



A problem shared is a problem solved!

managing data the Open Source way

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Sharing problems

- Generally, having the same problems as others is good, insofar as this broadens the pool for potential problem solvers.
- But to profit from solutions others have found, you need to know you it was the same problem to begin with.
- And even then, there are multiple ways to adopt solutions.

What to do with others' solutions?

- Often, having analogous problems does not necessarily lead to adopting others' solutions,
- but rather to adoption of the idea with modifications: "We want the same thing, just with X"
- Thus incurring maintenance costs by owning the solution instead of just stealing it.

Example 1: OAI-PMH

The **O**pen-**A**rchives-**I**nitiative **P**rotocol for **M**etadata **H**arvesting

- Problem: make metadata available for metadata harvesters
- Solution: A metadata dissemination protocol, custom made for/by academia,
- A bit like HTTP + search engines, but for academia.
- Arguably, using only HTTP+HTML that same problem is solved by non-academic search engines.
- ...and no programming language comes with out-of-the-box support for OAI-PMH

Example 2: DOI

Digital Object Identifiers

- Problem: Make persistent identification of the scholarly record possible.
- Solution: A managed redirection layer on top of HTTP URLs.
- Arguably the problem solved by DOI can be solved with "cool" URIs or HTTP redirection alone.
- We know about the problems with the "simple" solution. But fact is that the "better" solution comes at a price (and may not be that much better).

Example 2: DOI



John Kunze

@jakkbl

Following



Myth 2: PIDs rarely break. Nonsense. Millions of PIDs are broken. Updating redirection tables is real work for you and your successors. (You do have a succession plan, right?)

4:31 PM - 24 Aug 2018

Example 2: DOI



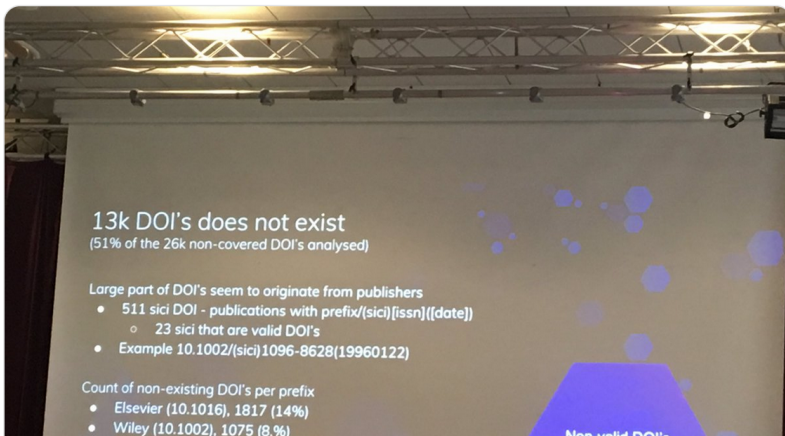
Alice Meadows

@alicejmeadows

Follow



Overview of 13k DOIs that don't exist - mostly publisher owned [#PIDapalooza19](#)



So I hope I have set the stage to focus on "stealing" – as in



Tom Knieper

@TomKnieper

Follow

Digital Humanities-Motto von Nerbonne:
"Beg, buy, steal or borrow!" #dhd2014

10:57 AM - 26 Mar 2014

Don't beg for programmer resources or buy custom solutions – steal what works for others.

Who to steal solutions from?

- Software developers are tool-makers and problem solvers
- *Data is Code!* – or at least often similar enough
- So let's see whether we can **curate linguistic research data** using Open Source tools.
- Often it just needs a bit of translation to discover shared problems!

So in the following we will look at the available tools.

Version control is essential for traceable data curation, thus allowing incremental progress.

It let's us answer the questions

- who?
- changed what?
- when?

It is better in that respect than backup, because it allows us to batch related changes into **commits**.

git as seen through GitHub

The screenshot displays a GitHub commit page for the repository 'lexibank / mitterhoferbena'. The commit is by user 'tresoldi' and is titled 'Added coordinates; removing glottocode'. The commit message is 'What? - executive summary'. The commit is 2 days old and has 1 parent (2bd630c). The commit hash is 59d5be3b5f6387b757fe9258ddf9fd956d9a3fb0. The commit shows 1 changed file with 13 additions and 13 deletions. The file 'etc/languages.csv' is highlighted. The diff shows changes to the 'Name,Transcriber,Glottocode,Date,Type,Latitude,Longitude' header and several rows of data. The changes are highlighted in red (deletions) and green (additions). The commit is labeled 'master'.

Which repository?

Added coordinates; removing glottocode

What? - executive summary

tresoldi committed 2 days ago

Who and when?

Showing 1 changed file with 13 additions and 13 deletions.

Which file?

What changed exactly?

```
... -1,14 +1,14 @@
1 1 Name,Transcriber,Glottocode,Date,Type,Latitude,Longitude
2 - Ihanja,Andy Huber,ben1262,9/15/2009,short wordlist,
3 - Ikuna,Michelle Morrison,ben1262,9/12/2009,full wordlist,
4 - Itambo,Andy Huber,ben1262,9/10/2009,short wordlist,
5 - Itipula,Michelle Morrison,ben1262,9/8/2009,full wordlist,
6 - Kanamalenga,Michelle Morrison,ben1262,9/16/2009,full wordlist,
7 - Liwengi,Andy Huber,ben1262,9/7/2009,full wordlist,
8 - Lwanzali,Andy Huber,ben1262,9/10/2009,short wordlist,
9 - Makanjaula,Andy Huber,ben1262,9/9/2009,short wordlist,
10 - Ujindile,Michelle Morrison,ben1262,9/14/2009,full wordlist,
11 - Ukalawa,Michelle Morrison,ben1262,9/11/2009,full wordlist,
12 - Utalingoro,Andy Huber,ben1262,9/9/2009,short wordlist,
13 - Utengule,Andy Huber,ben1262,9/15/2009,short wordlist,
14 - Wangama,Andy Huber,ben1262,9/14/2009,short wordlist,
2 + Ihanja,Andy Huber,,9/15/2009,short wordlist,-9.10589,34.6563
3 + Ikuna,Michelle Morrison,,9/12/2009,full wordlist,-9.13706,34.9083
4 + Itambo,Andy Huber,,9/10/2009,short wordlist,-9.36073,35.32647
```

Figure 1: A git commit as displayed on GitHub

Digression: Line-based text formats



To make the most of version control, data should be in line-based text formats.

- CLDF – the Cross-Linguistic Data Format – tries to do just that.
- Toolbox' SFM format is quite ok in that respect, too!
- But OLAC metadata records could fit as well.

Distributed version control

In **Distributed version control** systems each copy of the repository stores the complete history.

This may sound like unnecessary complication, but it allows using version control without a server (or network).

working offline = using git locally

synching = merge from/push to other clones of the repository

- collaboration platforms like GitHub add support for online collaboration on git repositories
- GitHub can be said to be all about "Connecting Communities, Languages Technology" :)
- Language resources are already on GitHub:
 - <https://github.com/LowResourceLanguages/EndangeredLanguages>
 - Glottolog
 - Mother Tongues dictionaries

Data publications the Open Source way

So we have our data versioned and on GitHub – how do we collaborate?

Submission = Pull Request

Review = Pull Request review

Acceptance = "merge into master"

Publication = release

Note: Using this workflow you can also contribute to **Glottolog**!

- GitHub is not an archiving or publication platform, though.
- ZENODO fills that gap:
 - Can pick up releases of GitHub repositories automatically
 - Provides longterm archiving ...
 - ...and access via a DOI
 - You can get a DOI for your Mother Tongues dictionary!

The screenshot displays the Zenodo website interface. At the top, the Zenodo logo is on the left, followed by a search bar, and 'Upload' and 'Communities' buttons. A user profile dropdown shows 'lingweb@shh.mpg.de'. Below the header, the 'Lexibank' community page is shown. It features a 'Recent uploads' section with a search bar and filters for 'February 7, 2019 (v2.1.1)', 'Dataset', and 'Open Access'. Two datasets are listed: 'LexiRumah 2.1.1: Eastwards Expansion' and 'Sub-grouping Kho-Bwa based on shared core vocabulary'. Each entry includes the upload date, dataset type, open access status, author names, a description, and a 'View' button. On the right, a green 'New upload' button is visible, and a 'Community' section shows a circular visualization of data points and a 'Lexibank' description with a 'Read more' link.

zenodo

Search

Upload

Communities

lingweb@shh.mpg.de

Lexibank

Recent uploads

Search Lexibank

February 7, 2019 (v2.1.1) Dataset Open Access

View

LexiRumah 2.1.1: Eastwards Expansion

Gereon Kaiping, Owen Edwards, Marian Klamer,

A lexical database of languages of the Lesser Sunda Islands and their suggested relations. Available through an online-interface on <https://lexirumah.model-ling.eu> Changes to this version: Fixing to several minor issues Adding languages further to the east Resetting IPA segmentation Small imp

Uploaded on February 7, 2019

6 more version(s) exist for this record

January 30, 2019 (v0.1) Dataset Open Access

View

Sub-grouping Kho-Bwa based on shared core vocabulary

Tiago Tresoldi, Johann-Mattis List,

Original source of the data: Lieberherr, Ismail and Bodt, Timotheus Adrianus (2017): Sub-grouping Kho-Bwa based on shared core vocabulary. *Himalayan Linguistics* 16(2). 26-63. URL: <https://escholarship.org/uc/item/4t27h5fg>

Uploaded on January 30, 2019

New upload

Community

Lexibank

Cross-linguistic lexical datasets in CLDF format.

[Read more](#)

Curated by: shh-dlce-zenodo

Figure 2: Publication and archiving platforms like ZENODO add persistence.

Adopting Open Source paradigms

Now we know how to publish the data, but **it's not finished yet!**

- use version control
- *release early – release often*
https://en.wikipedia.org/wiki/Release_early,_release_often
- For bonus points, specify maturity in metadata (a la "trove classifiers")

releasing often may create headaches for data consumers, though ...

Semantic Versioning for Datasets



snim2 commented on Feb 24, 2015

Collaborator



This is related to Issues [#9](#), [#10](#) and [#11](#).

Datasets may well evolve over time. When reading a paper which describes an experiment on a particular dataset it should be possible to find out which *version* of the dataset was used to produce the documented results. This aids reproducibility.

[Semantic versioning](#) is a common technique in software development. The idea is to provide a version number for the data which looks like: `MAJOR.MINOR.PATCH`

- the `MAJOR` version of the data, which should represent significant changes. In the case of datasets, this might mean that an experiment using version `1.0.0` of the dataset could not be run on version `2.0.0` without making some changes to the experiment, or the analysis of the results
- the `MINOR` version of the data which is compatible with other versions of the data which have the same `MAJOR` version. In the case of datasets, this might mean that any experiment or analysis performed on version `1.0.0` of the data should be repeatable with version `1.1.0` of the data.
- the `PATCH` version for bug fixes. For example version `1.0.1` of a dataset may fix a typo in version `1.0.1`.

<https://github.com/emhart/10-simple-rules-data-storage/issues/27#issue-58715520>

Semantic Versioning 2

For data creators:

patch release a.k.a. bugfix = fixing "typos"

minor release = additional data, but nothing changing the "gist" of it

major release = "backwards incompatible changes", different data,
different data layout

For data consumers:

- You'd always want to upgrade to the latest patch release of your chosen minor release to avoid working with "buggy" data
- Upgrading to the next minor version may change your analysis results but shouldn't break your analysis pipeline
- Upgrading to the next major version may require adapting your analysis code.

Digression: Re-usability

Why would you want to adopt semantic versioning?

To increase **"re-usability"** (the R in FAIR)!

"Usage by others" is a very good proxy for usability of data:

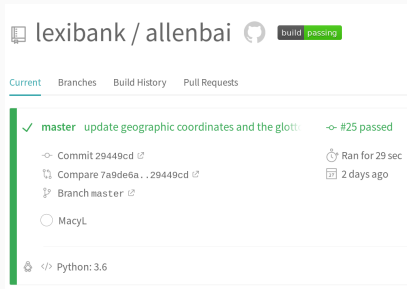
- if no one is using it, it's probably unusable.
- if others use it, it's clearly usable.

Thus, to adhere to FAIR data principles, do everything that increases the chances of others using your data.

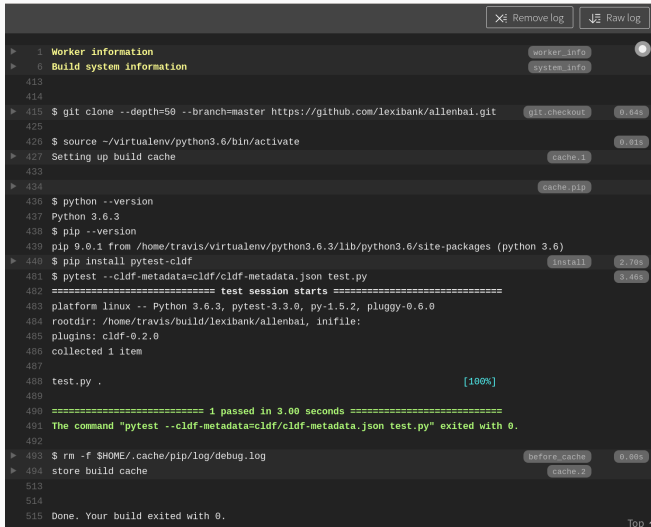
Continuous Integration

Releasing often is made a lot easier, if you know your data is consistent at all times.

Continuous Integration services allow automatic consistency checks for your data!



Continuous Integration



```
1 Worker information
6 Build system information
413
414
415 $ git clone --depth=50 --branch=master https://github.com/lexibank/allenbai.git
425
426 $ source ~/virtualenv/python3.6/bin/activate
427 Setting up build cache
433
434
436 $ python --version
437 Python 3.6.3
438 $ pip --version
439 pip 9.0.1 from /home/travis/virtualenv/python3.6.3/lib/python3.6/site-packages (python 3.6)
440 $ pip install pytest-cldf
481 $ pytest --cldf-metadata=cldf/cldf-metadata.json test.py
482 ===== test session starts =====
483 platform linux -- Python 3.6.3, pytest-3.3.0, py-1.5.2, pluggy-0.6.0
484 rootdir: /home/travis/build/lexibank/allenbai, inifile:
485 plugins: cldf-0.2.0
486 collected 1 item
487
488 test.py .
489
490 ===== 1 passed in 3.00 seconds =====
491 The command "pytest --cldf-metadata=cldf/cldf-metadata.json test.py" exited with 0.
492
493 $ rm -f $HOME/.cache/pip/log/debug.log
494 store build cache
513
514
515 Done. Your build exited with 0.
```

Figure 3: There's a pytest plugin for CLDF datasets!

- Now that our datasets are curated like Software packages, retrieving a dataset could work like **installing** a software package!
- This requires
 - a dataset archive which acts like e.g. a Linux distribution.
 - a package manager to access this archive

Following the spirit laid out above the solution may just be: Turn your data repository into a python package and use an existing package manager!

- add a **setup.py** file to the repository.
This allows you to manage your local datasets using python's standard package management tool **pip**:
 - retrieve (particular versions of) the package
 - inspect which datasets you have "installed"
 - "freeze" the state of your local datasets
 - "upgrade" datasets
- host your repository on a hosting platform known to pip
let's pip also handle the download/clone/update

pip for data creators

```
--
11  setup(
12      name='lexibank_allenbai',
13      description=metadata['title'],
14      license=metadata.get('license', ''),
15      url=metadata.get('url', ''),
16      py_modules=['lexibank_allenbai'],
17      include_package_data=True,
18      zip_safe=False,
19      entry_points={
20          'lexibank.dataset': [
21              'allenbai=lexibank_allenbai:Dataset',
22          ]
23      },
24      install_requires=[
25          'pylexibank>=0.11',
26      ],
27      extras_require={
28          'test': ['pytest-cldf'],
29      }
30  )
```

Now replicating a particular state of your local data is easy:

- specify all your "dependencies", i.e. datasets your analysis depends on, in a **requirements.txt** file,
 - this file can be read by **pip** ...
 - ...and written by **pip**, to document the local state!

- run

```
pip install -r requirements.txt
```

and watch the datasets in the correct versions being downloaded to your computer.

pip for data consumers

Branch: master ▾

[clics2](#) / datasets.txt



xrotwang fixed dataset stats and upgraded lexibank-ids to v1.2

1 contributor

17 lines (15 sloc) | 1.14 KB

```
1 -e git+https://github.com/lexibank/allenbai.git@v1.0#egg=lexibank_allenbai
2 -e git+https://github.com/lexibank/bantubvd.git@v1.0#egg=lexibank_bantubvd
3 -e git+https://github.com/lexibank/beidasinitic.git@v2.0#egg=lexibank_beidasinitic
4 -e git+https://github.com/lexibank/bowernpny.git@v1.1.1#egg=lexibank_bowernpny
5 -e git+https://github.com/lexibank/hubercolumbian.git@v1.0#egg=lexibank_hubercolumbian
6 -e git+https://github.com/lexibank/ids.git@v1.2#egg=lexibank_ids
7 -e git+https://github.com/lexibank/kraftchadic.git@v1.0#egg=lexibank_kraftchadic
8 -e git+https://github.com/lexibank/northeastalex.git@v1.0#egg=lexibank_northeastalex
9 -e git+https://github.com/lexibank/robinsonap.git@v1.1#egg=lexibank_robinsonap
10 -e git+https://github.com/lexibank/satterthwaitetb.git@v1.0#egg=lexibank_satterthwaitetb
11 -e git+https://github.com/lexibank/suntb.git@v1.1#egg=lexibank_suntb
12 -e git+https://github.com/lexibank/tls.git@v1.1#egg=lexibank_tls
13 -e git+https://github.com/lexibank/tryonsolomon.git@v1.0.1#egg=lexibank_tryonsolomon
14 -e git+https://github.com/lexibank/wold.git@v1.1#egg=lexibank_wold
15 -e git+https://github.com/lexibank/zgraggenmadang.git@v1.1#egg=lexibank_zgraggenmadang
16
```

Digression: Replicability

For once a concept that goes largely under the same name in software development and research. In software development the things you want to replicate are

- bugs (if you cannot replicate a bug someone else has encountered, you have a hard time fixing it)
- deployments (if your software does not replicate the same behaviour on a different machine, you cannot distribute it)

The main tool to ensure replicability in software development is controlling/replicating the entire software stack as much as possible. So there should be easy ways to figure out whether two systems are the same, or in which way they differ.

The same should be true for datasets: To help with replicability of research, it must be easy to figure out the differences between datasets - or if they are the same!

That's exactly what the setup described above is supposed to achieve.

If all you have is a hammer ...

https://en.wikipedia.org/wiki/Law_of_the_instrument

...don't try to build a nail gun ...



Look harder for nails!