

# Software Citation Workshop Results

Daina Bouquin<sup>‡</sup>, Daniel Chivvis<sup>‡</sup>

<sup>‡</sup> Center for Astrophysics | Harvard & Smithsonian, Cambridge, United States of America

Corresponding author: Daina Bouquin ([daina.bouquin@cfa.harvard.edu](mailto:daina.bouquin@cfa.harvard.edu)), Daniel Chivvis ([daniel.chivvis@cfa.harvard.edu](mailto:daniel.chivvis@cfa.harvard.edu))

## Abstract

Software is a copyrightable creative work that is foundationally important to the future of scholarly research, yet software citation is not ubiquitous. Despite increasing acceptance of general [software citation principles](#) (Smith et al. 2016), challenges exist that make their implementation difficult. As a result, metadata to facilitate software citation goes unrecorded, [software goes uncited](#) (Bouquin et al. 2020), and software authors continue to be divorced from their contributions to science and human cultural heritage. If this status quo persists, uncited software will become increasingly difficult to find, access, and build upon, which will prevent software from being a “Findable, Accessible, Interoperable, and Reusable” (FAIR) Digital Object in the future.

Addressing the challenges that currently impact software citation implementation requires action from the scholarly communication ecosystem and digital preservation landscape, along with cooperation from software authors and users. This situation presents an opportunity to enable a future for FAIR software through software citation by leveraging intersections between digital challenges in libraries and archives, and the work of experts in other disciplines to advance theory and practice. To achieve this end, the [Harvard-Smithsonian Center for Astrophysics](#) (CfA) has partnered with the [Institute of Museum and Library Services](#) (IMLS) to bring together stakeholders and experts representing the many forms of labor and expertise to address specific questions about software citation that have so far gone unresolved, such as:

- How can we enable software citation *when the software is part of a larger deposit of content* in an archival repository?
- How can we enable the *adoption of metadata standards* that support software citation in repositories?

To address the above questions, the Software Citation Workshop (SCW) was created. Although the meeting organizers originally planned for a fully in-person meeting, the constantly shifting pandemic landscape necessitated a new approach. Instead of one large meeting, SCW ‘22 started with a series of three online focus groups. These groups were held online from June 28th to June 30th, 2022. The goal of the focus groups was to help

meeting organizers better understand how various stakeholders view problems associated with software citation metadata availability in repositories and perceived barriers to implementing software citation metadata standards. The focus groups also helped to identify how these people think software citation problems should be prioritized by addressing specific challenges, such as:

1. What is the status of software citation adoption in your domain?
2. What barriers and incentives influence the availability of software citation metadata in repositories? (e.g., policies, curatorial practices, user-generated information)
3. From your perspective, how should people cite software that is part of a larger deposit? (e.g., Jupyter notebooks deposited with a paper)
4. What could we do to make software citation metadata available in these larger deposits?
5. What influences the adoption of metadata standards that support software citation in repositories?
6. Are curators aware of the differences between the specific software citation metadata formats? (i.e., [Citation File Format](#) (CFF) (Druskat 2022) vs. [CodeMeta](#) (Jones et al. 2020))
7. Are software authors aware of the different formats and when/how to use them?
8. What have your experiences been with either? Should we be encouraging one over the other?

In August 2022, an in-person workshop will summarize the answers to these challenges given by the online focus groups into an expanded and revised version of the [Software Citation Implementation Challenges](#) (Katz et al. 2019) document. In-person meeting attendees will be encouraged to brainstorm interventions to tackle and prioritize these newly defined software citation problems, and to lay out a series of mutually supporting approaches to address them. Attendees will also be given the opportunity to synthesize plans of action and other deliverables that can be shared widely.

This presentation aims to promote these yet to be determined plans of action by introducing attendees to the lessons learned and outputs produced by the SCW '22 meetings. Through open collaboration and feedback, this presentation will also introduce attendees to ways they can help ensure the future of software as a FAIR Digital Object.

## Keywords

metadata, digital repositories, credit, attribution

## Presenting author

Daina Bouquin, Daniel Chivvis

## Presented at

First International Conference on FAIR Digital Objects, poster

## Funding program

National Leadership Grants for Libraries Program (NLG-L)

## Grant title

National Leadership Grant for Libraries (NLG-L)

## Hosting institution

Center for Astrophysics | Harvard & Smithsonian

## Conflicts of interest

## References

- Bouquin D, Chivvis D, Henneken E, Lockhart K, Muench A, Koch J (2020) Credit Lost: Two Decades of Software Citation in Astronomy. The Astrophysical Journal Supplement Series 249 (1). <https://doi.org/10.3847/1538-4365/ab7be6>
- Druskat S (2022) Citation File Format (CFF). <https://citation-file-format.github.io/>. Accessed on: 2022-7-10.
- Jones M, Smith A, Mayes AC, Boettiger C (2020) The CodeMeta Project. <https://codemeta.github.io/>. Accessed on: 2022-7-10.
- Katz D, Bouquin D, Hong NC, Hausman J, Jones C, Chivvis D, Clark T, Crosas M, Druskat S, Fenner M, Gillespie T, Gonzalez-Beltran A, Gruenpeter M, Habermann T, Haines R, Harrison M, Henneken E, Hwang L, Jones M, Kelly A, Kennedy D, Leinweber K, Rios F, Robinson C, Todorov I, Wu M, Zhang Q (2019) Software Citation Implementation Challenges. arXiv <https://doi.org/10.48550/arxiv.1905.08674>
- Smith A, Katz D, Niemeyer K, et al. (2016) Software citation principles. PeerJ Computer Science 2 <https://doi.org/10.7717/peerj-cs.86>