

# A parallel algorithm for growing, unsupervised, self-organizing maps utilizing specialized regions of influence and neuron inertia

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## Abstract

The self-organizing map (SOM) is a common methodology used to capture and represent data patterns and increasingly playing a significant role in the development of neural networks. The primary objective of an SOM is to determine an approximate representation of data with an unknown probability distribution, from a multi-dimensional input space, using a lower dimensional neural network. The approximation by the network corresponds to the topological structure inherent in the data distribution. The classical SOM, and many of its variations such as the growing grid, construct the network based on randomly selected pieces of the input space, where the number of pieces increases over time. We give an overview of a parallel algorithm for the SOM (ParaSOM), which alternatively examines the entire input in each step, leading to a more accurate representation of input patterns after only a fraction of iterations, albeit requiring significantly more time. Both growing grid and ParaSOM, unlike the classical SOM, do not maintain a fixed number of neurons. Instead, their networks may grow and increase in density to match the input space. We present a comparison of results generated by implementations of ParaSOM and growing grid is made, making apparent their considerable performance differences despite having the growth feature in common.

**Keywords:** Neural Networks; Self-organizing map; Parallel learning algorithms; Pattern Recognition; Neural Systems