.13706896870869845
```

In

```
CPU times: user 10.1 ms, sys: 1.1 ms, total: 11.2 ms Wall
time: 24.9 ms
```

##**OVERVIEW OF R2 SCORES OF ALL MODELS**

In [49]:
```
print('Logistic Regression R2 Score on Validation set :',metrics.r2_score(val_y,
print('SVR R2 Score on Validation set :',metrics.r2_score(val_y, y_pred_val_svm))
print('Decision Tree Regressor R2 Score on Validation set :',metrics.r2_score(val
```

```
Logistic Regression R2 Score on Validation set : 0.5119499107890585
SVR R2 Score on Validation set : 0.5224440679687887
Decision Tree Regressor R2 Score on Validation set : 0.13706896870869845
```