```
import numpy as np
import pandas as pd
from sklearn.model_selection import train_test_split
from sklearn.naive_bayes import GaussianNB
from sklearn.metrics import *
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.metrics import confusion_matrix, ConfusionMatrixDisplay, classification_report
from sklearn.preprocessing import LabelEncoder
from matplotlib.colors import ListedColormap
```

```
df = pd.read_csv("https://raw.githubusercontent.com/YBIFoundation/Dataset/main/IRIS.csv")
df.head(5)
```

	sepal_length	sepal_width	petal_length	petal_width	species
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

```
df.describe(include='all')
```

	sepal_length	sepal_width	petal_length	petal_width	species
count	150.000000	150.000000	150.000000	150.000000	150
unique	NaN	NaN	NaN	NaN	3
top	NaN	NaN	NaN	NaN	Iris-setosa
freq	NaN	NaN	NaN	NaN	50
mean	5.843333	3.054000	3.758667	1.198667	NaN
std	0.828066	0.433594	1.764420	0.763161	NaN
min	4.300000	2.000000	1.000000	0.100000	NaN
25%	5.100000	2.800000	1.600000	0.300000	NaN
50%	5.800000	3.000000	4.350000	1.300000	NaN
75%	6.400000	3.300000	5.100000	1.800000	NaN
max	7.900000	4.400000	6.900000	2.500000	NaN

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 150 entries, 0 to 149
Data columns (total 5 columns):
 #   Column        Non-Null Count  Dtype  
---  ------        --------------  -----  
 0   sepal_length  150 non-null    float64
 1   sepal_width   150 non-null    float64
 2   petal_length  150 non-null    float64
 3   petal_width   150 non-null    float64
 4   species       150 non-null    object 
dtypes: float64(4), object(1)
memory usage: 6.0+ KB
```

```
print(df.shape)
df['species'].unique()
```

```
(150, 5)
array(['Iris-setosa', 'Iris-versicolor', 'Iris-virginica'], dtype=object)
```

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

```
sepal_length    0
sepal_width     0
petal_length    0
```

```
    petal_width     0
    species         0
    dtype: int64
```

```
x = df.iloc[:, 0:4]
y = df.iloc[:, 4:]
```

```
encode = LabelEncoder()
y = encode.fit_transform(y)
```

```
    /usr/local/lib/python3.10/dist-packages/sklearn/preprocessing/_label.py:116: DataConversionWarning: A column-vector y was passed when a
      y = column_or_1d(y, warn=True)
```

```
x_train, x_test, y_train, y_test = train_test_split(x, y, test_size=0.3, random_state=42)
```

```
naive_bayes = GaussianNB()
naive_bayes.fit(x_train, y_train)
y_pred = naive_bayes.predict(x_test)
y_pred
```

```
    array([1, 0, 2, 1, 1, 0, 1, 2, 1, 1, 2, 0, 0, 0, 0, 2, 2, 1, 1, 2, 0, 2,
           0, 2, 2, 2, 2, 2, 0, 0, 0, 0, 1, 0, 0, 2, 1, 0, 0, 0, 2, 1, 1, 0,
           0])
```

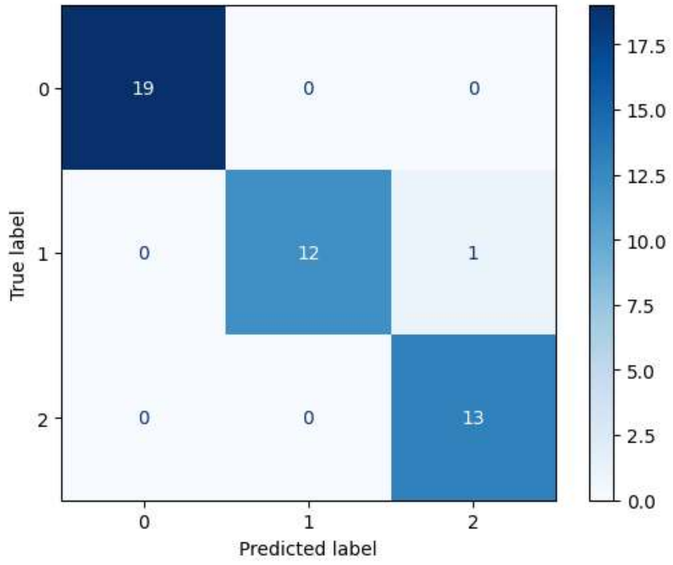
```
accuracy = accuracy_score(y_test,y_pred)
precision =precision_score(y_test, y_pred,average='micro')
recall = recall_score(y_test, y_pred,average='micro')
```

```
matrix = confusion_matrix(y_test, y_pred, labels = naive_bayes.classes_)
print(matrix)

tp, fn, fp, tn = confusion_matrix(y_test, y_pred, labels=[1, 0]).reshape(-1)
```

```
    [[19  0  0]
     [ 0 12  1]
     [ 0  0 13]]
```

```
cm = ConfusionMatrixDisplay(confusion_matrix=matrix, display_labels=naive_bayes.classes_)
cm.plot(cmap=plt.cm.Blues)
plt.show()
```



```
print(classification_report(y_test, y_pred))
```

```
                  precision    recall  f1-score   support

               0       1.00      1.00      1.00        19
               1       1.00      0.92      0.96        13
               2       0.93      1.00      0.96        13
```

```
    accuracy                           0.98        45
   macro avg       0.98      0.97      0.97        45
weighted avg       0.98      0.98      0.98        45
```

```
print("Accuracy: ", accuracy_score(y_test, y_pred))
print("Error Rate: ", (fp+fn)/(tp+tn+fp+fn))
print("Recall: ", tp/(tp+fn))
print("Specifity: ", tn/(fp+tn))
print("Prediction: ", tp/(tp+fp))
print("False Positive Rate: ", fp/(tn+fp))
```

```
Accuracy:  0.9777777777777777
Error Rate:  0.0
Recall:  1.0
Specifity:  1.0
Prediction:  1.0
False Positive Rate:  0.0
```