graspos

open research assessment dataspace

Tools and services landscape report

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Abstract

This report provides an overview of existing tools and services that can facilitate the implementation of Open-Science-aware responsible research assessment practices, aligning with the vision of the GraspOS project. The report will cover tools and services for metadata enrichment of scholarly data records (including community-led curation/annotation tools) and for monitoring the use and uptake of research outputs and Open Science practices. The report aims to inform the development of the GraspOS tools and services in the context of the WP3 ("Tools and services to support OS-aware RRA") activities.

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Abbreviation List

- API - Application Programming Interface
- FoS - Fields of Science
- OS - Open Science
- RRA - Responsible Research Assessment
- WP - Work Package

1. Executive Summary

The Tools and Services landscape analysis report aims to support the development of the GraspOS tools and services that will take place in the context of WP3 ("Tools and services to support OS-aware RRA"). Its main objective is to identify the state-of-the-art tools and services that can support the implementation of responsible research assessment practices and to facilitate monitoring the uptake and impact of OS.

The respective analysis was based mainly on desk research performed by WP3 representatives. During this process, three broad categories of services (namely "Scholarly data enrichment services", "OS monitoring services", and "Data services") were identified, each containing a couple of more specific sub-categories. A variety of tools and services was identified In each of the second-level categories. In total, 67 relevant resources have been identified and a brief technical description of each of them is included in the report.

2. Introduction

Research assessment refers to the process pivotal of evaluating scholarly outputs' quality, impact, and significance within the academic community. Research assessment holds immense importance as it serves multiple critical purposes. Firstly, it helps researchers gauge the effectiveness of their work, enabling them to refine and improve their approaches. Additionally, research assessment aids funding agencies and institutions in making informed decisions about resource allocation, investment, and support for specific projects. Finally, it contributes to the advancement of knowledge by identifying groundbreaking research, guiding scholarly discourse, and promoting innovation.

At the same time, Open Science (OS) is a movement that promotes the principles of transparency, accessibility, and collaboration in scientific research. It aims to make research outputs, such as publications, data, software, and methods, available and reusable by anyone. However, the current research assessment frameworks often do not recognise or reward OS practices. This creates a barrier for researchers who want to adopt OS and limits its potential benefits for society. Facilitating OS practices is essential not only because OS is crucial for advancing scientific processes and improving credibility in science, but also because it can also facilitate Responsible Research Assessment (RRA) processes, making a wealth of data available to extract qualitative evidence and calculate indicators to support the respective evaluation processes.

The GraspOS project aims to help the OS and RRA movements to mutually reinforce each other and to pave the way for the reform of the existing research assessment frameworks

towards OS-aware and more responsible alternatives. More specifically, WP3 ("Tools and services to support OS-aware RRA") of the GraspOS project aims to develop tools and services that support the implementation of RRA practices and/or facilitate monitoring and fostering of OS practices.

This report reviews the existing state-of-the-art tools and services that are relevant to this goal providing recommendations for the GraspOS development. More specifically, the focus is given on services that can support research evaluation processes by improving the quality and/or the coverage of the content included in scholarly data sources or by facilitating monitoring the uptake and impact of OS from multiple perspectives as well as other aspects of scientific merit and research performance.

3. Methodology of Landscape Analysis

The landscape analysis reported in this deliverable was based on a resource review conducted by WP3 representatives during the first seven months of the project's lifetime. As a first step, WP3 representatives crafted an initial list of tools and services that can facilitate the implementation of OS-aware RRA practices (Annex 7.1) based on their previous knowledge of the respective domain and an investigation of the relevant scientific literature (especially related surveys). Then, based on this initial list, a classification of the resources was proposed. Finally, additional tools and services have been included in all classification categories using a resource-chaining approach for the initially reported tools and services (in particular, exploiting the references and citations of the related publications and the outlinks of relevant websites).

The classification scheme used to categorise the resources was selected so that each category will represent an important type of functionality that can be valuable in facilitating the implementation of OS-aware RRA practices. More specifically, we have identified three broad categories (namely "Scholarly data enrichment services", "OS monitoring services", and "Data services"), each containing a couple of more specific sub-categories, resulting in a two-level classification scheme. Table 1 summarises the respective categories, together with brief explanations about the type of tools and services that are covered by each of them. Each resource identified in each category is briefly described in Sections 4, 5, and 6.

Table 1 *Identified categories for tools and services*

Scholarly data enrichment services	
Enrichment of research-related entities with missing attributes	Services to support the enrichment of scholarly (meta)data records related to research outputs and

	other research-related entities (e.g., institutions, researchers) with missing metadata that can be valuable in the context of supporting OS-aware RRA processes.
Enrichment of research-related entities with research assessment indicators	Services to enrich scholarly (meta)data records related to research outputs and other research-related entities (e.g., institutions, researchers) with a variety of metrics and indicators that capture (a) the uptake and impact of research outputs from different perspectives, (b) their usage (e.g., article views/downloads, accounting data of research services), (c) open science uptake, and (d) other types of scientific merit.
Enrichment of scholarly data with missing links and link semantics	Services to identify missing links between (meta)scholarly data records (e.g., authorship links, citations, affiliation links), but also missing semantics of existing links (e.g., contribution roles for authorship links, citation intent).
OS monitoring services	
OS monitoring for researchers	Services that provide metrics, indicators, information, and evidence, as well as intuitive visualisations to facilitate the OS-aware responsible assessment of researchers (individuals and groups).
OS monitoring for institutions	Services that support metrics, indicators, information, and evidence, as well as visualisations that can facilitate the implementation of the OS-aware RRA approaches at institutional and funder levels.
OS monitoring for countries	Services that provide comprehensive metrics, indicators, and visualisations to facilitate the implementation of OS-aware RRA strategies at the national level.
Data services	
Scholarly data resources	Curated collections of structured information about scholarly knowledge or datasets that are specifically

	intended for academic research and analysis purposes.

4. Scholarly data enrichment services

This section presents the scholarly data enrichment services we identified based on the landscape analysis. Each subsection elaborates on the services of the "Enrichment of research-related entities with missing attributes", "Enrichment of research-related entities with research assessment indicators", and "Enrichment of scholarly data with missing links and link semantics" subcategories. For each service, a brief description is given along with some basic metadata (e.g., its main URL, a list of relevant publications, any APIs offered).

4.1. Enrichment of research-related entities with missing attributes

This section focuses on services which can provide attributes of research outputs or other research-related entities (e.g., researchers, institutions) that are usually missing from traditional sources of scholarly (meta)data (e.g., Scientific Knowledge Graphs, Institutional Repositories), enabling their further enrichment. The missing attributes should provide an added value in using the data sources in the context of OS-aware RRA processes. The identified services may discover the respective attribute values by

(a) applying data mining techniques on research product contents (e.g., paper full-texts, dataset records) or descriptions (e.g., paper abstracts, dataset descriptions)
(b) calculating the missing values by combining and processing (meta)data from multiple sources
(c) leveraging expert curation processes

4.1.1. F-UJI

F-UJI is a web service to programmatically assess FAIRness of research data objects at the dataset level based on the FAIRsFAIR Data Object Assessment Metrics[1] that have been developed in the context of the FAIRsFAIR project[2], an initiative to support the adoption of

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[1] https://doi.org/10.5281/zenodo.3775793
[2] FAIRsFAIR project: https://www.fairsfair.eu/

FAIR data principles in Europe. The 'F' stands for FAIR and 'UJI' means 'Test' in Malay, hence F-UJI is a FAIR testing tool. A web application using the F-UJI web service as a backend has been deployed to demonstrate the evaluation of FAIRness of digital research data objects. However, although F-UJI is rapidly evolving, it is not yet available in a productive environment. In addition, although F-UJI deployments offer an API, there is no functional public F-UJI API available right now.

Table 2 *Summary of important information about F-UJI*

URL	https://www.f-uji.net/
Documentation	https://github.com/FAIRsFAIR/fuji#readme
Source code	https://github.com/FAIRsFAIR/fuji
Licence	MIT licence
Relevant publications	https://doi.org/10.5281/zenodo.4063720
Public API	N/A

4.1.2. FAIRshake

FAIRshake is a toolkit that enables the systematic assessment of the FAIRness of any digital resource. The FAIRshake toolkit was developed to enable the establishment of community-driven FAIR metrics and rubrics paired with manual and automated FAIR assessments. The FAIR assessment results are visualised as an insignia that represents the FAIR score in a compact grid of squares coloured in red, blue, and purple.

The toolkit comprises a full-stack web-server application containing a user interface with a search engine, a backend database, and an application-programming interface (API), as well as a Chrome extension and a bookmarklet.

FAIRshake also contains FAIR analytics modules that produce statistical reports about collections of assessments for a specific project. FAIRshake enables the community to study the FAIRness of the resources they produce and use.

Table 3 *Summary of important information about FAIRshake*

URL	https://fairshake.cloud/
Documentation	https://www.youtube.com/watch?v=7u0c4-yzXgA&ab_channel=NitrogenDataCommons

Source code	https://github.com/MaayanLab/FAIRshake
Licence	CC BY-NC-SA 4.0
Relevant publications	https://doi.org/10.1016/j.cels.2019.09.011
Public API	https://fairshake.cloud/swagger/

4.1.3. OpenAIRE Broker

OpenAIRE Broker is a subscription-notification service designed to enhance the metadata of scholarly content provided by various sources, including repositories, CRIS (Current Research Information Systems) systems, aggregators, knowledge graphs, and publisher databases. The service leverages the OpenAIRE Graph[3], a comprehensive and interconnected database of research outputs and related information aggregating millions of scholarly metadata collected from multiple trusted data sources.

By subscribing to the OpenAIRE Broker, content providers can receive additional metadata relevant to the records included in their sources, thereby enriching and enhancing the information available to their users. This service plays a crucial role in decentralising and promoting local re-use of metadata across different platforms, ensuring that the scholarly community has access to comprehensive and up-to-date information about research outputs.

Table 4 Summary of important information about OpenAIRE Broker.

URL	http://provide.openaire.eu/
Documentation	https://graph.openaire.eu/develop/broker.html
Source code	https://code-repo.d4science.org/D-Net/dnet-hadoop/src/branch/master/dhp-workflows/dhp-broker-events
Licence	AGPL-3.0
Relevant publications	N/A
Public API	https://graph.openaire.eu/develop/broker.html

4.1.4. OpenAIRE IIS text mining modules

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[3] https://graph.openaire.eu/

The OpenAIRE Information Inference Service (IIS)[4] consists of a set of text-mining modules designed to enrich scholarly data with automatically inferred metadata. These modules operate on a flexible big data processing pipeline that supports both full-text and metadata mining. The current modules offered by OpenAIRE IIS include:

- Citation Extraction: This module can identify and extract citations related to article-data, article-software, result-grant, and result-organisations. This enables the association of research outputs with relevant datasets, software, funding grants, and affiliations, providing a more comprehensive context for the research.
- Subject Inference: The subject inference module identifies and assigns subjects or categories to scholarly content. It uses recognised classification systems such as Frascati and SDGs (Sustainable Development Goals) to tag research outputs with relevant subject areas, making it easier for users to discover content related to specific topics or research domains.
- Community Context: This module focuses on capturing the broader community context of research outputs. It helps identify the academic and research communities the publication belongs to, shedding light on the collaborative networks and affiliations associated with the research.

By leveraging these text mining modules, the OpenAIRE IIS significantly enhances scholarly data by automatically extracting and inferring valuable metadata. This enrichment process not only aids in better categorising and contextualising research outputs but also facilitates more effective discovery, navigation, and exploration of scholarly literature.

Table 5 Summary of important information about the OpenAIRE IIS text mining modules.

URL	https://github.com/openaire/iis
Documentation	https://github.com/openaire/iis#readme
Source code	https://github.com/openaire/iis
Licence	Apache-2.0
Relevant publications	N/A
Public API	N/A

4.1.5.   OpenAIRE Metadata Validator

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[4] https://github.com/openaire/iis

The OpenAIRE metadata validator is a rule-based service that plays a pivotal role in offering comprehensive metrics for the compliance with the OpenAIRE Guidelines and the FAIR (Findable, Accessible, Interoperable, and Reusable) assessment of diverse content providers, including data repositories, software repositories, publication repositories, journals, and CRIS (Current Research Information System) systems. Through its systematic rule-based approach, the OpenAIRE metadata validator thoroughly scrutinises various aspects of metadata, ensuring that it adheres to the prescribed standards for findability, accessibility, interoperability, and reusability. Doing so, it establishes the level of FAIRness exhibited by content providers, offering valuable insights into the quality and openness of research outputs made available to the wider scientific community.

Table 6 Summary of important information about the OpenAIRE Metadata Validator.

URL	https://catalogue.openaire.eu/service/openaire.validator/overview
Documentation	N/A
Source code	N/A
Licence	Apache-2.0
Relevant publications	N/A
Public API	N/A

4.1.6. Rescognito

Rescognito is a free service aiming to help researchers recognise and promote Open Research. Rescognito uses the CRediT (Contributor Roles Taxonomy) standard, which defines 14 roles that researchers can claim for their involvement in a research activity. For example, a researcher can claim roles such as Conceptualisation, Methodology, Investigation, Writing, etc. Rescognito also integrates with ORCID (Open Research and Contributor IDentifier), which is a registry of unique identifiers for researchers and their works. By using Rescognito, researchers can easily and verifiably assert their CRediT roles for any publication with a DOI (Digital Object Identifier) and push them to their ORCID records. Rescognito aims to help researchers get more recognition and visibility for their diverse and valuable contributions to the advancement of science.

Table 7 Summary of important information about Rescognito.

URL	https://rescognito.com/
Documentation	https://www.loom.com/share/a3e39b6a84164b6f9abff0cf560ac312
Source code	N/A
Licence	N/A
Relevant publications	https://scholarlykitchen.sspnet.org/2021/03/08/can-we-re-engineer-scholarly-journal-publishing-an-interview-with-richard-wynne-rescognito/ (interview)
Public API	N/A

4.1.7. SciNoBo

SciNoBo, is a classification tool that assigns scientific fields to publications based on a predefined FoS taxonomies. To do so, it leverages the structural properties of the publication's manuscript and its list of citations and references. When available, venue-level field classifications are considered by the tool. Currently, SciNoBo classifications for more than 15 millions publications are available through the OpenAIRE Graph API and dataset.

Table 8 Summary of important information about SciNoBo.

URL	N/A
Documentation	N/A
Source code	N/A
Licence	N/A
Relevant publications	[1] https://doi.org/10.1145/3487553.3524677 [2] https://doi.org/10.3389/frma.2023.1149834
Public API	N/A

4.1.8. SCRE Pipeline

The SCRE Pipeline could be understood as a general and configurable AI-assisted content acquisition and processing pipeline for documents and projects that aggregates and performs data cleaning and semantic processing. More specifically, it is the CORE pipeline that is part of the architecture of the GoTriple discovery platform. The pipeline serves the purpose of harvesting and subsequently mapping metadata regarding publications and projects into the TRIPLE Data model. The architecture has been developed by Net7 company and they reserve all the rights to the software. The architecture is built using Apache Camel, and it consists of 3 key parts:

- Connectors
- Processors
- Persisters

The *connectors* retrieve the metadata from other databases for projects and publications; the *processors* curate and/or enrich the original metadata to fit the TRIPLE data model; and *persisters* allow memorisation of the metadata in the platform's indexes. It should be noted that the focus of creating the SCRE pipeline was to enable GoTriple to connect multiple sources into one discovery surface for the benefit of Social Sciences and Humanities disciplines.

The SCRE pipeline was created in the context of GoTriple and specifically worked successfully with sourcing metadata from OAI-PMH, OpenAIRE and Isidore data dumps. Further information about the SCRE Pipeline can be found the draft publication of the deliverable: 10.5281/zenodo.7359654

Table 9 Summary of important information about the SCRE Pipeline.

URL	https://project.gotriple.eu/
Documentation	N/A
Source code	N/A
Licence	N/A
Relevant publications	https://zenodo.org/record/7359654
Public API	http://134.158.33.132/user/login?destination=/

4.2. Enrichment of research-related entities with research assessment indicators

This section focuses on tools and services that can enrich scholarly (meta)data records corresponding to research-related entities (e.g., publications, software, dataset, researchers, institutions) with research assessment indicators of various types, especially indicators that capture the uptake or impact of Open Science.

4.2.1. BIP! Services (Ranker)

BIP! constitutes a comprehensive platform that facilitates scientific literature exploration and research assessment by leveraging advanced impact indicators calculated based on scholarly knowledge graphs. By aggregating citation data from Crossref, OpenCitations, and the OpenAIRE Graph, BIP! constructs an extensive citation network comprising over 130 million research products, including articles and datasets. This network forms the foundation for calculating a diverse set of citation-based indicators in a scalable manner, capturing various dimensions of scientific impact, such as popularity (current impact), influence (overall impact), and impulse (initial momentum).

The BIP! Ranker component (accessible at https://github.com/athenarc/Bip-Ranker) handles the computation of these impact indicators. These indicators have two main applications: first, they are used to rank search results in BIP! Finder[5], a tool that allows users to explore the literature based on the impact of the publications. Second, they are used to compute researcher-level metrics, which are then included in researcher profile pages within BIP! Scholar[6], a tool that provides valuable insights into individual researchers' impact.

Table 10 Summary of important information about the BIP! Services (Ranker).

URL	https://bip.imsi.athenarc.gr/
Documentation	https://bip.imsi.athenarc.gr/site/indicators
Source code	https://github.com/athenarc/Bip-Ranker
Licence	GPL-2.0

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[5] BIP! Finder accessible at https://bip.imsi.athenarc.gr/search
[6] BIP! Scholar available at https://bip.imsi.athenarc.gr/scholar

Relevant publications	https://dl.acm.org/doi/10.1145/3357384.3357850
Public API	https://bip-api.imsi.athenarc.gr/documentation

4.2.2. EC KIP OS indicators

EC KIP OS indicators is a suite of advanced software components for indicators on impact and collaboration of Open-Access-based research outputs on citation and network analysis. A variety of relevant indicators from the literature (e.g., Field-Weighted Citation Impact, Collaborative Index , Degree of collaboration , and Collaborative coefficient) have been implemented to be part of an indicators framework to monitor and evaluate the outputs of Horizon Europe.

Table 11 Summary of important information about the EC KIP OS indicators.

URL	N/A
Documentation	N/A
Source code	N/A
Licence	N/A
Relevant publications	https://research-and-innovation.ec.europa.eu/system/files/2023-05/swd-2023-132-monitoring-evaluation-he.pdf
Public API	N/A

4.2.3. EOSC accounting for services

The EOSC Accounting for Services is a platform aiming to streamline the process of efficiently collecting, aggregating, and sharing metrics across various infrastructures, providers, and projects. The system offers a REST API that accepts inputs from numerous sources, storing the data in a database and performing comprehensive aggregation. Moreover, the system provides a user-friendly interface that enables users to interact with the platform and access accounting data for specific time frames. All API resources are exclusively accessible to authenticated clients, safeguarding sensitive information and data security. One of the key elements of the Accounting Service is Metrics, which are quantitative measures used to assess and track the performance or usage of a service.

Table 12 Summary of important information about the EOSC accounting for services.

URL	https://accounting.eosc-portal.eu/
Documentation	https://argoeu.github.io/argo-accounting/docs
Source code	N/A
Licence	N/A
Relevant publications	N/A
Public API	https://argoeu.github.io/argo-accounting/openapi/explore

4.2.4.   OpenAIRE UsageCounts

The OpenAIRE Usage Counts Service effectively collects data on usage events and comprehensive usage statistics reports from a distributed network of data providers including repositories, e-journals, and CRIS systems. This is accomplished by employing open standards and protocols and harnessing reliable, consolidated, and comparable usage metrics, such as item download counts and metadata views that adhere to the COUNTER Code of Practice. The Usage Counts Service facilitates sharing statistics across this extensive network, delivering noteworthy value to diverse stakeholders.

At the level of data providers, it functions as a valuable tool for repository managers and hosting institutions to assess the effectiveness of their publication platforms. It can highlight popular publications for authors and readers on the individual item level. Furthermore, in conjunction with conventional metrics like citation counts and alternative metrics like mentions and recommendations, it can inform funding authorities involved in research evaluation processes. Importantly, the aggregated usage statistics are made accessible through portals like OpenAIRE's Explore or via an API based on Sushi-Lite, serving both human and automated consumption.

Table 13 Summary of important information about OpenAIRE UsageCounts.

URL	https://usagecounts.openaire.eu/
Documentation	https://usagecounts.openaire.eu/about
Source code	N/A
Licence	N/A
Relevant publications	https://doi.org/10.5281/zenodo.4268144

Public API	https://usagecounts.openaire.eu/resources#apis

4.2.5. OPERAS Metrics

OPERAS Metrics constitutes a usage and altmetrics platform tailored specifically for Open Access publishers within Humanities and Social Sciences. This platform collects usage and impact metrics concerning Open Access content, drawing data from various sources such as monographs, journals, and repositories. It offers a unified interface for accessing, presenting, and analysing these metrics in the publisher's website and in other platforms where the content is accessible. OPERAS Metrics also provides a tool that efficiently gathers usage and alternative metrics for Open Access publications. The primary goal is to aggregate usage and impact metrics from various sources, enabling streamlined access, visualisation, and analysis from a single entry point.

In contrast to many platforms limited to collecting their own metrics, OPERAS Metrics stands out by introducing a groundbreaking approach that facilitates metrics aggregation from third-party platforms. This initiative addresses a challenge often faced by scholarly publishers, who lack the resources to develop technical solutions for this purpose. While some argue for uniform collection and reporting mechanisms before integrating third-party metrics, OPERAS recognises the importance of providing authors, publishers, and other stakeholders with accessible data. It advocates for a simple standard, enabling seamless cross-platform analysis through transparent data tagging aligned with its respective definition.

Table 14 Summary of important information about OPERAS Metrics.

URL	https://metrics.operas-eu.org/
Documentation	https://metrics.operas-eu.org/docs/getting-started
Source code	N/A
Licence	N/A
Relevant publications	N/A
Public API	https://metrics.operas-eu.org/docs/metrics-api

4.3. Enrichment of scholarly data with missing links and link semantics

This section focuses on tools and services that can provide missing semantics or other types of missing attributes to research output links (like citations or other relationships between research outputs). The respective tools and services may reveal the missing semantics/attributes by analysing textual information that supplements the links (e.g., the "citances" - the snippet of text surrounding the citation within a document - in the case of citations) or can infer them using network analysis that considers the neighbourhood of the links in a scientific knowledge graph. In the following sections we present a list of popular tools and services in the respective category.

4.3.1.   Anystyle

Anystyle is a versatile software tool designed to ease the extraction of bibliographic references from academic documents and other text sources. Utilising cutting-edge natural language processing and machine learning techniques, Anystyle can automatically identify and parse references in various formats, including APA, MLA, Chicago, and more.

Available both as a command line tool[7] as well as a Web application[8] with a user-friendly interface, Anystyle aims at reducing the manual effort required for citation management. Anystyle streamlines the process of organising and formatting references, ultimately enhancing the efficiency and accuracy of scholarly work.

Table 15 Summary of important information about Anystyle.

URL	https://github.com/inukshuk/anystyle-cli
Documentation	https://github.com/inukshuk/anystyle-cli#readme
Source code	https://github.com/inukshuk/anystyle-cli
Licence	BSD-style licence
Relevant publications	N/A
Public API	https://anystyle.io/

4.3.2.   BIP! citation classifier (and NDR)

BIP! Citation Classifier's primary objective is to extend the existing citation data collected from various platforms, such as OpenCitations and OpenAIRE Graph. To achieve this goal, the

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[7] https://github.com/inukshuk/anystyle-cli
[8] https://anystyle.io/

classifier primarily focuses on identifying citations that have not been reported in the aforementioned sources in Computer Science. In Computer Science, conferences and workshops are very important, while it is common for such venues not to assign DOIs to their articles. To address this, the classifier gathers Open Science publications lacking DOIs from DBLP, a widely recognised bibliographic database for Computer Science publications, and leveraging advanced text analysis techniques, it extracts citation information directly from the manuscripts of these publications. The resulting output data is made available as an open resource on Zenodo (https://zenodo.org/record/8163673). Additionally, the tool provides annotation features for citations based on their intent, with plans for further improvement and expansion. Last but not least, as part of the GraspOS project, the BIP! Citation Classifier will be extended in research fields other than Computer Science, enhancing its utility, and reinforcing its role in supporting the advancement of open science practices.

Table 16 Summary of important information about the BIP! citation classifier (and NDR).

URL	https://zenodo.org/record/8163673
Documentation	https://zenodo.org/record/8163673
Source code	https://github.com/athenarc/bip-ndr-workflow
Licence	GPL-2.0
Relevant publications	https://arxiv.org/abs/2307.12794
Public API	N/A

4.3.3. CERMINE

CERMINE is a Java library and a web service for extracting metadata and content from PDF files containing academic publications. The system analyses the content of a PDF file and attempts to extract information such as the title of the article, journal information (title, etc.), bibliographic information (volume, issue, page numbers, etc.), authors and affiliations, keywords, abstract, and bibliographic references. CERMINE is written in Java at Centre for Open Science at the Interdisciplinary Centre for Mathematical and Computational Modelling, University of Warsaw. The code is licensed under GNU Affero General Public License version 3.

Table 17 Summary of important information about CERMINE.

URL	http://cermine.ceon.pl/index.html

Documentation	https://github.com/CeON/CERMINE/blob/master/README.md
Source code	https://github.com/CeON/CERMINE
Licence	GNU Affero General Public License
Relevant publications	https://doi.org/10.1007/s10032-015-0249-8
Public API	http://cermine.ceon.pl/index.html

4.3.4. EXCITE and OUTCITE

EXCITE is a toolset of citation extraction software with particular focus on the German-language social sciences. In the background, EXCITE uses CERMINE (Section 4.3.3) and GROBID (Section 4.3.6) for extracting content from PDF files. Afterwards, Anystyle (Section 4.3.1) and Exparser (Section 4.3.5) are used along with self processing of XML from GROBID and CERMINE for reference extraction and segmentation.

Note that the metadata of the cited papers may not be found in the available bibliographic databases. To this end, OUTCITE extends EXCITE focusing on the development of a toolchain to locate and link those "non-source" items.

In the following link you can access the demo interface of OUTCITE: https://demo-outcite.gesis.org/ .

Table 18 Summary of important information about EXCITE and OUTCITE.

URL	https://excite.informatik.uni-stuttgart.de/
Documentation	N/A
Source code	https://github.com/exciteproject
Licence	GPL-3.0
Relevant publications	[1] https://link.springer.com/chapter/10.1007/978-3-319-67162-8_15 [2] https://www.gesis.org/en/research/external-funding-projects/details/project/121/validatingmatching-and-retrieving-non-source-items-in-the-social-science
Public API	https://excite.informatik.uni-stuttgart.de/excite

4.3.5. Exparser

Exparser is a tool for extracting and segmenting reference strings from PDF documents. It is has been developed in the context of the project EXCITE (Section 3.34). The tool works in two phases: first it applies a reference line classification algorithm and, then, it proceeds with the reference segmentation & identification. Both classification and segmentation leverage, for their training, a set of features extracted from each line and token of the document. The respective models have been trained on research papers written in German and English languages.

Table 19 Summary of important information about Exparser.

URL	https://github.com/exciteproject/Exparser
Documentation	https://exparser.readthedocs.io/en/latest/
Source code	https://github.com/exciteproject/Exparser
Licence	GPL 3.0
Relevant publications	https://doi.org/10.1109/JCDL.2019.00035
Public API	N/A

4.3.6. GROBID

GROBID (GeneRation Of BIbliographic Data)[9] is a powerful open-source tool designed to extract and structure bibliographic information from scholarly documents. With its diverse set of functionalities, GROBID enables accurate and efficient extraction of metadata such as titles, authors, abstracts, and references from a wide range of academic documents, including research papers, patents, and technical reports. The toolkit also offers entity recognition for identifying and categorising named entities, such as affiliations, as well as support for full-text segmentation. Leveraging machine learning and natural language processing techniques, GROBID proves invaluable to researchers, digital libraries, and other institutions seeking to automate and streamline the information retrieval process from scholarly documents.

Table 20 Summary of important information about GROBID.

URL	https://github.com/kermitt2/grobid

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[9] https://github.com/kermitt2/grobid

Documentation	https://grobid.readthedocs.io/en/latest/
Source code	https://github.com/kermitt2/grobid
Licence	Apache-2.0
Relevant publications	https://link.springer.com/chapter/10.1007/978-3-642-04346-8_62
Public API	N/A

4.3.7. PDFSSA4MET

PDFSSA4MET attempts to facilitate metadata extraction and tagging based on structural and syntactic analysis of content. Given a PDF document that conforms to a fairly conventional structure, like most scholarly works do, this tool attempts to annotate the document with the following: title, authors, chapter headings, references, volume, number of pages, cited publications and URLs and suggested social tags.

Table 21 Summary of important information about PDFSSA4MET.

URL	https://github.com/eliask/pdfssa4met
Documentation	https://github.com/eliask/pdfssa4met#readme
Source code	https://github.com/eliask/pdfssa4met
Licence	GPL-3.0
Relevant publications	https://code.google.com/archive/p/pdfssa4met/
Public API	N/A

4.3.8. Scholarcy

Scholarcy is an online article summarizer that analyses research articles, reports and book chapters and breaks them down into sections to assist the user in assessing how important a given document is to their work. By identifying key information (e.g., study participants, main findings,limitations) Scholarcy helps the user to speedup the reading of a document and easily identify its main points. As an article summariser tool, Scholarcy creates a summary flashcard of any MS Word or PDF document offering links to open access versions of cited sources, and extracting figures, tables and images (after proper configuration).

Table 22 Summary of important information about Scholarcy.

URL	https://article-summarizer.scholarcy.com/
Documentation	N/A
Source code	N/A
Licence	N/A
Relevant publications	https://www.scholarcy.com/how-scholarcy-contributes-to-and-makes-use-of-open-citations/
Public API	https://article-summarizer.scholarcy.com/

4.3.9.   SciCite

SciCite is a tool that aims to help its users to identify the intent of citations in scientific articles. Its methodology is based on a neural multitask learning framework that considers structural information from the articles to improve the accuracy of the main model. SciCite's model achieves good performance without relying on external linguistic resources or hand-engineered features as done in previous methods.

Table 23 Summary of important information about SciCite.

URL	https://github.com/allenai/scicite/
Documentation	https://github.com/allenai/scicite/blob/master/README.md
Source code	https://github.com/allenai/scicite
Licence	Apache 2 licence
Relevant publications	https://arxiv.org/pdf/1904.01608.pdf
Public API	N/A

4.3.10.   Science Parse

Science Parse is a tool that parses scientific papers (in PDF format) and returns them in a structured form. Today, it supports annotation of the following fields: title, authors, abstract, individual sections, and bibliography; its item in the reference list contains title, venue, publication year and mentions, i.e., places in the paper where bibliographic entries are

mentioned. It should be noted that Science Parse is available as a command line tool, a library, and as a server to enable parsing PDF documents as a service.

Table 24 Summary of important information about Science Parse.

URL	https://github.com/allenai/science-parse
Documentation	https://github.com/allenai/science-parse#readme
Source code	https://github.com/allenai/science-parse
Licence	Apache 2.0
Relevant publications	N/A
Public API	N/A

4.3.11. Scite

Scite is a service that offers a "smart citation index", called "scite", that categorises citations according to their surrounding textual context. The index is created based on a deep-learning-based classification model that is able to estimate whether a statement provides supporting or contrasting evidence for the respective cited article, or if it is a simple mention to it. The development of Scite was based on the analysis of over 25 million full-text scientific articles and, currently, its database contains more than 880 million classified citation statements.

Table 25 Summary of important information about Scite.

URL	https://scite.ai
Documentation	https://help.scite.ai/en-us/
Source code	N/A
Licence	N/A
Relevant publications	https://doi.org/10.1162/qss_a_00146
Public API	https://scite.ai/apiterms

4.3.12. Semantic Citation Classifier

A software that performs the automatic annotation of in-text citations in academic papers provided in PDF. It works by applying two steps:

1. The *PDF Parsing* step. The software analyses the PDF provided as input, and extracts its basic bibliographic metadata (mainly the authors and the title), all the bibliographic references with all their metadata (authors, year of publication, title, venue, identifiers) marked up, the citances (?)citation sentences that contain in-text reference pointers (i.e., the textual device used to refer to bibliographic references such as "[3]" and "(Doe et al., 2023)"), and other structural information such as sections, when possible. All these data will be returned as an RDF dataset compliant with the OpenCitations Data Model (OCDM, https://opencitations.net/model) (Daquino *et al.*, 2020).

2. The *Citation Function Classification* step. It uses a combination of technologies, such as Large Language Models (LLMs) and Knowledge Graph Embeddings (KGEs), to analyse the RDF dataset generated in the previous step. It then characterises the citation assigning semantics to the each citation sentence within the PDF by associating a citation function to the related in-text reference pointer. The citation functions returned by the software will be a subset of those defined in the Citation Typing Ontology (CiTO, http://purl.org/spar/cito) (Peroni & Shotton, 2012). The output of this step will be the same RDF dataset provided as input enriched with the specification of the citation functions associated with each citation.

Table 26 *Summary of important information about the Semantic Citation Classifier.*

URL	N/A
Documentation	N/A
Source code	https://github.com/Francesco-Sovrano/SCAR-DL
Licence	MIT licence
Relevant publications	N/A
Public API	N/A

5. OS monitoring services

This section presents the OS monitoring services that we have identified based on the landscape analysis. Each subsection elaborates on the services in the "OS monitoring for researchers", "OS monitoring for institutions", "OS monitoring for countries" subcategories.

For each service, a brief description is given along with some basic metadata (e.g., its main URL, a list of relevant publications, any APIs offered).

5.1. OS monitoring for researchers

5.1.1. Academia

Academia.edu is an online platform that aims to assist academic and scholarly collaboration, enabling the members of the research community at large to share, explore, and engage with a wide array of research papers, publications, and academic content.

Academia.edu provides a space for scholars to create personal profiles, upload and showcase their research, and connect with peers across various disciplines. The platform also facilitates interaction through features like commenting, sharing, and following, fostering a vibrant community for scholarly discourse.

Academia.edu offers both free and premium membership options, with the latter providing additional benefits such as enhanced visibility and analytics.

Table 27 Summary of important information about Academia.

URL	https://www.academia.edu/
Documentation	N/A
Source code	N/A
Licence	N/A
Relevant publications	N/A
Public API	N/A

5.1.2. AMiner

AMiner is an online academic search and mining platform. Among other functionalities, Aminer automatically generates researcher profiles using information from the Web and other data sources and exploiting an advanced name disambiguation method. The respective profile pages present the list of publications of the researchers together with information about the main scientific fields for their papers, their main co-authors, and various research performance indicators.

Table 28 Summary of important information about AMiner.

URL	https://www.aminer.org/
Documentation	http://doc.aminer.org/en/latest/
Source code	N/A
Licence	N/A
Relevant publications	[1] https://doi.org/10.1145/2835776.2835849 [2] https://doi.org/10.1162/dint_a_00006
Public API	https://api.aminer.org/

5.1.3.   BIP! Scholar

BIP! Scholar is a platform that helps researchers showcase their work and achievements. It allows researchers to create personalised profile pages highlighting their publications, projects, collaborations, awards, and other aspects of their research careers. Drawing data from scholarly knowledge graphs, including OpenAIRE Graph, Crossref, OpenCitations, and ORCID, BIP! Scholar presents researchers with custom reports encompassing a wide array of researcher-level RRA (Responsible Research Assessment) indicators. These indicators capture diverse facets of researchers' performance, such as productivity, impact, and career stage, while also taking into account their different roles in specific works, as categorised by the CRediT taxonomy. The calculation of impact indicators takes place on an extensive citation network comprising over 130 million research products, connected by more than 1.5 billion citations. Apart from the indicators, BIP! Scholar also offers researchers the option to add additional facts and evidence to their profiles (e.g., explanations for academic gaps, narratives).

Table 29 Summary of important information about BIP! Scholar.

URL	https://bip.imsi.athenarc.gr/scholar
Documentation	https://bip.imsi.athenarc.gr/site/indicators
Source code	https://github.com/athenarc/bip-scholar-indicators
Licence	GPL-2.0
Relevant publications	https://doi.org/10.1145/3529372.3533296

Public API	https://bip-api.imsi.athenarc.gr/documentation

5.1.4. FRIS (Researchers)

FRIS (Flanders Research Information Space) is the regional portal that collects information for the research in Flanders aiming to increase its visibility.

For researchers in particular, FRIS contains the address of the active researchers in Flanders, the expertise of the researchers, an overview of the research and the results of their research. Moreover, the FRIS portal aims to unite researchers, by encouraging interdisciplinary research, networking among researchers.

Last but not least, FRIS allows to find experts based on a search through the tree structure of the scientific disciplines in Flanders[10]; this fixed classification is a list of existing scientific disciplines agreed in Flanders.

Table 30 Summary of important information about FRIS (Researchers).

URL	https://researchportal.be/en
Documentation	N/A
Source code	N/A
Licence	N/A
Relevant publications	N/A
Public API	N/A

5.1.5. Google Scholar (profiles)

Google Scholar is a free online service developed by Google for researchers. Its main functionality is an academic search engine that allows end-users to search for scholarly literature across various disciplines and sources. Another popular feature is that it allows the researchers to create profiles listing all their published works and offering a series of basic statistics and indicators about their academic performance.

Table 31 Summary of important information about Google Scholar (profiles).

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[10] FRIS Expert Finding module:
https://researchportal.be/en/expert/search?sort=search_api_relevance&order=desc

URL	https://scholar.google.com/intl/en/scholar/citations.html
Documentation	N/A
Source code	N/A
Licence	N/A
Relevant publications	https://scholar.googleblog.com/2014/08/fresh-look-of-scholar-profiles.html
Public API	N/A

5.1.6. Kudos

Kudos is an online platform designed to assist researchers in communicating and increasing the visibility of their scholarly work. Kudos enables researchers to create comprehensive narratives around their research, with the aim to attract more attention to their work. Kudos also assists researchers to connect their work with broader societal and academic contexts, enhancing the impact and accessibility of their publications. Finally, Kudos offers researcher profiles supporting a variety of metrics capturing the reach, readership and influence of your research.

Table 32 Summary of important information about Kudos.

URL	https://www.growkudos.com/
Documentation	N/A
Source code	N/A
Licence	N/A
Relevant publications	N/A
Public API	N/A

5.1.7. Lens Profiles

Lens Profiles is a service provided by The Lens that allows researchers or inventors to create, manage, and share their profiles on The Lens platform. Lens Profiles enables users to showcase their expertise, achievements, and contributions in the fields of research and

innovation. Users can also link their profiles to their patent and scholarly documents, collections, analytics, and applications on the Lens.

Table 33 *Summary of important information about Lens Profiles.*

URL	https://www.lens.org/lens/profiles
Documentation	https://support.lens.org/
Source code	N/A
Licence	N/A
Relevant publications	N/A
Public API	https://docs.api.lens.org/

5.1.8. OpenAlex (profiles)

OpenAlex, run by OurResearch[11] (with funding from Arcadia), was launched in 2022 as a replacement for Microsoft Academic Graph (MAG). The OpenAlex dataset describes scholarly entities and how those entities are linked to each other. There are five primary entity types: works (papers, books, datasets etc), authors, sources (such as journals, conferences, and repositories), institutions, and concepts. OpenAlex aggregates and harmonises data across numerous open sources, among others are MAG, Crossref, and UnpayWall. OpenAlex is free and open source, and primarily offers access via an API, and database snapshots. It should be noted that OpenAlex has introduced the Explore[12] web interface that allows users to search and explore the entities of the underlying data. Notably, this web interface, which is still a work in progress, displays basic metadata for authors, such as their name, affiliation(s), and the field(s) of their research works.

Table 34 *Summary of important information about OpenAlex (profiles).*

URL	https://explore.openalex.org/
Documentation	https://docs.openalex.org/
Source code	https://github.com/ourresearch
Licence	MIT License

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[11] http://ourresearch.org/
[12] OpenAlex Explore – https://explore.openalex.org/

Relevant publications	https://arxiv.org/abs/2205.01833
Public API	https://docs.openalex.org/how-to-use-the-api/api-overview

5.1.9. ORCID

ORCID (Open Researcher and Contributor ID) is a widely recognised and globally adopted platform that offers unique and persistent digital identifiers (named ORCID iDs) to researchers. ORCID iDs help researchers to connect themselves to their scholarly works, affiliations, and contributions. ORCID enhances the visibility of researchers' achievements and simplifies the research ecosystem's administrative processes. Researchers can also control the visibility of their data through their ORCID accounts, thereby maintaining ownership and privacy over their academic records.

Accessing data from ORCID involves primarily utilising its API; the ORCID API enables authorised parties, such as institutions, publishers, and research platforms, to interact with and retrieve information from the ORCID database programmatically. This allows seamless integration of researchers' profiles and activities into various systems, facilitating data exchange and ensuring up-to-date and reliable information. Additionally, the ORCID data are publicly provided under the Creative Commons CC0 1.0 licence via a data snapshot[13]. However, this public data file is updated once every year.

Table 35 *Summary of important information about ORCID.*

URL	https://orcid.org/
Documentation	https://info.orcid.org/documentation/
Source code	N/A
Licence	N/A
Relevant publications	N/A
Public API	https://info.orcid.org/documentation/features/public-api/

5.1.10. ORCID DE Monitor

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[13] ORCID public data file: https://info.orcid.org/public-data-file-use-policy/

The aim of the ORCID DE Monitor platform is to analyse (and visualise using aggregated data) the use and dissemination of the personal identifier ORCID and related information in Europe, such as providing repositories, metadata formats used, and technical platforms, including a time-based representation of developments, and to make the evaluations available to the public.

It was developed as part of the project "ORCID DE - Consolidation of the ORCID Information Infrastructure in Germany" funded by the German Research Foundation (DFG) from 2020 to June 2022 (2nd funding phase).

In particular, the analyses are based on data from the Bielefeld Academic Search Engine (BASE), the DOI registration agencies Crossref and DataCite, as well as metadata from the person records of the Gemeinsame Normdatei (GND) of the German National Biography.

It should be noted that the ORCID DE Monitor is still under development.

Table 36 *Summary of important information about ORCID DE Monitor.*

URL	https://monitor.orcid-de.org/en/index.php
Documentation	N/A
Source code	N/A
Licence	N/A
Relevant publications	N/A
Public API	N/A

5.1.11. Research.fi (Researchers Profile)

Research.fi is a service that collects and shares information on research conducted in Finland. The service improves the location of information and experts on research and increases the visibility and societal impact of Finnish research.

At the moment, the service contains information on the Finnish research system, publications by Finnish organisations, projects funded by public and private research funders, information on researchers operating in Finland and their research activities, and statistical information on the development of research resources and impact.

Researchers can use the Researcher's Profile Tool to publish their own information from the ORCID service or their home organisation in the Research.fi service. The researcher can create

a profile and share information such as contact information, affiliations, education and qualifications, and a description of their own research. Researchers can also attach to their profiles their research outputs (that are already in the Research.fi service).

Table 37 Summary of important information about Research.fi (Researchers Profile).

URL	https://research.fi/en/mydata
Documentation	https://wiki.eduuni.fi/display/CSCTTV/Researcher%27s+Profile+Tool
Source code	N/A
Licence	N/A
Relevant publications	N/A
Public API	N/A

5.1.12. ResearchGate

ResearchGate is an online network tailored to the needs of researchers, scholars, and academics, providing them with a collaborative platform to share, discover, and discuss scientific knowledge. Serving as a virtual nexus for the global research community, ResearchGate allows users to create profiles, showcase their publications, and connect with peers in their respective fields.

Researchers can engage in insightful discussions, seek feedback on their work, and collaborate on projects, fostering a dynamic and interactive environment for academic discourse. ResearchGate also offers features like Q&A sections, where members can pose and answer research-related queries, further enriching the collective pool of knowledge. By offering a seamless blend of social networking and scholarly resources, ResearchGate has emerged as a valuable tool for advancing research, fostering interdisciplinary connections.

Table 38 Summary of important information about ResearchGate.

URL	https://www.researchgate.net/
Documentation	N/A
Source code	N/A
Licence	N/A

Relevant publications	N/A
Public API	N/A

5.1.13. Semantic Scholar (author pages)

Semantic Scholar is a free, AI-powered research tool for scientific literature developed at the Allen Institute for AI. It uses natural language processing, machine learning, and machine vision to provide summaries, highlights, and insights for scholarly papers. One important service that is offered by Semantic Scholar is the feature of "author pages". Author pages are profile pages for researchers that contain their publications together with some relevant researcher-level indicators and statistics. The respective data are gathered from academic publisher partnerships and public sources.

Table 39 *Summary of important information about Semantic Scholar (author pages).*

URL	https://www.semanticscholar.org/
Documentation	https://api.semanticscholar.org/api-docs/graph
Source code	N/A
Licence	N/A
Relevant publications	https://doi.org/10.48550/arXiv.2301.10140
Public API	https://www.semanticscholar.org/product/api

5.1.14. Web of Science (Author Profiles)

Author Profiles by the Web of Science (provided by Clarivate Analytics) is a service that offers comprehensive and accurate information about the publications, citations, and impacts of individual researchers. A variety of metrics are also provided on the researcher profile page.

Table 40 *Summary of important information about the Web of Science (Author Profiles).*

URL	https://www.webofscience.com/wos/author/search
Documentation	https://www.webofscience.com/wos/author/search
Source code	N/A

Licence	N/A
Relevant publications	N/A
Public API	N/A

5.2. OS monitoring for institutions

5.2.1.   Dutch Open Science Dashboard

The Dutch Open Science Dashboard, based on indicators selected in the EOSC Synergy project[14], presents, via intuitive visualisations, quantitative metrics, each supported by a short explanatory narrative.

As of today, the supported metrics are the following:

1. Digital (Research) Infrastructures according to various sources and definitions
2. Research facilities/data repositories/infrastructures by discipline
3. Certified Repositories
4. PID systems implemented
5. Numbers of datasets in repositories (selection, harvested by NARCIS)
6. Datasets in University repositories
7. Access licences and access restrictions
8. Metadata standards used
9. Content types present in repositories
10. Open Access in publication repositories

Table 41 Summary of important information about the Dutch Open Science Dashboard.

URL	https://bi-poc.dataverse.tk/superset/dashboard/6/
Documentation	N/A
Source code	N/A
Licence	N/A
Relevant publications	N/A

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[14] https://www.eosc-synergy.eu/national-eosc-landscapes/

Public API	N/A

5.2.2. French open science monitor

The French Open Science Monitor is a tool that tracks and evaluates the progress of Open Science in France. It was launched in 2019 as part of the first French National Plan for Open Science. The monitor currently focuses on scholarly publications that have at least one coauthor with a French affiliation, and measures their rate of open access. It will eventually cover other aspects of Open Science, such as research data, software, and disciplinary practices. The main goal of the current French Open Science Monitor is to provide a dynamic and detailed view of the openness level and its evolution for French publications. It also analyses how these publications are made open, by developing specific indicators for open repositories and dissemination platforms.

Table 42 *Summary of important information about the French open science monitor.*

URL	https://frenchopensciencemonitor.esr.gouv.fr/
Documentation	https://frenchopensciencemonitor.esr.gouv.fr/about/faq
Source code	https://github.com/orgs/dataesr/repositories?q=bso
Licence	MIT licence (for the UI)
Relevant publications	https://hal.science/hal-03651518
Public API	https://data.enseignementsup-recherche.gouv.fr/explore/dataset/open-access-monitor-france/api/

5.2.3. FRIS (Organisations)

FRIS (Flanders Research Information Space) is the regional portal on researchers and their research in Flanders, offering a unique window on research in Flanders with the aim to increase its visibility.

The portal can be a source of inspiration for the Flemish government for reports, analysis and statistics for policy making and better following trends. The FRIS portal offers discovery services for research outputs (publications, patents, and datasets), researchers, organisations, and projects. For each organisation in particular, FRIS offers a dedicated dashboard, listing the affiliated researchers, current and past projects and publications, as well as a short description of the organisation's profile, and its related fields of expertise.

Table 43 Summary of important information about FRIS (Organisations).

URL	https://researchportal.be/en
Documentation	N/A
Source code	N/A
Licence	N/A
Relevant publications	N/A
Public API	N/A

5.2.4. In4M (by The Lens)

In4M is a service provided by The Lens that offers metrics and indicators for a number of leading global research institutions regarding their influence on industry and innovation. The underlying methodology relies on patent data and citations.

Table 44 Summary of important information about In4M (by The Lens).

URL	https://research.fi/en/results/organizations
Documentation	N/A
Source code	N/A
Licence	N/A
Relevant publications	N/A
Public API	N/A

5.2.5. OA Monitor DE

The Open Access Monitor (OA Monitor) records the publication output of German academic institutions in scientific journals offering a variety of statistics and visualisations. Its main objective is to support the transition towards an open access system in Germany. The underlying data are gathered from multiple sources, such as Web of Science, Dimensions, Scopus, Unpaywall, DOAJ, OpenAPC, and ROR.

Table 45 Summary of important information about OA Monitor DE.

URL	https://open-access-monitor.de/
Documentation	https://jugit.fz-juelich.de/synoa/oam-dokumentation/-/wikis/English-Version/Home
Source code	N/A
Licence	N/A
Relevant publications	N/A
Public API	https://jugit.fz-juelich.de/synoa/oam-dokumentation/-/wikis/English%20Version/Open%20Access%20Monitor/API%20of%20the%20OAM

5.2.6.   OpenAIRE MONITOR

OpenAIRE MONITOR is a service that produces well-documented, timely and accurate monitoring indicators of research activities for funders, research initiatives and organisations, by creating personalised and on-demand online configurable dashboards. It is highly configurable to accommodate mix & match indicators and metrics.

OpenAIRE MONITOR, built on top of the OpenAIRE Graph, offers a well-rounded and relevant set of metrics, as well as composite and more advanced indicators to build funder, institutional and research infrastructure monitoring dashboards, with the aim of being a one-stop shop for the monitoring, policymaking, analysis and reporting needs of stakeholders.

Table 46 *Summary of important information about OpenAIRE MONITOR.*

URL	https://monitor.openaire.eu/
Documentation	https://monitor.openaire.eu/methodology/terminology
Source code	N/A
Licence	N/A
Relevant publications	N/A
Public API	N/A

5.2.7.   Research.fi (Organisations)

Research.fi is a comprehensive platform that, among others, offers valuable insights and indicators for organisations operating in the research and innovation landscape of Finland. Through its Web user interface, Research.fi provides a wealth of information, and relevant indicators, related to the research outputs, personnel, and funding of each organisation and its subunits.

These indicators, presented with intuitive visualisations, enable organisations to assess their research performance, identify key trends, and make informed strategic decisions. By offering a holistic view of the research ecosystem, Research.fi equips organisations with the tools to measure their contributions, track their progress, and align their initiatives with broader research and innovation goals.

Table 47 *Summary of important information about Research.fi (Organisations).*

URL	https://research.fi/en/results/organizations
Documentation	N/A
Source code	N/A
Licence	N/A
Relevant publications	N/A
Public API	N/A

5.3. OS monitoring for countries

5.3.1.　EOSC Observatory

The EOSC Observatory serves as a tool for policy intelligence, aiming to oversee Open Science and the European Open Science Cloud (EOSC) by monitoring policies, practices, and their impacts. This observatory plays a pivotal role in tracking the readiness of Member States and Associated Countries (MS/AC) in terms of EOSC, encompassing contributions, investments, and implementation efforts. Its framework comprises both a back-end mechanism for conducting surveys and analysing responses, and a front-end interface for visualising and utilising the aggregated data. Notably, a key component of the EOSC Observatory is the "EOSC Observatory Country Pages", complemented by the efforts of the National Open Access Desks (NOAD)s. These pages offer up-to-date insights, key statistics, and relevant contacts and links

pertaining to EOSC within each country, contributing to a comprehensive understanding of the EOSC landscape.

Table 48 *Summary of important information about the EOSC Observatory.*

URL	https://eoscobservatory.eosc-portal.eu/
Documentation	N/A
Source code	N/A
Licence	N/A
Relevant publications	N/A
Public API	N/A

5.3.2. Open Science Observatory

The Open Science Observatory[15] (OSO), is an online platform that offers rich visualisations of various Open Science aspects in Europe. It draws data from the OpenAIRE Graph, a comprehensive and open scholarly communication graph, and other public data sources. The OSO allows end users to explore and compare the impact, productivity, and compliance of Horizon 2020, Horizon Europe, and other funded research projects to Open Science practices. It follows a top-down methodology for deriving indicators based on high level monitoring targets and employs metrics which can measure the openness of research output (publications, data, software or other research products) on various aspects (e.g., gold/green/fair) and the regional or thematic distributions (at EU, Country and Repository-level). It aims to provide services to funding agencies, policy makers, research organisations and researchers and help them assess different dimensions of OS research.

Table 49 *Summary of important information about the Open Science Observatory.*

URL	https://osobservatory.openaire.eu
Documentation	N/A
Source code	N/A
Licence	N/A

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[15] Open Sciece Observatory (OSO): https://osobservatory.openaire.eu

Relevant publications	https://doi.org/10.1007/978-3-030-55814-7_29
Public API	N/A

6. Data services

This section presents the data services that we have identified based on the landscape analysis. For each service, a brief description is given along with some basic metadata (e.g., its main URL, a list of relevant publications, any APIs offered).

6.1. Scholarly data resources

6.1.1.   Altmetric

Altmetric is a platform that enables tracking the attention that research outputs attract in social media, their usage statistics in reference management platforms (e.g., Mendeley), and their mentions in patents and policy documents. In general, Altmetric aims to gather and offer "altmetrics", i.e, metrics that aim to capture aspects of impact beyond those captured by traditional metrics (e.g., citation counts) attempting to offer insights related to the societal engagement and real-world relevance of research works.

Table 50 Summary of important information about Altmetric.

URL	https://www.altmetric.com/
Documentation	N/A
Source code	N/A
Licence	N/A
Relevant publications	N/A
Public API	https://www.altmetric.com/solutions/altmetric-api/

6.1.2.   BIP! DB

BIP! DB is an open resource[16] (available under CC-BY licence) that provides citation-based impact indicators, offering insights into various dimensions of scientific impact. These indicators encompass popularity (current impact, based on citation analysis), influence (overall impact, again based on citation analysis), and impulse (initial momentum, based on the citations an article received during the first years after its publication), providing a multifaceted view of a research product's impact. To compute those indicators, BIP! collects citation data from Crossref, OpenCitations, and the OpenAIRE Graph to build a comprehensive citation network comprising over 130 million research products, and more than 1.6 billion citation relations among them.

Table 51 Summary of important information about BIP! DB.

URL	https://doi.org/10.5281/zenodo.4386934
Documentation	https://bip.imsi.athenarc.gr/site/indicators
Source code	N/A
Licence	CC BY 4.0
Relevant publications	https://doi.org/10.1145/3442442.3451369
Public API	https://bip-api.imsi.athenarc.gr/documentation

6.1.3.   DataCite (and the PID Graph)

DataCite is a leading global non-profit organisation that provides persistent identifiers (DOIs) for research data and other research outputs. Organisations within the research community join DataCite as members to be able to assign DOIs to all their research outputs. This way, their outputs become discoverable and associated metadata is made available to the community. DataCite then develops additional services to improve the DOI management experience, making it easier for members to connect and share their DOIs with the broader research ecosystem and to assess the use of their DOIs within that ecosystem.

DataCite is also making scholarly data openly available. For instance, DataCite is leading the effort for the creation of a knowledge graph called the PID Graph. The PID Graph is a way of representing the connections between scholarly resources that are identified by persistent identifiers (PIDs). The PID Graph uses a technology called GraphQL, which allows users to query and explore the graph in a flexible and efficient way. The PID Graph includes resources

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[16] https://doi.org/10.5281/zenodo.4386934

such as publications, datasets, software, people, organisations, and funders, and links them using metadata provided by DataCite and other PID providers. The PID Graph enables new use cases for discovering and assessing the impact of research outputs.

Table 52 *Summary of important information about DataCite (and the PID Graph).*

URL	https://datacite.org/index.html
Documentation	https://support.datacite.org/docs/datacite-graphql-api-guide
Source code	N/A
Licence	CC-BY
Relevant publications	N/A
Public API	https://datacite.org/integratorapis.html

6.1.4. Dimensions

Dimensions is a research information database operated by Digital Science. It encompasses a vast collection of nearly 140 million publications and 1.8 billion citations and aims to establish links between research grants and their subsequent publications, clinical trials, and patents. The data are collected from many sources, including openly-available databases together with those with permissive content licences, such as PubMed, PubMed Central and Crossref. Dimensions has been developed through a dynamic collaboration across Digital Science and six of its portfolio businesses (ReadCube, Altmetric, Figshare, Symplectic, DS Consultancy and ÜberResearch) and serves a diverse audience, including academic institutions, funders, government bodies, industries, and publishers. Recently, Dimensions Modules & Apps has been launched, which is an innovative analytical and workflow app that provides targeted, visual, and accessible data analysis.

Table 53 *Summary of important information about Dimensions.*

URL	https://www.dimensions.ai
Documentation	https://www.dimensions.ai/resources/api-documentation/
Source code	https://github.com/digital-science/dimensions-api-lab
Licence	Proprietary
Relevant publications	https://www.abcd.usp.br/wp-content/uploads/2023/03/DimensionsDataGuide_v6.pdf
Public API	https://api-lab.dimensions.ai

	https://docs.dimensions.ai/dsl/api.html

6.1.5. Europe PMC

Europe PMC is a service that offers free and open access to life sciences literature. It contains metadata related to more than 42 million publications, preprints and other documents. The articles are enriched with links to supporting data, reviews, protocols, and other relevant resources. A variety of its contents are available for bulk download.

Table 54 Summary of important information about Europe PMC.

URL	https://europepmc.org/
Documentation	https://europepmc.org/Help
Source code	N/A
Licence	N/A
Relevant publications	https://doi.org/10.1093/nar/gku1061
Public API	https://europepmc.org/developers

6.1.6. GoTriple Platform

GoTriple stands as an innovative multilingual exploration platform tailored to the social sciences and humanities (SSH). Serving as a central hub, it facilitates the utilisation of research artefacts across the broad spectrum of SSH disciplines. These encompass publications, research data, project descriptions, and researcher profiles, all seamlessly drawn from diverse aggregators and source providers. Within GoTriple, these elements undergo semantic enrichment, and linkage, fostering an interconnected ecosystem. Through this platform, users are empowered to:

- Uncover and utilise open scholarly SSH resources, which are currently scattered across local and discipline-specific repositories, in multiple European languages
- Locate and engage with fellow researchers and projects that span disciplinary, cultural, and linguistic boundaries
- Employ innovative tools and services to support research efforts, visualise search outcomes, receive personalised recommendations, and partake in social networking
- Explore new ways of research funding, such as crowdfunding.

Table 55 Summary of important information about GoTriple Platform.

URL	https://gotriple.eu/
Documentation	N/A
Source code	N/A
Licence	N/A
Relevant publications	[1] https://doi.org/10.3390/publications10040049 [2] https://doi.org/10.3390/info11120563
Public API	N/A

6.1.7. Microsoft Academic Graph (MAG)

The Microsoft Academic Graph (MAG) is a large-scale academic database created by Microsoft Research. It contains scientific publication records, citation relationships between those publications, as well as authors, institutions, journals, conferences, and fields of study, aiming to provide a comprehensive and structured dataset of academic research information and to facilitate academic search, and analysis. The underlying technology uses machine learning, semantic inference and knowledge discovery from sources crawled and indexed by the Bing search engine. At the end of 2021, MAG was discontinued by Microsoft.

Table 56 *Summary of important information about Microsoft Academic Graph (MAG).*

URL	https://www.microsoft.com/en-us/research/project/microsoft-academic-graph/
Documentation	https://learn.microsoft.com/en-us/academic-services/graph/
Source code	https://github.com/azure-samples/microsoft-academic-graph-pyspark-samples/tree/master/
Licence	Proprietary
Relevant publications	[1] https://doi.org/10.1162/qss_a_00021 [2] https://doi.org/10.1145/2740908.2742839
Public API	N/A

6.1.8. OpenAIRE Graph

The OpenAIRE Graph (formerly known as the OpenAIRE Research Graph) is one of the largest open scholarly record collections worldwide, key in fostering Open Science and establishing its practices in the daily research activities. The OpenAIRE Graph is a vast collection of interlinked research products, contextualised and openly available, aiming at bringing discovery, monitoring, and assessment of science back in the hands of the scientific community. It is a massive collection of metadata and links between scientific products such as articles, datasets, software, and other research products, entities like organisations, funders, funding streams, projects, communities, and data sources.

The OpenAIRE Graph aggregates millions of metadata records collected from trusted data sources, including Open Access journals registered in DOAJ, Crossref, Unpaywall, ORCID, Microsoft Academic Graph, and Datacite, as well as repositories registered in OpenDOAR, re3data.org, FAIRSharing.org, and the EOSC Service Catalogue.

Table 57 Summary of important information about OpenAIRE Graph.

URL	https://graph.openaire.eu/
Documentation	https://graph.openaire.eu/docs/
Source code	https://code-repo.d4science.org/D-Net/dnet-hadoop
Licence	AGPL-3.0
Relevant publications	N/A
Public API	https://graph.openaire.eu/develop/overview.html

6.1.9.   OpenAlex

OpenAlex is an index of hundreds of millions of interconnected entities across the global research system. More specifically, OpenAlex contains metadata for the world's scholarly papers, researchers, journals, and institutions — along with all the ways they're connected to one another. OpenAlex is operated by a transparent and sustainable non-profit organisation. The respective data are openly available in CC0 and the code is open source.

Table 58 Summary of important information about OpenAlex.

URL	https://openalex.org
Documentation	https://docs.openalex.org/
Source code	https://github.com/orgs/ourresearch/repositories?language=&q=openalex&sort=&type=public
Licence	CC0
Relevant publications	https://arxiv.org/abs/2205.01833
Public API	https://docs.openalex.org/how-to-use-the-api/api-overview

6.1.10. OpenCitations (data)

OpenCitations is an independent, community-led, and not-for-profit Open Science infrastructure organisation that publishes open bibliographic and citation data by using Linked Open Data (LOD) using Semantic Web technologies. OpenCitations provides two main collections. The first one is the OpenCitations Indexes[17], which contains more than 1.4 billion citation links between entities gathered from different sources, which include Crossref, DataCite, and the National Institute of Health Open Citation Collection. The other collection is OpenCitations Meta[18], which currently includes basic bibliographic metadata (title, date of publication, venue, identifiers, authors, publisher, etc.) of the entities involved in the citations included in the OpenCitations Index. The OpenCitations Index and OpenCitations Meta constitute valuable resources for bibliometric analyses, such as estimating the impact of research products and enabling their reproducibility. All OpenCitations data are licensed using a CC0 waiver, are downloadable in full (https://opencitations.net/download), and can be accessed programmatically through its querying services (https://opencitations.net/querying), which include several REST APIs.

Table 59 *Summary of important information about OpenCitations (data).*

URL	https://opencitations.net/
Documentation	https://opencitations.net/model
Source code	https://opencitations.net/tools
Licence	CC0
Relevant publications	https://doi.org/10.1162/qss_a_00023
Public API	https://opencitations.net/datasets (multiple API links included)

6.1.11.   OPERAS Metrics

OPERAS Metrics[19] is a usage and altmetrics platform for Open Access publishers in the Humanities and Social Sciences. It collects usage and impact metrics related to published Open Access content from many different sources (monographs, journals, repositories) and allows their access, display and analysis from a single access point. Metrics are displayed for the publisher's website and for the other sites where a book is known to be available at. This way, the publisher can see the total impact and reach of their book across different platforms.

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[17] OpenCitations Indexes, https://opencitations.net/index
[18] OpenCitations Meta, https://opencitations.net/meta
[19] OPERAS metrics service: https://metrics.operas-eu.org/

The OPERAS Metrics service provides an Open Source tool to collect usage and impact metrics related to published Open Access content from many different sources, which are made available for access, display, and analysis from a single access point.

Table 60 *Summary of important information about OPERAS Metrics.*

URL	https://metrics.operas-eu.org/
Documentation	https://metrics.operas-eu.org/docs/getting-started
Source code	https://github.com/hirmeos
Licence	CC-BY
Relevant publications	N/A
Public API	https://metrics.operas-eu.org/docs/metrics-api

6.1.12. PlumX Metrics

PlumX Metrics is a comprehensive and innovative analytics platform that offers valuable insights into the impact and reach of scholarly research. PlumX Metrics provides insights into how people interact with an individual research output (articles, conference proceedings, book chapters, and many more) in the online environment providing a holistic view of research influence across various channels. Examples include when research is mentioned in the news or is tweeted about.

Collectively known as PlumX Metrics, these metrics are divided into five categories to help make sense of the huge amounts of data involved and to enable analysis by comparing like with like. Specifically, metrics are categorised into 5 distinct categories:

- *Citations* – This category contains both traditional citation indexes, such as Scopus, as well as citations that help indicate societal impact, such as Clinical or Policy Citations.
- *Usage* – Is a way to signal if anyone is reading the articles or using the research. Usage is the number one statistic researchers want to know after citations.
- *Captures* – This category indicates "intent to return" (i.e., that someone wants to come back to the research output). Captures can be a leading indicator of future citations.
- *Mentions* – This category measures activities such as news articles or blog posts about research. Mentions is a way to tell that people truly engage with the research.
- *Social Media* – This category includes the tweets, Facebook likes, etc. that reference the research. Social Media can help measure "buzz" and attention. Social media can also measure how well a particular piece of research has been promoted.

Table 61 *Summary of important information about PlumX Metrics.*

URL	https://plumanalytics.com/
Documentation	https://plu.mx/plum/developers/widgets (documentation for using widgets)
Source code	N/A
Licence	N/A
Relevant publications	N/A
Public API	N/A

6.1.13. ScholeXplorer

ScholeXplorer is a rich and extensive dataset that showcases Scholix[20] links, exposed by the OpenAIRE ScholeXplorer service. Comprising a staggering 417+ million bidirectional links, this dataset provides connections between literature-dataset and dataset-dataset entities. This comprehensive collection consists of 24+ million literature objects interconnected with 37+ million datasets.

Links are collected from prominent publishers like CrossRef and EventData, reputable data centres like DataCite, various institutional and thematic repositories, and significant life-science databases such as EMBL-EBI. Notably, ScholeXplorer also provides links that have been inferred by OpenAIRE through text-mining efforts involving around 14 million publication PDFs. To facilitate accessibility and data sharing, the dataset is structured into 30 compressed files, each approximately 10 GB in size, totaling more than 320 GB of data.

Table 62 *Summary of important information about ScholeXplorer.*

URL	https://scholexplorer.openaire.eu/
Documentation	https://doi.org/10.5281/zenodo.6351556
Source code	https://doi.org/10.5281/zenodo.1200252
Licence	CC0 1.0
Relevant publications	https://doi.org/10.1108/prog-06-2016-0048

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[20] http://www.scholix.org/

Public API	http://api.scholexplorer.openaire.eu/swagger-ui/index.html?urls.primaryName=Scholexplorer%20API%20V2.0

6.1.14. SciCite dataset

SciCite is a dataset of 11K manually annotated citation intents based on citation context in the computer science and biomedical domains. The size of the data for scaffold tasks is about 91K and 73K for section title and citation worthiness, respectively. SciCite provides a concise annotation scheme that is useful for navigating research topics and maschine reading of scientific papers.

Table 63 Summary of important information about the SciCite dataset.

URL	https://allenai.org/data/scicite
Documentation	https://github.com/allenai/scicite/#readme
Source code	https://github.com/allenai/scicite/
Licence	Apache Licence
Relevant publications	https://arxiv.org/abs/1904.01608
Public API	N/A

6.1.15. Scopus

Scopus is a curated database provided by Elsevier and containing abstracts and citations from peer-reviewed scientific articles. Currently, it contains more than 76 million records indexing content from more than 7,000 publishers. The content inclusion process is made by curators and is based on criteria of scientific quality and rigour. The database indexes a variety of metadata such as publication title, abstract, keywords, author names, linked affiliations, references, etc. Scopus offers an API that allows users to access and integrate its data and functionality into their own applications or platforms. The Scopus API provides various endpoints for searching, retrieving, and analysing bibliographic information, citation data, and more. The Scopus API is free for non-commercial use, but it requires users to register and obtain an API key.

Table 64 Summary of important information about Scopus.

URL	https://www.elsevier.com/en-in/solutions/scopus
Documentation	https://www.elsevier.com/solutions/scopus/support
Source code	N/A

Licence	N/A
Relevant publications	https://doi.org/10.1162/qss_a_00019
Public API	N/A

6.1.16. Semantic Scholar (Academic Graph)

Semantic Scholar is a free, AI-powered research tool for scientific literature developed at the Allen Institute for AI. It uses natural language processing, machine learning, and machine vision to provide summaries, highlights, and insights for scholarly papers. All underlying scholarly data (including metadata from more than 200 mi publications) are organised into a Scientific Knowledge Graph known as the "Semantic Scholar Academic Graph (S2AG)". The data included in S2AG are available via the S2AG API which is available based on a special-purpose licence agreement. Semantic Scholar also supports various research indicators that help scholars measure the impact and quality of their work. Some of these indicators are the number of citations, number of influential citations, citation velocity (i.e., the average number of citations per year over the last three years), and citation acceleration (i.e., the percentage of change in velocity over the last year).

Table 65 Summary of important information about Semantic Scholar (Academic Graph).

URL	https://www.semanticscholar.org/
Documentation	https://api.semanticscholar.org/api-docs/graph
Source code	N/A
Licence	N/A
Relevant publications	https://doi.org/10.48550/arXiv.2301.10140
Public API	https://www.semanticscholar.org/product/api

6.1.17. The Lens

The Lens (formerly known as "Patent Lens"), is a platform that provides open and transparent access to global patent and scholarly data. It is provided by Cambia, a non-profit organisation, and it aims to facilitate the discovery, analysis, and dissemination of information related to innovation and research. The Lens integrates scholarly and patent data from multiple sources (e.g., Crossref, PubMed), deduplicates and unifies them. Accessing the full corpus is possible

both via a REST API and a full bulk dataset (customised datasets are also available for download).

Table 66 Summary of important information about The Lens.

URL	https://www.lens.org/
Documentation	https://support.lens.org/
Source code	N/A
Licence	N/A
Relevant publications	N/A
Public API	https://docs.api.lens.org/

6.1.18.   Web of Science (Core Collection DB)

The Core Collection database of Web of Science (formerly known as "Web of Knowledge") is a curated citation index of scholarly publishing including content from journals, proceedings, books, and data compilations. It is based on the Science Citation Index (SCI) created by Gasfield in 1964 and it is currently owned by Crarivate Analytics. The respective data are made available to institutions and researchers via platforms, APIs, and the delivery of custom datasets.

Table 67 Summary of important information about the Web of Science (Core Collection DB).

URL	https://www.webofscience.com/wos/woscc/basic-search
Documentation	https://clarivate.com/support/
Source code	N/A
Licence	N/A
Relevant publications	https://doi.org/10.1162/qss_a_00018
Public API	N/A

7.   Conclusions

This comprehensive report aims to survey and assess the various tools and services available for promoting Open-Science-aware RRA practices. It seamlessly aligns with the vision of the GraspOS project. The report covers various topics, including metadata enrichment (which involves community-led curation annotation tools) and monitoring the adoption of Open Science practices. The valuable insights derived from this deliverable can be used to guide the evolution of tools and services within WP3, to create an ecosystem that effectively combines Open Science principles with RRA.

8. Annexes

8.1. List of tools and services

Name	URL
F-UJI	https://www.f-uji.net/
FAIRshake	https://fairshake.cloud/
OpenAIRE Broker	http://provide.openaire.eu/
OpenAIRE IIS text mining modules	https://github.com/openaire/iis
OpenAIRE Metadata Validator	https://catalogue.openaire.eu/service/openaire.validator/overview
Rescognito	https://rescognito.com/
SciNoBo	N/A
SCRE Pipeline	https://project.gotriple.eu/
BIP! Services (Ranker)	https://bip.imsi.athenarc.gr/
EC KIP OS indicators	N/A
EOSC accounting for services	https://accounting.eosc-portal.eu/
OpenAIRE UsageCounts	https://usagecounts.openaire.eu/
OPERAS Metrics	https://metrics.operas-eu.org/
Anystyle	https://github.com/inukshuk/anystyle-cli

BIP! citation classifier (and NDR)	https://zenodo.org/record/8163673
CERMINE	http://cermine.ceon.pl/index.html
EXCITE and OUTCITE	https://excite.informatik.uni-stuttgart.de/
Exparser	https://github.com/exciteproject/Exparser
GROBID	https://github.com/kermitt2/grobid
PDFSSA4MET	https://github.com/eliask/pdfssa4met
Scholarcy	https://article-summarizer.scholarcy.com/
SciCite	https://github.com/allenai/scicite/
Science Parse	https://github.com/allenai/science-parse
Scite	https://scite.ai
Semantic Citation Classifier	N/A
Academia	https://www.academia.edu/
Aminer	https://www.aminer.org/
BIP! Scholar	https://bip.imsi.athenarc.gr/scholar
FRIS (Researchers)	https://researchportal.be/en
Google Scholar (profiles)	https://scholar.google.com/
Kudos	https://www.growkudos.com/
Lens Profiles	https://www.lens.org/lens/profiles
OpenAlex (profiles)	https://explore.openalex.org/
ORCID	https://orcid.org/
ORCID DE Monitor	https://monitor.orcid-de.org/en/index.php
Research.fi (Researchers Profile)	https://research.fi/en/mydata
ResearchGate	https://www.researchgate.net/
Semantic Scholar (author pages)	https://www.semanticscholar.org/

Web of Science (Author Profiles)	https://www.webofscience.com/wos/author/search
Dutch Open Science Dashboard	https://bi-poc.dataverse.tk/superset/dashboard/6/
French open science monitor	https://frenchopensciencemonitor.esr.gouv.fr/
FRIS (Organisations)	https://researchportal.be/en
In4M (by The Lens)	https://research.fi/en/results/organizations
OA Monitor DE	https://open-access-monitor.de/
OpenAIRE MONITOR	https://monitor.openaire.eu/
Research.fi (Organisations)	https://research.fi/en/results/organizations
EOSC Observatory	https://eoscobservatory.eosc-portal.eu/
Open Science Observatory	https://osobservatory.openaire.eu
Altmetric	https://www.altmetric.com/
BIP! DB	https://doi.org/10.5281/zenodo.4386934
DataCite (and the PID Graph)	https://datacite.org/index.html
Dimensions	https://www.dimensions.ai
Europe PMC	https://europepmc.org/
GoTriple Platform	https://gotriple.eu/
Microsoft Academic Graph (MAG)	https://www.microsoft.com/en-us/research/project/microsoft-academic-graph/
OpenAIRE Graph	https://graph.openaire.eu/
OpenAlex	https://openalex.org
OpenCitations (data)	https://opencitations.net/
OPERAS Metrics	https://metrics.operas-eu.org/

PlumX Metrics	https://plumanalytics.com/
SciteXplorer	https://scholexplorer.openaire.eu/
SciCite dataset	https://allenai.org/data/scicite
Scopus	https://www.elsevier.com/en-in/solutions/scopus
Semantic Scholar (Academic Graph)	https://www.semanticscholar.org/
The Lens	https://www.lens.org/
Web of Science (Core Collection DB)	https://www.webofscience.com/wos/woscc/basic-search