Title : Implementation of Kohonen Self Organizing Maps and Constraint Topological Maps

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Date: 05/18/2019

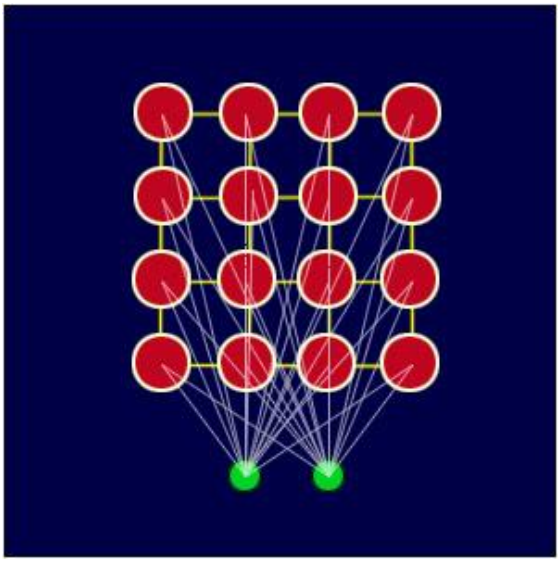

Image Source:
https://medium.com/@valentinerutto/selforganizing maps-in-english-35574f95b0ac

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Abstract: Self Organizing Map is trained using unsupervised learning technique. It is a type of Artificial Neural Network it differs from ANN as they use competitive learning approach rather than error correction learning. In this paper the dataset is used is generated randomly using python numpy.

Key words: Self Organizing Map, Constrained Topology Mapping, Dimensionality reduction, CTM, KSOM, Clustering algorithm, Artificial Neural Network, Kohonen Map.

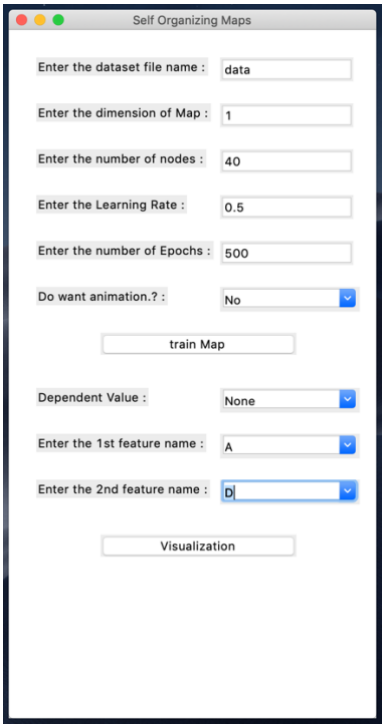
Introduction: Dimensionality reduction has been one of the important concepts in data analysis. SOM algorithm represents high dimensional input data with a 1D and 2D map. The map node weights match the input vector to find Best Matching Unit and the area of the lattice is selectively optimized. As the network performs unsupervised training it doesn't require the knowledge of target values. The nodes in the network converge to form a cluster to represent group of entities with similar features. It is used as classification tool to various problem domains, including speech recognition, image data compression and image recognition.

Algorithm:

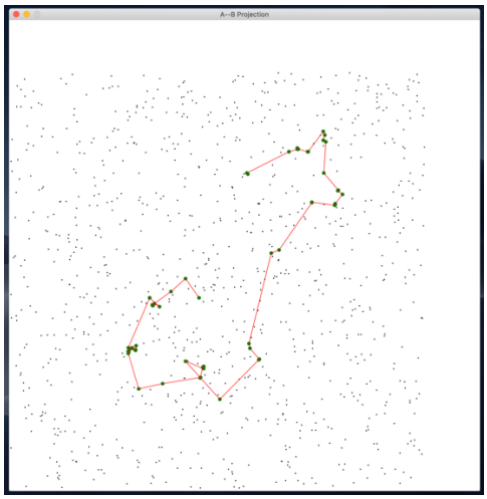
- Each node weights are randomly initialized.
- An input vector is chosen at random from the set of training data.
- Every node weight compared with the input vector to calculate which one's weights are most like the input vector. The winning node is known as Best Matching Unit (BMU).
- The neighborhood of the BMU is calculated. The neighbors decrease over time.
- The BMU is rewarded to become more likely to sample vector. The neighbors also become more like the sample vector. The nodes closer to the winning node, the more weights get altered and the farther away the neighbor is from the BMU, the less it learns.
- Repeat step 2 for N iterations.

Results:

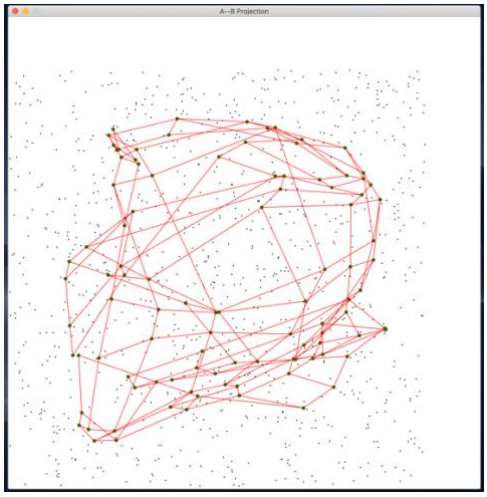
GUI: GUI to get user input.



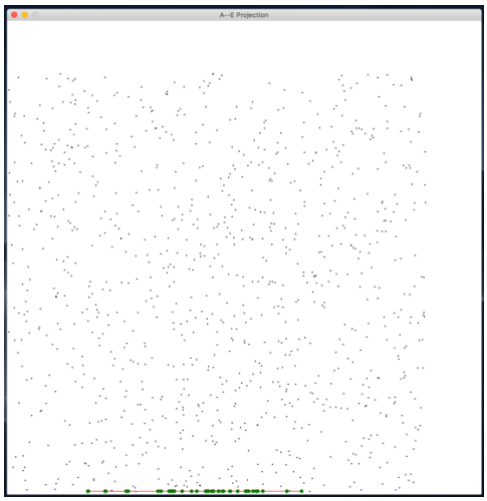
1D Map:



2D Map:



Constrained Topology Map:



Conclusion:

The advantages of using this algorithm over other clustering tool is flexibility in determining the number of clusters needed. The output of other techniques is only grouping and does not give the decision maker any information about the relation between similar parts. We believe that by extending the current SOM network with constrained maps will give powerful decision-making system.

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