

Supplement to:

Stadtfeld, Christoph, and Per Block. 2017. "Interactions, Actors, and Time: Dynamic Network Actor Models for Relational Events." *Sociological Science* 4: 318-352.

1 Effect specifications used in the case study

This appendix provides the mathematical definitions of the process state and the effect specifications of the illustrative case study in the Empirical Illustration of DyNAM and REM: Phone Calls in a Student House section.

1.1 Definition of the process state

The process state y consists of three networks:

- $x^{(1)}$: communication in the past
- $x^{(2)}$: communication in the past hour
- $x^{(3)}$: friendship

Two actor covariates are defined:

- $z^{(1)}$: floor
- $z^{(2)}$: grade type

There is one set of nodes:

- A : the set of 84 individuals

No global covariates were defined in this example.

1.2 Effect functions

Sixteen effects were used to specify the models. The first five effects specify the DyNAM rate function, effects six to sixteen specify the receiver choice function.

1. Intercept: $r_1(i, y) = 1$

2. egoX recentCallsSent: $r_2(i, y) = \sum_{h \in A} x_{ih}^{(2)}$
3. egoX recentCallsReceived: $r_3(i, y) = \sum_{h \in A} x_{hi}^{(2)}$
4. outdegreeX friendship: $r_4(i, y) = \sum_{h \in A} x_{ih}^{(3)}$
5. outdegreeX callNetwork: $r_5(i, y) = \sum_{h \in A} x_{ih}^{(1)}$
6. outdegree callNetwork: $s_6(i, j, y) = x_{ij}^{(1)}$
7. outdegree callNetworkPastHour: $s_7(i, j, y) = I(x_{ij}^{(2)} > 0)$
8. reciprocity callNetwork: $s_8(i, j, y) = x_{ij}^{(1)}$
9. reciprocity callNetworkPastHour: $s_9(i, j, y) = x_{ij}^{(2)}$
10. inPop callNetwork: $s_{10}(i, j, y) = \sum_{h \in A} x_{hj}^{(1)}$
11. inPop friendship: $s_{11}(i, j, y) = \sum_{h \in A} x_{hj}^{(3)}$
12. transitivity callNetwork: $s_{12}(i, j, y) = \sum_{h \in A} x_{ih}^{(1)} x_{hj}^{(1)}$
13. transitivity friendship: $s_{13}(i, j, y) = \sum_{h \in A} x_{ih}^{(3)} x_{hj}^{(3)}$
14. sameX floor: $s_{14}(i, j, y) = I(z_i^{(1)} = z_j^{(1)})$
15. sameX gradeType: $s_{15}(i, j, y) = I(z_i^{(2)} = z_j^{(2)})$
16. X friendship: $s_{16}(i, j, y) = x_{ij}^{(3)}$

The rate effects 1–5 can be reformulated as network effects $s_1(i, j, y)$ to $s_5(i, j, y)$ that are invariant to the chosen receiver j . As such they can be used to specify relational event models (as illustrated in the case study). However, these parameters are not identifiable in the receiver choice sub model of DyNAM as the statistics do not vary between receivers.