ASSIGNMENT - 3

21BCE7255_- UPPALAPATI BALAJI

Loading the dataset

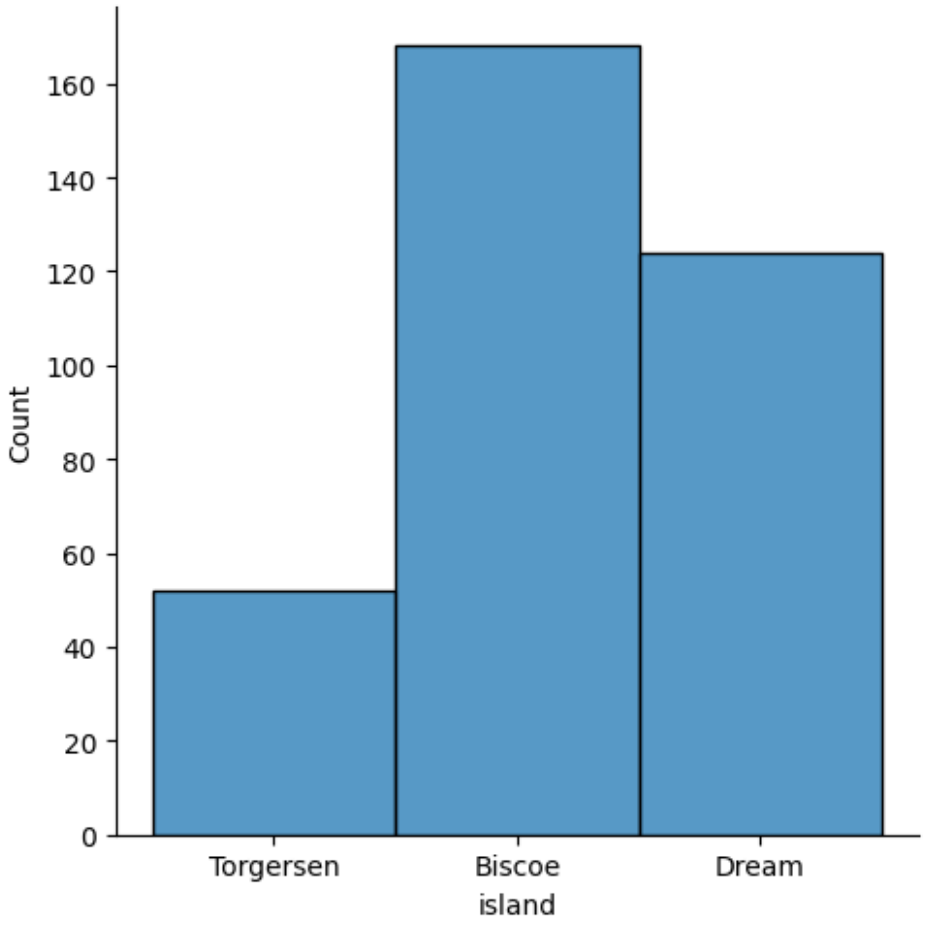
```
import numpy as np
import pandas as pd
import io
from google.colab import files
uploaded=files.upload()
df = pd.read_csv(io.BytesIO(uploaded['penguins_size.csv']))
print(df)
```

```
<IPython.core.display.HTML object>

Saving penguins_size.csv to penguins_size.csv
    species     island  culmen_length_mm  culmen_depth_mm  flipper_length_mm
\
0    Adelie  Torgersen              39.1             18.7              181.0
1    Adelie  Torgersen              39.5             17.4              186.0
2    Adelie  Torgersen              40.3             18.0              195.0
3    Adelie  Torgersen               NaN              NaN                NaN
4    Adelie  Torgersen              36.7             19.3              193.0
..      ...        ...               ...              ...                ...
339  Gentoo     Biscoe               NaN              NaN                NaN
340  Gentoo     Biscoe              46.8             14.3              215.0
341  Gentoo     Biscoe              50.4             15.7              222.0
342  Gentoo     Biscoe              45.2             14.8              212.0
343  Gentoo     Biscoe              49.9             16.1              213.0

     body_mass_g     sex
0         3750.0    MALE
1         3800.0  FEMALE
2         3250.0  FEMALE
3            NaN     NaN
4         3450.0  FEMALE
..           ...     ...
339          NaN     NaN
340       4850.0  FEMALE
341       5750.0    MALE
342       5200.0  FEMALE
343       5400.0    MALE

[344 rows x 7 columns]
```

Univariate Analysis

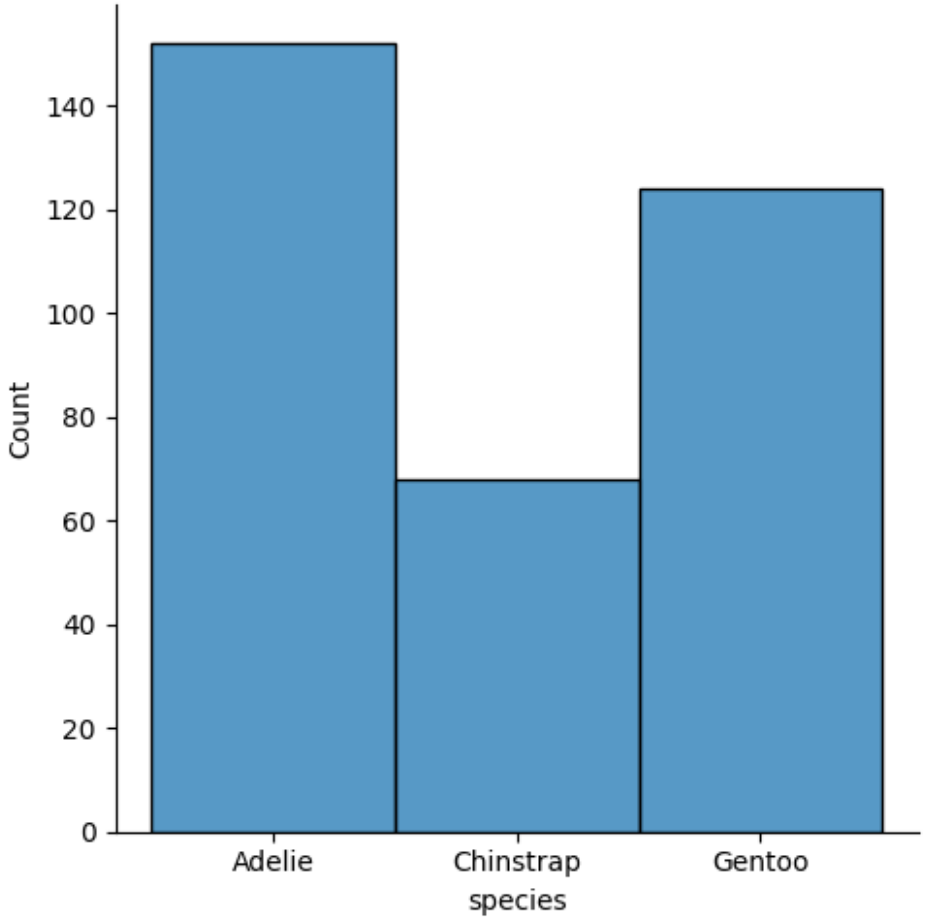
```
import seaborn as sb
import matplotlib.pyplot as plt

sb.displot(df['island'])
```

```
<seaborn.axisgrid.FacetGrid at 0x7b5460bf5f30>
```

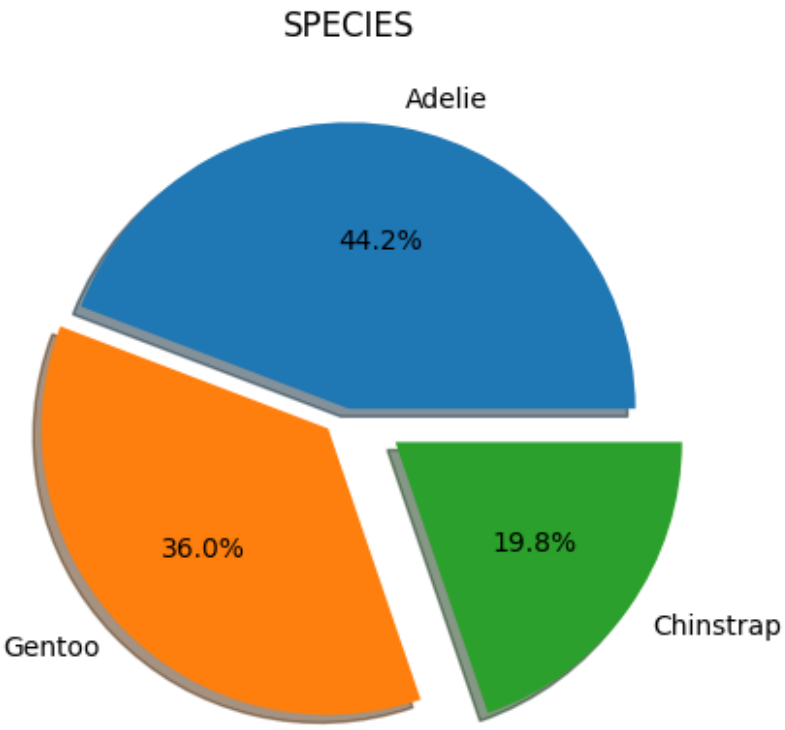



```
sb.displot(df['species'])
```

```
<seaborn.axisgrid.FacetGrid at 0x7b5460b4bd90>
```

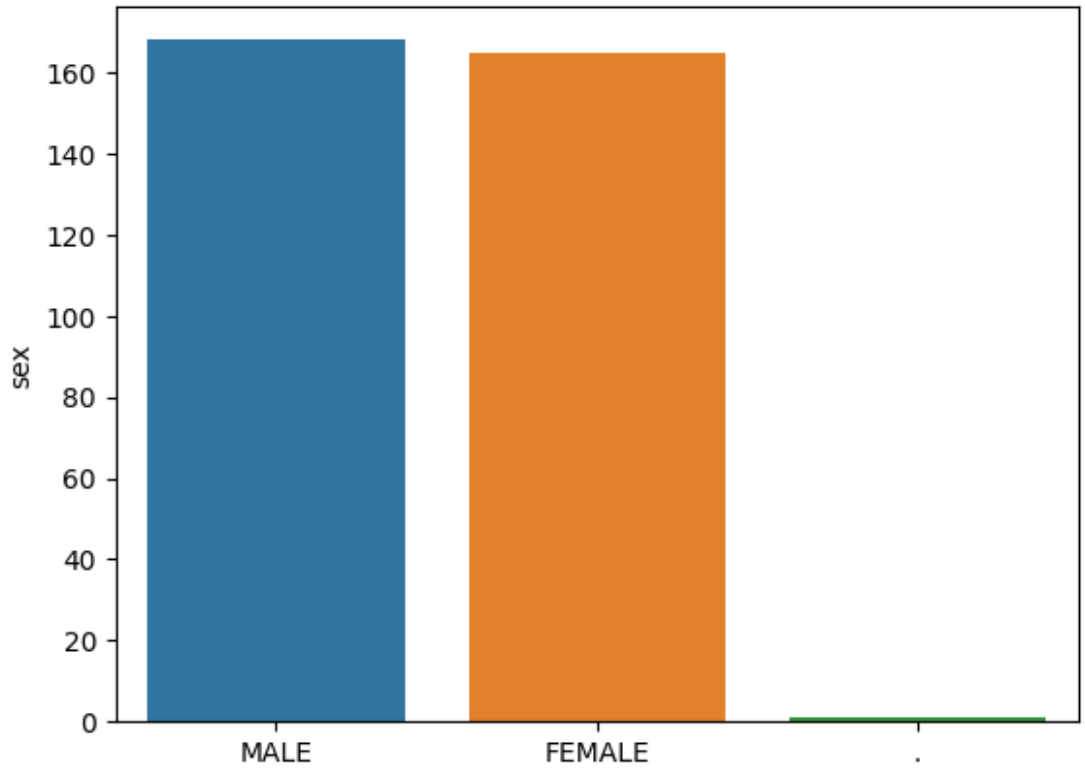



```
plt.pie(df.species.value_counts() ,  [0,0.1,0.2] , labels = [ 'Adelie' ,
'Gentoo','Chinstrap' ] , autopct ='%1.1f%%',shadow = True,)
plt.title('SPECIES')
plt.show()
```




```
sb.barplot(x =df.sex.value_counts().index,y =df.sex.value_counts() )
```

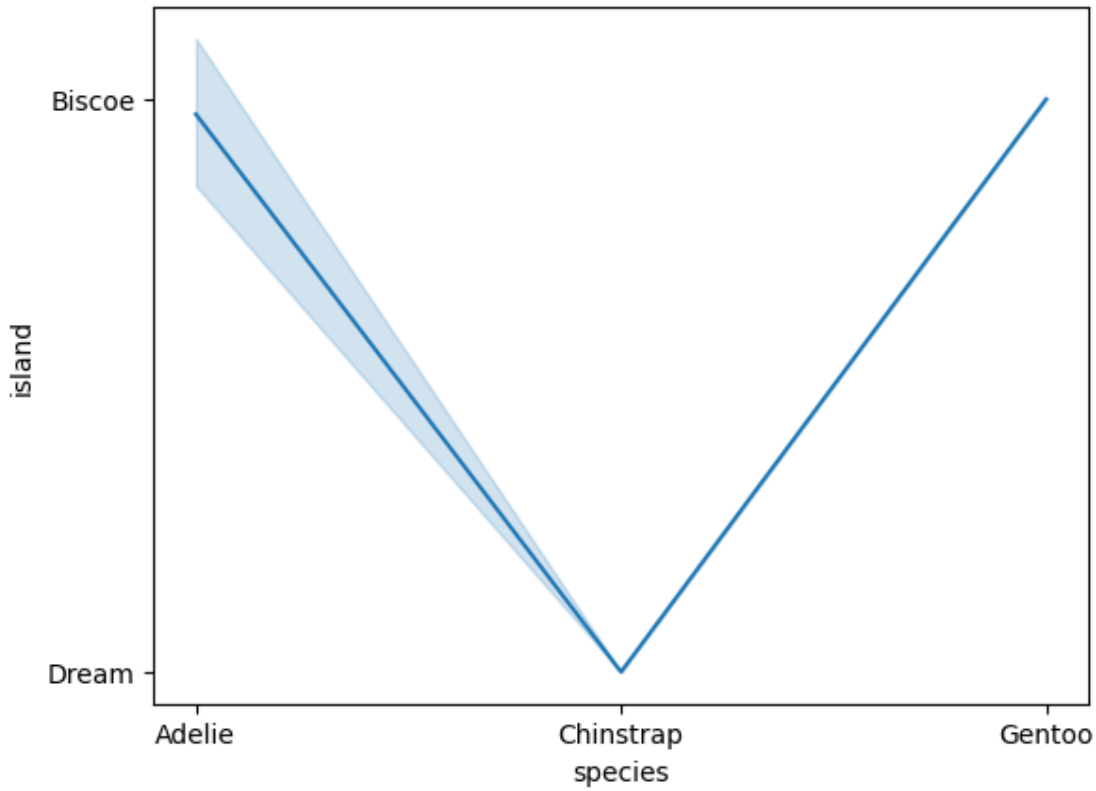
```
<Axes: ylabel='sex'>
```



Bivariate Analysis

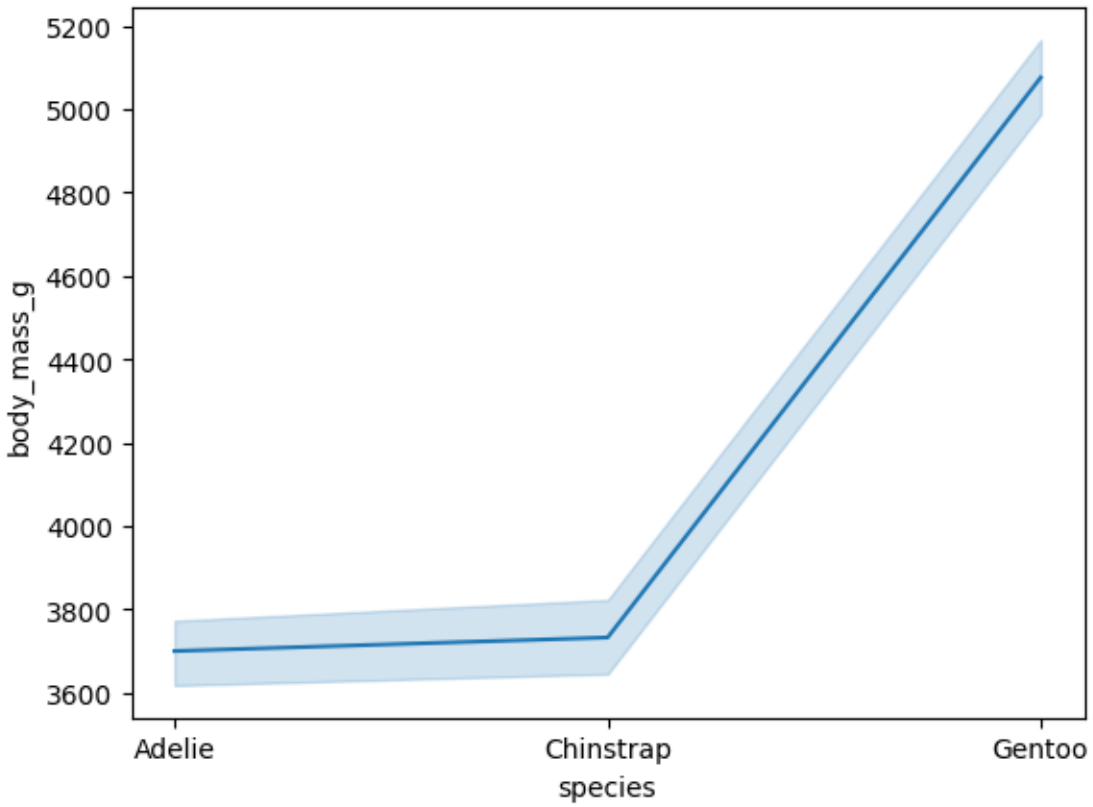
```
sb.lineplot(x = df['species'],y=df['island'])
```

```
<Axes: xlabel='species', ylabel='island'>
```



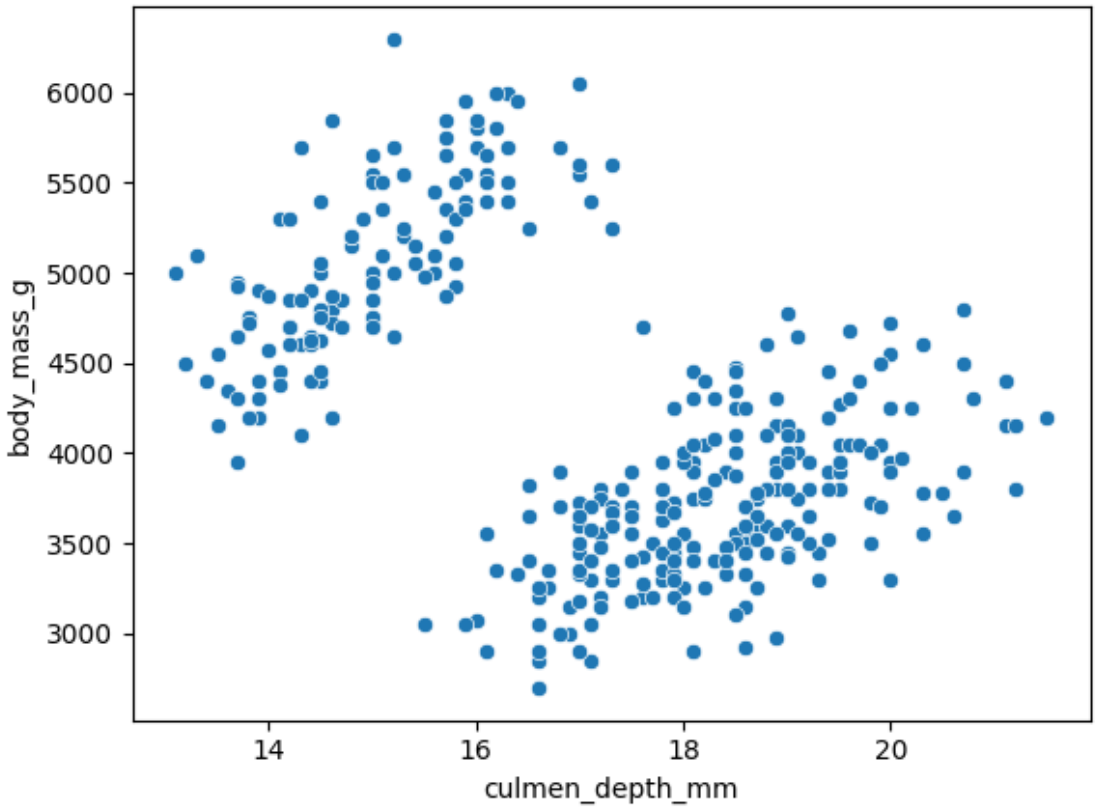

```
sb.lineplot(x = df['species'],y=df['body_mass_g'])
```

```
<Axes: xlabel='species', ylabel='body_mass_g'>
```




```
sb.scatterplot(x = df['culmen_depth_mm'],y=df['body_mass_g'])
```

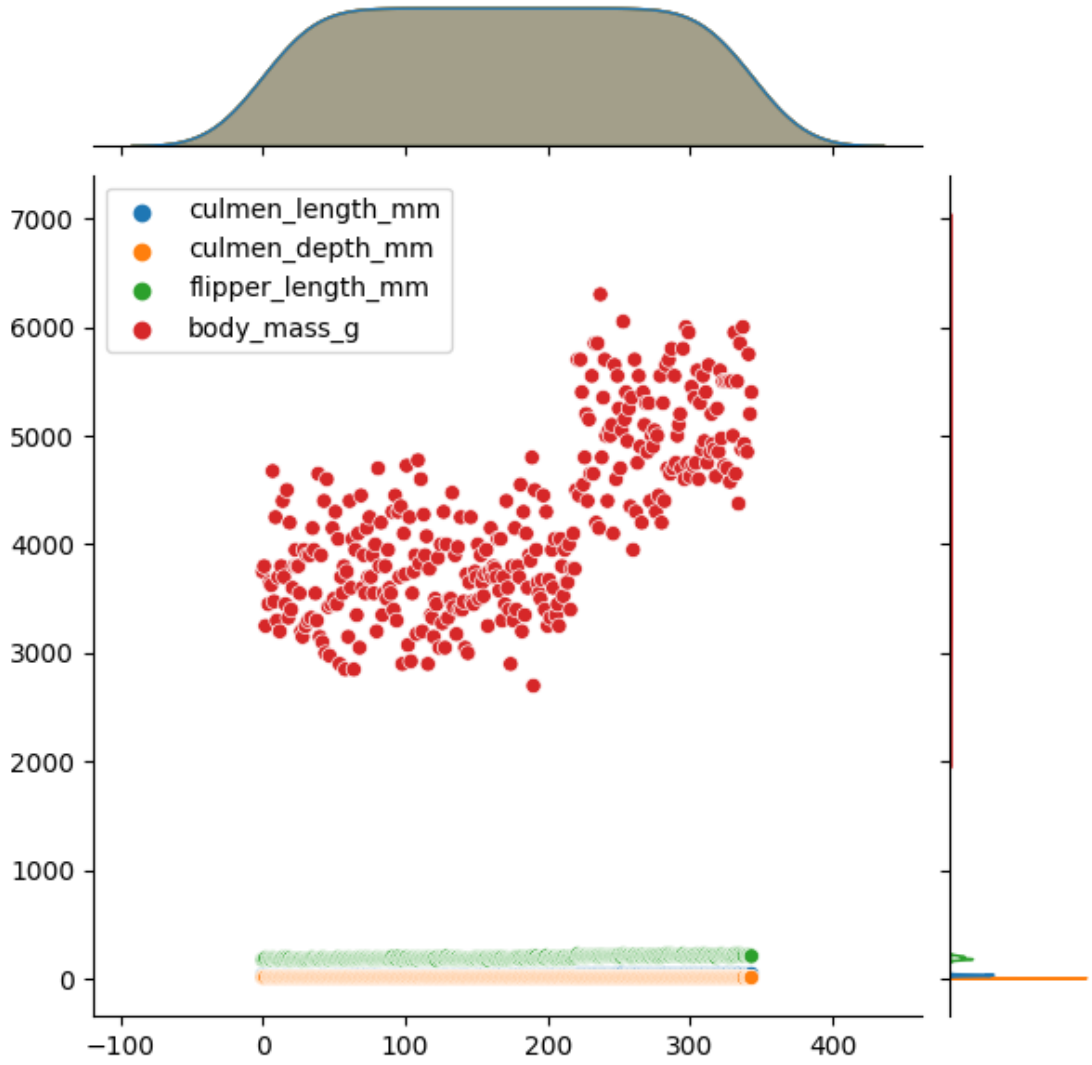
```
<Axes: xlabel='culmen_depth_mm', ylabel='body_mass_g'>
```



Multivariate Analysis

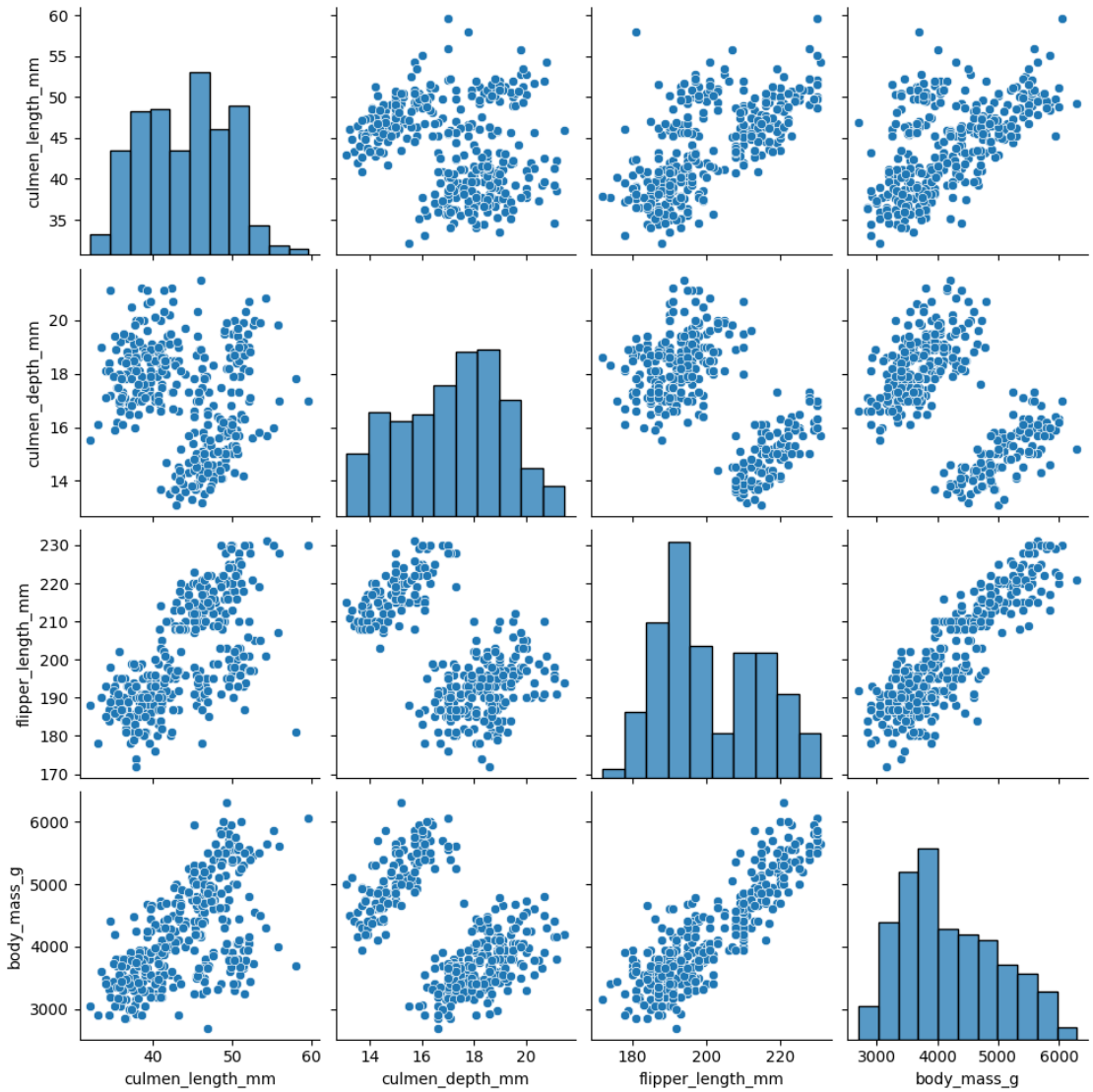
```
sb.jointplot(data=df)
```

```
<seaborn.axisgrid.JointGrid at 0x7b545ea07880>
```



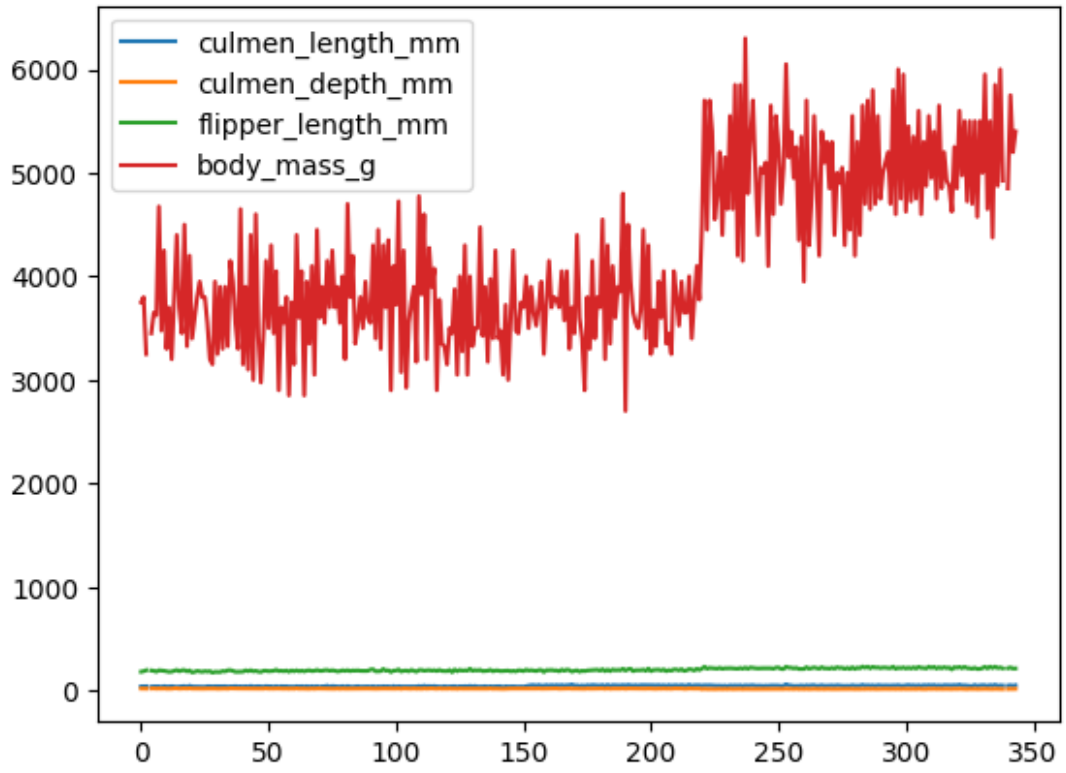

```
sb.pairplot(df)
```

```
<seaborn.axisgrid.PairGrid at 0x7b545e5b47c0>
```


culmen_length_mm
culmen_depth_mm
flipper_length_mm
body_mass_g
60
55
50
45
40
35
20
18
16
14
230
220
210
200
190
180
170
6000
5000
4000
3000
40
50
60
14
16
18
20
180
200
220
3000
4000
5000
6000

```
df.plot()
```

```
<Axes: >
```



Few descriptive statistics

```
df.describe()
```

```
       culmen_length_mm  culmen_depth_mm  flipper_length_mm  body_mass_g
count        342.000000       342.000000         342.000000   342.000000
mean          43.921930        17.151170         200.915205  4201.754386
std            5.459584         1.974793          14.061714   801.954536
min           32.100000        13.100000         172.000000  2700.000000
25%           39.225000        15.600000         190.000000  3550.000000
50%           44.450000        17.300000         197.000000  4050.000000
75%           48.500000        18.700000         213.000000  4750.000000
max           59.600000        21.500000         231.000000  6300.000000
```

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 344 entries, 0 to 343
Data columns (total 7 columns):
 #   Column             Non-Null Count  Dtype
---  ------             --------------  -----
 0   species            344 non-null    object
 1   island             344 non-null    object
 2   culmen_length_mm   342 non-null    float64
 3   culmen_depth_mm    342 non-null    float64
 4   flipper_length_mm  342 non-null    float64
```

```
 5   body_mass_g        342 non-null    float64
 6   sex                334 non-null    object
dtypes: float64(4), object(3)
memory usage: 18.9+ KB
```

Checking for Null Values

```
df.isnull().any()
```

```
species              False
island               False
culmen_length_mm      True
culmen_depth_mm       True
flipper_length_mm     True
body_mass_g           True
sex                   True
dtype: bool
```

```
df.isnull().sum()
```

```
species               0
island                0
culmen_length_mm      2
culmen_depth_mm       2
flipper_length_mm     2
body_mass_g           2
sex                  10
dtype: int64
```

Label Encoding

```
from sklearn.preprocessing  import LabelEncoder
le = LabelEncoder()

df['sex'] = le.fit_transform(df['sex'])
df
```

```
    species     island  culmen_length_mm  culmen_depth_mm  flipper_length_mm
\
0    Adelie  Torgersen              39.1             18.7              181.0
1    Adelie  Torgersen              39.5             17.4              186.0
2    Adelie  Torgersen              40.3             18.0              195.0
3    Adelie  Torgersen               NaN              NaN                NaN
4    Adelie  Torgersen              36.7             19.3              193.0
..      ...        ...               ...              ...                ...
339  Gentoo     Biscoe               NaN              NaN                NaN
340  Gentoo     Biscoe              46.8             14.3              215.0
341  Gentoo     Biscoe              50.4             15.7              222.0
342  Gentoo     Biscoe              45.2             14.8              212.0
343  Gentoo     Biscoe              49.9             16.1              213.0

     body_mass_g  sex
```

```
0         3750.0    2
1         3800.0    1
2         3250.0    1
3            NaN    3
4         3450.0    1
..           ...  ...
339          NaN    3
340       4850.0    1
341       5750.0    2
342       5200.0    1
343       5400.0    2

[344 rows x 7 columns]
```

Filling Null Values by using Mean

```
df.fillna(df.mean() , inplace= True)
df
```

```
<ipython-input-19-826902893166>:1: FutureWarning: The default value of
numeric_only in DataFrame.mean is deprecated. In a future version, it will
default to False. In addition, specifying 'numeric_only=None' is deprecated.
Select only valid columns or specify the value of numeric_only to silence
this warning.
  df.fillna(df.mean() , inplace= True)

    species     island  culmen_length_mm  culmen_depth_mm  flipper_length_mm
\
0    Adelie  Torgersen          39.10000         18.70000         181.000000
1    Adelie  Torgersen          39.50000         17.40000         186.000000
2    Adelie  Torgersen          40.30000         18.00000         195.000000
3    Adelie  Torgersen          43.92193         17.15117         200.915205
4    Adelie  Torgersen          36.70000         19.30000         193.000000
..      ...        ...               ...              ...                ...
339  Gentoo     Biscoe          43.92193         17.15117         200.915205
340  Gentoo     Biscoe          46.80000         14.30000         215.000000
341  Gentoo     Biscoe          50.40000         15.70000         222.000000
342  Gentoo     Biscoe          45.20000         14.80000         212.000000
343  Gentoo     Biscoe          49.90000         16.10000         213.000000

     body_mass_g  sex
0    3750.000000    2
1    3800.000000    1
2    3250.000000    1
3    4201.754386    3
4    3450.000000    1
..           ...  ...
339  4201.754386    3
340  4850.000000    1
341  5750.000000    2
342  5200.000000    1
```

```
343  5400.000000    2

[344 rows x 7 columns]
```

One hot encoding

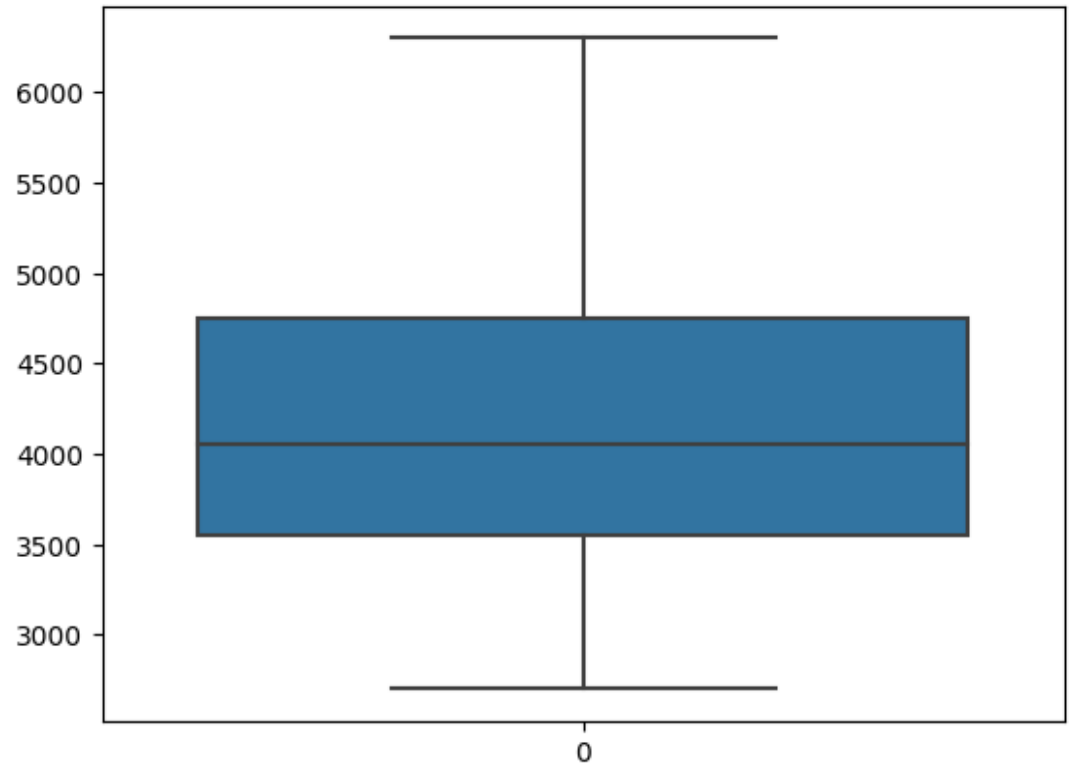
```
df_main = pd.get_dummies(df,columns =['species' , 'island'  ])
df_main.head()
```

```
   culmen_length_mm  culmen_depth_mm  flipper_length_mm  body_mass_g  sex  \
0          39.10000         18.70000         181.000000  3750.000000    2
1          39.50000         17.40000         186.000000  3800.000000    1
2          40.30000         18.00000         195.000000  3250.000000    1
3          43.92193         17.15117         200.915205  4201.754386    3
4          36.70000         19.30000         193.000000  3450.000000    1

   species_Adelie  species_Chinstrap  species_Gentoo  island_Biscoe  \
0               1                  0               0              0
1               1                  0               0              0
2               1                  0               0              0
3               1                  0               0              0
4               1                  0               0              0

   island_Dream  island_Torgersen
0             0                 1
1             0                 1
2             0                 1
3             0                 1
4             0                 1
```

Outliers

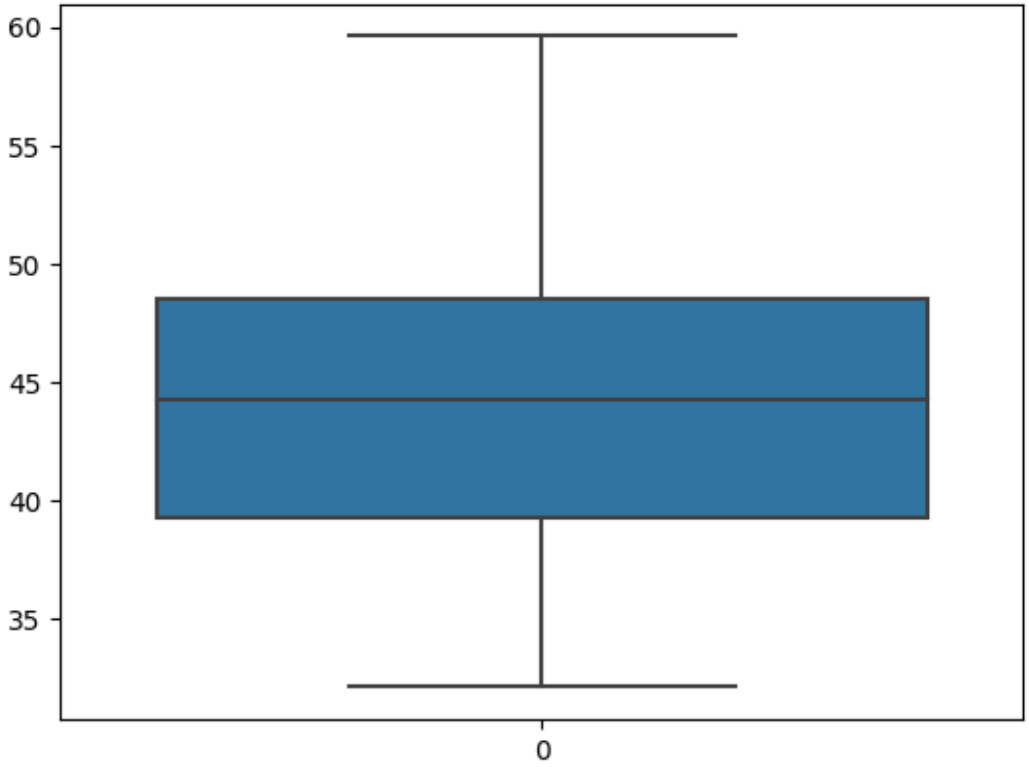
```
sb.boxplot(df['body_mass_g'])
```

```
<Axes: >
```



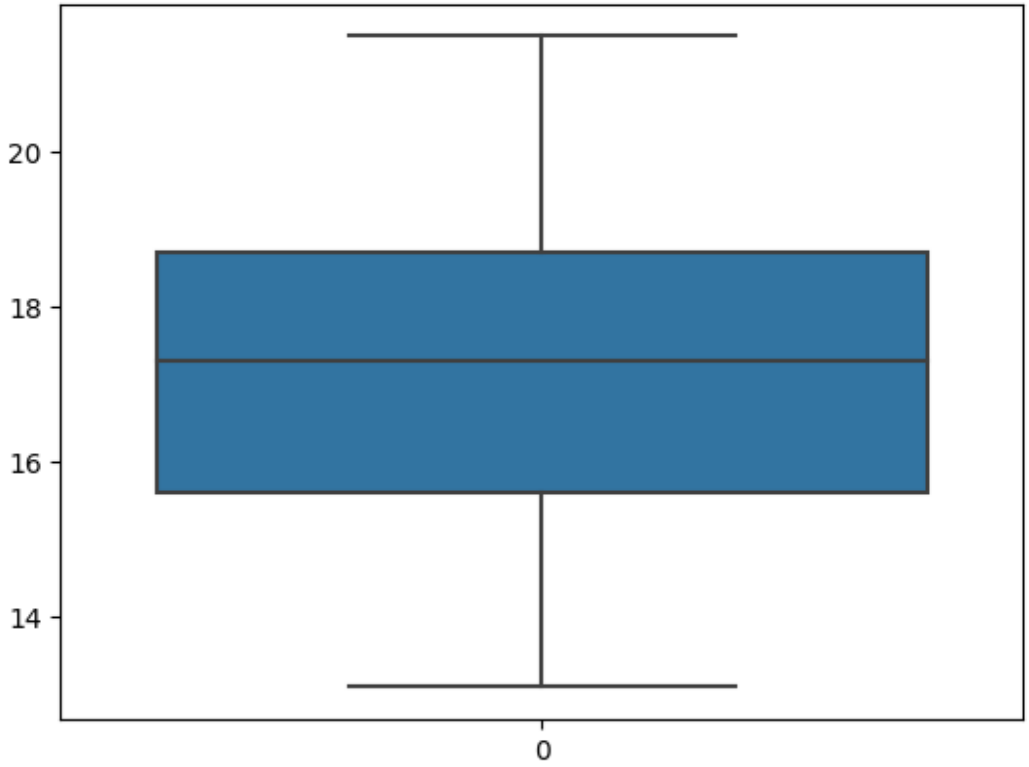

```
sb.boxplot(df['culmen_length_mm'])
```

```
<Axes: >
```



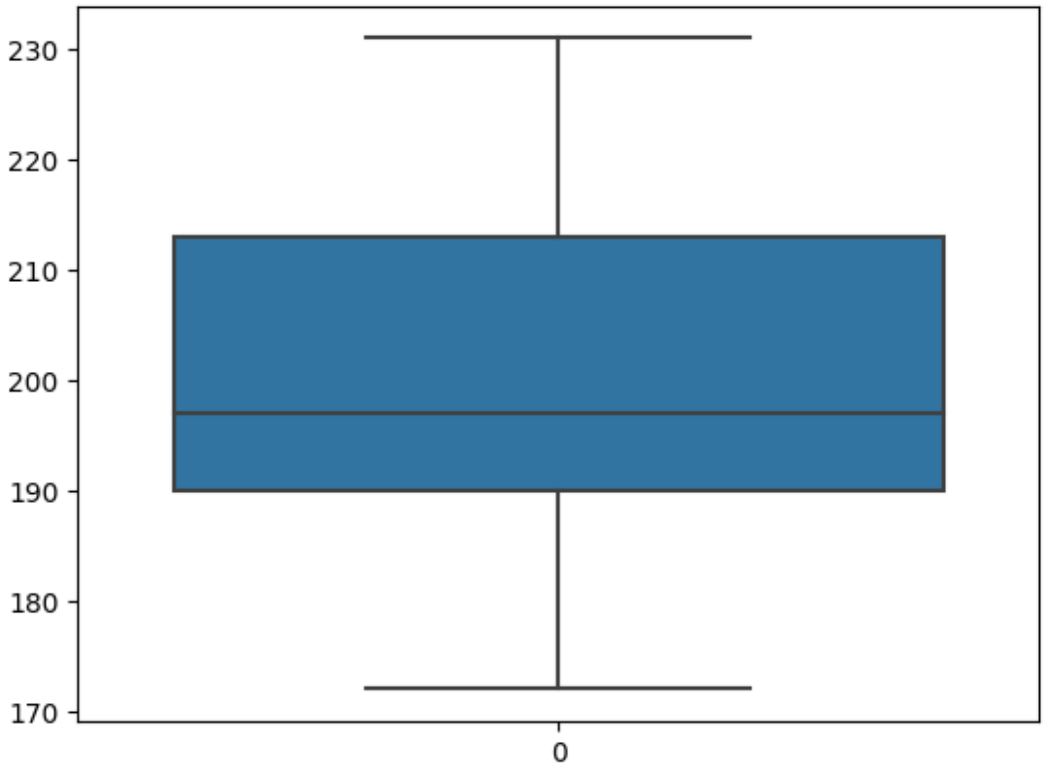

```
sb.boxplot(df['culmen_depth_mm'])
```

```
<Axes: >
```




```
sb.boxplot(df['flipper_length_mm'])
```

```
<Axes: >
```



Correlation of independent variables with target

```
df_main.corr()
```

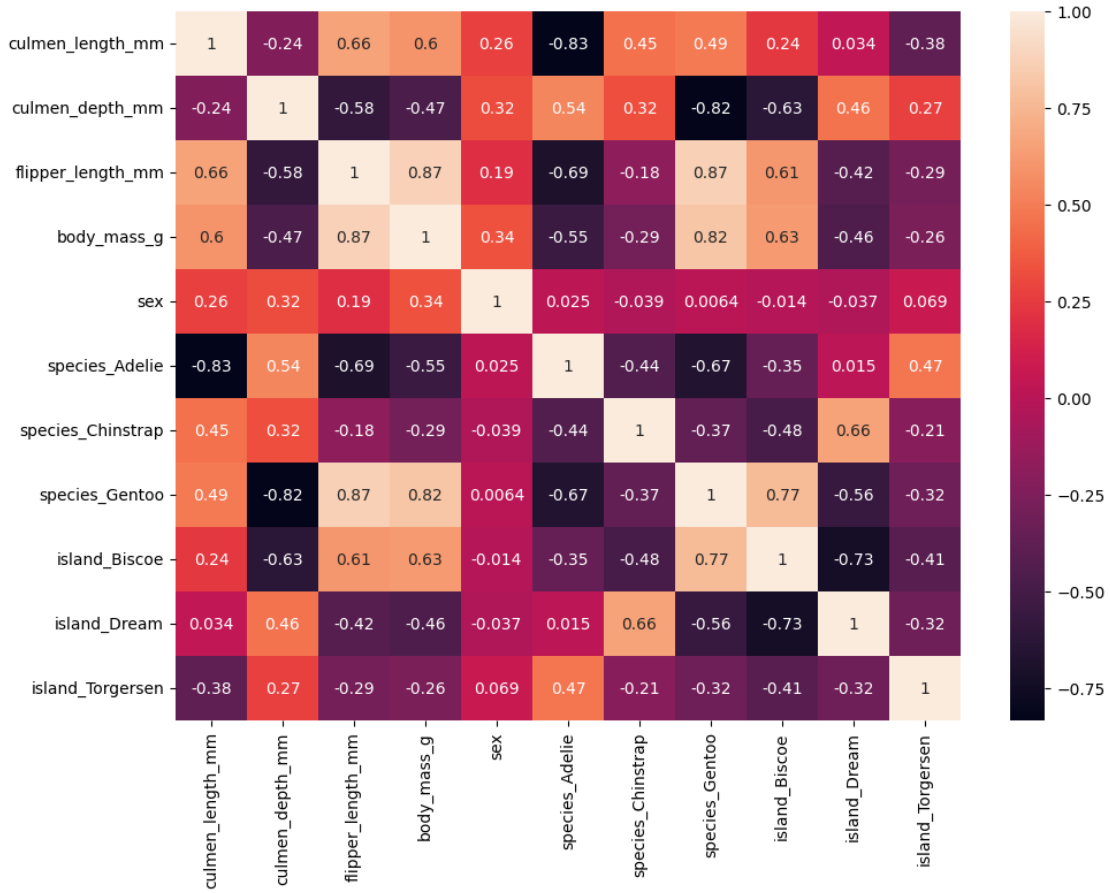
```
                   culmen_length_mm  culmen_depth_mm  flipper_length_mm  \
culmen_length_mm           1.000000        -0.235053           0.656181
culmen_depth_mm           -0.235053         1.000000          -0.583851
flipper_length_mm          0.656181        -0.583851           1.000000
body_mass_g                0.595110        -0.471916           0.871202
sex                        0.264024         0.316379           0.193476
species_Adelie            -0.834277         0.537305          -0.692055
species_Chinstrap          0.448530         0.320468          -0.180520
species_Gentoo             0.490869        -0.821550           0.865530
island_Biscoe              0.238622        -0.630442           0.609855
island_Dream               0.033950         0.455604          -0.420557
island_Torgersen          -0.378494         0.269073          -0.287321

                   body_mass_g       sex  species_Adelie  species_Chinstrap
\
culmen_length_mm      0.595110  0.264024       -0.834277           0.448530
culmen_depth_mm      -0.471916  0.316379        0.537305           0.320468
flipper_length_mm     0.871202  0.193476       -0.692055          -0.180520
body_mass_g           1.000000  0.340402       -0.554721          -0.291351
sex                   0.340402  1.000000        0.024857          -0.038745
species_Adelie       -0.554721  0.024857        1.000000          -0.441643
species_Chinstrap    -0.291351 -0.038745       -0.441643           1.000000
```

```
species_Gentoo        0.815411  0.006427       -0.667991          -0.372649
island_Biscoe         0.625523 -0.013800       -0.354038          -0.484951
island_Dream         -0.459651 -0.036926        0.014743           0.661151
island_Torgersen     -0.256785  0.068753        0.474285          -0.209464
```

```
                   species_Gentoo  island_Biscoe  island_Dream  \
culmen_length_mm         0.490869       0.238622      0.033950
culmen_depth_mm         -0.821550      -0.630442      0.455604
flipper_length_mm        0.865530       0.609855     -0.420557
body_mass_g              0.815411       0.625523     -0.459651
sex                      0.006427      -0.013800     -0.036926
species_Adelie          -0.667991      -0.354038      0.014743
species_Chinstrap       -0.372649      -0.484951      0.661151
species_Gentoo           1.000000       0.768424     -0.563636
island_Biscoe            0.768424       1.000000     -0.733496
island_Dream            -0.563636      -0.733496      1.000000
island_Torgersen        -0.316818      -0.412295     -0.316818

                   island_Torgersen
culmen_length_mm          -0.378494
culmen_depth_mm            0.269073
flipper_length_mm         -0.287321
body_mass_g               -0.256785
sex                        0.068753
species_Adelie             0.474285
species_Chinstrap         -0.209464
species_Gentoo            -0.316818
island_Biscoe             -0.412295
island_Dream              -0.316818
island_Torgersen           1.000000
```

```
plt.figure(figsize=(11,8))
sb.heatmap(df_main.corr(),annot =True)
```

```
<Axes: >
```



Getting the Dependent and Independent Variables

```
df_main.head()
```

```
   culmen_length_mm  culmen_depth_mm  flipper_length_mm  body_mass_g  sex  \
0          39.10000         18.70000         181.000000  3750.000000    2
1          39.50000         17.40000         186.000000  3800.000000    1
2          40.30000         18.00000         195.000000  3250.000000    1
3          43.92193         17.15117         200.915205  4201.754386    3
4          36.70000         19.30000         193.000000  3450.000000    1

   species_Adelie  species_Chinstrap  species_Gentoo  island_Biscoe  \
0               1                  0               0              0
1               1                  0               0              0
2               1                  0               0              0
3               1                  0               0              0
4               1                  0               0              0

   island_Dream  island_Torgersen
0             0                 1
1             0                 1
2             0                 1
```

```
3             0                1
4             0                1
```

```
y  = df_main['body_mass_g']
y
```

```
0      3750.000000
1      3800.000000
2      3250.000000
3      4201.754386
4      3450.000000
          ...
339    4201.754386
340    4850.000000
341    5750.000000
342    5200.000000
343    5400.000000
Name: body_mass_g, Length: 344, dtype: float64
```

```
x=df_main.drop(columns  = ['body_mass_g'] , axis=1)
x
```

```
     culmen_length_mm  culmen_depth_mm  flipper_length_mm  sex  \
0             39.10000         18.70000         181.000000    2
1             39.50000         17.40000         186.000000    1
2             40.30000         18.00000         195.000000    1
3             43.92193         17.15117         200.915205    3
4             36.70000         19.30000         193.000000    1
..                 ...              ...                ...  ...
339           43.92193         17.15117         200.915205    3
340           46.80000         14.30000         215.000000    1
341           50.40000         15.70000         222.000000    2
342           45.20000         14.80000         212.000000    1
343           49.90000         16.10000         213.000000    2

     species_Adelie  species_Chinstrap  species_Gentoo  island_Biscoe  \
0                 1                  0               0              0
1                 1                  0               0              0
2                 1                  0               0              0
3                 1                  0               0              0
4                 1                  0               0              0
..              ...                ...             ...            ...
339               0                  0               1              1
340               0                  0               1              1
341               0                  0               1              1
342               0                  0               1              1
343               0                  0               1              1

     island_Dream  island_Torgersen
0               0                 1
1               0                 1
```

```
2               0                 1
3               0                 1
4               0                 1
..            ...               ...
339             0                 0
340             0                 0
341             0                 0
342             0                 0
343             0                 0

[344 rows x 10 columns]
```

Scaling the Data

```
from sklearn.preprocessing import MinMaxScaler
scale =MinMaxScaler()
X_scaled= pd.DataFrame(scale.fit_transform(x),columns =x.columns)
X_scaled.head()
```

```
   culmen_length_mm  culmen_depth_mm  flipper_length_mm       sex  \
0          0.254545         0.666667           0.152542  0.666667
1          0.269091         0.511905           0.237288  0.333333
2          0.298182         0.583333           0.389831  0.333333
3          0.429888         0.482282           0.490088  1.000000
4          0.167273         0.738095           0.355932  0.333333

   species_Adelie  species_Chinstrap  species_Gentoo  island_Biscoe  \
0             1.0                0.0             0.0            0.0
1             1.0                0.0             0.0            0.0
2             1.0                0.0             0.0            0.0
3             1.0                0.0             0.0            0.0
4             1.0                0.0             0.0            0.0

   island_Dream  island_Torgersen
0           0.0               1.0
1           0.0               1.0
2           0.0               1.0
3           0.0               1.0
4           0.0               1.0
```

Split the Given data to Training as well as Testing data

```
from sklearn.model_selection import train_test_split
X_train,X_test,y_train,y_test =
train_test_split(X_scaled,y,test_size=0.3,random_state=42)
```

Printing Testing as well as Training data shapes

```
X_train.shape
```

```
(240, 10)
```

```
X_train.head()
```

```
     culmen_length_mm  culmen_depth_mm  flipper_length_mm       sex  \
31           0.185455         0.595238           0.101695  0.666667
245          0.509091         0.238095           0.728814  0.666667
277          0.487273         0.226190           0.813559  0.666667
165          0.723636         0.595238           0.491525  0.666667
250          0.552727         0.261905           0.847458  0.666667

     species_Adelie  species_Chinstrap  species_Gentoo  island_Biscoe  \
31              1.0                0.0             0.0            0.0
245             0.0                0.0             1.0            1.0
277             0.0                0.0             1.0            1.0
165             0.0                1.0             0.0            0.0
250             0.0                0.0             1.0            1.0

     island_Dream  island_Torgersen
31            1.0               0.0
245           0.0               0.0
277           0.0               0.0
165           1.0               0.0
250           0.0               0.0
```

```
y_train.shape
```

```
(240,)
```

```
y_train.head()
```

```
31     3900.0
245    5100.0
277    5000.0
165    4050.0
250    5250.0
Name: body_mass_g, dtype: float64
```

```
X_test.shape
```

```
(104, 10)
```

```
X_test.head()
```

```
     culmen_length_mm  culmen_depth_mm  flipper_length_mm       sex  \
194          0.683636         0.714286           0.406780  0.666667
157          0.476364         0.559524           0.440678  0.333333
225          0.523636         0.047619           0.644068  0.333333
208          0.476364         0.416667           0.322034  0.333333
318          0.592727         0.154762           0.525424  0.333333

     species_Adelie  species_Chinstrap  species_Gentoo  island_Biscoe  \
194             0.0                1.0             0.0            0.0
157             0.0                1.0             0.0            0.0
```

```
225             0.0                0.0             1.0             1.0
208             0.0                1.0             0.0             0.0
318             0.0                0.0             1.0             1.0

     island_Dream  island_Torgersen
194           1.0               0.0
157           1.0               0.0
225           0.0               0.0
208           1.0               0.0
318           0.0               0.0
```

```
y_test.shape
```

```
(104,)
```

```
y_test.head()
```

```
194    3550.0
157    3950.0
225    4550.0
208    3250.0
318    4625.0
Name: body_mass_g, dtype: float64
```