import numpy as np

import matplotlib.pyplot as plt

class ART1:

def \_\_init\_\_(self, input\_size, vigilance=0.75):

self.input\_size = input\_size

self.vigilance = vigilance

self.weights = []

def match(self, pattern, weight):

intersection = np.minimum(pattern, weight)

return np.sum(intersection) / np.sum(pattern) >= self.vigilance

def train(self, patterns):

labels = []

for pattern in patterns:

matched = False

for i, weight in enumerate(self.weights):

if self.match(pattern, weight):

self.weights[i] = np.minimum(pattern, weight)

labels.append(i)

matched = True

break

if not matched:

self.weights.append(pattern.copy())

labels.append(len(self.weights) - 1)

return labels

patterns = np.array([

[1, 1, 0, 0, 1, 0],

[1, 1, 0, 0, 1, 0],

[0, 0, 1, 1, 0, 1],

[1, 0, 1, 0, 1, 0],

])

art = ART1(input\_size=6, vigilance=0.8)

labels = art.train(patterns)

for i, pattern in enumerate(patterns):

print(f"Input {i+1}: {pattern} → Cluster: {labels[i]}")