Alejandro Mora

Max-Planck Institute for the Physics of Complex Systems,
Dresden Germany
alejmora@mpipks-dresden.mpg.de

Dynamics of a SIRS epidemic model on an adaptive network

The study of epidemic spreading on adaptive networks combine tools from the classical epidemiology, statistical physics, and dynamical systems theory. Adaptive evolution of the network topology depending on the local state of the nodes provides a more realistic approach to the propagation of contagious diseases. We investigate the dynamics of a *susceptible-infected-recovered-susceptible* (SIRS) epidemiological process on an adaptive network. The recovered state is proposed to represent either temporal immunity or susceptible population turnover. A node in the recovered state loses its links at a fast rate whereas new links are permanently created between nodes in the other epidemiological states. We analyze the system behavior with extended mean-field equations that include links between nodes as dynamical variables and a moment closure that approximates higher order correlations between nodes. The numerical solution of such correlation equations show the emergence of discontinuous transitions, bifurcations, and oscillations of the disease prevalence. This study is compared with analogous results of intensive agent-based simulations on networks. Finally, we discuss application to real epidemics.

This is a joint work with Thilo Gross and Gerd Zschaler from the Biological Network Dynamics Group, Max-Planck Institute for the Physics of Complex Systems, Nöthnitzer Straße 38, 01187 Dresden Germany