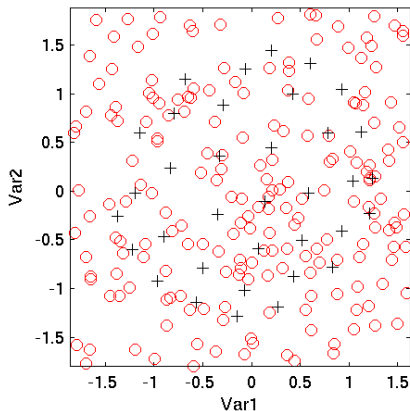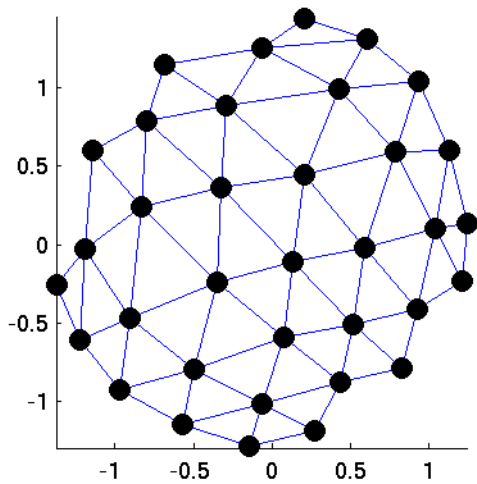# 1.   Visualization of Self-Organizing Map
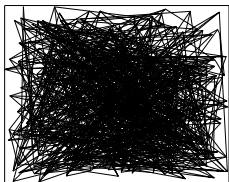
- 2D data, SOM is trained using samples $x = \begin{bmatrix} Var1 \\ Var2 \end{bmatrix}$

- Scatterplot of data
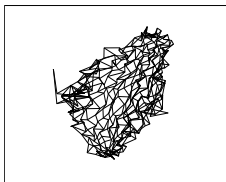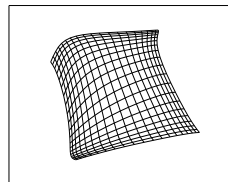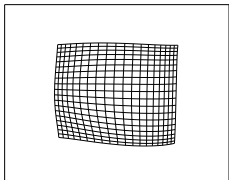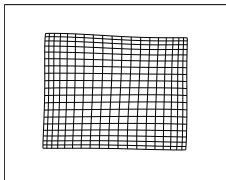
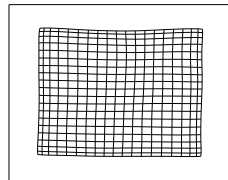- SOM grid
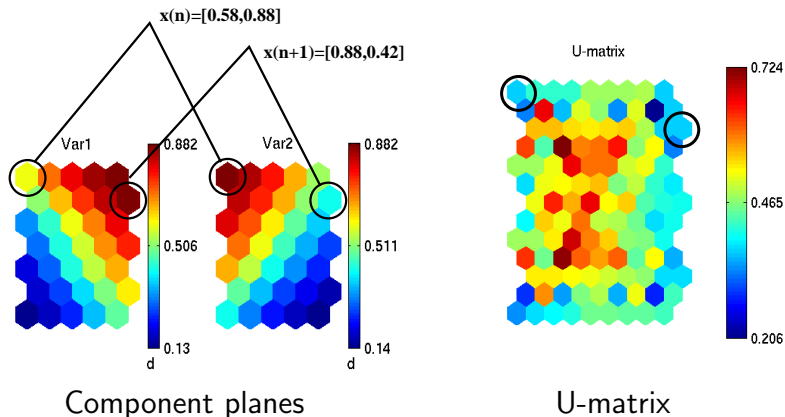
- Organization of SOM
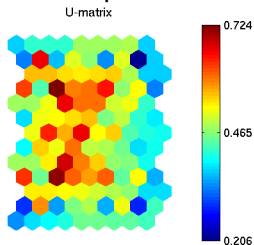

| 0 | 20 | 100 |
| 1000 | 5000 | 10000 |

- SOM component planes present parameter values of neurons in the grid

- U-matrix visualizes the distances between neuron prototype vectors
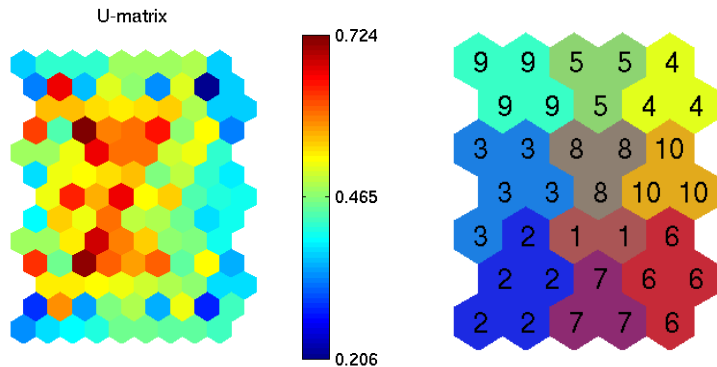

Component planes

U-matrix

1.1 U-matrix (Unified distance matrix)

– visualizes a trained map and the clusters of map

– distances between neurons are visualized using color scale, e.g.

  ∗ red color between the neurons is for larger distance
  ∗ blue color is for smaller distance
  ∗ color of neuron itself is a mean of distances to all neighbors
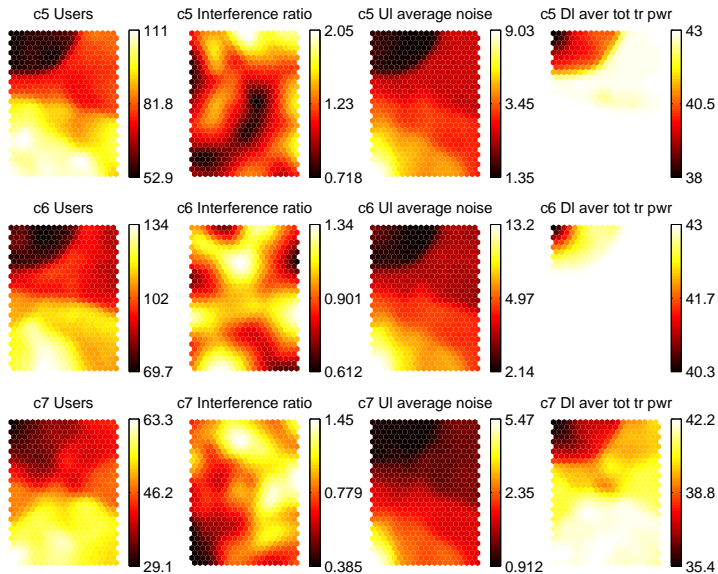
– red areas separate the clusters

- Clusters of SOM
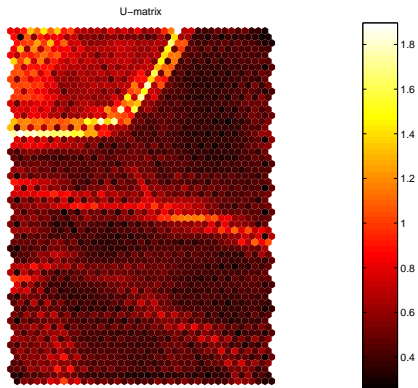 - clusters can be found using k-means

- Example with mobile network data

c5 Users | c5 Interference ratio | c5 UI average noise | c5 Dl aver tot tr pwr

c6 Users | c6 Interference ratio | c6 UI average noise | c6 Dl aver tot tr pwr

c7 Users | c7 Interference ratio | c7 UI average noise | c7 Dl aver tot tr pwr
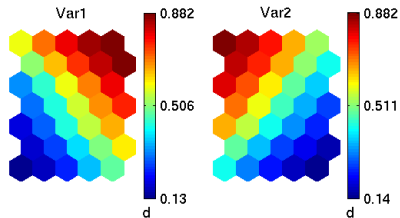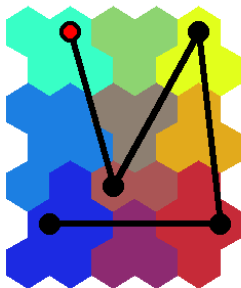
SOM 21−Jan−2000, Data: all

7

- Light color separates clusters

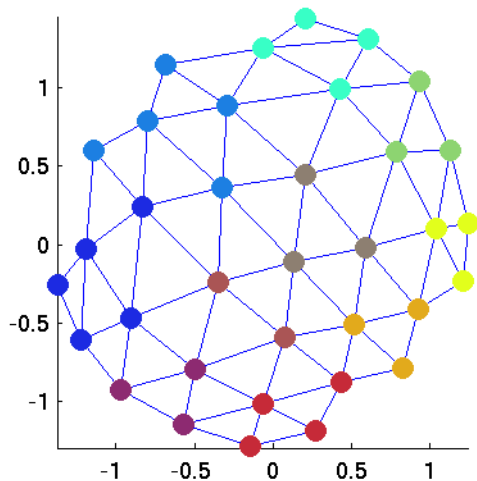 - Clusters are operational states of mobile cells

SOM 21−Jan−2000, Data: all

- Trajectories
  - visualize the change of operational state of the process

- SOM grid which has been colored using clusters of SOM

- These visualizations has been done using Matlab and Somtoolbox

- Somtoolbox can be found from:
  `http://www.cis.hut.fi/projects/somtoolbox/`