

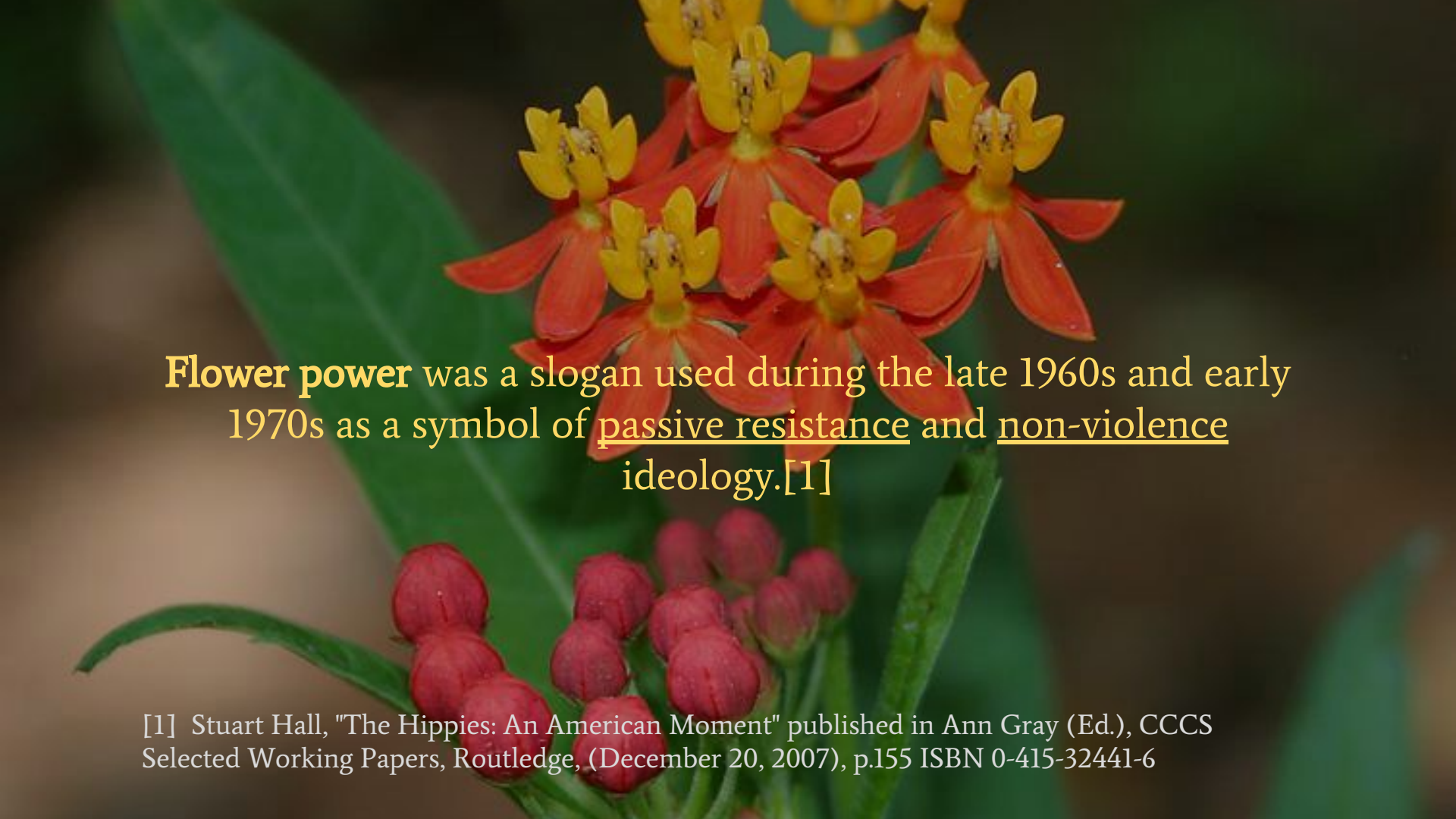


Asclepias: Flower Power for Software Citation

Jose Benito Gonzalez Lopez (CERN/Zenodo)

Alexandros Ioannidis (CERN/Zenodo)

on behalf of Asclepias Project Team



Flower power was a slogan used during the late 1960s and early 1970s as a symbol of passive resistance and non-violence ideology.[1]

[1] Stuart Hall, "The Hippies: An American Moment" published in Ann Gray (Ed.), CCCS Selected Working Papers, Routledge, (December 20, 2007), p.155 ISBN 0-415-32441-6



Asclepias

Enabling Software Citation and Discovery through links (PIDs) exchange
in astronomy

Asclepias



American Astronomical Society



Alfred P. Sloan
FOUNDATION



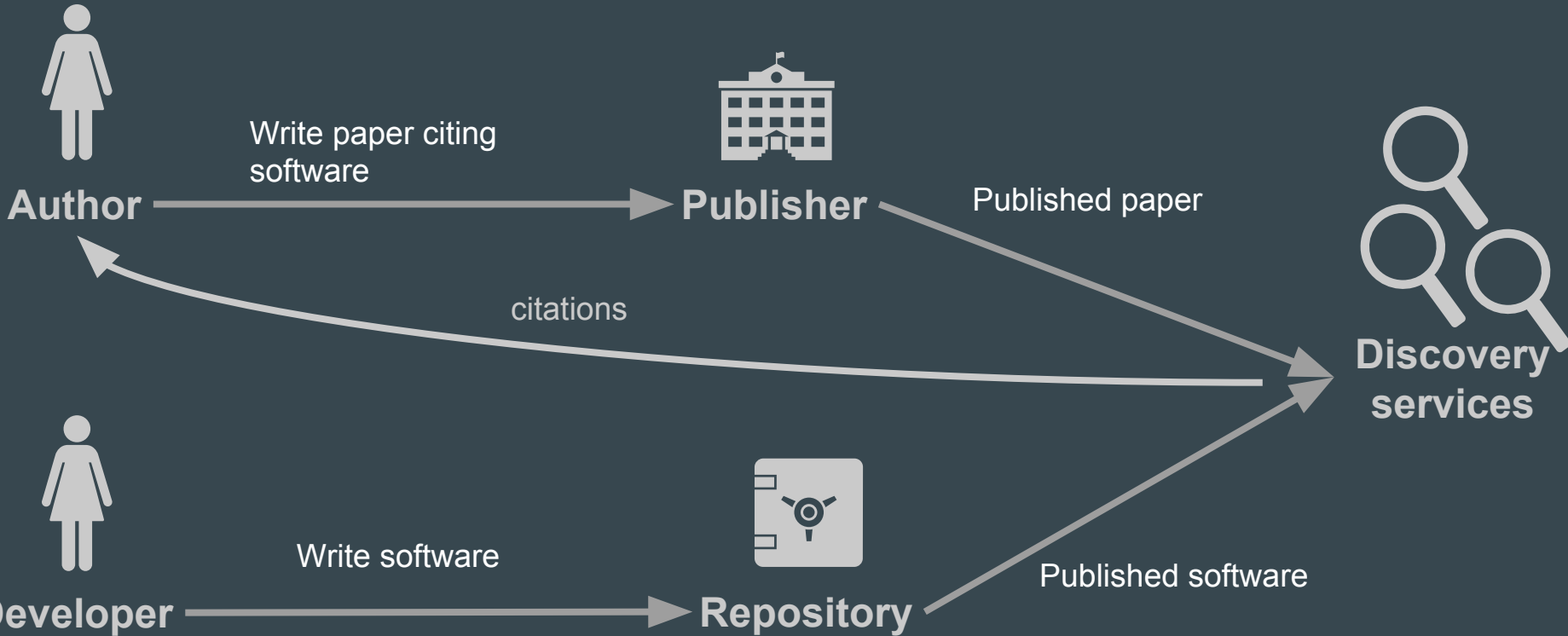
Astrophysics Data System

zenodo

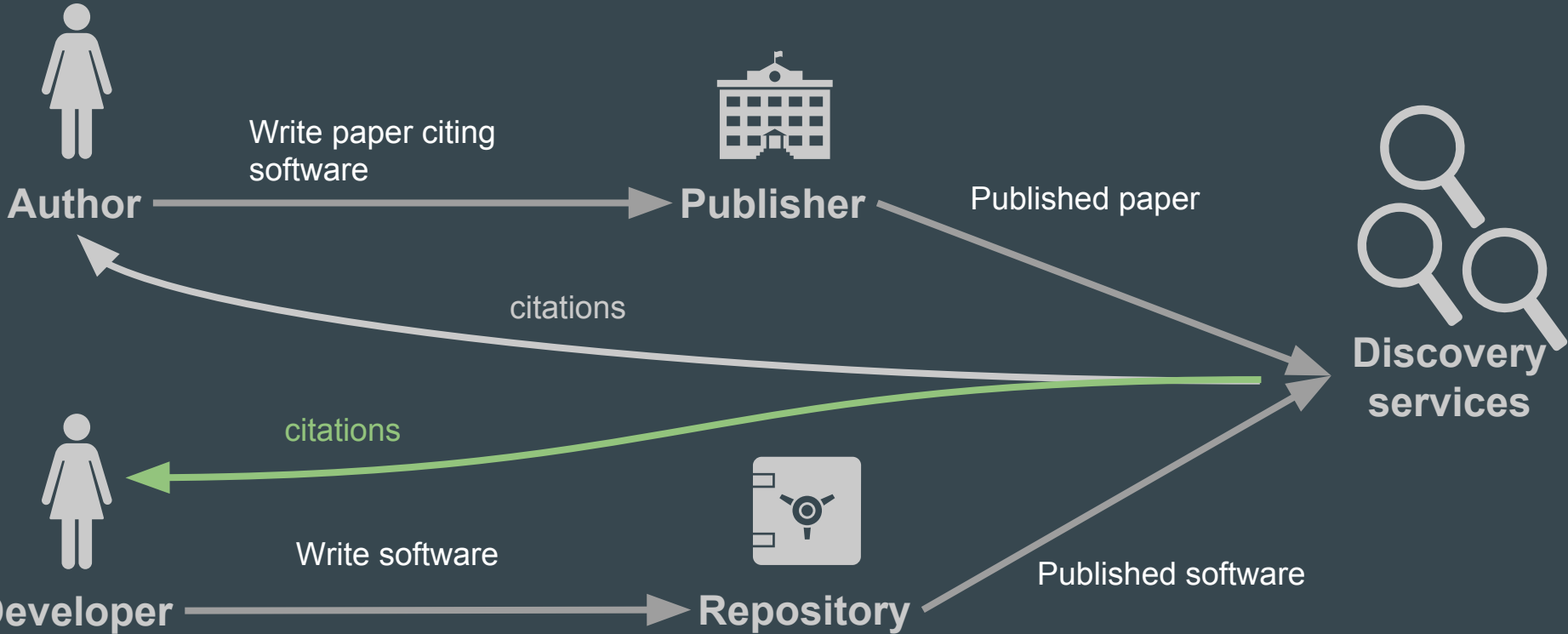
How to receive credit for software in astronomy?

Making software a first-class citizen

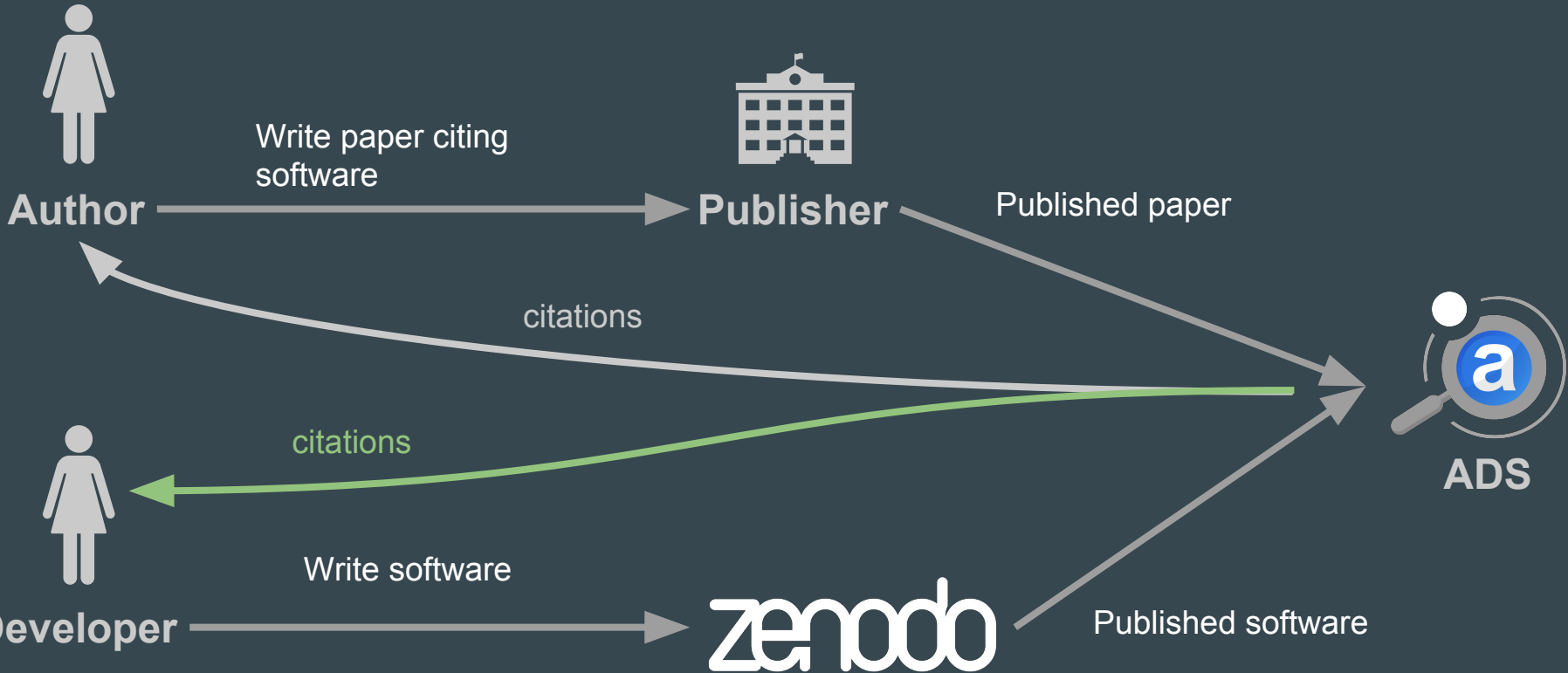
The current workflow



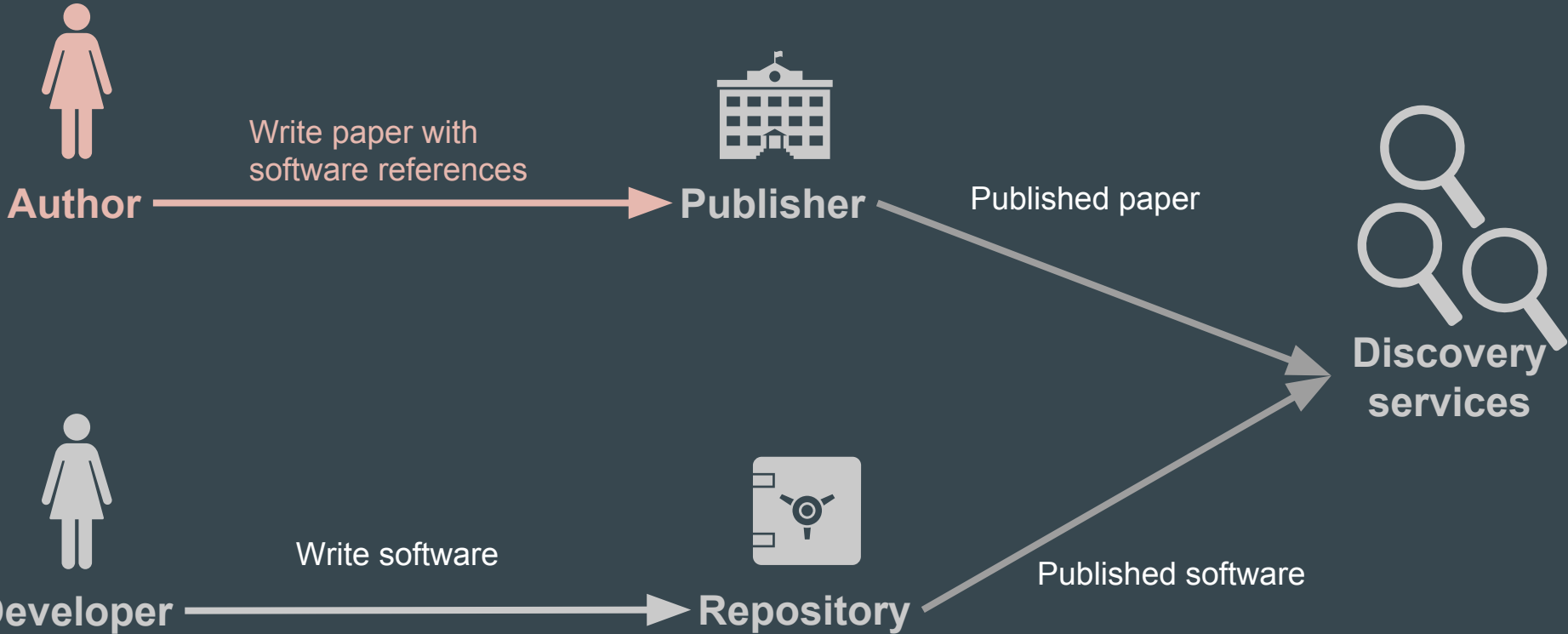
The current workflow



Asclepias use case: astronomy



The current workflow issues/solutions



Authors

- Information loss
 - Include citation in paper
- BibTeX/... for reference manager
 - “Software” type doesn’t exist
 - No version field support
- Multiple IDs for software:
 - DOI? URL? name?
 - DOI: zero, one or more?

How should I cite LMFIT?

See <https://dx.doi.org/10.5281/zenodo.11813>

build passing coverage 87% license BSD DOI 10.5281/zenodo.53155

Documentation

- Installation
 - Dependencies
 - Using pip
 - From source
 - Tests
- Getting started
- A note about sigmas
- Custom plotting
- Detailed API documentation

Attribution

If you make use of this code, please cite the JOSS paper:

```
@article{corner,  
  Author = {Daniel Foreman-Mackey},  
  Doi = {10.21105/joss.00024},  
  Title = {corner.py: Scatterplot matrices in Python},  
  Journal = {The Journal of Open Source Software},  
  Year = 2016,  
  Volume = 24,  
  Url = {http://dx.doi.org/10.5281/zenodo.45906}  
}
```

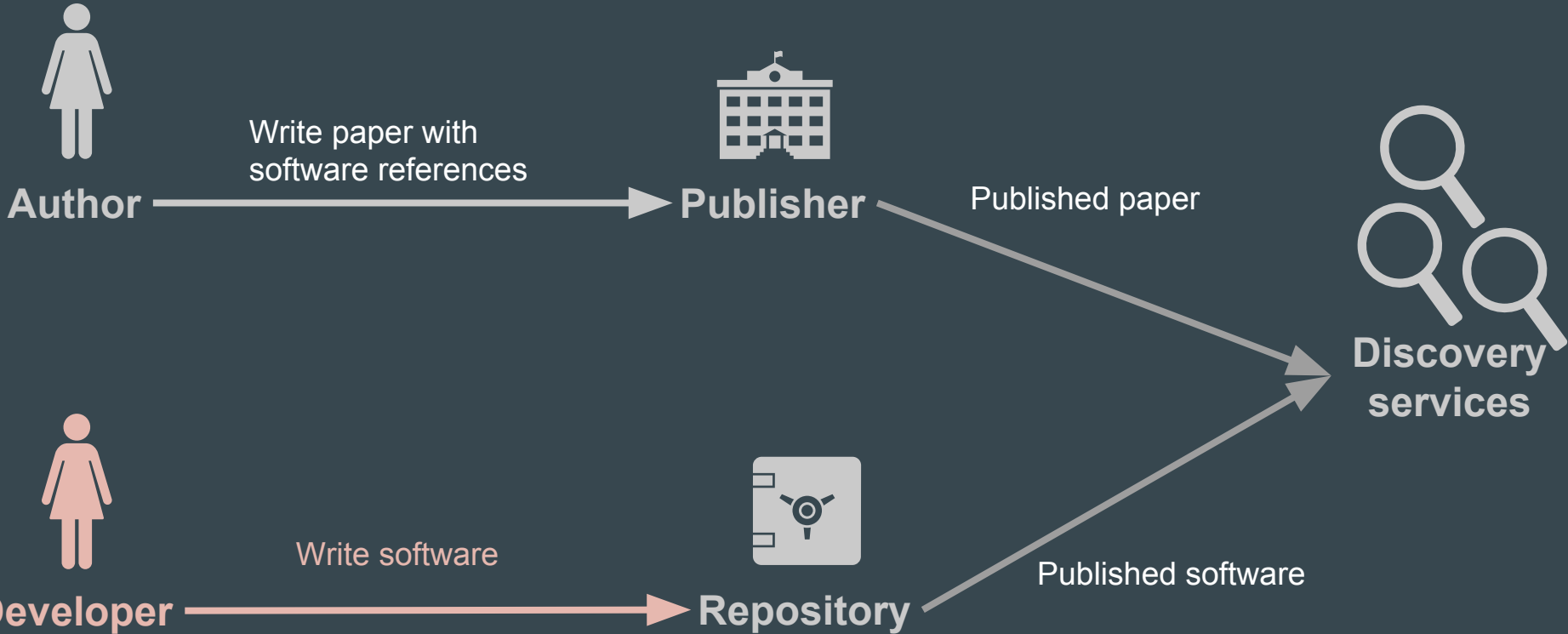
Software PID buffet: Triangle.py/Corner.py

- Triangle.py
 - 10.5281/zenodo.10598
 - 10.5281/zenodo.11020
- Corner.py
 - 10.5281/zenodo.45906
 - 10.5281/zenodo.53155
 - 10.5281/zenodo.591491 (Concept)
- JOSS
 - 10.21105/joss.00024
- ASCL (Astronomy Source Code Library)
 - <https://ascl.net/1702.002>

The image displays four overlapping screenshots related to the software 'corner.py':

- Top Left:** JOSS (The Journal of Open Source Software) article page for 'corner.py: Scatterplot matrices in Python' by Daniel Foreman-Mackey. It includes a DOI (10.21105/joss.00024), a summary, and references.
- Top Right:** Zenodo repository page for 'corner.py: corner.py v2.0.0'. It shows the file listing for the v2.0.0 release, including files like 'corner.py', 'Dockerfile', and 'README.rst'.
- Middle Left:** ASCL Code Repository page for 'ASCL Code Res [ascl:1702.002]'. It features a navigation bar with 'Home', 'About', and 'Release' links.
- Middle Right:** GitHub repository page for 'corner.py'. It shows the commit history and a 'Share' button with social media icons.

The current workflow issues/solutions



Developers should ensure software is citable

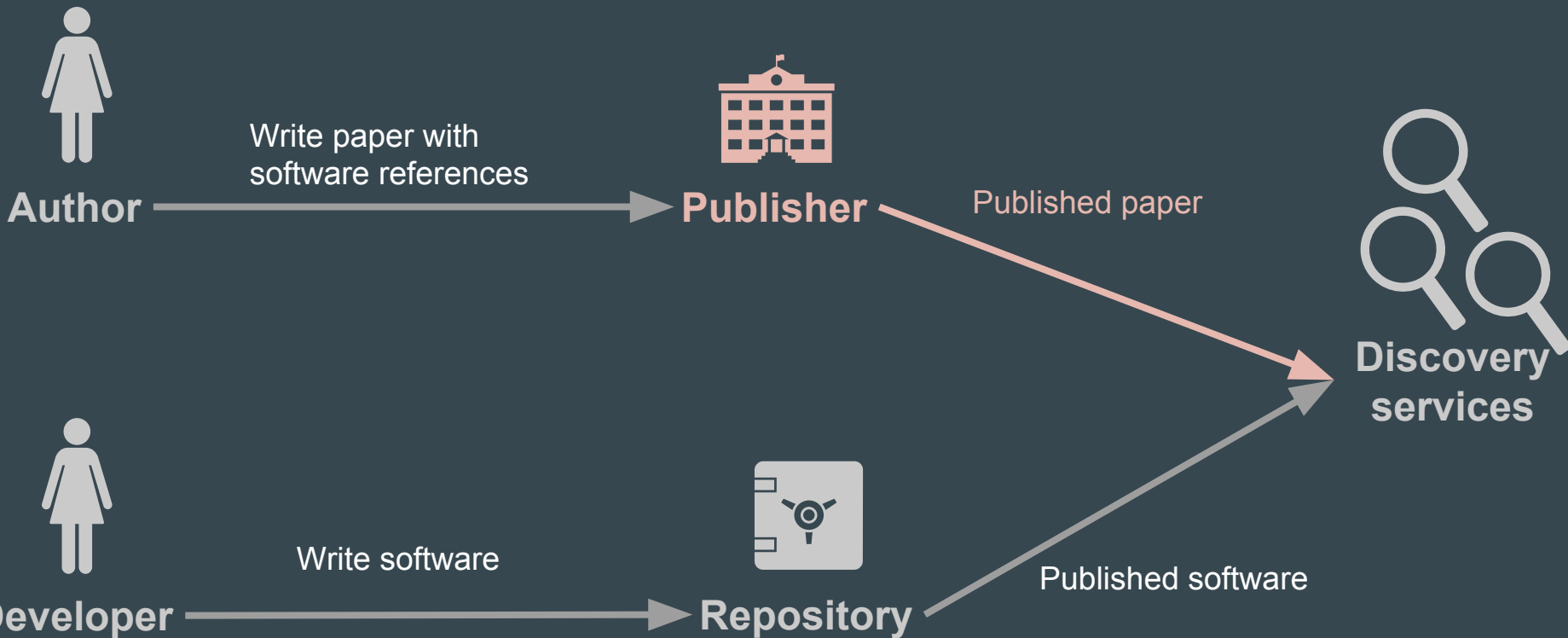
- Use a proper repository to publish software (a.k.a. get a DOI)
 - Versioning support
 - Dynamic authorship
 - Name changes
- Suggest clear citation in the software website



The screenshot displays the Zenodo page for the software package 'imfit/imfit-py 0.9.12'. The page is organized into several sections:

- File Structure:** A tree view showing the directory structure, including files like 'README.md', 'LICENSE', and various data files.
- Metadata:** Information about the software, including its name, size (1.7 MB), and a DOI (10.5281/zenodo.1417034).
- Check for updates:** A section for tracking updates and citations to the version.
- Citations:** A list of publications that cite this software, such as 'Dahl: A modular pipeline suite for experiment control and data analysis' and 'PRETRON: An Open Source Toolkit for analysis of Prevalence'.
- Versions:** A table showing the history of releases, including version numbers, dates, and download counts.
- Cite as:** A section providing a clear citation for the software, including the authors and the DOI.
- Export:** Options to export the software information in various formats like JSON, CSV, BibTeX, etc.

The current workflow issues



Information loss: include citation

- Policy not favouring software citation
- Journal authoring system issues:
 - Information from BibTeX is lost
 - CrossRef DOI → JATS XML → PDF
- Software citation policy
- Authoring system:
 - Working with vendor to produce correct DOI metadata and JATS XML (machine readability).



[← Back to Policies](#)

Policy Statement on Software

1 January 2016

AAS Journals have adopted a policy that reflects the importance of software to the astronomical community, and the need for clear communication about such software which ensures that credit is appropriately given to its authors. The policy provides clear guidelines for citing software in all papers, and supports the publication of descriptive papers about software relevant to research in astronomy and astrophysics.

Guidelines for software papers

AAS Journals welcome papers which describe the design and function of software of relevance to research in astronomy and astrophysics. Such papers should contain a description of the software, its novel features and its intended use. Such papers need not include research results produced using the software, although including examples of applications can be helpful. There is no minimum length requirement for software papers.

If a piece of novel software is important to published research then it is likely appropriate to describe it in such a paper.

We highly recommend that authors release code described in a paper under an appropriate open source license (see <http://opensource.org/licenses> or <http://choosealicense.com>) and archive the published version of their code using a service such as Zenodo (<https://zenodo.org>) or FigShare (<http://figshare.com>) which will provide a unique digital object identifier (DOI) and ensure that the code is accessible in the long term. However, any papers which provide a clear statement on how to access the code - for example, by contacting the author - are acceptable.

Workflows for publishing code with a DOI include [Making your Code Citable](#) from GitHub & Zenodo.

Guidelines for citation of software

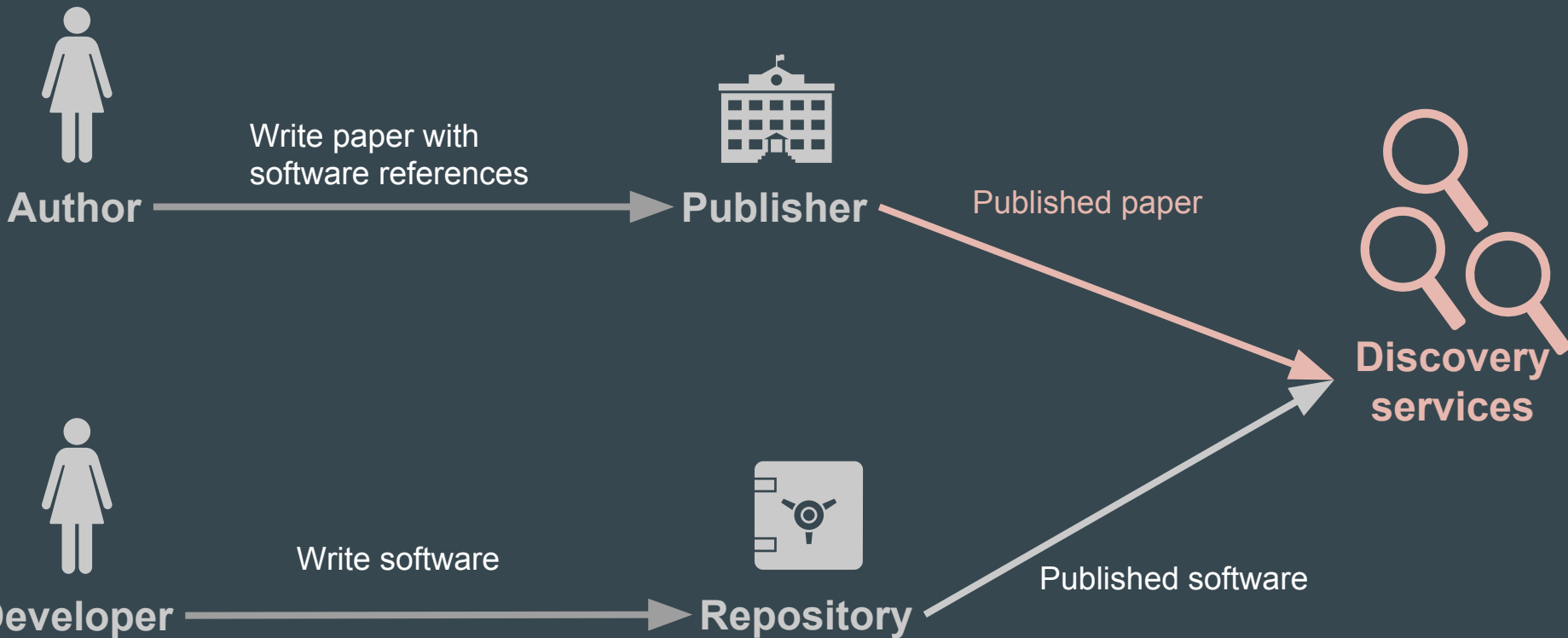
Software can be cited in two ways:

- Citing the paper describing the software (e.g. [galpy: A python Library for Galactic Dynamics](#), Bovy 2015, *ApJ*, 216, 29);
- Citing a DOI for the software, for example, obtained via Zenodo or FigShare (e.g. Foreman-Mackey et al. 2014, *corner.py*, v0.1.1, Zenodo, [doi:10.5281/zenodo.11020](https://doi.org/10.5281/zenodo.11020), as developed on [GitHub](#))

Ideally, both forms of citation should be included. The former extends credit to the authors for their publication and tells the reader where to learn about the software. The latter gives the reader access to the exact version of the software used in the project. These forms of citation are intended to allow authors to properly reference their use of software; alongside these formal references, they may also want to include links to appropriate code repositories, such as GitHub, or indices, such as the [Astrophysics Source Code Library](#).

Authors may also include a section below the acknowledgments listing scientific software packages used as part of the work presented in the manuscript. This should be done via the new `\software` AASTeX 6 macro. The content of the command should take the form of a list of software name and citation in parentheses, for example:

The current workflow issues

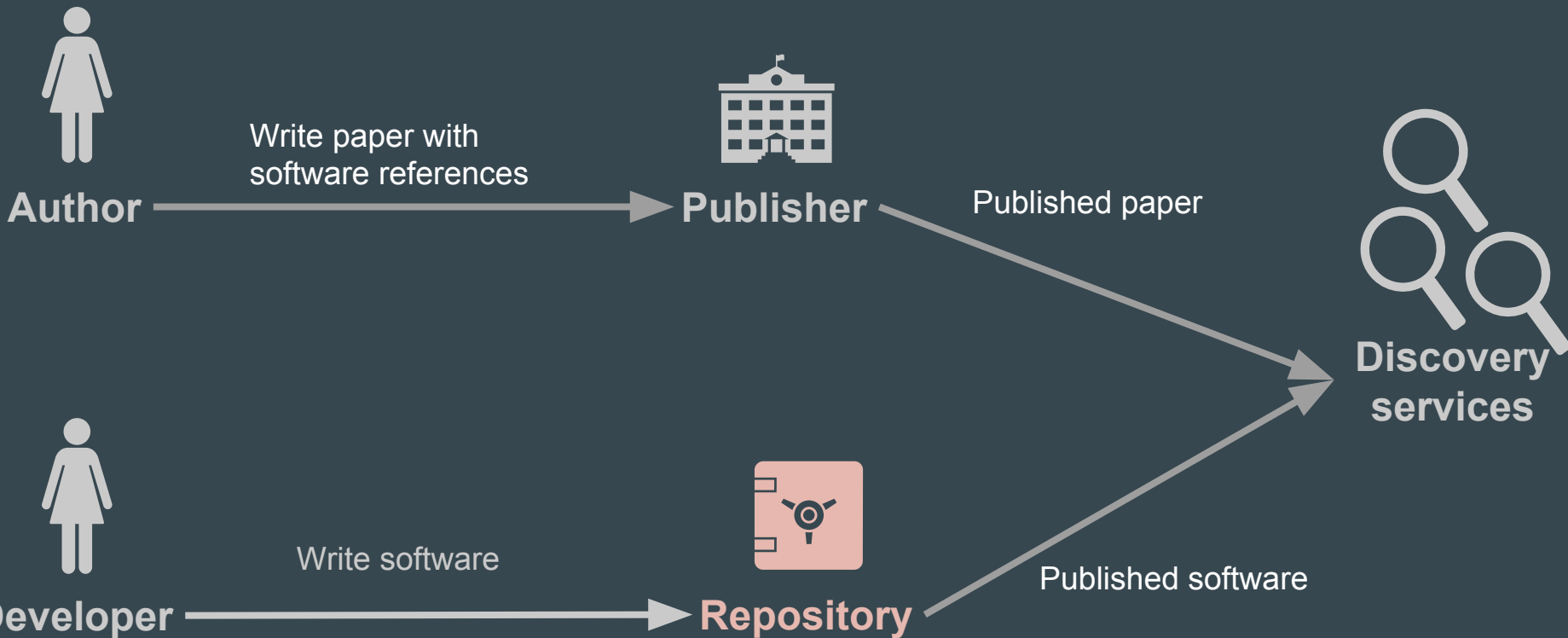


Information loss: ingest paper and track citations

- Discovery system supporting software records?
- Ingestion workflow incapable of identifying software
- Inability to identify synonymous identifiers
- **Synonymous PIDs**
- **Version relationships**
- **BibTeX generation fixes**

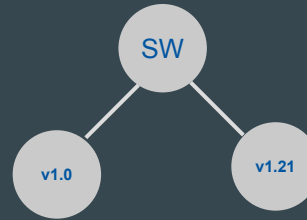
A screenshot of the Astrophysics Data System (ADS) website. The search bar contains 'title:triangle.py'. The left sidebar shows navigation options: Abstract, Citations (39), References, Co-Reads, Graphics, Metrics, and Export. The main content area displays a list of papers under the heading 'Papers which cite triangle.py: triangle.py v0.1.1'. The list includes five entries with their respective titles, authors, and publication dates. Each entry has icons for document, list, and citation. The first entry is 'The Mean Metal-line Absorption Spectrum of Damped Ly α Systems in BOSS' by Mas-Ribas, Lluís; Miralda-Escudé, Jordi; Pérez-Ràfois, Ignasi, and 6 more. The second is 'Using Long-term Millisecond Pulsar Timing to Obtain Physical Characteristics of the Bulge Globular Cluster Terzan 5' by Prager, Brian J.; Ransom, Scott M.; Freire, Paulo C. C., and 4 more. The third is 'The H α luminosity-dependent clustering of star-forming galaxies from $z \sim 0.8$ to $z \sim 2.2$ with HIZELS' by Cochrane, R. K.; Best, P. N.; Sobral, D., and 4 more. The fourth is 'ALMA observations of the multiplanet system 61 Vir: what lies outside super-Earth systems?' by Marino, S.; Wyatt, M. C.; Kennedy, G. M., and 4 more. The fifth is 'A Three-dimensional View of Turbulence: Constraints on Turbulent Motions in'.

The current workflow issues



Repositories should ensure software is citable properly

- DOI Versioning:
 - Version relationships
 - Version number field
 - DataCite metadata
 - Dynamic authorship
- BibTeX generation fixes
- GitHub integration



The screenshot shows a Zenodo record page for the software 'uvotpy: UVOTPY-2.1.2 Swift UVOT grism analysis' by Paul Kuhn. The page includes a search bar, a 'newer version' notification, and a file browser showing the contents of the 'uvotpy-2.1.2.zip' file. The file browser lists various files and folders, including 'README', 'RELEASE_NOTES.txt', 'LICENSE', 'setup.py', 'uvotpy', and 'calfiles'. The 'uvotpy' folder contains a 'superseded' sub-folder with several files, including 'swugu0160_1_1600_1600_cool_20041120v999.arf' and 'swugu0160_axi1330ay1030_dx70dy70_o1_20041120v001.arf'.

zenodo Search Upload Com

There is a **newer version** of this record available.

March 21, 2016

uvotpy: UVOTPY-2.1.2 Swift UVOT grism analysis

Paul Kuhn

The Swift UVOT grisms (uv: 170-500nm; visible: 285-660 nm) spectral data reduction package is a replacement for the uvotgrism Pool from the HEADAS Swift software. This requires a recent HEADAS Swift installation and CALDB as available from HEASARC. Recently the coincidence loss correction was redeveloped and is now formulated in a fully consistent manner to the theory as used successfully for point sources. Updates to the calibration files were made consistent with the reformulated correction.

Recent software updates have been described in the Release notes for 2.1.0. The latest calibration files that were missing in the previous versions were added in 2.1.1, while this release fixes a small typo affecting the uvotgrism script.

Documentation sources are described in the Readme as well as how to cite this software.

Preview

uvotpy-2.1.2.zip

- PaulKuhn-uvotpy-b78c147
 - README 1.4 kB
 - RELEASE_NOTES.txt 22.2 kB
 - __init__.py 133 Bytes
 - licence
 - licence.txt 1.8 kB
 - setup.py 3.1 kB
 - uvotpy 138 Bytes
 - __init__.py
 - calfiles
 - superseded
 - swugu0160_1_1600_1600_cool_20041120v999.arf 11.5 kB
 - swugu0160_1_1600_1600_hot_20041120v999.arf 11.5 kB
 - swugu0160_1_20041120v999.arf 11.5 kB
 - swugu0160_1_cool_1600_1600_20041120v999.arf 11.5 kB
 - swugu0160_1_install_20041120v999.arf 14.4 kB
 - swugu0160_1_old_20041120v999.arf 14.4 kB
 - swugu0160_axi1330ay1030_dx70dy70_o1_20041120v001.arf 112.3 kB

Publication date: March 21, 2016

DOI: 10.5281/zenodo.5620

Related identifiers: Supplement to: <https://github.com>

Communities: zenodo

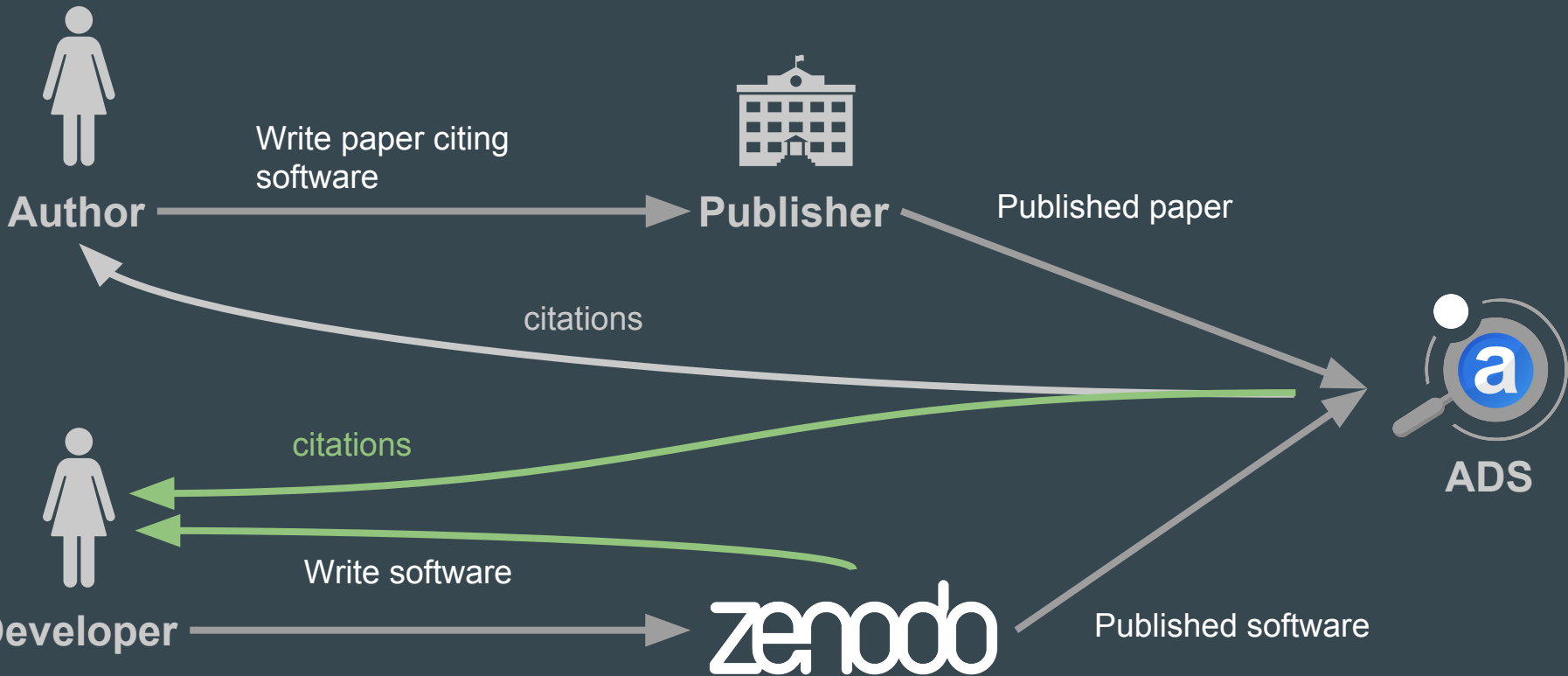
License (for files): [Other \(Open\)](#)

Versions

- Version 9 10.5281/zenodo.5620
- Version 8 10.5281/zenodo.5620
- Version 7 10.5281/zenodo.5620
- Version 6 10.5281/zenodo.5620
- Version 5 10.5281/zenodo.5620

Are all versions? You can see all versions of this record and always resolve to the latest version.

Systemic issues need joint effort to be solved



Interoperability



Scopus®

Universe of Links



zenodo

Meet the Asclepias Broker!



<https://asclepias-broker.readthedocs.io/en/latest/index.html>

Number of citations

Search citations

By default aggregated citations for all versions











Link to citing paper

Synonymous PIDs handling

Beta Citations 162

Show only: Literature (160) Unknown (2) Dataset (0) Software (0)
 Citations to this version

Search

	Spectral Energy Distribution of the inner accretion flow ar... Ma, Ren-Yi et al. (DOI: 10.1093/mnras/sty3039)	2018	ADS ARXIV DOI ?
	Exploring the Origins of Earth's Nitrogen: Astronomical Obs... Rice, Thomas S. et al. (DOI: 10.3847/1538-4357/aadfdb)	2018	ADS ARXIV DOI ?
	Eclipsing Binaries in the Open Cluster Ruprecht 147. I. EPL... Torres, Guillermo et al. (DOI: 10.3847/1538-4357/aadca8)	2018	ADS ARXIV DOI ?
	Free-form modelling of galaxy clusters: a Bayesian and data... Olamaie, Malak et al. (DOI: 10.1093/mnras/sty2495)	2018	ADS ARXIV DOI ?
	Observing the circumgalactic medium of simulated galaxies t... Liang, Cameron J et al. (DOI: 10.1093/mnras/sty1668)	2018	ADS ARXIV DOI ?
	Low Metallicities and Old Ages for Three Ultra-diffuse Gala... Gu, Meng et al. (DOI: 10.3847/1538-4357/aabbae)	2018	ADS ARXIV DOI ?
	The architecture and formation of the Kepler-30 planetary s... Panichi, F et al. (DOI: 10.1093/mnras/sty1071)	2018	ADS ARXIV DOI ?
	Bayesian Analysis of Hot-Jupiter Radius Anomalies: Evidence... Thorngren, Daniel P. & Fortney, Jonathan J. (DOI: 10.3847/1538-3881/aaba13)	2018	ADS ARXIV DOI ?
	RadVel: The Radial Velocity Modeling Toolkit Fulton, Benjamin J. et al. (DOI: 10.1088/1538-3873/aaaaa8)	2018	ADS ARXIV DOI ?
	Source selection for cluster weak lensing measurements in t... Medezinski, Elinor et al. (DOI: 10.1093/pasj/psy009)	2018	ADS ARXIV DOI ?

Asclepias Broker

- Web application exposing a REST API and an ingestion pipeline
- Stores and exposes information about scholarly links (in Scholix format)
- Free and Open Source (<https://github.com/asclepias>)
- “Citation Exchange as a Service” - easy to setup and configure
- Any repository or discovery service can setup an instance and benefit from it

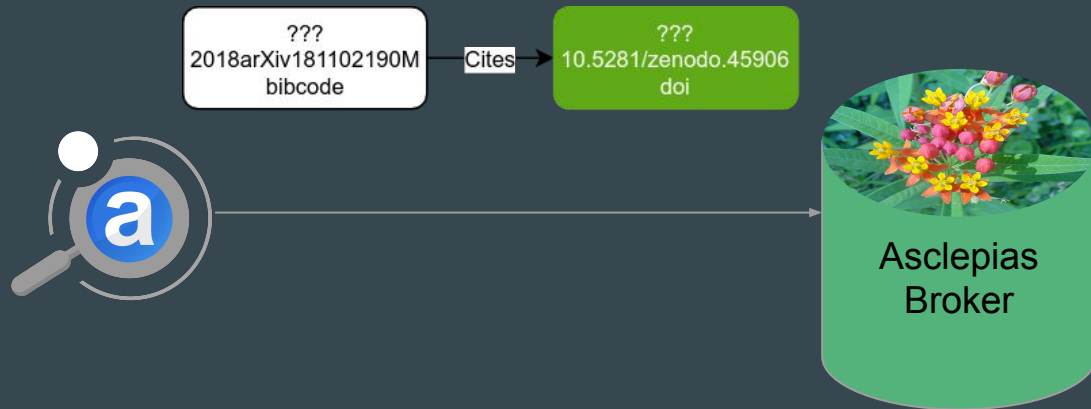


What does the broker do for you?

- Event handling (Scholix)
 - Receive citations from trusted and curated sources
- Ingestion
 - Grouping of multiple identifiers for same resource (URL, DOI, arXiv, etc)
 - Keep citation count aggregated per version and all at once
 - Automatic metadata enhancement
- Expose a search REST API
- Harvest other sources for citations

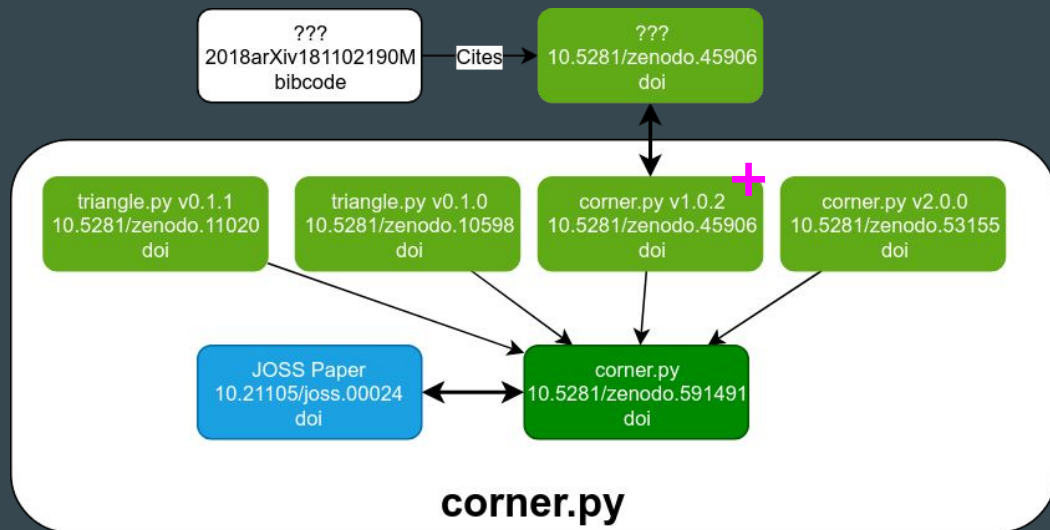
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What does the broker do for you?

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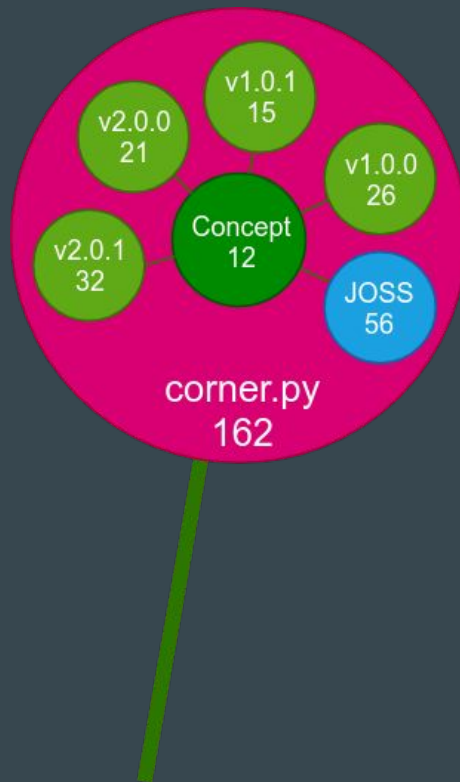
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What does the broker do for you?

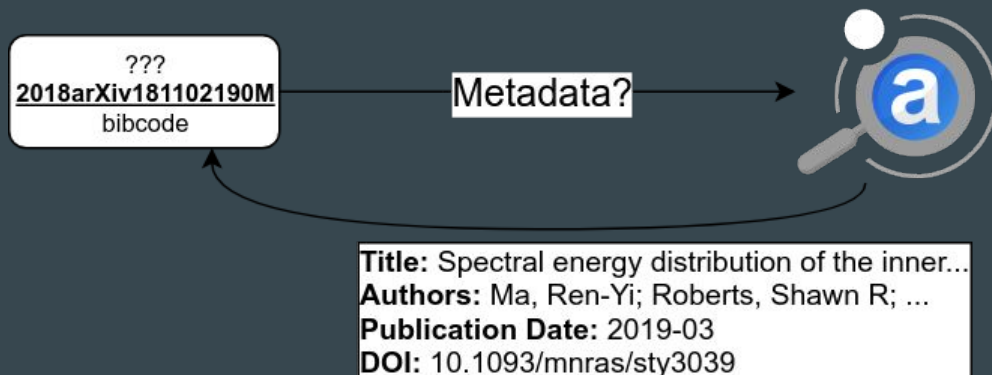


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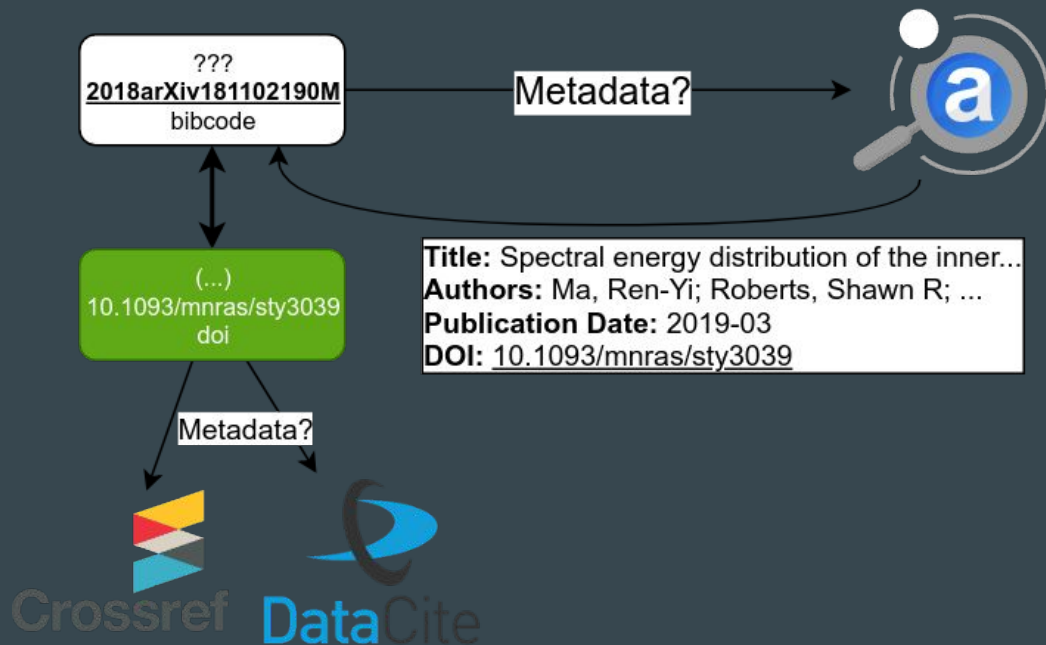
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```
GET /relationships?  
id=10.5281/zenodo.53155  
relation=isCitedBy  
group_by=version
```

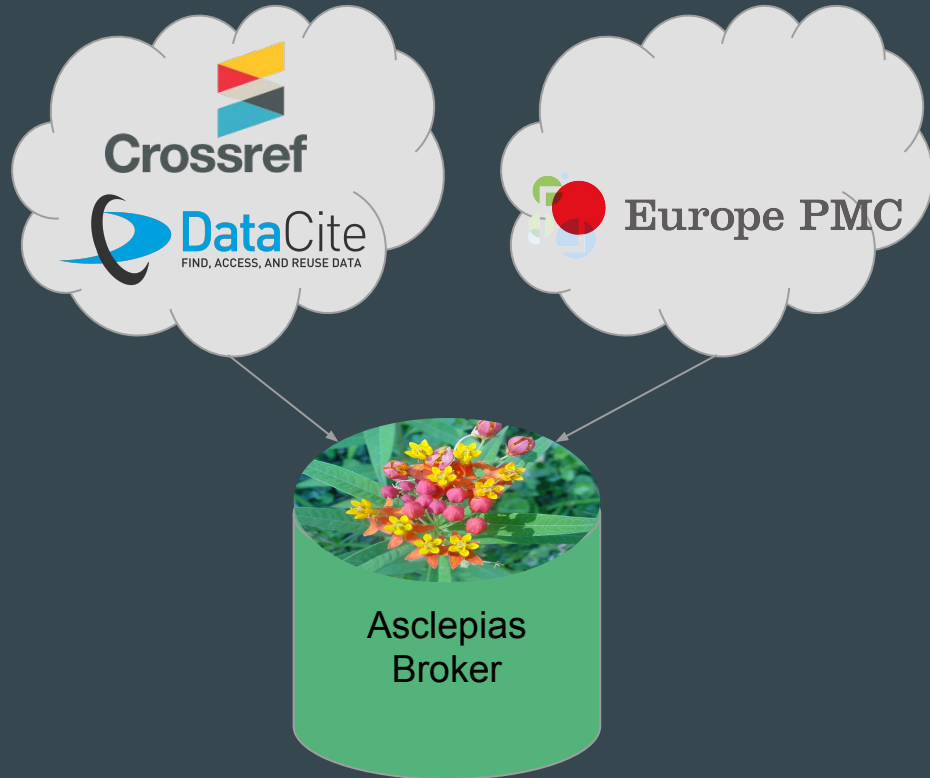
```
[  
{<citation-1>},  
{<citation-2>},  
{<citation-3>},  
...  
]
```

A screenshot of the Zenodo website showing search results for a specific version. The page title is "Citations 162". There are filters for "Literature (160)", "Unknown (2)", "Dataset (0)", and "Software (0)". A search bar is visible. The results list several papers with their titles, authors, DOIs, and publication years (all 2018). Each result has buttons for "ADS", "ARXIV", and "DOI".

Document Icon	Title	Year	Buttons
📄	Spectral Energy Distribution of the inner accretion flow ar... Ma, Ren-Yi et al. (DOI: 10.1093/mnras/sty3039)	2018	ADS ARXIV DOI
📄	Exploring the Origins of Earth's Nitrogen: Astronomical Obs... Rice, Thomas S. et al. (DOI: 10.3847/1538-4357/aadfdb)	2018	ADS ARXIV DOI
📄	Eclipsing Binaries in the Open Cluster Ruprecht 147. I. EPL... Torres, Guillermo et al. (DOI: 10.3847/1538-4357/aadca8)	2018	ADS ARXIV DOI
📄	Free-form modelling of galaxy clusters: a Bayesian and data... Otaima, Malak et al. (DOI: 10.1093/mnras/sty2495)	2018	ADS ARXIV DOI
📄	Observing the circumgalactic medium of simulated galaxies I... Liang, Cameron J. et al. (DOI: 10.1093/mnras/sty1668)	2018	ADS ARXIV DOI
📄	Low Metallicities and Old Ages for Three Ultra-diffuse Gala... Gu, Meng et al. (DOI: 10.3847/1538-4357/aabbae)	2018	ADS ARXIV DOI
📄	The architecture and formation of the Kepler-30 planetary s... Panichi, F. et al. (DOI: 10.1093/mnras/sty1071)	2018	ADS ARXIV DOI
📄	Bayesian Analysis of Hot-Jupiter Radius Anomalies: Evidence... Thongren, Daniel P. & Fortney, Jonathan J. (DOI: 10.3847/1538-3881/aaba13)	2018	ADS ARXIV DOI
📄	RadVel: The Radial Velocity Modeling Toolkit Fulton, Benjamin J. et al. (DOI: 10.1088/1538-3873/aaaaa8)	2018	ADS ARXIV DOI
📄	Source selection for cluster weak lensing measurements in t... Medezinski, Elinor et al. (DOI: 10.1093/pasj/psy009)	2018	ADS ARXIV DOI

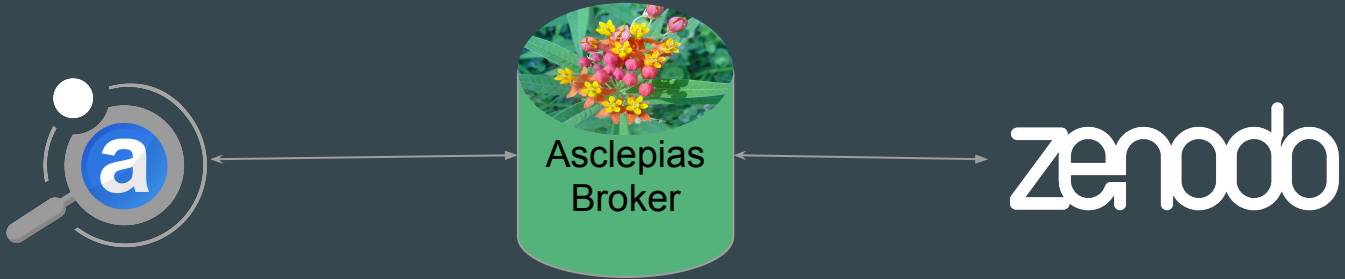
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- **Harvest other sources for citations**



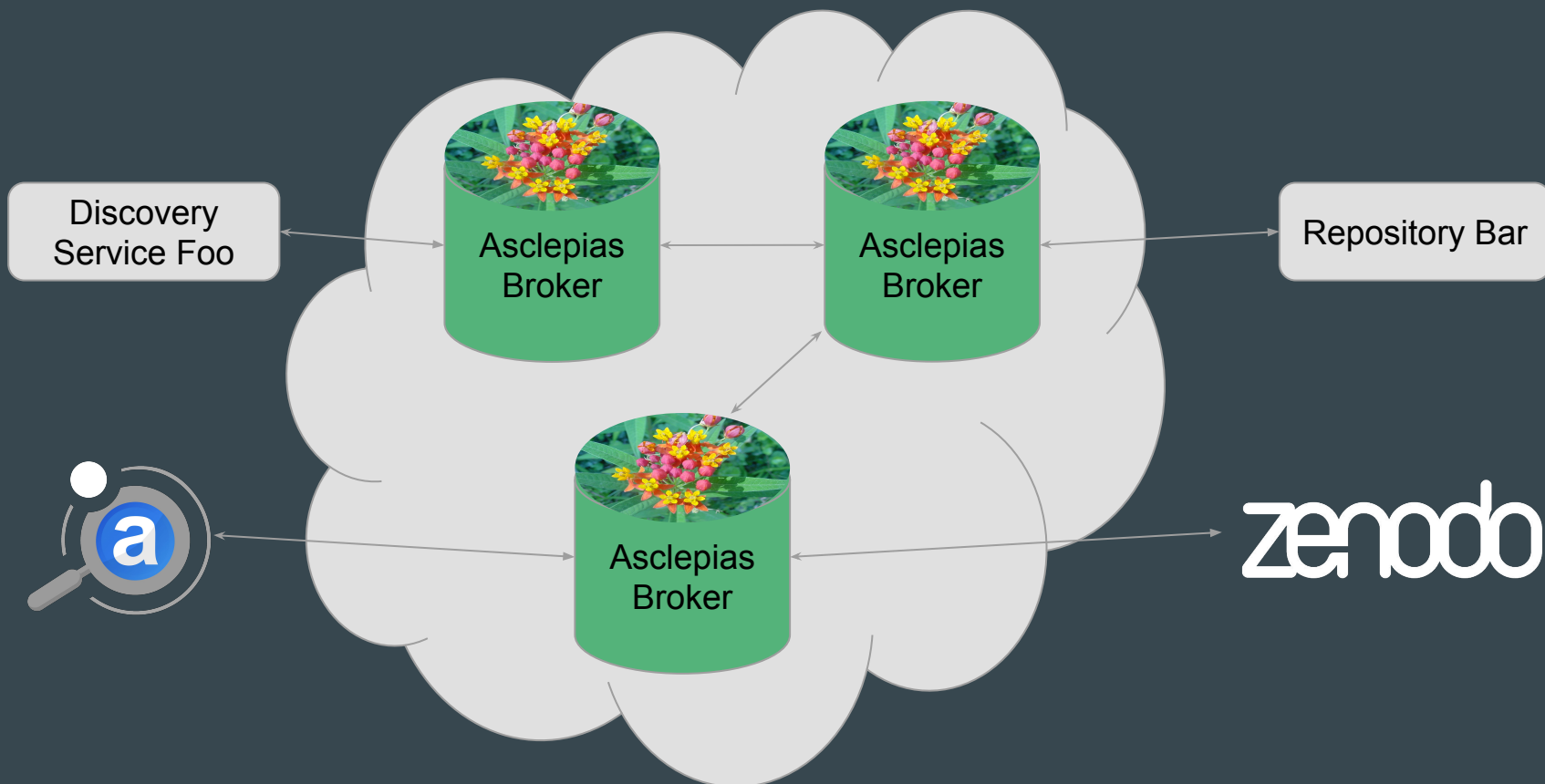
Current working setup

Software citation in Astronomy



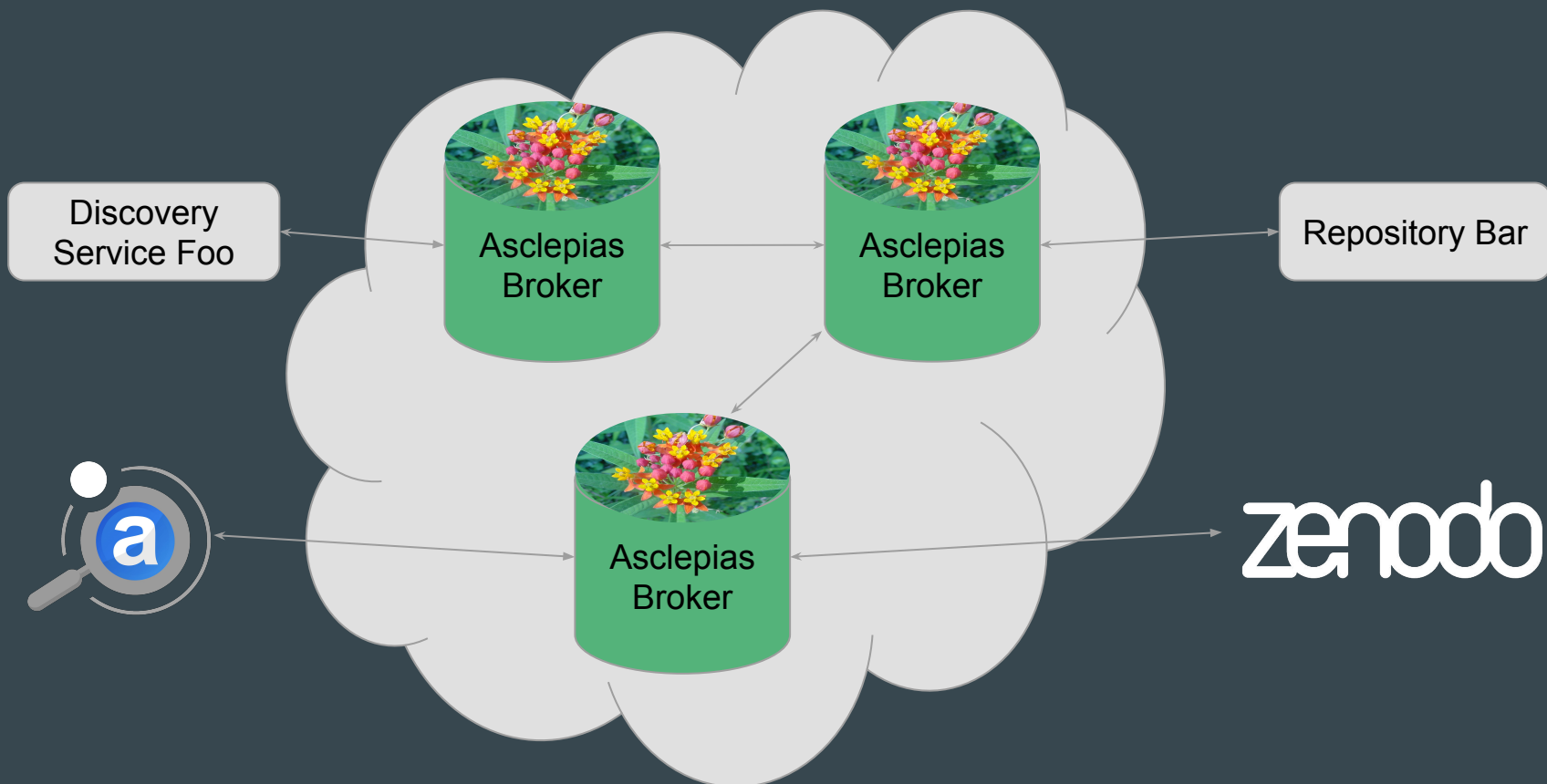
Expanding network

Software citation in Astronomy



Expanding domains

Data citation in Physics or..



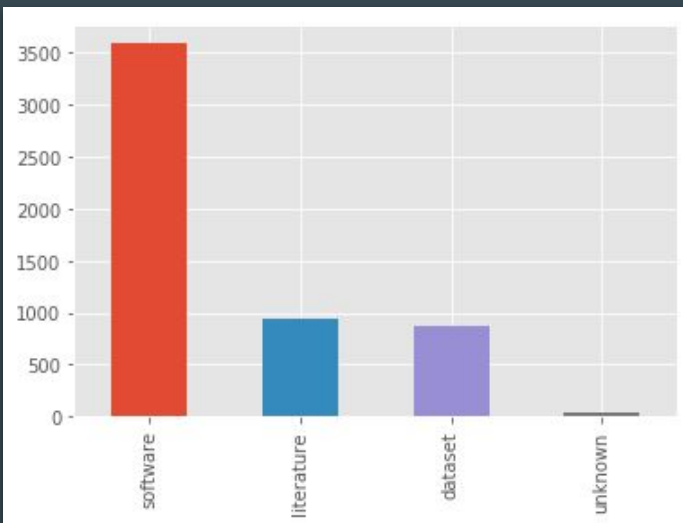


Appendix

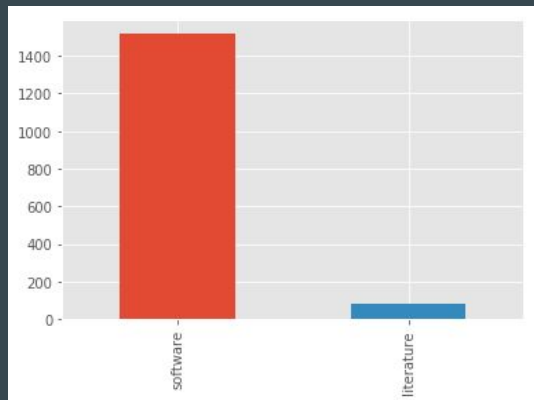
Interesting numbers from software citation data

Disclaimer: this is an initial raw analysis from a yet not fully deduplicated/curated dataset

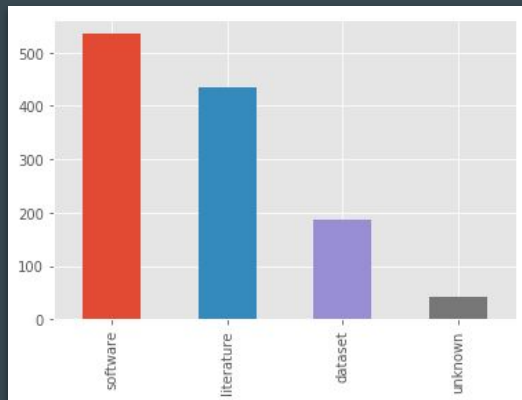
What is being cited on Zenodo?



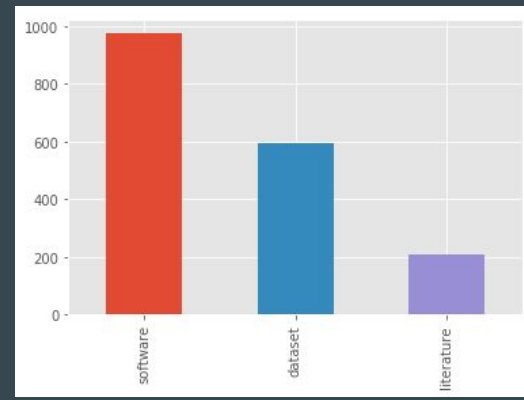
NASA ADS



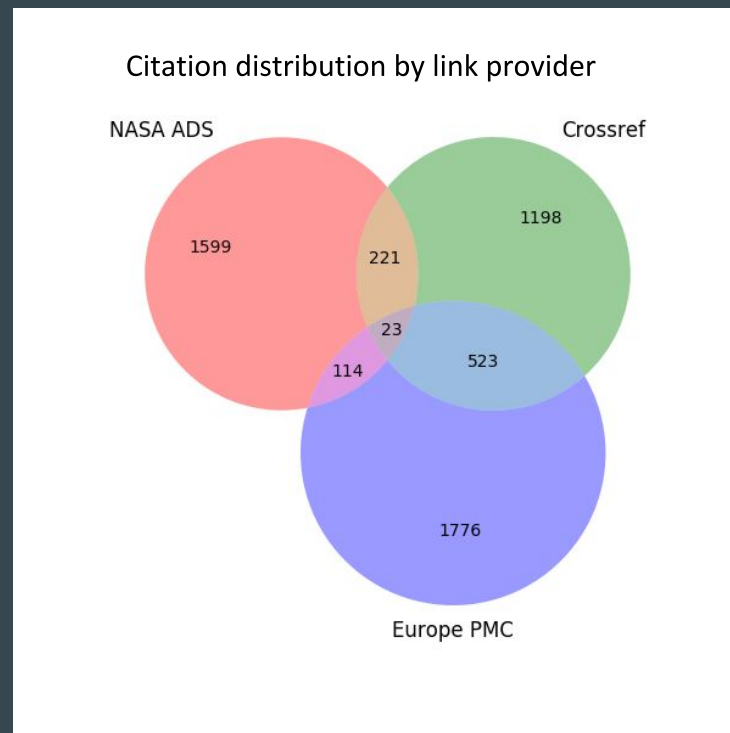
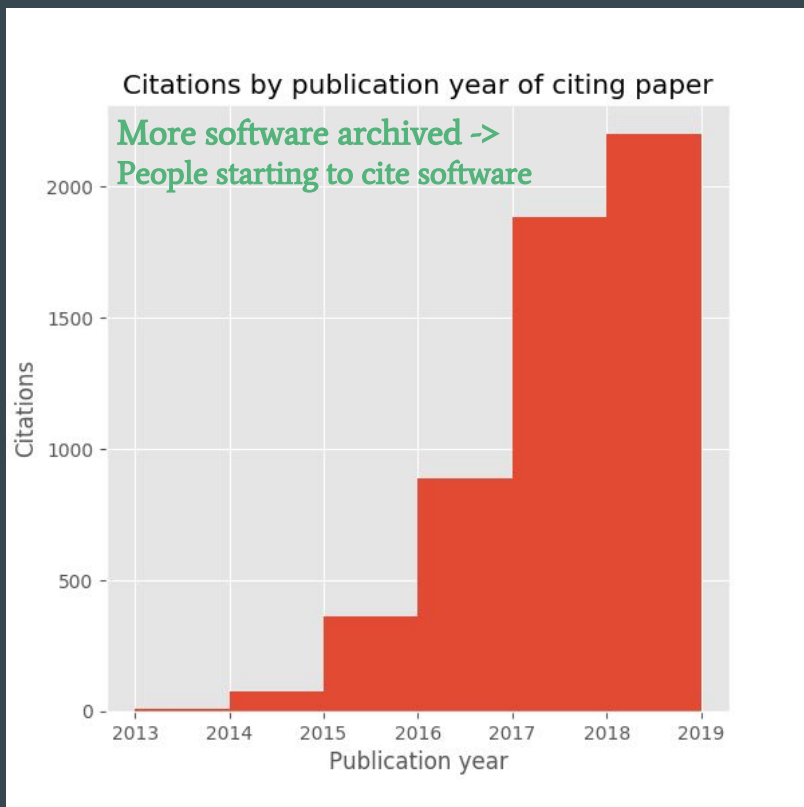
Crossref



EuropePMC



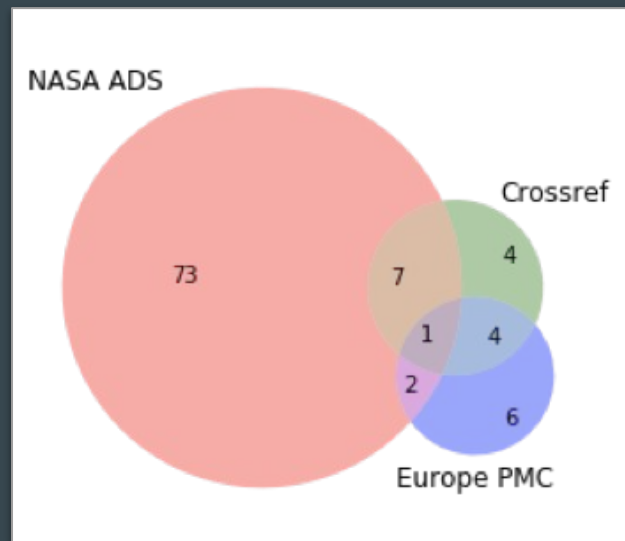
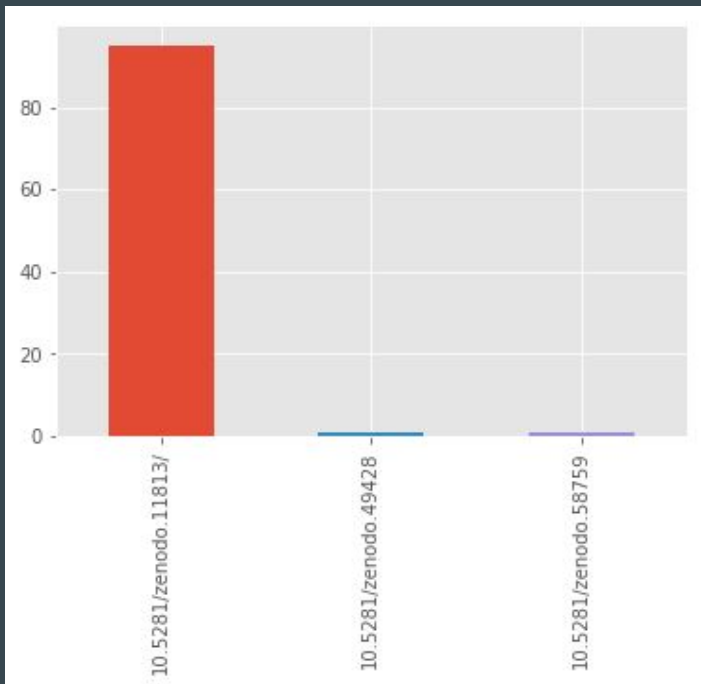
Where do you find citations to Zenodo DOIs?



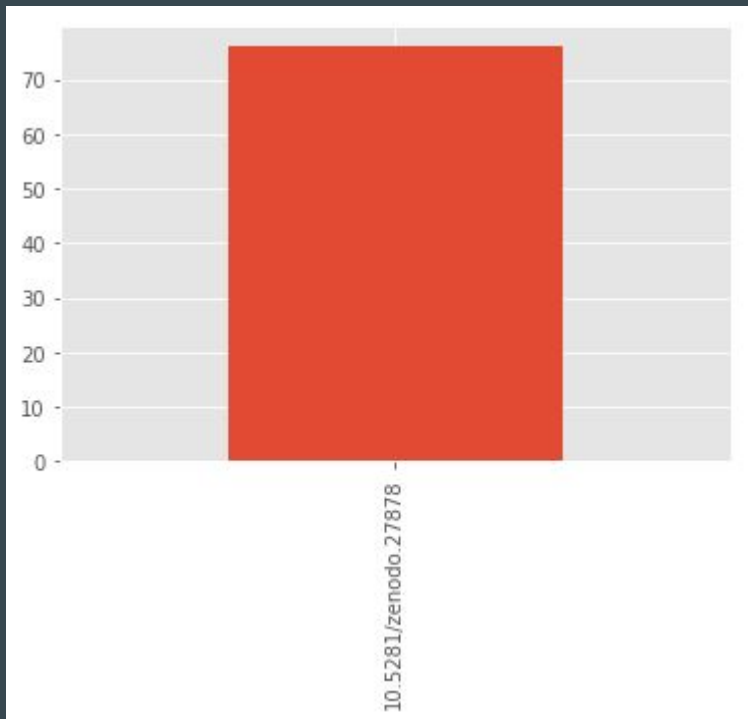
What is the impact of citation recommendations? (1/4)

How should I cite LMFIT?

See <https://dx.doi.org/10.5281/zenodo.11813>



What is the impact of citation recommendations? (2/4)



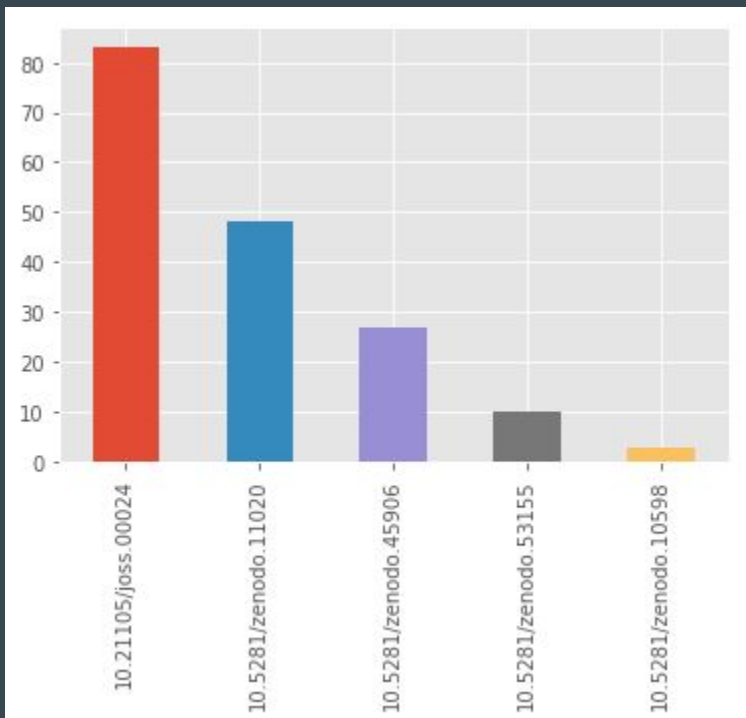
Lasagne Citation (BibTeX)

Jan Schlüter edited this page on 16 Mar 2017 · 2 revisions

To cite Lasagne in your work, use the following BibTeX entry:

```
@misc{lasagne,  
  author      = {Sander Dieleman and  
                Jan Schlüter and  
                Colin Raffel and  
                Eben Olson and  
                Søren Kaae Sønderby and  
                Daniel Nouri and  
                Daniel Maturana and  
                Martin Thoma and  
                Eric Battenberg and  
                Jack Kelly and  
                Jeffrey De Fauw and  
                Michael Heilman and  
                Diogo Moitinho de Almeida and  
                Brian McFee and  
                Hendrik Weideman and  
                Gábor Takács and  
                Peter de Rivaz and  
                Jon Crall and  
                Gregory Sanders and  
                Kashif Rasul and  
                Cong Liu and  
                Geoffrey French and  
                Jonas Degrave},  
  title       = {Lasagne: First release.},  
  month       = aug,  
  year        = 2015,  
  doi         = {10.5281/zenodo.27878},  
  url         = {http://dx.doi.org/10.5281/zenodo.27878}  
}
```

What is the impact of citation recommendations? (3/4)



build passing coverage 87% license BfD DOI 10.5281/zenodo.53155

Documentation

- Installation
 - Dependencies
 - Using pip
 - From source
 - Tests
- Getting started
- A note about sigmas
- Custom plotting
- Detailed API documentation

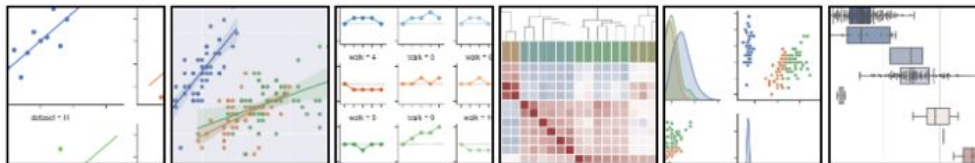
Attribution

If you make use of this code, please cite the JOSS paper:

```
@article{corner,  
  Author = {Daniel Foreman-Mackey},  
  Doi = {10.21105/joss.00024},  
  Title = {corner.py: Scatterplot matrices in Python},  
  Journal = {The Journal of Open Source Software},  
  Year = 2016,  
  Volume = 24,  
  Url = {http://dx.doi.org/10.5281/zenodo.45906}  
}
```

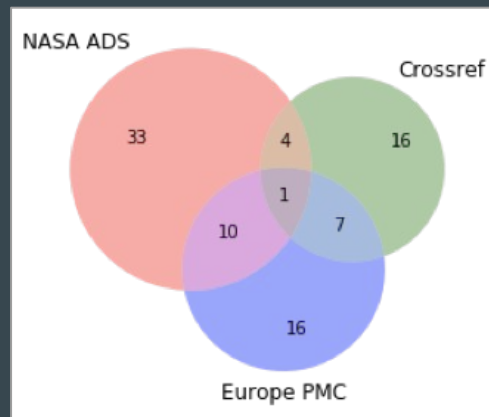
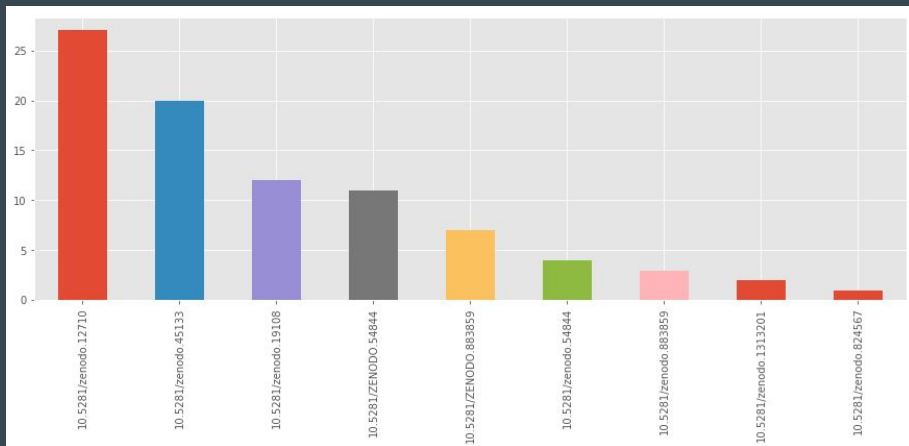
What is the impact of citation recommendations? (4/4)

seaborn: statistical data visualization



pypi v0.9.0 license BSD (3-clause) DOI 10.5281/zenodo.883859 build passing codecov 94%

Seaborn is a Python visualization library based on matplotlib. It provides a high-level interface for drawing attractive statistical graphics.





Questions & Comments

Do you harvest citations?
Contact us at info@zenodo.org

by @jotabe & @alexiopan