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Geometric Significance of Topological Neighborhood in Standard and Oscillating SOM Models

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Abstract

The role of Topological Neighborhood (TN) in SOM cognitive modeling has biological and computational implications. The modeling significance of the TN width function (epoch) is associated with the initial TN width parameter 0. Furthermore, 0 is decisive in determining the geometric area under the TN-width function curve through the epochs of SOM training; measures training "opportunity". From this perspective, what is considered narrow (or wide) TN during SOM formation is a function of the TN width area covered.

In computer simulations of standard-TN SOM and of our previously proposed oscillating-TN SOM models, we calculated the area using the Riemann integral of the corresponding (epoch) function (standard, oscillating) and epoch-interval. The results show: a) for the same 0 and epoch-interval, the value remains unchanged irrespective of the (epoch) function used; b) when reducing 0, it reduces and directly affects the SOM representation of the input space.