University of Konstanz
Algorithmics Group
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Network Modeling
Winter Term 2014/2015

Assignments $\mathcal{N}^{\underline{o}}$ 10

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Task 1: ERGMs and SAOMs — 5 points

Let $x(t_0)$ and $x(t_1)$ be two observations of a network at two time points t_0 and t_1 and v a binary attribute (e.g. gender). We consider a stochastic actor-oriented model for undirected ties assuming that the initiative is two-sided and the choice is dictatorial.
Consider an evaluation function based on edges, reciprocity, and homophily with respect to v. Is there an ERGM which is the limiting distribution of this SAOM?

Task 2: SAOM assumptions — 5 points

Let us consider the assumptions of SAOMs and the data requirements to estimate the model. What is a good schedule (time elapsed between two observations) to collect your data and to avoid troubles in justifying the plausibility of some assumptions and in reaching the convergence of the Robbins-Monro algorithm?
(Keep also in mind that each survey is costly...)

Task 3: Time-homogeneity of the parameter of the evaluation function – R task — 5 points

Let $x(t_0), \ldots, x(t_M)$ be $M + 1$ observations of a network at $M + 1$ time points. Let us assume thet we estimated a SAOM for the entire sequence of the observed networks.
One of the assumption of the SAOM is that the parameter β of the objective function is constant over time. A simple way to see if your data support this assumption consist in

1. estimating the same SAOM for each pair of consecutive network observations (i.e. a model for $x(t_0)$ and $x(t_1)$, one for $x(t_1)$ and $x(t_2)$, and so on)

2. comparing the estimates of β. If they are similar, it seems reasonable to assume that actors use the same decision rule over time (i.e. β is constant over time).

Let us consider the data collected by A. Knecht (4 adjacency matrices + gender) and a specification of the SAOM including edges, reciprocity, transitive triplets, ego covariate, alter covariate, and same gender. Is it reasonable to assume that actors use the same decision rule over time, using the method describe above?