

Mining in Geographic Data

Methods used for mining spatial and spatiotemporal data

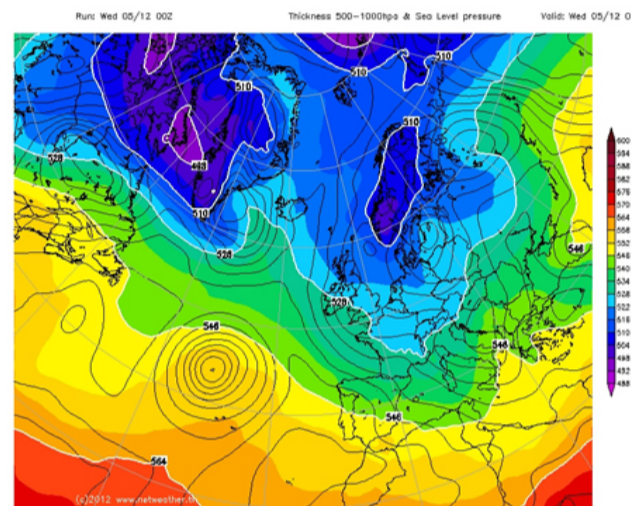
Motivation

Spatial data describe objects, events or other features on or near the surface of the Earth. It typically combines location and attribute information, for example, characteristics of related objects, events, or phenomena with temporal information. The location provided may be static in the short term, such as a piece of equipment, an earthquake event, or the location of a poor child. It may also be dynamic, such as moving vehicle or the spread of an infectious disease.

Such data are usually large in volume and are collected from various sources, e. g. by satellite imagery, phone data, or from social media. We gathered several approaches which process these kind of data with great results.

Location prediction

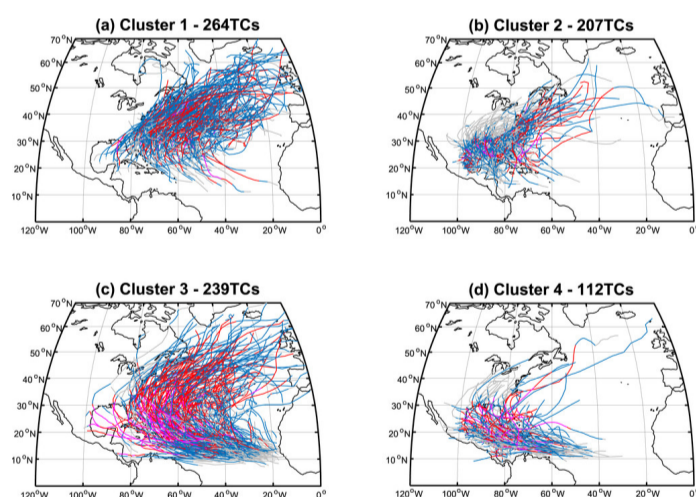
Frequent pattern mining allows us to discover common patterns in the dataset. It helps us characterize the data, predict the behavior of existing objects, and even detect anomalies when one of the objects starts to behave out of order.



Weather prediction

Trajectory clustering

The point of clustering trajectory data is to find groups of trajectories that share similar or even identical paths. An example of trajectory clustering can be seen in a framework which groups together hurricanes with similar trajectories.



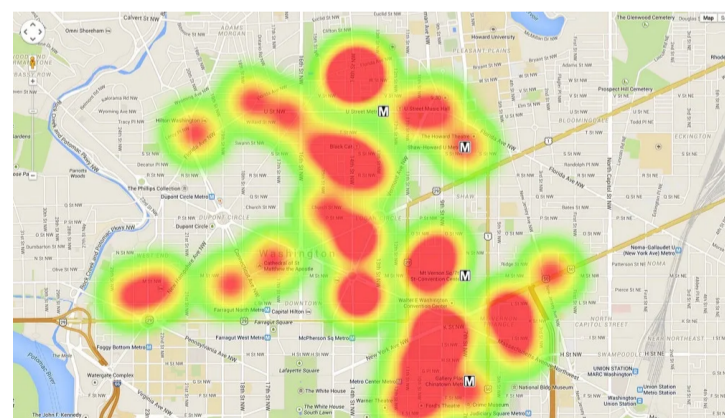
Cluster analysis of Atlantic Tropical Storms and Hurricanes

Geographic customer segmentation

People living close to each other often have similar buying patterns. Detecting these patterns is useful from a marketing perspective. Association rules mining or clustering techniques can help in revealing these patterns.

Hot-Spot analysis

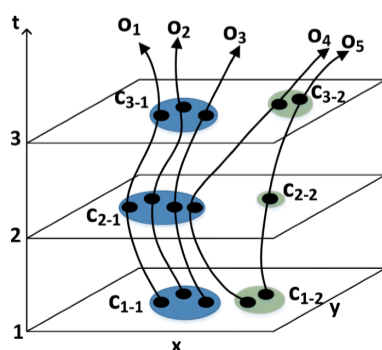
Hot-Spot is an area with a high concentration of observed events. Hot-Spots can be used to identify outbreaks of diseases. Also can be used to find areas with high criminality activity or traffic accidents. This area uses mainly point clustering algorithms.



Crime hot-spot analysis in Washington DC

Convoy clustering

Convoy clustering is also based on trajectories. It tracks big groups of object moving together, such as flocks of animals or convoys of cars.



Evolution of a convoy in spatio temporal dataset