About me
Network analysis: studying relationships in their context and structure
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We are interested in this relation.
The central relation that interests us appears in a context where the two individuals also have other relationships.

Our two individuals can have common relations.
These "neighbors" can also be in relationship with each other, independently of the couple of individuals we are interested in.
Or be connected to individuals who do not have a relationship with our two basic individuals.
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Network analysis: studying relationships in their context and structure
Applied Network Analysis

1. Some typical applications
Circulation networks
While we often speak of networks as a map, this time it is a question of drawing one, with cities, ports, fairs, and trading posts, linked together by land, river, and sea communications. From merchant agreements to ship's logs or customs accounting books, many historical sources allow us to reconstruct the entry and exit of people and goods.


Network of the "Incanto", the annual auction system for Venetian trade lines (13th-15th centuries).
Affiliation networks
Very useful for analyzing lists of members of learned societies, participants in events, or people sitting on boards of directors, this kind of bipartite graph is easy to model since most serial historical sources are already organized into such lists of affiliations.


Network of philanthropic charities in Geneva in 1903.

↑ Connected works if they have affiliated members in common.

→ People connected if they are affiliated with the same charities (main component). Size = intermediality; color = Mr. (black), Mrs. (gray), Miss (white).
Kinship networks

When we think of genealogical studies, we readily imagine two-dimensional trees, centered around a single person. But the reality and complexity of society quickly makes the study of kinship networks necessary. The genealogical databases allows to take into account a multitude of parameters of different family links and fine temporality of all these individual trajectories.
Occurrences
Extraction of named entities (people, places, organizations, etc.) from documents. This makes it possible to link individuals mentioned in records, to connect people involved in contracts in a notary's register, or concepts mentioned scholarly works.


Network of transactions extracted from notarial deeds (in color) connected by the people who signed them (small gray dots). Acts of the seigneury of Castelnau Montratier (South-West France) between 1238 and 1768.
Co-occurrences

The next step is often to create a co-occurrence network. This is how we can see the structure of concepts used simultaneously in a text, whether it is a literary work, a correspondence, or a collection of official documents. We can of course apply the same principle to other bipartite networks, starting for example from a network of affiliations (B) to see only the intersections, i.e. the relations created between members of the same learned societies.

Hoffman, Cointet, Brandt, Key, Bearman (2018). « The (Protestant) Bible, the (printed) sermon, and the word(s): The semantic structure of the Conformist and Dissenting Bible, 1660-1780 », Poetics, 68, 89-103.

→ Coocurrence network of nouns and verbs in a sliding window of 5 Bible verses.

↓ Comparative networks of nouns and verbs in verses quoted in sermons by English Protestant nonconformists (Puritans) on the left and conformists (Anglicans) on the right, in the 18th and 19th centuries.
Correspondence networks
Popularized by several large projects on letter corpora, it has the particularity of not being based on the content of the documents but on their metadata: it is not the occurrences of individuals that are extracted but specifically the sender and the recipient.


Benjamin Franklin and Voltaire correspondence networks (letters received and sent).
Sociograms

It’s probably the most intuitive representation of an interpersonal network. It is not necessarily the most obvious one to construct for the historian because individual relationships are generally not extractable in a serial way and are very heterogeneous. But the exercise of reconstructing the social network of a group of individuals based on their personal writings (for friendly, intimate relationships), their accounting records (for economic relationships) and official documents (for more political relationships), can be very fruitful.


† Synthesis of all the relationships between Florence’s great families in the 15th century: marriage and economic relationships (top left), political relationships and alliances (top right).

← A case study of marriage alliances.
Temporal networks
It is an interesting way to analyze large number of linked events (a succession of battles involving the same troops, for instance), or a social network of individuals that unfolds over time (for example, on the basis of a personal diary in which encounters can be dated). This way of fixing vertices at a point in time is often used to represent citations between publications, to show a kind of intellectual "genealogy".


Network of philanthropic organizations in New York, connected if they share members. Organizations are placed on the time axis (vertical) at the year they have their first relationship.
Applied Network Analysis: Some Typical Applications

- The Journal of Historical Network Research (open access)
- The HNR Conference and other events
- The HNR Bibliography, >1000 references

www.historicalnetworkresearch.org
Applied Network Analysis:

II. Understanding what type of source will be transformed into a network
Understanding what type of source will be transformed into a network

**METAPHORICAL NETWORKS**
- The intuitive picture
  - Using network analysis terminology to describe a situation. Convenient because these concepts are very effective for history, but limited to a very descriptive approach.

**RECONSTITUTED NETWORKS**
- The catch-all patchwork
  - Not made from serial data, but drawn from information compiled, to give an overview of the knowledge we have on a subject. Heterogeneity and multiple types of relations generally prevents formal analysis.

**EXTRACTED NETWORKS**
- From a list to a graph
  - Network extracted from the contents of a well-defined and homogeneous corpus of documents, often presented as a list (or transformed into a list) and modeled as a bipartite graph (that can be projected into a one-mode network).

**METADATA NETWORKS**
- Mapping the documents themselves
  - Network based on documents metadata, to analyse their circulation, authors, thematic proximity, etc. For very large datasets, it makes sense to focus on overall flows rather than on the content of each document.

Understanding what type of source will be transformed into a network

A conceptual framework to prepare the modeling
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Scenario 1: Circulation network with multiple transportation means, places, goods, routes, letters, geopolitical relations, etc.
Understanding what type of source will be transformed into a network

Scenario 2: Affiliation network based on interlocking data with multiple companies, institution, categories, etc.
Scenario 3: **Social network**
Based on diaries, letters, adding information on friendship groups, families, etc.

Applied Network Analysis:

III. Defining the role of network analysis in the research process
Defining the role of network analysis in the research process

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Defining the role of network analysis in the research process

Demonstration

Data can be understood without being visualized, but it is effective in conveying a message.
Defining the role of network analysis in the research process
Visualization is necessary to understand the data, it brings out knowledge.
Defining the role of network analysis in the research process
Defining the role of network analysis in the research process

Interactive visualization is a way to explore data.
Defining the role of network analysis in the research process
Illustration

Visualization has no meaning in itself, it is a decoration that conveys the idea that we are talking about something complex.
Defining the role of network analysis in the research process
Applied Network Analysis:

IV. Assessing the implications for historical discourse
Translation from one language to another has always existed, but multiplying the steps adds to the complexity of source criticism.
Translating results into interpretations
Example: what does *betweenness centrality* mean in these situations?
Conclusion:
The (Digital) Historian’s Toolbox
Conclusion: The (Digital) Historian’s Toolbox

DATA MANAGEMENT
- Data extraction methods
- Data transformation and cleaning tools
- Basic statistical analysis

TEXT MINING
- Ngrams, expressions, co-occurrences
- Named-entity recognition
- Text reuse detection
- Text analysis, classification, similarity
- Topic modeling

NETWORK ANALYSIS
- Sociograms
- Affiliations, bipartite graphs
- Correspondence networks
- Graph interfaces

SPATIAL ANALYSIS
- Cartography
- Statistical mapping
- 3D Modeling

AUDIO/VISUAL
- Annotation
- Facial detection
- Sequence analysis
- Augmented reality

QUANTITATIVE ANALYSIS
- Advanced quantitative analysis
- Career paths, temporality
- Multivariate statistics

BASICS
- Text editor, bibliographical software
- Image and video editor
- Simple database software
- Online publishing, blogs, social media

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