**SOM**

**Important links:**

[**https://towardsdatascience.com/self-organizing-maps-ff5853a118d4**](https://towardsdatascience.com/self-organizing-maps-ff5853a118d4)

[**https://www.cs.hmc.edu/~kpang/nn/som.html**](https://www.cs.hmc.edu/~kpang/nn/som.html)

[**http://blog.yhat.com/posts/self-organizing-maps-2.html**](http://blog.yhat.com/posts/self-organizing-maps-2.html)

[**https://users.ics.aalto.fi/jhollmen/dippa/node9.html**](https://users.ics.aalto.fi/jhollmen/dippa/node9.html)

**Introduction:**

Self Organizing Map (SOM) is basically used for pattern recognition. It was built by inspiration that brain also has organized areas for different types of neural senses. Different parts of brains process different types of signals from its environment. It belongs to the competitive learning algorithms class means that it learns by affecting its neighbor neurons. It simply recognizes the spatially related areas of input and organizes them on a paper like map. For example: if we give an input of world data, then it can highlight the poor and prosperous states or areas of world or it can rearrange the countries of the world according their financial situations.

**Uniqueness:**

It is basically unsupervised model of neural network. It is a clustering technique and its uniqueness from other clustering algorithms like K-means lies in its visual behavior. This technique visually shows the clusters. This model was basically designed for the multidimensional dataset because it process multi-attributed data into 2D space (hidden layer) neurons. We can assume it as 3D model, in which input neurons interact with our data in 2D space, while 3rd dimension shows the data vectors. One neuron is a vector known as codebook vector. These multi-dimensional units can have different types of arrangement in 2D space i.e. rectangular, hexagonal etc.

**Training:**

During the training process, the weights are adjusted. Data must be preprocessed according to the requirement because none of the models is applicable to all types of data. Unlike the weights in other neural network architecture, the weights in this model denote the spatial location of the specific node within the 3rd dimension of hidden layer respective to the nodes of input layer. So during training, Best Matching Unit (BMU) is calculated based on the minimum distance (can be Euclidean distance) from the input units and in this way, complete hidden layer is adjusted spatially. Keep it in mind that during all the training process, data is not disturbed in 2D space due to which topographical relation among data points remains constant. It has been observed that during training, the data that belongs to the same clusters are arranged in same region in 2D space. During all this process, the input space topology is preserved means that the neighbors of a vector in input will remain neighbors in resulted Self Organizing Map (SOM). The weight adjusting formula includes learning rate that decreases as the time passes.