Influential Nodes in the Australian PID Graph (National Graph)

Amir Aryani

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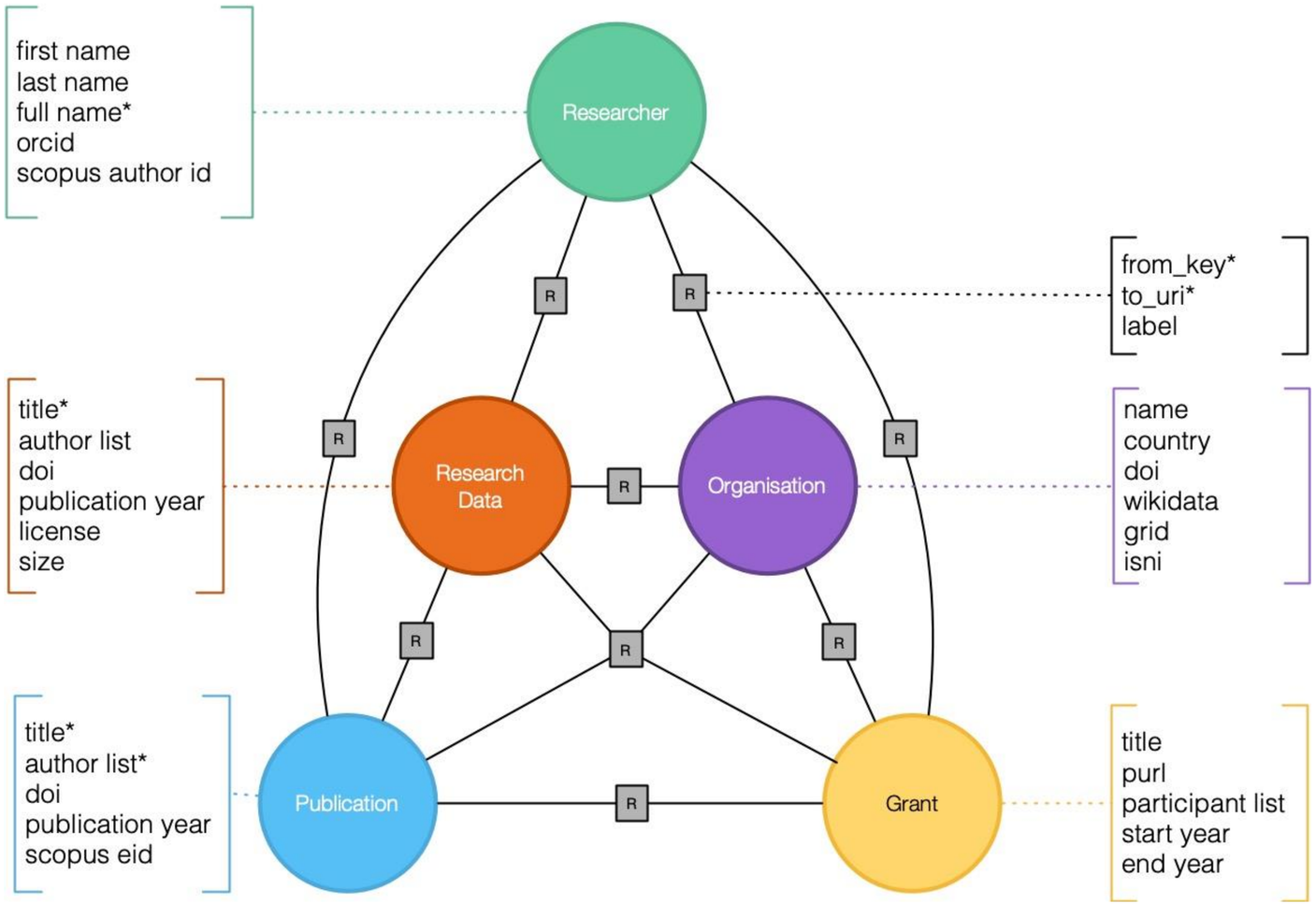
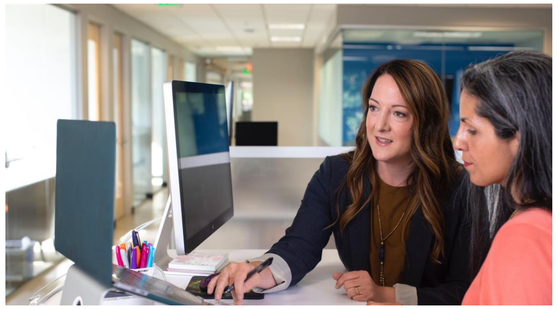
[4] National Computation Infrastructure (NCI), Canberra, ACT, Australia
[5] Research Graph Foundation Ltd., Melbourne, Vic, Australia
[6] Australian Research Data Commons, Melbourne, Vic, Australia

What is Research Graph?





Connection Types

Type A: α: PID – [metadata] → PID

Type B: β: Text (e.g PDF) – [DM & NLP (%)] → PID

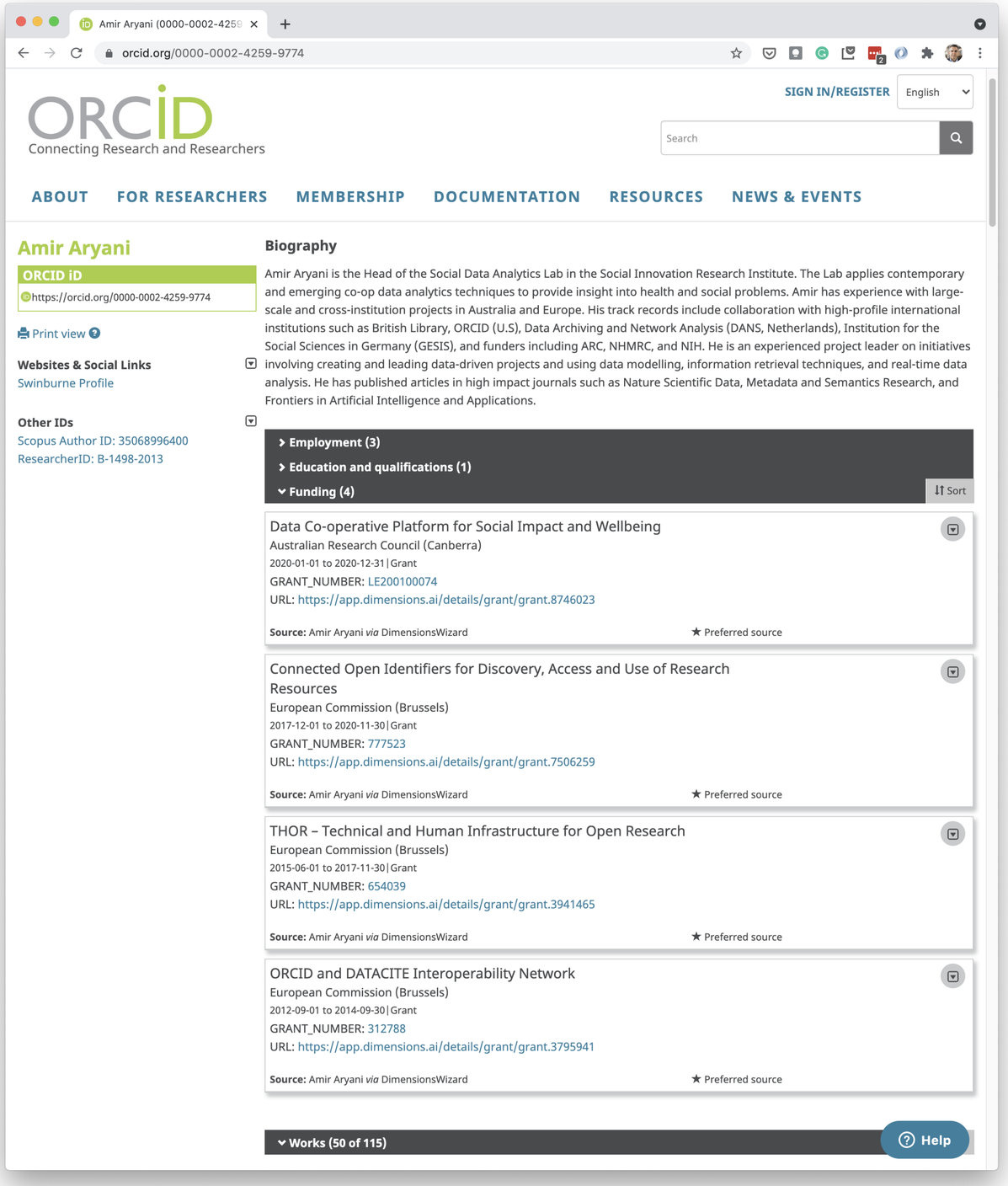
Type T: Θ: Text (e.g PDF) – [DM & NLP (%)] → Text

Persistent Identifier (PID)

- Open Researcher and Contributor Identifier (ORCID iD)
- Digital Object Identifier (DOI)
- PubMed ID
- International Standard Name Identifier (ISNI)
- ROR
- Funder ID
- WikiData ID

Type A

Explicit link between PIDs in their metadata



Type B

Connecting (Text ➔ PIDs (DOI, ORCID, PubMed)

- Text mining,
- Fuzzy search, and
- Graph modeling.

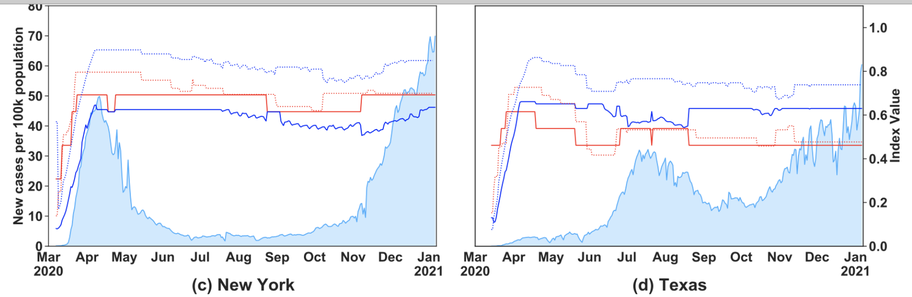


Fig. 12 Trends in COVID-19 cases per 100,000 population since first 50 cases and the NPI-based indices in representative US states. At the beginning of the pandemic the 4 states shown have similar trends in the NPI index values. As the pandemic progressed, particularly by October 2020, there was as decrease in the NPI index values that appears to be associated with a subsequent increase in new COVID-19 cases.

dataset are an accurate representation of reality as some of the interventions capture a governmental request that might not be followed by the entire population. Thus, it might be useful to integrate the WNTRAC dataset with other publicly available data sources that can provide information regarding the level of compliance with an intervention, such as mobility information as exemplified by the NPI Index discussed above. Lastly, one other interesting use case is to estimate the economic impact of NPIs, for example, by relating unemployment rates and jurisdictional debt with NPIs. Estimating the effect of NPIs on non-COVID-19 health problems, such as late cancer detection due to missed screening tests, will also be useful.

Code availability

The source code for the WNTRAC automated NPI curation system, including the data processing pipeline, WNTRAC Curator tool and NPI data browser is available in a public GitHub repository at https://github.com/IBM/wntrac/tree/master/code alongside the up-to-date version of the dataset https://github.com/IBM/wntrac/tree/master/data. Please refer to the README file in repository for further instructions on using the code.

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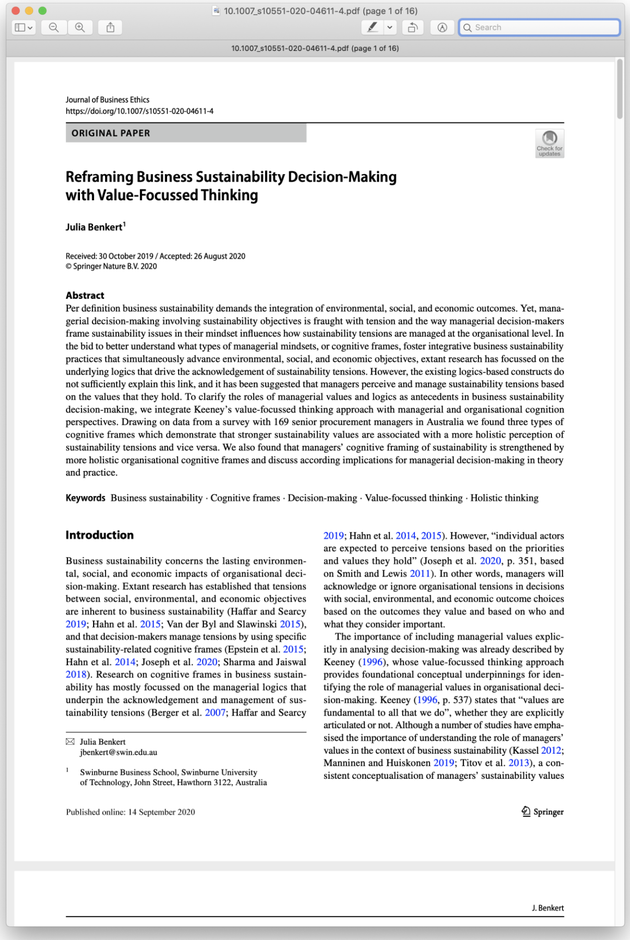
Type T

θ: Text (e.g PDF) – [DM & NLP (%)] → Text



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Journal of Business Ethics
https://doi.org/10.1007/s10551-020-04611-4

ORIGINAL PAPER

Check for updates

Reframing Business Sustainability Decision-Making with Value-Focussed Thinking

Julia Benkert[1]

Received: 30 October 2019 / Accepted: 26 August 2020

Abstract
Per definition business sustainability demands the integration of environmental, social, and economic outcomes. Yet, managerial decision-making involving sustainability objectives is fraught with tension and the way managerial decision-makers frame sustainability issues in their mindset influences how sustainability tensions are managed at the organisational level. In the bid to better understand what types of managerial mindsets, or cognitive frames, foster integrative business sustainability practices that simultaneously advance environmental, social, and economic objectives, extant research has focussed on the underlying logics that drive the acknowledgement of sustainability tensions. However, the existing logics-based constructs do not sufficiently explain this link, and it has been suggested that managers perceive and manage sustainability tensions based on the values that they hold. To clarify the roles of managerial values and logics as antecedents in business sustainability decision-making, we integrate Keeney's value-focussed thinking approach with managerial and organisational cognition perspectives. Drawing on data from a survey with 169 senior procurement managers in Australia we found three types of cognitive frames which demonstrate that stronger sustainability values are associated with a more holistic perception of sustainability tensions and vice versa. We also found that managers' cognitive framing of sustainability is strengthened by more holistic organisational cognitive frames and discuss according implications for managerial decision-making in theory and practice.

Keywords Business sustainability · Cognitive frames · Decision-making · Value-focussed thinking · Holistic thinking

Introduction

Business sustainability concerns the lasting environmental, social, and economic impacts of organisational decision-making. Extant research has established that tensions between social, environmental, and economic objectives are inherent to business sustainability (Haffar and Searcy 2019; Hahn et al. 2015; Van der Byl and Slawinski 2015), and that decision-makers manage tensions by using specific sustainability-related cognitive frames (Epstein et al. 2015; Hahn et al. 2014; Joseph et al. 2020; Sharma and Jaiswal 2018). Research on cognitive frames in business sustainability has mostly focussed on the managerial logics that underpin the acknowledgement and management of sustainability tensions (Berger et al. 2007; Haffar and Searcy 2019; Hahn et al. 2014, 2015). However, "individual actors are expected to perceive tensions based on the priorities and values they hold" (Joseph et al. 2020, p. 351, based on Smith and Lewis 2011). In other words, managers will acknowledge or ignore organisational tensions in decisions with social, environmental, and economic outcome choices based on the outcomes they value and based on who and what they consider important.

The importance of including managerial values explicitly in analysing decision-making was already described by Keeney (1996), whose value-focussed thinking approach provides foundational conceptual underpinnings for identifying the role of managerial values in organisational decision-making. Keeney (1996, p. 537) states that "values are fundamental to all that we do", whether they are explicitly articulated or not. Although a number of studies have emphasised the importance of understanding the role of managers' values in the context of business sustainability (Kassel 2012; Manninen and Huiskonen 2019; Titov et al. 2013), a consistent conceptualisation of managers' sustainability values

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ELSEVIER

Weighted bee colony algorithm for discrete optimization problems with application to feature selection

CrossMark

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[b] Department of Computer Science, Aberystwyth University, Wales, UK
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Categorical optimization
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Weighted bee colony optimization

ABSTRACT

The conventional bee colony optimization (BCO) algorithm, one of the recent swarm intelligence (SI) methods, is good at exploration whilst being weak at exploitation. In order to improve the exploitation power of BCO, in this paper we introduce a novel algorithm, dubbed as weighted BCO (wBCO), that allows the bees to search in the solution space deliberately while considering policies to share the attained information about the food sources heuristically. For this purpose, wBCO considers global and local weights for each food source, where the former is the rate of popularity of a given food source in the swarm and the latter is the relevancy of a food source to a category label. To preserve diversity in the population, we embedded new policies in the recruiter selection stage to ensure that uncommitted bees follow the most similar committed ones. Thus, the local food source weighting and recruiter selection strategies make the algorithm suitable for discrete optimization problems. To demonstrate the utility of wBCO, the feature selection (FS) problem is modeled as a discrete optimization task, and has been tackled by the proposed algorithm. The performance of wBCO and its effectiveness in dealing with feature selection problem are empirically evaluated on several standard benchmark optimization functions and datasets and compared to the state-of-the-art methods, exhibiting the superiority of wBCO over the competitor approaches.

1. Introduction

Swarm intelligence (SI) is one of the well-known classes of optimization and refers to algorithms relying on the intelligence of a swarm to locate the best parts of the solution space. Particle swarm optimization (PSO) (Kennedy and Eberhart, 1995), ant colony optimization (ACO) (Dorigo et al., 1999) and BCO (Nikolic and Teodorovic, 2013; Teodorovic et al., 2006), are examples of SI algorithms. Many problems such as text clustering (Dziwiński, et al., 2012), feature selection (Forsati et al., 2014; Forsati et al., 2012; Unler and Murat, 2010), etc., can be modeled as discrete optimization problems and solutions obtained through SI algorithms.

BCO is one of the most recent developments of swarm intelligence proposed by Teodorovic et al. (2006), which has been successfully applied to many fields of science including image analysis (Ghareh Mohammadi and Saniee Abadeh, 2014), bioinformatics (Li et al., 2014), etc. The algorithm simulates the natural behavior of the bees in locating food resources. In summary, the BCO algorithm has five main stages: (1) initialization, (2) solution creation, (3) fitness assessment, (4) loyalty measurement, and (5) recruiters selection.

In the first step, the algorithm parameters are initialized (*initialization*). Then in the second step the solutions are created, partially in the sense that the whole solution will not be created at once while during several forward and backward steps a complete solution will be created (*solution creation*). In BCO a forward step occurs once the bees leave their hive to create solutions and explore the solution space, while the backward stage occurs once the bees return to their hive to measure the goodness of the produced solutions, share the attained information and finally select the follower and recruiters.

During the solution creation steps, after each forward movement, the bees return to their hive to assess the solutions (*fitness assessment*). The fitness assessment occurs in the backward step, where each bee also measures how loyal it is to the created partial solution (*loyalty measurement*). Finally, before performing the next forward movement, the bees must be divided into two sets of committed (recruiter) and uncommitted (followers) bees to decide

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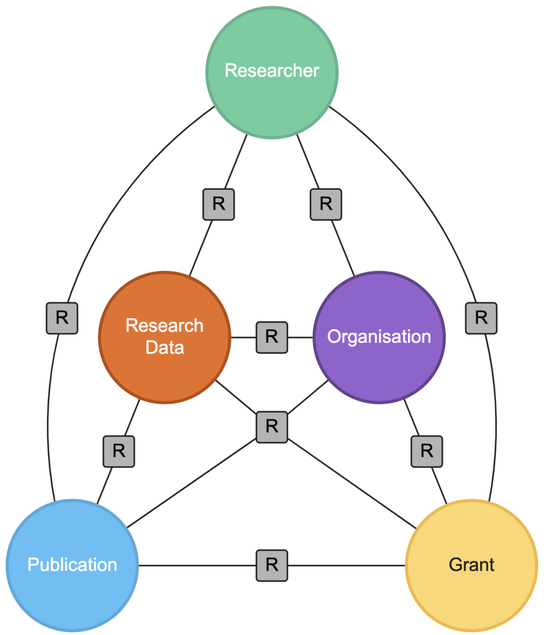
0952-1976/

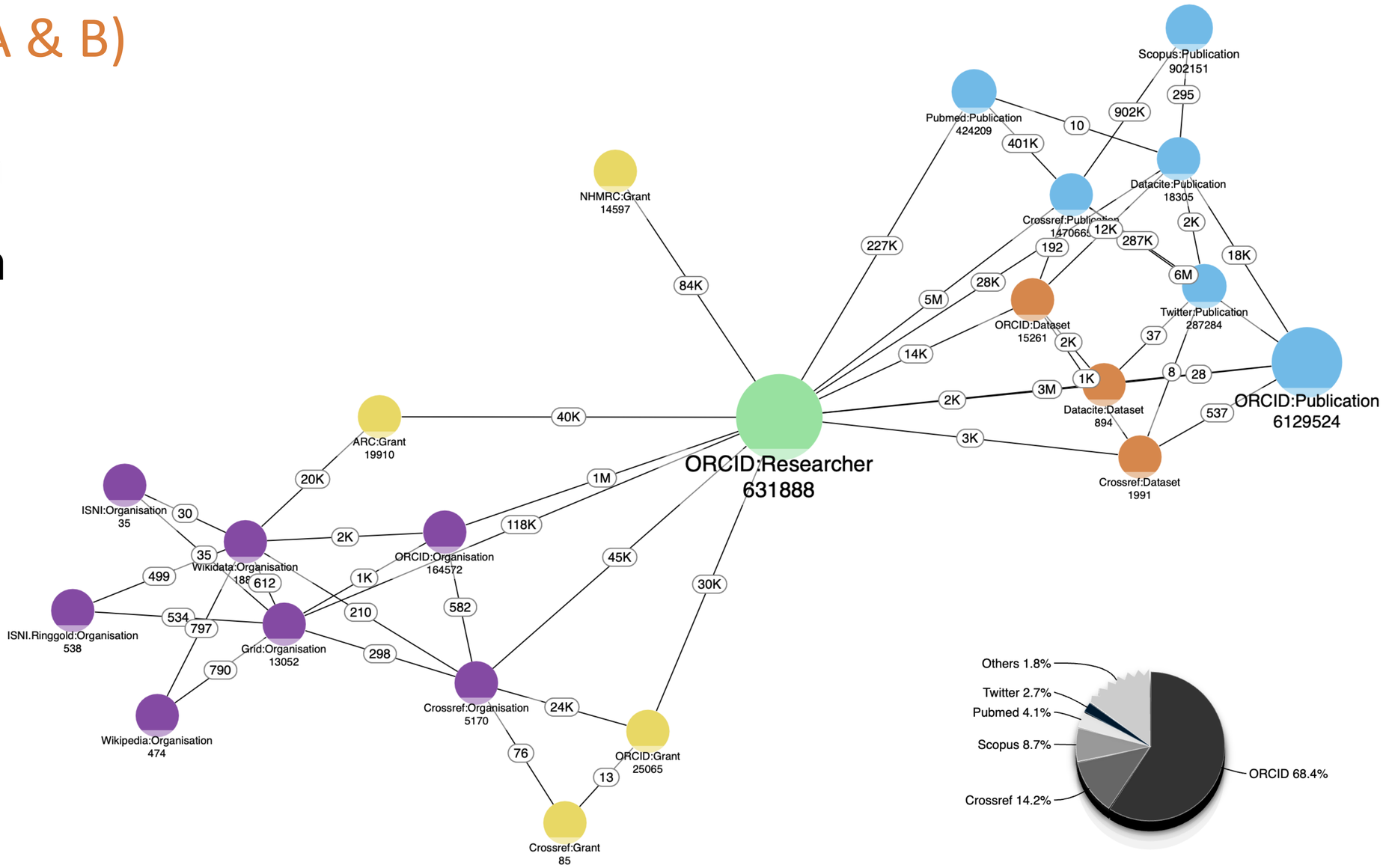
PID Graph (Type A & B)

Nodes: 11 million

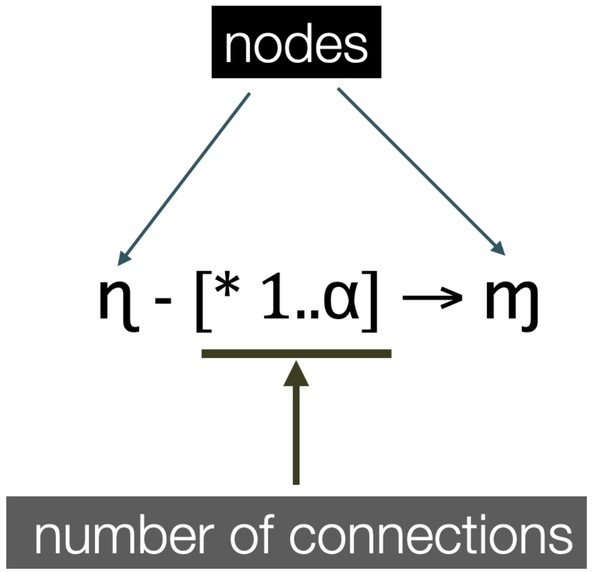
Relations: 18 million

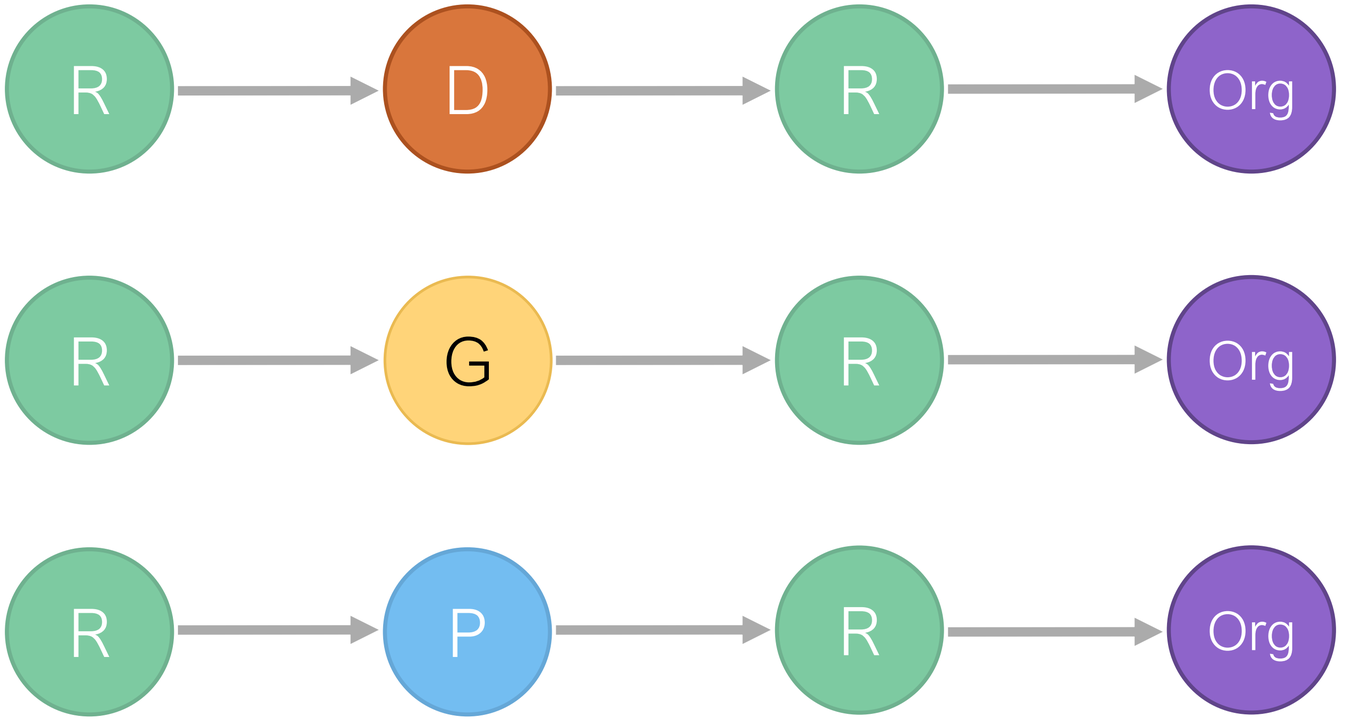
Last updated: 11 Sept 2023





Three Degrees of Separation and Building Collaboration Networks

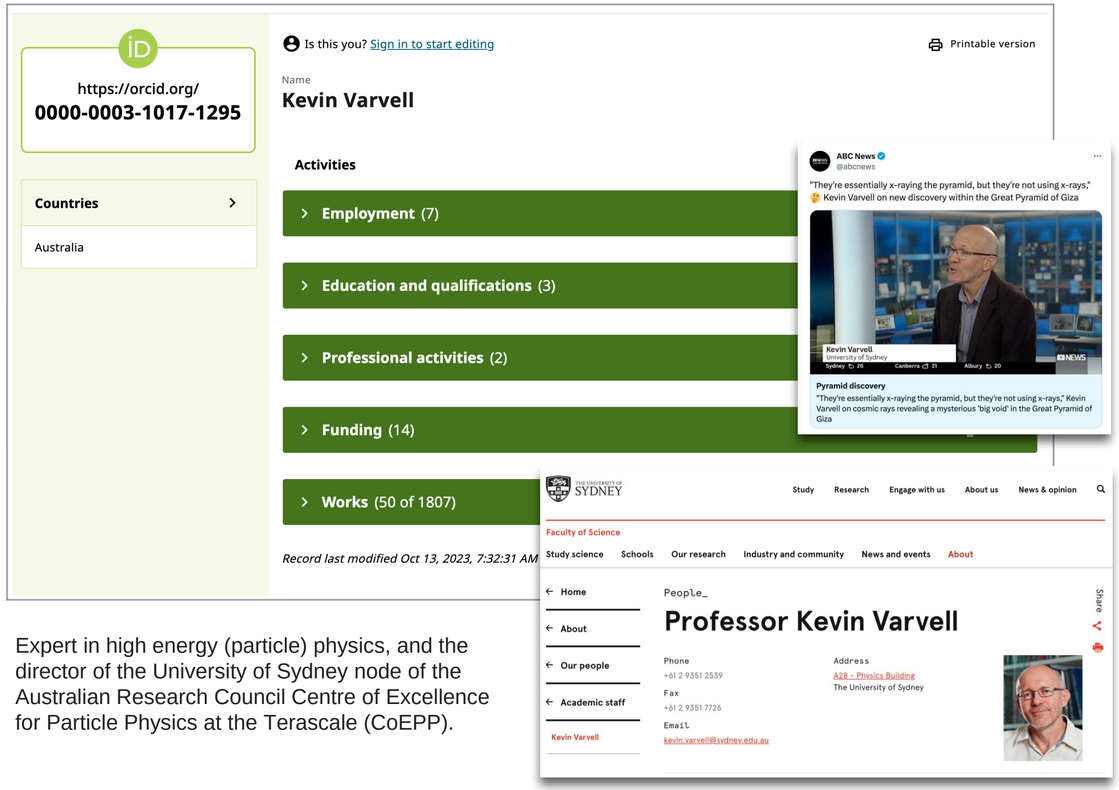




Most Connected Researchers

```
MATCH (o:organisation {country:"AU"})--(n:orcid:researcher)--(c:crossref)--(m:orcid:researcher)
WITH n.key AS researcherKey, n.orcid as orcid, n.full_name as name, COUNT(distinct(m)) AS collaboratorsCount
RETURN orcid, name, collaboratorsCount
ORDER BY collaboratorsCount DESC
LIMIT 10;
```

1. 0000-0003-1017-1295,**Kevin Varvell**,4565
2. 0000-0003-2447-3251,Amanda Caroline Dawson,4553
3. 0000-0002-3111-0910,Elisabetta Barberio,4488
4. 0000-0003-4073-4941,Iain Bertram,4353
5. 0000-0003-0221-3037,Troels Petersen,4296
6. 0000-0003-0373-1346,Anthony Morley,4273
7. 0000-0002-1222-7937,Daniele Zanzi,4158
8. 0000-0003-2005-595X,Francesca Ungaro,4108
9. 0000-0002-9449-0412,Seyed Ruhollah Shojaii,3959
10. 0000-0003-2250-4181,Abhishek Sharma,3873



Expert in high energy (particle) physics, and the director of the University of Sydney node of the Australian Research Council Centre of Excellence for Particle Physics at the Terascale (CoEPP).

Most Connected Universities

```
MATCH (o:organisation {country:"AU"})--(n:orcid:researcher)
WITH o.name as organisation, COUNT(distinct(n)) AS rCount
RETURN organisation, rCount
ORDER BY researcherCount DESC
LIMIT 10;
```

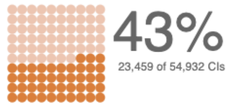
1. University of Melbourne, 9909
2. Monash University, 9832
3. University of Queensland, 8434
4. University of Sydney, 7472
5. Australian National University, 6140
6. University of New South Wales, 6037
7. Queensland University of Technology, 5218
8. Macquarie University, 4729
9. University of Adelaide, 4008
10. University of Technology Sydney, 3785

```
MATCH (o:organisation)--(n:orcid:researcher)
Where o.country<>"AU"
WITH o.name as organisation, COUNT(distinct(n)) AS rCount
RETURN organisation, researcherCount
ORDER BY researcherCount DESC
LIMIT 10;
```

1. University of Oxford, 6791
2. University of Cambridge, 6235
3. University College London, 4423
4. Imperial College London, 4213
5. University of Edinburgh, 2846
6. University of Manchester, 2837
7. Stanford University, 2806
8. University of Copenhagen, 2660
9. Massachusetts Institute of Technology, 2639
10. King's College London, 2622

Missing ORCID links to Grants (Australian Research Council)

43% of Investigators have missing links to ORCID



From 2001 to 2023, there are 20,352 ARC grants linked to 8,679 ORCID records.

Number of CIs with ORCID per Admin Organisation

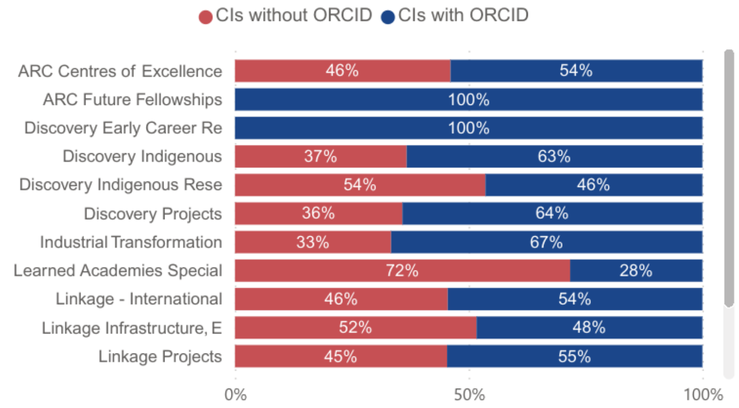
20,352
Grants

54,932
CIs

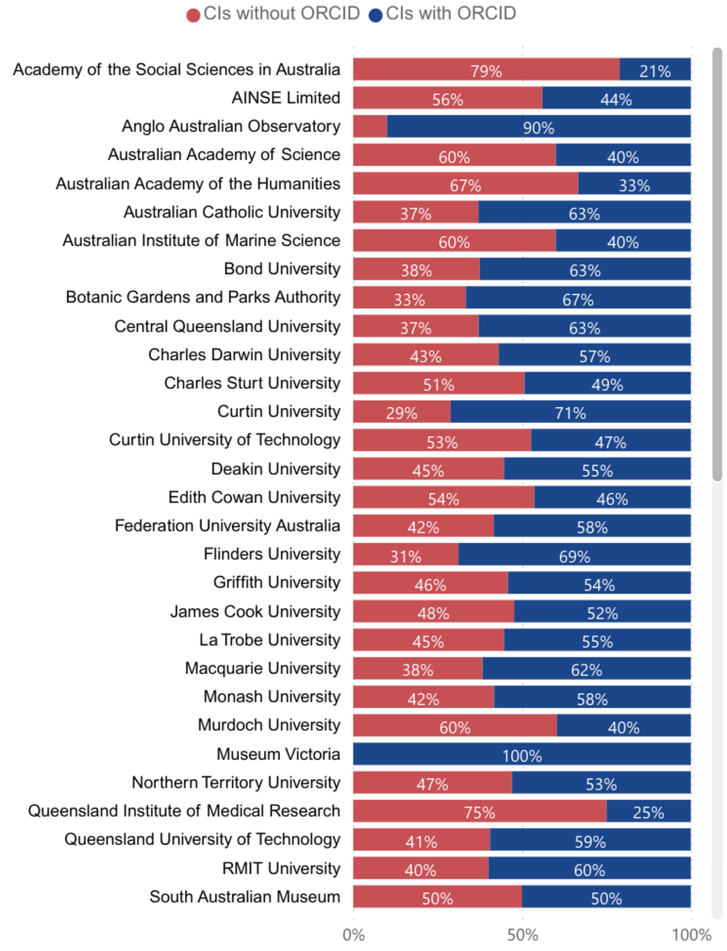
23,459
CIs without ORCID

31,473
CIs with ORCID

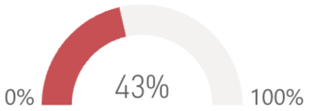
CIs with/without ORCID by Scheme



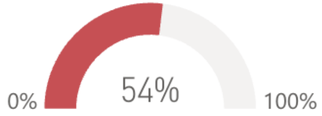
CIs with/without ORCID by Admin Organisation



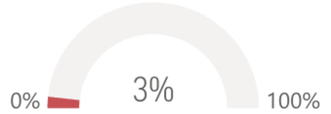
CI without ORCID (%)



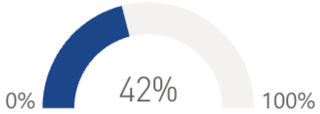
Grants with at least one CI without ORCID



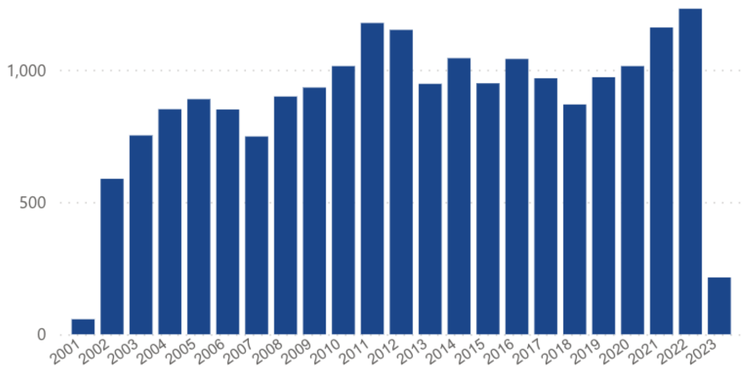
Grants that all CIs are missing ORCID links



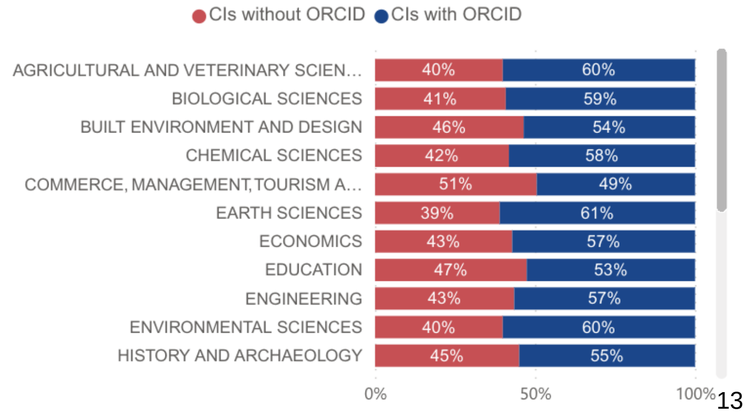
Grants with more than half CIs with ORCID



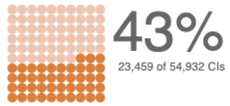
Number of grants by start year



CIs with/without ORCID by Primary FoR

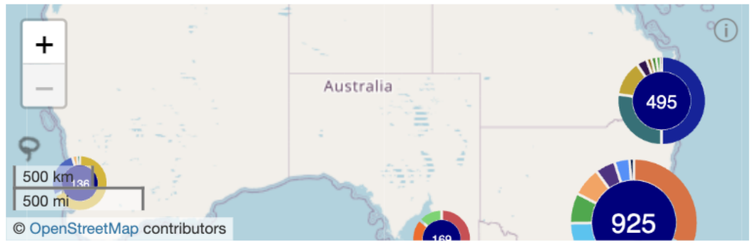


43% of Investigators have missing links to ORCID



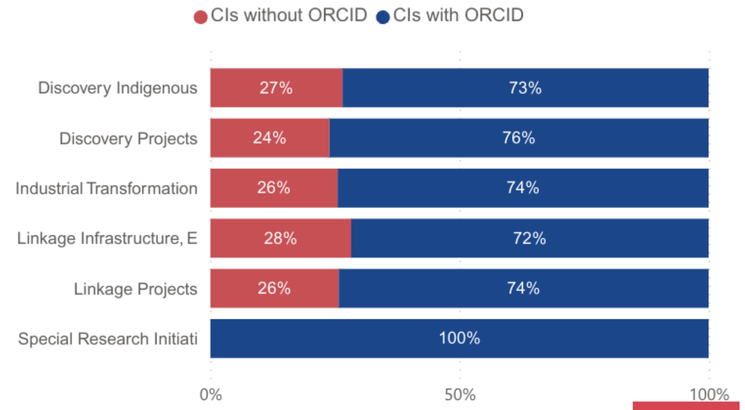
From 2001 to 2023, there are 20,352 ARC grants linked to 8,679 ORCID records.

Number of CIs with ORCID per Admin Organisation

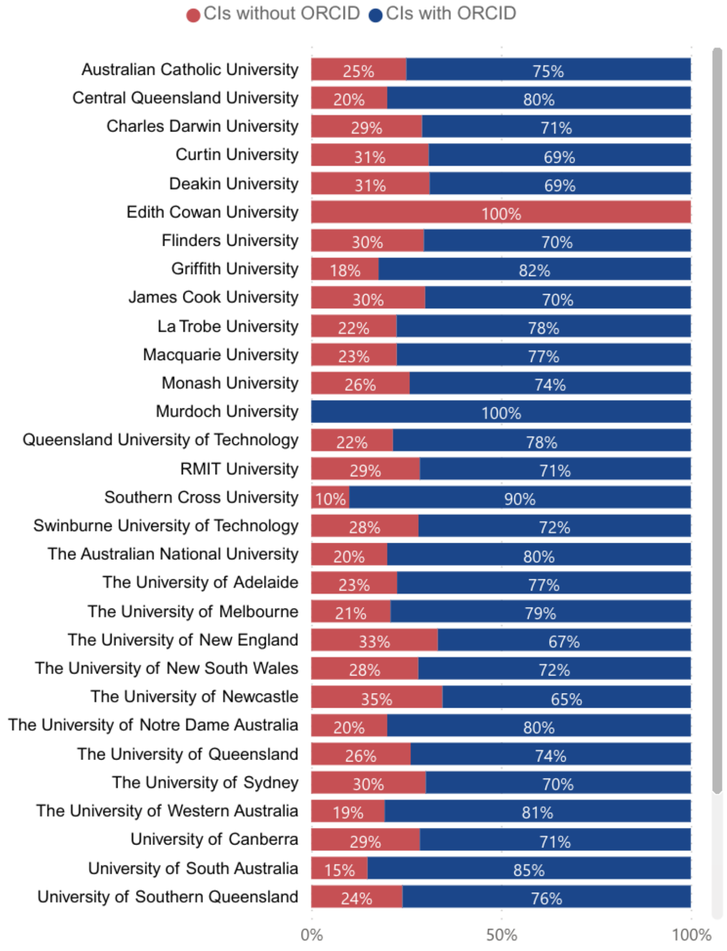


1,231	3,192
Grants	CIs
806	**2,386**
CIs without ORCID	CIs with ORCID

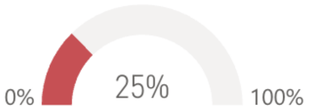
CIs with/without ORCID by Scheme



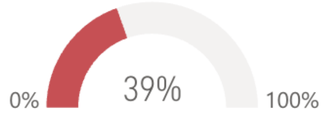
CIs with/without ORCID by Admin Organisation



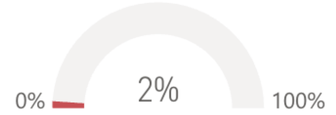
CI without ORCID (%)



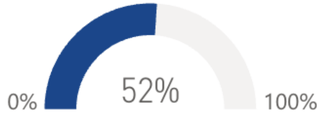
Grants with at least one CI without ORCID



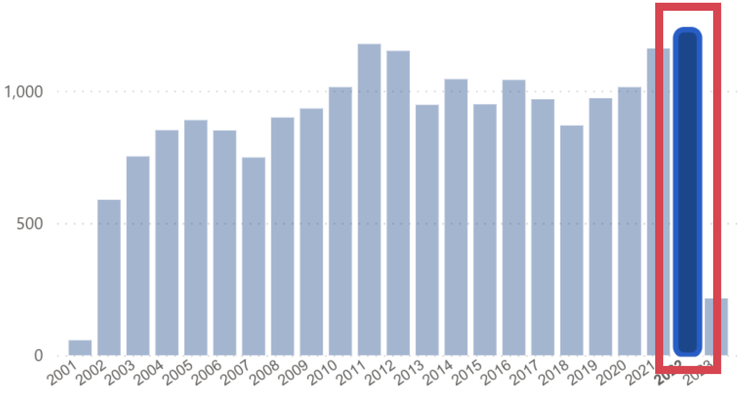
Grants that all CIs are missing ORCID links



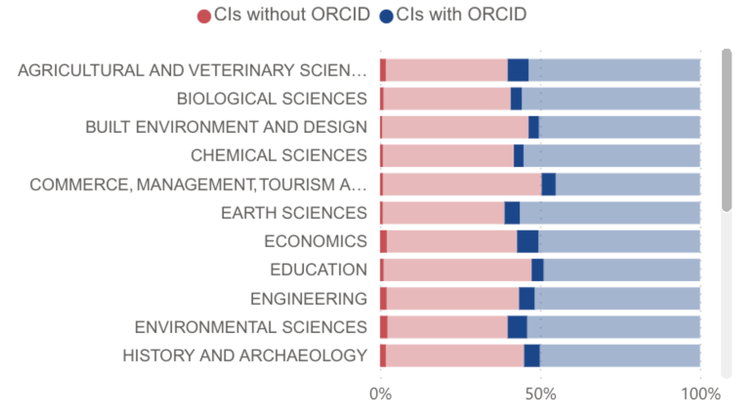
Grants with more than half CIs with ORCID



Number of grants by start year



CIs with/without ORCID by Primary FoR



ROR Connected to ARC Grants

19% of organisations participated in ARC grants can be linked to ROR identifiers

19%
2,663 of 14,153 organisations

From 30,088 projects between 2000 and 2023

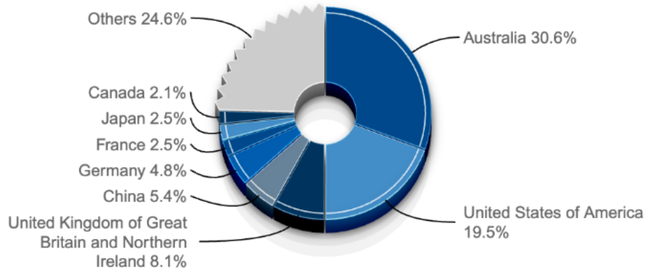
Search organisation name

Search

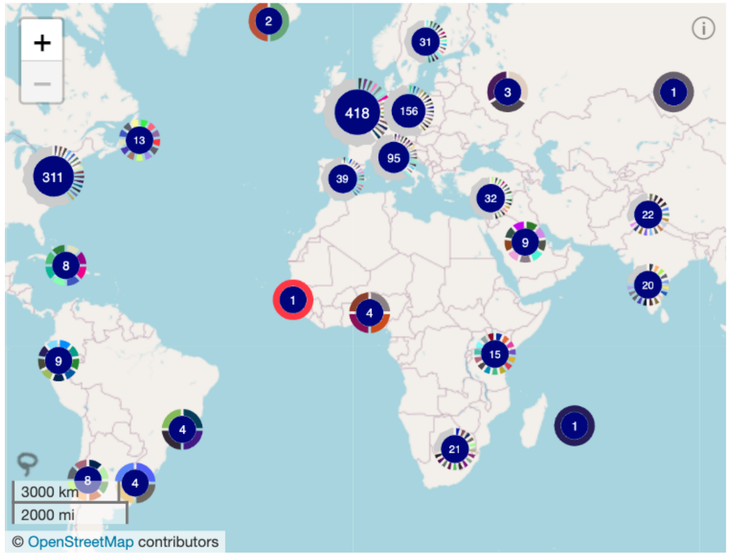
30,088	14,153	2,663
Number of projects	Organisations	Organisations with ROR

Organisations by country

Zoom-out

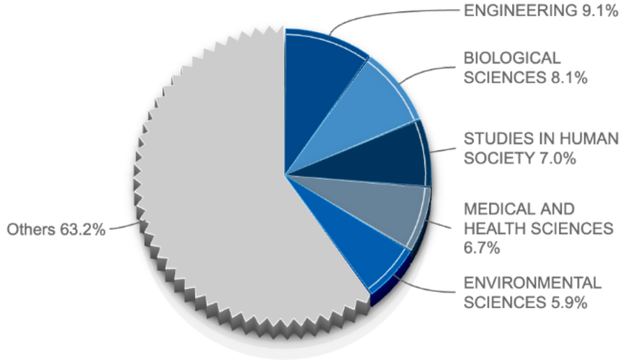


Organisations with ROR identifier



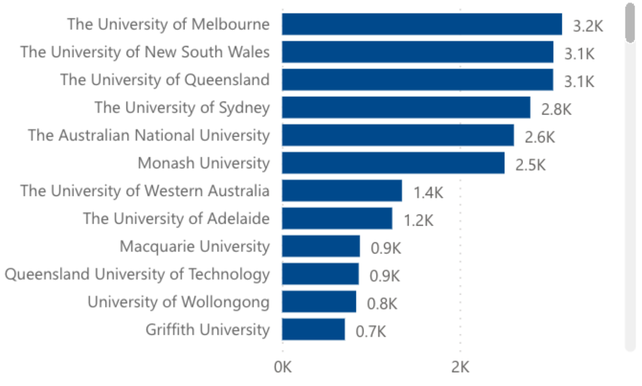
Organisation by fields of research

Zoom-out



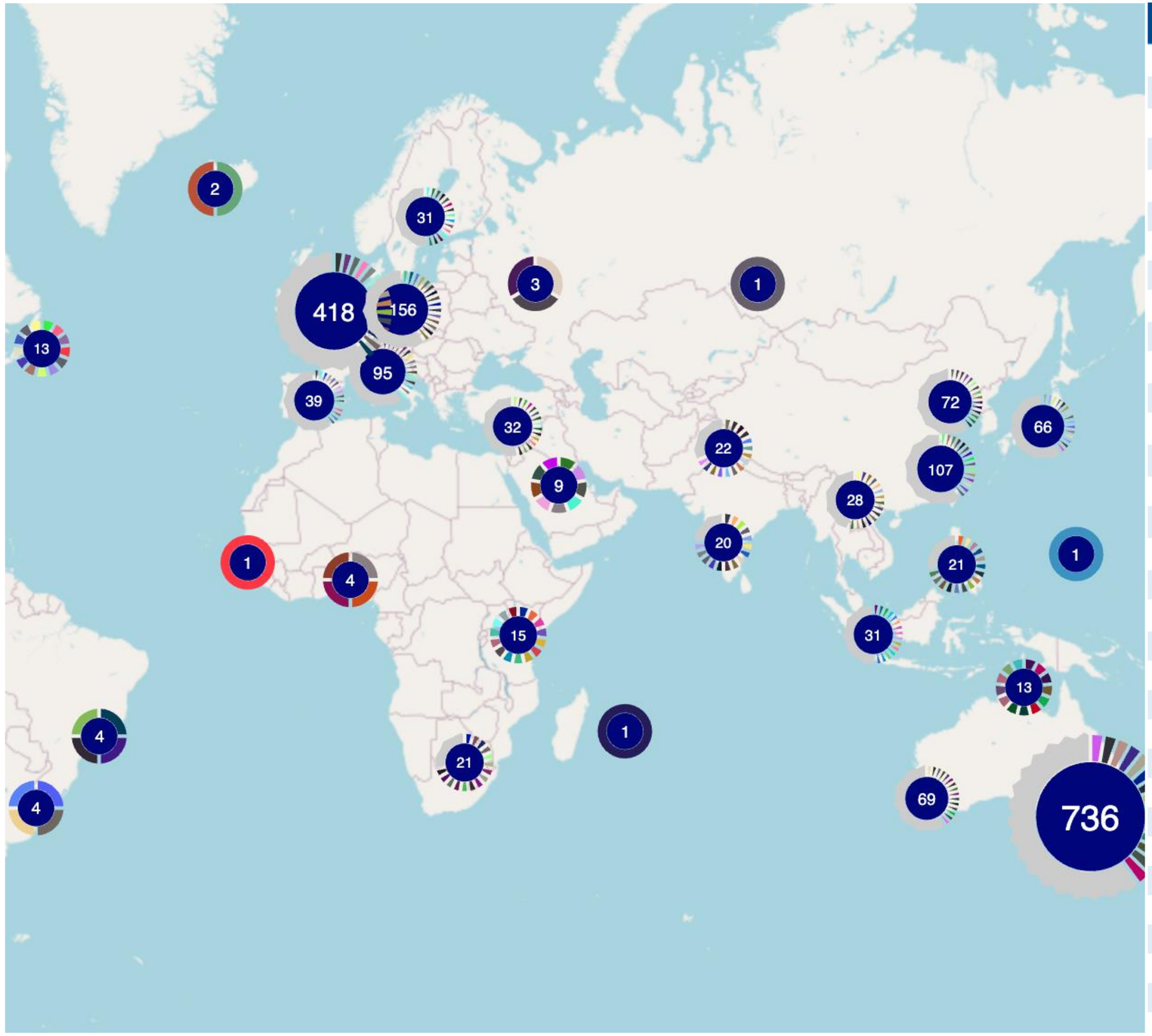
Projects by admin organisations

State view



Country/City/Organisations	ROR Identifier
Albania	
Tirana	
Polytechnic University of Tirana	05aec4025
Argentina	
Buenos Aires	
National Scientific and Technical Research Council	03cqe8w59
United Nations Development Programme	02rz8v083
University of Buenos Aires	0081fs513
Córdoba	
Universidad Nacional de Córdoba	056tb7j80
Santa Fe	
National University of the Littoral	00pt8r998
Armenia	

Project code	Status	Start	End	Title
AR04/00252	Closed			Anglo-Australian Observatory Research Fellowship.
CE0348155	Closed	2003	2011	Centre for Advanced Silicon Photovoltaics and Photonics.
CE0348177	Closed	2003	2007	ARC Centre for Perceptive & Intelligent Machines in Complex Environments.
CE0348178	Closed	2003	2011	Australian Centre for Quantum-Atom Optics.
CE0348193	Closed	2003	2005	ARC Centre for Structural & Functional Microbial Genomics.
CE0348198	Closed	2003	2012	ARC Centre for Solar Energy Systems.
CE0348205	Closed	2003	2010	ARC Centre for Kangaroo Genome.
CE0348212	Closed	2003	2011	CENTRE for INTEGRATIVE LEGUME RESEARCH.
CE0348217	Closed	2003	2012	Centre for Mathematical and Statistical Modelling of Complex Systems.



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Santa Fe	
National University of the Littoral	00pt8r998
Armenia	
Yerevan	
National Institute of Health	02qwkrw10
Australia	
Acton	
National Computational Infrastructure	04yx6dh41
Adelaide	
Aboriginal Health Council of South Australia	02mpkkr38
Alzheimer's Australia	05bcgfn72
Australian Centre for Plant Functional Genomics	00xwvfm64
Australian Institute of Business	01wf5jq34
Australian Plant Phenomics Facility	02zj7b759
Australian Water Quality Centre	04mwphf10
Australian Wine Research Institute	0569vjj73
Cancer Council SA	01e399z24
Department for Education and Child Development	03bc44j62
Department of Environment Water and Natural Resources	053gv9453
Department of the Premier and Cabinet	0381t6379
Flinders University	01kpzv902
Government of South Australia	04g3scy39
Hanson Institute	047kx5j58

ORCID Consortium

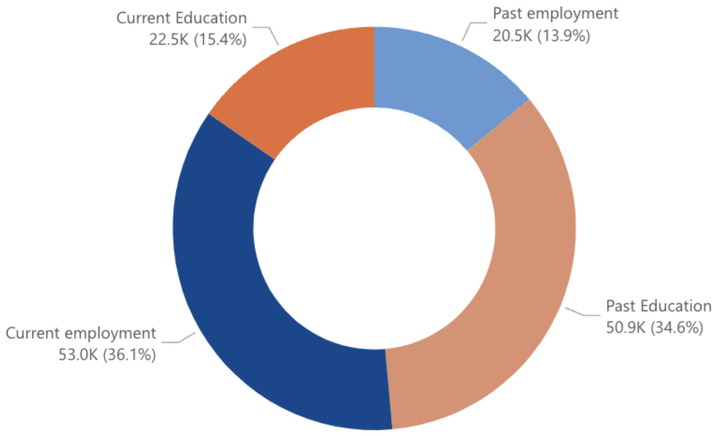
103,963 ORCIDs are affiliated with the consortium members

Search Institute/Campus

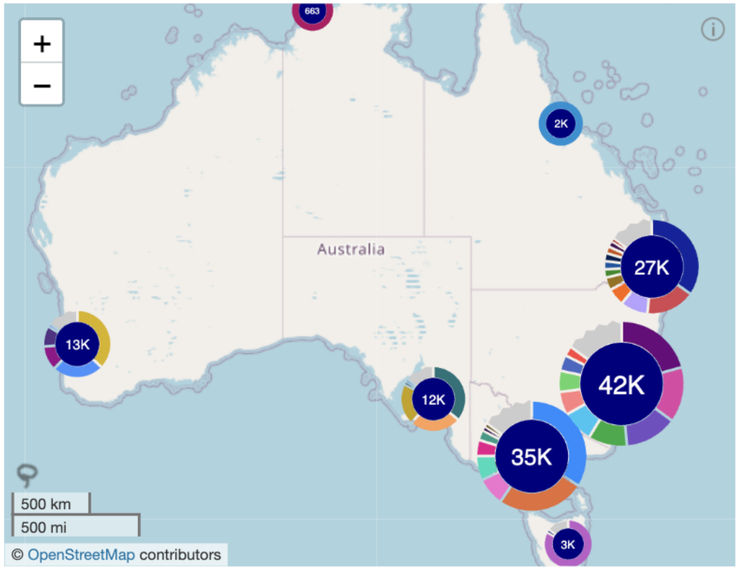
Search

Consortium Members	Institutes/Campuses	ORCID
43	185	103,963

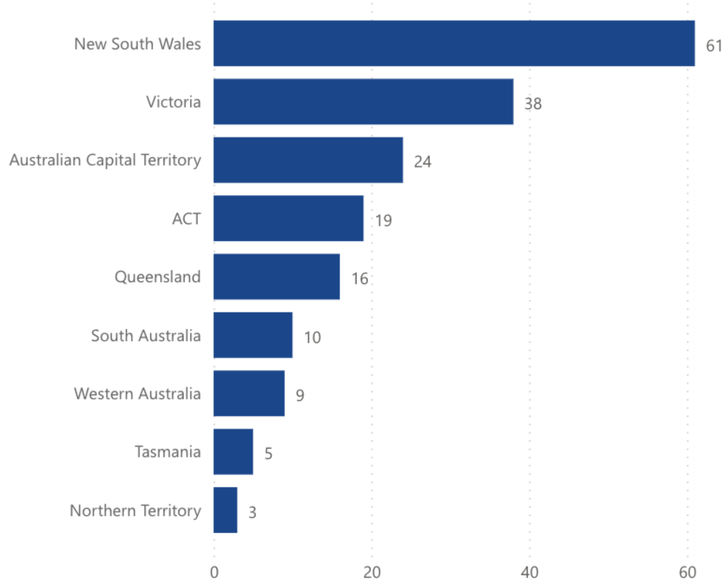
ORCID by Status



ORCID by Institute/Campus



Institute/Campus by State and Territory



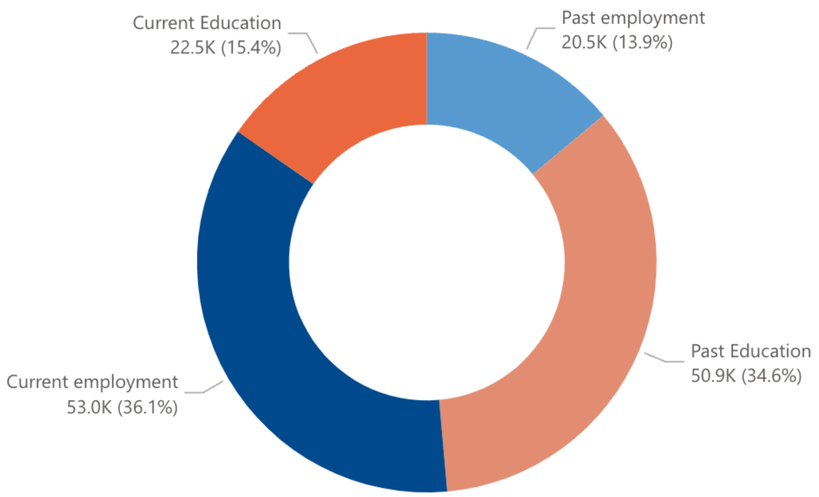
Consortium Member	Institute/Campus	Wikidata ID	WikiURL	Past Education	Current Education	Past Employment	Current Employment	ORCID
Australian Catholic University	Australian Catholic University	Q781371	https://www.wikidata.org/wiki/Q781371	260	67	182	434	870
Australian Catholic University	Sydney College of Divinity	Q7659877	https://www.wikidata.org/wiki/Q7659877	14	4	4	1	22
Australian Catholic University	University of Queensland	Q866012	https://www.wikidata.org/wiki/Q866012	5645	1901	1984	3368	10,919
Australian National Data Service	Australian National Data Service	Q4824459	https://www.wikidata.org/wiki/Q4824459			11	4	15
Australian National University	Australian National University	Q127990	https://www.wikidata.org/wiki/Q127990	3077	918	1177	2208	6,388
Australian National University	Canberra Hospital	Q5031265	https://www.wikidata.org/wiki/Q5031265	1		26	48	74
Australian National University	Goulburn Base Hospital	Q16891798	https://www.wikidata.org/wiki/Q16891798				2	2
Australian National University	Mount Stromlo Observatory	Q1310548	https://www.wikidata.org/wiki/Q1310548	1				1
Australian Nuclear Science and Technology Organisation	Australian Nuclear Science and Technology Organisation	Q781606	https://www.wikidata.org/wiki/Q781606	5	1	70	117	193
Australian Nuclear Science and Technology Organisation	Department of Industry, Innovation and Science	Q19872849	https://www.wikidata.org/wiki/Q19872849			1	2	3
Australian Research Council	ARC Centre of Excellence for Electromaterials Science	Q30273556	https://www.wikidata.org/wiki/Q30273556			3		3
Australian Research Council	Australian Research Council	Q4824612	https://www.wikidata.org/wiki/Q4824612			20	14	34
Australian Research Council	Australian Research Council Centre of Excellence For Engineered Quantum Systems	Q54833696	https://www.wikidata.org/wiki/Q54833696	1			3	4

ORCID Consortium Connections

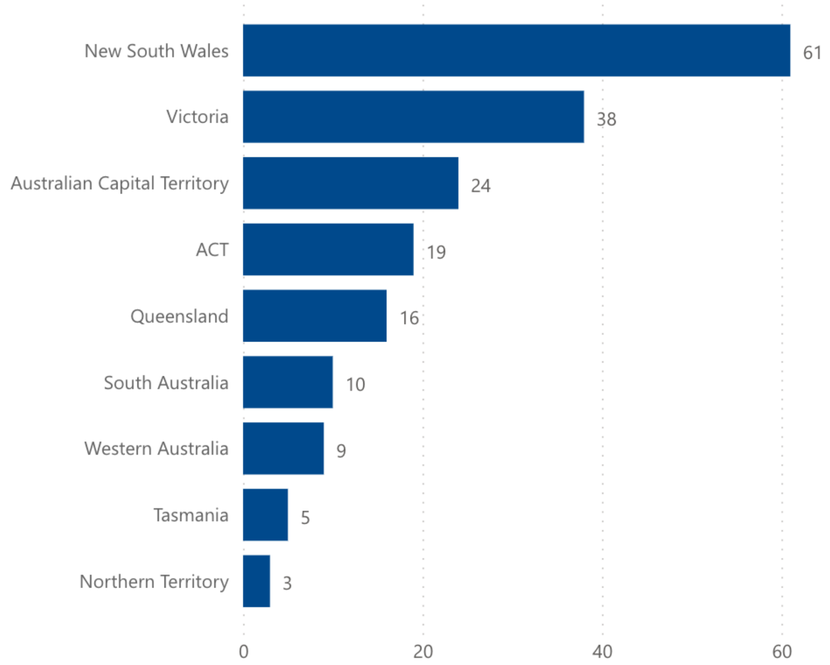
103,963 ORCIDs are affiliated with the consortium members

Consortium Members	Institutes/Campuses	ORCID
43	185	103,963

ORCID by Status

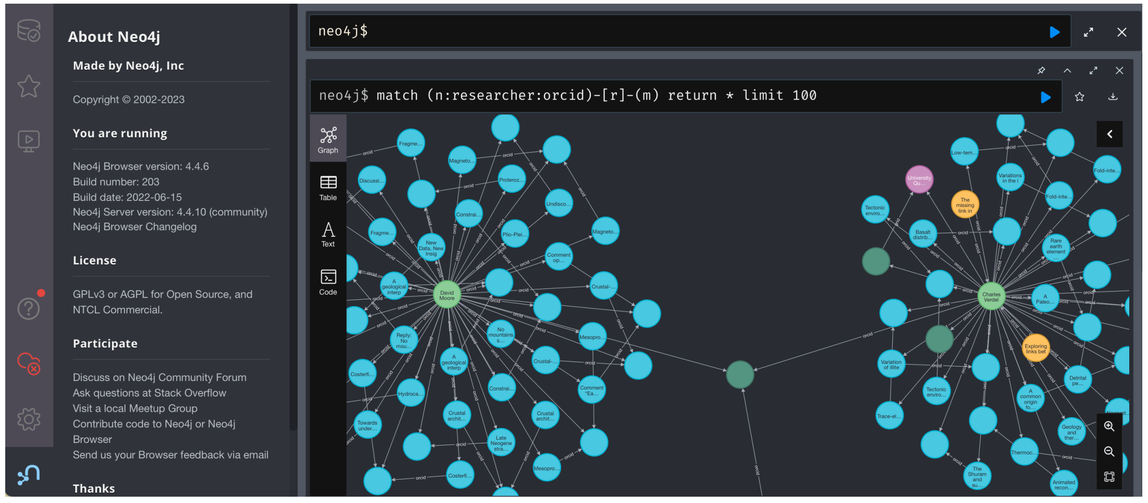


Institute/Campus by State and Territory



Access via Neo4j Graph Database

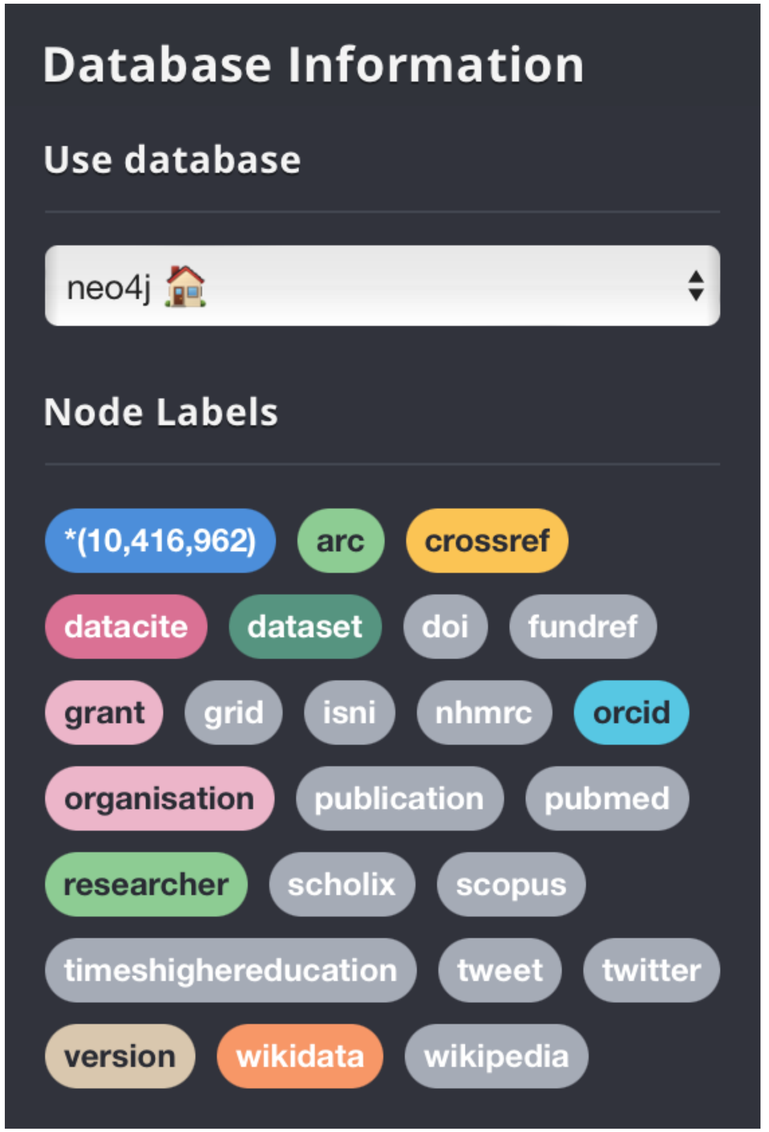
National Graph project utilises the robust technology of Neo4j to construct and deploy our graph database. Renowned for its scalability, performance, and user-friendly interface, Neo4j enables us to develop a native graph database based on the Research Graph Schema that has been purposefully designed and optimised to deliver high-performance graph queries.



Nodes are Grouped by Labels

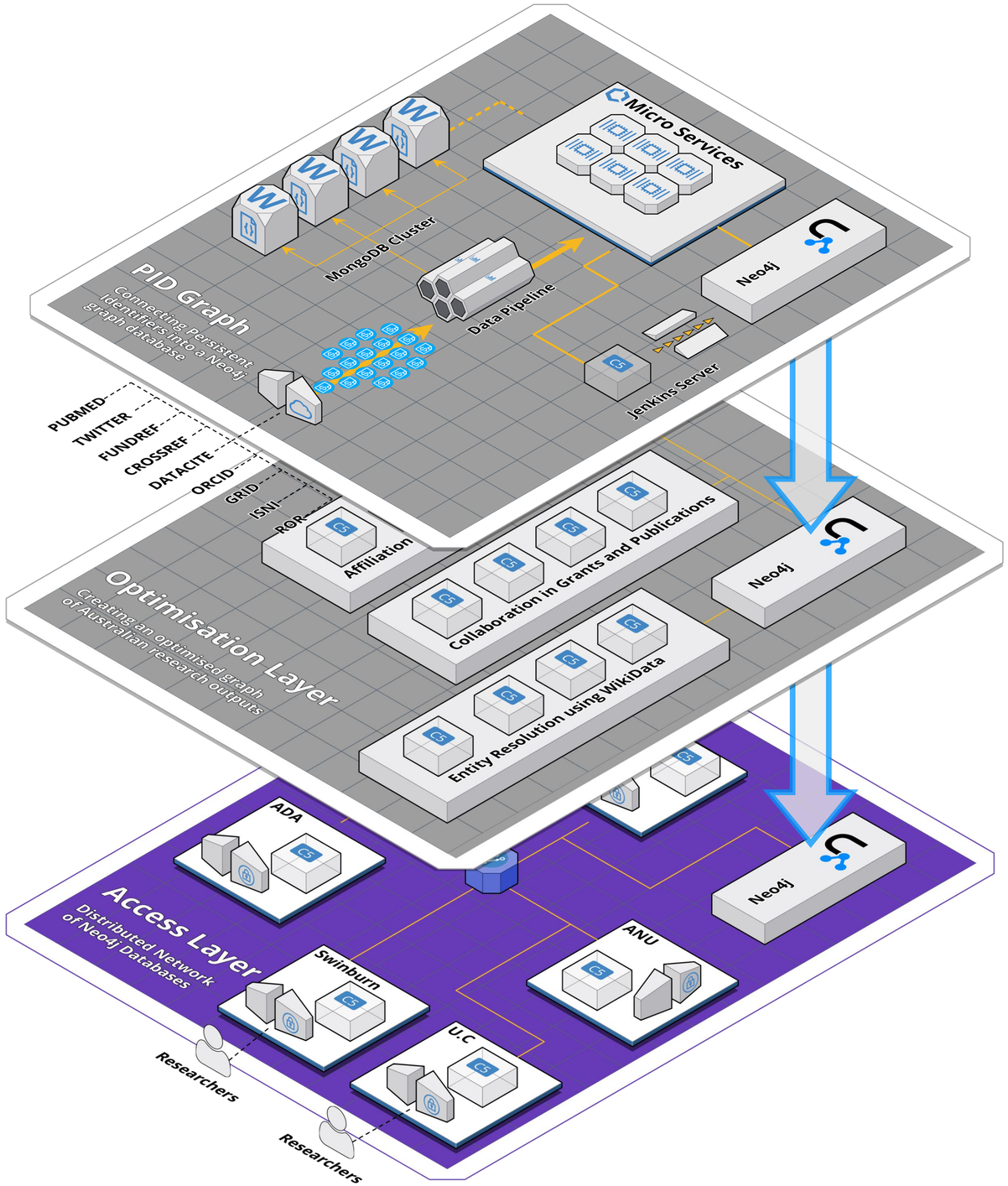
```
Match (n:researcher) return * limit 10

Match (n:orcid) return * limit 10

Match (n:researcher:orcid) return * limit 10
```

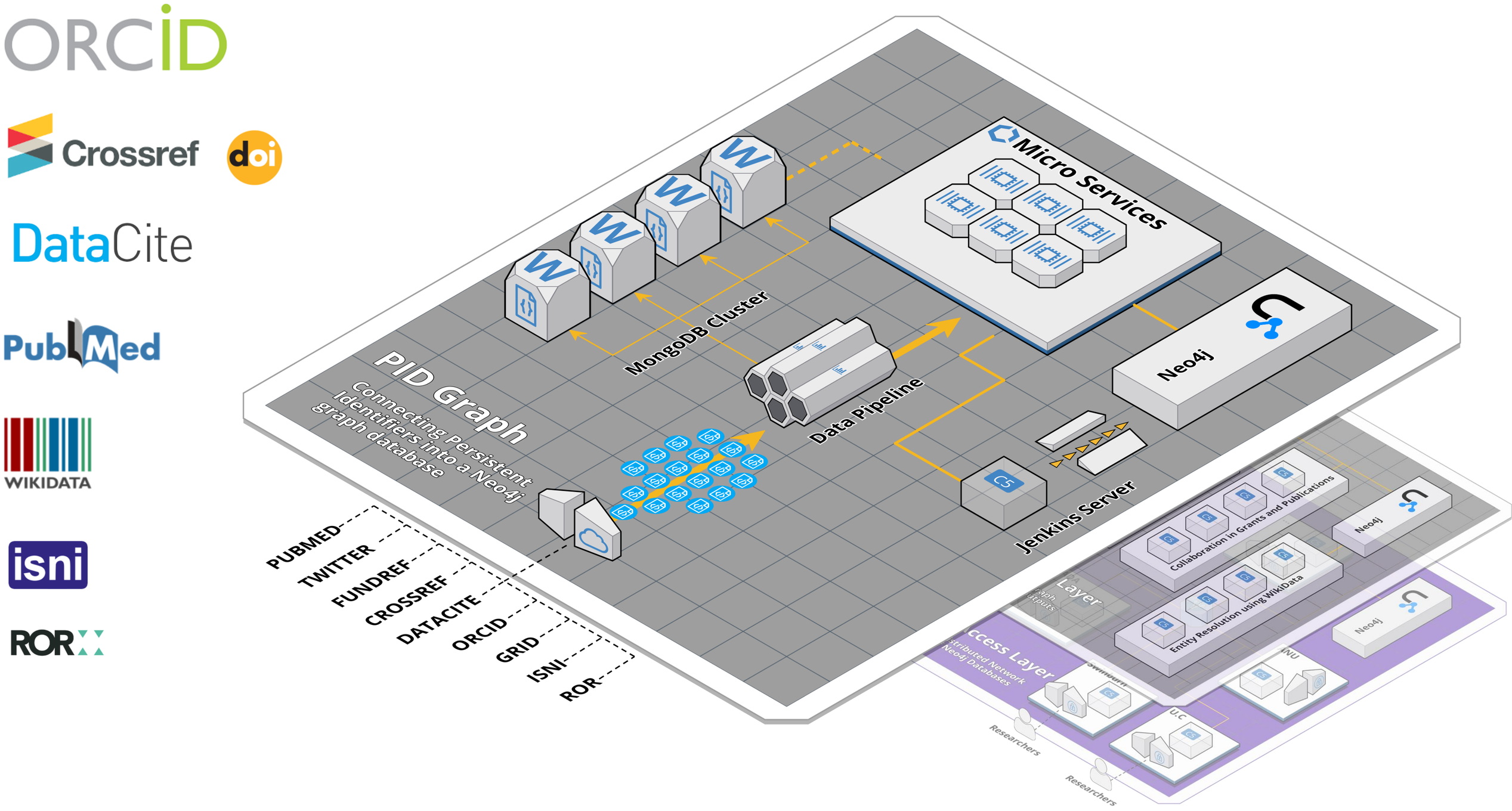
Neo4j nodes are grouped by labels. These labels enable optimised information retrieval, and provide a logical structure of the graph. Labels in our graph represent metadata sources or data types, allowing for targeted searches based on specific metadata, such as finding researchers with ORCID profiles.



Multilayer Data Infrastructure

Simplifying the infrastructure using separation of concerns.




ORCID
Crossref
doi
DataCite
PubMed
WIKIDATA
isni
ROR
PID Graph
Connecting Persistent Identifiers into a Neo4j graph database
MongoDB Cluster
Micro Services
Data Pipeline
Neo4j
Jenkins Server
PUBMED
TWITTER
FUNDREF
CROSSREF
DATACITE
ORCID
GRID
ISNI
ROR
Collaboration in Grants and Publications
Entity Resolution using WikiData
Layer
Graph Inputs
Access Layer
Distributed Network Neo4j Databases
Researchers
Researchers

Access to National PID Graph

Email: NationalGraph@ResearchGraph.ORG

Web: https://researchgraph.org/national-graph