In [1]:

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import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.decomposition import PCA
from sklearn.preprocessing import StandardScaler, LabelEncoder
from sklearn.model_selection import train_test_split
from sklearn.neighbors import KNeighborsClassifier
from sklearn.metrics import accuracy_score, classification_report, confusion_matrix

df = pd.read_csv('iris.csv')

X = df.iloc[:, :-1].values
y = df.iloc[:, -1].values

label_encoder = LabelEncoder()
y = label_encoder.fit_transform(y)

scaler = StandardScaler()
X_scaled = scaler.fit_transform(X)

pca = PCA(n_components=2)
X_pca = pca.fit_transform(X_scaled)

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

knn = KNeighborsClassifier(n_neighbors=3)
knn.fit(X_train, y_train)
y_pred = knn.predict(X_test)

accuracy = accuracy_score(y_test, y_pred)
print(f"Accuracy: {accuracy:.4f}")
print("\nClassification Report:")
print(classification_report(y_test, y_pred, target_names=label_encoder.classes_))
print("Confusion Matrix:")
print(confusion_matrix(y_test, y_pred))

plt.figure(figsize=(8,6))
plt.scatter(X_pca[y == 0, 0], X_pca[y == 0, 1], label=label_encoder.classes_[0], alpha=0.6)
plt.scatter(X_pca[y == 1, 0], X_pca[y == 1, 1], label=label_encoder.classes_[1], alpha=0.6)
plt.scatter(X_pca[y == 2, 0], X_pca[y == 2, 1], label=label_encoder.classes_[2], alpha=0.6)
plt.title('PCA (2D) + k-NN Classification')
plt.xlabel('Principal Component 1')
plt.ylabel('Principal Component 2')
plt.legend()
plt.grid(True)
plt.show()
```

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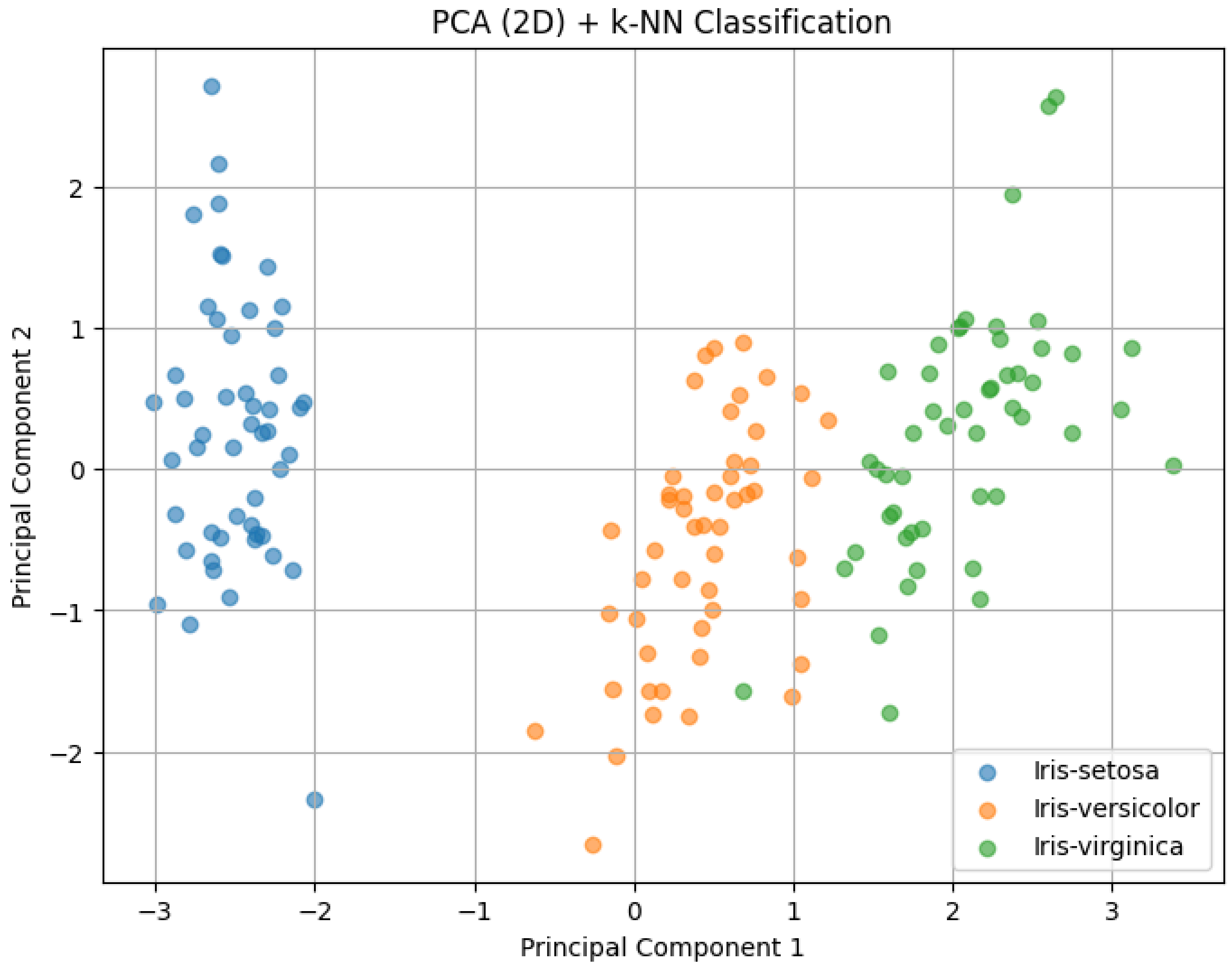
Accuracy: 0.9778

Classification Report:
                 precision    recall  f1-score   support

    Iris-setosa       1.00      1.00      1.00        19
Iris-versicolor       1.00      0.92      0.96        13
 Iris-virginica       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

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


PCA (2D) + k-NN Classification
Principal Component 1
Principal Component 2
−3
−2
−1
0
1
2
3
2
1
0
−1
−2
Iris-setosa
Iris-versicolor
Iris-virginica

```
In [ ]:
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