Machine learning LAB-09

Perumalla Dharan
AP21110010201

1. Implement Naïve Bayes classifier for following datasets and evaluate the classification performance. Draw the confusion matrix, compute accuracy, error and other measures as applicable.
    a. The enjoy sports dataset as. given below

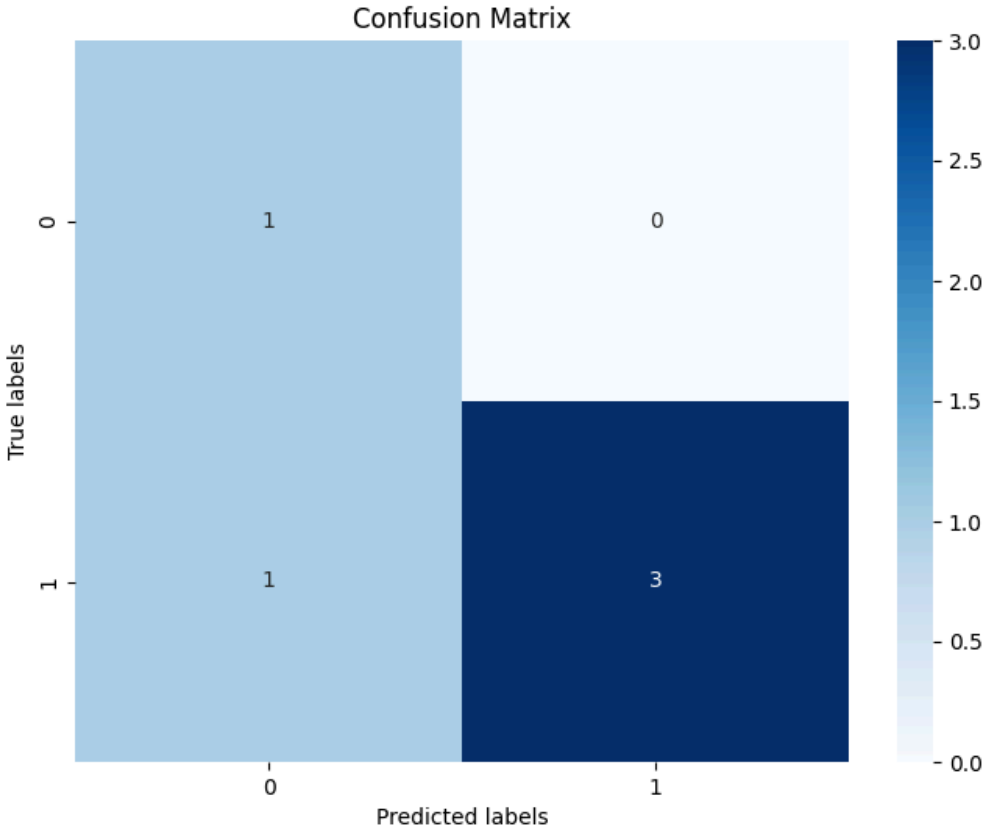
Day	Outlook	Temp.	Humidity	Wind	Decision
1	Sunny	Hot	High	Weak	No
2	Sunny	Hot	High	Strong	No
3	Overcast	Hot	High	Weak	Yes
4	Rain	Mild	High	Weak	Yes
5	Rain	Cool	Normal	Weak	Yes
6	Rain	Cool	Normal	Strong	No
7	Overcast	Cool	Normal	Strong	Yes
8	Sunny	Mild	High	Weak	No
9	Sunny	Cool	Normal	Weak	Yes
10	Rain	Mild	Normal	Weak	Yes
11	Sunny	Mild	Normal	Strong	Yes
12	Overcast	Mild	High	Strong	Yes
13	Overcast	Hot	Normal	Weak	Yes
14	Rain	Mild	High	Strong	No

```
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import LabelEncoder
from sklearn.naive_bayes import GaussianNB
from sklearn.metrics import confusion_matrix, accuracy_score

# Define the dataset
data = {
    'Outlook': ['Sunny', 'Sunny', 'Overcast', 'Rain', 'Rain',
'Rain', 'Overcast', 'Sunny', 'Sunny', 'Rain', 'Sunny',
'Overcast', 'Overcast', 'Rain'],
    'Temp': ['Hot', 'Hot', 'Hot', 'Mild', 'Cool', 'Cool',
'Cool', 'Mild', 'Cool', 'Mild', 'Mild', 'Mild', 'Hot', 'Mild'],
```

```
    'Humidity': ['High', 'High', 'High', 'High', 'Normal',
'Normal', 'Normal', 'High', 'Normal', 'Normal', 'Normal',
'High', 'Normal', 'High'],
    'Wind': ['Weak', 'Strong', 'Weak', 'Weak', 'Weak', 'Strong',
'Strong', 'Weak', 'Weak', 'Weak', 'Strong', 'Strong', 'Weak',
'Strong'],
    'Decision': ['No', 'No', 'Yes', 'Yes', 'Yes', 'No', 'Yes',
'No', 'Yes', 'Yes', 'Yes', 'Yes', 'Yes', 'No']
}

# Convert categorical variables into numerical ones
le = LabelEncoder()
data_encoded = {col: le.fit_transform(data[col]) for col in
data}

# Split the dataset into training and testing sets
X = list(zip(data_encoded['Outlook'], data_encoded['Temp'],
data_encoded['Humidity'], data_encoded['Wind']))
y = data_encoded['Decision']
X_train, X_test, y_train, y_test = train_test_split(X, y,
test_size=0.3, random_state=1)

# Implement the Naive Bayes classifier
model = GaussianNB()

# Train the classifier with the training set
model.fit(X_train, y_train)

# Predict the test set results
y_pred = model.predict(X_test)

# Evaluate the model
print("Confusion Matrix:\n", confusion_matrix(y_test, y_pred))
print("Accuracy: ", accuracy_score(y_test, y_pred))
```

```
# Plot the confusion matrix
import matplotlib.pyplot as plt
import seaborn as sns
plt.figure(figsize=(8, 6))
sns.heatmap(confusion_matrix(y_test, y_pred), annot=True,
cmap='Blues', fmt='g')
plt.xlabel('Predicted labels')
plt.ylabel('True labels')
plt.title('Confusion Matrix')
plt.show()

# Classification Report
from sklearn.metrics import classification_report
print("\nClassification Report:")
print(classification_report(y_test, y_pred))
```

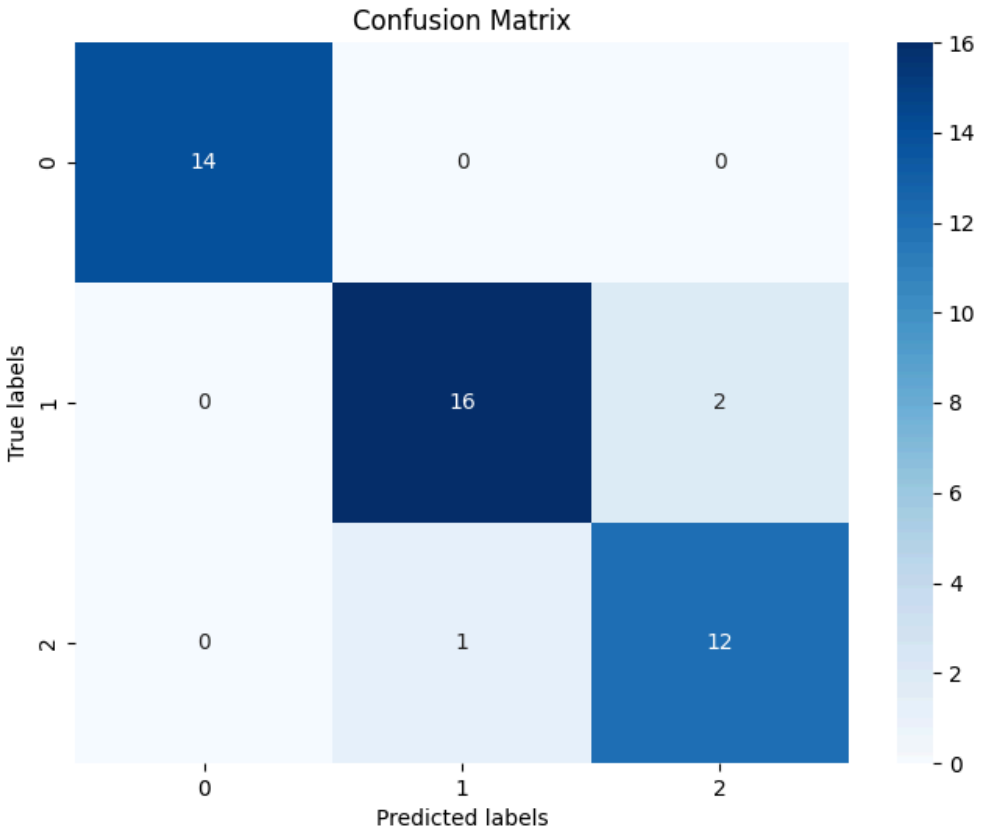
```
Confusion Matrix:
 [[1 0]
 [1 3]]
Accuracy:  0.8

Classification Report:
              precision    recall  f1-score   support

           0       0.50      1.00      0.67         1
           1       1.00      0.75      0.86         4

    accuracy                           0.80         5
   macro avg       0.75      0.88      0.76         5
weighted avg       0.90      0.80      0.82         5

PS E:\SRM\Machine_Learning>
```



b. The Iris dataset

```
# b. The Iris dataset

from sklearn.datasets import load_iris
from sklearn.model_selection import train_test_split
from sklearn.naive_bayes import GaussianNB
from sklearn.metrics import confusion_matrix, accuracy_score
import matplotlib.pyplot as plt
import seaborn as sns

# Load the Iris dataset
iris = load_iris()
X = iris.data
y = iris.target

# Split the dataset into training and testing sets
X_train, X_test, y_train, y_test = train_test_split(X, y,
test_size=0.3, random_state=1)

# Implement the Naive Bayes classifier
model = GaussianNB()

# Train the classifier with the training set
model.fit(X_train, y_train)

# Predict the test set results
y_pred = model.predict(X_test)

# Calculate the accuracy of the model
accuracy = accuracy_score(y_test, y_pred)
print("Accuracy:", accuracy)
```

```
# Calculate the confusion matrix
conf_matrix = confusion_matrix(y_test, y_pred)
print("\nConfusion Matrix:")
print(conf_matrix)

# Plot the confusion matrix
plt.figure(figsize=(8, 6))
sns.heatmap(conf_matrix, annot=True, cmap='Blues', fmt='g')
plt.xlabel('Predicted labels')
plt.ylabel('True labels')
plt.title('Confusion Matrix')
plt.show()

# Classification Report
from sklearn.metrics import classification_report
print("\nClassification Report:")
print(classification_report(y_test, y_pred))
```


Confusion Matrix
14
0
0
0
16
2
0
1
12
True labels
Predicted labels
0
1
2
16
14
12
10
8
6
4
2
0

```
Confusion Matrix:
[[14  0  0]
 [ 0 16  2]
 [ 0  1 12]]

Classification Report:
              precision    recall  f1-score   support

           0       1.00      1.00      1.00        14
           1       0.94      0.89      0.91        18
           2       0.86      0.92      0.89        13

    accuracy                           0.93        45
   macro avg       0.93      0.94      0.93        45
weighted avg       0.94      0.93      0.93        45

PS E:\SRM\Machine_Learning>
```