

Assignments \mathcal{N}^o 10

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Task 1: Time heterogeneity

8 points

Let $x(t_0), \dots, x(t_M)$ 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 assumption of the SAOM is that the parameters β_k , ($k = 1, \dots, K$) 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.