

# Implementation of a Self-Organizing Map

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# OVERVIEW

# What is a SOM ?

## Definition

It is a neural network of just one layer : the output layer.

An SOM with 9 neurons in a 3x3 lattice

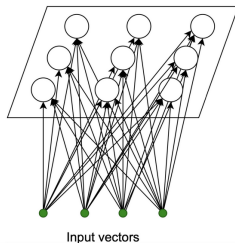


Figure: Reprensation of a SOM (2) of Bibliography.

## Wikipedia

A self-organizing map (SOM) is used to produce a low-dimensional (typically two-dimensional) representation of a higher dimensional data set, while preserving the topological structure of the data.

# Motivation

The Self-Organizing Maps permit to :

- ▶ Analyse and visualise the data. It represents complex data on a map of only two or three dimensions (see Convergence slide).
- ▶ Detect patterns from the data. Clustering (see K-means slide).
- ▶ Improve a deep neuronal network by sorting the data at the beginning.

# Similarities with the Perceptron

## Perceptron

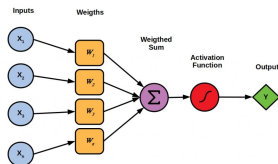


Figure: Diagram of a Perceptron.

It is also a one-layer neuronal network. However, this one is used to separate two different classes. The output is actually a binary one.

This is a supervised learning algorithm.

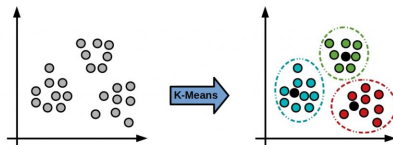
## SOM

The SOM can gather vectors due to their similarities.

The SOM is an **unsupervised learning algorithm**.

# Similarities with K-means algorithm

K-means algorithm is an unsupervised learning technique that can automatically gather data by creating **clusters**, which are subsets of data elements that share common characteristics.



**Figure:** Process of K-means algorithm

The user must define the number of clusters **K**. However, The SOM does not require this, it guesses the right amount of clusters.

# Convergence

The convergence of the SOM algorithm depends on the dimension of the dataset(1).



# ALGORITHM

# BIBLIOGRAPHY

<https://www.baeldung.com/cs/som-algorithm>