

NISO Reproducibility Badging

Update for FORCE11 Software Citation Implementation WG

2 June 2020

Publishers are faced with a tremendous opportunity ...

- Reproducibility in the sciences is moving from an academic conversation to a reality – albeit slowly
 - The literature dates back to the mid-90s
 - Action has been limited, but we are on the cusp of step-wise advances
- The U.S. National Academies of Science created an AdHoc Committee in 2017 to address Reproducibility in Science
 - The AdHoc was in response to a request from the U.S. Congress
 - 234-page report delivered in June 2018
- Publishers have a golden opportunity to be a key enabler of Reproducibility
 - The effectiveness of solutions “depends on whether they are clear, easy to follow, and harmonized across funders and publishers”

Recommendations for reproducibility

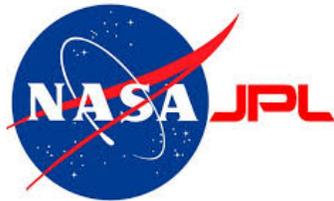
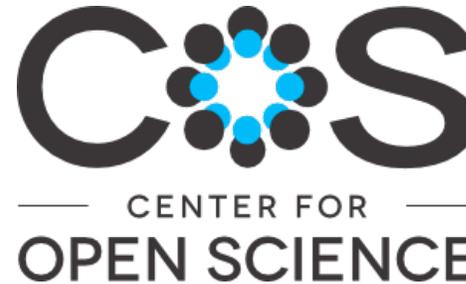
- Develop a Recommended Practice: Toward a Compatible Taxonomy, Definitions, and Recognition Badging Scheme for Reproducibility in the Computational and Computing Sciences
 - Work proposed by a coalition of researchers, publishers, professional societies and academic librarians in 2018
 - Taking into account prior efforts and working towards recommended practice for the computational and computer sciences (but applicable more widely)
- Focus on standardization
- Main body of work done by a NISO working group in 2019



Reproducibility vs Replicability

- **Reproducibility** is obtaining consistent results using the same input data, computational steps, methods, and code, and conditions of analysis.
- **Replicability** is obtaining consistent results across studies aimed at answering the same scientific question, each of which has obtained its own data.
 - The National Academies of Sciences, Engineering and Medicine, Reproducibility and Replicability in Science:
<https://www.nap.edu/catalog/25303/reproducibility-and-replicability-in-science>
- Memo to ACM Publication Board to ask them to align terminology in computer sciences with what is used elsewhere

Wide range of contributors



Existing badging schemes

- [ACM](#)



- [IEEE](#) (in TPDS)



- [COS](#) (also Elsevier JESPC, E&HB)



- Springer Nature (BMC Microbiology)

- Open Data badge



- Wiley, Biostatistics, JASA – A&CS

Reproducibility Badging Definitions

- **Open Research Objects (ORO)**: author-created digital objects (inc data and code) are permanently archived in a public repository that assigns a global identifier and guarantees persistence
 - ORO-A: all relevant research objects made available
 - What is “relevant” is left to the editorial board, in addition to authors
- **Research Objects Reviewed (ROR)**: all relevant author-created digital objects were reviewed
 - Results Reproduced (ROR-R): badge issuer has regenerated results using author-created research objects
 - Review criteria is left to the editorial board (JOSS used as an example for software)
- **Results Replicated (RER)**: an independent study has obtained consistent results leading to the same findings (potentially using new artifacts or methods)
- *ORO & ROR are independent; publication may be awarded one but not the other*

Badge Metadata

- Version of the schema or specification
- Issuing organization
- Badge type
- Badge definition
- Paper DOI
- Issuing date
- **References (linked DOIs to artifacts)**
- Review criteria URI (for the ROR badge)
- Optional: validation hash or cryptographic key

Doesn't include items that belong to the metadata of the associated research objects themselves, such as software citation (e.g. CodeMeta or CFF file), license information, programming language, etc. Nevertheless, these research objects should contain standard and complete metadata.

Other requirements

- Badge validator
- Badge help / documentation
- Badge revocation
- Badge design

Community Feedback requested!

- Public comment period open until June 18, 2020
- Review the draft recommendation and submit comments:
- <https://www.niso.org/standards-committees/reproducibility-badging>