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# Logistic Regression Binary Classification using Scikit-learn

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 LogisticRegression
from sklearn.metrics import confusion_matrix, classification_report, roc_auc_score, roc_curve
import matplotlib.pyplot as plt
import pandas as pd
import numpy as np

# Load dataset
data = load_breast_cancer()
X = pd.DataFrame(data.data, columns=data.feature_names)
y = pd.Series(data.target)

# Split and standardize
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
scaler = StandardScaler()
X_train_scaled = scaler.fit_transform(X_train)
X_test_scaled = scaler.transform(X_test)

# Train logistic regression model
model = LogisticRegression()
model.fit(X_train_scaled, y_train)
y_pred = model.predict(X_test_scaled)
y_prob = model.predict_proba(X_test_scaled)[: , 1]

# Evaluation metrics
conf_matrix = confusion_matrix(y_test, y_pred)
class_report = classification_report(y_test, y_pred)
roc_auc = roc_auc_score(y_test, y_prob)
fpr, tpr, thresholds = roc_curve(y_test, y_prob)

# Plot ROC curve
plt.figure()
plt.plot(fpr, tpr, label=f"ROC curve (area = {roc_auc:.2f})")
plt.plot([0, 1], [0, 1], 'k--')
plt.xlabel('False Positive Rate')
plt.ylabel('True Positive Rate')
plt.title('Receiver Operating Characteristic')
plt.legend(loc='lower right')
plt.savefig("roc_curve.png")
plt.close()
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