```
Assignment No:6
Aim:
1. Concepts used in Naïve Bayes classifier
2. Naive Bayes Example
3. Confusion Matrix Evaluation Metrics

import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
from sklearn.naive_bayes import GaussianNB
from sklearn.metrics import precision_score, recall_score,
accuracy_score, confusion_matrix

url =
"https://archive.ics.uci.edu/ml/machine-learning-databases/iris/iris.d
ata"

columns = ['sepal_length', 'sepal_width', 'petal_length',
'petal_width', 'species']

df = pd.read_csv(url, header=None, names=columns)

df.head()
```

	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['species'] = df['species'].astype('category').cat.codes

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

```
sepal_length    0
sepal_width     0
petal_length    0
petal_width     0
species         0
dtype: int64
```

```
X = df.drop('species', axis=1)
y = df['species']

X_train, X_test, y_train, y_test = train_test_split(X, y,
test_size=0.3, random_state=42)
```

```
scaler = StandardScaler()
X_train = scaler.fit_transform(X_train)
X_test = scaler.transform(X_test)

gaussian = GaussianNB()
gaussian.fit(X_train, y_train)
```

```
GaussianNB()
```

```
y_pred = gaussian.predict(X_test)

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')

print(f"Accuracy: {accuracy}")
print(f"Precision: {precision}")
print(f"Recall: {recall}")
```

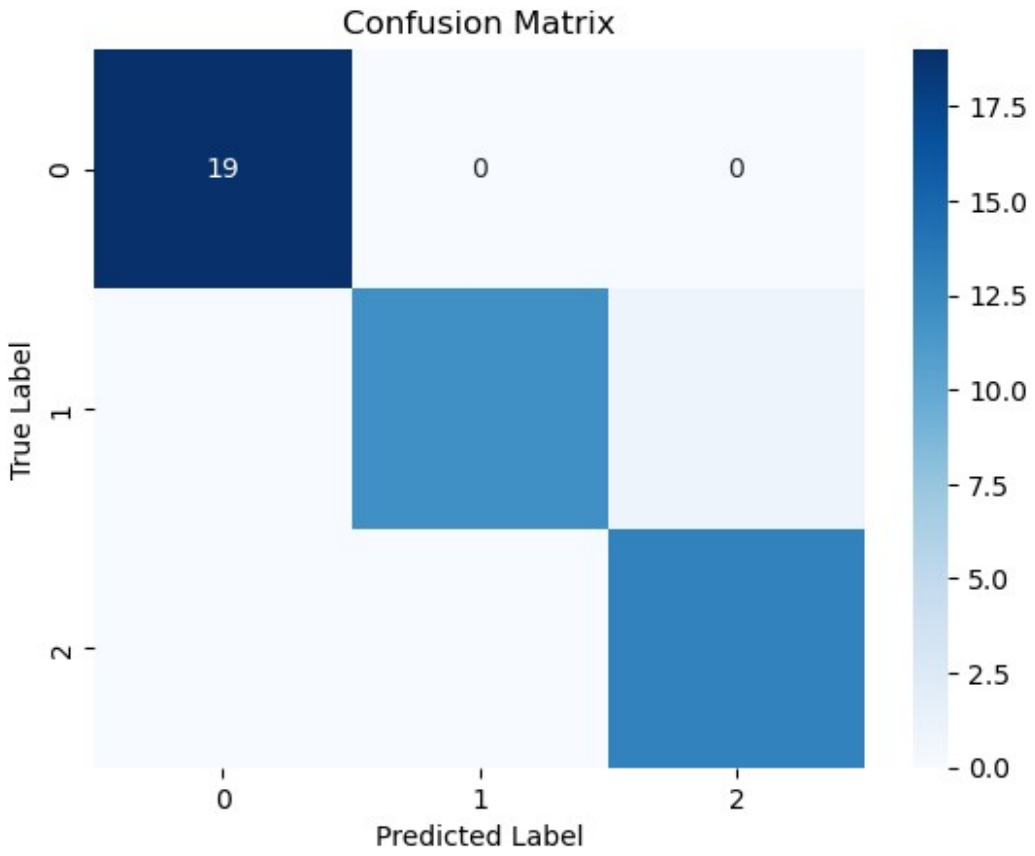
```
Accuracy: 0.9777777777777777
Precision: 0.9777777777777777
Recall: 0.9777777777777777
```

```
cm = confusion_matrix(y_test, y_pred)

print("Confusion Matrix:")
print(cm)
```

```
Confusion Matrix:
[[19  0  0]
 [ 0 12  1]
 [ 0  0 13]]
```

```
import seaborn as sns
sns.heatmap(cm, annot=True, fmt="d", cmap="Blues",
xticklabels=np.unique(y), yticklabels=np.unique(y))
plt.title('Confusion Matrix')
plt.ylabel('True Label')
plt.xlabel('Predicted Label')
plt.show()
```

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