

Joseph App
GEOG 560 Final Project Executive Summary
May 10, 2018

Graph Theory as a Spatial Predictor of Violent Conflict

Motivation:

This project is inspired by a BBC News article titled “Can mapping conflict data explain, predict and prevent violence?” by Dr. Weisi Guo. Guo makes an astounding argument that conflict is strongly correlated to the network structure of the world's cities. He uses graph theory to show that cities with high strategic centrality are strongly correlated to “fuzzy” cultural boundaries and a high number of attacks.

Methods:

I will calculate the betweenness centrality of zones (B_z), degree (D_z) and strategic centrality ($S_z = B_z/D_z$) of cities within the Sahel region of Africa. The R igraph package will be used to obtain these values based on a graph created with cities as vertices and the inverse distance between nodes as the graph edges. With these values computed, conduct a linear regression analysis to see if the number of attacks (dependent variable) is correlated with these three variables.

Results:

The global cities graph created by Guo et al. is a good predictor of violence at the global level. The results however show a deterioration of this model at the regional level. Due to the persistence of violence in this region as well as a lack of variance in the spatial network of Sahelian cities, no statistical relation was found between graph metrics and the number of attacks within 50 and 100 km of Sahelian cities.

Discussion:

Proper computing power and time are necessary to fully recreate the global network of 7322 vertices and their 130,000 edges. This is not currently feasible on my personal laptop. Likewise, automation of this process is necessary. It was possible and not prohibitively time-consuming for me to calculate the metrics 350 times for each zone, however this can and should be automated with appropriate geocomputing methods for analysis on a global graph.