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# Import libraries
import pandas as pd
from sklearn.datasets import load_breast_cancer
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
from sklearn.metrics import classification_report, accuracy_score
from sklearn.neighbors import KNeighborsClassifier
from sklearn.svm import SVC
from sklearn.tree import DecisionTreeClassifier

# Load dataset
data = load_breast_cancer()
X = data.data
y = data.target

# Preprocessing - Scaling
scaler = StandardScaler()
X = scaler.fit_transform(X)

# Train-test split
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)

# Initialize models
models = {
    "K-Nearest Neighbors": KNeighborsClassifier(n_neighbors=5),
    "SVM": SVC(kernel='linear'),
    "Decision Tree": DecisionTreeClassifier(random_state=42)
}

# Train, predict, and evaluate
results = {}
for name, model in models.items():
    model.fit(X_train, y_train)
    y_pred = model.predict(X_test)

    accuracy = accuracy_score(y_test, y_pred)
    report = classification_report(y_test, y_pred, target_names=data.target_names, output_dict=True)

    results[name] = {
        "Accuracy": accuracy,
        "Precision": report['weighted avg']['precision'],
        "Recall": report['weighted avg']['recall'],
        "F1-score": report['weighted avg']['f1-score']
    }

# Display results
df_results = pd.DataFrame(results).T
print("\nPerformance Comparison:")
print(df_results)

# Detailed classification reports
for name, model in models.items():
    y_pred = model.predict(X_test)
    print(f"\n{name} Classification Report:\n")
    print(classification_report(y_test, y_pred, target_names=data.target_names))

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Performance Comparison:

	Accuracy	Precision	Recall	F1-score
K-Nearest Neighbors	0.947368	0.947368	0.947368	0.947368
SVM	0.956140	0.956488	0.956140	0.956237
Decision Tree	0.947368	0.947368	0.947368	0.947368

K-Nearest Neighbors Classification Report:

	precision	recall	f1-score	support
malignant	0.93	0.93	0.93	43
benign	0.96	0.96	0.96	71
accuracy			0.95	114
macro avg	0.94	0.94	0.94	114
weighted avg	0.95	0.95	0.95	114

SVM Classification Report:

	precision	recall	f1-score	support
malignant	0.93	0.95	0.94	43
benign	0.97	0.96	0.96	71

accuracy			0.96	114
macro avg	0.95	0.96	0.95	114
weighted avg	0.96	0.96	0.96	114

Decision Tree Classification Report:

	precision	recall	f1-score	support
malignant	0.93	0.93	0.93	43
benign	0.96	0.96	0.96	71
accuracy			0.95	114
macro avg	0.94	0.94	0.94	114
weighted avg	0.95	0.95	0.95	114

