In [ ]:
```
from sklearn.datasets import load_iris
from sklearn.model_selection import train_test_split
from sklearn.metrics import confusion_matrix
from sklearn.naive_bayes import MultinomialNB,GaussianNB
from sklearn.metrics import accuracy_score
import seaborn as sb
import pandas as pd
```

In [ ]:
```
data = pd.read_csv("Iris.csv")
```

In [ ]:
```
data.describe()
```

Out[ ]:

	Id	SepalLengthCm	SepalWidthCm	PetalLengthCm	PetalWidthCm
count	150.000000	150.000000	150.000000	150.000000	150.000000
mean	75.500000	5.843333	3.054000	3.758667	1.198667
std	43.445368	0.828066	0.433594	1.764420	0.763161
min	1.000000	4.300000	2.000000	1.000000	0.100000
25%	38.250000	5.100000	2.800000	1.600000	0.300000
50%	75.500000	5.800000	3.000000	4.350000	1.300000
75%	112.750000	6.400000	3.300000	5.100000	1.800000
max	150.000000	7.900000	4.400000	6.900000	2.500000

In [ ]:
```
data.head()
```

Out[ ]:

	Id	SepalLengthCm	SepalWidthCm	PetalLengthCm	PetalWidthCm	Species
0	1	5.1	3.5	1.4	0.2	Iris-setosa
1	2	4.9	3.0	1.4	0.2	Iris-setosa
2	3	4.7	3.2	1.3	0.2	Iris-setosa
3	4	4.6	3.1	1.5	0.2	Iris-setosa
4	5	5.0	3.6	1.4	0.2	Iris-setosa

In [ ]:
```
data.isnull().sum()
```

Out[ ]:
```
Id               0
SepalLengthCm    0
SepalWidthCm     0
PetalLengthCm    0
PetalWidthCm     0
Species          0
dtype: int64
```

In [ ]:
```
data.dtypes
```

Out[ ]:
```
Id                int64
SepalLengthCm    float64
SepalWidthCm     float64
PetalLengthCm    float64
PetalWidthCm     float64
Species           object
dtype: object
```

In [ ]:
```
# X, y = load_iris(return_X_y=True)
X = data.drop(columns=["Species"])
y = data["Species"]
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.3, ra
# X_train, X_test, y_train, y_test = train_test_split(data, test_size=0.3,
nb_classifier = GaussianNB()
# nb_classifier = MultinomialNB()
y_pred = nb_classifier.fit(X_train, y_train).predict(X_test)
print("Number of mislabeled points out of a total %d points : %d" % (X_test
```

```
Number of mislabeled points out of a total 45 points : 0
```

In [ ]:
```
nb_classifier.score(X_test,y_test)
```

Out[ ]:
```
1.0
```

In [ ]:
```
accuracy_score(y_test, y_pred)
```

Out[ ]:
```
1.0
```

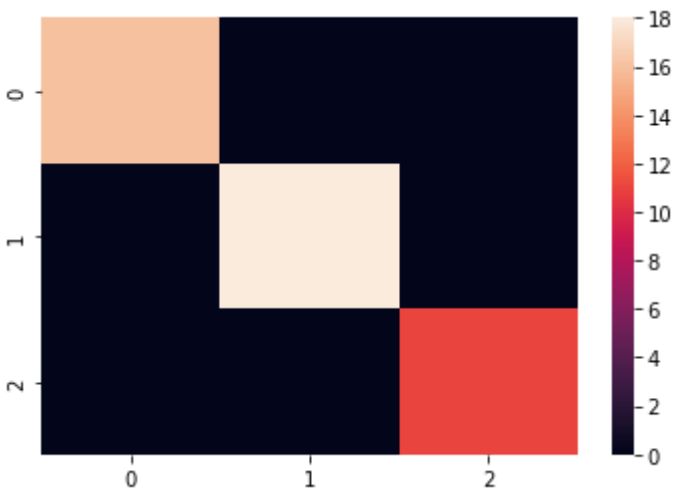
In [ ]:
```
nb_classifier.score(X_train,y_train)
```

Out[ ]:
```
0.9904761904761905
```

In [ ]:
```
cm = confusion_matrix(y_test,y_pred)
```

In [ ]:
```
sb.heatmap(cm)
```

Out[ ]:
```
<AxesSubplot:>
```



In [ ]:
```
tp_setosa = cm[0][0]
tp_verginica = cm[1][1]
```

```
tp_versicolor = cm[2][2]

tp = tp_setosa+tp_verginica+tp_versicolor
```

In [ ]:

```
tn_setosa = cm[1][1]+cm[1][2]+cm[2][1]+cm[2][2]
tn_verginica = cm[0][0]+cm[0][2]+cm[2][0]+cm[2][2]
tn_versicolor = cm[0][0]+cm[0][1]+cm[1][0]+cm[1][1]

tn = tn_setosa+tn_verginica+tn_versicolor
```

In [ ]:

```
fp_setosa = cm[1][0]+cm[2][0]
fp_verginica = cm[0][1]+cm[2][1]
fp_versicolor = cm[0][2]+cm[1][2]

fp = fp_setosa+fp_verginica+fp_versicolor
```

In [ ]:

```
fn_setosa = cm[0][1]+cm[0][2]
fn_verginica = cm[1][0]+cm[1][2]
fn_versicolor = cm[2][0]+cm[2][1]

fn = fn_setosa+fn_verginica+fn_versicolor
```

In [ ]:

```
print("TP : ",tp)
print("TN : ",tn)
print("FP : ",fp)
print("FN : ",fn)

print("Precision  : ",tp/(tp+fp)*100,"%")
print("Recall     : ",tp/(tp+fn)*100,"%")
print("Error Rate : ",(fn+fp)/(fn+fp+tn+tp)*100,"%")
print("Accuracy   : ",(tp+tn)/(tp+tn+fp+fn)*100,"%")
```

```
TP :  45
TN :  90
FP :  0
FN :  0
Precision  :  100.0 %
Recall     :  100.0 %
Error Rate :  0.0 %
Accuracy   :  100.0 %
```