

Invisible Bridges ? Scientific landscapes around similar objects studied from Economics and Geography perspectives

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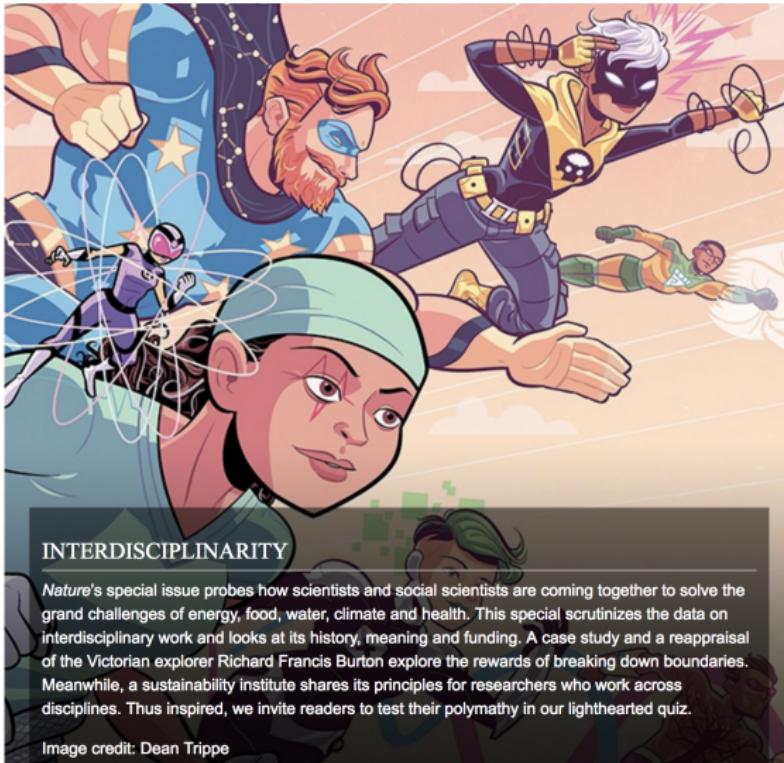
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An Utopia of interdisciplinarity ?



Perspectivism

Scientific Perspectivism [Giere, 2010] : each scientific entreprise as a perspective, which medium is called a model

Question 1 : Which compromises between transversal approaches (interdisciplinary) and vertical approaches (specialization) ?

→ Banos' virtual spiral [Banos, 2013] ; Complex Systems integrated roadmap [Bourgine et al., 2009]

Question 2 : Taking interdisciplinarity as an objective, which processes of knowledge production and interactions between disciplines occur and would be desirable ?

Geographical systems

Geographical System by essence heterogeneous and require interdisciplinarity

[Fujita et al., 1999] : comparer à la théorie évolutive : juste reproduire hiérarchie, est-ce assez ? ; question de l'équilibre.

Research Question

Research Objective

Methodology

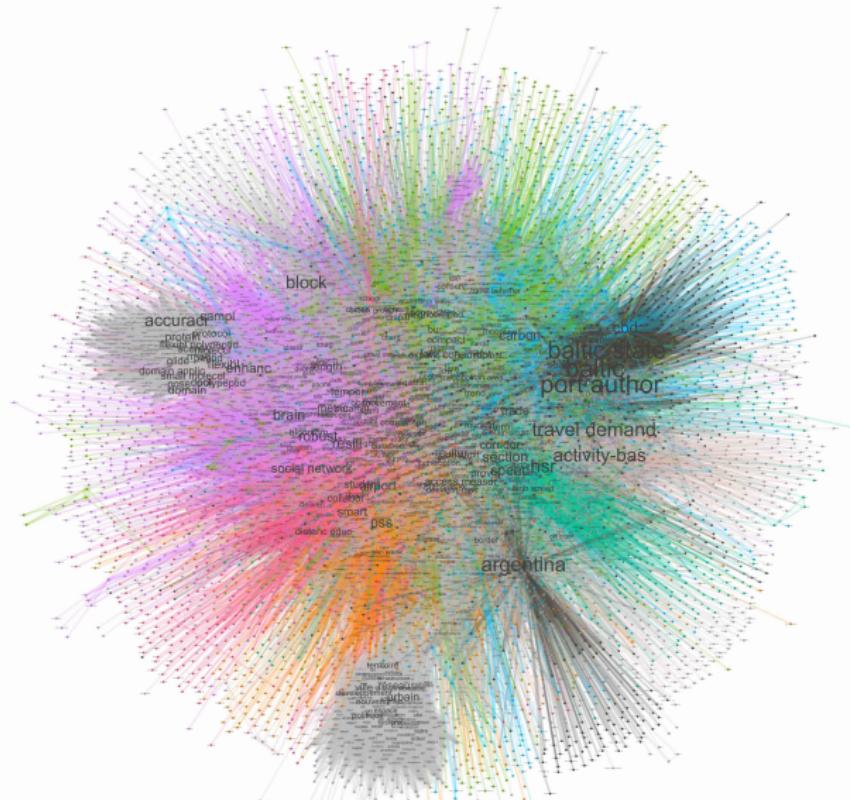
Interactions between Networks and Territories

Citation Network



Citation Network Properties

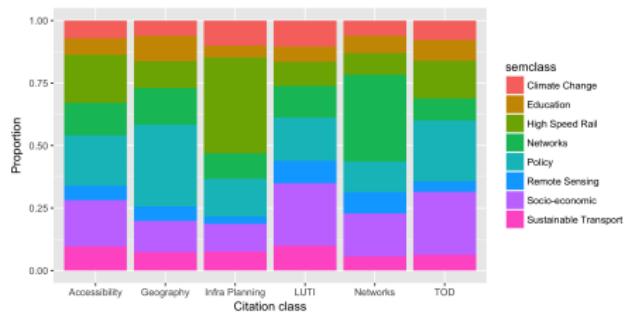
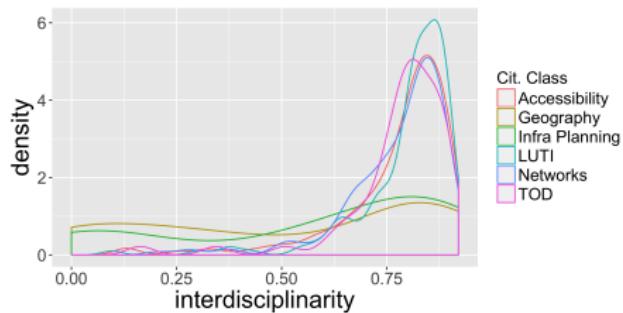
Semantic Network



Semantic communities

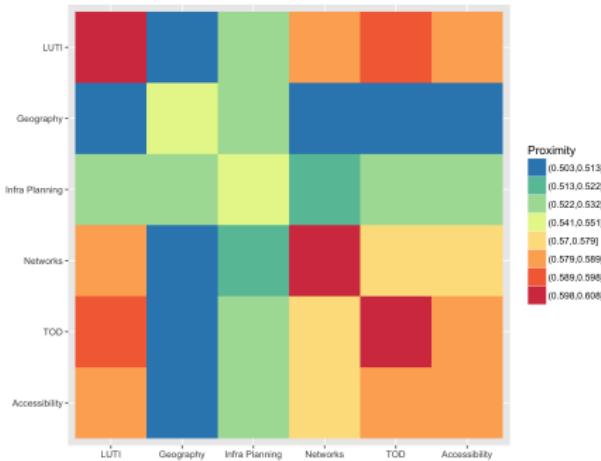
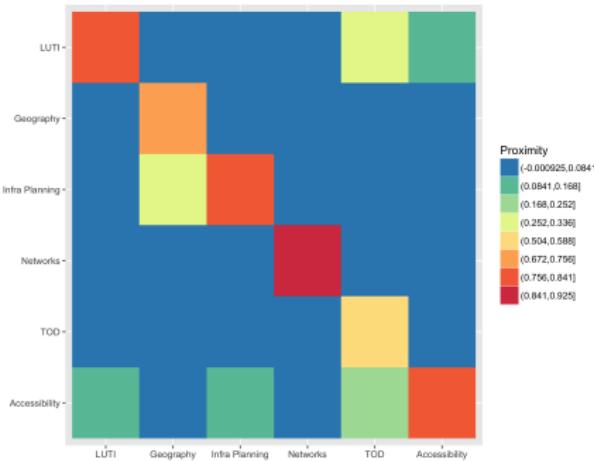
Name	Size	Weight	Keywords
Networks	820	13.57%	social network, spatial network, res
Policy	700	11.8%	actor, decision-mak, societi
Socio-economic	793	11.6%	neighborhood, incom, live
High Speed Rail	476	7.14%	high-spe, corridor, hsr
French Geography	210	6.08%	système, développement, territoire
Education	374	5.43%	school, student, collabor
Climate Change	411	5.42%	mitig, carbon, consumpt
Remote Sensing	405	4.65%	classif, detect, cover
Sustainable Transport	370	4.38%	sustain urban, travel demand, activi
Traffic	368	4.23%	traffic congest, cbd, capit
Maritime Networks	402	4.2%	govern model, seaport, port author
Environment	289	3.79%	ecosystem servic, regul, settlement
Accessibility	260	3.23%	access measur, transport access, urb
Agent-based Modeling	192	3.18%	agent-bas, spread, heterogen
Transportation planning	192	3.18%	transport project, option, cba
Mobility Data Mining	168	2.49%	human mobil, movement, mobil phone
Health Geography	196	2.49%	healthcar, inequ, exclus
Freight and Logistics	239	2.06%	freight transport, citi logist, modali
Measuring	166	1.0%	score, sampl, metric

Interdisciplinarity patterns



Distribution of interdisciplinaries (Left) and semantic composition of citation communities (Right)

Community Proximities



Proximities between citation communities (Left) and semantic communities (Right)

Urban growth

Urban growth : Citation Network Structure

Discussion

Conclusion



- Code et data available at
<https://github.com/JusteRaimbault>

Reserve slides

Reserve Slides

Measuring Interdisciplinarity

- References as probability matrix for themes $\mathbf{P} = (p_{ij})$ [?]
- First order interdisciplinarity $I_i = 1 - \sum_j p_{ij}^2$
- Let \mathbf{A} citation network adjacency matrix, \mathbf{I}_k row selection matrix for class k ($Id \cdot \mathbb{1}_{c(i)=k}$) such that $\mathbf{I}_k \cdot \mathbf{A} \cdot \mathbf{I}_{k'}$ gives exactly citations from k to k'
- Citation proximity given by $c_{kk'} = \sum \mathbf{I}_k \cdot \mathbf{A} \cdot \mathbf{I}_{k'} / \sum \mathbf{I}_k \cdot \mathbf{A}$
- Semantic distance $\mathbf{D} = d_{ii'} = \sqrt{\frac{1}{2} \sum (p_{ij} - p_{i'j})^2}$ and Semantic proximity given by $s_{kk'} = \mathbf{I}_k \cdot \mathbf{D} \cdot \mathbf{I}_{k'} / \sum \mathbf{I}_k \sum \mathbf{I}_{k'}$

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