Assignments N° 10


Task 1: Time heterogeneity 8 points

Let \( x(t_0), \ldots, x(t_M) \) be \( M + 1 \) observations of a network at \( M + 1 \) time points. Let us assume that we estimated a SAOM for the entire sequence of the observed networks.

One of the assumptions of the SAOM is that the parameters \( \beta_k, \ (k = 1, \ldots, K) \) of the evaluation function are constant over time. During the lecture we introduced a test statistic to determine if this assumption is supported by the data. Could you imagine an alternative way to see if the data support this assumption?

(Hint: The alternative way does not require the formulation of a statistical test. It is a heuristic procedure based on parameter estimation.)

Task 2: Time heterogeneity – R task 6 points

Let us consider the data collected by A. Knecht and a specification of the SAOM including edges, reciprocity, transitive triplets, ego, alter and same gender covariates.

a) Check for time heterogeneity using the heuristic procedure defined in Task 1.

b) Use the `sienaTimeTest` function in Rsiena in order to properly test if there is time heterogeneity.

b.1) Interpret the result of the joint significance test of time heterogeneity

b.2) Which statistics are time-dependent?
b.3) Include time dummy variables for reciprocity, estimate the model and comment your results.

Task 3: Goodness of fit - R task 6 points

Let us consider the data collected by A. Knecht, and in particular the second and the third observations. Given a specification of the SAOM including edges and reciprocity, evaluate the goodness of fit of the model using the function sienaGOF.

a) Comment the results.

b) Add at least 4 (network or attribute-related) statistics in order to improve the GOF. Motivate the choice of the statistics and send us the gof plots corresponding to the suggested specification.