Determining Spatial Contact Networks for Pathogen Transmission

Kate Behrman
Sasha Mikheyev
Erin Taylor
"Understanding the spatial contact network for disease transmission is a holy grail because it will allow prediction about the spread of emerging pathogens and ultimately guide public health and veterinary intervention programs." (Grenfell et. al. 2002)

http://spreadsheets.google.com/ccc?key=0Anx0qRmat9NcnpLdkhCYnRQRVpbfFBfc0FDWm10c1E&hl=en

See sheet entitled “MeaslesOutbreaks”
Calculating the Directed Transfer Function

1. Fit multivariate autoregressive model to time series

\[ X(t) = \sum_{i=1}^{p} A(i) X(t - i) + E(t) \]

2. Fourier Transform the regression coefficients

3. Take the inverse to get DTF

\[ \text{DTF}_{ij} \Rightarrow \text{Causal influence of } j \text{ on } i \]

Randomize time series to determine significance
Influence of a city on disease spread scales with its population size