Introduction to Geographical Mobility Pattern Visualization and COVID-19 Contagion Risk Analysis in Fragmented Patches

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I will explain about the mobility and COVID-19 cases data collection and preparation. We used the aggregated mobility datasets of the US by SafeGraph company to construct mobility networks from where individuals go. SafeGraph provides cellphone data and, for security of the users, anonymizes the data and aggregates them in census block groups (CBG). We also used coronavirus daily confirmed cases time series data from Johns Hopkins University COVID-19 Data Repository. This dataset provides cumulative counts of confirmed cases at county level for the US. Then, I will explain how we built the weekly mobility networks based on movements of individuals from one CBG to another CBG during a week. The dynamics of social fragmentation during the COVID-19 outbreak are analyzed by applying the Louvain method with modularity optimization. I will talk about the meaning of communities, how we colored them by polygons on the map, and how we quantify the risk exposure of COVID-19 for the communities.

Here, we have designed a multi-level quarantine process based on the mobility patterns of individuals and the severity of COVID-19 contagion in the US. By identifying the natural boundaries of social mobility, policymakers can impose travel restrictions that are minimally disruptive to social and economic activity. The dynamics of social fragmentation during the COVID-19 outbreak are analyzed by applying the Louvain method with modularity optimization to weekly mobility networks. In a multi-scale community detection process, using the locations of confirmed cases, natural break points as well as high risk areas for contagion are identified. At the smaller scales, for communities with a higher number of confirmed cases, contact tracing and associated quarantine policies is increasingly important and can be informed by the community structure.