```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

from sklearn.datasets import load_iris
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
from sklearn.neighbors import KNeighborsClassifier
from sklearn.metrics import accuracy_score, confusion_matrix, classification_report
```

```
iris = load_iris()
X = iris.data
y = iris.target

df = pd.DataFrame(X, columns=iris.feature_names)
df['target'] = y

df.head()
```

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

Next steps: Generate code with df | New interactive sheet

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

```
X_train, X_test, y_train, y_test = train_test_split(
    X_scaled, y, test_size=0.2, random_state=42
)
```

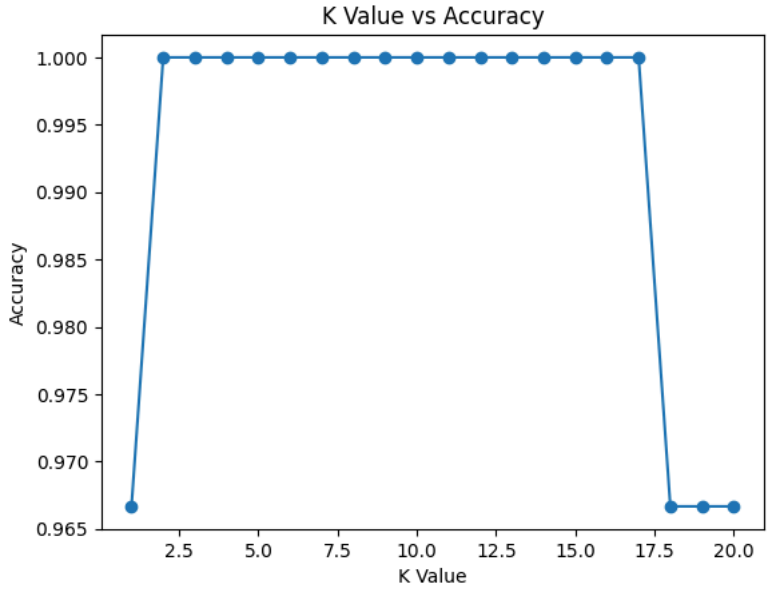
```
model = KNeighborsClassifier(n_neighbors=3)
model.fit(X_train, y_train)
y_pred = model.predict(X_test)
```

```
print("Accuracy:", accuracy_score(y_test, y_pred))
print("\nConfusion Matrix:\n", confusion_matrix(y_test, y_pred))
print("\nClassification Report:\n", classification_report(y_test, y_pred))
```

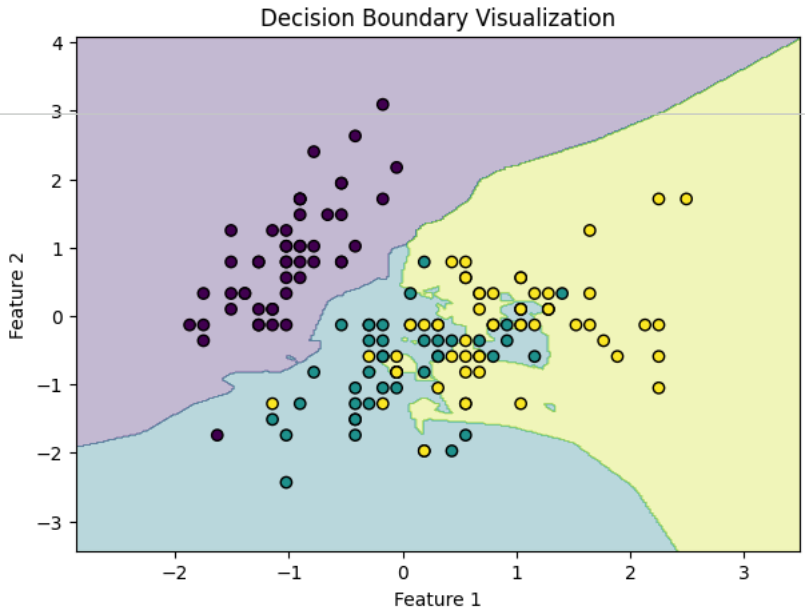
```
Accuracy: 1.0

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

Classification Report:
              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
```

```
scores = []
k_values = range(1, 21)

for k in k_values:
```

```
    knn = KNeighborsClassifier(n_neighbors=k)
    knn.fit(X_train, y_train)
    scores.append(knn.score(X_test, y_test))

plt.plot(k_values, scores, marker='o')
plt.xlabel("K Value")
plt.ylabel("Accuracy")
plt.title("K Value vs Accuracy")
plt.show()
```




```
X_vis = X_scaled[:, :2]  # use first 2 features

X_train2, X_test2, y_train2, y_test2 = train_test_split(X_vis, y, test_size=0.2, random_state=42)

knn_vis = KNeighborsClassifier(n_neighbors=5)
knn_vis.fit(X_train2, y_train2)

h = .02
x_min, x_max = X_vis[:, 0].min() - 1, X_vis[:, 0].max() + 1
y_min, y_max = X_vis[:, 1].min() - 1, X_vis[:, 1].max() + 1

xx, yy = np.meshgrid(np.arange(x_min, x_max, h),
                     np.arange(y_min, y_max, h))

Z = knn_vis.predict(np.c_[xx.ravel(), yy.ravel()])
Z = Z.reshape(xx.shape)

plt.figure(figsize=(7, 5))
plt.contourf(xx, yy, Z, alpha=0.3)
plt.scatter(X_vis[:, 0], X_vis[:, 1], c=y, edgecolors='k')
plt.title("Decision Boundary Visualization")
plt.xlabel("Feature 1")
plt.ylabel("Feature 2")
plt.show()
```


Decision Boundary Visualization
Feature 2
Feature 1
4
3
2
1
0
−1
−2
−3
−2
−1
0
1
2
3