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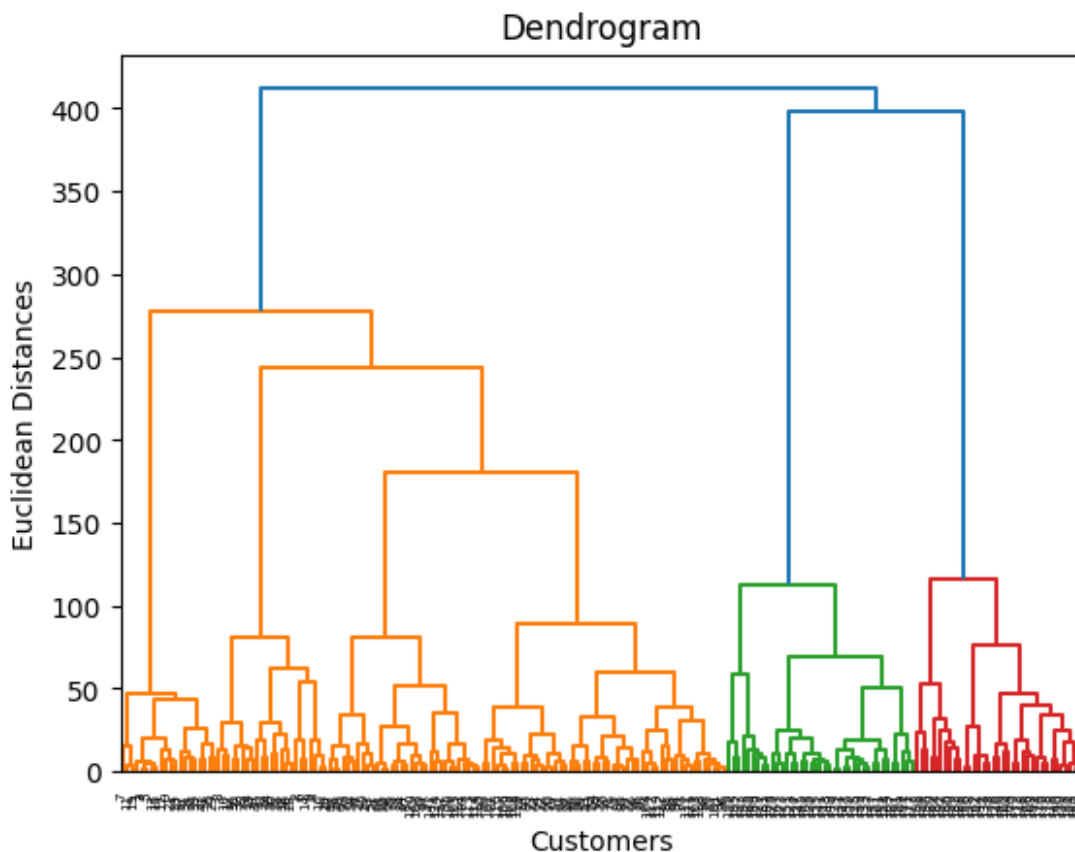
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from sklearn.cluster import AgglomerativeClustering
import scipy.cluster.hierarchy as sch

df = pd.read_csv('mall_customers.csv')

X = df[['Age', 'Annual Income (k$)', 'Spending Score (1-100)']].values

dendrogram = sch.dendrogram(sch.linkage(X, method='ward'))
plt.title('Dendrogram')
plt.xlabel('Customers')
plt.ylabel('Euclidean Distances')
plt.show()

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n_clusters = 5

hc = AgglomerativeClustering(n_clusters=n_clusters,
                              affinity='euclidean', linkage='ward')
cluster_labels = hc.fit_predict(X)

df['Cluster'] = cluster_labels

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for cluster in range(n_clusters):
    cluster_data = df[df['Cluster'] == cluster]
    plt.scatter(cluster_data['Annual Income (k$)'],
                cluster_data['Spending Score (1-100)'], label=f'Cluster {cluster}')

plt.xlabel('Annual Income (k$)')
plt.ylabel('Spending Score (1-100)')
plt.legend()
plt.show()

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