POIR 613: Measurement Models and Statistical Computing

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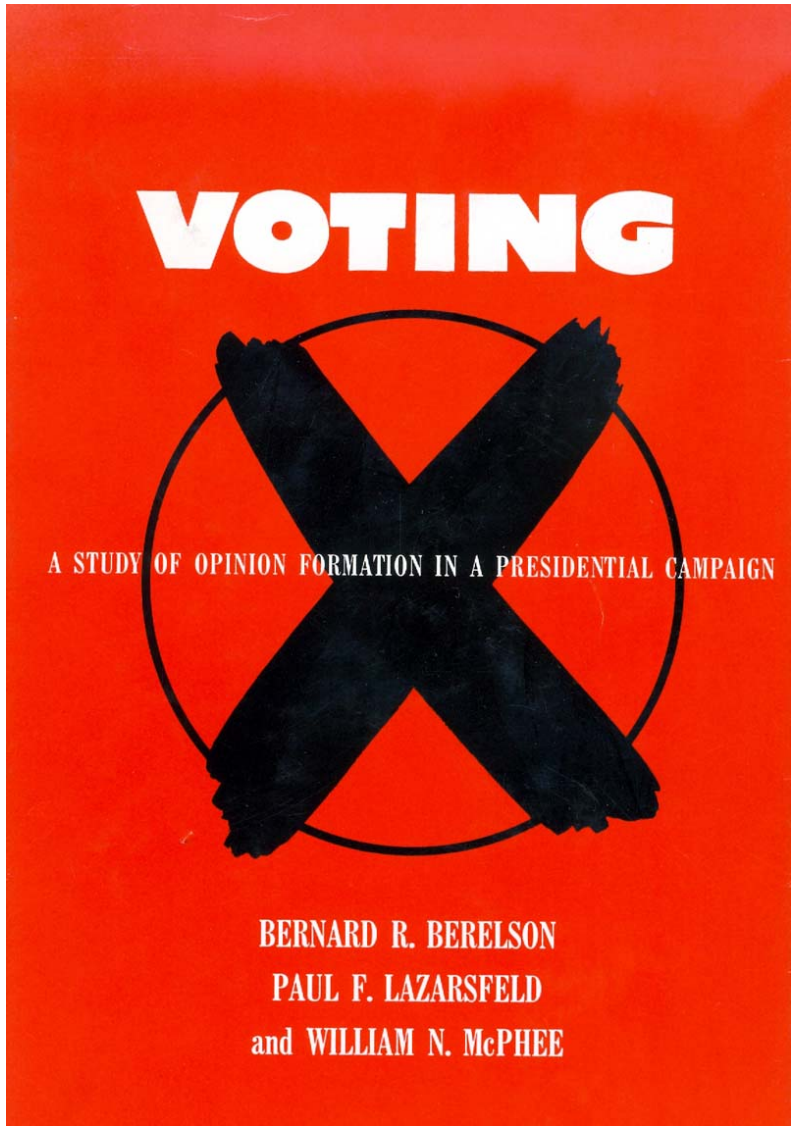
Today

1. Solutions for last week's challenge
2. Next deadline: October 30 for descriptive statistics
3. Other announcements:
   - No class on November 21st
   - Office hours at regular time tomorrow
4. Today:
   - Introduction to network analysis

Introduction to
social network analysis

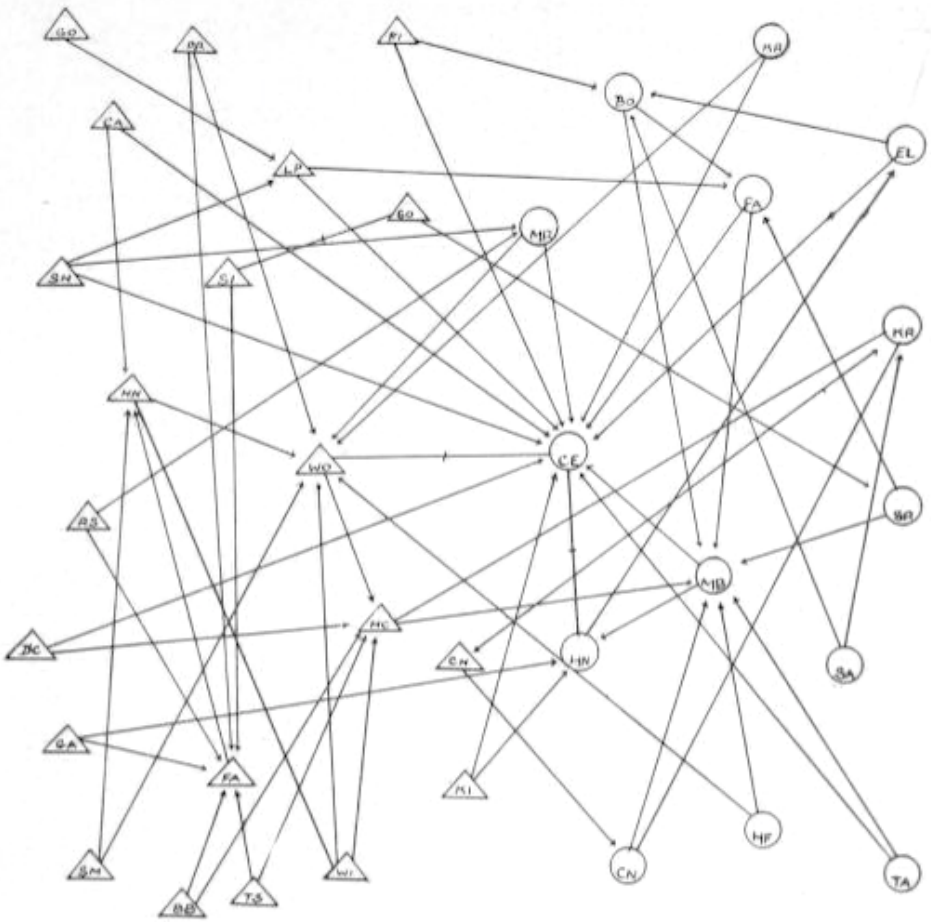
Political behavior is social

- Opinion formation as a *social process* (Berelson et al, 1954)



- *Voting is contagious* (Nickerson, 2008)

EVOLUTION OF GROUPS



CLASS STRUCTURE, 1ST GRADE

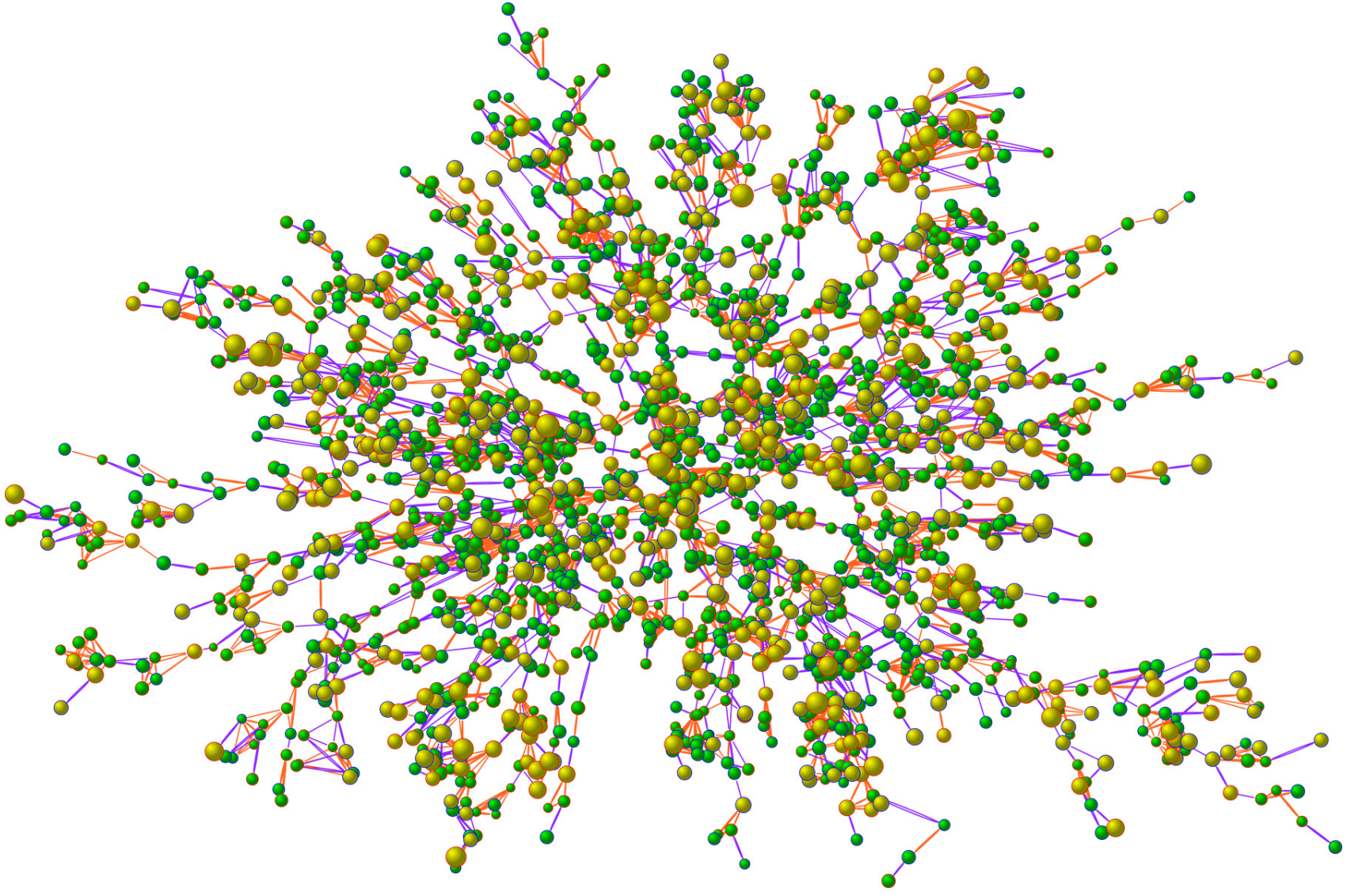
21 boys and 14 girls. *Unchosen*, 18, GO, PR, CA, SH, FI, RS, DC, GA, SM, BB, TS, WI, KI, TA, HF, SA, SR, KR; *Pairs*, 3, EI-GO, WO-CE, CE-HN; *Stars*, 5, CE, WO, HC, FA, MB; *Chains*, 0; *Triangles*, 0; *Inter-sexual Attractions*, 22.

EVOLUTION OF GR

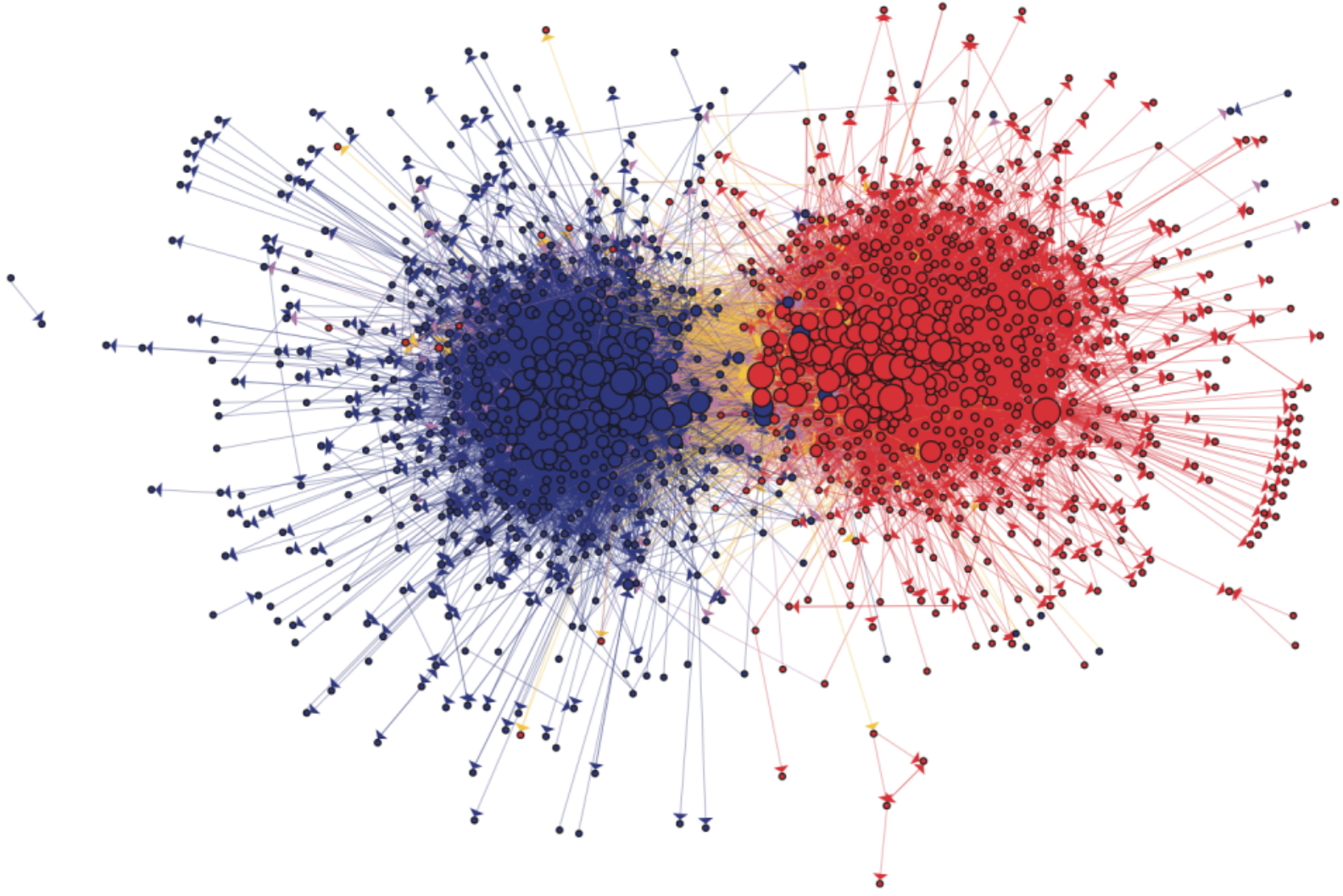
CLASS STRUCTURE, 2ND

14 boys and 14 girls. *Unchosen*, 9, WI, KP, SH; *Pairs*, 11, ZV-MK, MK-LN, OW-ZI, GR-JN-PO, PO-SL, HF-BE, GL-GU; *Stars*, 2, SL, SL-JN-PO; *Inter-sexual Att*

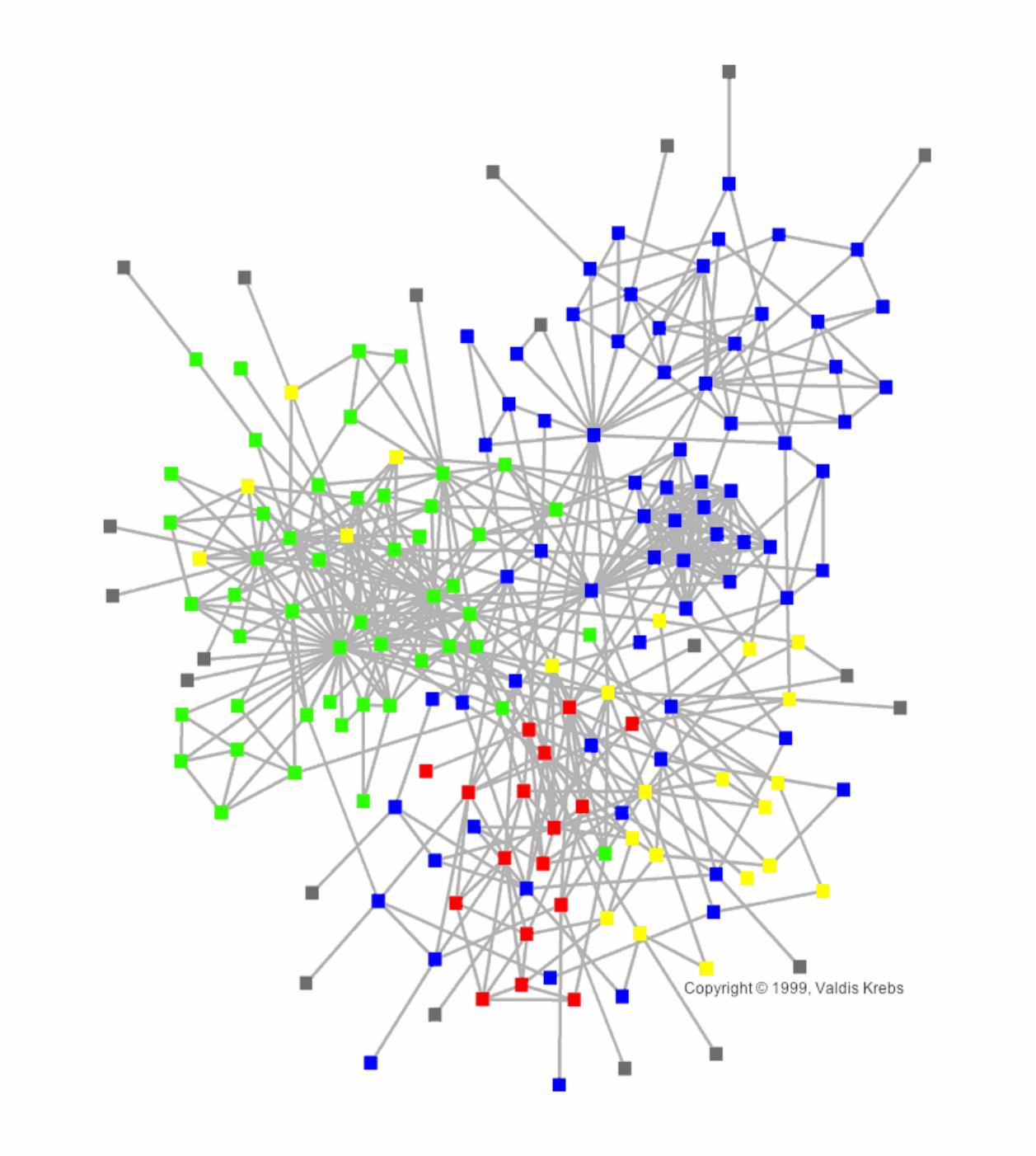
Moreno, “Who Shall Survive?” (1934)



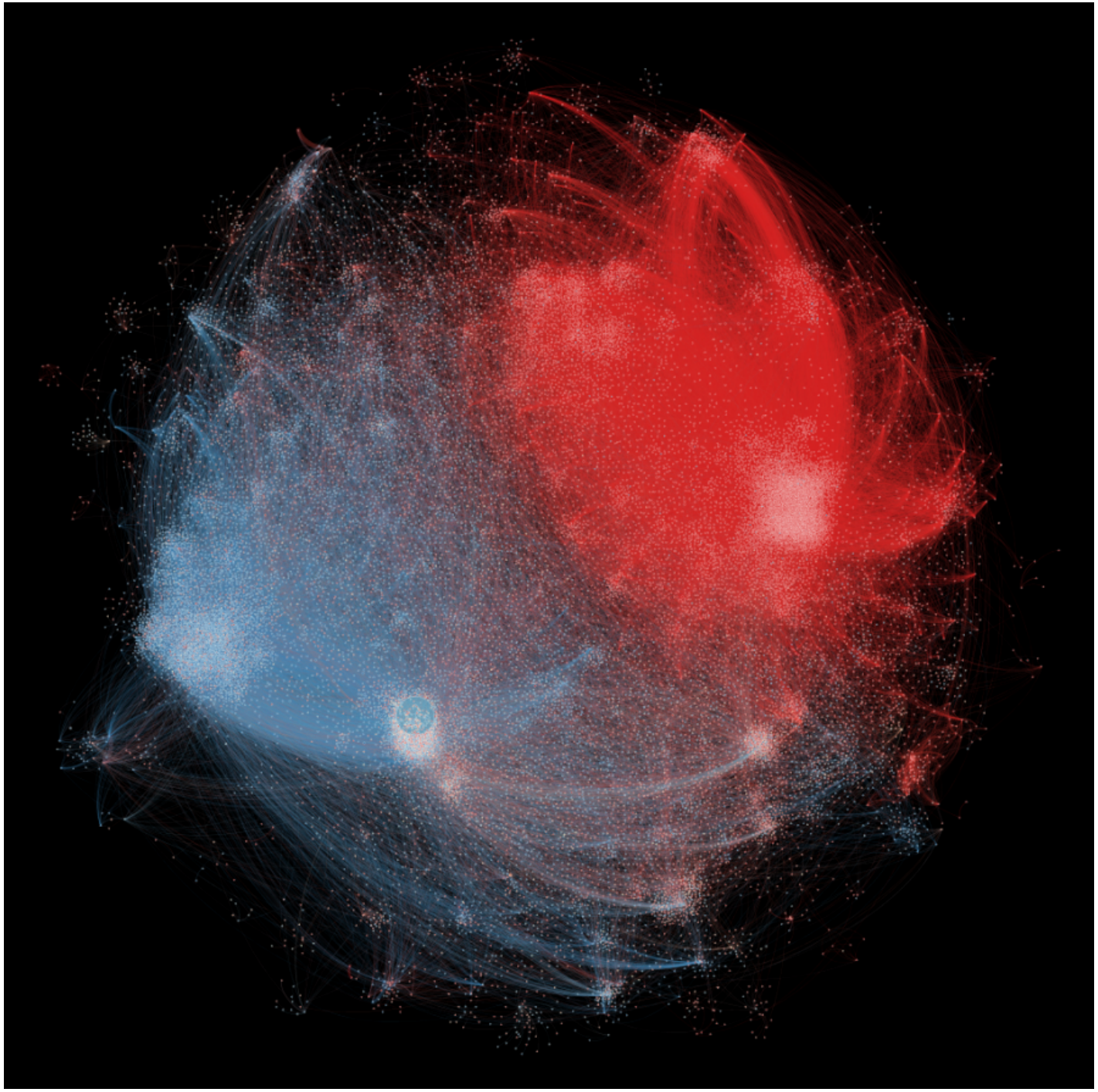
Christakis & Fowler, NEJM, 2007



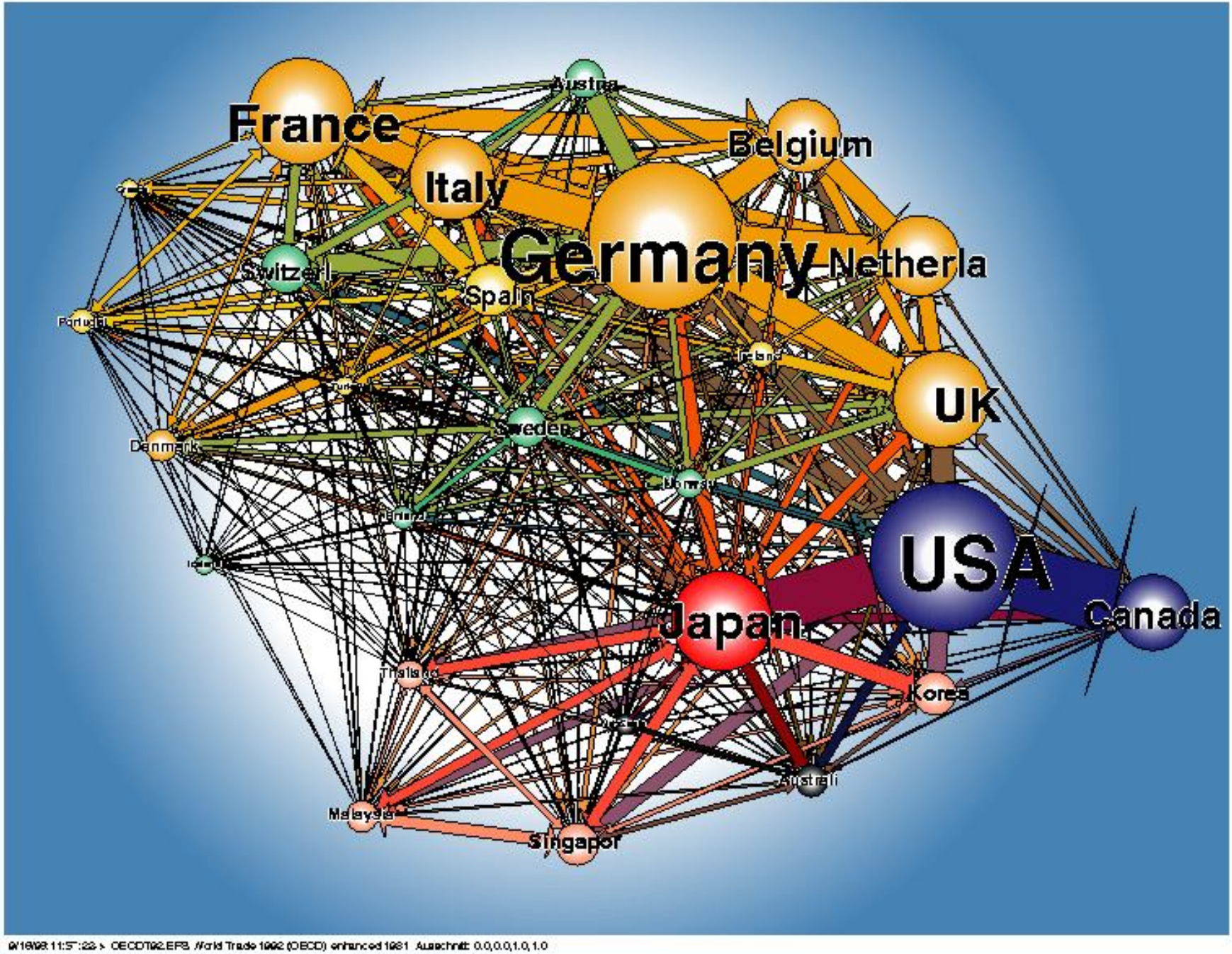
Adamic & Glance, 2004, IWLD



Email network of a company



Barbera et al, 2015, Psychological Science



(c) Lothar Krempel, Max Planck Institut f. Gesellschaftsforschung, Cologne

9/18/98 11:57:22 > OECDT92.EPS /World Trade 1992 (OECD) enhanced 1981 Ausschnitt: 0.0,0.0,1.0,1.0

Basic concepts

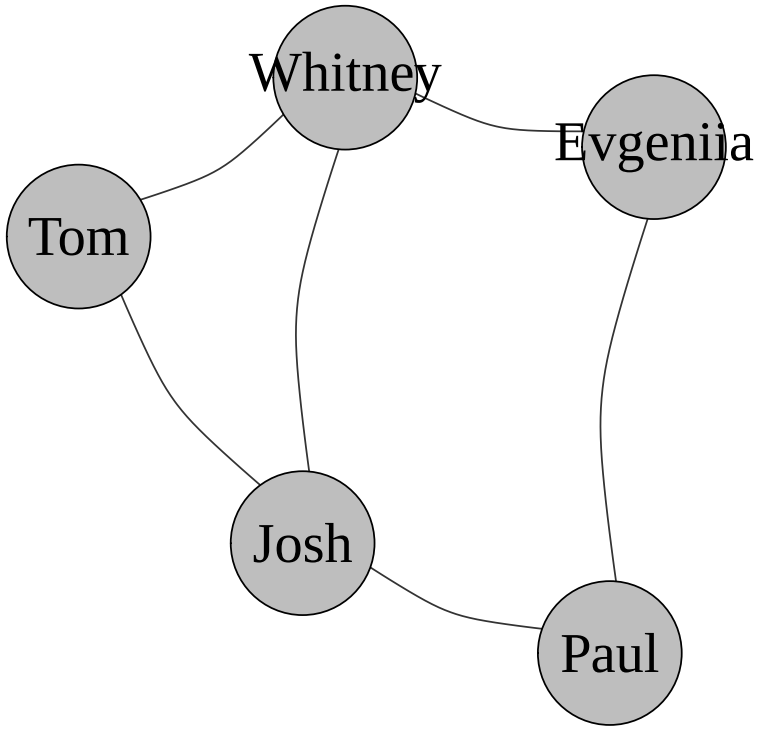
- Node (vertex): each of the units in the network
- Edge (tie): connection between nodes
  - Undirected: symmetric connection, represented by lines
  - Directed: imply direction, represented by arrows
- A network consists of a set of nodes and edges

Networks everywhere

- Classroom: students / friendships
- Twitter: users / retweets
- Academic literature: papers / citations
- Internet: websites / hyperlinks
- Trade: countries / trade flows
- Biology: neurons / connections
- Text: documents / cosine similarity

Basic concepts

Network Visualization

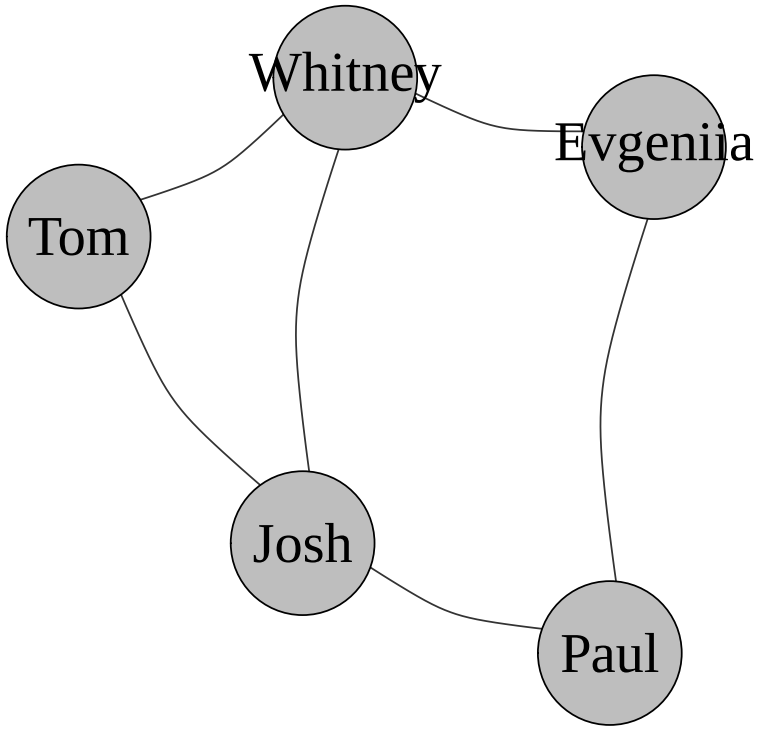


Adjacency Matrix

	P	J	E	W	T
P	0	1	1	0	0
J	1	0	0	1	1
E	1	0	0	1	0
W	0	1	1	0	1
T	0	1	0	1	0

Basic concepts

Network Visualization



Edgelist

	Node1	Node2
1	Paul	Josh
2	Paul	Evgeniia
3	Josh	Whitney
4	Josh	Tom
5	Whitney	Tom
6	Evgeniia	Whitney

Social network analysis

Three levels of analysis:

1. **Micro**: who are the most *influential* nodes? (centrality measures)
2. **Meso**: what type of communities or clusters emerge in the network? (community detection, latent space models...)
3. **Macro**: what are the mechanisms that explain how nodes are connected? (hierarchy, homophily, diffusion..)

Three types of tools

1. **Visualization**: layout algorithms
2. **Quantification**: measures of centrality
3. **Experimentation**: at node and network level