Different kinds of networks
Basic terminology
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Outline of the course

Social Network Analysis

1: Introduction

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NASP-ESLS Ph.D. Programme - University of Milan

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A network

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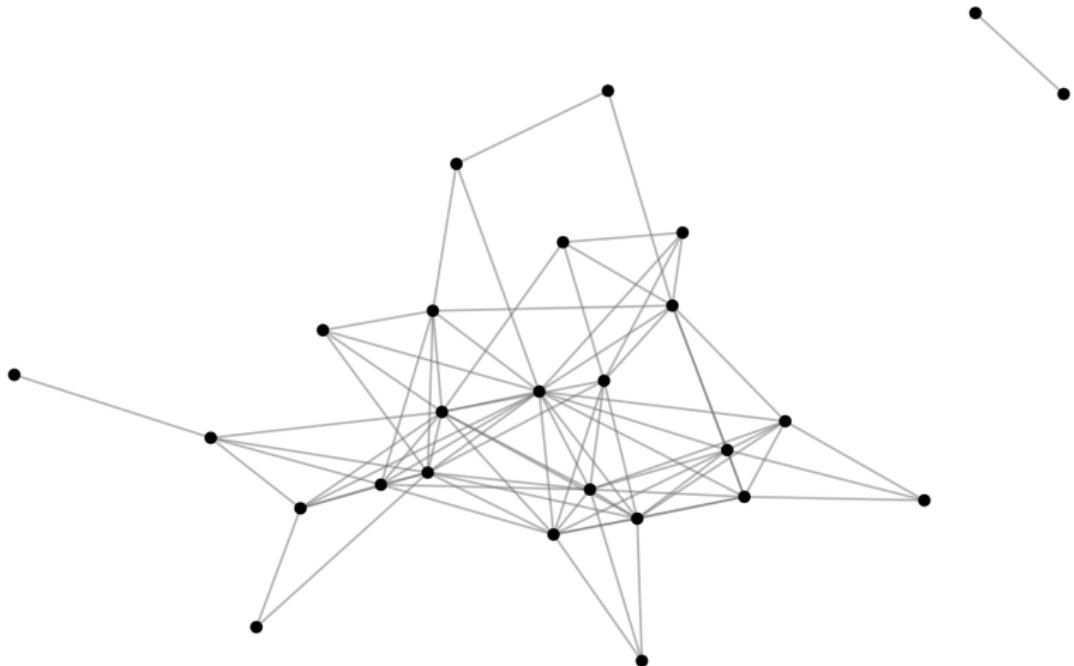
Another network

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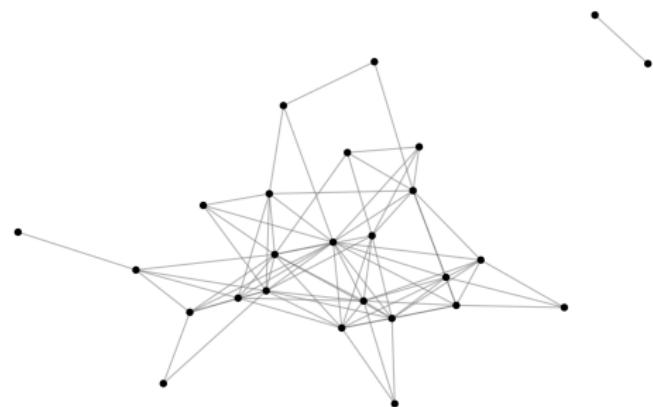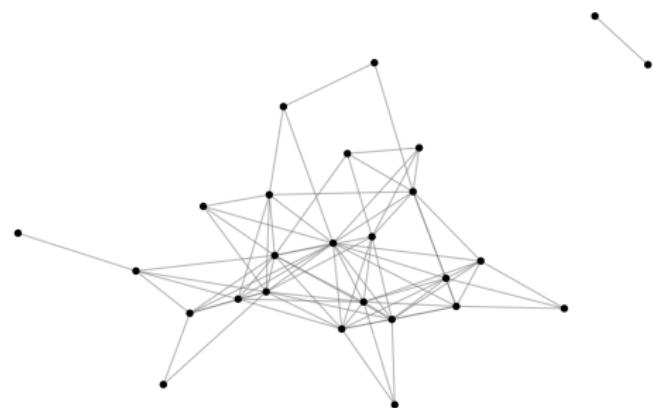
Collaboration among professionals

▶ Collaboration between freelancers in a coworking space

Bianchi, Casnici, and Squazzoni (2018)
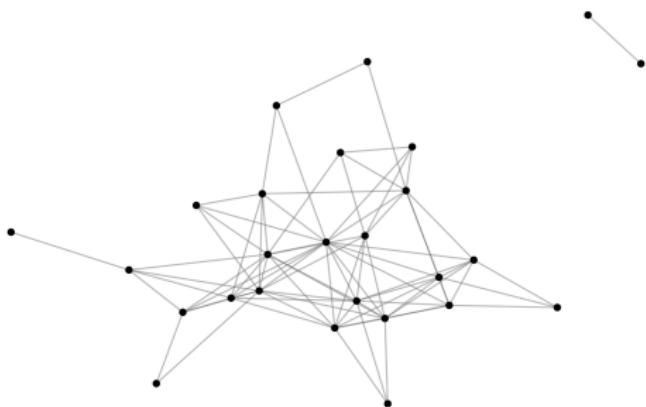
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Collaboration among professionals

- ▶ Collaboration between freelancers in a coworking space
- ▶ actors are individuals

Bianchi, Casnici, and Squazzoni (2018)
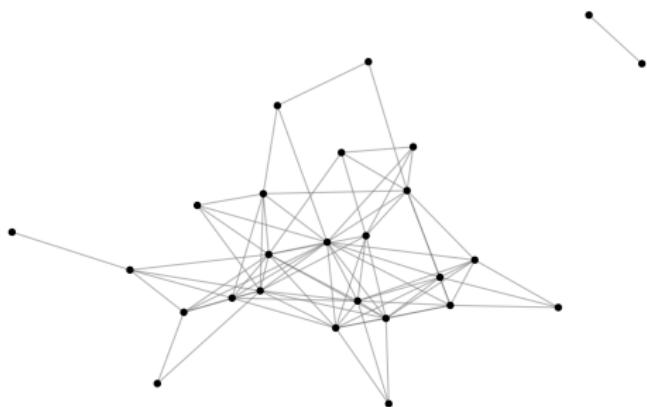
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Collaboration among professionals

Bianchi, Casnici, and Squazzoni (2018)

- ▶ Collaboration between freelancers in a coworking space
- ▶ actors are individuals
- ▶ *undirected* network: $x \rightarrow j \Leftrightarrow j \rightarrow x$

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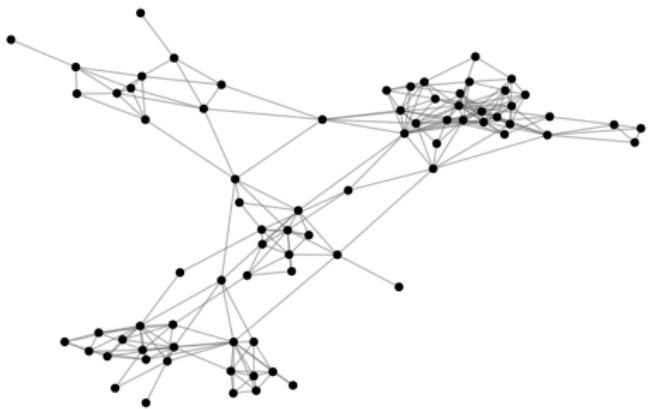
Collaboration among professionals


Bianchi, Casnici, and Squazzoni (2018)

- ▶ Collaboration between freelancers in a coworking space
- ▶ actors are individuals
- ▶ *undirected* network: $x \rightarrow j \Leftrightarrow j \rightarrow x$
- ▶ No organization $\Rightarrow$ autonomous social selection $\Rightarrow$ relatively low clustering
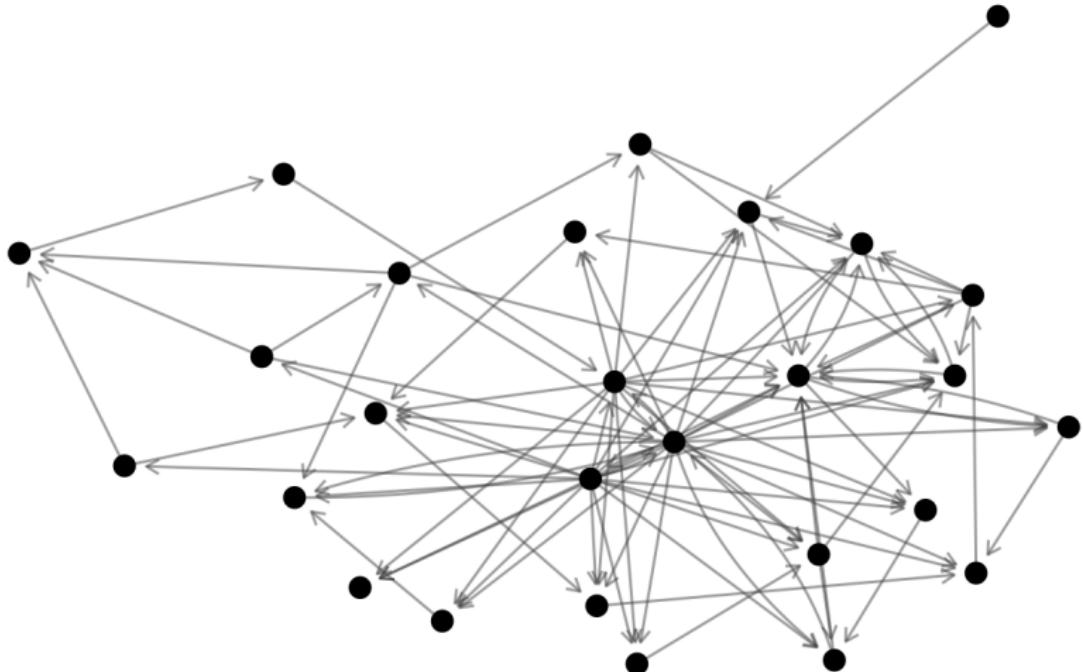
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Collaboration within an organization

▶ Collaboration between employees of a publishing company

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# Collaboration within an organization
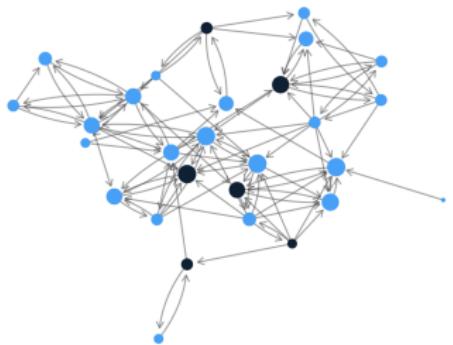
- ▶ Collaboration between employees of a publishing company
- ▶ Organization $\Rightarrow$ formal hierarchy $\Rightarrow$ interactions are constrained by an exogenous structure $\Rightarrow$ more *clustering*

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A different kind of network
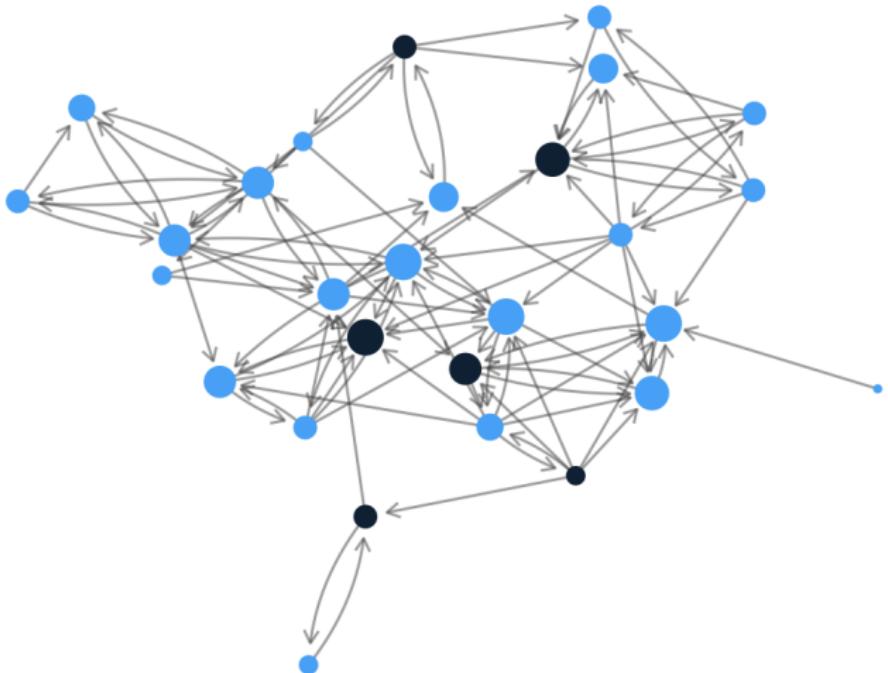
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What's the difference?

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Network 1

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Network 2

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# Network 1

▶ Requests of professional advice between freelancers in a coworking space

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Network 1

► Requests of professional advice between freelancers in a coworking space
► *directed* network

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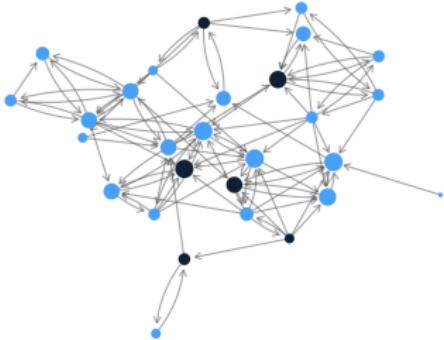
Network 1

- ▶ Requests of professional advice between freelancers in a coworking space
- ▶ *directed* network
- ▶ heterogeneous resource distribution $\rightarrow$ low level of *reciprocity* + high clustering $\rightarrow$ social status

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Network 2

Bianchi, Casnici, and Squazzoni
(2018)

▶ Requests of (non-business)
social support between
freelancers in a coworking
space

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Network 2

Bianchi, Casnici, and Squazzoni
(2018)

▶ Requests of (non-business)
social support between
freelancers in a coworking
space
▶ *directed* network

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# Network 2

Bianchi, Casnici, and Squazzoni (2018)

▶ Requests of (non-business) social support between freelancers in a coworking space
▶ *directed* network
▶ more homogeneous resource distribution $\rightarrow$ higher level of reciprocity

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Basic terminology

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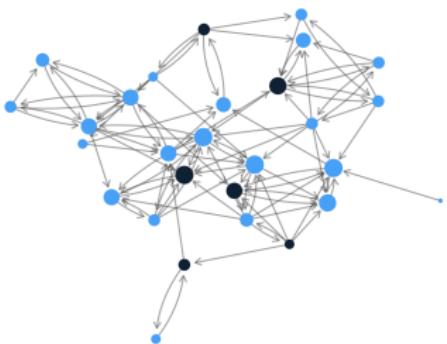
Nodes and ties

- *graph*: a pair $G(V, E)$

- V: a set of *vertices* (sing., *vertex*) or *nodes* (usually denoted as i, j, k)

- E: a set of *edges* or *links*

- Social scientists' parlance:
  - *nodes = actors*
  - *edges = ties*

- *directed* graph: *digraph* (nodes and *arcs*)

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Social network research
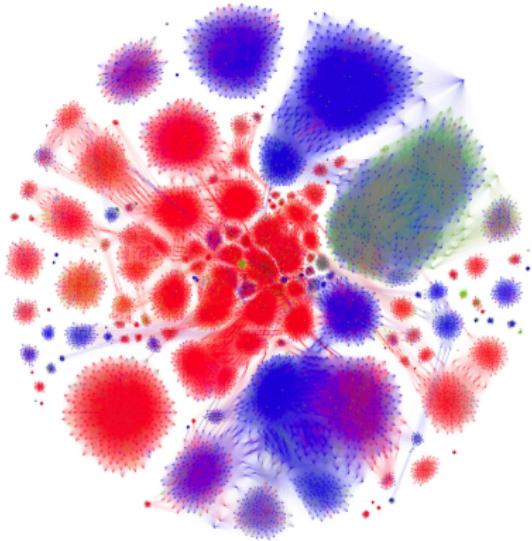
- ▶ *Social network research*: the application of a coherent set of philosophical, mathematical, and statistical tools to study social relationships (we'll see different purposes next time)
- ▶ *Social Network Analysis* (SNA): analysing network (relational) quantitative data with mathematical and statistical tools
  - ▶ computing descriptive statistics: e.g., how large is this network? is this network more or less centralized? who are the nodes that bridge these two network clusters?
  - ▶ testing hypotheses of social processes: e.g.,has reciprocity affected the evolution/emergence of this network?is this network more or less homophilous than that other network?
- ▶ *Network science*: mostly used by researchers with background in physics, mostly interested in developing simple models describing many (social) networks across many fields (GENERALIZATION ALERT)

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Small and large networks
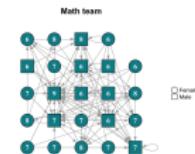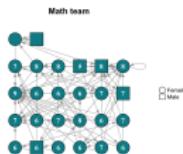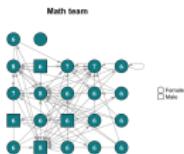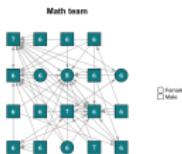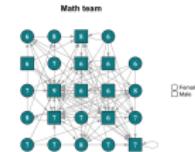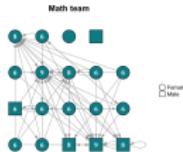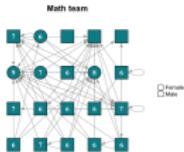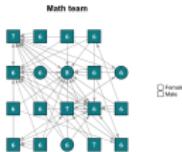
$n = 29$
Bianchi, Casnici, and Squazzoni
(2018)
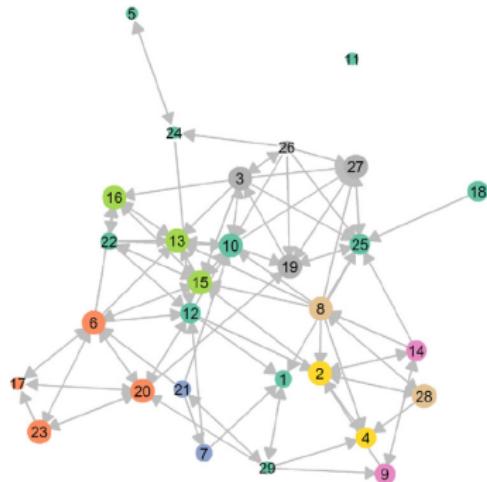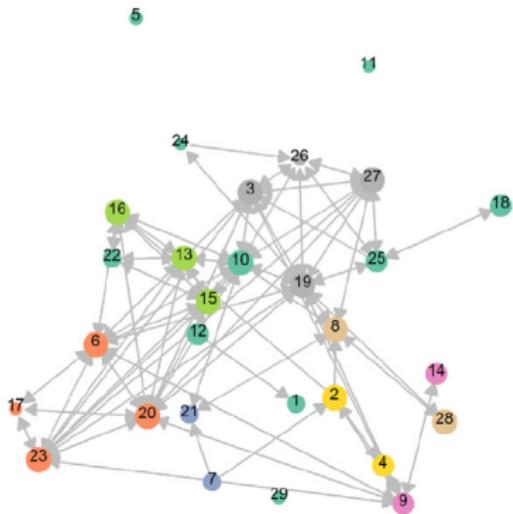
$n = 12{,}019$
Cousin, Bianchi, and Vitale
(2021)

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Multi-level networks

De Gioannis, Bianchi, and Squazzoni (2021)

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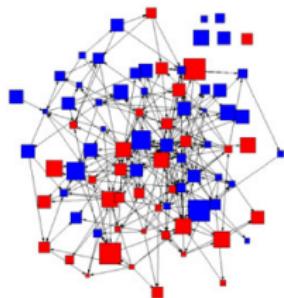
Multiplex networks

Bianchi, Casnici, and Squazzoni
(2018)

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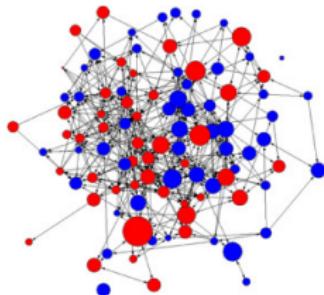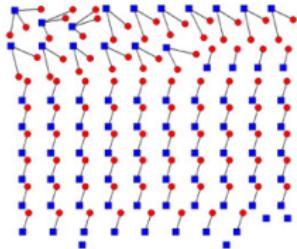
More complex multilevel networks
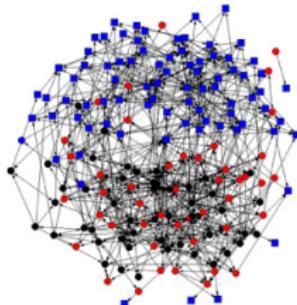
(a) Laboratory collaboration network (A)

(b) Researcher advice network (B)
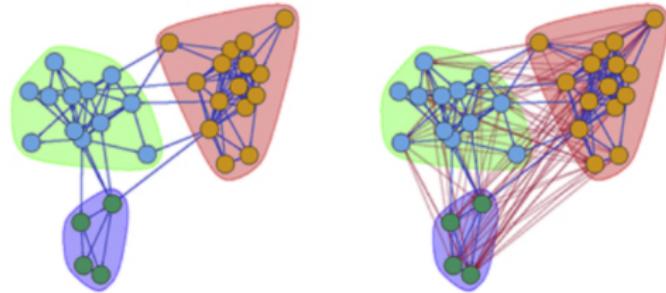
(c) Researcher-laboratory affiliations (X)

(d) Overall multilevel network (M)

Wang et al. (2016)

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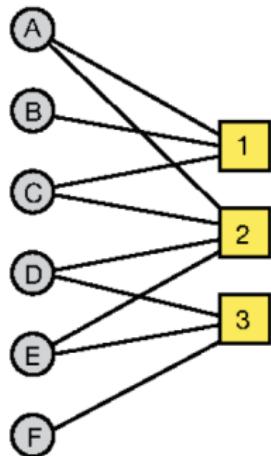
Positive and negative ties
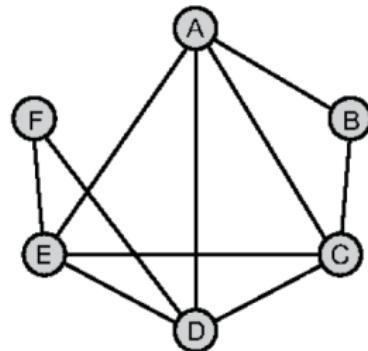
Friendship and dislike ties in a class of a Hungarian high school (Stadtfeld, Takács, and Vörös 2020)

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Bipartite (two-mode) networks

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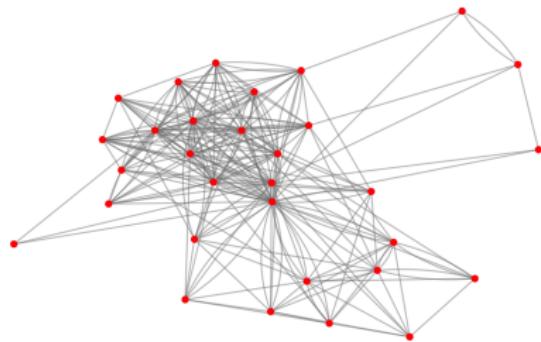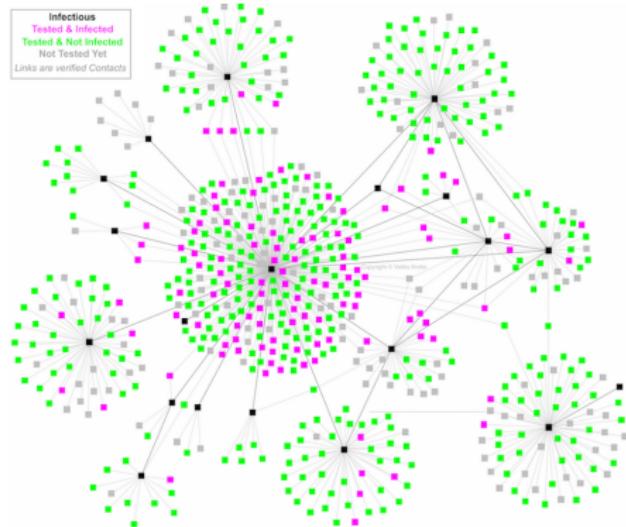
Social ties
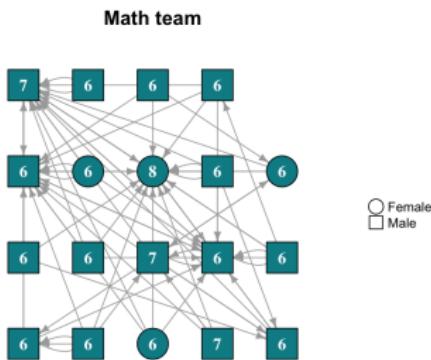
Friendship ties within a class of a Hungarian high school (Vit et al. 2023)

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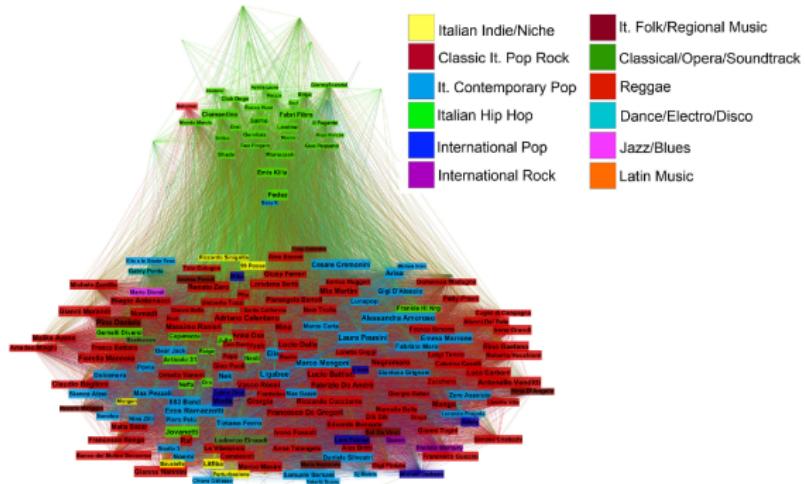
Social contacts

Contacts of a sample of
tubercolosis-infected
people in Southwest
America, 2010 (Andre et al.
2007)

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Social perception

Math team

○ Female
□ Male

Nominations to represent a classroom (high school in Milan, 2019) in a math competition by gender (De Gioannis, Bianchi, and Squazzoni 2021)

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Social network?

Airoldi (2021)

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Good models for good research

▶ Graph theory allows us to represent relationships between objects.

▶ In the social sciences we use it to model social relationships between social actors. *Social* networks are models of *social* relationships.

▶ Models are neither true or false. They can be more or less useful as representations of what we aim to study.

▶ Beware of the assumptions!

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Schedule

Link to syllabus

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Assessment

1. Active participation to classes (i.e., engaging in discussions).

2. Final meeting: oral presentation reporting:

   ▶ simple analysis of network data (provided by me or collected by you) OR
   ▶ critical analysis of a previously assigned article reporting empirical network research OR
   ▶ design of an empirical network research related to your own dissertation project

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Background reading

Robins (2015) (Ch. 1-2)

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References I

Airoldi, Massimo. 2021. 'The Techno-Social Reproduction of Taste Boundaries on Digital Platforms: The Case of Music on YouTube'. *Poetics*, 101563. https://doi.org/10.1016/j.poetic.2021.101563.

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Robins, Garry. 2015. *Doing Social Network Research. Network-Based Research Design for Social Scientists*. London: Sage.

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Wang, Peng, Garry Robins, Philippa Pattison, and Emmanuel Lazega. 2016. 'Social Selection Models for Multilevel Networks'. *Social Networks* 44: 346–62.
https://doi.org/10.1016/j.socnet.2014.12.003.