

# Exploration of Geographic Information Systems-Based Medical Databases Using Self-Organizing Maps (SOM): A Case Study of Adult Asthma

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## Abstract

In recent times, the implementation of both self-organizing maps (SOM) and geographic information systems (GIS) to facilitate visualization, classification, organization, and analysis of the continually growing digital data has gained wide recognition. SOM is a very powerful category of unsupervised neural networks with competitive and cooperative learning abilities. The SOM algorithm is essential for extracting implicit, valuable, and interesting information from vast quantities of data. The principal advantages of SOM include but are not limited to the identification of clusters of similar sequences, projection and visualization of high dimensional data spaces, and the preservation of topological relationships between data vectors. These advantages are essentially valuable to geospatial data which often come with multiple attributes where the dimensionality, complexity and the amount of data is prohibitively large for manual analysis. In this study, we explore the capabilities of both SOM and GIS for potential use in spatially-oriented biomedical databases. These capabilities are illustrated by a case study of adult asthma patient data using a variety of visualization spaces. Extracted features of similar sequences obtained from the experiment are presented.

**Key Words:** self-organizing maps; SOM; GIS; biomedical geocomputations; spatial databases; clustering; pattern recognition