



Socio-Cultural Cognitive Modeling



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Overview

Socio-Cultural Cognitive Mapping (SCM) is a latent-space method for characterizing populations based on shared attributes, placing nodes on a spatial representation. Goodness-of-fit for these evaluations is based by comparing two different matrices and their Chi-Square scores.

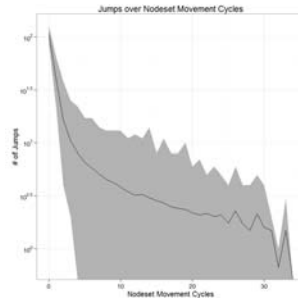
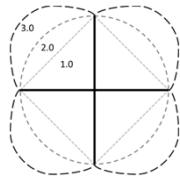
SCM allows users to use network or attribute data for informing frequency matrices and has advantages over both Multi-Dimensional Scaling and Principal Components Analysis.

Navigating a Latent Space

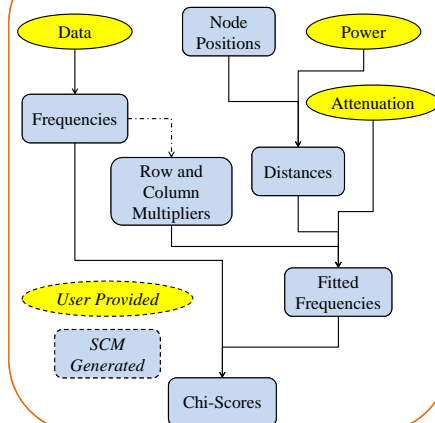
The SCM needs to move nodes to best satisfy the frequency values between nodes. Frequency may have multiple semantics, but one common semantic is similarity.

Node movements can be both local and random, sometimes called a jump movement. Jump movements help even out the problem of arbitrary initial random placement of the nodes. Jump movements are much more common in early stages of the process.

Users, in addition to providing data, are expected to offer a range of power and attenuation settings. Power settings influence the resulting distance calculation between any two points, and thus the resulting Chi-Square scores.



Technical Overview



LSS and MVS

The SCM process offers two related algorithms for creating the latent space. The Levine Statistical Segregation (LSS) is highly tuned for placing points in tight formations. It works best with frequency data.

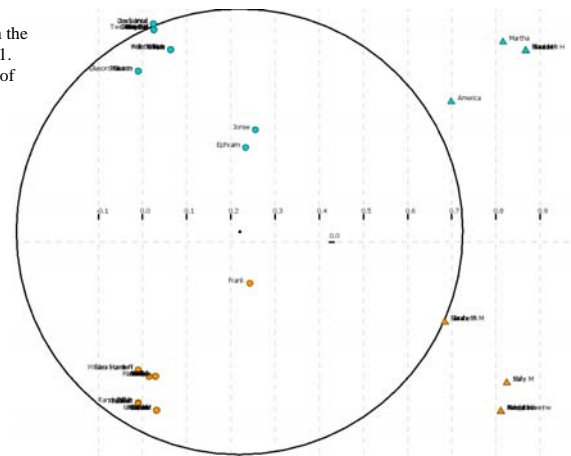
The Morgan Visual Segregation (MVS) is better suited for data with a similarity semantic. It does not use attenuation or multipliers, so may be less subject to overfitting.

Hatfield-McCoy Case Study

The Hatfields and McCos were two rural families across the Big Sandy River from each other on the West Virginia and Kentucky sides respectively. The two families feuded bitterly from 1863 to 1891. "Devil Anse" Hatfield led the Hatfields of West Virginia while Randolph McCoy led the McCos of Kentucky.

The feud escalated over time until eventually most of the McCos moved to Pikesville (20 or 30 miles farther from the border) to escape the violence and Devil Anse was arrested after an armed shootout.

Attribute	Percent with Attribute
Man	75.8%
Woman	24.2%
Hatfield	45.5%
McCoy	54.5%
Devil Anse (Hatfield) Family	18.2%
Randolph (McCoy) Family	24.2%
Intermarried	10.6%
Harmed Hatfield	7.6%
Harmed McCoy	6.1%
Killed in Feud	16.7%



Hatfield-McCoy: LSS (0.7 Power, 3.0 Attenuation)

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