Research compendia enable code review during peer review

with CODECHECK and Opening Reproducible Research (o2r)

https://codecheck.org.uk/ | https://o2r.info

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Slides PDF

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> *The problem is that most modern science is so complicated, and most journal articles so brief, it's impossible for the article to include details of many important methods and decisions made by the researcher as he analyzed his data on his computer.*

Ben Marwick: How computers broke science – and what we can do to fix it

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"Claerbout's claim" in Donoho (2010), An invitation to reproducible computational research

Claerbout & Karrenbach (1992), Electronic documents give reproducible research a new meaning

Traditional and modern research(ers)

FROM

T

- broad knowledge: cross-discipline, collaboration
- deep knowledge: domain speciality (expertise and skills)

TO

π

- broad knowledge: cross-discipline, collaboration
- deep knowledge
  - domain speciality (expertise and skills)
  - stats/computing/reproducibility

Sources: T-shaped skills; Hacking Academia: Data Science and the University; When All Science Becomes Data Science; Community-level data science Public domain images: Wikipedia, CDC, Wikipedia, kallerma

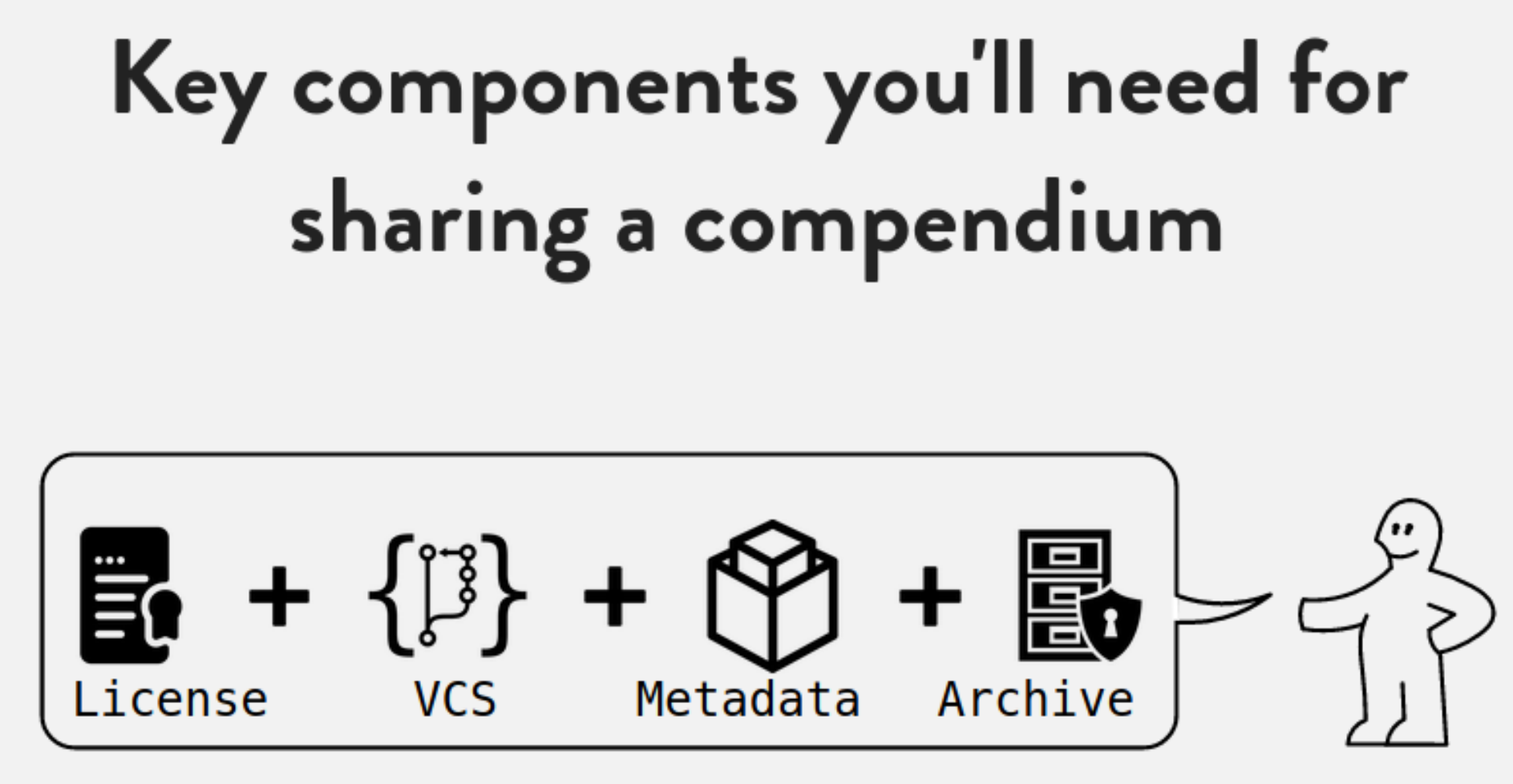
Research Compendium

research-compendium.science

Research compendia

> ...We introduce the concept of a *compendium as* both *a container for* the different elements that make up the document and its computations (i.e. *text, code, data, ...*), and as a means for *distributing*, *managing* and *updating* the collection.

Gentleman, Robert, and Duncan Temple Lang. 2007. "Statistical Analyses and Reproducible Research". Journal of Computational and Graphical Statistics 16 (1): 1–23. https://doi.org/10.1198/106186007X178663



Source: Ram (2019), How To Make Your Data Analysis Notebooks More Reproducible

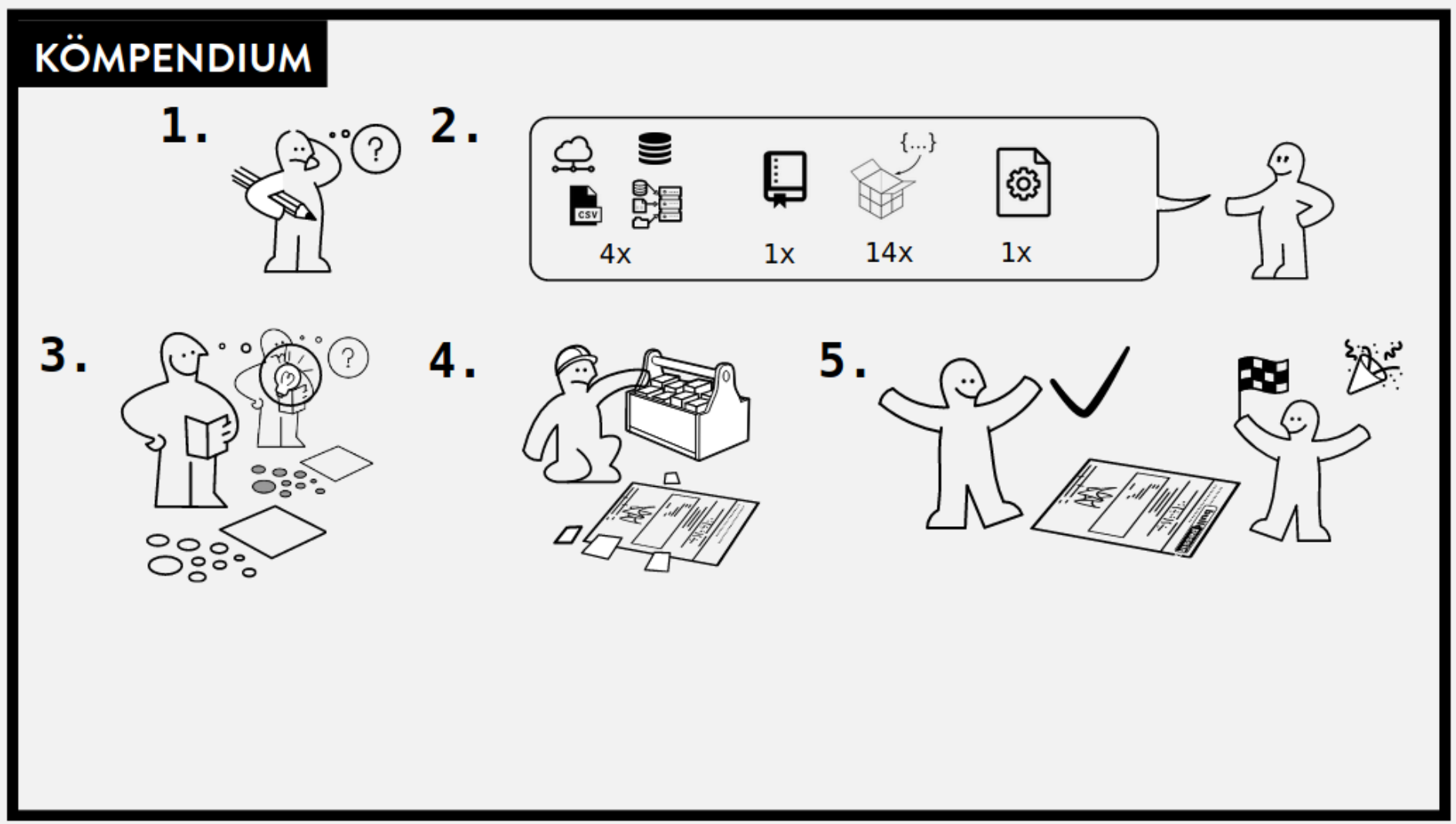
Research compendia

Ram (2019), How To Make Your Data Analysis Notebooks More Reproducible

- small, medium, large compendia

- Stick with the conventions of your peers
- Keep data, methods and outputs separate
- Specify your computational environment as clearly as you can

- Leverage the R package structure and support tools/services as much as possible
- Use modern tools to make your compendia more accessible (repo2docker, containerit, holepunch, drake)
- Don't forget long-term archives and simpler formats (Zenodo)



Source: Ram (2019), How To Make Your Data Analysis Notebooks More Reproducible

Transparent

Credit

Discover

Reuse

Colaborate

Starting tomorrow, I will ...

(and you can recommend to the authors of the papers you reproduce)

- have a `README` ("all else is details")
- use good file names and relative paths (or Jenny Bryan will come and get you)
- use text-based, open file formats
- only work in containers (Rule 10)
- apply templates & follow commmunity practices (e.g., `rrtools`)
- write and publish notebooks
- use only scripts, no point-and-click
- embrace openness & be ne fi ts
- document for future me
- work/review in the spirit of preproducibility

https://gph.is/2JF2u2T

= USE RESEARCH COMPENDIA

More on research compendia at research-compendium.science

You want to introduce changes in your community?

Reproducible Publications at AGILE Conferences

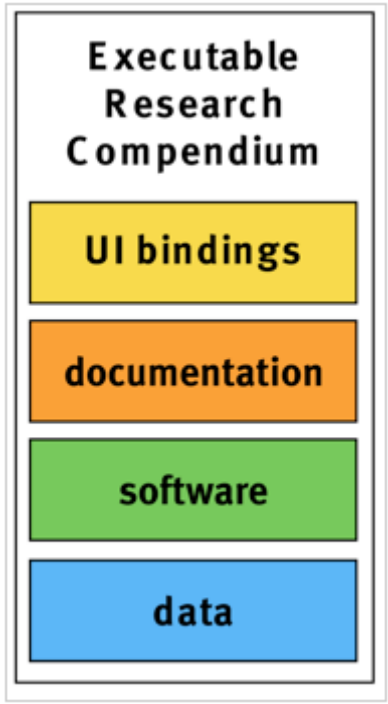
AGILE Reproducible Paper Guidelines

https://reproducible-agile.github.io/

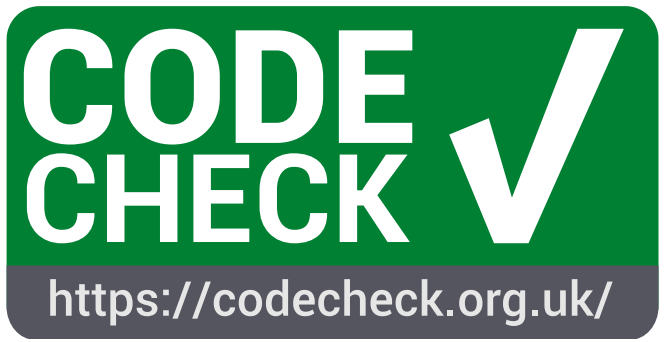
Advanced control of computing environments

- Binder-ready research compendium

- Research compendium + container + bindings = Executable Research Compendium (o2r.info/results/)
- Ten Simple Rules for Writing Dockerfiles for Reproducible Data Science



How can research compendia enable code review during peer review?



A process for independent reproduction of computations underlying research

The four CODECHECK principles

The four CODECHECK principles

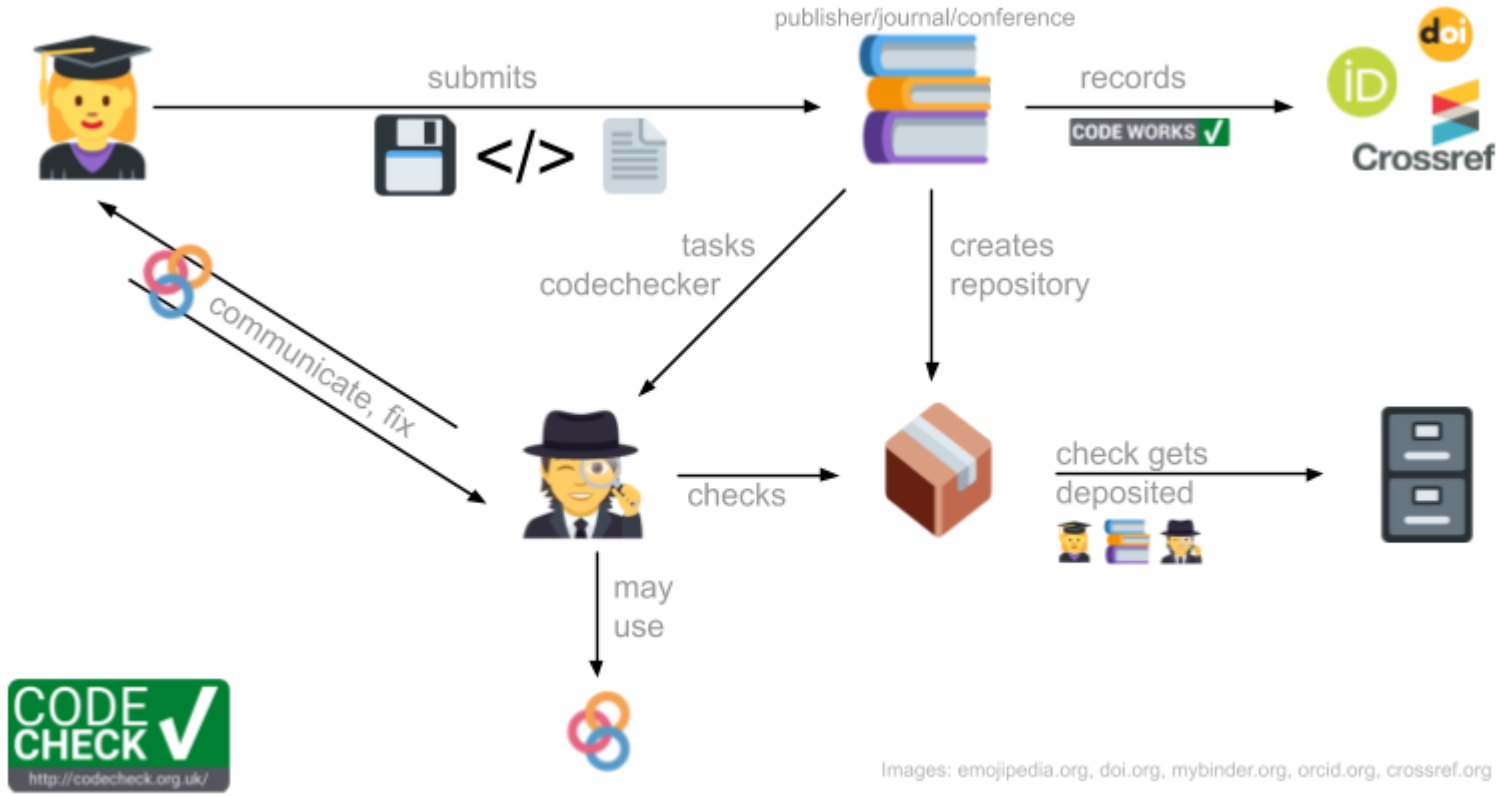
1. Codecheckers record but don’t investigate or fix.

2. Communication between humans is key.

3. Credit is given to codecheckers.

4. Workflows must be auditable.

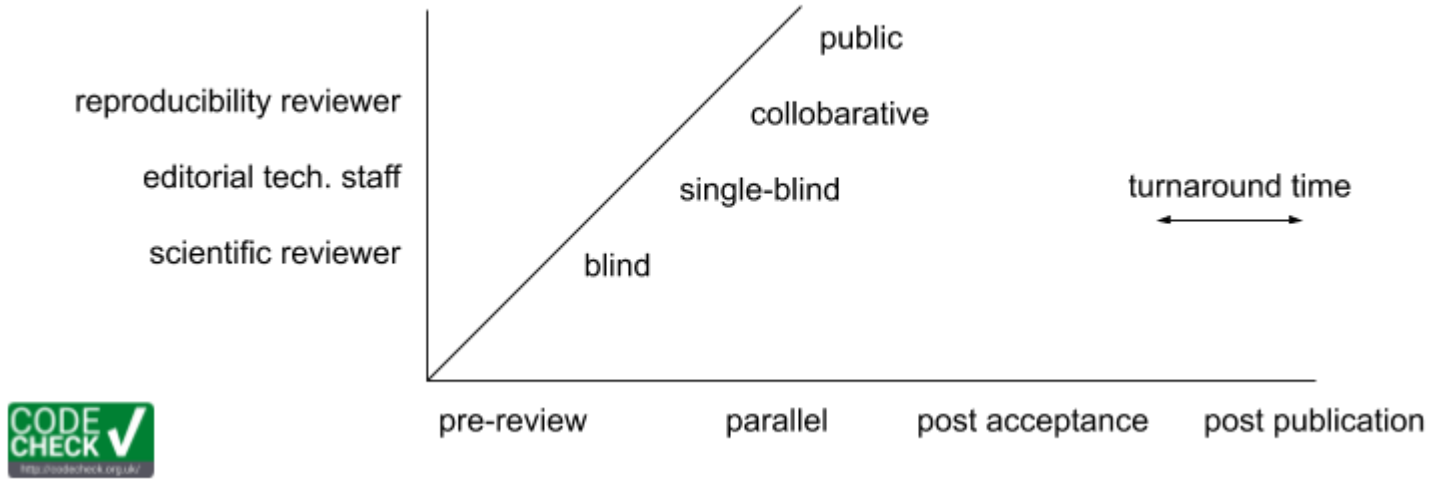
Implementing the CODECHECK process



Sketch of steps and responsibilities to implement a CODECHECK.

https://codecheck.org.uk/process/

Process variations



- Post review with extra role (ECR opportunity)
- Pre-review with extra role on staff
- Parallel reproducibility reviewer (flexible skill match)
- Regular reviewer (not widely established during last 10 years ¯_(ツ)_/¯)
- Independent community pre-review at ReproHacks or for preprints

https://codecheck.org.uk/process/

CODECHECKs

https://codecheck.org.uk/register/

http://doi.org/10.5281/zenodo.3674056

https://doi.org/10.5281/zenodo.3741797

Get Involved

Go to a ReproHack to acquire the skills to become a codechecker ✓

https://codecheck.org.uk/get-involved/

- codechecker
- author
- reviewer
- editor
- publisher
- conference organiser

More information: codecheck.org.uk

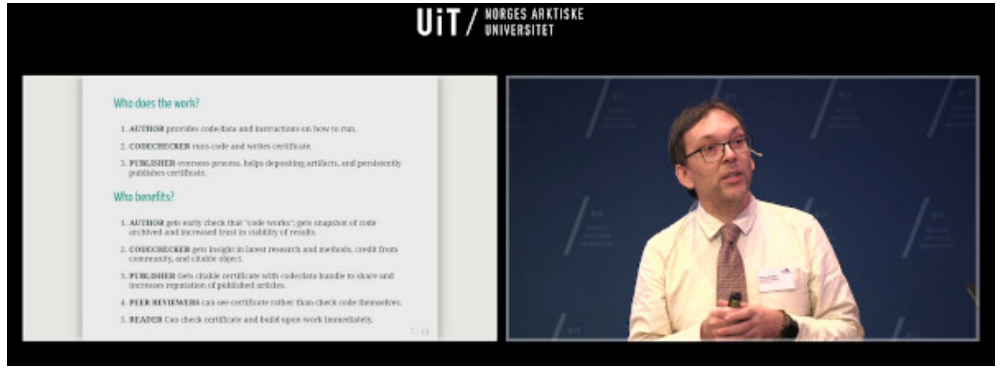
Team

- github.com/codecheckers
- StephenEglen
- nordholmen
- ✉ Stephen Eglen, University of Cambridge
- ✉ Daniel Nüst, ifgi, University of Münster

The project is supported by a Mozilla Open Science Mini-Grant (see official announcement) from February 2019 to May 2020.

Material

Watch Stephen's talk at The 14th Munin Conference on Scholarly Publishing 2019:

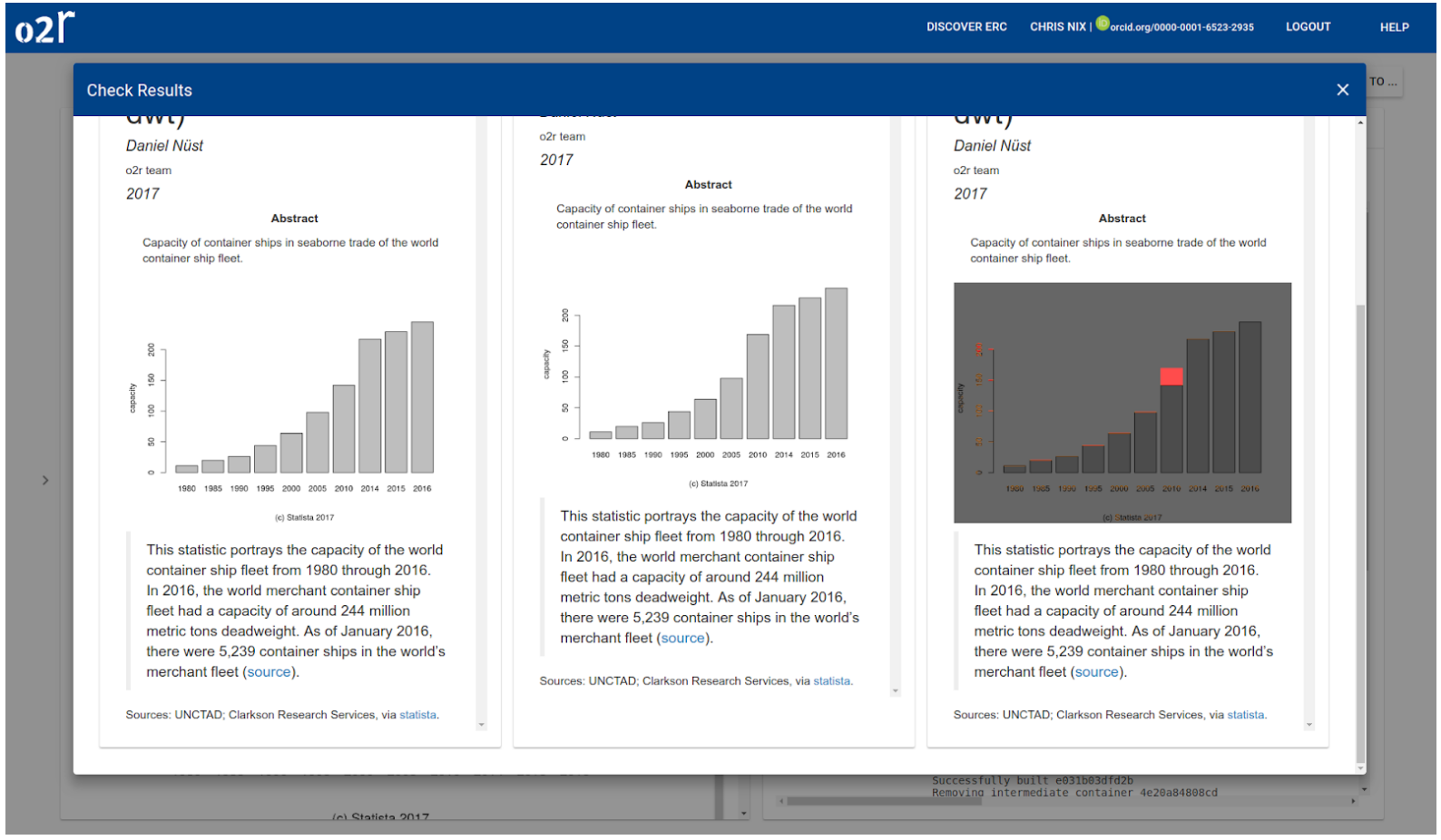


ERCs in peer review

https://o2r.info/pilots/

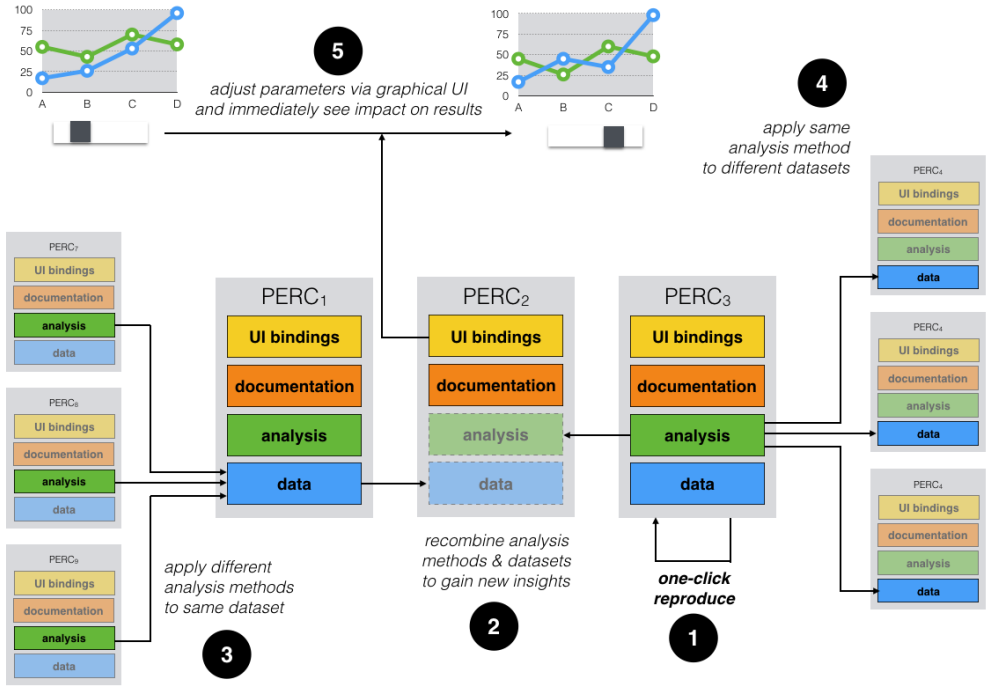
- Collaboration pilots
- OJS pilot

o2r goals and benefits



https://o2r.info/results | https://o2r.uni-muenster.de/

o2r goals and benefits



Nüst, Daniel, Markus Konkol, Edzer Pebesma, Christian Kray, Marc Schutzeichel, Holger Przibytzin, and Jörg Lorenz. 2017. Opening the Publication Process with Executable Research Compendia. D-Lib Magazine 23 (1/2). https://doi.org/10.1045/january2017-nuest.

Kray, Christian, Pebesma, Edzer, Konkol, Markus, Nüst, Daniel (2019). Reproducible Research in Geoinformatics:

Take home messages

Rule 1: Have a README: all else is details.*

low tech & high tech approaches exist (CODECHECK & o2r, and more), but we need individuals to be leaders and you can be one by adjusting your habits

burden mostly on author, but *benefits* clear and immediate > start early {in career, in project}

marathon to change habits and community practice > must push as individuals to achieve the needed *cultural change*

THANK YOU!

Slides:

- DOI 10.5281/zenodo.3855440
- PDF
- https://github.com/codecheckers/slides

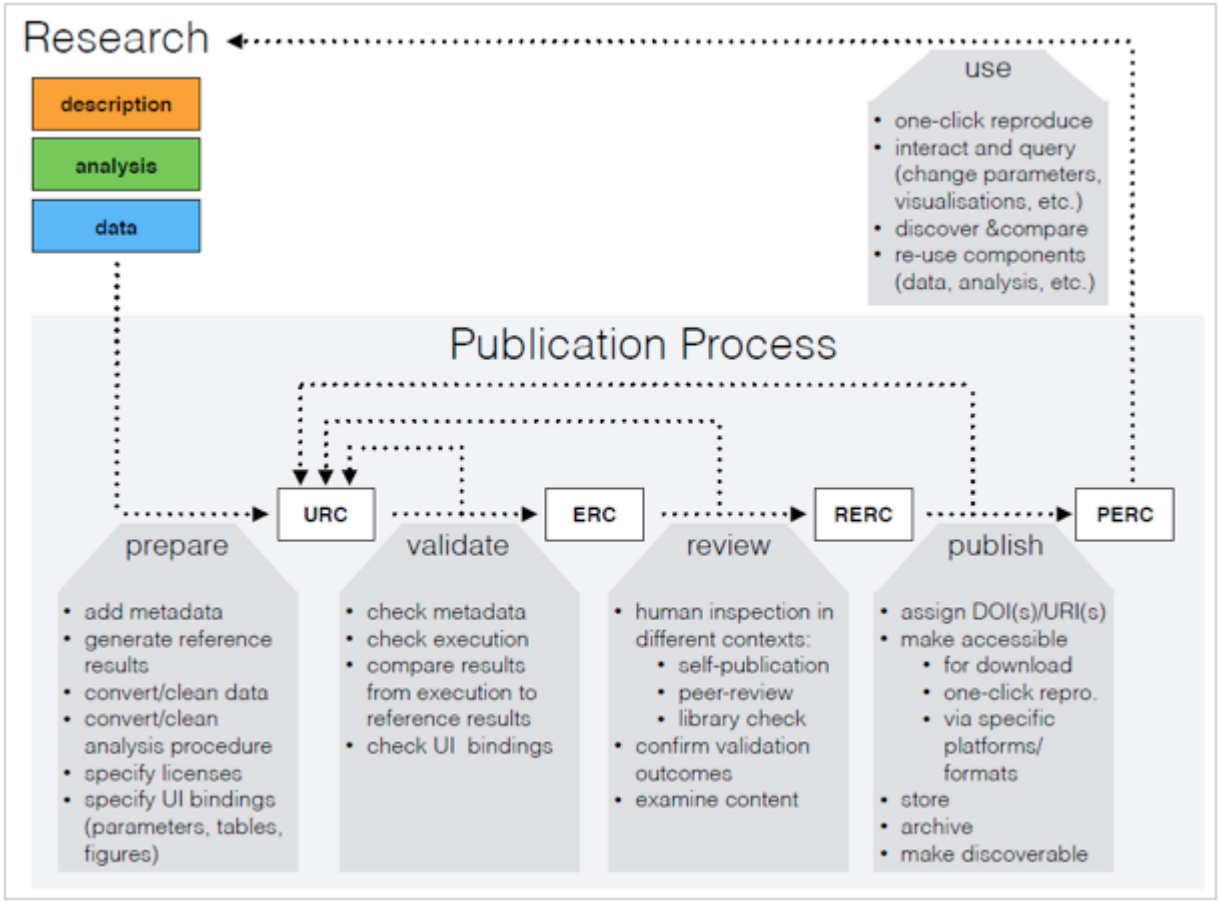
Computational Research / Data Science 2020

Challenges

- dependency hell
- FAIR
- licensing
- sensitive data
- big data

Opportunities/Solutions

- version control
- containerisation
- openness (data, software, preprints)
- community
- self-education
- collaboration
- research integrity
- The Carpentries
- subsets/enclaves/domains



The ERC-based publication process: a research workspace is prepared for a URC, which is validated to become an ERC, which turns into an RERC after peer review, and eventually published as a PERC to be used, e.g. for subsequent cycles.

https://doi.org/10.1045/january2017-nuest