Digital Object Identifiers for Research Software

JHU Open Source Programs Office

Explainer

Research software is the collection of tools, codes, and libraries that allow a researcher to generate new data or analyze and make meaning of existing data.

"Data Science and Research Software Engineering Collaboration." Accessed March 14, 2024. https://researchsupport.harvard.edu/data-science-research-software-engineering-collaboration.

Software is foundationally important to scientific and social progress; however, traditional acknowledgment of the use of others' work has not adapted in step with the rapid development and use of software in research.

Bouquin, Daina, Ana Trisovic, Oliver Bertuch, and Elena Colón-Marrero. "Advancing Software Citation Implementation (Software Citation Workshop 2022)." arXiv, February 15, 2023. http://arxiv.org/abs/2302.07500.

One way to improve acknowledgement of software is to create (also known as “minting”) and include a persistent identifier or PID in your code citation.

The Digital Object Identifier, or DOI, is the persistent identifier most commonly used for **research outputs** in the scholarly communications ecosystem.

The DOI system is governed by the DOI Foundation, and the numbers are allocated and registered by organizations referred to as “registration agencies.” Well-known registration agencies include Crossref, which focuses on scholarly content, and DataCite, which focuses on datasets.

While DOIs are appropriate for research software, different scholarly contexts use different types of persistent identifiers; for example, ISSNs for journals, and ORCiDs for individual researchers.

Key benefits of persistent identifiers:

- **Put research into context** by providing standard information around authorship
- **Promote research trust and transparency**
- **Help streamline information flow** by enabling automated metadata transmission across scholarly communication tools and systems.
- **Improve research tracking** by making it easier for research institutions to monitor works from their authors and for authors to track their own impacts
- **Improve research discoverability and accessibility** by making it easier to link verified locations of research records and outputs, including any open access versions.

Scholastica, “A PID’s Life: What Journals and Scholars Need to Know,” accessed October 15, 2024, https://blog.scholasticahq.com/post/pid-life-what-journals-scholars-need-to-know/.

How can I get a DOI or PID for my code?

Deposit your code with the JHU Research Data Repository

You can get a DOI by depositing a version of your code in the JHU Research Data Repository.

The Data Services team will work with you to create a software deposit, and mint a DataCite DOI for a specific version of your code.

https://dataservices.library.jhu.edu/archiving/

Deposit your code with other archiving tools

There are several web-based archiving tools you can use to deposit software and receive a DOI or PID. Examples include:

- Figshare - integrates with GitHub, provides DataCite DOI
- Open Science Framework (OSF) - provides DataCite DOI
- Software Heritage - provides a Software Heritage Identifier (SWHID) which is persistent and unique (but not a DOI)
- Zenodo - integrates with GitHub, provides CrossRef DOI

Publish your code in a journal

Software papers can be published in software-specific journals, such as the Journal of Open Source Software (JOSS), the Journal of Open Research Software (JORS), and others. Published papers are assigned a DOI that can be used in your software citation. Note: DOIs should be minted for either the paper or the code, not both.

Domain-specific journals are also beginning to accept software papers. An updated list of which journals accept software papers is maintained by the Software Sustainability Institute:

https://www.software.ac.uk/top-tip/which-journals-should-i-publish-my-software

Once your software is assigned a DOI or other PID, be sure to update the citation file in your code repository.

Not sure how? View our Citation explainer!

Questions? Ask the JHU Open Source Programs Office

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