



NISO RP-40-2021

JATS4R Software Citations

Version 1.0

*A Recommended Practice of the
National Information Standards Organization*

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All inquiries should be addressed to: NISO, 3600 Clipper Mill Road, Suite 302, Baltimore, MD 21211 or via email at nisohq@niso.org

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<https://jats4r.org/software-citations/>

Software citations

Status: Published

Version: 1.0

Provenance

JATS4R software citation subgroup members:

Mohamed Abdelhakeem, *Hindawi*, Jeffrey Beck, *NCBI/NLM/NIH* (<https://orcid.org/0000-0002-1798-9797>), Daina Bouquin, *Harvard-Smithsonian Center for Astrophysics* (<https://orcid.org/0000-0003-2626-3688>), Shani Chachamu, *Oxford University Press*, Neil Chue Hong, *University of Edinburgh* (<https://orcid.org/0000-0002-8876-7606>), Andreas Czerniak, *Bielefeld University* (<https://orcid.org/0000-0003-3883-4169>), Chris Erdmann, *AGU* (<https://orcid.org/0000-0003-2554-180X>), Michael Evans, *F1000*, Kara Handren, *University of Toronto* (<https://orcid.org/0000-0003-3877-8371>), Brooks Hanson, Melissa Harrison (Chair), *eLife* (<https://orcid.org/0000-0003-3523-4408>), Trevor J Hiblar, *Silverchair*, Daniel S. Katz, *University of Illinois* (<https://orcid.org/0000-0001-5934-7525>), Lauren Kmec, *AAAS* (<https://orcid.org/0000-0003-2301-5208>), Thomas Lemberger, *EMBO*, Alain Monteil, *INRIA* (<https://orcid.org/0000-0003-3150-4837>), August Muench, *American Astronomical Society* (<https://orcid.org/0000-0003-0666-6367>); Luke Prescott, *Hindawi*, Shelley Stall, *AGU* (<https://orcid.org/0000-0003-2926-8353>), Jake Yeston, *AAAS* (<https://orcid.org/0000-0002-8252-0848>); Viviana Letizia, *Elsevier* (<https://orcid.org/0000-0003-1088-5255>)

Emerging references subgroup:

Brooke Begin, *Silverchair*; Lauren Fischer, *The JAMA Network*; Michael Jensen, *Westchester Publishing Services*; August Muench, *American Astronomical Society*; Stephen Laverick (Chair), *Green Fifteen Publishing Consultancy*; Wei Zhao, *OCUL/Scholars Portal*

History

Emerging references subgroup

Working: September 27, 2017 - Jan 3, 2020

Software citation subgroup

Working: March 1, 2021 - Sept 1, 2021

JATS4R Steering Committee review: September 7, 2021 - October 1, 2021

Public Review: October 1, 2021 - November 1, 2021

JATS4R Steering Committee review: November 2 - November 5, 2021

NISO Topic Committee review: November 5 - November 17, 2021

Published: November 19, 2021

Context

<element-citation>, <mixed-citation>,
 <person-group>, <name> / <string-name> / <collab>, <article-title>, <source>, <publisher-name>,
 <year>, <pub-id>, <ext-link>, <version>

JATS 1.2 and above: <part-title>

@publication-type, @person-group-type, @content-type, @pub-id-type, @assigning-authority,
 @xlink:href, @designator

Description

Software citation and credit is a very complex topic. This subgroup is composed of a group of people with experience and knowledge of this subject. We recognise that we must balance our desire for the perfect software citation with the reality of the information that is available and the willingness of publishers to provide granular tagging of that information. Minimally we need to work with what authors give to publishers and how publishers can tag that information.

The aim of this JATS4R recommendation is to enable support for the various ways people may cite software. The additional reading section details software citation initiatives that are promoting change and development, but the JATS4R recommendation passes no judgement on whether an individual XML document is conforming to these or not; the idea is to support whatever use cases journals are seeing and authors are using.

For this group to come up with a recommendation that is useful and conforms to a JATS4R recommendation structure, we defined the following as out of scope:

- Distinguishing between citations to software and citations to articles about software
- Distinguishing between a software paper and another type of paper if/where we can

Minimal software reference

Although more complete references are most useful to the reader (and indexer), we appreciate that sometimes it is not always possible to obtain all the items required for a standard reference. The FORCE11 Software Citation Implementation Working Group (Katz et al., 2021) identified the minimal requirements as Author, Title, Publication venue, Date, and Identifier. However, the JATS4R validator will only fail a tagged software citation (defined by @publication-type value of "software") if it does not contain an identifier OR a url (see examples 1A-C). For publishers using the Harvard referencing system we appreciate an author and date are required. Katz et al. recommend the renderer may insert *n.d.* to the human-readable display citation/reference if no date is provided. See section below on Authorship for author details. However, these are decisions for individual publishers to make for their content.

Citation of complex objects, containing a multiple content types (e.g., data and software)

We are aware that authors are exploring different ways to make their content, source materials, and methodology accessible to the readers. For instance, packages of software and data can be uploaded to Zenodo with one DOI, and Notebooks can be created with varying capabilities of reuse. We appreciate this is challenging to publishers, and editorial decisions must be made as to how to cite and incorporate this material. This JATS4R recommendation makes no recommendation as to how this should be referenced, except to provide a recommendation on how to tag it if the publisher deems it software (or data - see [Data citations](#) recommendation). JATS4R does not recommend dual tagging of references using the @publication-type attribute (e.g. data | software) and will fail validation if this is done. The publisher must decide which category to use.

Research Resource Identifiers (RRIDs)

Research Resource Identifiers (RRIDs; Bandrowski and Martone, 2016) are commonly found in the methods section of life science papers, where they typically refer to reagents and antibodies used in an experiment. However, RRIDs are also used to identify software tools that are used in analyses. This recommendation passes no judgement on the editorial policy of the journal (whether to tag RRIDs as references or leave within the text) but examples of how to tag an RRID as a reference are provided (see examples 1B and 5B).

Authorship

As software practices shift, our assumption is that it is less likely publishers receive links to software held on a university website page (which JATS4R discourages because these often result in link-rot) and more software is cited from a dedicated software collaboration platform (e.g. GitHub or GitLab) or general purpose archival repository (e.g. Zenodo). We recognise the author names are often missing from GitHub READMEs and only user-names and handles are available. Likewise, contributors to code repositories vary over time, and the contributors to software may be different from the authors of a research paper associated with the software. This recommendation gives no guidance to publishers on how to manage policy decisions associated with these issues. However, it does deal with the lack of names by allowing for user names and handles to be used in author tags (see example 3). Anon can be used if authors cannot be found at all.

Additional reading

Bandrowski AE & Martone ME. (2016). RRIDs: A Simple Step toward Improving Reproducibility through Rigor and Transparency of Experimental Methods. *Neuron*, 90(3), 434–436.
[10.1016/j.neuron.2016.04.030](https://doi.org/10.1016/j.neuron.2016.04.030)

Chue Hong NP, Katz DS, Barker M, Lamprecht A-L, Martinez C, Psomopoulos FE, Harrow J, Castro LJ, Gruenpeter M, Martinez PA & Honeyman T. (2021). FAIR Principles for Research Software (FAIR4RS Principles). Research Data Alliance. [10.15497/RDA00065](https://doi.org/10.15497/RDA00065)

Chue Hong NP, Allen A, Gonzalez-Beltran A, de Waard A, Smith AM, Robinson C, Jones C, Bouquin D, Katz DS, Kennedy D, Ryder G, Hausman J, Hwang L, Jones MB, Harrison M, Crosas M, Wu M, Löwe P, Haines R, ... Pollard T. (2019). Software Citation Checklist for Authors (Version 0.9.0). Zenodo. [10.5281/zenodo.3479198](https://doi.org/10.5281/zenodo.3479198)

Chue Hong NP, Allen A, Gonzalez-Beltran A, de Waard A, Smith AM, Robinson C, Jones C, Bouquin D, Katz DS, Kennedy D, Ryder G, Hausman J, Hwang L, Jones MB, Harrison M, Crosas M, Wu M, Löwe P, Haines R, ... Pollard T. (2019). Software Citation Checklist for Developers (Version 0.9.0). Zenodo. [10.5281/zenodo.3482769](https://doi.org/10.5281/zenodo.3482769)

European Commission. Directorate General for Research and Innovation. (2020). Scholarly infrastructures for research software: report from the EOSC Executive Board Working Group (WG) Architecture Task Force (TF) SIRS. Publications Office. [10.2777/28598](https://doi.org/10.2777/28598)

Katz DS, Chue Hong NP, Clark T, Muench A, Stall S, Bouquin D, Cannon M, Edmunds S, Faez T, Feeney P, Fenner M, Friedman M, Grenier G, Harrison M, Heber J, Leary A, MacCallum C, Murray H, Pastrana E, ... Yeston, J. (2021). Recognizing the Value of Software: A Software Citation Guide [version 2; peer review: 2 approved]. F1000Research, 9, 1257. [10.12688/f1000research.26932.2](https://doi.org/10.12688/f1000research.26932.2)

Smith AM, Katz DS & Niemeyer KE. (2016). Software Citation Principles. PeerJ Computer Science, 2, e86. [10.7717/peerj-cs.86](https://doi.org/10.7717/peerj-cs.86)

Task Force on Best Practices for Software Registries: Montei A, Gonzalez-Beltran A, Ioannidis A, Allen A, Lee A, Bandrowski A, Wilson BE, Mecum B, Fan Du C, Robinson C, Garijo D, Katz DS, Long D, Milliken G, Ménager H, Hausman J, Spaaks JH, Fenlon K, Vanderbilt K, ... Morrell T. (2020). Nine Best Practices for Research Software Registries and Repositories: A Concise Guide. arXiv. [arXiv:2012.13117v1](https://arxiv.org/abs/2012.13117v1)

Di Cosmo R. (2020) Archiving and Referencing Source Code with Software Heritage. In: Bigatti A, Carette J, Davenport J, Joswig M, de Wolff T (eds) International Conference on Mathematical Software (ICMS) 2020. Lecture Notes in Computer Science, vol 12097. Springer. [10.1007/978-3-030-52200-1_36](https://doi.org/10.1007/978-3-030-52200-1_36)

Recommendation

1. @publication-type="software" on <mixed-citation> or <element-citation>. Use "software" as the value of @publication-type to indicate that the citation is to software. Do not attempt dual tagging of references using the @publication-type attribute (e.g. data | software), one or the other is required.

[[[Validator tool result](#): when @publication-type contains 'software' case insensitively and does not exactly equal 'software' all lower-case, ERROR]]

Note: This maps to [Datacite](#) resourceTypeGeneral attribute "Software". JATS4R policy is to use lowercase for attribute values so would require crosswalk mapping of "software" to "Software".

2. @person-group-type on <person-group>. As per existing JATS4R recommendations on general [citations](#), use the <person-group> element to specify authors and other contributors in a citation. Use the @person-group-type attribute to specify the role of a contributor, when it is possible to identify them with a role. A separate <person-group> element should be used for each role. This attribute has a fixed list of allowed values in the Journal Publishing tag set: all-authors; assignee; author; compiler; curator; director; editor; guest-editor; inventor; transed; translator.

[[[Validator tool result](#):: when multiple <person-group> elements using the same @person-group-type role are used ERROR]]

[[[Validator tool result](#):: when multiple <person-group> element is used without @person-group-type present ERROR]]

3. <name> / <string-name> / <collab>. As per existing JATS4R recommendations on general [citations](#), the <name> or <string-name> element should be used for an individual named author. When groups of authors (consortia) are cited under a group name or an institution is cited as the contributor, the <collab> element should be used (see Example 2C).
4. @content-type on string-name. For instances where the author name cannot be found, but, for example, a GitHub username is available, use @content-type with value of "username" on string-name (see Example 3).
5. <part-title> (JATS v1.2 and forward). Use this element to display the software title. Use <article-title> for JATS v 1.1 and backward (see Examples 4A and B).

[[[Validator tool result](#): when reference with @publication-type="software" and DTD version ≥ 1.2 uses <article-title> WARNING]]

6. <source>. This element should be used to capture the higher level information about where the software is published or hosted, for example GitHub, Zenodo, BioModels, Software Heritage (see Examples 4A and B)
7. <publisher-name>. Where the name of the publisher is available, it should be captured using this element. Please note that this should not be confused with the <source> element where <source> is a host for the software and <publisher-name> captures the party/entity responsible

for the software (see Examples 4A and B).

8. <year>. This should contain the 4-digit year of publication. If the element contains anything other than a single 4-digit year (such as, for example, "2012A", "2005Q1"), then use the @iso-8601-date attribute to specify the 4-digit year.

[[[Validator tool result](#): if the content is not 4-digit year and there is no @iso-8601-date with content ERROR]]

9. <pub-id>. If there is a well-defined identifier for software this element should be used, for example doi, accession number, or SWHID. As per existing JATS4R recommendations on [data citations](#) (recommendation 6), this element should be used to hold both the repository ID for the software, in the element content (see Examples 1A-C), and, if applicable, the full URI to the software, in the @xlink:href attribute (see Examples 5A-B).

Note: GitHub/Bitbucket/GitLab are not considered reliable authorities for providing IDs, so a GitHub git commit ID is not considered a <pub-id> and so skip to recommendation 12.

[[[Validator tool result](#): when <source> contains GitHub/Bitbucket/GitLab and <pub-id> contains commit ID WARNING]]

[[[Validator tool result](#): when <element-citation publication-type="software"> does not have an <ext-link> element or <pub-id> element with an @ext-link-type attribute, or a <pub-id pub-id-type="doi"> containing a valid DOI ERROR]]

10. @pub-id-type on <pub-id>. Consistent with what is stated in the JATS Tag Libraries for versions 1.2 and newer, and in contrast to the older definition ("Type of publication identifier or the organization or system that defined the identifier"), this attribute should only be used to state the type of identifier and not to specify the organisation or system that defined the identifier (for example, doi, SWHID, accession, See Examples 1A-C). In the Publishing schemas, @pub-id-type is a controlled list. Version 1.3 introduced the "other" value for @pub-id-type that can be used when a specific value that is not on the controlled list for @pub-id-type is entered in the @custom-type attribute. (see Example 5A).
11. @assigning-authority on <pub-id>. When the given type of identifier can be assigned by more than one organisation (e.g. accession numbers biomodels.db, docker hub) and the organisation registering the identifier is known, you should include the @assigning-authority attribute on the <pub-id> element (see Examples 6A-B).

Note: DOIs do not require an assigning-authority because although there are different DOI registrants, the DOI organisation is a central resolver service.

12. @xlink:href on <pub-id>. Optional. Including an @xlink:href with a fully resolved URI can improve the near term reusability of content. However, as identifying authorities can change their base URIs over time, omitting @xlink:href can improve the long term reusability of content. The decision to include @xlink:href should be evaluated by the interested parties on a case by case basis.
13. <ext-link>. Must be used to provide the URI for the software available online if there is not a pub-id containing a resolvable link. Use the standard xlink attributes to provide a live link. Do not use for DOIs (see Examples 7A-B)

[[[Validator tool result](#): when <ext-link> element with an @ext-link-type attribute value of "uri" does not have a @xlink:href attribute WARNING]]

[[[Validator tool result](#): when <element-citation publication-type="software"> does not have an <ext-link> element or <pub-id> element with an @ext-link-type attribute, or a <pub-id pub-id-type="doi"> containing a valid DOI ERROR]]

[[[Validator tool result](#): when <ext-link> element has @ext-link-type attribute value of "doi" or value is a DOI ERROR]]

14. <version>. Use this element to display the human-readable version number of the software. Any version information should be captured using this element. This should contain the entire string. For example, <version>Version 8.01b</version>. See Examples 4.
15. JATS v 1.1 and forward @designator on <version>. Use this attribute to contain the machine-readable version number of the dataset. The element contents can be a more human-readable note (see point 11). The @designator attribute of <version> should contain only the pertinent version number and should not contain any editorial text. For example, <version designator="8.01b">Version 8.01b</version>. See Examples 4.

Examples

Example 1: Minimal software reference

Example 1A: pub-id is Software heritage Identifier

```
<ref id="bib2">
<element-citation publication-type="software">
<pub-id
pub-id-type="swhid">swh:1:dir:7dc782970300a97e9bca9038ba34728c857a0638</pub-id>
</element-citation>
</ref>
```

Example 1B: pub-id is RRID

```
<ref id="bib2">
  <element-citation publication-type="software">
    <pub-id pub-id-type="rrid">SCR_007358</pub-id>
  </element-citation>
</ref>
```

Example 1C: pub-id is DOI

```
<ref id="bib2">
  <element-citation publication-type="software">
    <pub-id pub-id-type="doi">10.6084/m9.figshare.14152595.v1</pub-id>
  </element-citation>
</ref>
```

Example 2: Authorship

Example 2A: Individual authors (element-citation)<ref id="bib2">

```
<element-citation publication-type="software">
  <person-group person-group-type="author">
    <name>
      <surname>Bates</surname>
      <given-names>D</given-names>
    </name>
    <name>
      <surname>Maechler</surname>
      <given-names>M</given-names>
    </name>
    <name>
      <surname>Bolker</surname>
      <given-names>B</given-names>
    </name>
    <name>
      <surname>Walker</surname>
      <given-names>S</given-names>
    </name>
    <name>
      <surname>Haubo Bojesen Christensen</surname>
      <given-names>R</given-names>
    </name>
    <name>
      <surname>Singmann</surname>
```

```

      <given-names>H</given-names>
    </name>
    <name>
      <surname>Dai</surname>
      <given-names>B</given-names>
    </name>
    <name>
      <surname>Grothendieck</surname>
      <given-names>G</given-names>
    </name>
    <name>
      <surname>Green</surname>
      <given-names>P</given-names>
    </name>
  </person-group>
  <person-group person-group-type="curator">
    <name>
      <surname>Bolker</surname>
      <given-names>B</given-names>
    </name>
  </person-group>
  <year iso-8601-date="2016">2016</year>
  <ext-link ext-link-type="uri"
xlink:href="https://cran.r-project.org/web/packages/lme4/index.html">https://cran.r-project.org/w
eb/packages/lme4/index.html</ext-link>
  </element-citation>
</ref>

```

Example 2B: Consortia author(s)

```

<ref id="bib33"><element-citation publication-type="software">
  <person-group person-group-type="author">
    <collab>R Development Core Team</collab>
  </person-group>
  <year iso-8601-date="2015">2015</year>
  <ext-link ext-link-type="uri"
xlink:href="http://www.r-project.org/">http://www.r-project.org/</ext-link>
  </element-citation>
</ref>

```

Example 2C: Authorship (mixed-citation)

```

<ref id="bib2">
<mixed-citation publication-type="software">

```

```

<person-group person-group-type="author">
  <string-name>
    <surname>Bates</surname>
    <given-names>D</given-names>
  </string-name>
  <string-name>
    <surname>Maechler</surname>
    <given-names>M</given-names>
  </string-name>
  <string-name>
    <surname>Bolker</surname>
    <given-names>B</given-names>
  </string-name>
  <string-name>
    <surname>Walker</surname>
    <given-names>S</given-names>
  </string-name>
  <string-name>
    <surname>Haubo Bojesen Christensen</surname>
    <given-names>R</given-names>
  </string-name>
  <string-name>
    <surname>Singmann</surname>
    <given-names>H</given-names>
  </string-name>
  <string-name>
    <surname>Dai</surname>
    <given-names>B</given-names>
  </string-name>
  <string-name>
    <surname>Grothendieck</surname>
    <given-names>G</given-names>
  </string-name>
  <string-name>
    <surname>Green</surname>
    <given-names>P</given-names>
  </string-name>
</person-group>
<person-group person-group-type="curator">
  <name>
    <surname>Bolker</surname>
    <given-names>B</given-names>
  </name>

```

```

    </person-group>
    <year iso-8601-date="2016">2016</year>
    <ext-link ext-link-type="uri"
xlink:href="https://cran.r-project.org/web/packages/lme4/index.html">https://cran.r-project.org/w
eb/packages/lme4/index.html</ext-link>
    </mixed-citation>
</ref>

```

Example 3: GitHub user name for author

```

<ref id="bib2">
  <element-citation publication-type="software">
    <person-group person-group-type="author">
      <string-name content-type="username">hubgit</string-name>
    </person-group>
    <ext-link ext-link-type="uri"
xlink:href="https://github.com/JATS4R/jats-validator-docker">https://github.com/JATS4R/j
ats-validator-docker</ext-link>
  </element-citation>
</ref>

```

```

<ref id="bib3">
<element-citation publication-type="software">
  <person-group person-group-type="author">
    <name>
      <surname>Kotila</surname>
      <given-names>M</given-names>
    </name>
    <name>
      <surname>Wilcox</surname>
      <given-names>C</given-names>
    </name>
    <string-name content-type="username">monkeywithacupcake</string-name>
  </person-group>
  <year iso-8601-date="2019">2019</year>
  <part-title>Numerical computing is fun</part-title>
  <source>GitHub</source>
  <ext-link ext-link-type="uri"
xlink:href="https://github.com/eka-foundation/numerical-computing-is-fun"
>https://github.com/eka-foundation/numerical-computing-is-fun</ext-link>
</element-citation>
</ref>

```

Example 4: Full reference

Example 4A: Part-title (JATS v 1.2 and above)

```

<ref id="bib1">
  <element-citation publication-type="software">
    <person-group person-group-type="author">
      <collab>R Development Core Team</collab>
    </person-group>
    <part-title>R: a language and environment for statistical computing</part-title>
  </element-citation>
  <source>r-project.org</source>
  <version designator="3.2.2">3.2.2</version>
  <year iso-8601-date="2015">2015</year>
  <publisher-name>R Foundation for Statistical Computing</publisher-name>
  <ext-link ext-link-type="uri"
    xlink:href="http://www.r-project.org/">http://www.r-project.org/</ext-link>
</ref>
<ref id="bib2">
  <element-citation publication-type="software">
    <person-group person-group-type="author">
      <name>
        <surname>Ferry</surname>
        <given-names>Q</given-names>
      </name>
      <name>
        <surname>Steinberg</surname>
        <given-names>J</given-names>
      </name>
      <name>
        <surname>Webber</surname>
        <given-names>C</given-names>
      </name>
      <name>
        <surname>FitzPatrick</surname>
        <given-names>DR</given-names>
      </name>
      <name>
        <surname>Ponting</surname>
        <given-names>CP</given-names>
      </name>
      <name>
        <surname>Zisserman</surname>

```

```

        <given-names>A</given-names>
      </name>
      <name>
        <surname>Nellåker</surname>
        <given-names>C</given-names>
      </name>
    </person-group>
    <year iso-8601-date="2014">2014</year>
    <part-title>Diagnostically relevant facial gestalt information from ordinary photos
database</part-title>
    <source>GitHub</source>
    <ext-link ext-link-type="uri"
xlink:href="https://github.com/ChristofferNellaker/Clinical_Face_Phenotype_Space_Pipeline">https://github.com/ChristofferNellaker/Clinical_Face_Phenotype_Space_Pipeline</ext-link>
    </element-citation>
  </ref>
<ref id="bib3">
  <element-citation publication-type="software">
    <person-group person-group-type="author">
      <string-name content-type="username">hubgit</string-name>
    </person-group>
    <year iso-8601-date="2020">2020</year>
  </source>GitHub</source>
  <part-title>jats-validator-docker</part-title>
  <ext-link ext-link-type="uri"
xlink:href="https://github.com/JATS4R/jats-validator-docker">https://github.com/JATS4R/jats-validator-docker</ext-link>
  </element-citation>
</ref>

```

Example 4B: article-title (JATS v 1.1 and below)

```

<ref id="bib1">
  <element-citation publication-type="software">
    <person-group person-group-type="author">
      <name>
        <surname>Rasband</surname>
        <given-names>WS</given-names>
      </name>
    </person-group>
    <year iso-8601-date="1997">1997</year>
    <article-title>Image J</article-title>
    <publisher-name>US National Institutes of Health</publisher-name>
  </source>imagej</source>

```

```

        <ext-link ext-link-type="uri"
xlink:href="http://imagej.nih.gov/ij/">http://imagej.nih.gov/ij/</ext-link>
    </element-citation>
</ref>
<ref id="bib2">
    <element-citation publication-type="software">
        <person-group person-group-type="author">
            <name>
                <surname>Ferry</surname>
                <given-names>Q</given-names>
            </name>
            <name>
                <surname>Steinberg</surname>
                <given-names>J</given-names>
            </name>
            <name>
                <surname>Webber</surname>
                <given-names>C</given-names>
            </name>
            <name>
                <surname>FitzPatrick</surname>
                <given-names>DR</given-names>
            </name>
            <name>
                <surname>Ponting</surname>
                <given-names>CP</given-names>
            </name>
            <name>
                <surname>Zisserman</surname>
                <given-names>A</given-names>
            </name>
            <name>
                <surname>Nellåker</surname>
                <given-names>C</given-names>
            </name>
        </person-group>
        <year iso-8601-date="2014">2014</year>
        <article-title>Diagnostically relevant facial gestalt information from ordinary photos
database</article-title>
        <source>GitHub</source>
        <ext-link ext-link-type="uri"
xlink:href="https://github.com/ChristofferNellaker/Clinical_Face_Phenotype_Space_Pipeline">htt
ps://github.com/ChristofferNellaker/Clinical_Face_Phenotype_Space_Pipeline</ext-link>

```



```

    </element-citation>
  </ref>
<ref id="bib3">
  <element-citation publication-type="software">
    <person-group person-group-type="author">
      <string-name content-type="username">hubgit</string-name>
    </person-group>
    <year iso-8601-date="2020">2020</year>
  <source>GitHub</source>
  <article-title>jats-validator-docker</article-title>
  <ext-link ext-link-type="uri"
    xlink:href="https://github.com/JATS4R/jats-validator-docker">https://github.com/JATS4R/j
    ats-validator-docker</ext-link>
  </element-citation>
</ref>

```

Example 5: pub-id

Example 5A - pub-id: Software Heritage Identifier with xlink:href

```

  <ref id="bib2">
    <element-citation publication-type="software">
      <pub-id pub-id-type="other" custom-type="swhid"
        xlink:href="https://archive.softwareheritage.org/swh:1:dir:7dc782970300a97e9bca9038b
        a34728c857a0638">swh:1:dir:7dc782970300a97e9bca9038ba34728c857a063</pub-id>
      </element-citation>
    </ref>

```

Example 5B - pub-id: RRID with xlink:href

```

  <ref id="bib2">
    <element-citation publication-type="software">
      <pub-id pub-id-type="rrid"
        xlink:href="https://scicrunch.org/resolver/SCR_007358">SCR_007358</pub-id>
      </element-citation>
    </ref>

```

Example 6: assigning-authority

Example 6A: assigning authority on pub-id (Biomodels)

Note: accession with assigning authority pair, renderer could create a link so xlink:href not required unless renderer is known to be not able to do this (see recommendation 5)

```

<ref id="bib2">

```

```

<element-citation publication-type="software">
  <pub-id assigning-authority="EBI"
    pub-id-type="accession">
    BIOMD0000000156</pub-id>
  </element-citation>
</ref>

```

Example 6B: Accession with xlink:href

```

<ref id="bib2">
  <element-citation publication-type="software">
    <source>BioModels</source>
    <pub-id assigning-authority="EBI" pub-id-type="accession"
      xlink:href="https://identifiers.org/biomodels.db:BIOMD0000000156">BIOMD0000000156</pub-id>
    </element-citation>
  </ref>

```

Example 6C: assigning authority on pub-id (dockerhub)

```

<element-citation publication-type="software">
  <person-group person-group-type="author">
    <name>
      <surname>Abadi</surname>
      <given-names>Martín</given-names>
    </name>
    <name>
      <surname>Agarwal</surname>
      <given-names>Ashish</given-names>
    </name>
    ...
    <name>
      <surname>Zheng</surname>
      <given-names>Xiaoqiang</given-names>
    </name>
  </person-group>
  <year iso-8601-date="2021">2021</year>
  <part-title>TensorFlow Docker Image</part-title>
  <source>Docker Hub</source>
  <version designator="2.6.0">2.6.0</version>
  <pub-id pub-id-type="accession" assigning-authority="docker-hub"
    xlink:href="https://hub.docker.com/r/tensorflow/tensorflow/">tensorflow/tensorflow:2.6.0</pub-id>
</element-citation>

```

Example 7: ext-link

Example 7A - CRAN example

```

<ref id="bib2">
<element-citation publication-type="software">
<ext-link ext-link-type="uri"
xlink:href="https://cran.r-project.org/web/packages/lme4/index.html">https://cran.r-project.org/w
eb/packages/lme4/index.html</ext-link>
</element-citation>
</ref>

```

Example 7B - GitHub example

```

<ref id="bib2">
<element-citation publication-type="software">
<ext-link ext-link-type="uri"
xlink:href="https://github.com/JATS4R/jats-validator-docker">https://github.com/JATS4R/jats-vali
dator-docker</ext-link>
</element-citation>
</ref>

```