

High-Dimensional Visualization of Clinically-Acquired Geospatial Data using Self-Organizing Maps (SOM)

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Abstract

The objective of this study is to visualize high-dimensional data vectors using a powerful unsupervised neural network, the self-organizing maps (SOM) algorithm together with geographic information systems (GIS). The learning procedure implemented in SOM closely follows a biological understanding of how neurons in the human brain function as they process, organize, and store incoming and outgoing information. The information obtained through these learning procedures is then used to generalize and for application in new or unknown situations. This type of learning procedure is what embodies the SOM algorithm. SOM provides a versatile neural network architecture for data exploration and mining, because it utilizes its neurons efficiently and only wastes very few or none when representing any data. Consequently, the SOM algorithm together with GIS presents a novel approach for biodata management because they can both be effectively used to classify and visualize a large number of dimensions or unit data vectors. In this experiment, we report on SOM effectiveness and expressiveness in the training and representation of geospatial biodata sets derived from clinical records of patients.

Key Words: self-organizing maps; SOM; biomedical geocomputations; visualization; data exploration; clustering; pattern recognition