Import libraries

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.datasets import load_iris
from sklearn.preprocessing import StandardScaler
from sklearn.model_selection import train_test_split
from sklearn.naive_bayes import GaussianNB
from mlxtend.plotting import plot_confusion_matrix
from sklearn.metrics import confusion_matrix, accuracy_score,
classification_report, precision_score, recall_score, f1_score
import warnings
warnings.filterwarnings("ignore")
%matplotlib inline
```

Load data

```
iris = load_iris()
iris.keys()
```

```
dict_keys(['data', 'target', 'frame', 'target_names', 'DESCR',
'feature_names', 'filename', 'data_module'])
```

```
x = pd.DataFrame(iris['data'], columns=iris['feature_names'])
y = pd.DataFrame(iris['target'], columns=['target'])
```

```
x.head()
```

```
   sepal length (cm)  sepal width (cm)  petal length (cm)  petal width
(cm)
0                5.1               3.5                1.4
0.2
1                4.9               3.0                1.4
0.2
2                4.7               3.2                1.3
0.2
3                4.6               3.1                1.5
0.2
4                5.0               3.6                1.4
0.2
```

Basic stats

```
x.shape, y.shape
```

```
((150, 4), (150, 1))
```

```
x.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 150 entries, 0 to 149
Data columns (total 4 columns):
 #   Column             Non-Null Count  Dtype  
---  ------             --------------  -----  
 0   sepal length (cm)  150 non-null    float64
 1   sepal width (cm)   150 non-null    float64
 2   petal length (cm)  150 non-null    float64
 3   petal width (cm)   150 non-null    float64
dtypes: float64(4)
memory usage: 4.8 KB
```

```
y.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 150 entries, 0 to 149
Data columns (total 1 columns):
 #   Column  Non-Null Count  Dtype
---  ------  --------------  -----
 0   target  150 non-null    int32
dtypes: int32(1)
memory usage: 728.0 bytes
```

```
x.describe()
```

```
       sepal length (cm)  sepal width (cm)  petal length (cm)  petal 
width (cm)
count         150.000000        150.000000         150.000000        
150.000000
mean            5.843333          3.057333           3.758000        
1.199333
std             0.828066          0.435866           1.765298        
0.762238
min             4.300000          2.000000           1.000000        
0.100000
25%             5.100000          2.800000           1.600000        
0.300000
50%             5.800000          3.000000           4.350000        
1.300000
75%             6.400000          3.300000           5.100000        
1.800000
max             7.900000          4.400000           6.900000        
2.500000
```

Data preparation

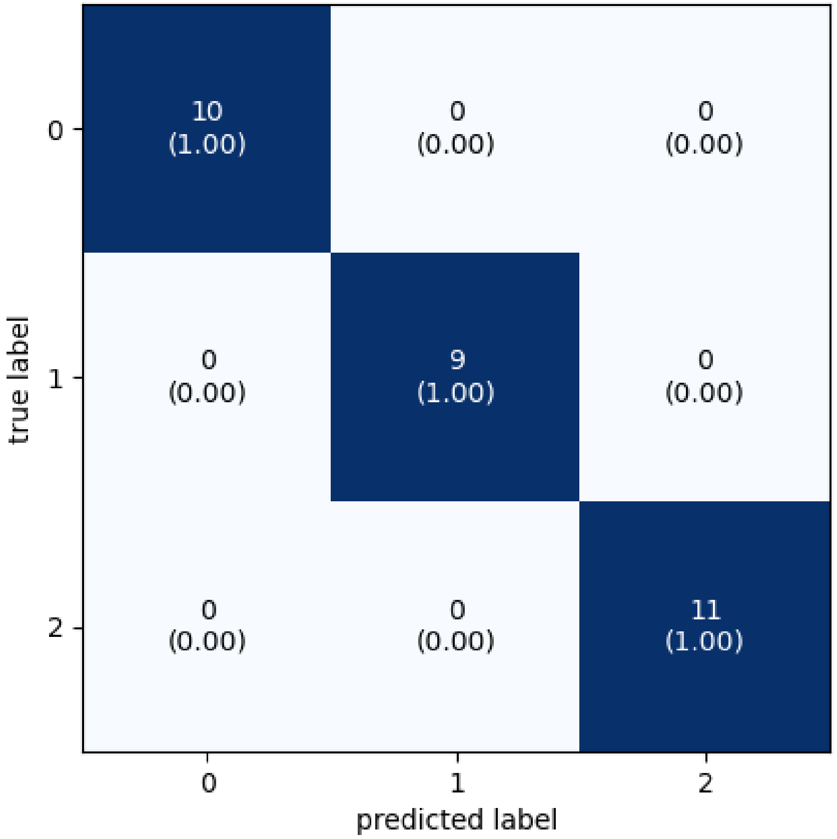
```
scaler = StandardScaler()
x = scaler.fit_transform(x.values)

x_train, x_test, y_train, y_test = train_test_split(x, y.values,
test_size=0.2, random_state=42)

x_train.shape, x_test.shape, y_train.shape, y_test.shape

((120, 4), (30, 4), (120, 1), (30, 1))
```

Model building

```
model = GaussianNB()

model.fit(x_train, y_train)

GaussianNB()

y_pred = model.predict(x_test)
```

Evalutation

```
cm = confusion_matrix(y_test, y_pred)
print(cm)

[[10  0  0]
 [ 0  9  0]
 [ 0  0 11]]

plot_confusion_matrix(conf_mat=cm, figsize=(5,5), show_normed=True)
plt.show()
```



```
print(f"TP value is {cm[0,0]}")
print(f"TN value is {cm[1,1] + cm[2,2]}")
print(f"FP value is {cm[0,1] + cm[0,2]}")
print(f"FN value is {cm[1,0] + cm[2,0]}")
```

```
TP value is 10
TN value is 20
FP value is 0
FN value is 0
```

```
print(f"Accuracy score is {accuracy_score(y_test, y_pred)}")
```

```
Accuracy score is 1.0
```

```
print(f"Error rate is {1 - accuracy_score(y_test, y_pred)}")
```

```
Error rate is 0.0
```

```
print(f"Precision score is {precision_score(y_test, y_pred,
average='macro')}")
```

```
Precision score is 1.0
```

```
print(f"Recall score is {recall_score(y_test, y_pred,
average='macro')}")
```

```
Recall score is 1.0
```

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

```
              precision    recall  f1-score   support

           0       1.00      1.00      1.00        10
           1       1.00      1.00      1.00         9
           2       1.00      1.00      1.00        11

    accuracy                           1.00        30
   macro avg       1.00      1.00      1.00        30
weighted avg       1.00      1.00      1.00        30
```