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import matplotlib.pyplot as plt
import numpy as np
from sklearn.datasets import load_iris
from sklearn.cluster import KMeans, AgglomerativeClustering
from sklearn.decomposition import PCA

iris = load_iris()
X = iris.data

# 1. K-Means (analiza skupień)
kmeans = KMeans(n_clusters=3, random_state=42)
kmeans_labels = kmeans.fit_predict(X)

# 2. Agglomerative Clustering
agglo = AgglomerativeClustering(n_clusters=3)
agglo_labels = agglo.fit_predict(X)

# 3. Porównanie AC and K-means
pca = PCA(n_components=2) # 2 wymiarowe dane
X_reduced = pca.fit_transform(X)

# KM
plt.figure(figsize=(12, 5))
plt.subplot(1, 2, 1)
plt.scatter(X_reduced[:, 0], X_reduced[:, 1], c=kmeans_labels,
            cmap='viridis', s=50)
plt.title('K-Means')
plt.xlabel('Komponent 1')
plt.ylabel('Komponent 2')

# AC
plt.subplot(1, 2, 2)
plt.scatter(X_reduced[:, 0], X_reduced[:, 1], c=agglo_labels,
            cmap='viridis', s=50)
plt.title('Agglomerative Clustering')
plt.xlabel('Komponent 1')
plt.ylabel('Komponent 2')

plt.tight_layout()
plt.show()

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