Social Network Analysis

Network processes, local dependency, random graphs

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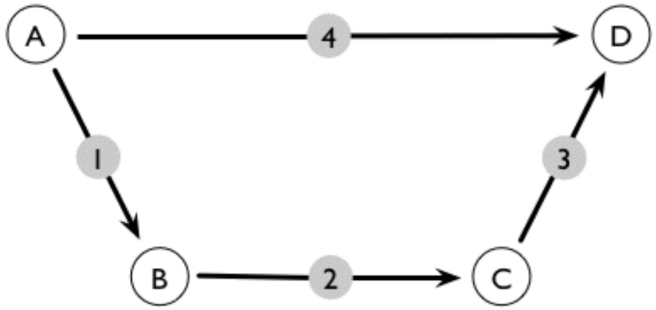
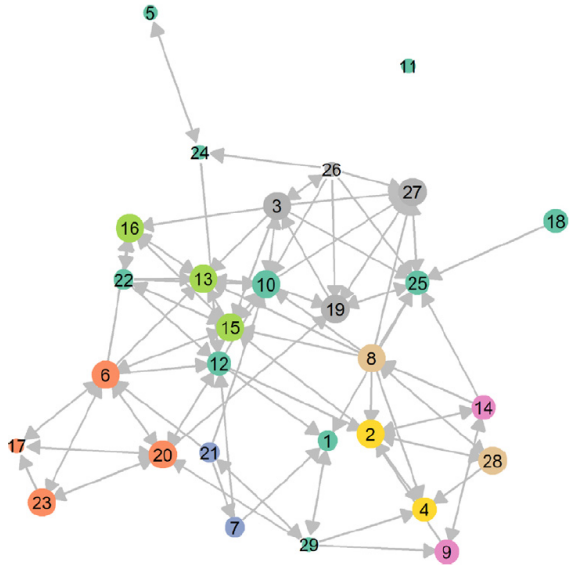
Processes and mechanisms



Coleman (1994)

- We test hypothetical causal mechanisms in order to explain social phenomena
- (Part of) these mechanisms can be relational processes (interactions)
- In order to find evidence of these processes, we model the *explanandum* as a social network of actors and their relations
- We look for the relational 'traces' left by social mechanisms operating over time in our network
- The aim is eventually to explain the network

Support in a coworking space



Bianchi, Casnici, and Squazzoni (2018)

Statistic	Value
# nodes	29
# links	99
density	0.12
average degree	3.41

Reciprocity?

- Is solidarity in this coworking space explained by a norm of reciprocity?
- Is there a tendency towards reciprocity in my network?

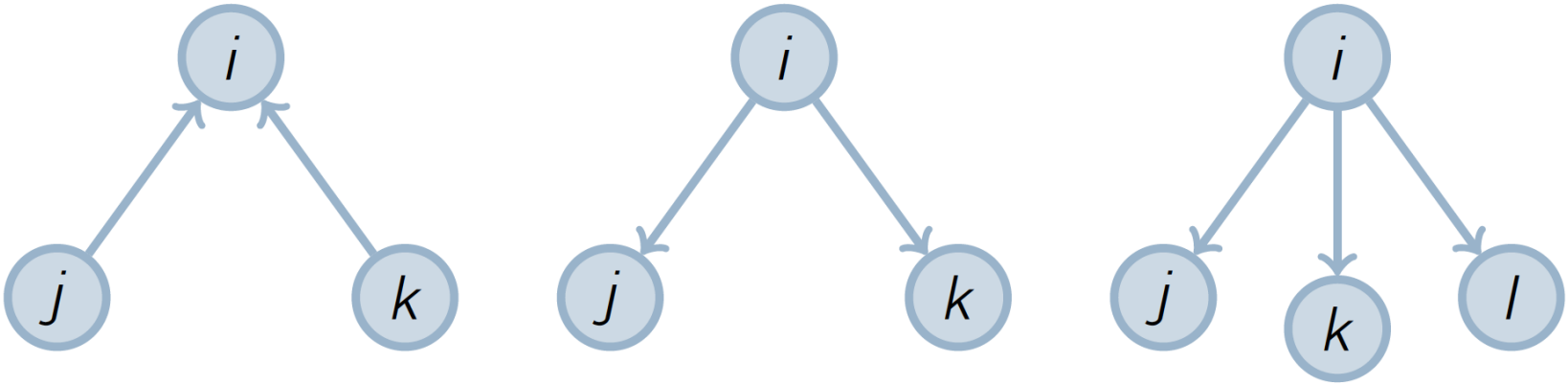
Random graph models

- (Stochastic) models of graphs: defined as a family of random tie-variables
- $N = \{1, \ldots, n\}$ is fixed and predetermined
- Let J be the set of all possible relational ties for N (no self-loops) (cardinality of J is $\frac{n(n-1)}{2}$)
- E (set of ties) is a random subset of J
- For any element of J (i,j), X_{ij} is a **tie-variable** which can be either 0 or 1
- All tie-variables make up a stochastic adjacency matrix $\mathbf{X} = [X_{ij}]$
- A target empirical network is a realization $x = [x_{ij}]$ of $\mathbf{X}$
- *Erdős-Rényi* model (Gilbert): $G(n,p)$ (a graph G with n vertices and $Pr(x_{ij} = 1) = p$)

Dependency (reciprocity)

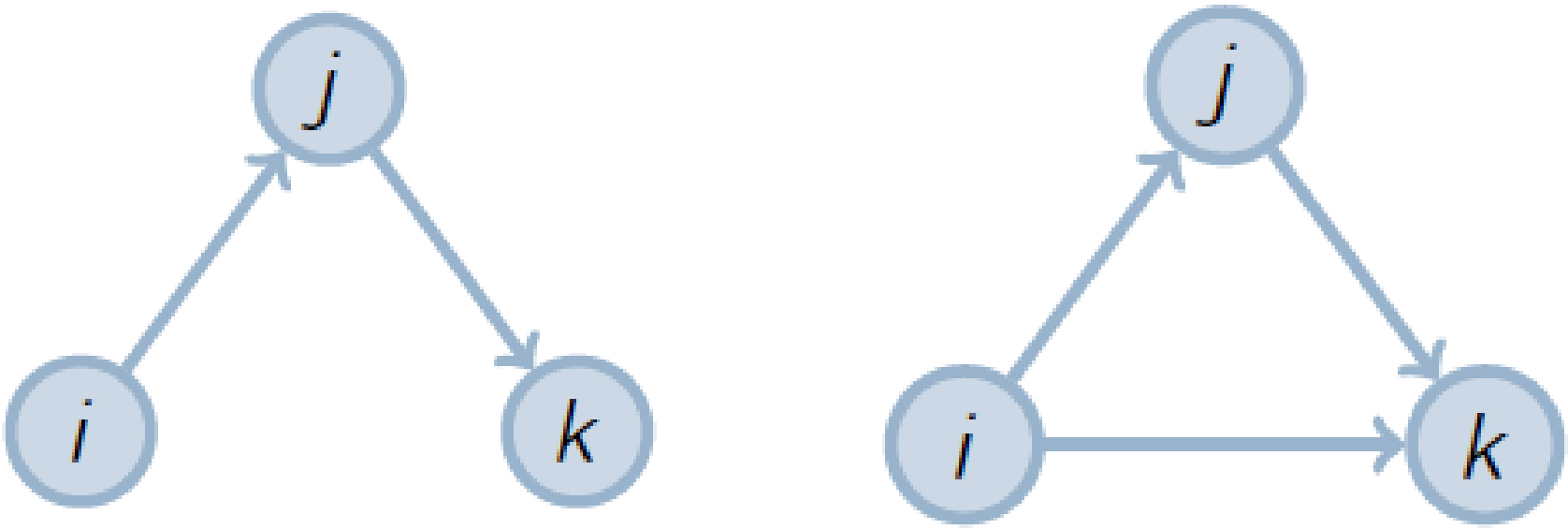
- In this case, $Pr(x_{ij} = 1)$ depends on $Pr(x_{ji} = 1)$
- This violates the assumption of independence of observations of standard generalized linear modelling

Dependency (centrality)



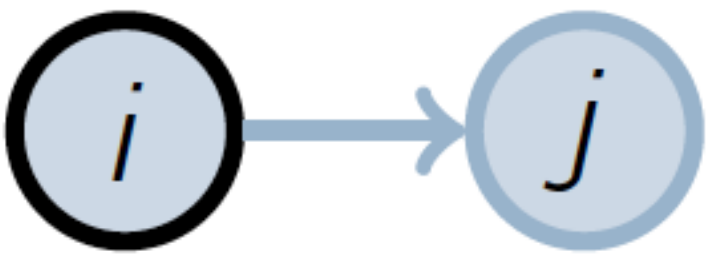
The probability of $x_{ij} = 1$ depends on j's centrality

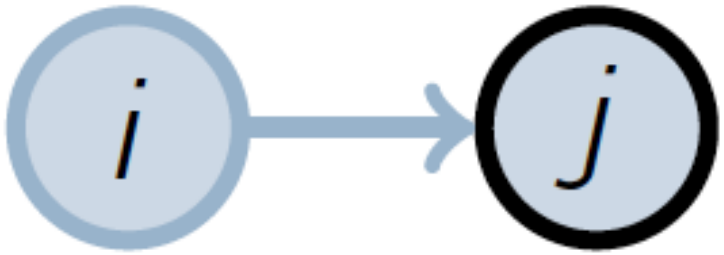
Dependency (transitive closure)



- $Pr(x_{ik} = 1)$ depends on $Pr(x_{ij} = 1)$ & $Pr(x_{jk} = 1)$
- At a global level, **path (transitive) closure** lets **clustering** emerge

Dependency (social selection)





Reading

Lusher, Koskinen, and Robins (2013), Ch. 2-4

References

Bianchi, Federico, Niccolò Casnici, and Flaminio Squazzoni. 2018. 'Solidarity as a Byproduct of Professional Collaboration: Social Support and Trust in a Coworking Space'. *Social Networks* 54: 61–72. https://doi.org/10.1016/j.socnet.2017.12.002.

Coleman, James S. 1994. *Foundations of Social Theory*. Cambridge, MA: Harvard University Press.

Lusher, Dean, Johan Koskinen, and Garry Robins. 2013. *Exponential Random Graph Models for Social Networks. Theory, Methods, and Applications*. New York, NY: Cambridge University Press.