**SOM CODE:**

import pandas as pd

from sklearn.preprocessing import MinMaxScaler

import numpy as np

import matplotlib.pyplot as plt

from minisom import MiniSom

file\_path = 'c:/Users/HP/Desktop/emc java/E-commerce Customer Behavior - Sheet1.csv'

data = pd.read\_csv(file\_path)

data\_numeric = data[['Age', 'Total Spend', 'Items Purchased', 'Average Rating', 'Days Since Last Purchase']]

scaler = MinMaxScaler()

data\_scaled = scaler.fit\_transform(data\_numeric)

som = MiniSom(x=10, y=10, input\_len=data\_scaled.shape[1], sigma=1.0, learning\_rate=0.5)

som.random\_weights\_init(data\_scaled)

som.train\_random(data\_scaled, num\_iteration=200)

win\_map = som.win\_map(data\_scaled)

frequencies = np.zeros((10, 10))

for x in range(10):

    for y in range(10):

        if (x, y) in win\_map:

            frequencies[x, y] = len(win\_map[(x, y)])

plt.figure(figsize=(10, 10))

plt.imshow(frequencies, cmap='Blues', interpolation='nearest')

plt.colorbar(label='Number of Customers')

for i, x in enumerate(data\_scaled):

    winner = som.winner(x)

    if frequencies[winner] > 5:

        plt.text(winner[0] + 0.5, winner[1] + 0.5, '◉', color='red', fontsize=12)

    else:

        plt.text(winner[0] + 0.5, winner[1] + 0.5, '◯', color='black', fontsize=8)

plt.title("SOM Clustering of E-commerce Customers")

plt.xlabel('SOM X Axis')

plt.ylabel('SOM Y Axis')

plt.grid(False)

plt.show()