

Network science meets Digital humanities: many challenges and some success stories

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to be best in
point of view.
Translation
another language;
language foreign to
written communication
right





Humanities



Humanities

A Venn diagram consisting of two overlapping circles. The top circle is blue and contains the text 'Humanities'. The bottom circle is orange and contains the text 'Data Mining (OCR, NLP)'. The circles overlap in the center.

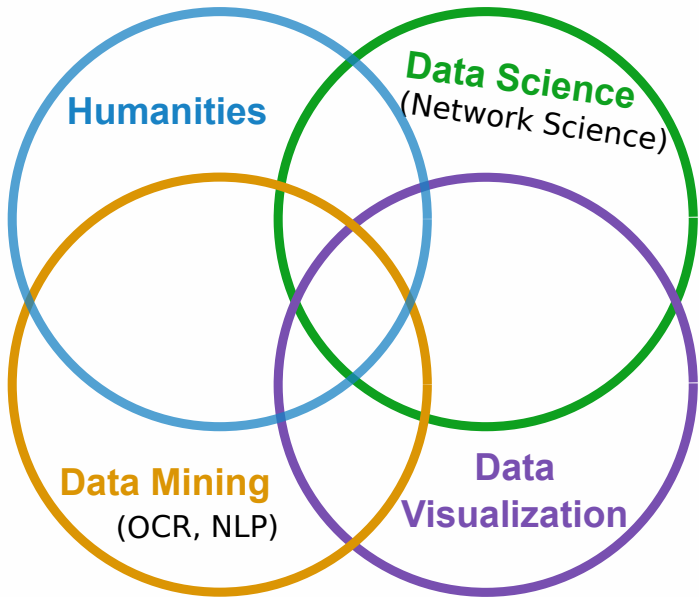
Data Mining
(OCR, NLP)

A Venn diagram consisting of three overlapping circles. The top circle is blue and labeled 'Humanities'. The bottom-left circle is orange and labeled 'Data Mining (OCR, NLP)'. The bottom-right circle is purple and labeled 'Data Visualization'. The circles overlap in various combinations, representing the intersection of these fields.

Humanities

Data Mining
(OCR, NLP)

**Data
Visualization**

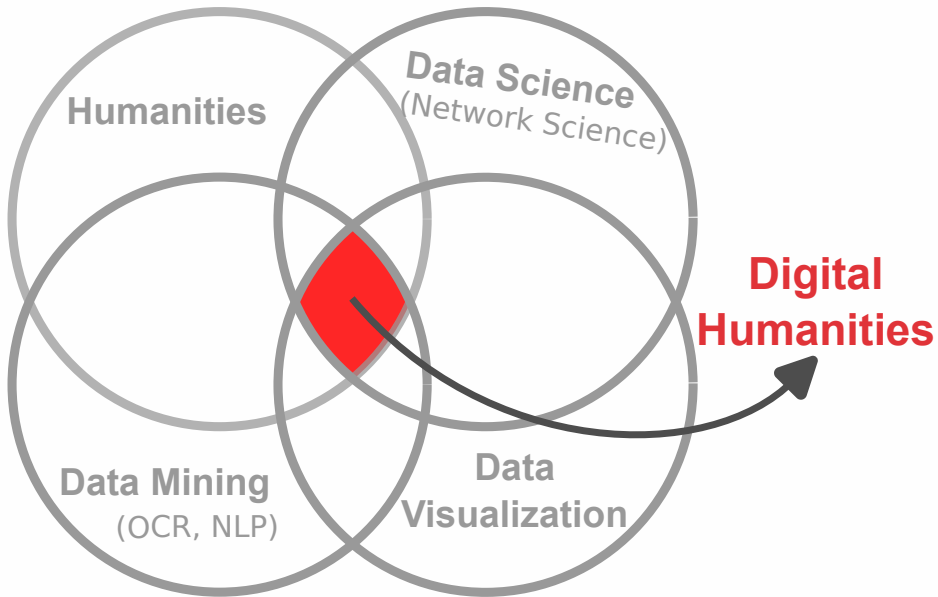


Humanities

Data Science
(Network Science)

Data Mining
(OCR, NLP)

**Data
Visualization**



How networks can help us in addressing research questions *relevant for the humanities?*



- Translation flows in Ibero-American periodicals.

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- Women marginalization in Ibero-American film culture.

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- Women marginalization in Ibero-American film culture.
- Geography of intellectual cooperation during the interwar period.

101
to be best in any
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Translation

Translation flows in
Ibero-American periodicals

language
written commu

Dataset

- A collection of $\approx 31,500$ contributions (records) published in 42 modernist periodicals during the first half of the XXth century.



Data

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- We group periodicals into regions (Iberian peninsula, Andes, Rio de la Plata, etc.)
- We select only **translated contributions** (*i.e.*, 981 records).

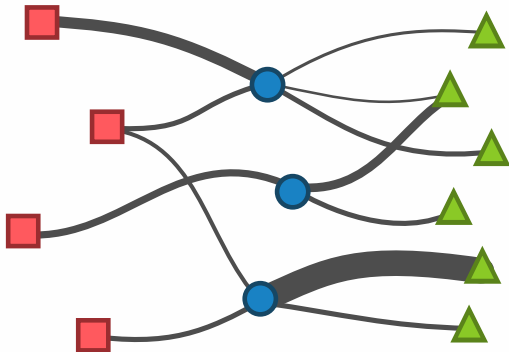
Data

Dataset

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- We group periodicals into regions (Iberian peninsula, Andes, Rio de la Plata, etc.)
- We select only **translated contributions** (*i.e.*, 981 records).
- For each record, we consider its **publication's region**, **original language**, and the **author's country of origin**.

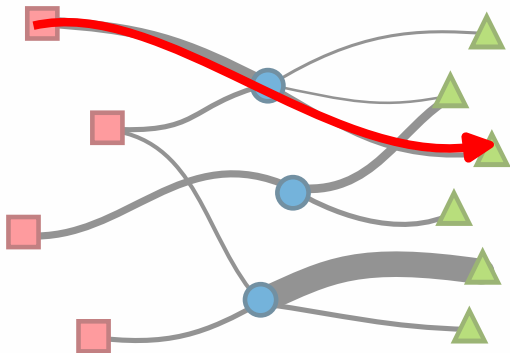
Methods

- We build a tri-partite *weighted* network whose nodes are:
 - **countries of origin,**
 - **languages,**
 - **regions.**

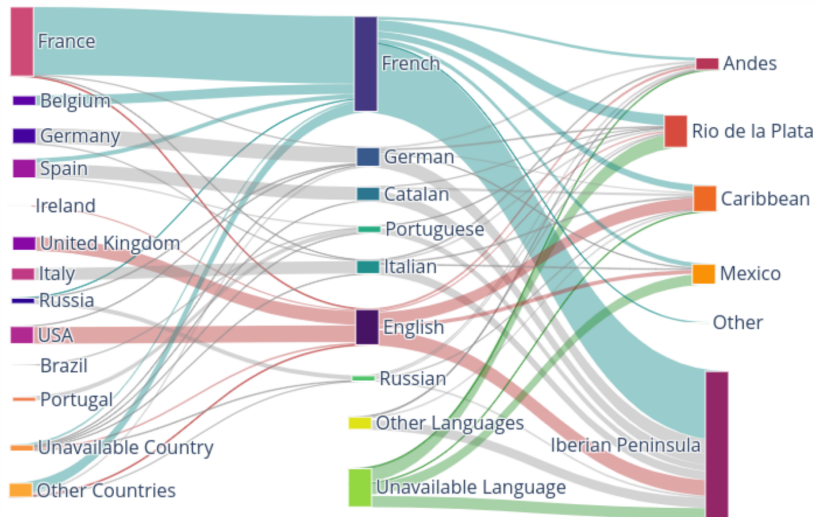


Methods

- We build a tri-partite *weighted* network whose nodes are:
 - **countries of origin,**
 - **languages,**
 - **regions.**
- We analyze the network to study the **flows of translation** (*i.e.*, who is translating what).

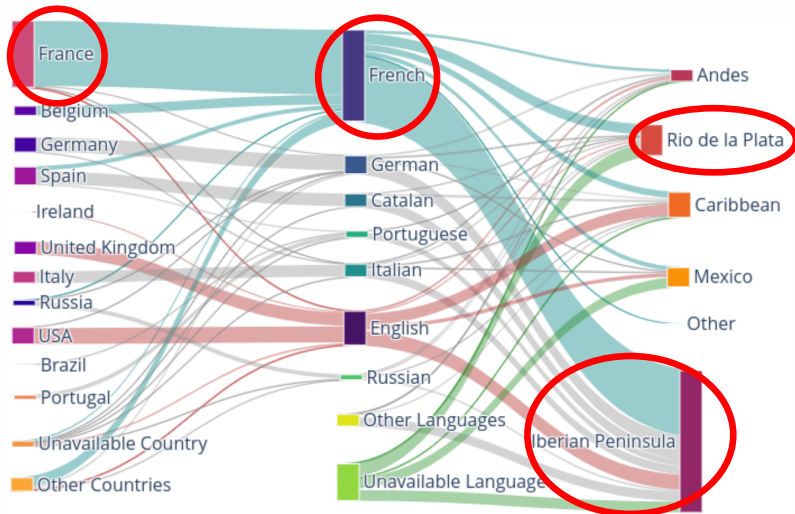


Results



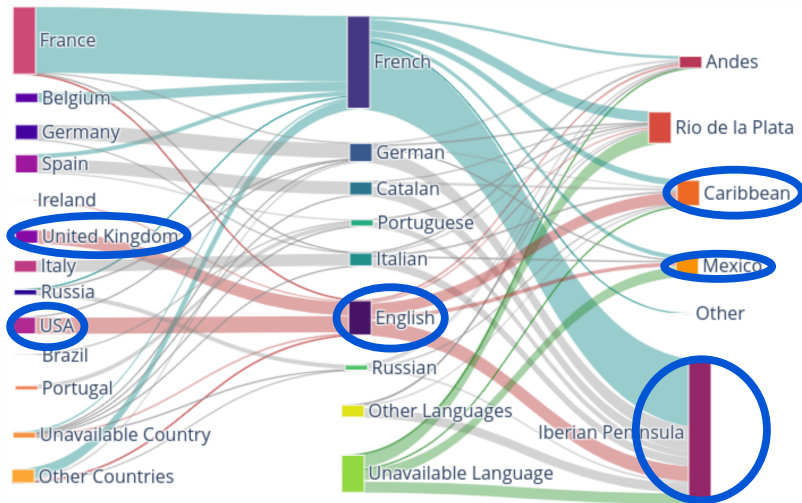
• D. Roig-Sanz et al. "Global Translation Flows in Ibero-American Periodicals: A Network Science Perspective." Accepted for publication (2023).

Results



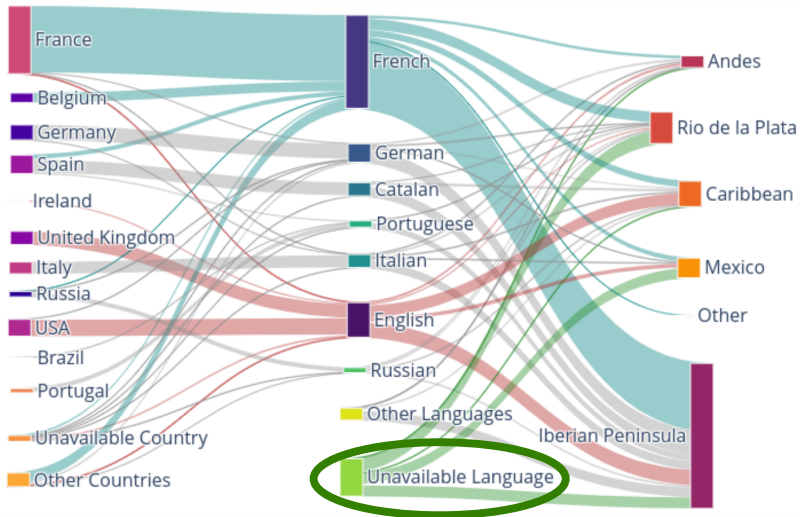
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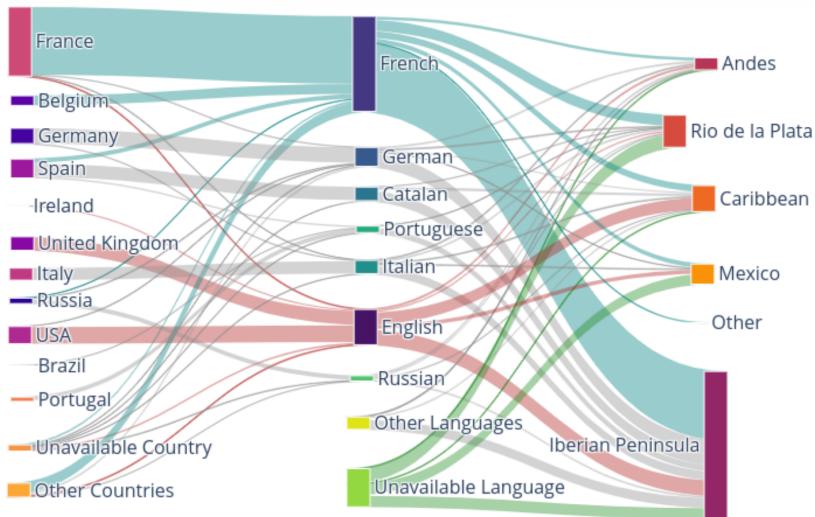
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**Women marginalization
in Ibero-American film culture**

Manually collected (*follow the actor*) relationships between people **associated with film culture** during the first half of XXth century based on:

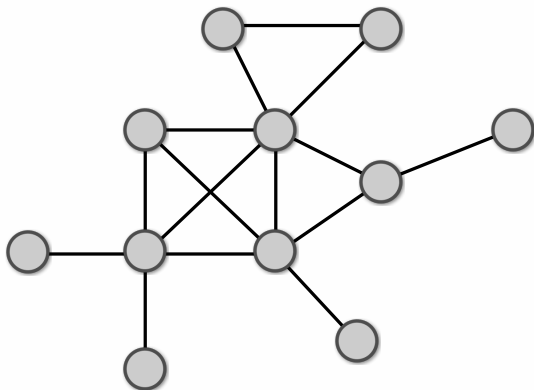
- participation to events (*e.g.*, projections),
- involvement in collective bodies (*e.g.*, a cineclub),
- editorial relationships (*e.g.*, publication in a specialized periodical),
- personal relationships (*e.g.*, friendship),
- epistolary correspondence.

Translating into an unweighted network with $N = 1367$ nodes (women and men).



How **central** (especially in a *diffusion context*) were women in the field of film culture?

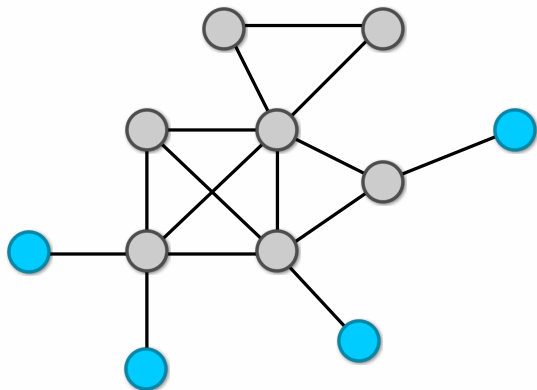
Methods



- S. B. Seidman, *Social Networks*, **5**, 269–287, (1983). DOI: [10.1016/0378-8733\(83\)90028-X](https://doi.org/10.1016/0378-8733(83)90028-X)
- M. Kitsak *et al.*, *Nature Physics*, **6**, 888–893, (2010). DOI: [10.1038/nphys1746](https://doi.org/10.1038/nphys1746)


Methods


 k -shell 1 ($k_s = 1$)

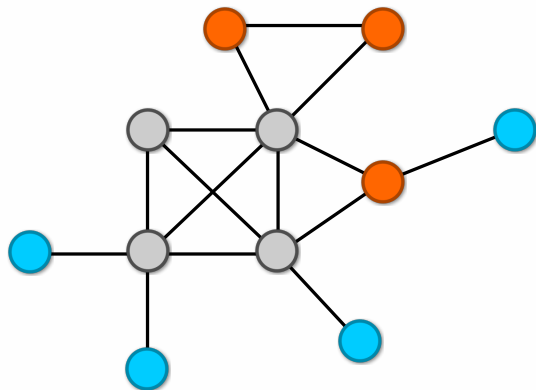


- S. B. Seidman, *Social Networks*, **5**, 269–287, (1983). DOI: [10.1016/0378-8733\(83\)90028-X](https://doi.org/10.1016/0378-8733(83)90028-X)
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Methods


 k -shell 1 ($k_s = 1$)

 k -shell 2 ($k_s = 2$)




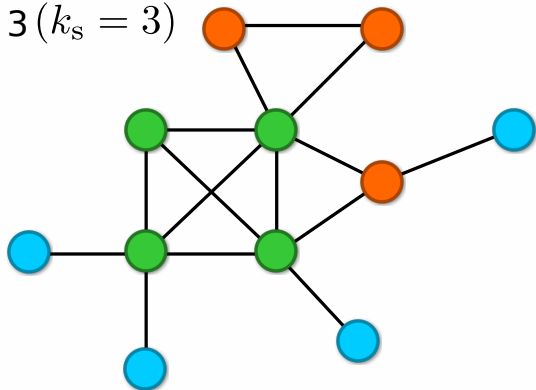
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Methods

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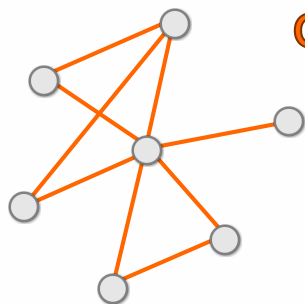
 k -shell 2 ($k_s = 2$)

 k -shell 3 ($k_s = 3$)



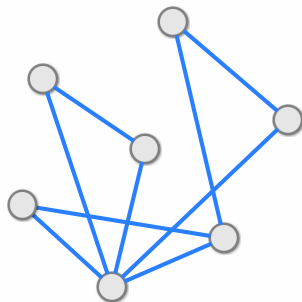
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Methods



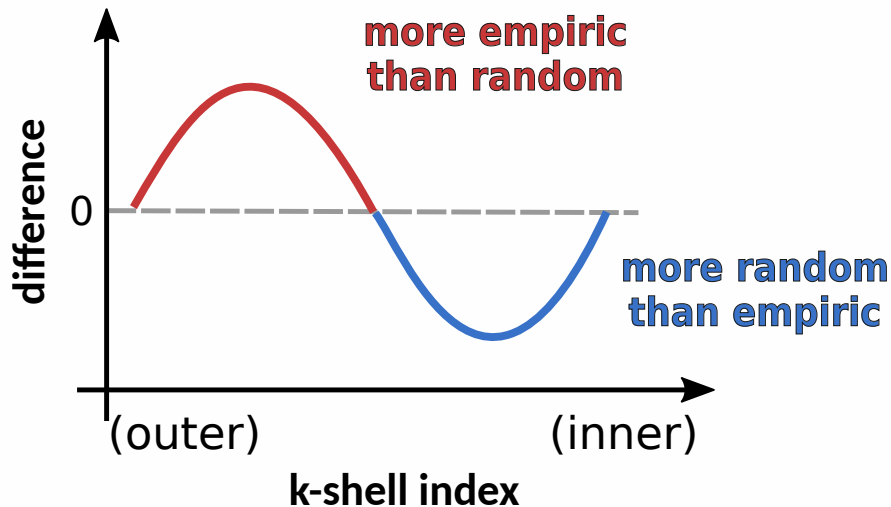
**Original
network**

**Randomized
(shuffled)
counterpart**

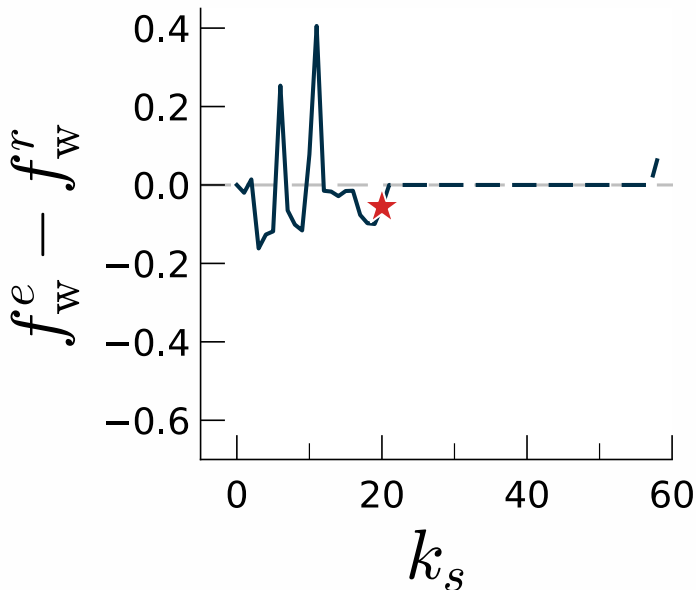


- B. K. Fosdick, *et al.*, *SIAM Review*, **60**, 315–355, (2018). DOI: [10.1137/16M1087175](https://doi.org/10.1137/16M1087175)

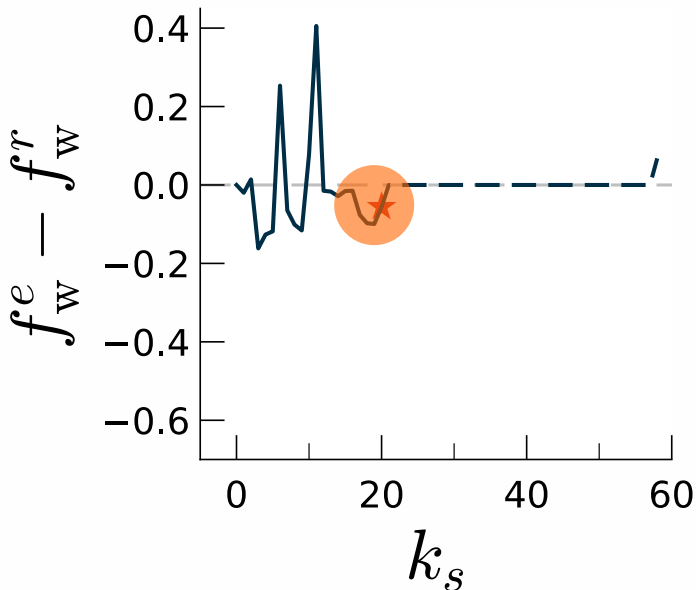
Results



Results



Results



Geography of intellectual cooperation during the interwar period





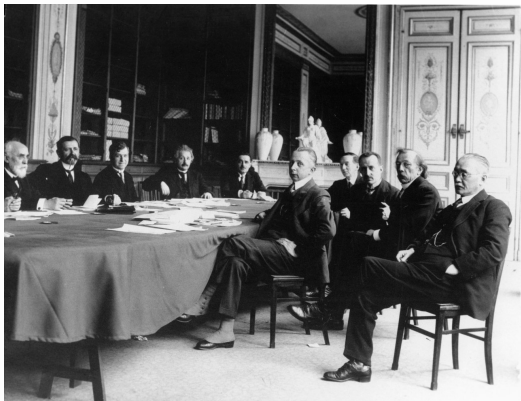
ALL QUIET ON THE WESTERN FRONT

Directed by LEWIS MILESTONE • *a* CARL LAEMMLE de Production • *Story by* ERICH MARIA REMARQUE
Adaptation and Dialogue by MAXWELL ANDERSON and GEORGE ABBOTT

A UNIVERSAL PICTURE

International Committee on Intellectual Cooperation (ICIC)

- Founded in 1922.
- Based in Geneva.
- Advisory organization of the League of Nations.



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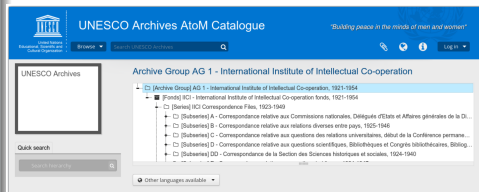
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The data: UNESCO's archives

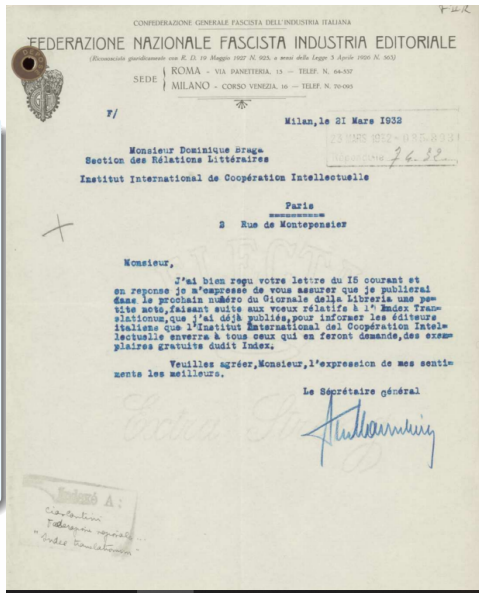
- 1 Scanned documents of one folder (folder A: *internal affairs*) of the IIIC's archive.



<https://atom.archives.unesco.org/iiic>

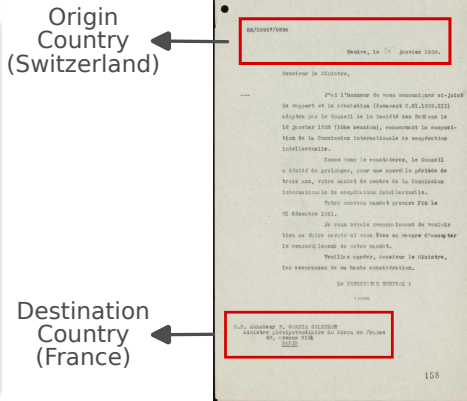
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- 2 Over the 59,820 documents available in folder A, we extract 4,265 typewritten letters with an **origin** and **destination** locations.



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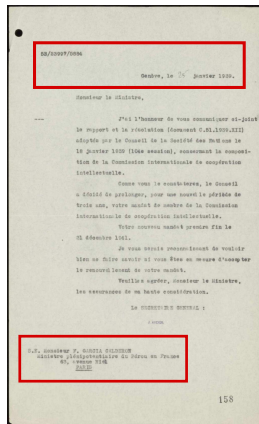
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- 2 Over the 59,820 documents available in folder A, we extract 4,265 typewritten letters with an **origin** and **destination** locations.
- 3 We use this information to build a weighted network of *information exchange* between countries.

Switzerland



$$w_{ij} = 1$$

France



Method: Network cartography in a nutshell

Method: Network cartography in a nutshell

- A technique to **assign roles to nodes** by studying their connectivity pattern.

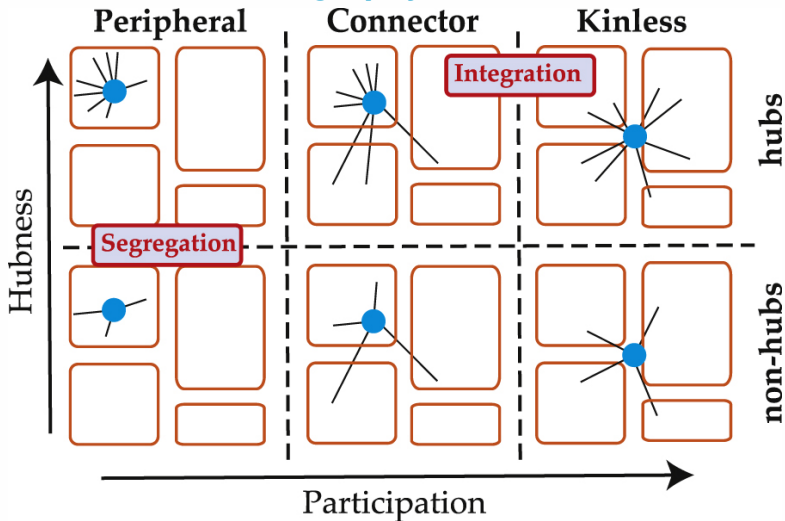
- R. Guimerá, and L. A. N. Amaral, “*Functional cartography of complex metabolic networks*”. *Nature*, **433**, 895, (2005). DOI: [10.1038/nature03288](https://doi.org/10.1038/nature03288)

Method: Network cartography in a nutshell

- A technique to **assign roles to nodes** by studying their connectivity pattern.
- **It requires a partition of the network into groups** (*i.e.*, the results *depend* on the partitioning criterion).

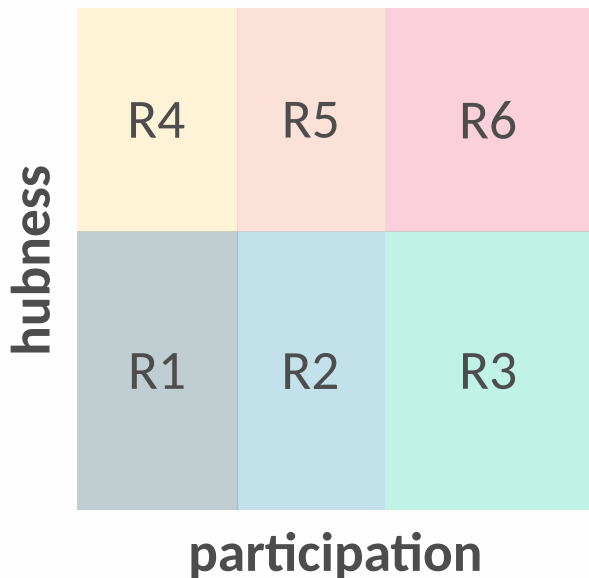
• R. Guimerá, and L. A. N. Amaral, “*Functional cartography of complex metabolic networks*”. *Nature*, **433**, 895, (2005). DOI: [10.1038/nature03288](https://doi.org/10.1038/nature03288)

Method: Network cartography in a nutshell



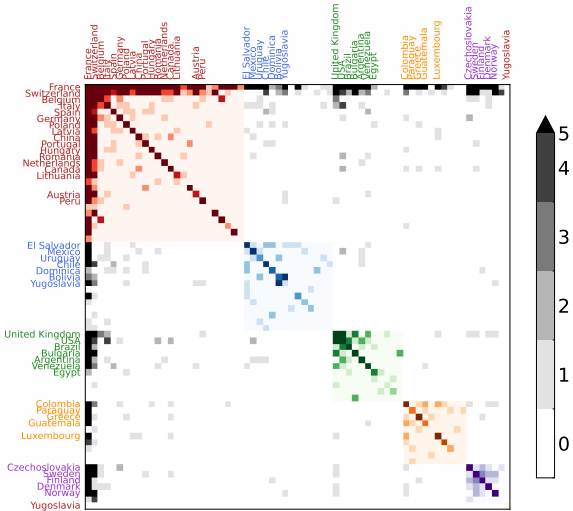
- F. Klimm, et al. "Individual node's contribution to the mesoscale of complex networks". *New Journal of Physics*, **16**, 125006, (2014). DOI: 10.1088/1367-2630/16/12/125006

Method: Network cartography in a nutshell



Results

Results



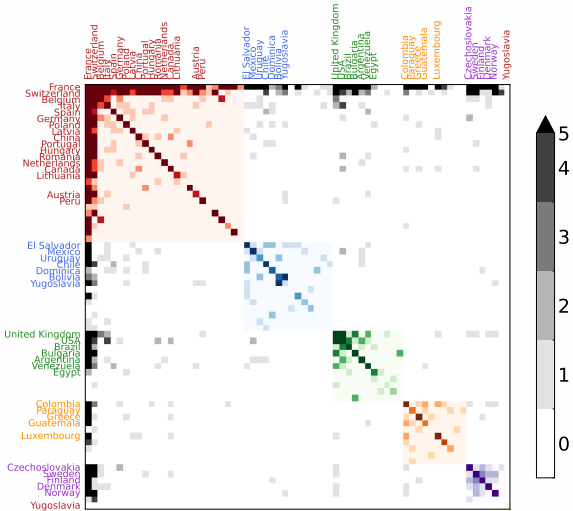
• V. A. Traag, et al. "From Louvain to Leiden: guaranteeing well-connected communities". Sci. Rep., 9, 5233, (2019). DOI: 10.1038/s41598-019-41695-z

Results

N_{comms}
 Q

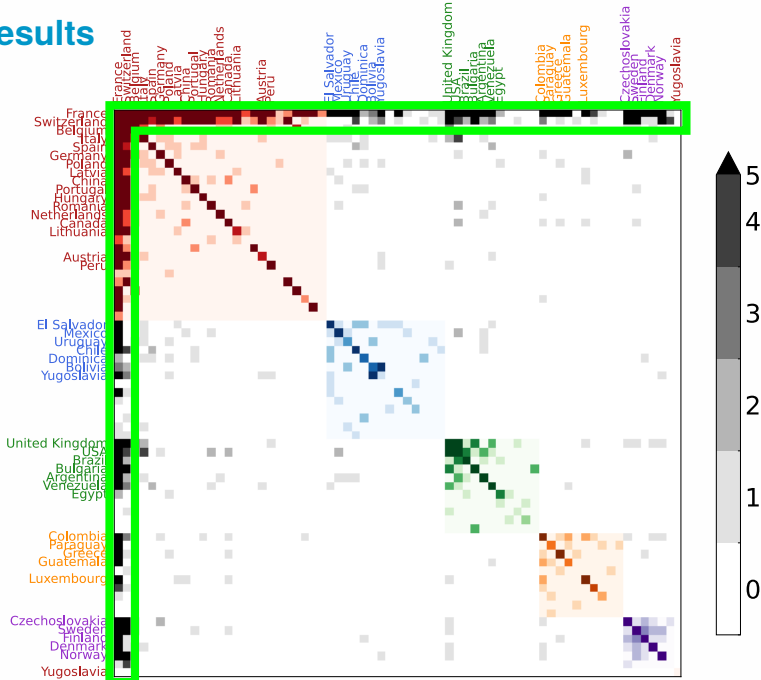
6

0.053



• V. A. Traag, et al. "From Louvain to Leiden: guaranteeing well-connected communities". Sci. Rep., 9, 5233, (2019). DOI: 10.1038/s41598-019-41695-z

Results



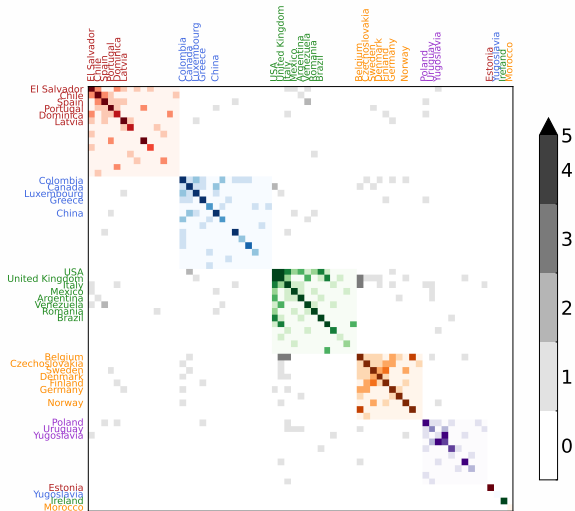
Was there intellectual cooperation **beyond** that with (and between) France and Switzerland?

Results

N_{comms}
 Q

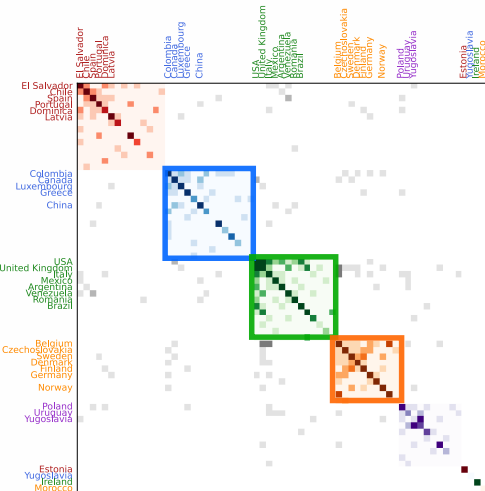
8

0.468



- R. Rodríguez-Casañ *et al.*, “Studying the geographical organization of the International Institute of Intellectual Cooperation via network cartography.” Forthcoming (2023).

Results



C1 Spain, Portugal, Latvia, Lithuania, Chile, El Salvador, Dominican Republic, Dominica, Iran, Palestine, Lebanon, South Africa, Japan, and Thailand.

C2 Hungary, Luxembourg, Monaco, Colombia, Paraguay, Guatemala, Costa Rica, Panama, Greece, Albania, Turkey, Canada, Liberia, and China.

C3 Italy, United Kingdom, United States of America, Mexico, Haiti, Argentina, Brazil, Venezuela, Austria, Romania, Bulgaria, India, and Jordan.

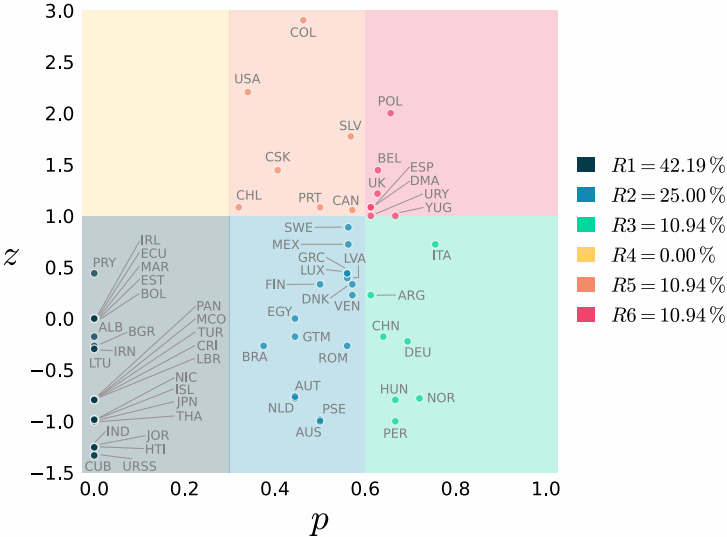
C4 Belgium, Czechoslovakia, Germany, Netherlands, Sweden, Norway, Denmark, Finland, Cuba, and URSS.

C5 Uruguay, Peru, Bolivia, Nicaragua, Ecuador, Poland, Yugoslavia, Egypt, Iceland, and Australia.

C6 – C8 Estonia | Ireland | Morocco.

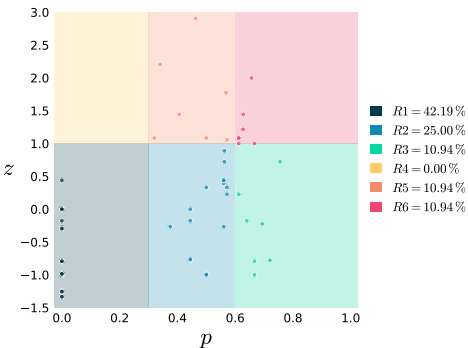
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Results



R6 Belgium, United Kingdom, Spain, Poland, Uruguay, Dominica, and Yugoslavia.

R5 Czechoslovakia, Chile, United States of America, Colombia, Canada, Portugal, and El Salvador.

R4 —

R3 Italy, Hungary, Germany, Argentina, China, Norway, and Peru.

R2 Romania, Mexico, Sweden, Latvia, Netherlands, Austria, Brazil, Luxembourg, Denmark, Finland, Venezuela, Greece, Guatemala, Egypt, Palestine, and Australia.

R1 Japan, Estonia, Bulgaria, Lithuania, Cuba, India, Bolivia, Paraguay, Monaco, Ireland, Iran, Turkey, URSS, Morocco, Nicaragua, Costa Rica, Ecuador, Haiti, Iceland, Lebanon, Dominican Republic, Jordan, Albania, South Africa, Liberia, Panama, and Thailand.

• R. Rodríguez-Casañ *et al.*, "Studying the geographical organization of the International Institute of Intellectual Cooperation via network cartography." Forthcoming (2023).

Conclusions

Take Home Messages

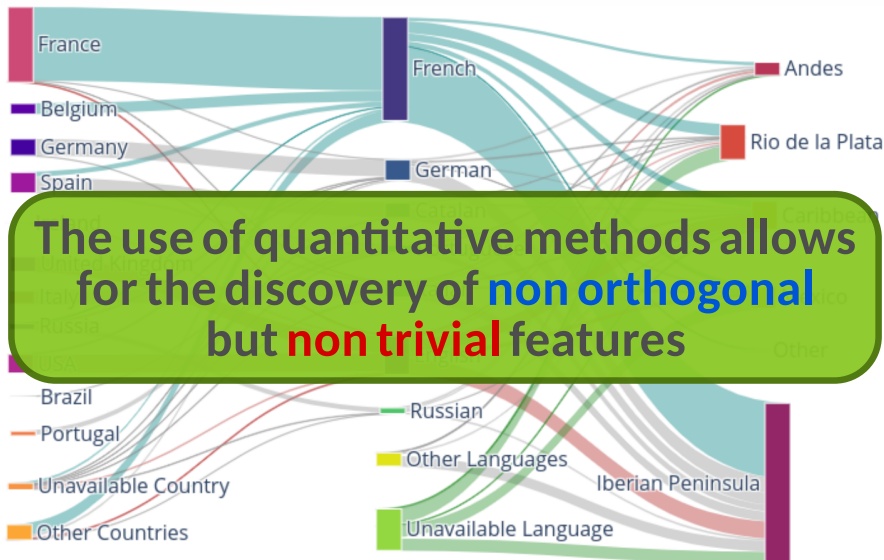


Digital humanities are an opportunity for Network science

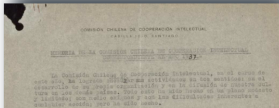
to be best
point of view
Translation
another language;
language foreign to
written communica
rights



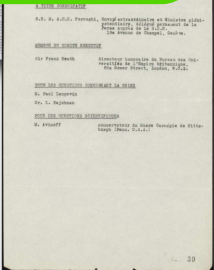
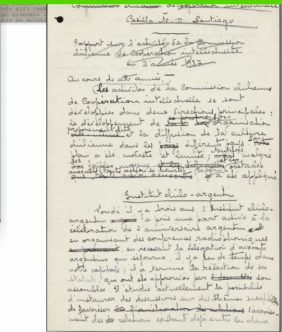
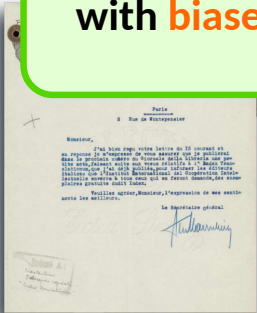
Take Home Messages



Take Home Messages



Not all that shines is gold: we have to deal with **biased**, **unstructured**, **incomplete**, and **noisy** data.



Acknowledgements

**Javier
Borge Holthofer**



**Diana
Roig Sanz**



**Elisabet
Carbó Catalan**



**Albert
Solé Ribalta**

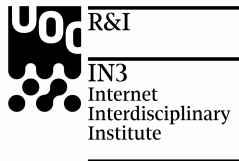
**Ainamar
Clariana Rodagut**



**Rubén
Rodríguez Casañ**



**Ventsislav
Ilkoff**



Acknowledgements



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ERC-2018-STG
ID: 803860

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Extra content

Alternative grouping

Question

Can we consider **other types** of groupings?

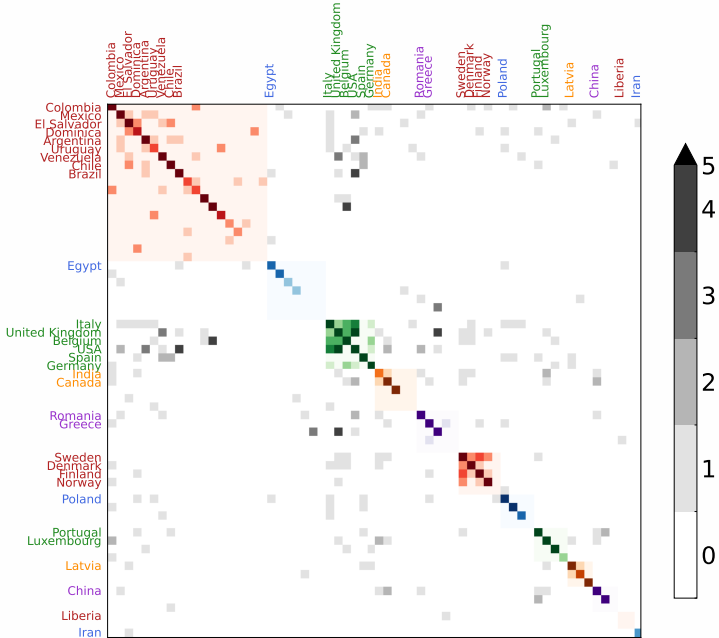
Alternative grouping



Historical grouping

Group's name	Countries
EU western and USA	France, United Kingdom, Switzerland, Germany, Italy, Belgium, The Netherlands, Spain, and United States of America
EU central countries	Austria, Czechoslovakia, Hungary, and Poland
EU eastern countries	Albania, Bulgaria, Greece, Yugoslavia, and Romania
Baltic countries	Estonia, Latvia, and Lithuania
Nordic countries	Denmark, Finland, Norway, Iceland, and Sweden
Latin countries	Portugal, Argentina, Bolivia, Brazil, Colombia, Costa Rica, Cuba, Chile, Dominican Republic, Ecuador, Dominica, Guatemala, Honduras, Mexico, Nicaragua, Panama, Peru, Paraguay, El Salvador, Uruguay, and Venezuela
UK's Dominions	Australia, Canada, India, South Africa, and Ireland
Colonies	Egypt, Benin, French Guiana, Haiti, Turkey, Lebanon, Jordan, Morocco, and Palestine
Eastern countries	China, Japan, Cambodia, and Thailand
Middle East	Iran
Other countries	Luxembourg, Monaco, Liberia, and URSS

Historical grouping



Bibliography



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DOI: 10.20375/0000-000d-1cff-6



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M. Kitsak, *et al.* “*Identification of influential spreaders in complex networks*.” *Nature Physics*, **6**, 888–893, (2010).
DOI: 10.1038/nphys1746

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