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Provisional outline and reading list

Course on "A stochastic process approach to agent-based modelling and simulation"
Max Planck Institute for Demographic Research (MPIDR), Rostock
Course coordinator: Anna Klabunde

Wednesday, October 21

9.30-11.00 Süßmilch lecture:
Studying social influence in networks using the stochastic actor-oriented model

Abstract

Assessing peer influence is difficult because of what Manski (1993) called the "reflection problem": it is difficult to decide whether peers are alike because they selected each other based on similarity of attributes and behaviour (social selection), or because they influenced each other (social influence). Examples where such questions occur are studies of adolescent development, with behaviours such as smoking, drinking, and school attitudes. As a first step, the researcher must decide whom to consider as peers. A social network approach suggests that those may be considered as peers who regard each other as subjectively relevant interaction partners, and to study entire peer networks in groups with a natural network boundary such as school cohorts. Panel data of the relational network and relevant behavioural variables in such groups can be helpful to obtain evidence for social selection and for social influence in such groups. To analyze and model such data, a major challenge is to find good representations of the dependence structures that characterize social network data.

This lecture treats stochastic actor-oriented models, a class of continuous-time Markov chain models that allow representing the interdependent dynamics of networks and individual attributes for data collected in a panel design. Tie and attribute changes here are modelled as the results of "choices" made by the nodes in the network, governed by multinomial logistic regression models, where a large number of such changes will be made, unobserved, between successive panel observations. This allows much flexibility in the representation of dependencies between ties as well as dependence on covariates. The models can be characterized as generalized linear models with a lot of missing data. They are implemented in the R package RSiena. An overview of stochastic actor-oriented models and estimation procedures will be given, illustrated by examples.

11.30-13.00 Lecture:
Actor-oriented dynamic social network modeling, part II

This lecture will go more in detail about stochastic actor-oriented models.

1. Revisit the simulation model.
2. Model specification: what are potential determinants of changes in networks and behavior?
3. Estimation by Method of Moments.
4. Briefly: extensions, current developments.

14.00-17.00 Computer lab:
SIENA package for the statistical analysis of longitudinal social network data

The computer lab will illustrate the basic operation of the R package. It will be helpful to have some previous knowledge of RSiena.
Please have a look at the website, which contains a lot of information about the methodology and applications:

http://www.stats.ox.ac.uk/~snijders/siena/

For the computer lab, it should be noted that the RSiena package at CRAN is out of date. Please install the RSiena test from R-Forge, which can be done by the following command in R:

install.packages("RSiena", repos="http://R-Forge.R-project.org")

Alternatively, you can download the package from
http://www.stats.ox.ac.uk/~snijders/siena/siena_downloads.htm
and install from .zip (for Windows) or from .tgz (for Mac) on your computer.

It will be convenient to download the manual, and have that available for reference:
http://www.stats.ox.ac.uk/~snijders/siena/RSiena_Manual.pdf

If you wish to prepare in advance, you can read the following two publications. This is not necessary, however.

Snijders, T.A.B., van de Bunt, G.G., and Steglich, C.E.G. (2010). Introduction to actor-based models for network dynamics. *Social Networks*, 32, 44-60.
DOI: http://dx.doi.org/10.1016/j.socnet.2009.02.004

Tom A.B. Snijders and Christian E.G. Steglich (2015). Representing Micro-Macro Linkages by Actor-Based Dynamic Network Models. *Sociological Methods & Research*, 44, 222-271.
DOI: http://dx.doi.org/10.1177/0049124113494573

Further literature can be found at the Siena website.

General background literature for social networks:

Alexandra Marin and Barry Wellman (2011). Social network analysis: An introduction. In J. Scott & P.J. Carrington (eds.), *The SAGE Handbook of Social Network Analysis* London: Sage, p. 11-25.

Garry Robins (2013). A tutorial on methods for the modeling and analysis of social network data. Journal of Mathematical Psychology 57, 261-274.

Tom A.B. Snijders. (2011). Statistical Models for Social Networks. *Annual Review of Sociology*, 37, 129-151.