

#### Visualizing Science Using OpenAlex and VOSviewer

**Nees Jan van Eck** Centre for Science and Technology Studies (CWTS), Leiden University

**OpenAlex how-to webinar** December 14, 2023

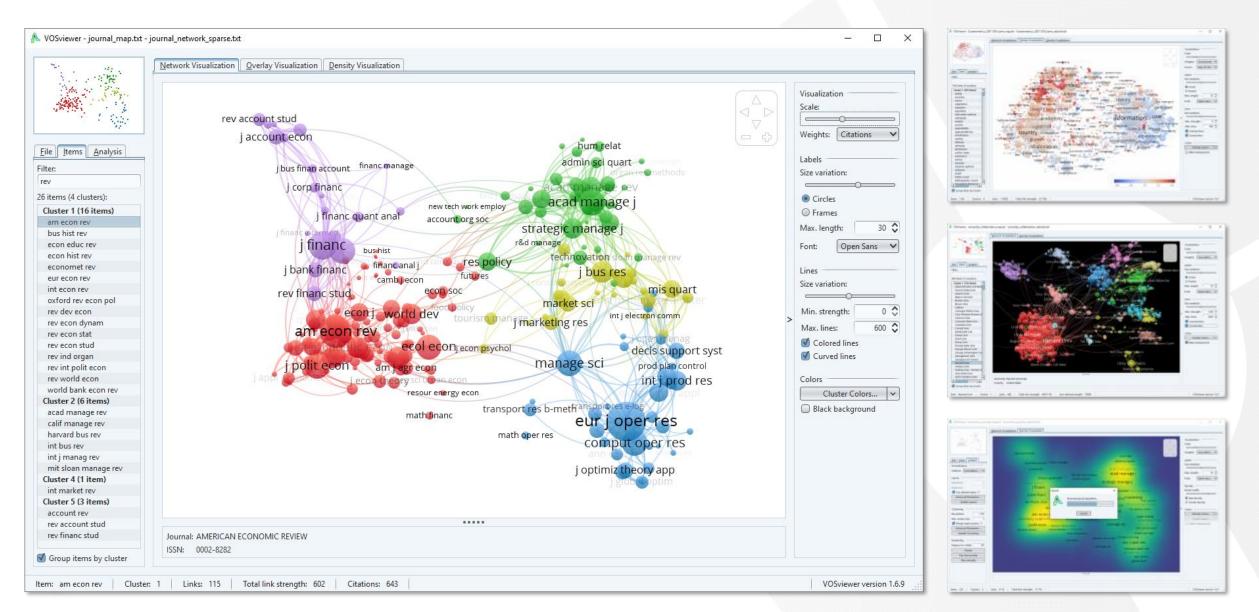


### Outline

- VOSviewer intro
- OpenAlex + VOSviewer demos
- Q&A



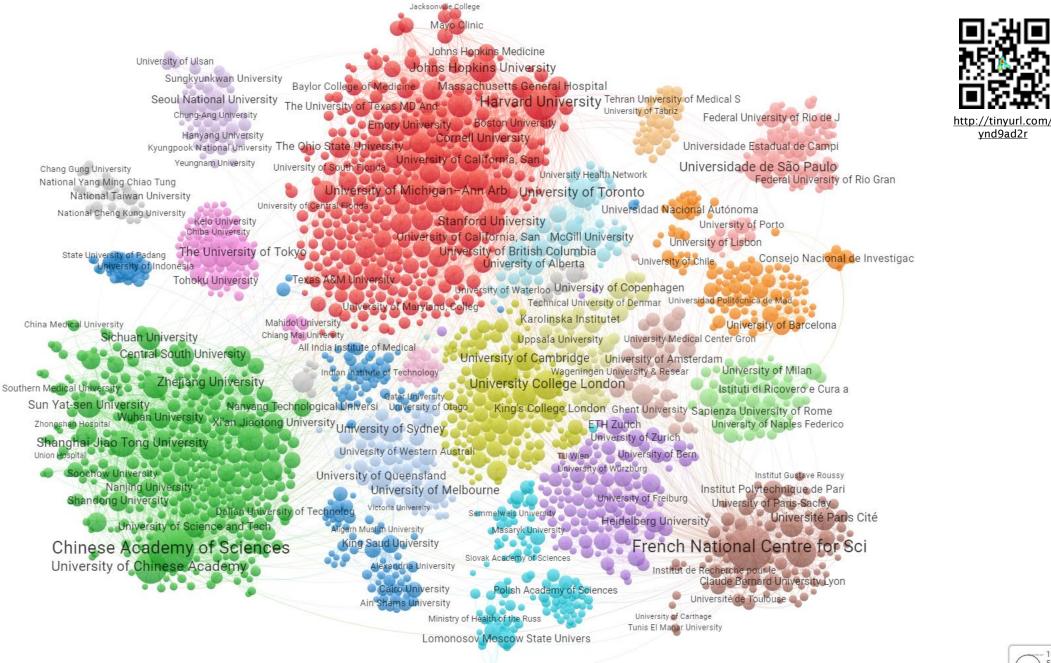
#### VOSviewer



#### VOSviewer

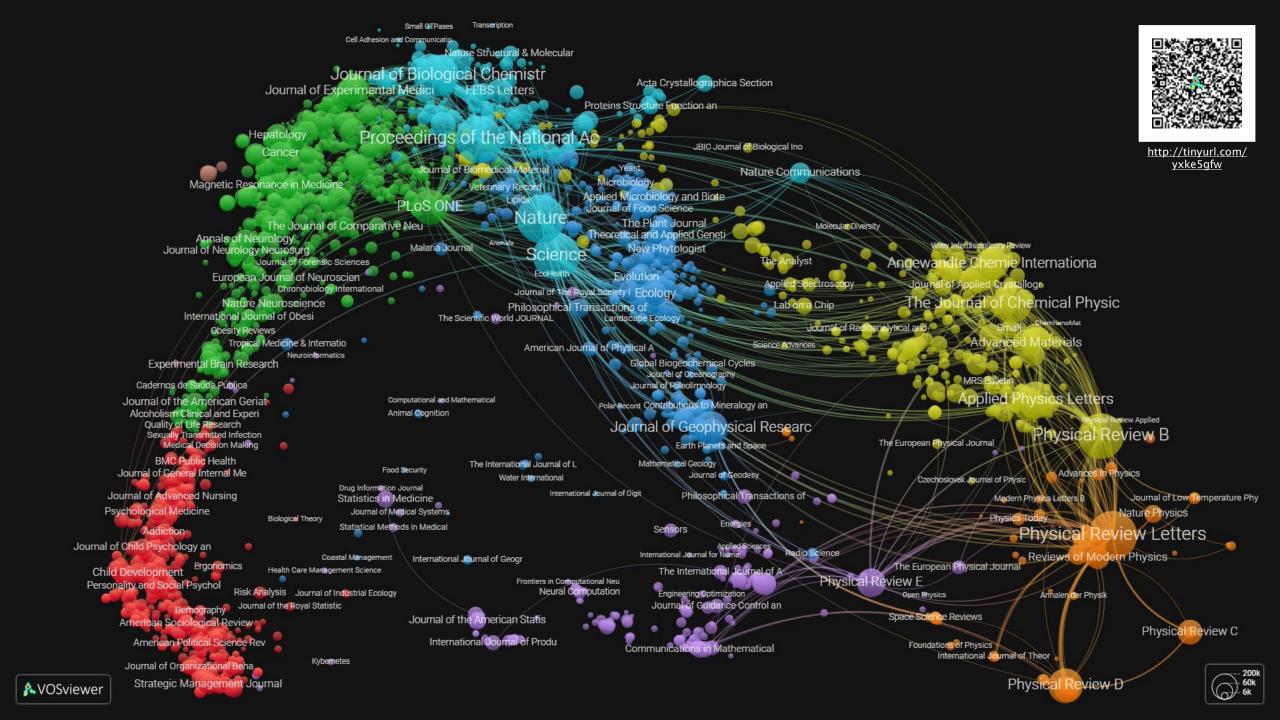
- Focus on visualization of scientometric networks
- Support for large number of data sources
- Text mining functionality
- Advanced visualization features
- Relatively easy to use
- Limited analysis options
- Developed at CWTS



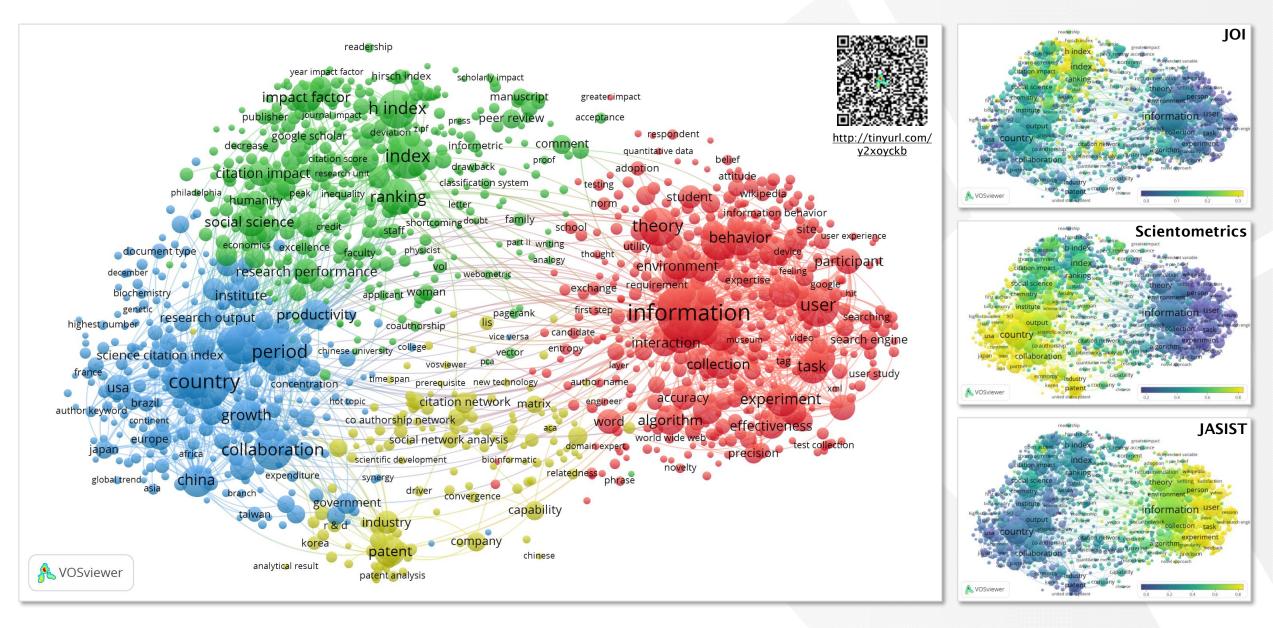


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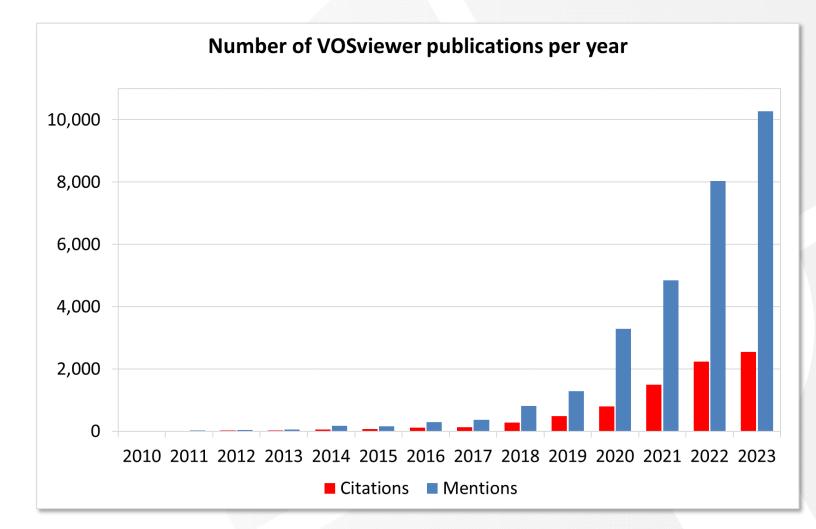


### **Text mining**



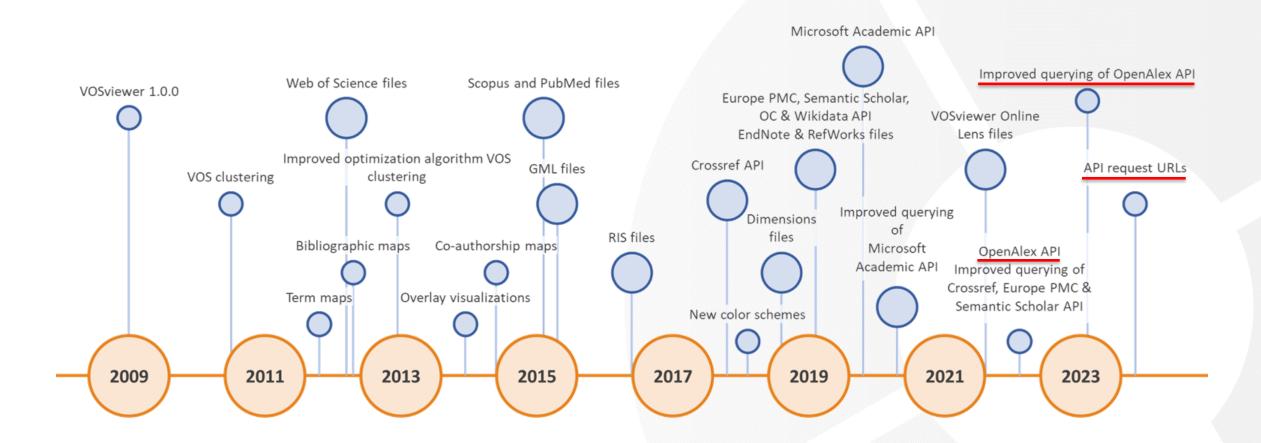
# **Users of VOSviewer**

- Researchers
- Research institutions
- Research funders
- Scientific publishers
- Industry





#### Development



#### Data sources supported by VOSviewer













Semantic Scholar



**LENS.ORG** Solving The Problem Of Problem Solving<sup>Th</sup>

Dimensions

Web of Science



OPEN & ACCESS Freely evaluable enline	@ PLOS   over
Citation Analysis May Sever Impact of Clinical Research a Research	
Nees Jan van Eck <sup>1</sup> *, Ludo Waltman <sup>1</sup> , Anthony F. J.	van Baan <sup>1</sup> , Robert J. M. Klautz <sup>2</sup> , Wilco C. Peul <sup>3</sup>
actes. The Netherlands, 3Department of Neurosurgery, Leiden University Medical	Center Leden. The Netherlands
Abstract Background: Clation analysis has become an important tool However, different areas of medical research may have con medical field. Because of this, it is unclear to what extent clate between research units active in different areas of medical re	for research performance assessment in the medical sciences. siderably different ditation practices, even within the same tion-based bibliometric indicators allow for valid comparisons search.
Methodology: A visualization methodology is introduced th research areas. The methodology extracts terms from the tike these terms to visualize the structure of a medical field and to other in their average citation impact.	at reveals differences in citation practices between medical is and abstracts of a large collection of publications and uses indicate how research areas within this field differ from each
Results: Visualizations are provided for 32 medical fields, defin database. The analysis focuses on three fields: Cardiac & card these fields, there turn out to be large differences in clation tend to focus on clinical intervention research, while high- id agnostic research.	ed based on journal subject categories in the Web of Science liovacular systems, Clinical neurology, and Surgery. In each of practices between research areas. Low-impact research areas mpact research areas are often more oriented on basic and
Conclusions: Popular bibliometric indicators, such as the h-in citation practices between medical fields. These indicators comparisons. More sophisticated bibliometric indicators do within-field heterogeneity in citation practices. As a conseque be subtantially underestimated in comparison with basic an	
Citations van Eck NJ, Waltman L, van Raam AFJ, Klautz RJM, Peul WC (2013) Cit	ution Analysis May Severely Underestimate the impact of Citrical Research as
Compared to Basic Research PLoS ONE 8(4): e62395. doi:10.1371.journal.pone.00 Editor: Onristian Lovis, University Hospitals of Geneva, Seltzerland	
Received October 2, 2012; Accepted March 20, 2013; Published April 24, 201 Capyright: 0 2013 van Eck et al. This is an open-access atticle distributed un unrestricted use, distribution, and reproduction in any medium, provided the of	3 oder the terms of the Geative Commons Attribution Liamus, which permits ginal author and source are credited.
Punding: The authors have no support or funding to report. Competing Interests: Nees Jan van Eds, Ludo Waltman, and Anthony F. J. van R University, which has commercial interests in the production of bibliometric indica sharing data and materials.	aan are affiliated with the Center for Science and Technology Studies of Leiden ators. This does not alter the authors' adherence to all the PLOS ONE policies on
sharing data and materials. * E-mait ecknjøvanikostuleidemunikosi	
Introduction Clusters anylysis is widdy used is the successor of encourter performance is the models since [1]. Especially the isolate [2] and the inspect factor, [6]-3 are example, paped kildsourch indicators, Hourow, the use of their influences for performance indicators. Hourow, the use of their influences for the performance indicators is ritation practice between fields of usinc [2]. For most indicators of the performance indicators in the encount differences in clusters practice between fields of usinc [2]. For most inger in molecular biologies of an isolators, patient is the successful of the successful of the successful of the successful of the successful of the successful of the biologies in an interface of the successful of the successful of the successful of the successful of the successful of the biologiest of the successful of the successful of the successful of the successful of the successful of the successful of the biologiest of the successful of the s	difference is duting practice between fields of science [10]. These follow-model indicators spinsible regularly duting the state of th
PLOS ONE   www.plosone.org 1	April 2013   Volume 8   Issue 4   e6286
	Underestimation of the Impact of Clinical Research
available bibliometric indicators, one should be aware of biases caused by differences in citation practices between areas of medical research, especially between basic and clinical areas.	Author Contributions Generies and designed the experiments NJE LW. Performed the experiments: NJE LW. Analysed the data: AFJR RJMK WCP.
	experiments: NJE L.W. Analysed the data: AFJR RJMK WCP. Contributed reagents/materials/analysis tools: NJE LW, Wrote the paper: NJE LW AFJR RJMK WCP.
Acknowledgments We would like to thank Cathelijn Waaijer for helpful suggestions in the	NJE LW AFJE RJMK WCP.
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### **Bibliographic data sources**

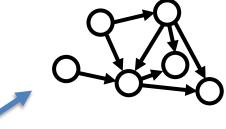
	OpenAlex	Dimensions	Scopus	Web of Science
Journals	180,000	110,000	40,000	30,000
Publications	150 million	110 million	50 million	80 million
Citations	1.5 billion	1.5 billion	1.7 billion	1.8 billion

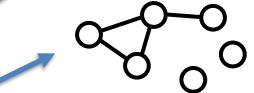


#### **Bibliometric networks in VOSviewer**

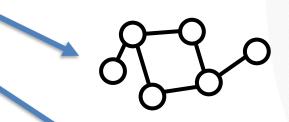
Bibliographic data source

OpenAlex Crossref Europe PMC WoS Scopus Dimensions Lens Semantic Scholar PubMed





- Log



Bibliographic coupling network of pubs / journals / authors

Co-occurrence network of keywords / terms

Citation network of pubs / journals / authors / orgs / countries

Co-authorship network of authors / orgs / countries

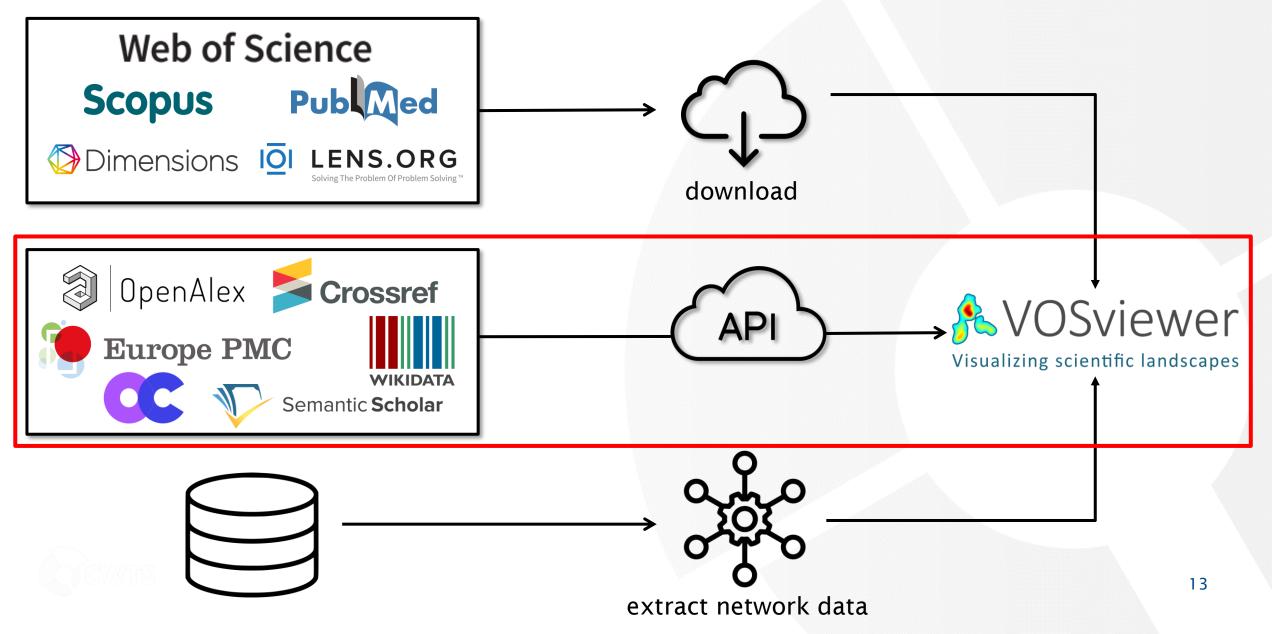
Co-citation network of pubs / journals / authors / orgs / countries

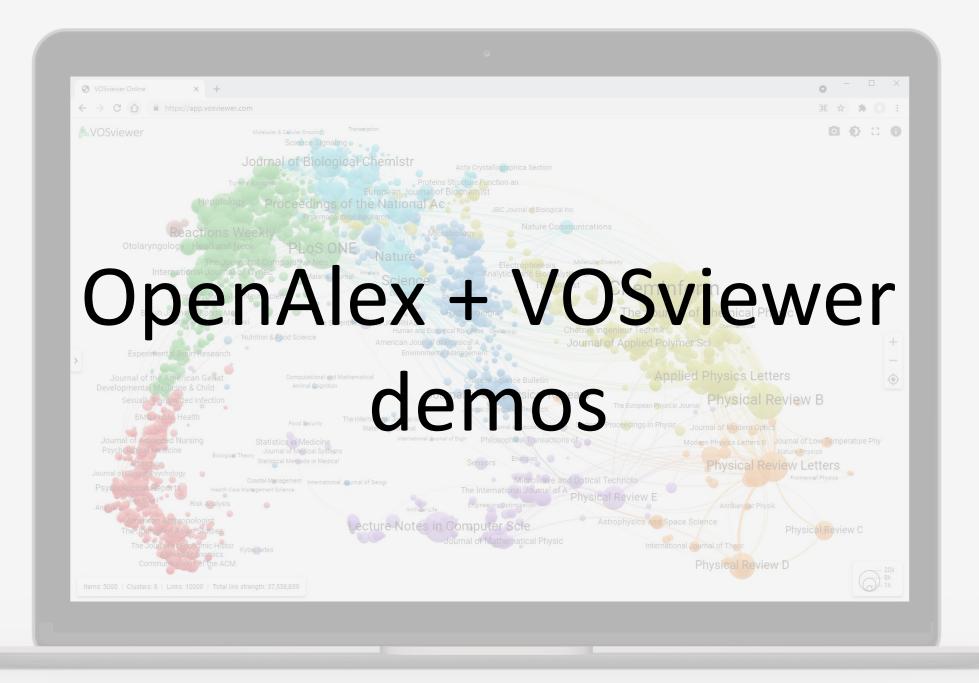


#### Types of networks supported by each data source

	Co-authorship	Co-occurrence	Citation	Bibliographic coupling	Co-citation
OpenAlex	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	×
Crossref	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$
Europe PMC	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$
Web of Science	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$
Scopus	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$
Dimensions	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$
Lens	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	×
PubMed	$\checkmark$	$\checkmark$	×	×	×
Semantic Scholar	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$
OCC / COCI	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	×
Wikidata	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	×

#### Data access





### **Demo 1: Co-authorship network of a researcher**

- OpenAlex •
  - Filters:
    - Author: Nees Jan van Eck
    - Source type: journal
- VOSviewer
  - API: OpenAlex
  - API request URL: https://api.openalex.org/works?pag e=1&filter=authorships.author.id:A5 079208483, primary\_location.source .type:journal&sort=cited\_by\_count:d esc

OpenAlex     OpenAlex     Filter (2) Sort (1) Column (5) Count View Export Help      Pri /works?page=1&filter=authorships.author.id%3A5079208483,primary_location.source.type%3Ajournal     About 110 results      Title     Software survey: VOSviewer, a computer program for bibliometric mapping     From Louvain to Leiden: guaranteeing well-connected communities		
OpenAlex Filter (2) Sort (1) Column (5) Count View Export Help      /works?page=1&filter=authorships.author.id:A5079208483,primary_location.source.type:journal About 110 results Title Software survey: VOSviewer, a computer program for bibliometric mapping	1&sort=cited_by_count:desc	
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Title Software survey: VOSviewer, a computer program for bibliometric mapping		
Software survey: VOSviewer, a computer program for bibliometric mapping		
Software survey: VOSviewer, a computer program for bibliometric mapping		
	2009 article / /.958	
A unified approach to mapping and clustering of bibliometric networks	2019 article 🗸 2,057 2010 article 🗸 1,155	
A unned approach to mapping and clustering of bibliometric networks Citation-based clustering of publications using CitNetExplorer and VOSviewer	2010 article  1,155 2017 article  1,018	
A smart local moving algorithm for large-scale modularity-based community detection	2017 article    667	
Constructing bibliometric networks: A comparison between full and fractional counting	2016 article 🗸 612	
How to normalize cooccurrence data? An analysis of some well-known similarity measures	2009 article 🗸 498	
A comparison of two techniques for bibliometric mapping: Multidimensional scaling and VOS	2010 article 🗸 461	
A new methodology for constructing a publication-level classification system of science	2012 article 🗸 427	
CitNetExplorer: A new software tool for analyzing and visualizing citation networks	2014 article 🗸 409	
Towards a new crown indicator: Some theoretical considerations	2011 articla . / 358	- 0
The Leiden ranking 2011/2012: Data collection, indicators, and i		5
The inconsistency of the h-index	ay Visualization Density Visualization	
Large-scale comparison of bibliographic data sources: Scopus,		Visualization Scale:
BIBLIOMETRIC MAPPING OF THE COMPUTATIONAL INTELLIGE	cristian colliander Vunwei chen	Weights: Documents
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joost kosten martijn s. visser	vincent traag rodrigo.costas alexis-michel mugabushaka	Lines
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greg j. siegle	david van putten	
johan ormel madene v. strege		
philip spinhoven steven d. hollon		
Cluster 4 (5 items) andré []	frants rg havekes im	
boraine		
Group items by cluster		
Items: 86 Clusters: 27 Links: 257 Total link stren	anth. (02	VOSviewer version 1.6



#### Demo 2: Bibliographic coupling network of highly cited publications ✓ ③ Open ← → C

- OpenAlex •
  - Filters:
    - Sources: Scientometrics OR Journal of Informetrics OR Quantitative Science Studies
- VOSviewer •
  - API: OpenAlex
  - API request URL: https://api.openalex.org/works?pag e=1&filter=primary\_location.source.i d:S148561398|S205292342|S42101 95326&sort=cited\_by\_count:desc

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About 9,288 results						
Title		Year Type	Open Access	Citation count		
Software survey: VOSviewer, a computer program for bibliome	atrio monping	2009 article	open Access	7,958		
bibliometrix : An R-tool for comprehensive science mapping a		2009 article 2017 article	-	3,742		
The journal coverage of Web of Science and Scopus; a compa		2017 article 2015 article	~	1,882		
Theory and practise of the g-index		2006 article	~	1,637		
Citation review of Lagergren kinetic rate equation on adsorption	on reactions	2004 article	-	1,482		
A unified approach to mapping and clustering of bibliometric	networks	2010 article	$\checkmark$	1,155		
The bibliometric analysis of scholarly production: How great is	s the impact?	2015 article	$\checkmark$	1,146		
Co-word analysis as a tool for describing the network of intera of polymer chemsitry	actions between basic and technological research: The case	e 1991 article	-	1,117		
An approach for detecting, quantifying, and visualizing the e	s VOSviewer					
Sets Theory field						
Sets Theory field Citation-based clustering of publications using CitNetExplor	Network Visualization Qverlay Visualiza	tion Density Visualization				
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Item: nees jan van eck (2009) Cluster: 1 Links: 75 Total link strength: 161 Citations: 7958

VOSviewer version 1.6.20



#### **Demo 3: Co-occurrence network of terms extracted** from a set of related publications

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A VOSviewer

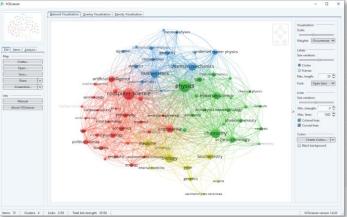
File Items Analys Filter: 685 items (3 clusters): Cluster 1 (264 items) aacr ability abstract abstract nr accumulation ace2 acid activation activity advance alt alteration american association animal anti inflammatory anti inflammatory ager anti inflammatory prop anti malaria drug anticancer effect antimalarial activity antimalarial agent antimalarial drug chlor antiplasmodial activity antitumor effect apoptosis apr assay autophagic flux \_\_\_\_\_ Sroup items by cluster Items: 685 Clusters:

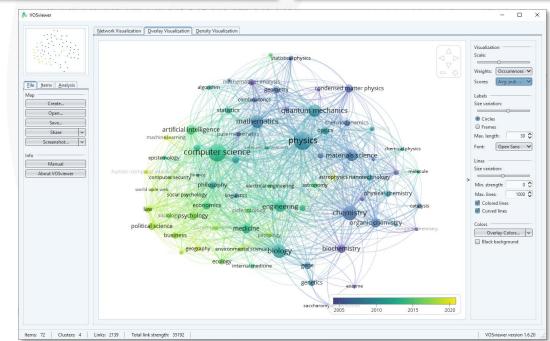
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Text (title): chloroquine	Author ID:	⑦ ORCID:	0		
• Year: 2016-2022	Affiliation: Source ID:	⑦         ROR ID:           ⑦         ISSN:	0		
	Text: Chloroquine	⑦         Year:         2016	to 2022	Density Visualization	- 🗆 X
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phildelphia		apoptosis apr assay autophagic flux	philodelphia	2018.5 2019.0 2019.5 2020.0 2	2020.5
Links: 78667 Total link strength: 237268	VOSviewer version 1.6.20	Items: 685 Clusters: 3 Links:	78667 Total link strength: 237268	1	VOSviewer version 1.6.20

### Demo 4: Co-occurrence network of concepts based on a set of collaborative publications

- OpenAlex
  - Filters:
    - Institution: Leiden University AND Delft University of Technology
- VOSviewer
  - API: OpenAlex
  - API request URL: <u>https://api.openalex.org/works?pag</u> <u>e=1&filter=authorships.institutions.li</u> <u>neage:I98358874+I121797337&sort</u> <u>=cited\_by\_count:desc</u>

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bout 1,593 results					
Title	Year	Туре	Open Access	Citation c	ount
Natural deep eutectic solvents as new potential media for green technology	2013	article	~	1	,636
Genome sequencing and analysis of the versatile cell factory Aspergillus niger CBS 513.88	2007	article	~	1	,031
Are Natural Deep Eutectic Solvents the Missing Link in Understanding Cellular Metabolism and Physiology?	2011	article	~		820
Tailoring properties of natural deep eutectic solvents with water to facilitate their applications	2015	article	~		755
Pyruvate Metabolism inSaccharomyces cerevisiae	1996	article	~		707
Eleven grand challenges in single-cell data science	2020	article	~		680
The <i>Herschel</i> -Heterodyne Instrument for the Far-Infrared (HIFI)	2010	article	~		635
An interlaboratory comparison of physiological and genetic properties of four Saccharomyces cerevisiae strains	2000	article	~		507
14-3-3 proteins: key regulators of cell division, signalling and apoptosis	2001	article			502
Natural Deep Eutectic Solvents as a New Extraction Media for Phenolic Metabolites in Carthamus tinctorius L.	2013	article	~		485
A comparison of two techniques for bibliometric mapping: Multidimensional scaling and VOS	2010	article	~		461
Copper(ii)-catalysed aerobic oxidation of primary alcohols to aldehydes	2003	article			453
In Situ Observation of Active Oxygen Species in Fe-Containing Ni-Based Oxygen Evolution Catalysts: The Effect of pH on Electrochemical Activity	2015	article			437
Preparation, optimization, and structures of cross-linked enzyme aggregates (CLEAs)	2004	article			435
Innic Linuide and Dean Eutertic Solvante in Natural Products Research: Mixtures of Solide as Extraction Solvante	2013	articla			351 *



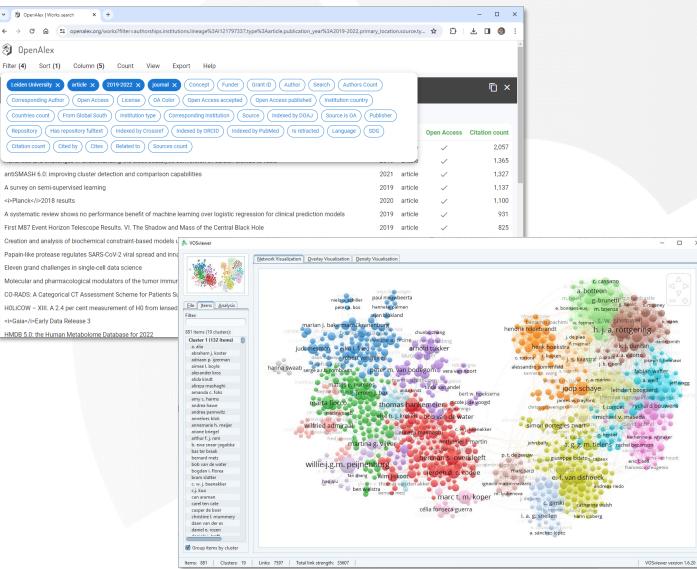




### **Demo 5: Co-authorship network of researchers of a** university and their collaborators

🖄 OpenAlex

- OpenAlex ٠
  - Filters:
    - Institution: Leiden University
    - Work type: article
    - Source type: journal
    - Year<sup>.</sup> 2019-2022
- VOSviewer
  - API: OpenAlex
  - API request URL: https://api.openalex.org/works?pag e=1&filter=authorships.institutions.li neage:I121797337,publication\_year: 2019-2022,type:article,primary\_location.s ource.type:journal&sort=cited\_by\_co unt:desc







#### openalex.org

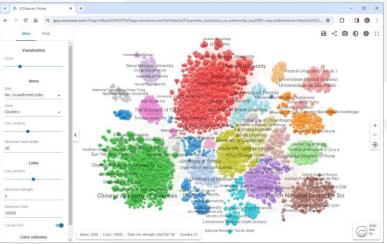
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Leiden University x article x 2019-2022 x journal x Concept Funder Grant ID Author Search Authors	Count )			n >
Corresponding Author Open Access License OA Color Open Access accepted Open Access published Institution count	N			· L. ,
Countries count From Global South Institution type Corresponding Institution Source Indexed by DOAJ Source is OA	Publisher			
Repository (Has repository fulltext) (Indexed by Crossref) (Indexed by ORCID) (Indexed by PubMed) (Is retracted) (Language	SDG			
	300		Open Access	Citation coun
Citation count Cited by Cites Related to Sources count			~	2,057
a ranoo ana ananangoo manaaraanang are aloo aoatay ao oomalaan ar aaroon alonaa ta taalo	2017		~	1,365
ntiSMASH 6.0: improving cluster detection and comparison capabilities	2021	article	~	1,327
survey on semi-supervised learning	2019	article	~	1,137
i>Planck2018 results	2020	article	~	1,100
systematic review shows no performance benefit of machine learning over logistic regression for clinical prediction models	2019	article	~	931
irst M87 Event Horizon Telescope Results. VI. The Shadow and Mass of the Central Black Hole	2019	article	~	825
treation and analysis of biochemical constraint-based models using the COBRA Toolbox v.3.0	2019	article	~	761
apain-like protease regulates SARS-CoV-2 viral spread and innate immunity	2020	article	~	755
leven grand challenges in single-cell data science	2020	article	~	680
folecular and pharmacological modulators of the tumor immune contexture revealed by deconvolution of RNA-seq data	2019	article	~	664
O-RADS: A Categorical CT Assessment Scheme for Patients Suspected of Having COVID-19—Definition and Evaluation	2020	article	~	651
0LICOW – XIII. A 2.4 per cent measurement of H0 from lensed quasars: 5.3σ tension between early- and late-Universe probes	2019	article	~	646
I>GalaEarly Data Release 3	2021	article	~	596
HMDB 5.0: the Human Metabolome Database for 2022	2021	article	~	586

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VOSviewer version 1.6.20 was release on October 31, 2023. This version offimproved features for creating maps

#### app.vosviewer.com



## Do it yourself!

#### Thank you for your attention!





Q&A