**AML Algorithm #10 : Agglomerative Hierarchical Clustering**

import pandas as pd

import numpy as np

import matplotlib.pyplot as plt

from sklearn.decomposition import PCA

from sklearn.cluster import AgglomerativeClustering

from sklearn.preprocessing import StandardScaler, normalize

from sklearn.metrics import silhouette\_score

import scipy.cluster.hierarchy as shc

X = pd.read\_csv('credit.csv')

X = X.drop('CUST\_ID', axis = 1)

X.fillna(method ='ffill', inplace = True)

scaler = StandardScaler()

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

X\_normalized = normalize(X\_scaled)

X\_normalized = pd.DataFrame(X\_normalized)

pca = PCA(n\_components = 2)

X\_principal = pca.fit\_transform(X\_normalized)

X\_principal = pd.DataFrame(X\_principal)

X\_principal.columns = ['P1', 'P2']

plt.figure(figsize =(8, 8))

plt.title('Visualising the data')

Dendrogram = shc.dendrogram((shc.linkage(X\_principal, method ='ward')))

ac2 = AgglomerativeClustering(n\_clusters = 3)

# Visualizing the clustering

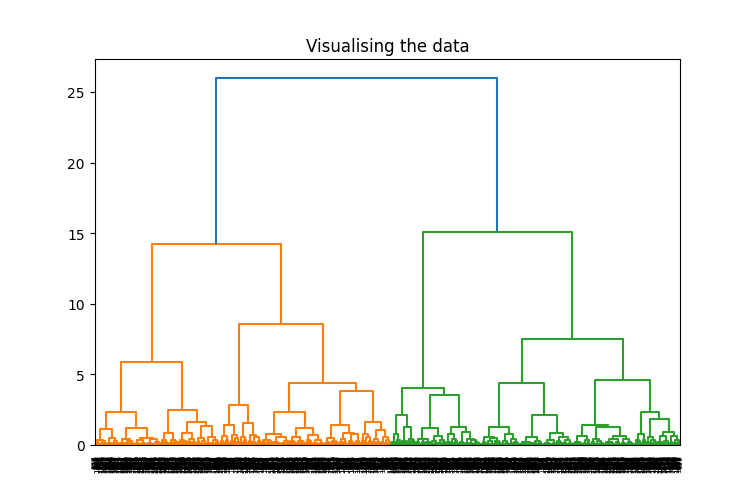
plt.figure(figsize =(6, 6))

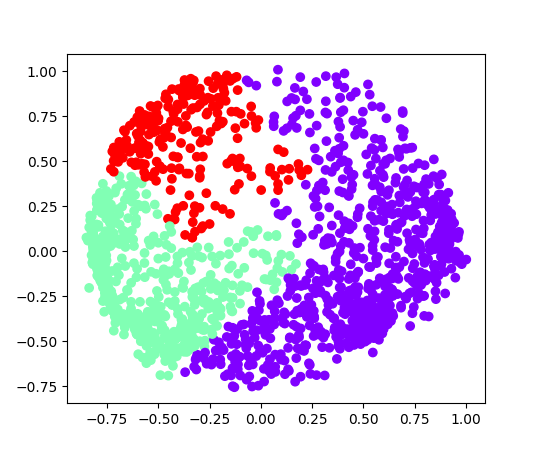
plt.scatter(X\_principal['P1'], X\_principal['P2'],

c = ac2.fit\_predict(X\_principal), cmap ='rainbow')

plt.show()

**Output :**

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