LAB NO:06

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# Step 1: Load the dataset
from sklearn.datasets import load_breast_cancer
import pandas as pd
import matplotlib.pyplot as plt


data = load_breast_cancer()
df = pd.DataFrame(data.data, columns=data.feature_names)
df['target'] = data.target

# Step 2: Data Preprocessing
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
from sklearn.impute import SimpleImputer

# Handle missing values (if any)
imputer = SimpleImputer(strategy='mean')
X = imputer.fit_transform(df.drop(columns='target'))
y = df['target']

# Standardize features
scaler = StandardScaler()
X = scaler.fit_transform(X)

# Step 3: Train/Test Split
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)

# Step 4: Grid Search for Hyperparameter Tuning (using SVM as example)
from sklearn.model_selection import GridSearchCV
from sklearn.svm import SVC
```

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param_grid = {
    'C': [0.1, 1, 10],
    'kernel': ['linear', 'rbf'],
    'gamma': ['scale', 'auto']
}

grid = GridSearchCV(SVC(), param_grid, refit=True, cv=5, scoring='accuracy')
grid.fit(X_train, y_train)

# Step 5: Predictions using best parameters
best_model = grid.best_estimator_
y_pred = best_model.predict(X_test)

# Step 6: Evaluate Performance
from sklearn.metrics import accuracy_score, precision_score, recall_score, f1_score, confusion_matrix, ConfusionMatrixDisplay

print("Best Parameters:", grid.best_params_)
print("Accuracy:", accuracy_score(y_test, y_pred))
print("Precision:", precision_score(y_test, y_pred))
print("Recall:", recall_score(y_test, y_pred))
print("F1 Score:", f1_score(y_test, y_pred))

# Step 7: Visualize Confusion Matrix
import matplotlib.pyplot as plt

cm = confusion_matrix(y_test, y_pred)
disp = ConfusionMatrixDisplay(confusion_matrix=cm, display_labels=data.target_names)
disp.plot(cmap='pink')
plt.title("Confusion Matrix")
plt.show()
```

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Best Parameters: {'C': 0.1, 'gamma': 'scale', 'kernel': 'linear'}
Accuracy: 0.9824561403508771
Precision: 0.9726027397260274
Recall: 1.0
F1 Score: 0.9861111111111112
```