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In [1]: import pandas as pd
import numpy as np
from sklearn.datasets import load_breast_cancer
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
from sklearn.linear_model import Perceptron
from sklearn.metrics import accuracy_score, confusion_matrix, roc_curve, auc, precision_recall_curve
import seaborn as sns
import matplotlib.pyplot as plt
data = load_breast_cancer()
X = pd.DataFrame(data.data, columns=data.feature_names)
y = pd.Series(data.target)
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
scaler = StandardScaler()
X_train = scaler.fit_transform(X_train)
X_test = scaler.transform(X_test)
perceptron = Perceptron(max_iter=1000, eta0=0.1, random_state=42)
perceptron.fit(X_train, y_train)
y_pred = perceptron.predict(X_test)
accuracy = accuracy_score(y_test, y_pred)
print(f'Accuracy: {accuracy:.4f}')
print(f'Final Weights: {perceptron.coef_}')
conf_matrix = confusion_matrix(y_test, y_pred)
plt.figure(figsize=(12, 4))
plt.subplot(1, 3, 1)
sns.heatmap(conf_matrix, annot=True, fmt='d', cmap='Blues',
            xticklabels=data.target_names,
            yticklabels=data.target_names)
plt.xlabel('Predicted')
plt.ylabel('True')
plt.title('Confusion Matrix')
fpr, tpr, _ = roc_curve(y_test, perceptron.decision_function(X_test))
roc_auc = auc(fpr, tpr)
plt.subplot(1, 3, 2)
plt.plot(fpr, tpr, color='darkorange', lw=2, label=f'ROC curve (AUC = {roc_auc:.2f})')
plt.plot([0, 1], [0, 1], color='navy', lw=2, linestyle='--')
plt.xlabel('False Positive Rate')
plt.ylabel('True Positive Rate')
plt.title('ROC Curve')
plt.legend(loc='lower right')
precision, recall, _ = precision_recall_curve(y_test, perceptron.decision_function(X_test))
plt.subplot(1, 3, 3)
plt.plot(recall, precision, color='green', lw=2)
plt.xlabel('Recall')
plt.ylabel('Precision')
plt.title('Precision-Recall Curve')
plt.tight_layout()
plt.show()

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Accuracy: 0.9737

Final Weights: [[-0.29708989 0.3979993 -0.22971536 -0.36722303 -0.29458505 0.60765684
-0.48742822 -0.87535615 0.57180141 0.38323832 -1.25108911 0.09947304
-0.20503338 -1.0116695 -1.12802674 0.30730166 0.40703831 -0.82537704
0.33157064 0.3003877 -0.73262937 -1.15607325 -0.37557777 -0.70380201
-0.20128268 -0.03769604 -0.78013419 -0.92248386 -1.58936503 0.14415303]]

