NetSci'06 planning

Tutorial:

Statistical inference for network dynamics

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In network studies in the social sciences, it often is important to use methods of statistical inference (parameter estimation, hypothesis testing, etc.) for analyzing empirical network data. Longitudinal data are especially interesting. In many case, requirements of the way how data are collected lead to network panel data, i.e., repeated observations of the network on a given set of actors, at two or more moments in time.

A large and flexible class of models for dynamics of directed networks can be obtained as *stochastic actor-oriented models*. In such models, the nodes in the network are regarded as social actors who have control over their outgoing ties, and who change their outgoing ties, subject to inertia conditions, so as to optimize an individual objective function plus a stochastic disturbance term. It is convenient to require that the model is a continuous-time Markov process in which no more than one tie variable can change at any given moment. By varying the specification of the objective function, a rich and flexible model of many types of network dynamics can be obtained, which can be used for statistical inference. The freeware program SIENA is available for statistical inference on the basis of this model. This permits researchers to obtain conclusions from empirical data about the process driving the network dynamics including parameter estimates, hypothesis tests, and goodness-of-fit results.

The model will be presented with an example of friendship dynamics in a group of students. Various generalizations will be briefly discussed. The main generalization is to data structures where behavior (performance, attitudes, etc.) of the actors is observed in addition to the network, and where the model aims at studying the mutual interrelations between network structure and behavior.

Reference

Snijders, Tom A.B, The Statistical Evaluation of Social Network Dynamics.
Pp. 361-395 in *Sociological Methodology -2001*, edited by M.E. Sobel and M.P. Becker. Boston and London: Basil Blackwell.