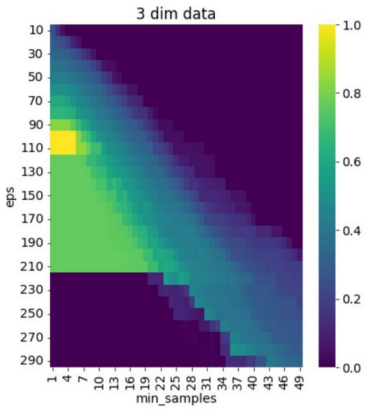
LCPB 23-24 Exercise 2, data visualization and clustering

Exercise 4A

Visualize and clusterize the data in the file **x_12d.dat** (N=600 samples, L=12 dimensions), which also has labels for checking the performances (y_12d.dat).

1. ***"eps" (ε) and "minPts" (m_P) in DBSCAN algorithm for clustering***
   Refine the grid with more values of ε and m_P and plot a heat-map showing the normalized mutual information (NMI) between true and predicted clusters, similar to the one on the right.

   Is the high NMI region showing a correlation between ε and m_P?

   Note: In the lesson we have looked at the typical distance between a point and its closest neighbor, but this does not say what the typical distance is from the 2^{nd}, 3^{rd}, …, m_P-neighbor.
   The plots of ranked distances to the i-th neighbor might also help choose the ε for a given i=m_P .

2. **Understanding the 12-dimensional data**
   Use the principal component analysis (PCA) to visualize the first components of the data. Does it help understand its structure?

3. **Compare different clustering methods**
   a) Perform a k-means clustering of the data, with k=3. Does it work better than DBSCAN? Why?
   b) Perform a hierarchical clustering of the data and plot the corresponding dendrogram. Does it work better than DBSCAN?

4. **OPTIONAL: Visualize the data** with other methods from the scikit package