

(Psychometric) Network Analysis

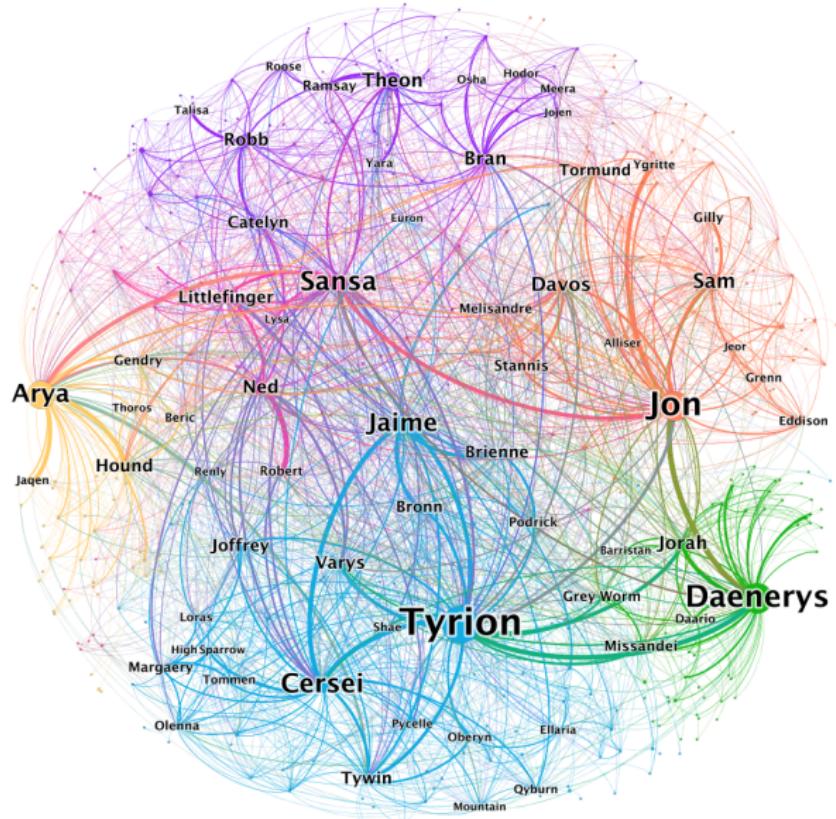
Using Survey Items As Nodes in a Network

Todd K. Hartman

Professor of Quantitative Social Science
Department of Social Statistics
The University of Manchester
<https://tkhartman.netlify.app/>
todd.hartman@manchester.ac.uk

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Social Network Analysis: A Network of Thrones



What Are (Mixed) Graphical Models (MGMs)?

- Network analysis with (at least) two important distinctions
 - Nodes: in Social NA = people, agents; in MGMs = survey items, variables
 - Causality: SEMs assume common underlying cause(s); MGMs assume nodes **may** causally influence each other (Borsboom, 2013)
 - Thus change in one node likely causes changes in other nodes
- MGMs allow links between survey items (mixed = various response scales) to be mapped in a visual network (Epskamp, 2017)
- Within these networks, possible to identify communities of nodes that are interconnected and highly influential/central
- Most MGMs have been used in psychopathology (cf. Dalege, 2017; 2019; see also Boutyline, 2017; Brandt, 2019; Fishman & Davis, 2022; Hartman et al., 2022)

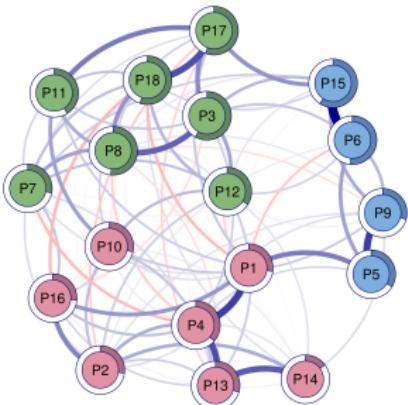
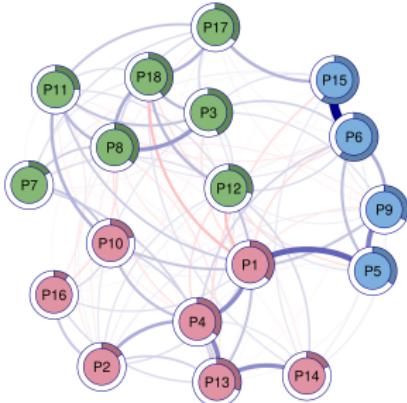
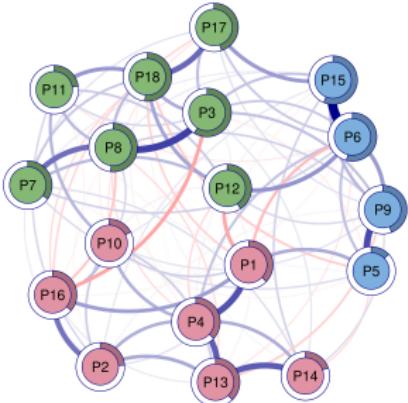
Estimation of MGMs

- Generalized linear (and similar) models via penalized maximum likelihood
- Fits lasso and elastic-net model paths for regression in supervised learning
- Pairwise interactions, controlling for other nodes in the network
- Examine resulting network models for similarities and differences, focusing on:
 - *Global Strength* of each network (i.e., sum of the absolute value of its edge-weights)
 - *Community Structure* (i.e., latent factors summarizing clustering of variables)

Network Psychometrics Continued

- For graphical networks, issues are represented by nodes and associations by edges
 - Graphical Least Absolute Shrinkage and Selector Operator (glasso) with Extended Bayesian Information (EBIC, where gamma = .5 for optimal model selection)
- Fruchterman-Reingold algorithm for visualization ('qgraph' package in R; Epskamp, 2012)
- Network Comparison Test ('NetworkComparisonTest' package).
- Robustness check: Differences in Global Expected Influence (GEI, sum of raw edge-weights)

Example: UK Belief Networks (Left, Centre, Right)



Right-Wing Authoritarianism

- P1: The Death Penalty
- P2: Spending Money on the Army
- P4: Stiff Jail Terms for Criminals
- P10: Lower Taxes to promote Business
- P13: Traditional Family Values
- P14: Monogamy
- P16: Brexit

Interpersonal Liberalism ("Wokeness")

- P3: Multiculturalism
- P7: Higher Benefits for the Poor
- P8: Immigration
- P11: International Government
- P12: Rehabilitation of Offenders
- P17: Public Demonstrations
- P18: International Aid

Intrapersonal Liberalism

- P5: Euthanasia (physician-assisted suicide)
- P6: Gay Rights
- P9: Legalized Abortion
- P15: Trans Rights