

Bibliometric Network Visualization with OpenAlex: An Analysis of the Quantum Computing Hardware Ecosystem

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Superconducting quantum computing: a review

Review | Published: 15 July 2020

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Science China Information Sciences

Aims and scope →

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Abstract

Over the last two decades, tremendous advances have been made for constructing large-scale quantum computers. In particular, quantum computing platforms based on superconducting qubits have become the leading candidate for scalable quantum processor architecture, and the milestone of demonstrating quantum supremacy has been first achieved using 53 superconducting qubits in 2019. In this study, we provide a brief review on the experimental efforts towards the large-scale superconducting quantum computer, including qubit design, quantum control, readout techniques, and the implementations of error correction and quantum algorithms. Besides the state of the art, we finally discuss future perspectives, and which we hope will motivate further research.

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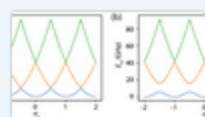
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Review Article | Published: 25 March 2021

Materials challenges for trapped-ion quantum computers

Kenneth R. Brown , John Chiaverini, Jeremy M. Sage & Hartmut Häffner

Nature Reviews Materials 6, 892–905 (2021) | [Cite this article](#)

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Abstract

Trapped-ion quantum information processors store information in atomic ions maintained in position in free space by electric fields. Quantum logic is enacted through manipulation of the ions' internal and shared motional quantum states using optical and microwave signals. Although trapped ions show great promise for quantum-enhanced computation, sensing and communication, materials research is needed to design traps that allow for improved performance by means of integration of system components, including optics and electronics for ion-qubit control, while minimizing the near-ubiquitous electric-field noise produced by trap-electrode surfaces. In this Review, we consider the materials requirements for such integrated systems, with a focus on problems that hinder current progress towards practical quantum computation. We give suggestions for how materials scientists and trapped-ion technologists can work together to develop materials-based integration and noise-mitigation strategies to enable the next generation of trapped-ion quantum computers.

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Proprietary Scientific Publication Model

- ◇ Criticisms:
 - ◇ Systemic bias against smaller organizations
 - ◇ Less dissemination
 - ◇ Less reproducibility
 - ◇ Perverse incentive model ("Publish or Perish")

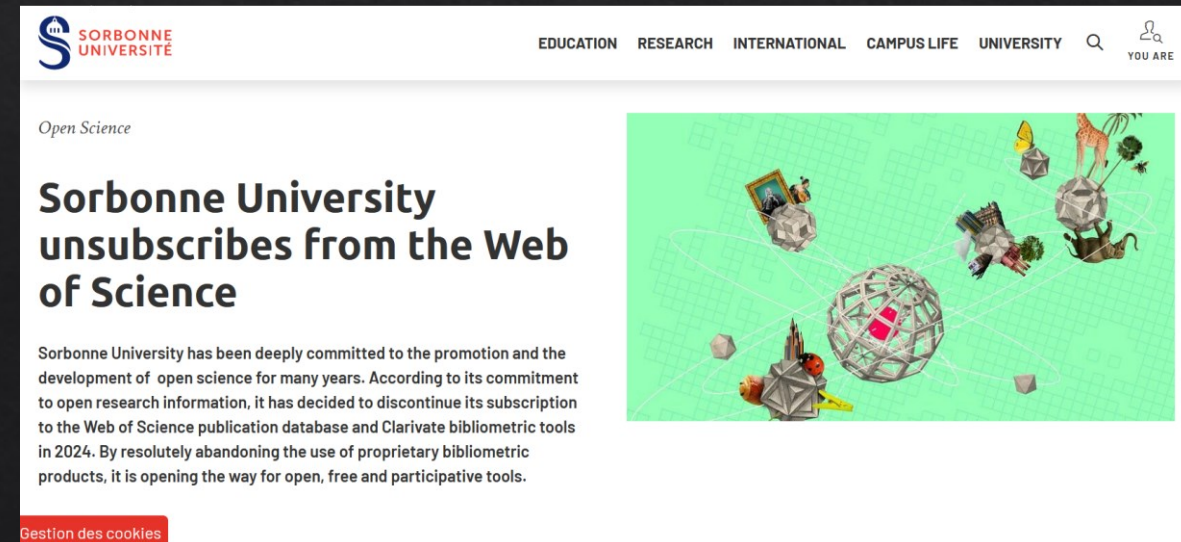
Paradigm shift – Open Science

- ◇ Open Science = an umbrella term for a number of initiatives that aim at making science more accessible
- ◇ Ex:
 - ◇ Switzerland : Open Research Data (ORD) Strategy
 - ◇ Horizon Europe



Open Bibliometrics

- ❖ Bibliometrics : statistical analysis of books, papers and other publications
- ❖ Bibliographic databases used for bibliometric analysis
- ❖ Traditional use of proprietary databases, e.g. Web of Science, Scopus, etc.
- ❖ New alternatives for academic institutions, e.g. Declaration of Barcelona, CWTS Leiden, Université de Sorbonne





- ◆ Launched 03.01.2022
- ◆ Fully open research catalogue
- ◆ Developed by the nonprofit OurResearch
- ◆ ~250 M works

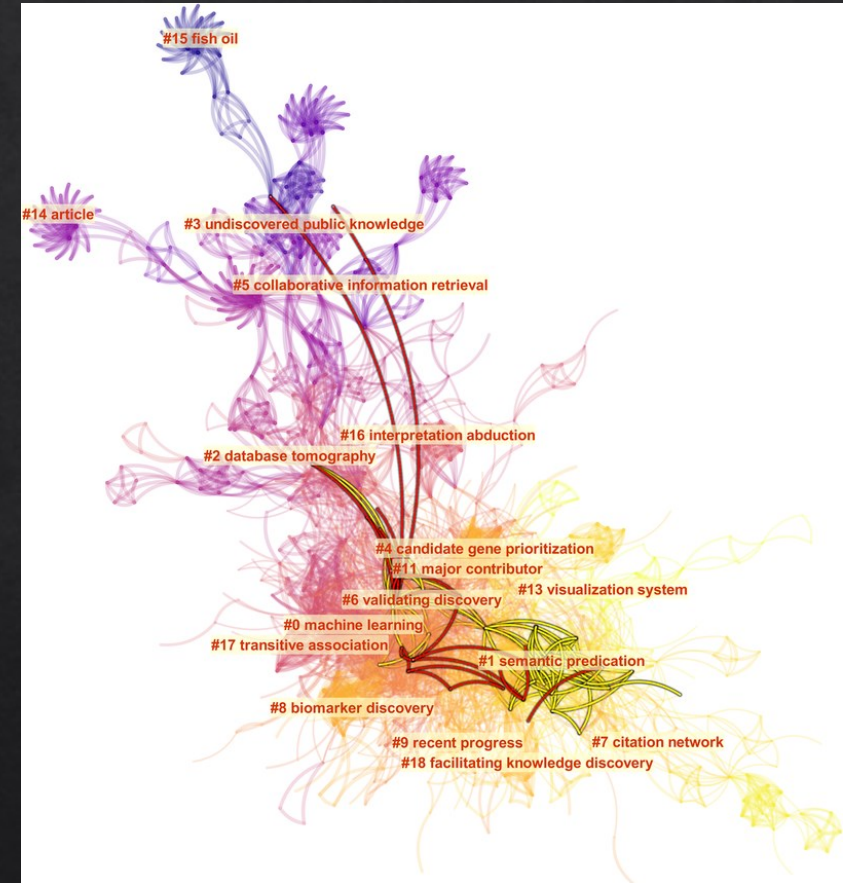
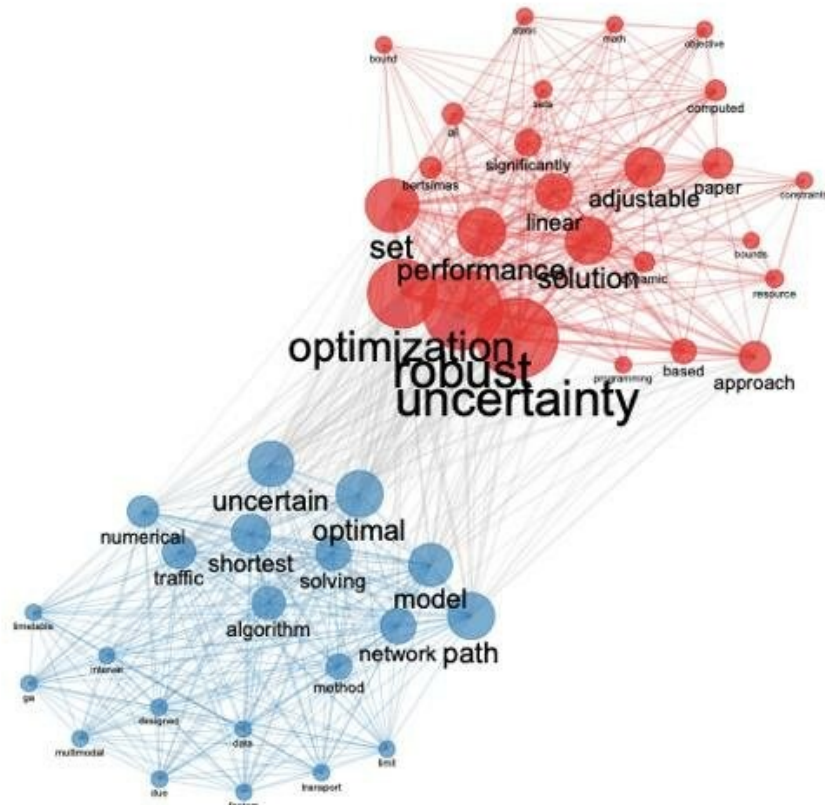
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OpenAlex	243M	48M	1.9B	Freemium	Fully open, CC0 license	Non-profit
Scopus	87M	20.5M (ref)	1.8B	Subscription	Closed	For Profit
Web of Science (core)	87M (ref)	12M (ref)	1.8B	Subscription	Closed	For Profit
Dimensions	135M	29M (ref)	1.7B	Freemium	Partly open, personal use	For Profit
Google Scholar	389M (estimated)	?	?	Free	Closed	For Profit
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Quantum Computing

- ◆ Recent technological advances with revolutionary and disruptive impacts on science and technology – with important implication for defense.
- ◆ Use of OpenAlex data to capture the research landscape surrounding quantum computing
- ◆ Keyword: Quantum Coherence Times ; Quantum Gates ; Quantum Circuits ; Quantum Control Electronics ; Quantum Error Correction ; Quantum Processor Cooling
- ◆ Concepts: Computer Science ; Engineering

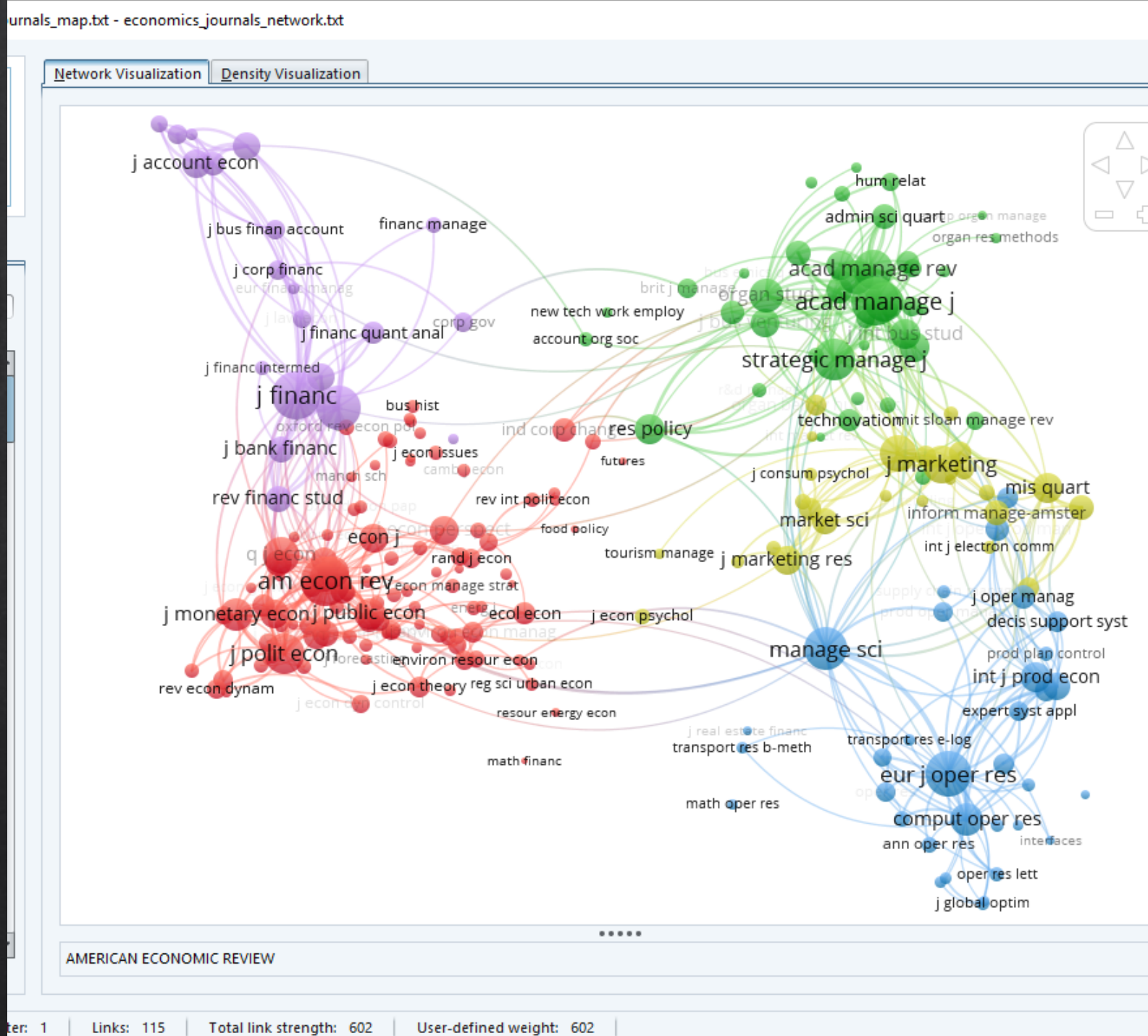


Bibliometric Networks



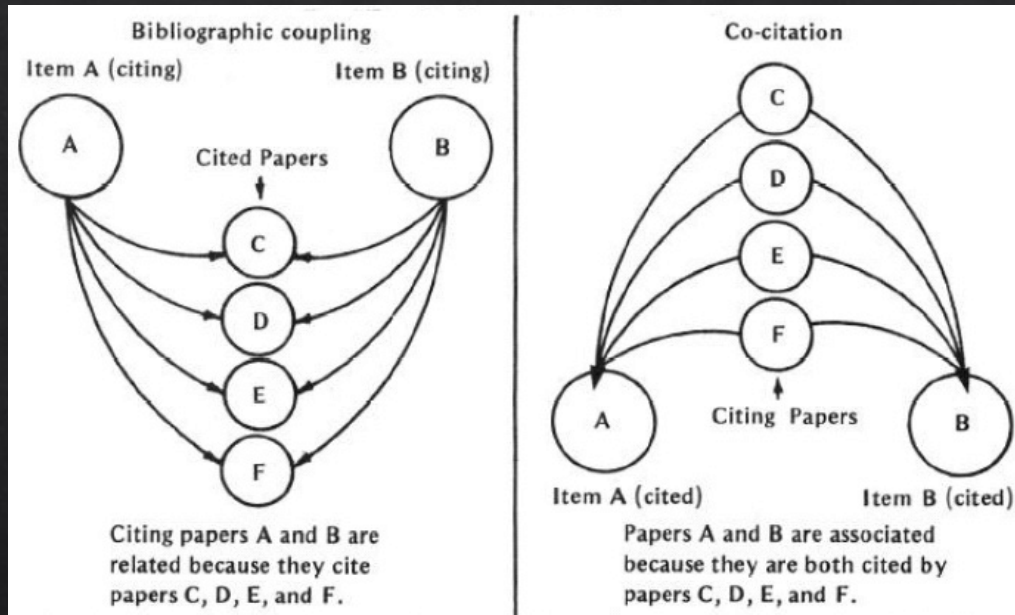
VOSviewer

- ◆ Bibliometric visualization software
- ◆ Developed by CWTS Leiden
- ◆ Useful for large networks
- ◆ Distance-based

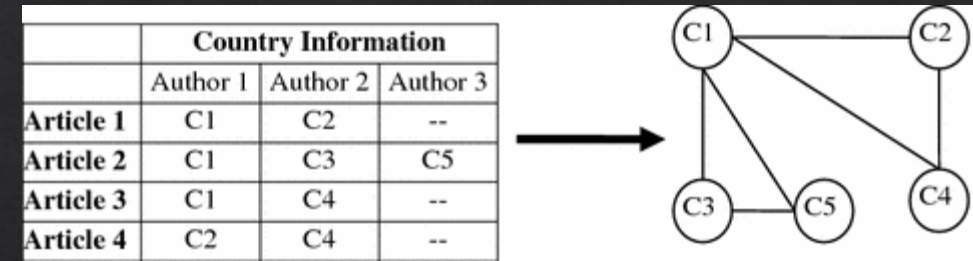


Types of analysis

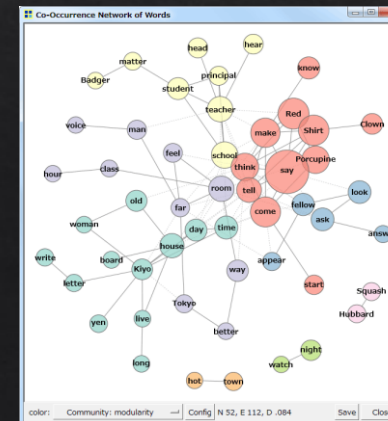
Bibliometric coupling / co-citation



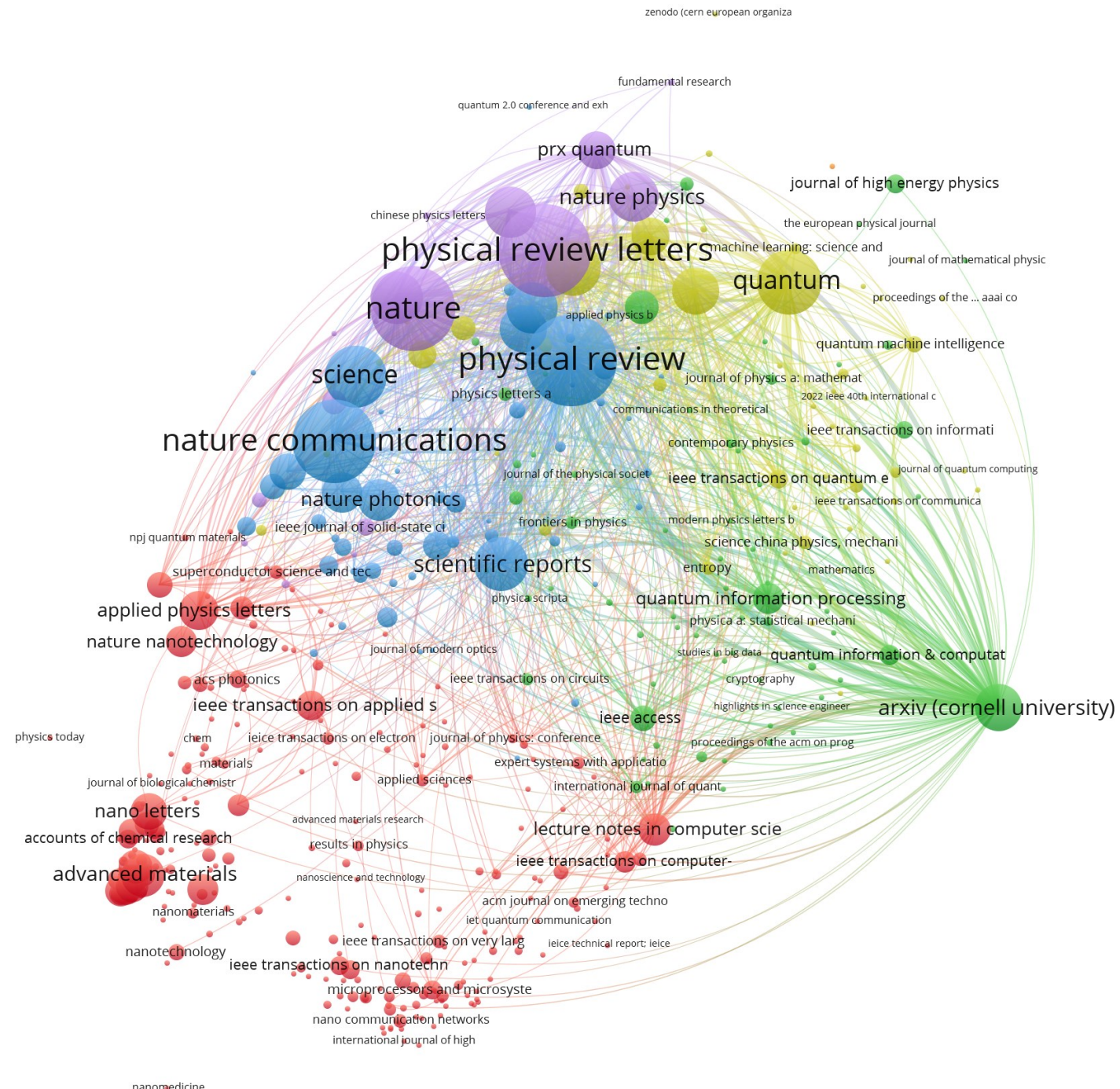
Co-authorship



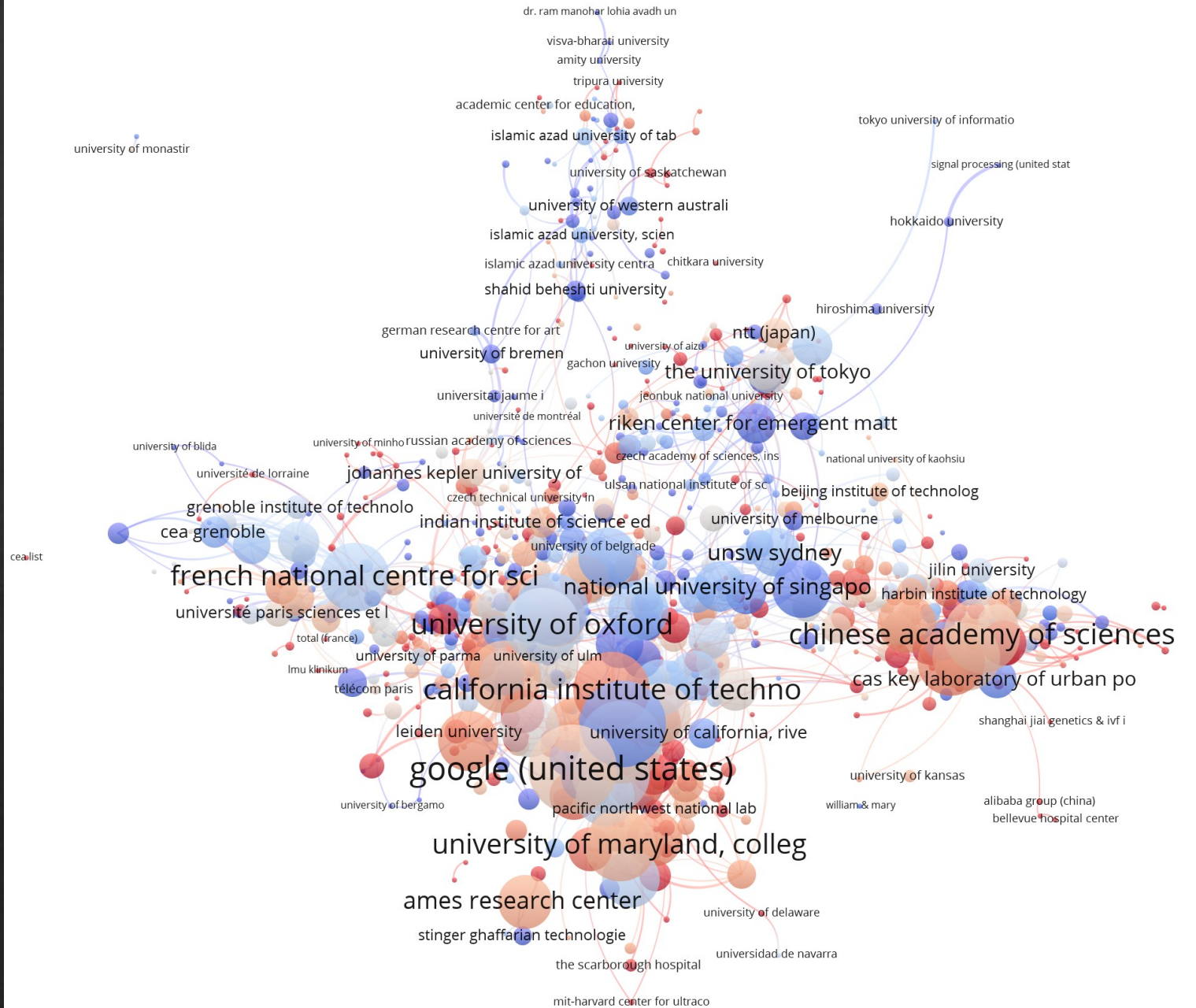
Co-occurrence



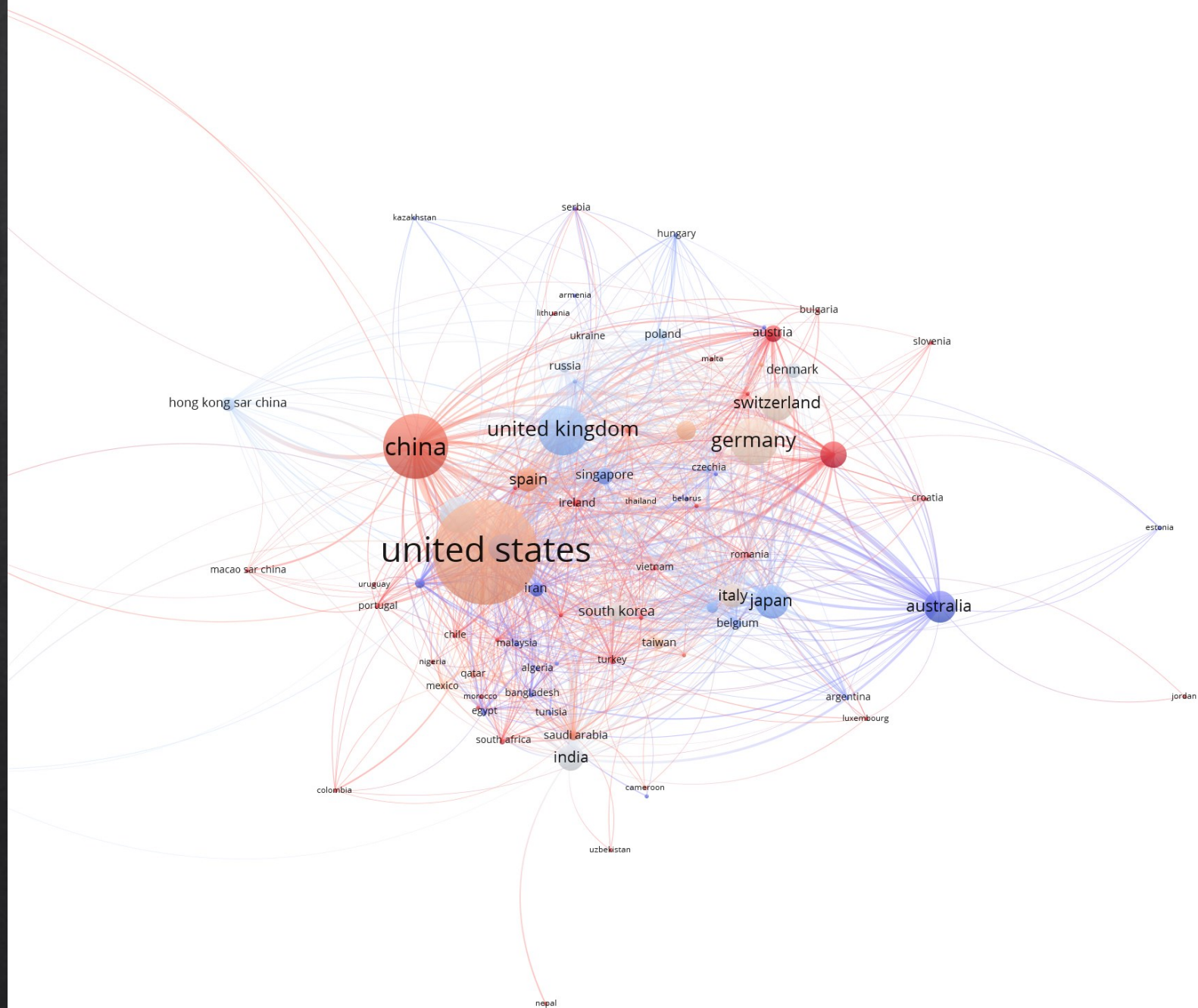
Similarity between journals and other sources



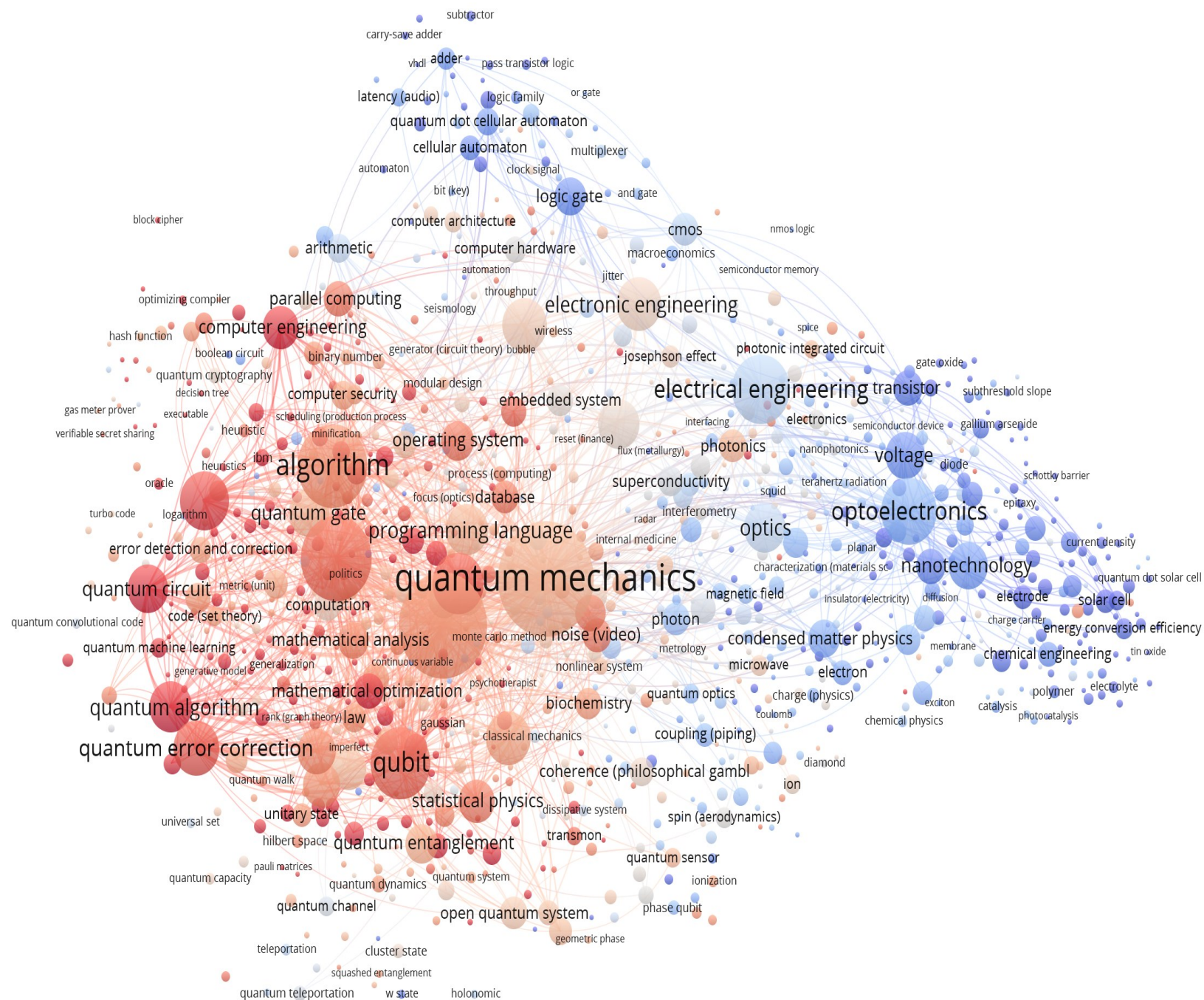
Collaboration between organizations



Collaboration between countries



Research focus through OpenAlex Concepts



Limitations

- ◊ Lack of scaling options for nodes
- ◊ No co-citation

Thank you for your attention !

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