# Assignment 6

In [1]:
```
import pandas as pd
import numpy as np
```

In [2]:
```
df=pd.read_csv("iris.csv")
df
```

Out[2]:

| | sepallength | sepalwidth | petallength | petalwidth | class |
|---|---|---|---|---|---|
| **0** | 5.1 | 3.5 | 1.4 | 0.2 | Iris-setosa |
| **1** | 4.9 | 3.0 | 1.4 | 0.2 | Iris-setosa |
| **2** | 4.7 | 3.2 | 1.3 | 0.2 | Iris-setosa |
| **3** | 4.6 | 3.1 | 1.5 | 0.2 | Iris-setosa |
| **4** | 5.0 | 3.6 | 1.4 | 0.2 | Iris-setosa |
| **...** | ... | ... | ... | ... | ... |
| **145** | 6.7 | 3.0 | 5.2 | 2.3 | Iris-virginica |
| **146** | 6.3 | 2.5 | 5.0 | 1.9 | Iris-virginica |
| **147** | 6.5 | 3.0 | 5.2 | 2.0 | Iris-virginica |
| **148** | 6.2 | 3.4 | 5.4 | 2.3 | Iris-virginica |
| **149** | 5.9 | 3.0 | 5.1 | 1.8 | Iris-virginica |

150 rows × 5 columns

In [3]:
```
df.dtypes
```

Out[3]:
```
sepallength    float64
sepalwidth     float64
petallength    float64
petalwidth     float64
class           object
dtype: object
```

In [4]:
```
df['class']=df['class'].astype('category')
df.dtypes
```

Out[4]:
```
sepallength     float64
sepalwidth      float64
petallength     float64
petalwidth      float64
class          category
dtype: object
```

In [5]:
```
df['class']=df['class'].cat.codes
df
```

Out[5]:

| | sepallength | sepalwidth | petallength | petalwidth | class |
|---|---|---|---|---|---|
| **0** | 5.1 | 3.5 | 1.4 | 0.2 | 0 |
| **1** | 4.9 | 3.0 | 1.4 | 0.2 | 0 |
| **2** | 4.7 | 3.2 | 1.3 | 0.2 | 0 |
| **3** | 4.6 | 3.1 | 1.5 | 0.2 | 0 |
| **4** | 5.0 | 3.6 | 1.4 | 0.2 | 0 |
| **...** | ... | ... | ... | ... | ... |
| **145** | 6.7 | 3.0 | 5.2 | 2.3 | 2 |
| **146** | 6.3 | 2.5 | 5.0 | 1.9 | 2 |
| **147** | 6.5 | 3.0 | 5.2 | 2.0 | 2 |
| **148** | 6.2 | 3.4 | 5.4 | 2.3 | 2 |
| **149** | 5.9 | 3.0 | 5.1 | 1.8 | 2 |

150 rows × 5 columns

In [6]:
```
df.isnull().sum()
```

Out[6]:
```
sepallength    0
sepalwidth     0
petallength    0
petalwidth     0
class          0
dtype: int64
```

In [7]:
```
(df <= 0).sum()
```

Out[7]:
```
sepallength     0
sepalwidth      0
petallength     0
petalwidth      0
class          50
dtype: int64
```

In [8]:
```
print(df.shape)
```

```
(150, 5)
```

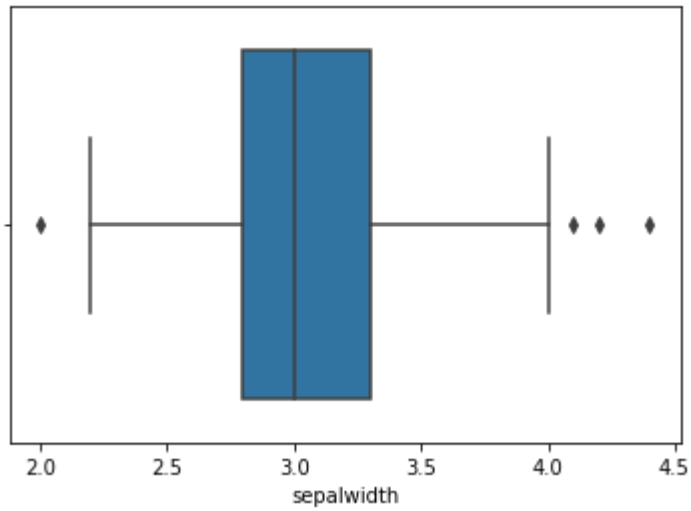
In [9]:
```
# co-relation matrix
def DetectOutlier(df,var):
  Q1 = df[var].quantile(0.25)
  Q3 = df[var].quantile(0.75)
  IQR = Q3 - Q1
  high, low = Q3+1.5*IQR, Q1-1.5*IQR

  print("Highest allowed in variable:", var, high)
  print("lowest allowed in variable:", var, low)

  count = df[(df[var] > high) | (df[var] < low)][var].count()

  print('Total outliers in:',var,':',count)



DetectOutlier(df,'sepallength')

DetectOutlier(df,'sepalwidth')

DetectOutlier(df,'petallength')

DetectOutlier(df,'petalwidth')
```

```
Highest allowed in variable: sepallength 8.350000000000001
lowest allowed in variable: sepallength 3.1499999999999986
Total outliers in: sepallength : 0
Highest allowed in variable: sepalwidth 4.05
lowest allowed in variable: sepalwidth 2.05
Total outliers in: sepalwidth : 4
Highest allowed in variable: petallength 10.349999999999998
lowest allowed in variable: petallength -3.649999999999999
Total outliers in: petallength : 0
Highest allowed in variable: petalwidth 4.05
lowest allowed in variable: petalwidth -1.95
Total outliers in: petalwidth : 0
```

In [10]:
```
import seaborn as sns
sns.boxplot(df['sepalwidth'])
```

```
C:\Users\DELL\AppData\Local\Programs\Python\Python39\lib\site-packages\seaborn
\_decorators.py:36: FutureWarning: Pass the following variable as a keyword ar
g: x. 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(
```

Out[10]:
```
<AxesSubplot:xlabel='sepalwidth'>
```



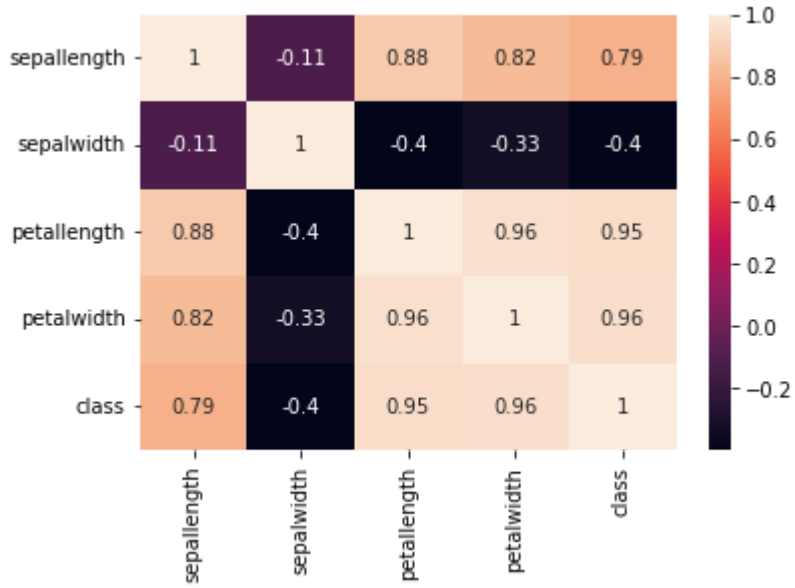

In [11]:
```
def OutlierRemoval(df,var):
  Q1 = df[var].quantile(0.25)
  Q3 = df[var].quantile(0.75)
  IQR = Q3 - Q1
  high, low = Q3+1.5*IQR, Q1-1.5*IQR

  print("Highest allowed in variable:", var, high)
  print("lowest allowed in variable:", var, low)

  count = df[(df[var] > high) | (df[var] < low)][var].count()


  print('Total outliers in:',var,':',count)

  df = df[((df[var] >= low) & (df[var] <= high))]
  return df
```

In [12]:
```
print(df.shape)
df = OutlierRemoval(df,'sepalwidth')
print(df.shape)
```

```
(150, 5)
Highest allowed in variable: sepalwidth 4.05
lowest allowed in variable: sepalwidth 2.05
Total outliers in: sepalwidth : 4
(146, 5)
```

In [13]:
```
import seaborn as sns
sns.heatmap(df.corr(),annot=True)
```

Out[13]: <AxesSubplot:>




In [14]:
```
import numpy as np
import matplotlib.pyplot as plt
import pandas as pd
import seaborn as sns
```

In [15]:
```
# split the data into inputs and outputs
X = df.iloc[:, [0,2,3]].values
y = df.iloc[:, 4].values
```

In [16]:
```
# training and testing data
from sklearn.model_selection import train_test_split

# assign test data size 25%
X_train, X_test, y_train, y_test =train_test_split(X,y,test_size= 0.25, random_st
```

In [17]:
```
# importing standard scaler
from sklearn.preprocessing import StandardScaler

# scalling the input data
sc_X = StandardScaler()
X_train = sc_X.fit_transform(X_train)
X_test = sc_X.fit_transform(X_test)
```

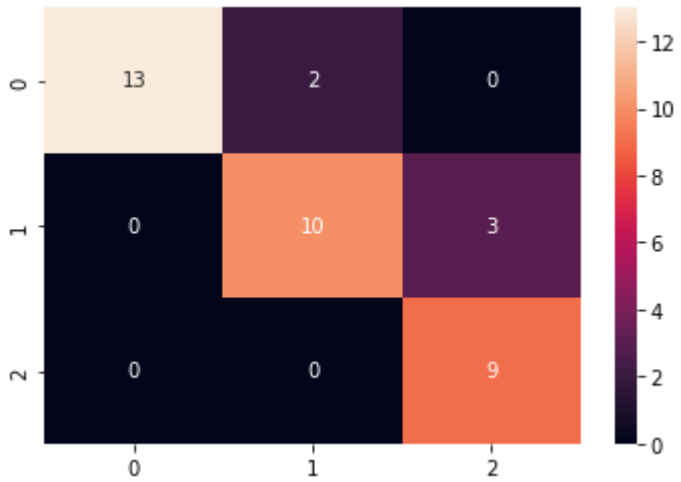
In [18]:
```
# importing standard scaler
from sklearn.preprocessing import StandardScaler

# scalling the input data
sc_X = StandardScaler()
X_train = sc_X.fit_transform(X_train)
X_test = sc_X.fit_transform(X_test)
```

In [19]:
```
# import Gaussian Naive Bayes classifier
from sklearn.naive_bayes import GaussianNB

# create a Gaussian Classifier
classifer1 = GaussianNB()

# training the model
classifer1.fit(X_train, y_train)

# testing the model
y_pred1 = classifer1.predict(X_test)
```

In [20]:
```
# importing accuracy score
from sklearn.metrics import accuracy_score

# printing the accuracy of the model
print(accuracy_score(y_test,y_pred1))
```

```
0.8648648648648649
```

In [21]:
```
# importing the required modules
import seaborn as sns
from sklearn.metrics import confusion_matrix

# passing actual and predicted values
cm = confusion_matrix(y_test, y_pred1)

# true write data values in each cell of the matrix
sns.heatmap(cm, annot=True)
plt.savefig('confusion.png')
```



In [22]:
```
# importing classification report
from sklearn.metrics import classification_report

# printing the report
print(classification_report(y_test, y_pred1))
```

```
              precision    recall  f1-score   support

           0       1.00      0.87      0.93        15
           1       0.83      0.77      0.80        13
           2       0.75      1.00      0.86         9

    accuracy                           0.86        37
   macro avg       0.86      0.88      0.86        37
weighted avg       0.88      0.86      0.87        37
```