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Assignment No. 6
Contents for Theory:
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.naive_bayes import GaussianNB
from sklearn.metrics import accuracy_score, precision_score,
recall_score, confusion_matrix

url = 'C:/Users/Ashwini/Desktop/Iris.csv'
df = pd.read_csv(url)

print("First 5 rows of the dataset:")
print(df.head())

First 5 rows of the dataset:
   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

print("\n Checking for null values:")
print(df.isnull().sum())


 Checking for null values:
Id               0
SepalLengthCm    0
SepalWidthCm     0
PetalLengthCm    0
PetalWidthCm     0
Species          0
dtype: int64

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

X = df.drop(columns=['Species'])
Y = df['Species']
```

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X_train, X_test, y_train, y_test = train_test_split(X, Y,
test_size=0.2, random_state=42)
gaussian = GaussianNB()
gaussian.fit(X_train, y_train)
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')
cm = confusion_matrix(y_test, y_pred)

print("\n Model Performance:")
print(f" Accuracy: {accuracy:.4f}")
print(f" Precision: {precision:.4f}")
print(f" Recall: {recall:.4f}")
```

```
 Model Performance:
 Accuracy: 1.0000
 Precision: 1.0000
 Recall: 1.0000
```

```python
print("\n Confusion Matrix:")
print(cm)
```

```
 Confusion Matrix:
[[10  0  0]
 [ 0  9  0]
 [ 0  0 11]]
```

```python
import seaborn as sns

plt.figure(figsize=(6, 5))
sns.heatmap(cm, annot=True, fmt="d", cmap="Blues",
xticklabels=np.unique(df['Species']),
yticklabels=np.unique(df['Species']))
plt.xlabel("Predicted")
plt.ylabel("Actual")
plt.title("Confusion Matrix Heatmap")
plt.show()
```
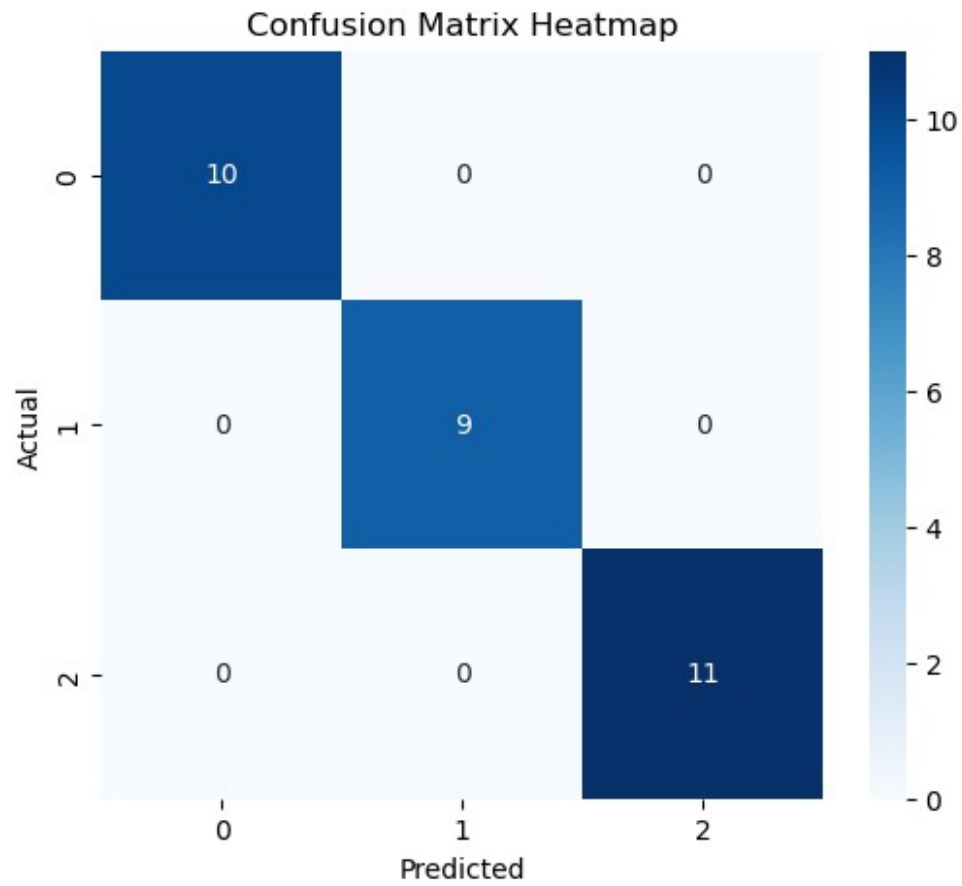
Confusion Matrix Heatmap

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