

A new opportunity for complexity science: Digital humanities

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3rd CS³ meeting – Madrid (Spain)
Thursday, February 20th 2025



UNIVERSITAT DE
BARCELONA



Acknowledgements

**Javier
Borge Holthoefer**



**Diana
Roig Sanz**



**Elisabet
Carbó Catalan**



**Albert
Solé Ribalta**



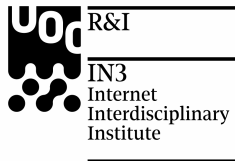
**Ainamar
Clariana Rodagut**



**Rubén
Rodríguez Casañ**



**Ventsislav
Ikoff**







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



What are Digital Humanities?



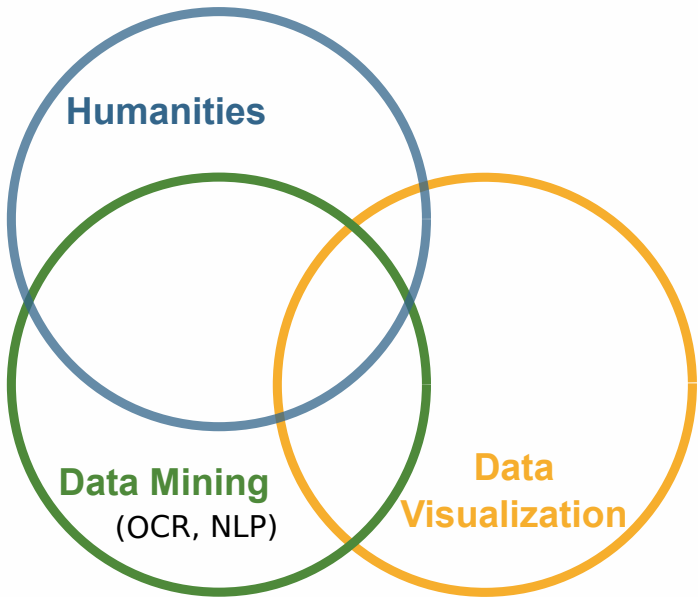
Humanities



Humanities

A Venn diagram consisting of two overlapping circles. The top circle is blue and labeled 'Humanities'. The bottom circle is green and labeled 'Data Mining (OCR, NLP)'. The circles overlap in the center, representing the intersection of the two fields.

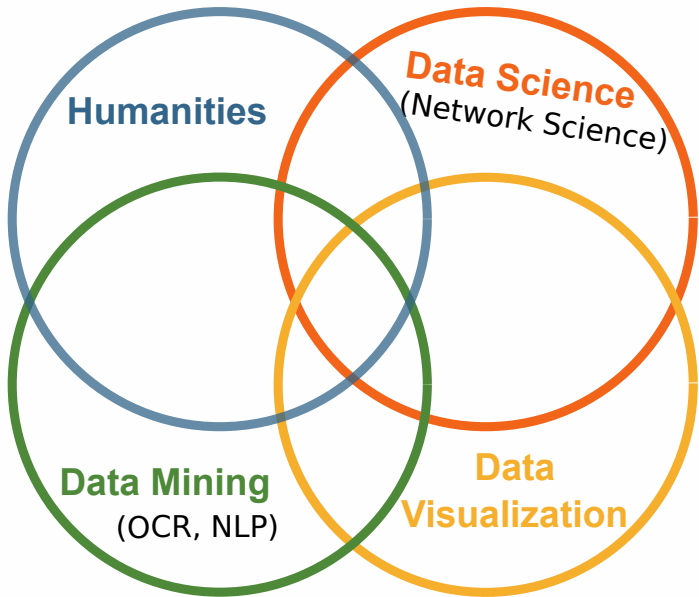
Data Mining
(OCR, NLP)



Humanities

Data Mining
(OCR, NLP)

**Data
Visualization**

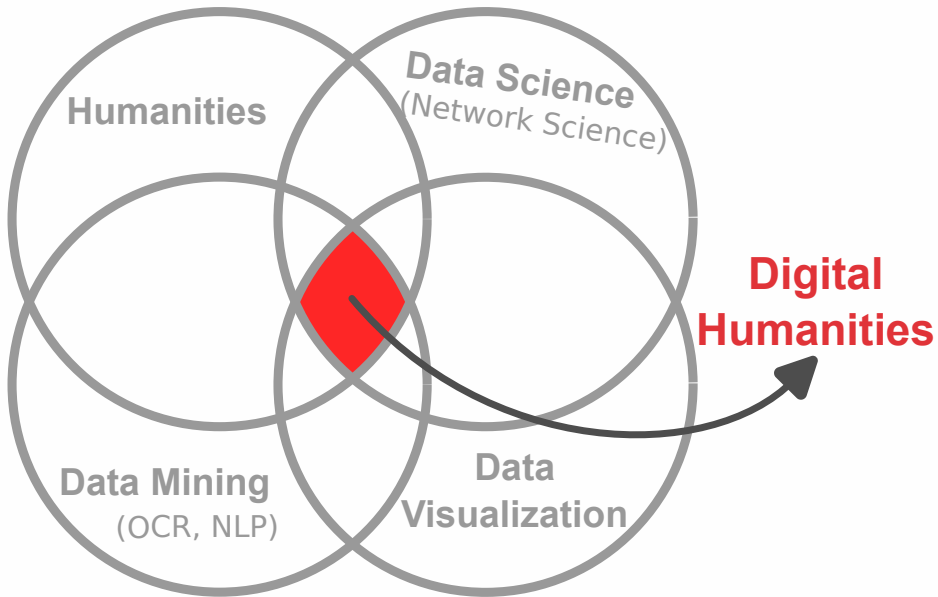


Humanities

Data Science
(Network Science)

Data Mining
(OCR, NLP)

**Data
Visualization**





How *complexity science* can help us in
addressing research questions
*relevant for scholars working in art and
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.
- Geopolitics of intellectual cooperation during the interwar period.

to be best in any
point of view.

Translation

Translation flows in
Ibero-American periodicals

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.)



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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).

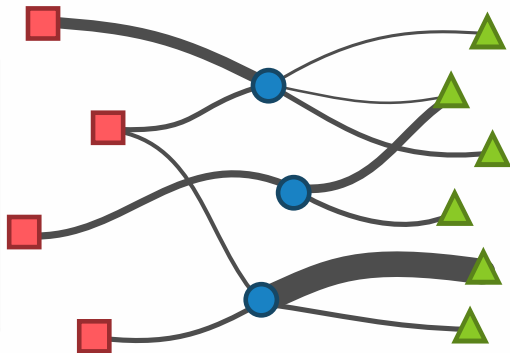
Data

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**.

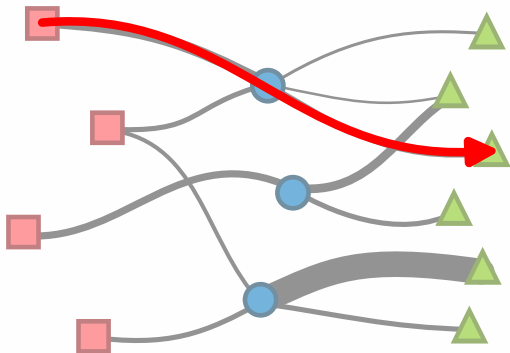
Methods

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

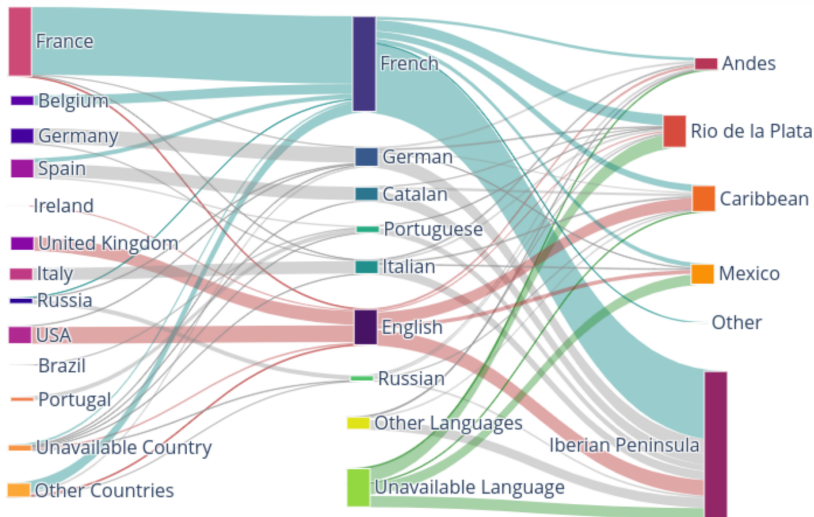


Methods

- 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).

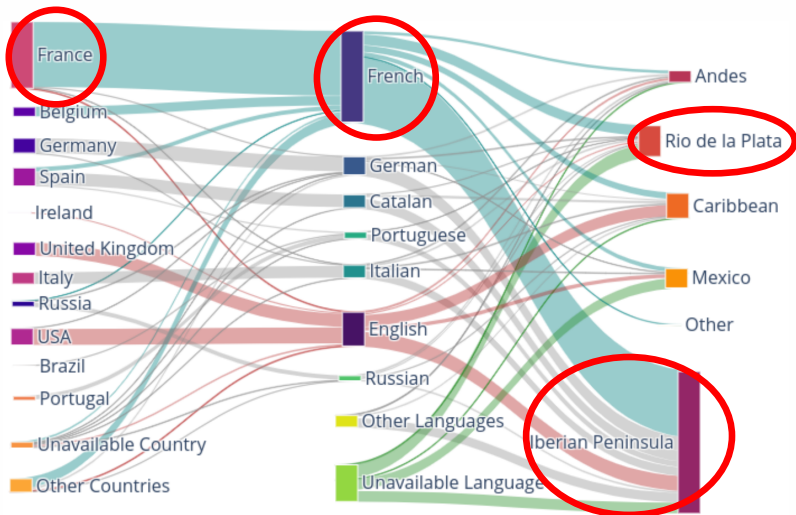


Results



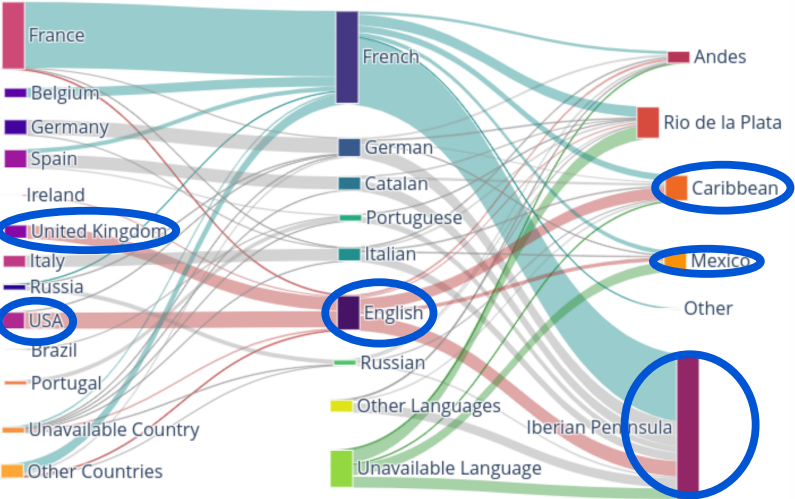
• D. Roig-Sanz *et al.* in Humanities and Big Data in Ibero-America: Theory, methodology and practical applications, De Gruyter (2024) DOI: 10.1515/9783110753523-011.

Results



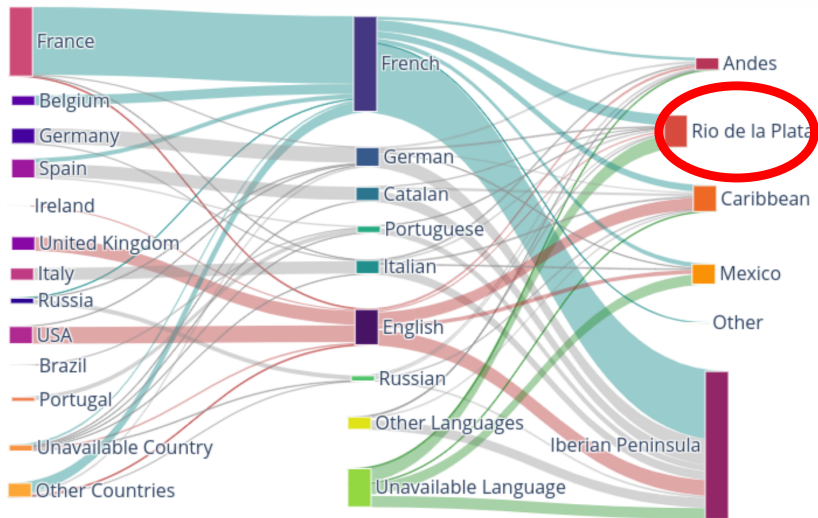
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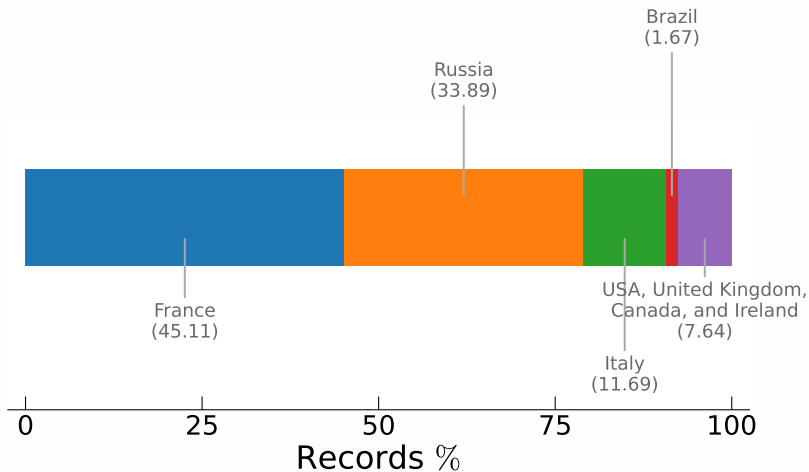
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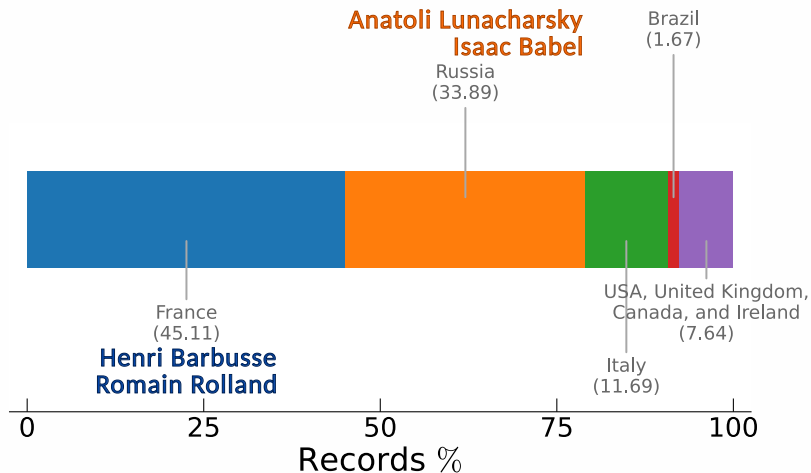
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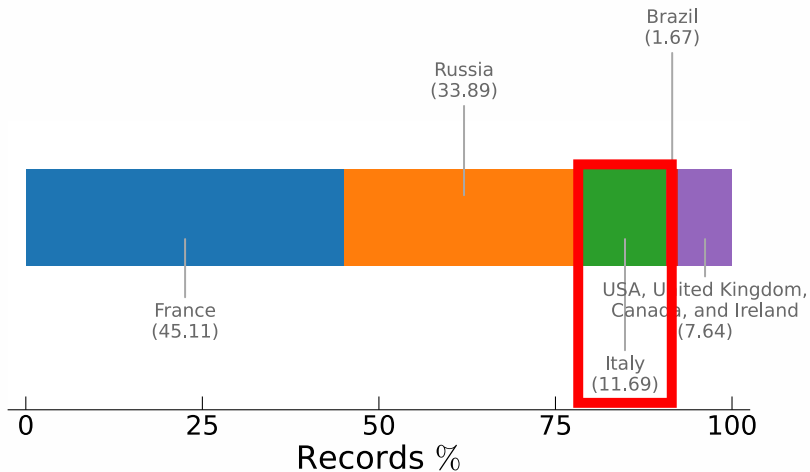
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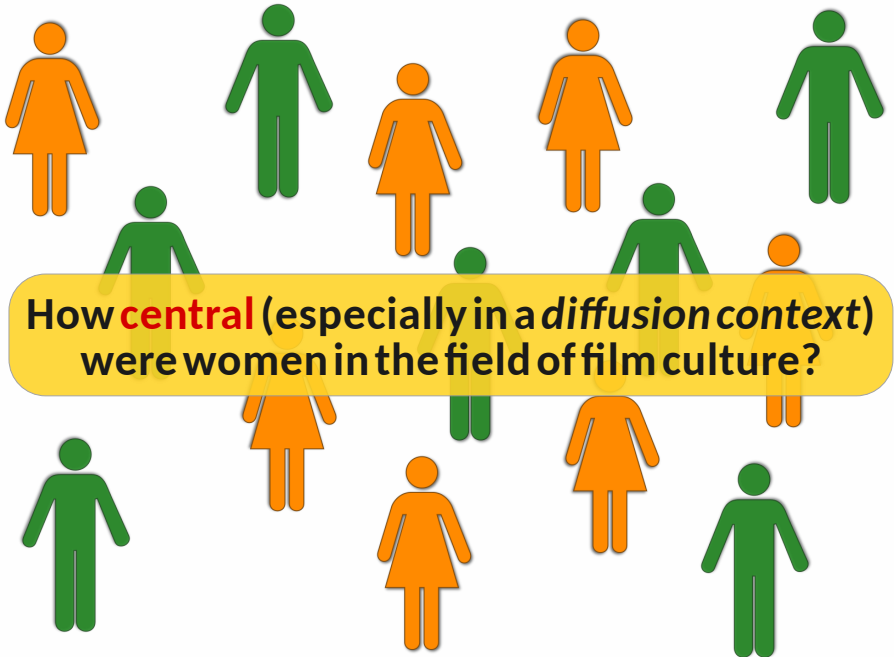
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**Women marginalization
in Ibero-American film culture**



- Attendees at a screening in a private film club at Fernando Pereda e Isabel Gilbert house in 1938 in Montevideo (Uruguay). Source: <https://tinyurl.com/26s4m83y>



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

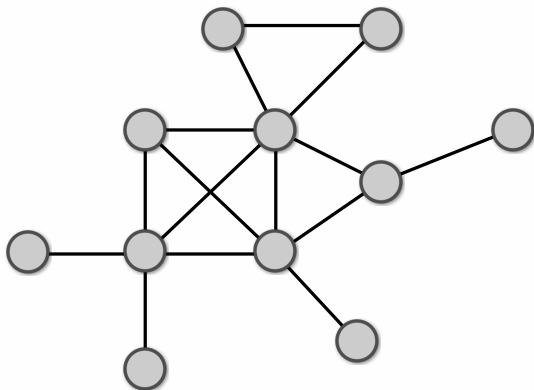
Manually collected (*follow the actor*) relationships between people **associated with film culture** during the first half of XXth century based on:

- 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).


Methods (k -core decomposition)

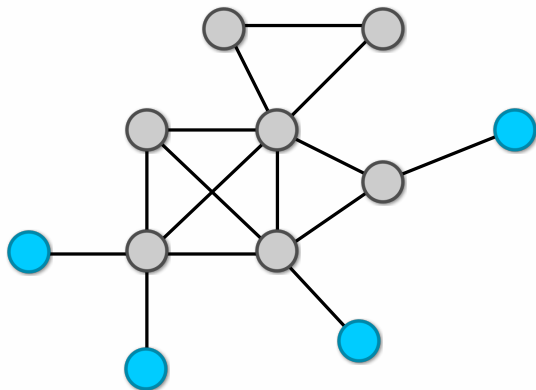
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- S. B. Seidman, *Social Networks*, **5**, 269–287, (1983). DOI: [10.1016/0378-8733\(83\)90028-X](https://doi.org/10.1016/0378-8733(83)90028-X)
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Methods (k -core decomposition)

 k -shell 1 ($k_s = 1$)

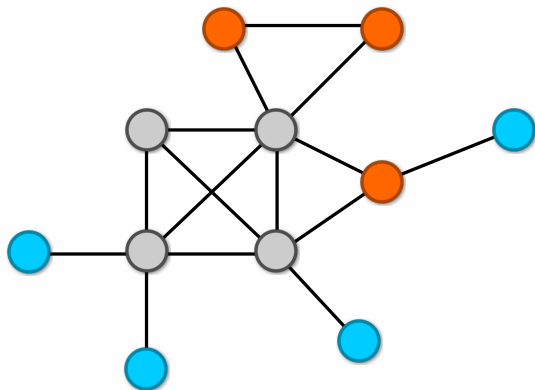


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Methods (k -core decomposition)

 k -shell 1 ($k_s = 1$)

 k -shell 2 ($k_s = 2$)



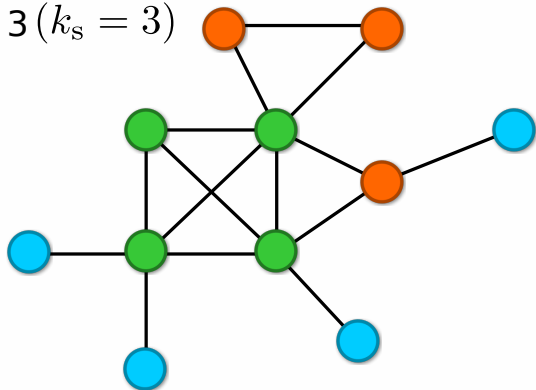
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Methods (k -core decomposition)

 k -shell 1 ($k_s = 1$)

 k -shell 2 ($k_s = 2$)

 k -shell 3 ($k_s = 3$)

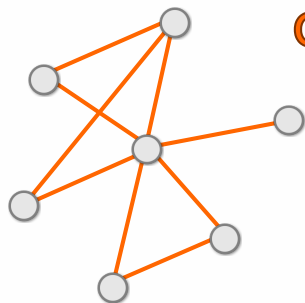


- S. B. Seidman, *Social Networks*, **5**, 269–287, (1983). DOI: [10.1016/0378-8733\(83\)90028-X](https://doi.org/10.1016/0378-8733(83)90028-X)
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Methods (k -core decomposition)

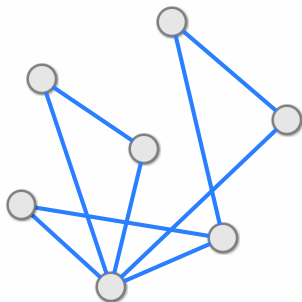
$$f_W(k_s) = \frac{N_W(k_s)}{N(k_s)},$$

Methods (k -core decomposition)



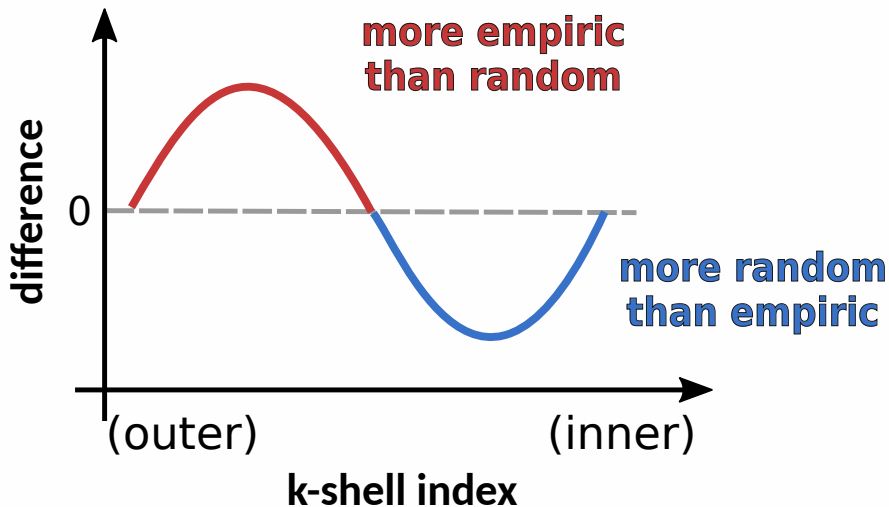
Original
network

Randomized
(shuffled)
counterpart

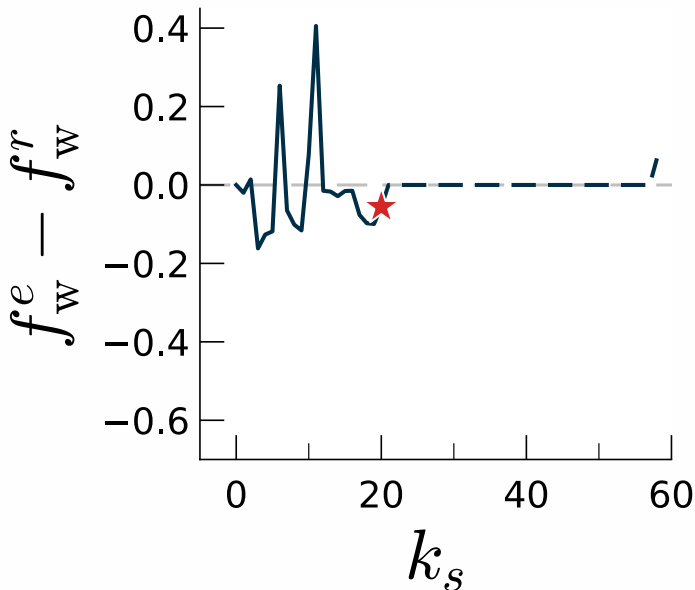


- B. K. Fosdick, *et al.*, SIAM Review, **60**, 315–355, (2018). DOI: [10.1137/16M1087175](https://doi.org/10.1137/16M1087175)

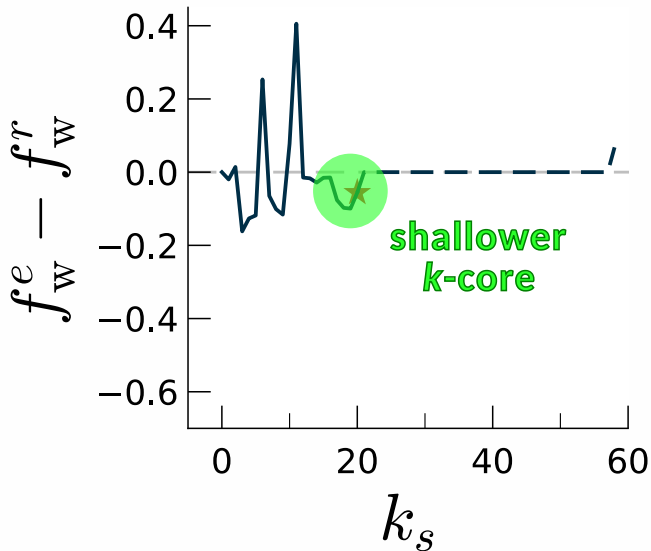
Results



Results



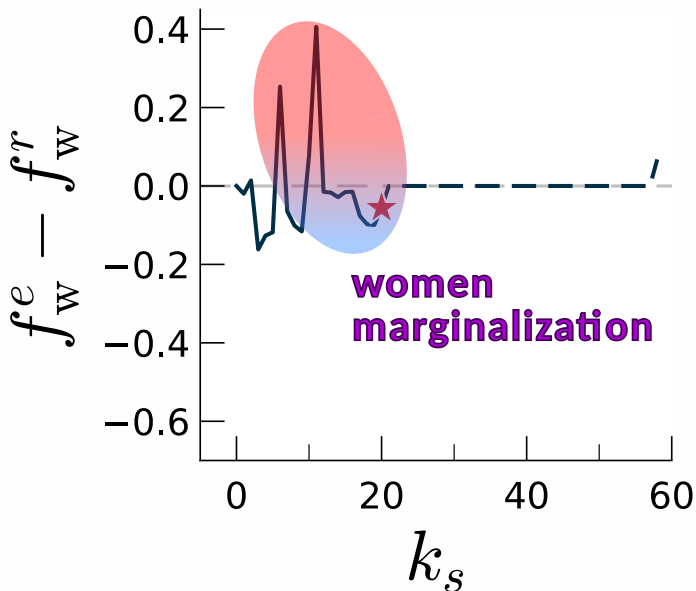
Results



• I. Malvestio, *et al.* Sci. Rep. **10**, 14702, (2020). DOI: [10.1038/s41598-020-71426-8](https://doi.org/10.1038/s41598-020-71426-8)

• S. Osat, *et al.* Phys. Rev. Research **2**, 023176, (2020). DOI: [10.1103/PhysRevResearch.2.023176](https://doi.org/10.1103/PhysRevResearch.2.023176)

Results



Geopolitics of intellectual cooperation during the interwar period





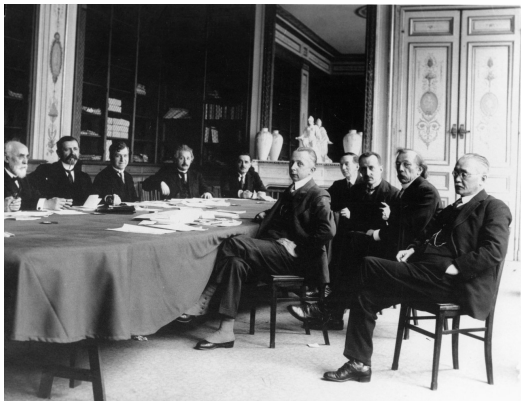
ALL QUIET ON THE WESTERN FRONT

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.



• <https://unesco.libguides.com/IICI>

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International Institute of Intellectual Cooperation (IIIC)

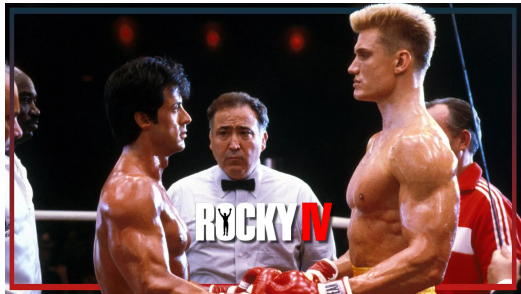
- Founded in 1926.
- Based in Paris.
- Created to support the work ICIC as an **executive branch**.
- Ancestor of UNESCO.

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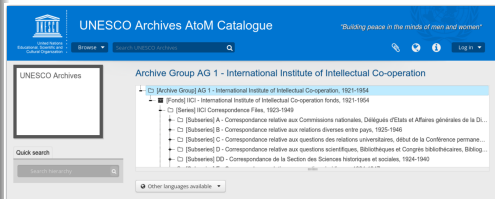




What was the *role* played by countries in the web of global intellectual cooperation?

The data: UNESCO's archives

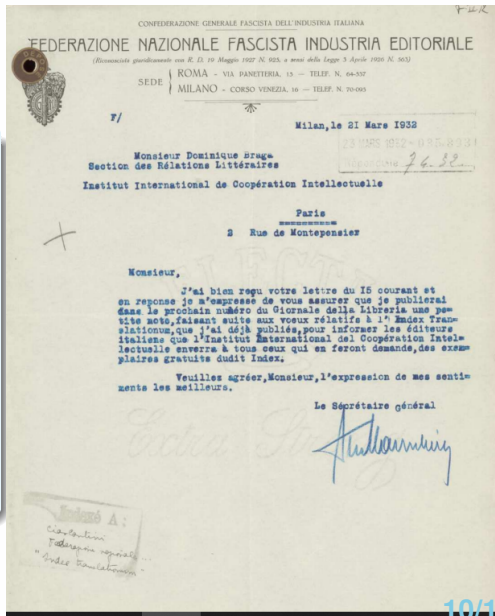
- 1 Scanned documents of one folder (folder A: *internal affairs*) of the IIIC's archive.



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

The data: UNESCO's archives

- 1 Scanned documents of one folder (folder A: *internal affairs*) of the IIC's archive.
- 2 Over the 59,820 documents available in folder A, we extract 4,265 typewritten letters with an **origin** and **destination** locations.

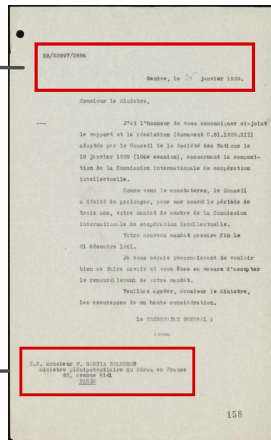


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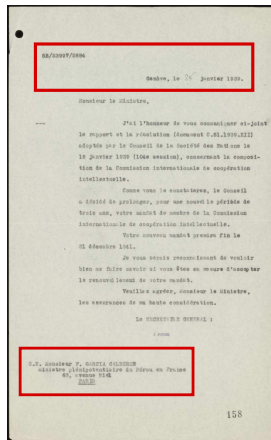
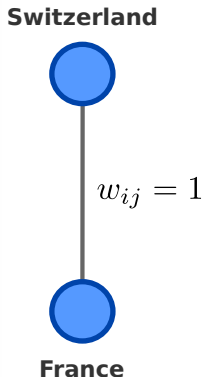
Origin
Country
(Switzerland)

Destination
Country
(France)



The data: UNESCO's archives

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



Method: Network cartography in a nutshell

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

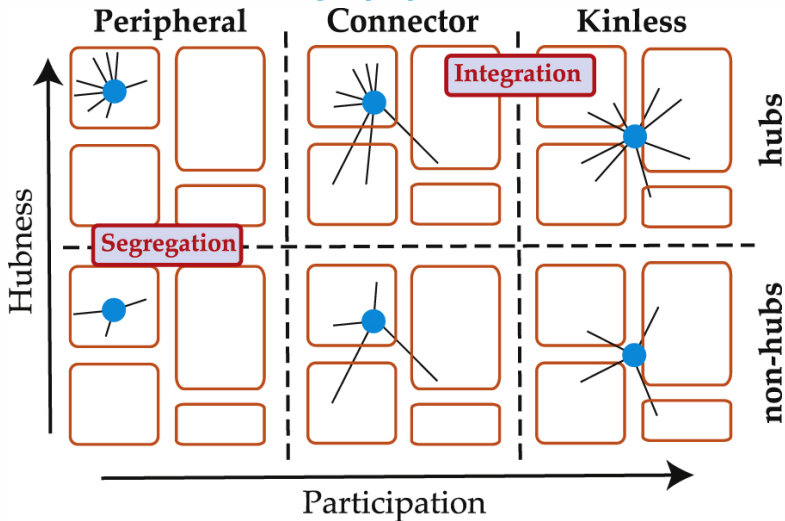
- R. Guimerá, and L. A. N. Amaral, "*Functional cartography of complex metabolic networks*". Nature, **433**, 895, (2005). DOI: [10.1038/nature03288](https://doi.org/10.1038/nature03288)

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).

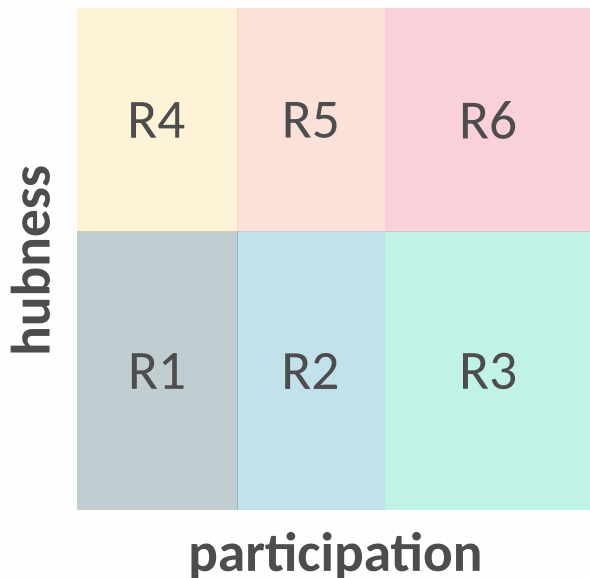
- R. Guimerá, and L. A. N. Amaral, “*Functional cartography of complex metabolic networks*”. *Nature*, **433**, 895, (2005). DOI: [10.1038/nature03288](https://doi.org/10.1038/nature03288)

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

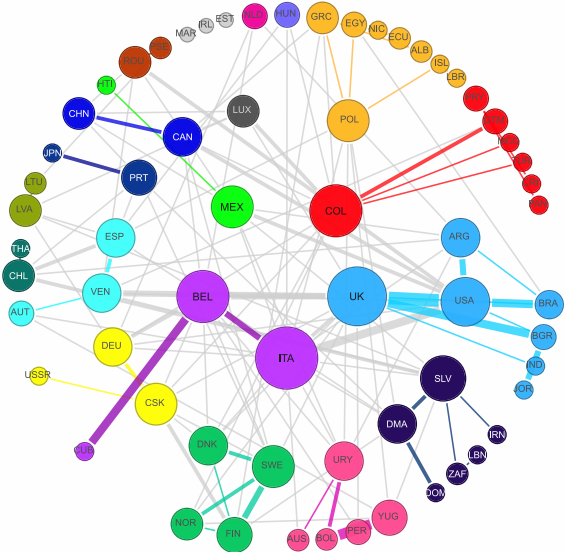
Results

N_{comms}

21

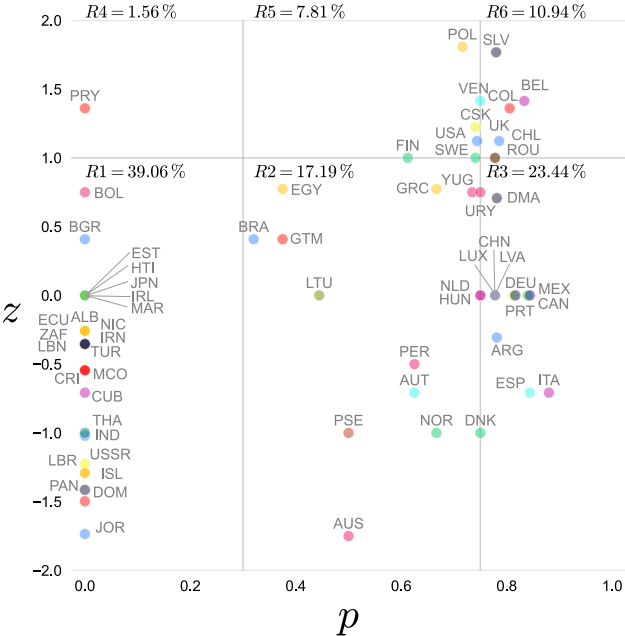
Q

0.787

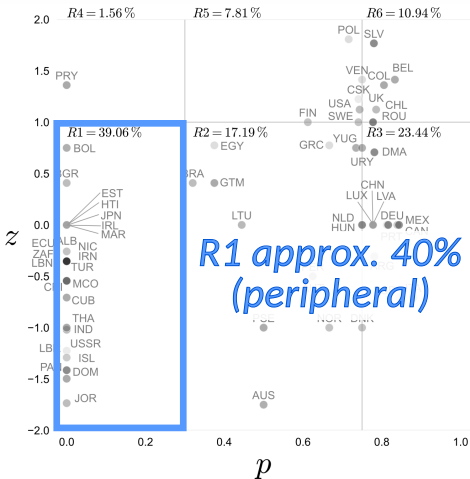


• R. Rodríguez-Casañ *et al.*, Hum. Soc. Sci. Commun. **11**, 1408 (2024).

Results



Results



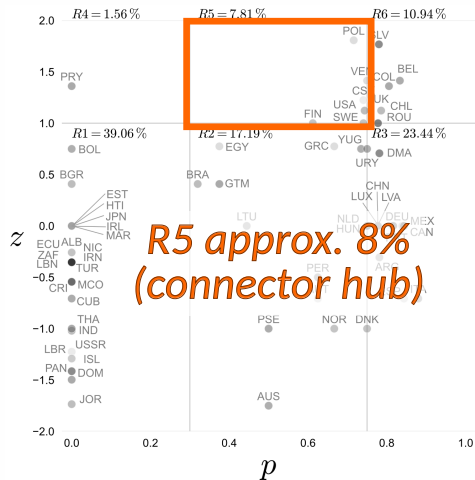
R1

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

• R. Rodríguez-Casañ *et al.*, Hum. Soc. Sci. Commun. **11**, 1408 (2024).

DOI: [10.1057/s41599-024-03829-1](https://doi.org/10.1057/s41599-024-03829-1)

Results

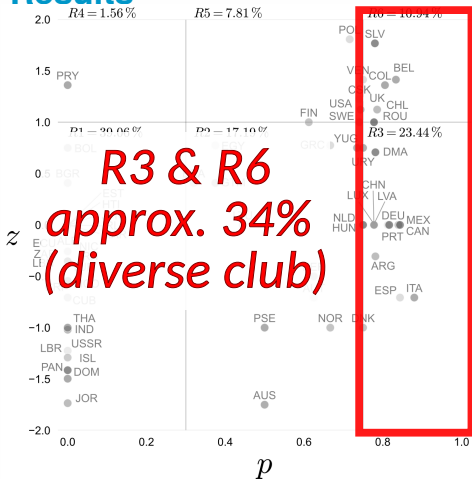


R5 United States of America,
Sweden, Finland, Czechoslovakia,
Poland.

• R. Rodríguez-Casañ *et al.*, Hum. Soc. Sci. Commun. **11**, 1408 (2024).

DOI: 10.1057/s41599-024-03829-1

Results



R6

Belgium, United Kingdom,
Romania, Chile, **Colombia,**
El Salvador, Venezuela.

R3

Italy, Spain, Portugal, Germany,
Hungary, Netherlands,
Luxembourg, **Denmark,** Latvia,
China, Canada, Mexico,
Argentina, Uruguay, Dominica.

• R. Rodríguez-Casañ *et al.*, Hum. Soc. Sci. Commun. **11**, 1408 (2024).

DOI: [10.1057/s41599-024-03829-1](https://doi.org/10.1057/s41599-024-03829-1)

• M. A. Bertolero, *et al.* "The diverse club." Nat. Comms. **8**, 1277, (2017).

DOI: [10.1038/s41467-017-01189-w](https://doi.org/10.1038/s41467-017-01189-w)

Conclusions

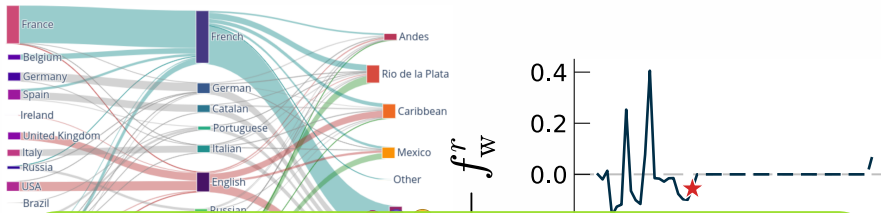
Take Home Messages



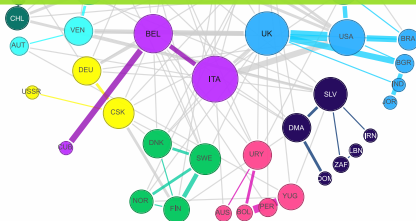
Digital humanities ARE an opportunity for Complexity science



Take Home Messages



The use of quantitative methods allows for the discovery of *non orthogonal* but *non trivial* features



k_s

Take Home Messages



All that glitters is not gold: we have to deal with **biased**, **unstructured**, **incomplete**, and **noisy** data.



Comisión Chilena de Cooperación Intelectual
Cajón de Maipo, Santiago

Report sur l'activité de la Commission chilienne de coopération intellectuelle en l'année 1933

Qu'en est de cette année —
Les activités de la Commission chilienne de coopération intellectuelle se sont développées dans deux directions principales : le développement de travaux de coopération intellectuelle et la diffusion de la culture chilienne dans les autres pays de l'Amérique latine.
Ces deux tâches ont été accomplies par la Commission chilienne de coopération intellectuelle en l'année 1933, malgré les difficultés matérielles et financières auxquelles elle a dû faire face.

Statut de la Commission chilienne de coopération intellectuelle
Ainsi qu'il y a deux ans j'ai eu l'honneur de vous en faire un rapport, la Commission chilienne de coopération intellectuelle a eu l'honneur de vous en faire un rapport en vous montrant les conditions matérielles et financières auxquelles elle a dû faire face.

BOLETIN TITIKAKA

A. PÉREZ RODRÍGUEZ

J. S. de A. J. L. Ferrer, donat extrajudicial en España y administrador de la imprenta "El Financiero" en la ciudad de Madrid.

MINISTRO DE OBRAS PÚBLICAS

Dr. P. S. Rodríguez

MINISTRO DE OBRAS PÚBLICAS

Dr. P. S. Rodríguez

Take Home Messages

The value of computation is not merely to accelerate literary research or expand its scale; on the contrary, ideas drawn from computer science have given literary scholars new questions, and have encouraged us to frame existing questions in a more explicitly theorized way.

At bottom, distant readers are not arguing against close reading. They're just pointing to a blank space on our map of the past — where questions about large samples or long timelines might be located — in order to say “none of us really know what's in there yet.”

A confession of ignorance [...] calls for a different genre of response. [...] it would be better to judge it simply by asking whether the blind spot it identified is turning out to contain anything interesting.

T. Underwood, "A Genealogy of Distant Reading." *Dig. Hum. Quart.*, 11, 1-12 (2017)

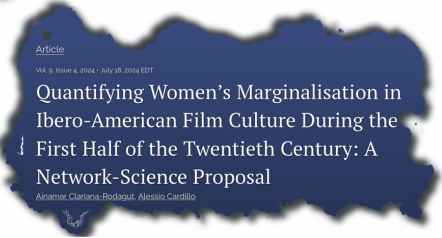
Acknowledgements II



DOI: 10.1515/9783110753523-011

DOI: 10.22148/001c.118589

Open Dataset
DOI: 10.34810/data977



DOI: 10.1057/s41599-024-03829-1

Open Dataset
DOI: 10.34810/data985



Acknowledgements II



European Research Council
Established by the European Commission

ERC-2018-STG
ID: 803860



GOBIERNO
DE ESPAÑA

MINISTERIO
DE CIENCIA, INNOVACIÓN
Y UNIVERSIDADES



AGENCIA
ESTATAL DE
INVESTIGACIÓN

PID2022-141558NB-I00
RYC2023-044587-I

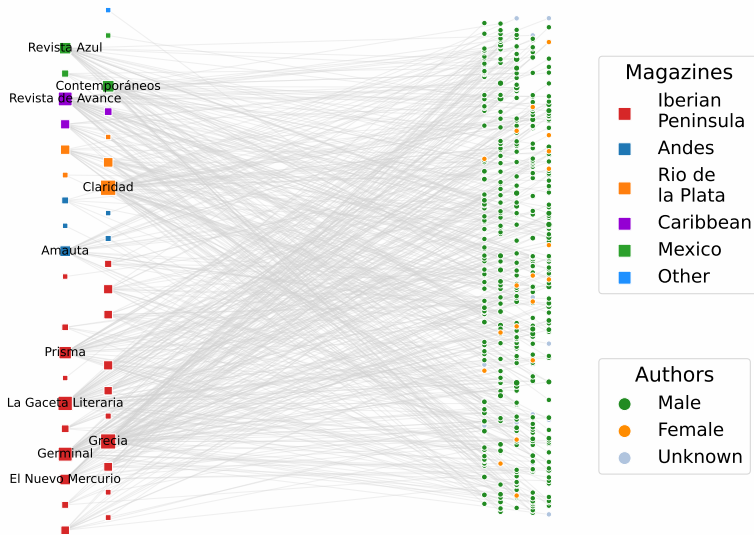
@ alessio.cardillo@ub.edu

 <https://cardillo.web.bifi.es/>

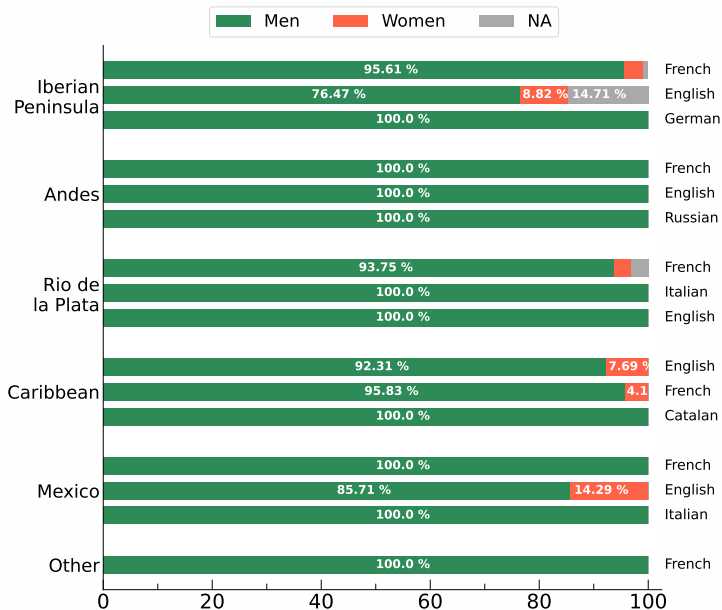
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Extra content

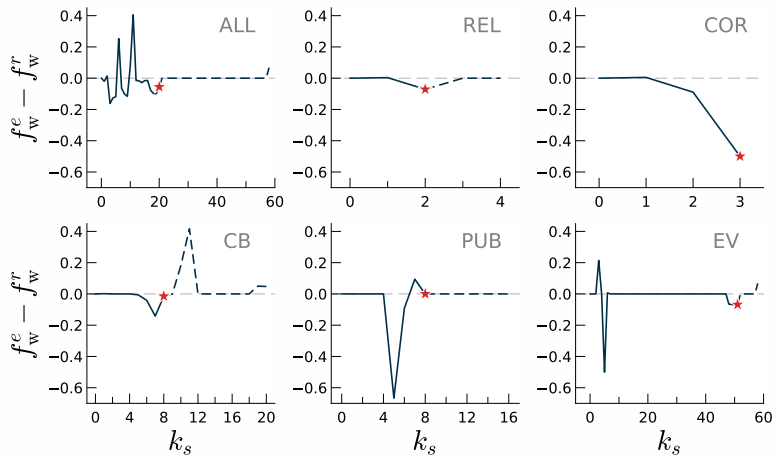
Translations in Ibero-American Periodicals



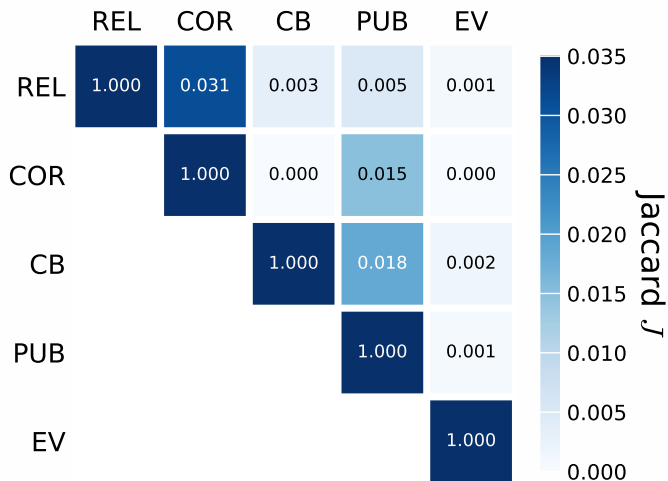
Translations in Ibero-American Periodicals



Women marginalization



Women marginalization



Cartography

within module degree κ

$$\kappa_i = \sum_j a_{ij} \delta_{c_i, c_j}$$

hubness z

$$z_i = \frac{\kappa_i - \overline{\kappa_{c_i}}}{\sigma_{\kappa_{c_i}}}$$

Participation coefficient p

$$p_i = 1 - \sum_j^{N_c} \left(\frac{\kappa_i(c_j)}{k_i} \right)^2$$

III C – partition into groups

N_{comms}	15
Q	0.242

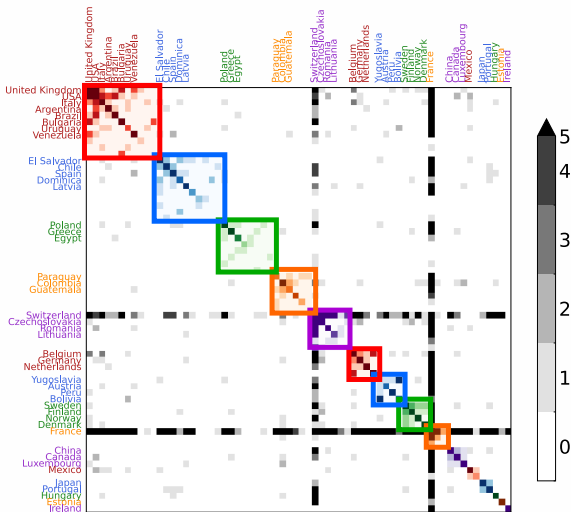
- V. A. Traag, et al. “From Louvain to Leiden: guaranteeing well-connected communities”. Sci. Rep., **9**, 5233, (2019). DOI: [10.1038/s41598-019-41695-z](https://doi.org/10.1038/s41598-019-41695-z)

IIC – partition into groups

N_{comms}
 Q

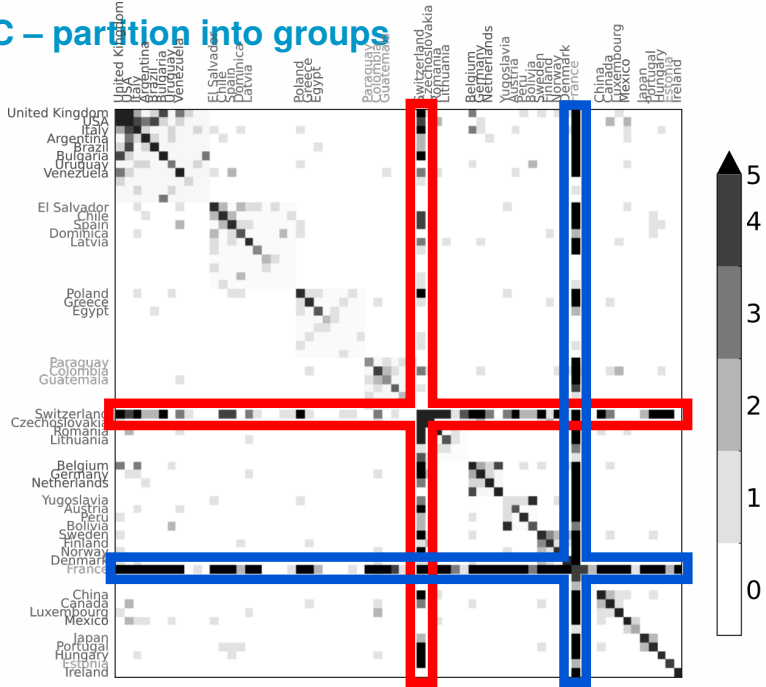
15

0.242

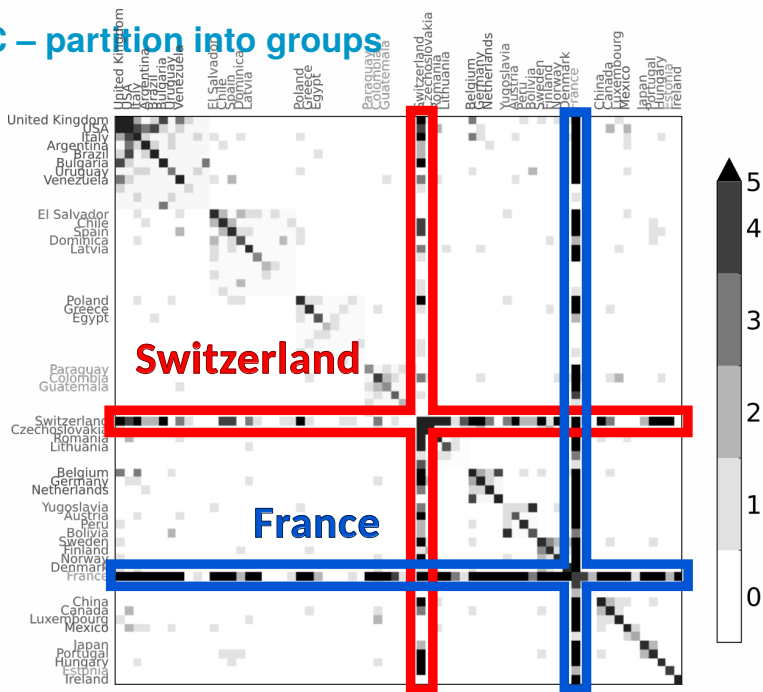


• V. A. Traag, et al. "From Louvain to Leiden: guaranteeing well-connected communities". Sci. Rep., 9, 5233, (2019). DOI: 10.1038/s41598-019-41695-z

IIIC – partition into groups



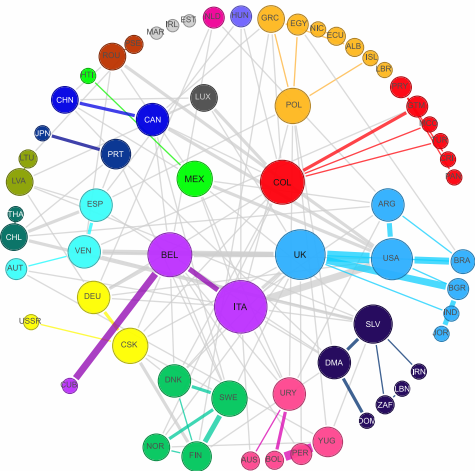
IIIC – partition into groups



IIIC – partition into groups

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

IIIC – partition into groups



C1 **Poland**, Greece, Albania, Nicaragua, Ecuador, Iceland, Egypt, and Liberia.

C2 **United Kingdom, United States of America, Argentina**, Brazil, Bulgaria, India, and Jordan.

C3 **Colombia, Paraguay, Guatemala**, Monaco, Turkey, **Costa Rica**, and **Panama**.

C6 Sweden, Denmark, Norway, and Finland.

C7 Spain, Austria, and Venezuela.

C8 Germany, Czechoslovakia, and USSR.

C9 **Belgium, Italy**, and Cuba.

Others All o—ther countries.

IIIC – 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 USSR

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