import numpy as np

import matplotlib.pyplot as plt

from sklearn.datasets import load\_wine

from sklearn.cluster import KMeans

from sklearn.metrics import silhouette\_score

from sklearn.preprocessing import StandardScaler

data = load\_wine()

X, y = data.data, data.target

scaler = StandardScaler()

X\_scaled = scaler.fit\_transform(X)

k = 3

kmeans = KMeans(n\_clusters=k, random\_state=42)

kmeans.fit(X\_scaled)

labels = kmeans.labels\_

centers = kmeans.cluster\_centers\_

score = silhouette\_score(X\_scaled, labels)

print("轮廓系数:", score)

plt.scatter(X\_scaled[:, 0], X\_scaled[:, 1], c=labels, cmap='viridis', alpha=0.5)

plt.scatter(centers[:, 0], centers[:, 1], c='red', marker='X', s=200)

plt.xlabel("Feature 1 (标准化)")

plt.ylabel("Feature 2 (标准化)")

plt.title("K-Means聚类结果（K=3）")

plt.show()

original\_size = X.shape[0]

reduced\_size = k

reduction\_ratio = (1 - reduced\_size / original\_size) \* 100

print(f"原始数据量: {original\_size}, 归约后: {reduced\_size}, 归约率: {reduction\_ratio:.2f}%")