

# **Social Network Analysis**

**Adina Nerghes** 



# Digital Humanities Lab

- Advancing the humanities through digital methods
- Focus on big 'textual' data
- Interdisciplinary
  - Events & Entities
  - Change
  - Connections



### Marieke van Erp



Melvin Wevers



Adina Nerghes



### We live in a connected world

"To speak of social life is to speak of the **association** between people – their associating in work and in play, in love and in war, to trade or to worship, to help or to hinder. It is in the **social relations** men establish that their interests find expression and their desires become realized."



Social Network Analysis (SNA) provides a set of **tools** to empirically extend our theoretical intuition of the patterns that construct **social structure**.



# Why networks matter

- Intuitive: "goods" travel through contacts between actors, which can reflect a power distribution or influence attitudes and behaviors. Our understanding of social life improves if we account for this social space.
- Less intuitive: patterns of inter-actor contact can have effects on the spread of "goods" or power dynamics that could not be seen focusing only on individual behavior.



### Jacob Moreno and the Birth of Social Network Analysis

- Psychiatrist and psychodrama founder
- Moreno conducted studies to research group behavior using "sociometric tests"
- The four features of social network analysis (Freeman, 2004):
  - Motivated by a structural intuition based on ties linking social actors
  - Grounded in systematic empirical data
  - Use of graphic imagery
  - Relied on the use of mathematical and/or computational models



Moreno's network of runaways.



### A relational and structural perspective

- The network perspective involves the study of entities as embedded in a network of relations and seek explanations for social behavior in the structure of these networks rather than in the individuals alone
- Not just a methodology: it is a unique perspective on how society functions. Instead of focusing on individuals and their attributes, or on macroscopic social structures, it centers on relations
- Applications:
  - Understand how to improve the effectiveness of a network
  - Uncover patterns in relationships or interactions
  - Find/follow paths that information flows
  - Identify key players
  - Test hypotheses
  - Promote social cohesion



This is an early depiction of what we call an 'ego' network, i.e. a personal network. The graphic depicts varying tie strengths via concentric circles (Wellman, 1998)

Similarities			Social Relations				Interactions	Flows
Location	Membership	Attribute	Kinship	Other role	Affective	Cognitive	e.g.,	e.g.,
e.g.,	e.g.,	e.g.,	e.g.,	e.g.,	e.g.,	e.g.,	Sex with	Information
Same	Same	Same	Mother of	Friend of	Likes	Knows	Talked to	Beliefs
spatial	clubs	gender	Sibling of	Boss of	Hates	Knows	Advice to	Personnel
temporal	Same	Same		Student of	etc.	about	Helped	Resources
space	etc.	etc.		Competitor of		Sees as happy	Harmed	etc.
						etc.	etc.	



Network Analysis in the Social Sciences Stephen P. Borgatti, *et al. Science* **323**, 892 (2009); DOI: 10.1126/science.1165821



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temporal space	Same	Same		Student of	etc.	about	Helped	Resources
	etc.	etc.		Competitor of		Sees as happy	Harmed	etc.
(Borgatti et. al., 2009)					etc.	etc.		



A visualization of US bloggers (Adamic and Glance, 2005)



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space	etc.	etc.		Competitor of		Sees as happy	Harmed	etc.
						etc.	etc.	



Centrality and Prestige of Florentine Families



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Bearman, P. S., Moody, J., & Stovel, K. (2016). *Chains of affection: The structure of adolescent romantic and sexual networks*. Handbook of Applied System Science, 110(1), 164–190.



A reduced social network depicting email flow from group leaders in a number of groups in Enron.



Irons, A., & Lallie, H. (2014). Digital Forensics to Intelligent Forensics. Future Internet, 6(3), 584–596.

### Semantic networks

- Defined as: "representational format [that would] permit the 'meanings' of words to be stored, so that humanlike use of these meanings is possible'' (Quillian, 1968, p. 216)
- The meaning of a word could be represented by the set of its verbal associations
- Basic assumption: language (is) can be modeled as networks of words and the (lack of) relations among words







**Networks of words** 

### Semantic Networks

**Networks of concepts** 



# What makes semantic networks interesting?

- Correspond to a natural way of **organizing information** and the way humans think
- Semantic networks allow to **model** semantic relationships (Sowa, 1991)
- Investigate the meaning of texts by detecting the relationships between and among words and themes (Alexa, 1997; Carley, 1997a)
- Allow the analysis of words in their **context** (Honkela, Pulkki, & Kohonen, 1995)
- Expose semantic **structures** in document collections (Chen, Schuffels, & Orwig, 1996)
- Very **flexible** way of organizing data: you can easily **extend** the structure of semantic networks if needed
- You can easily convert **almost any** other data structure into semantic networks
- To represent **knowledge** or to support automated systems for reasoning about knowledge.





# Networks and Modes

- Social and semantic networks are generally analyzed:
  - Separately
  - As 1-mode networks





two-mode network





### Socio-semantic networks

- The socio-semantic framework can account for the meaning structure along with the underlying social structures
- Can map not only how meaning is created through word co-use but also map this to the pattern of users connected to words and user interactions
- Based on 2-mode networks:

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 two-mode representations of actors/ entities and the concepts they employ



# Socio-semantic networks

 Actors can be related to each other through the different symbolic forms they use, e.g. ideologies, as in a two-mode network of actors and concepts.





Fuhse, J., Stuhler, O., Riebling, J., & Martin, J. L. (2019). Relating social and symbolic relations in quantitative text analysis. A study of parliamentary discourse in the Weimar Republic. Poetics.

#### MOMMA By Mell Lazarus



### Thank you





"Whenever we look at life, we look at networks." - Fritjof Capra

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