



Gauging impact with the Map of Science and bibliometrics

June 2024



CSET



Emerging
Technology
Observatory



About CSET and ETO



- Georgetown's [Center for Security and Emerging Technology](#) analyzes emerging technologies and their security implications
 - Over 60 interdisciplinary staff, including a 14-person data science and engineering team

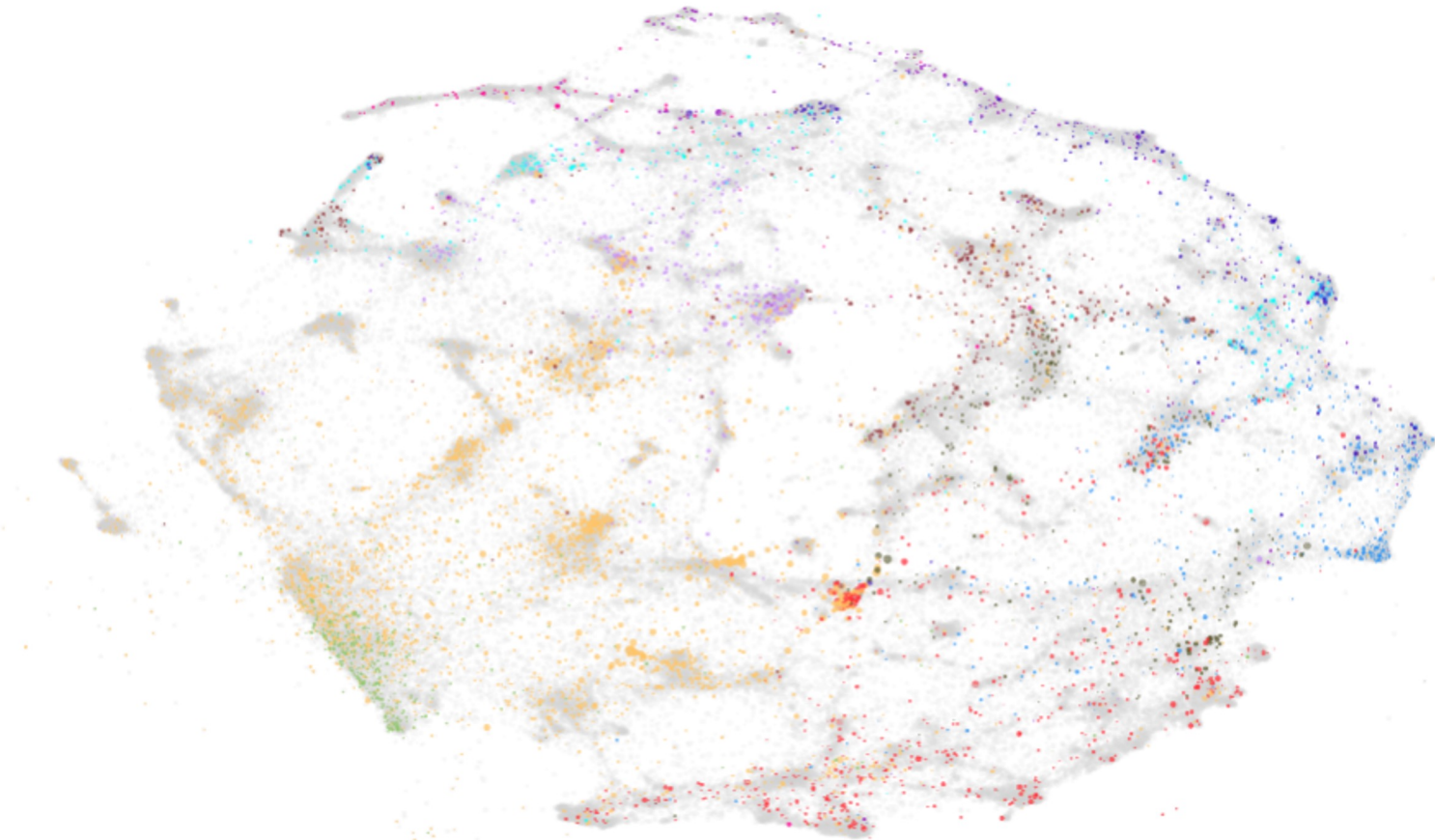


- CSET's [Emerging Technology Observatory](#) (ETO) builds public data resources - tools, visualizations, and datasets - to inform critical decisions on emerging tech issues

The Map of Science in Brief

- The [Map of Science](#) is ETO's flagship tool for exploring research literature across topics, sources, languages and geographies
- Applies **citation-based clustering** to detailed metadata on **200 million+** academic articles extracted from public-access and commercial datasets
- **Core function:** help users quickly pinpoint and characterize key trends and groupings in the research literature landscape

How the Map Works



2D visualization of the Map clusters ([fastest-growing 10% highlighted](#); clusters with more intercluster citation links are closer together)

Group 200m+ articles into ~110k clusters based *solely* on citation patterns

- Maximizing modularity of citation
- Each cluster is set of related research questions or techniques

For more information: [ETO documentation](#), [Rahkovsky et al. 2021](#)

The Map in practice

Map of Science: Cluster 13840



Subjects

General subjects

Medicine, Biology, Chemistry | [View other clusters related to these topics](#)

Specific subjects

Oncology, Cancer research, Gastroenterology | [View other clusters related to these topics](#)

Key concepts

breast cancer, triple-negative breast cancer, metastatic triple-negative breast, breast cancer immunotherapy, immune cells

1.85% of all articles are AI-related

0.04% of English-language articles are related to robotics

1.6% of English-language articles are related to computer vision

0% of English-language articles are related to natural language processing

0% of English-language articles are related to AI safety

0% of English-language articles are related to cybersecurity



Vital signs

2,495 recent articles in the cluster

95.47% of articles are in English

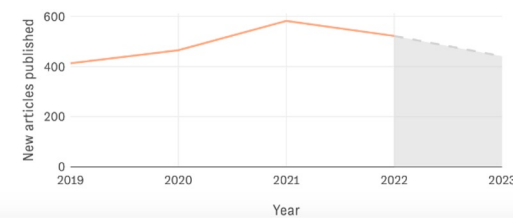
Average article is 5.38 years old

Growth rating: 44th percentile

Expected to grow extremely fast

Citation rating: 64th percentile

Articles added over time



Switch to detail view to understand any particular cluster in depth

The Map in practice

Map of Science

- Subjects
 - General subjects
 - Medicine, Biology, Chemis
 - Specific subjects
 - Oncology, Cancer research
 - Key concepts
 - breast cancer, triple-nega
- Vital signs
 - 2,495 recent articles in th
 - Average article is 5.38 yea
 - Expected to grow extreme

Top author countries

Country	Articles (last five years)	Yearly citations (average)
United States	753	10.08
China	581	3.63
Italy	208	13.34
United Kingdom	192	16.64
Germany	188	14.94
Spain	165	14.11
Japan	160	17.12
Australia	155	19.19
France	154	17.17
Belgium	139	13.19

AI-related insights

- 1.85% of all articles are AI-related
- 0.04% of English-language articles are related to robotics
- 1.6% of English-language articles are related to computer vision
- 0% of English-language articles are related to natural language processing
- 0% of English-language articles are related to AI safety
- 0% of English-language articles are related to cybersecurity

Articles added over time

Year	New articles published
2019	~400
2020	~450
2021	~550
2022	~450
2023	~400

Switch to detail view to understand any particular cluster in depth

The Map in practice

Map of Science

Subjects

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Medicine, Biology, Chemis

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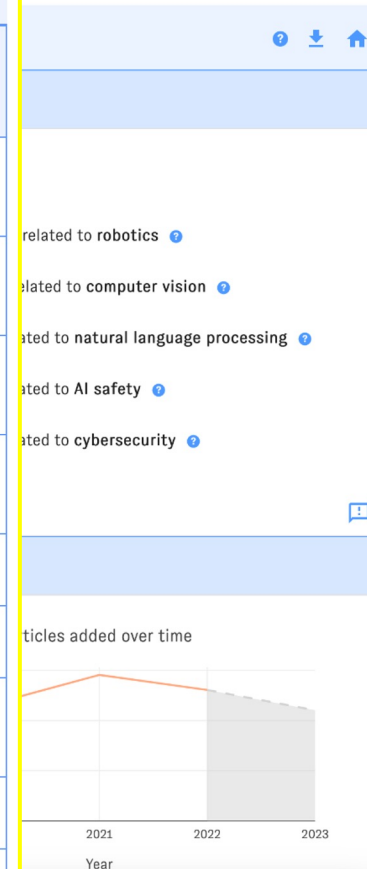
Expected to grow extreme

Top author countries

Country	Articles (last five years)
United States	
China	
Italy	
United Kingdom	
Germany	
Spain	
Japan	
Australia	
France	
Belgium	

Top funders

Funding organization	Articles (last five years)	Yearly citations (average)
National Natural Science Foundation of China (China)	200	4.65
National Institutes of Health (United States)	142	9.29
Breast Cancer Research Foundation (United States)	84	13.69
National Cancer Institute (United States)	47	11.69
AstraZeneca	35	8.64
Merck & Company	34	54.03
Susan G. Komen Breast Cancer Foundation (United States)	33	10.71
Bristol-Myers Squibb	29	5.49
Ministry of Science and Technology (China)	24	5.98
United States Department of Defense (United States)	22	5.31



Switch to detail view to understand any particular cluster in depth

The Map in practice

Top funders ?

Key articles

- core** articles are especially highly connected to other papers within the cluster.
- review** articles cite between 100 and 1000 other articles. These articles describe and systematize other contributors' research.
- highly cited** articles are the articles in the cluster with the most citations overall.

Order list by

ARTICLE CATEGORY ?

core **highly cited** Pembrolizumab plus chemotherapy versus placebo plus chemotherapy for previously untreated locally recurrent inoperable or metastatic triple-negative breast cancer (KEYNOTE-355): a randomised, placebo-controlled, double-blind, phase 3 clinical trial
2020: The Lancet. 1,010 citations. [Web of Science](#)

core **highly cited** Long-term Clinical Outcomes and Biomarker Analyses of Atezolizumab Therapy for Patients With Metastatic Triple-Negative Breast Cancer: A Phase 1 Study
2019: JAMA oncology. 562 citations. [DOI](#)

core **highly cited** Neoadjuvant atezolizumab in combination with sequential nab-paclitaxel and anthracycline-based chemotherapy versus placebo and chemotherapy in patients with early-stage triple-negative breast cancer (IMpassion031): a randomised, double-blind, phase 3 trial
2020: The Lancet. 632 citations. [DOI](#) [Web of Science](#)

Source	Articles (last five years)
Technology (China)	24
United States Department of Defense (United States)	22

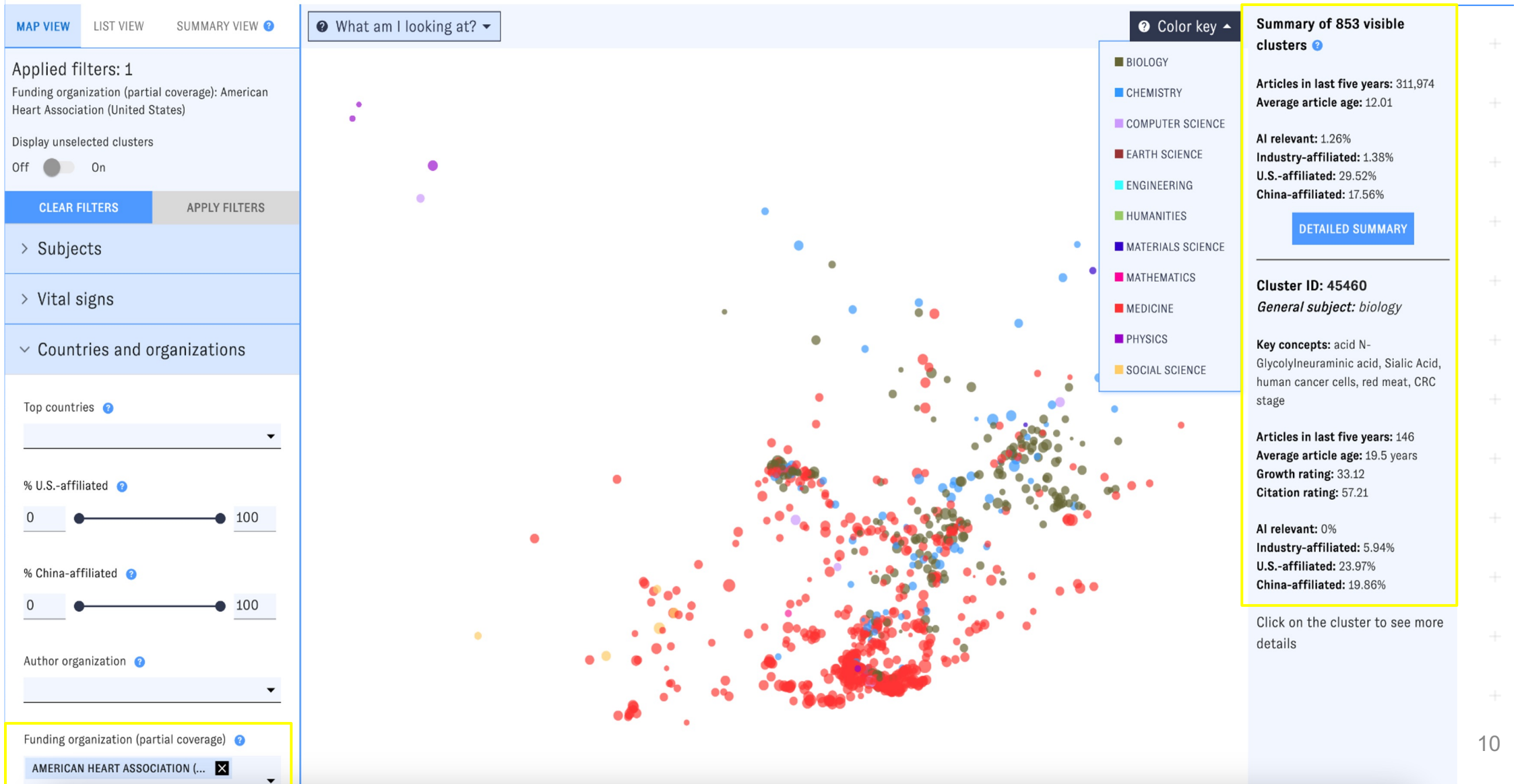
Top sources ?

Source	Articles (last five years)
Cancer Research	142
Cancers	106
Journal of Clinical Oncology	87
Frontiers in oncology	80
Research Square (Research Square)	76
Annals of Oncology	62
Breast cancer research and treatment	46
Clinical cancer research : an official journal of the American Association for Cancer Research	37
npj Breast Cancer	35
Frontiers in immunology	33

What Does This Mean for Funders?

- Funder search is hard
 - Publications tend to be inconsistent in how affiliated institutions are recorded and spelled
 - Data sources amplify this problem as we attempt to deduplicate & combine metadata
 - Clusters aggregate metadata - if you're not in the top 10 for the cluster, you're not able to be found
- The Map was originally built for high-level trend analysis and horizon scanning – but you can look for orgs among the trends
 - Not built to track individuals or labs

What Does This Mean for Funders?



Using the Map to assess funding strategy

- Is our organization active in notable clusters?

Using the Map to assess funding strategy

- Is our organization active in notable clusters?
- “Pure” bibliometric impact indicators:
 - [Clusters with high growth](#) (high number of recent publications)
 - [Highly cited clusters](#)
 - [Highly cited and high growth](#)
 - [Clusters expected to grow extremely fast](#)

Using the Map to assess funding strategy

- Is our organization active in notable clusters?
- Patenting impact indicators:
 - [Clusters with high patent impact](#) (patents citing to the cluster)
 - [Clusters with broad patent impact](#) (% of articles with citing patents)

Using the Map to assess funding strategy

- Is our organization active in notable clusters?
- Other indicators of strategic interest
 - Interdisciplinary clusters
 - “AI+” clusters
 - Clusters where other organizations of interest are active

Other Tools

- Methodologies (if existing dataset of research literature)
- Datasets (if not)

Other Tools

- Methodologies
- Targeted funder/organization search is easier than corpus-wide monitoring
 - Removes the aggregation effect of our Map of Science
 - Especially if doing this once a year/infrequently
- Data Mining
 - Text extraction of funders, recipients, grant programs, citations, research topics
 - Hard, expensive, lots of upkeep
 - Requires database management, entity extraction & resolution, and consistent upkeep

Other Tools

- Datasets
- OpenAlex - publicly available corpus of research literature
 - One of the contributing sources to our Map of Science
 - [Bulk data](#) or [user-friendly UI](#) with full-text or funder search

Other Tools

1 🔍 Fulltext includes "Alzheimer's Association" ✕

+ 🗑️

Works

⌵ ⬇ ⋮

The diagnosis of dementia due to Alzheimer's disease: Recommendations from the National Institute on Aging-Alzheimer's Association workgroups on diagnostic guidelines for Alzheimer's disease
2011 · Guy M. McKhann, David S. Knopman, et al. · *Alzheimer's & dementia*
Cited by 13,730 PDF

The diagnosis of mild cognitive impairment due to Alzheimer's disease: Recommendations from the National Institute on Aging-Alzheimer's Association workgroups on diagnostic guidelines for Alzheimer's disease
2011 · Marilyn Albert, Steven T. DeKosky, et al. · *Alzheimer's & dementia*
Cited by 7,533 PDF

Toward defining the preclinical stages of Alzheimer's disease: Recommendations from the National Institute on Aging-Alzheimer's Association workgroups on diagnostic guidelines for Alzheimer's disease
2011 · Reisa A. Sperling, Paul S. Aisen, et al. · *Alzheimer's & dementia*
Cited by 5,823 PDF

National Institute on Aging-Alzheimer's Association guidelines for the neuropathologic assessment of Alzheimer's disease
2012 · Bradley T. Hyman, Creighton H. Phelps, et al. · *Alzheimer's & dementia*
Cited by 2,069 PDF

Introduction to the recommendations from the National Institute on Aging-Alzheimer's Association workgroups on diagnostic guidelines for Alzheimer's disease
2011 · Clifford R. Jack, Marilyn Albert, et al. · *Alzheimer's & dementia*
Cited by 1,656 PDF

2012 Alzheimer's disease facts and figures Alzheimer's Association *

Stats

+ ⬇

144,000 results

🏠 institution ⋮ ✕

<input type="checkbox"/> University of London	5,752
<input type="checkbox"/> Harvard University	3,853
<input type="checkbox"/> University College London	3,520
<input type="checkbox"/> United States Department of Veterans Affairs	3,226
<input type="checkbox"/> Veterans Health Administration	3,180
More...	


🏷️ type ⋮ ✕

<input type="checkbox"/> article	121,600
<input type="checkbox"/> preprint	10,830
<input type="checkbox"/> book-chapter	3,709
<input type="checkbox"/> dissertation	2,323
<input type="checkbox"/> review	2,031
More...	

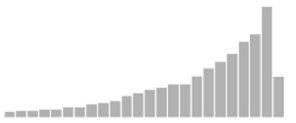
📁 topic ⋮ ✕

<input type="checkbox"/> Diagnosis and Management of Alzheimer's Disease	12,180
<input type="checkbox"/> Mechanisms of Alzheimer's Disease	11,580
<input type="checkbox"/> Analysis of Brain Functional Connectivity Networks	2,951
<input type="checkbox"/> Pathophysiology of Parkinson's Disease	2,869
<input type="checkbox"/> Role of Microglia in Neurological Disorders	2,845
More...	

🔒 open access ⋮ ✕

 **90.2%**
129,900 works
More...

📅 year ⋮ ✕

 More...

Other Tools

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Works

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Stats

144,000 results

5,220,000 citations

type

- article
- preprint
- book-chapter
- dissertation
- review

institution

<input type="checkbox"/> University of London	5,752
<input type="checkbox"/> Harvard University	3,853
<input type="checkbox"/> University College London	3,520
<input type="checkbox"/> United States Department of Veterans Affairs	3,226
<input type="checkbox"/> Veterans Health Administration	3,180
More...	

topic

- Diagnosis and Management of Alzheimer's Disease
- Mechanisms of Alzheimer's Disease
- Analysis of Brain Function and Networks
- Pathophysiology of Parkinson's Disease
- Role of Microglia in Neurodegenerative Disorders

open access

year

Add to report:

- APC sum
- author
- Citations sum
- Country
- institution
- keyword
- language
- open access
- topic
- type
- year

More

Other Tools

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Stats

144,000 results

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field

- Medicine
- Biochemistry, Genetics and Molecular Biology
- Neuroscience
- Psychology
- Health Professions

5,034

4,178

More...

institution

- University of London
- Harvard University 3,853
- University College London 3,520
- United States Department of Veterans Affairs 3,226
- Veterans Health Administration 3,180

More...

open access

- Alzheimer's Disease
- Mechanisms of Alzheimer's Disease
- Analysis of Brain Function and Networks
- Pathophysiology of Parkinson's Disease
- Role of Microglia in Neurodegenerative Disorders

year

- open access
- topic
- type
- year

More

Other Tools

Alzheimer's Association

Funder

View works



RPI



Visit homepage

Works count: 3,218

Cited by: 165,500

Top works

[View all](#)

The diagnosis of dementia due to Alzheimer's disease: Recommendations from the National Institute on Aging-Alzheimer's Association workgroups on diagnostic guidelines for Alzheimer's disease

2011 · Guy M. McKhann, David S. Knopman, et al. · *Alzheimer's & dementia*

Cited by 13,730 PDF

Imaging brain amyloid in Alzheimer's disease with Pittsburgh Compound-B

2004 · William E. Klunk, Henry Engler, et al. · *Annals of neurology*

Cited by 3,994

National Institute on Aging-Alzheimer's Association guidelines for the neuropathologic assessment of Alzheimer's disease

2012 · Bradley T. Hyman, Creighton H. Phelps, et al. · *Alzheimer's & dementia*

Cited by 2,069 PDF

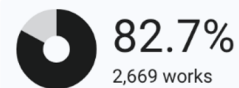
Key stats

year



[More...](#)

open access



2,669 works

[More...](#)

topic

Mechanisms of Alzheimer's Disease	694
Diagnosis and Management of Alzheimer's Disease	469
Role of Microglia in Neurological Disorders	165
Analysis of Brain Functional Connectivity Networks	103
Diffusion Magnetic Resonance Imaging	64

Other Tools

- Datasets
- OpenAlex - publicly available corpus of research literature
 - One of the contributing sources to our Map of Science
 - Bulk data or user-friendly UI with funder search
- Downsides
 - Available stats are useful, but not customizable
 - Limits the amount of insight you can get into impact
 - Ex. citations per year would not be available, just total citations
 - Just one data source with its own collection/availability issues
 - However, HRA members might be better represented in these types of aggregators

Other Tools

- Datasets
- Dimensions - a cross-cutting data aggregator and service provider
 - Grants, publications, patents*
 - More holistic approach to “impact” than looking solely at research
 - Pre-generated metadata
 - Entity extraction & resolution, funders, funding amount, etc.
 - No need for in-house time/resources
 - Centralized data & straightforward document linkage
 - Available technical assistance



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