



# ANNs **T**utorials for Beginners in Arabic

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## STRUCTURE AND BASIC IDEA OF (SOM)

Self organizing Map (SOM) neurons execute both **competitive** and **cooperative** processes:

**Competitive Process:** The neuron whose weight vector comes closest to the input vector (i.e. is most similar to it) is declared the winner.

**Cooperative Process:** When one neuron fires, its closest neighbours tend to get excited more than those further away. There is a topological neighbourhood that decays with distance.

4- Calculating the size of the neighborhood around the BMU. The size of the neighborhood around the BMU is decreasing with an exponential decay function. It shrinks on each iteration until reaching just the BMU.

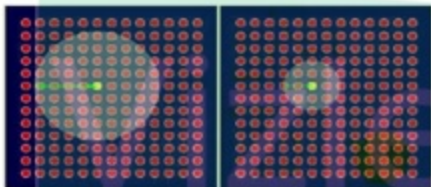
$$\sigma(t) = \sigma_0 \exp\left(-\frac{t}{\lambda}\right)$$

$\sigma_0$  = the width of lattice at time zero

$t$  = the current time step

$\lambda$  = the time constant

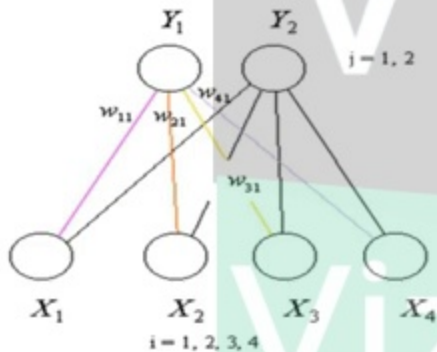
The value of  $\lambda$  depends on  $\sigma_0$  and the chosen number of iterations for algorithm.



Size of the neighborhood around the BMU shrinks

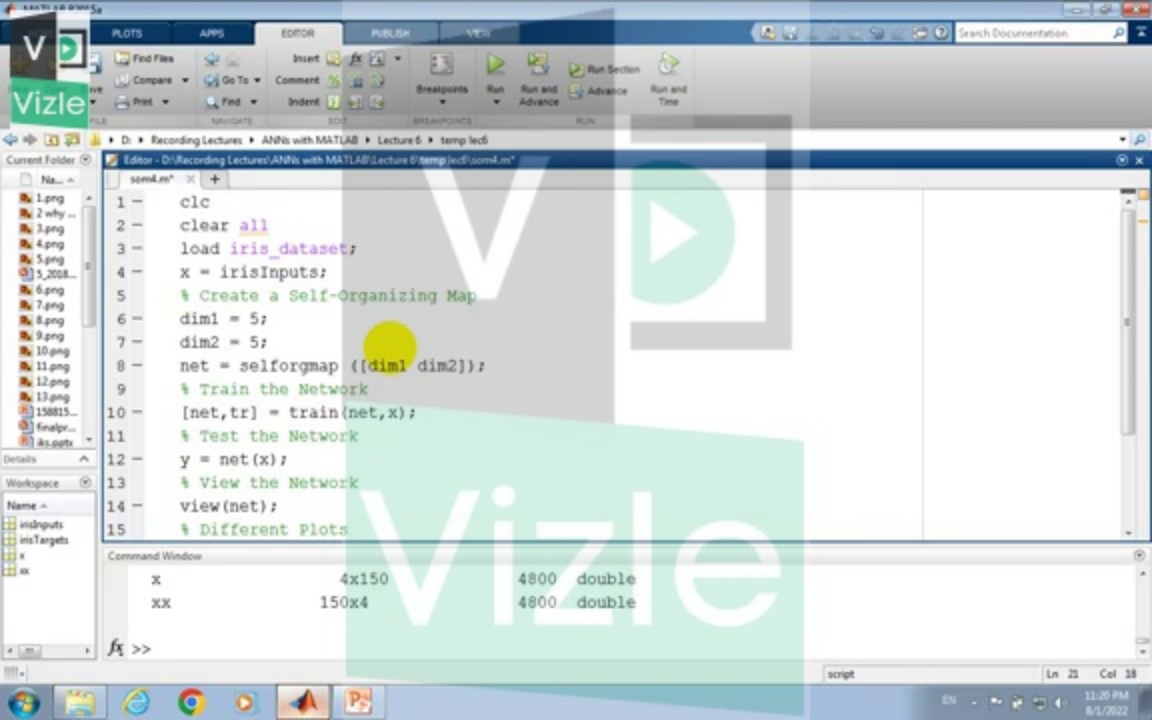
## Example

To make the problem very simple, suppose that there are only two neurons in the output layer as shown below:



Let the initial weight matrix be

$$\begin{bmatrix} w_{11} & w_{12} \\ w_{21} & w_{22} \\ w_{31} & w_{32} \\ w_{41} & w_{42} \end{bmatrix} = \begin{bmatrix} 0.2 & 0.8 \\ 0.6 & 0.4 \\ 0.5 & 0.7 \\ 0.9 & 0.3 \end{bmatrix}$$





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