

Open Science Kitchen



*TODAY:
Open Reproducible
Research:
Challenges and
Opportunities*

By Markus Konkol

Next Open Science Kitchen: 24th June 2021, 14:00

Dennie Hebels from the University of Maastricht will give a talk on:
“Engaging society: How public outreach meets Open Science”



Open Science

Building Trust with Open Science

What requirements does building trust place on the pursuit of science?

16:00 – 17:30 UTC, 02 June 2021

**Featuring OSCT member
David Fernandez Rivas!**




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<https://www.openscience-twente.com/community/join/>

Twitter: @OSCTwente

Open Reproducible Research

Challenges and Opportunities

Dr. Markus Konkol,
Open Science Officer
 @MarkusKonkol

1) *We start with this one*

2) *Then this one*

3) *Finally this one*

UNIVERSITY OF TWENTE.



ITC



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](#)

"[..] an article about a computational result is advertising, not scholarship. The actual scholarship is the full software environment, code and data, that produced the result."

"Claerbout's claim" in Donoho, 2010

“From time to time over the past few years, I’ve politely refused requests to referee an article on the grounds that it lacks enough information for me to check the work.”

Stark (2018): Nature **557**, 613 (2018). doi: <https://doi.org/10.1038/d41586-018-05256-0>

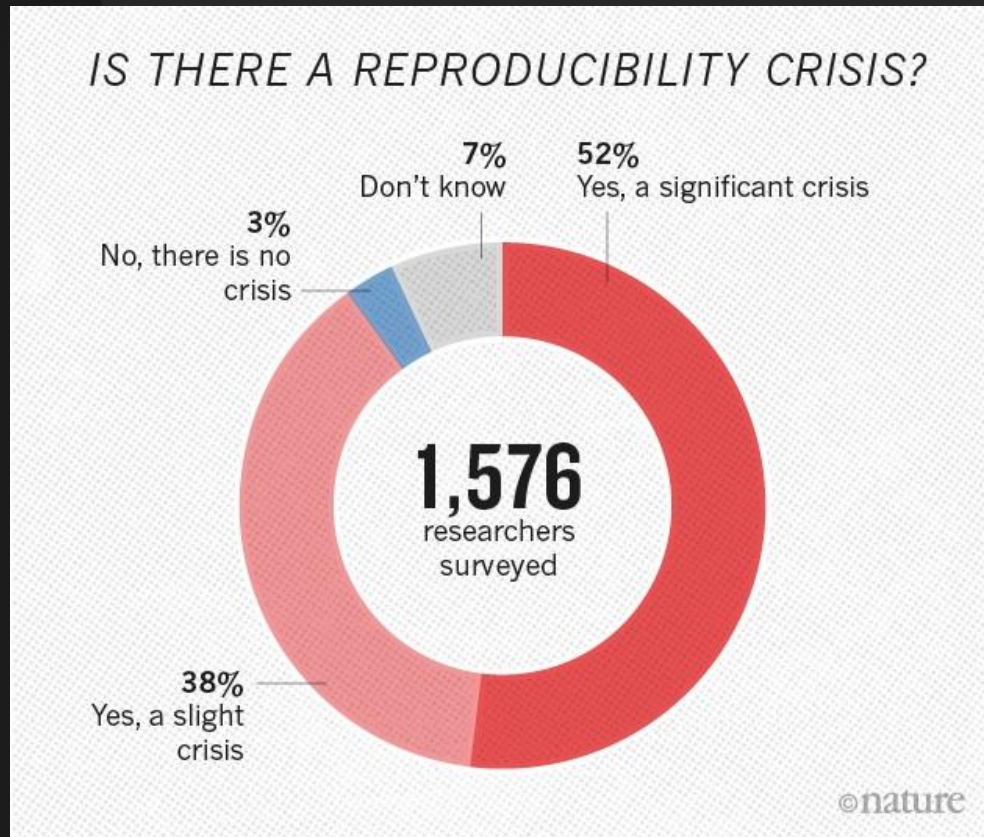
Open Reproducible Research

Reproducible research refers to achieving exactly the same results (e.g. tables, figures, numbers) as reported in the paper by using the same source code and data. In **Open reproducible research**, these materials are publicly accessible.

Replicable research refers to coming to similar conclusions based on newly collected data or a newly implemented analysis.

Replicability & reproducibility are essential for scientific work.

The reproducibility crisis



Reproducible research refers to achieving exactly the same results (e.g., tables, figures, numbers) as reported in the paper by using the same source code and data. In **Open reproducible research**, these materials are publicly accessible.



Baker, M. (2016). 1,500 scientists lift the lid on reproducibility. *Nature News*, 533(7604), 452.

From: <https://gph.is/g/4DAnQjB>

The reproducibility crisis

Open Access | Published: 23 October 2015

The prevalence of statistical reporting errors in psychology (1985–2013)

[Michèle B. Nuijten](#) , [Chris H. J. Hartgerink](#), [Marcel A. L. M. van Assen](#), [Sacha Epskamp](#) & [Jelte M. Wicherts](#)

Behavior Research Methods **48**, 1205–1226(2016) | [Cite this article](#)

General prevalence of inconsistencies

Across all journals and years 49.6 % of the articles with NHST results contained at least one inconsistency (8,273 of the 16,695 articles) and 12.9 % (2,150) of the articles with NHST

<https://doi.org/10.3758/s13428-015-0664-2>

The reproducibility crisis

Open Access | Published: 23 October 2015

The prevalence of statistical inconsistency in psychology (1985–2014)

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Behavior Research Methods **48**, 1205–1226

General prevalence of inconsistency

Across all journals and years 49.6 % of articles showed inconsistency (8,273 of the 16,695 articles)

Research articles

Analytic reproducibility in articles receiving open data badges at the journal *Psychological Science*: an observational study

Tom E. Hardwicke , Manuel Bohn, Kyle MacDonald, Emily Hembacher, Michèle B. Nuijten, Benjamin N. Pelloquin, Benjamin E. deMayo, Bria Long, Erica J. Yoon and Michael C. Frank

Published: 06 January 2021 | <https://doi.org/10.1098/rsos.201494>

3. Results

Prior to seeking original author involvement, all target values in 9 out of the 25 articles (36%, CI [19,57]) were reproducible, with the remaining 16 articles (64%, CI [43,81]) containing at least one major numerical discrepancy. After requesting input from original

<https://doi.org/10.3758/s13428-015-0664-2>

<https://doi.org/10.1098/rsos.201494>

The reproducibility crisis

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Psychological Science: an observational study

Tom E. Hartgerink, Michèle B. Nuijten, and Michael J. Kane

Published: 06

3. Results

Prior to seeking
(36%, CI [19,5
containing at

Research Articles

Computational reproducibility in geoscientific papers: Insights from a series of studies with geoscientists and a reproduction study

Markus Konkol , Christian Kray , & Max Pfeiffer

Pages 408–429 | Received 09 Apr 2018, Accepted 30 Jul 2018, Published online: 13 Aug 2018

[Download citation](#)

<https://doi.org/10.1080/13658816.2018.1508687>

 Check for updates

3.5.3. Results

Below, we first report on the technical issues we encountered and then summarise the differences between the original and reproduced figures that we observed.

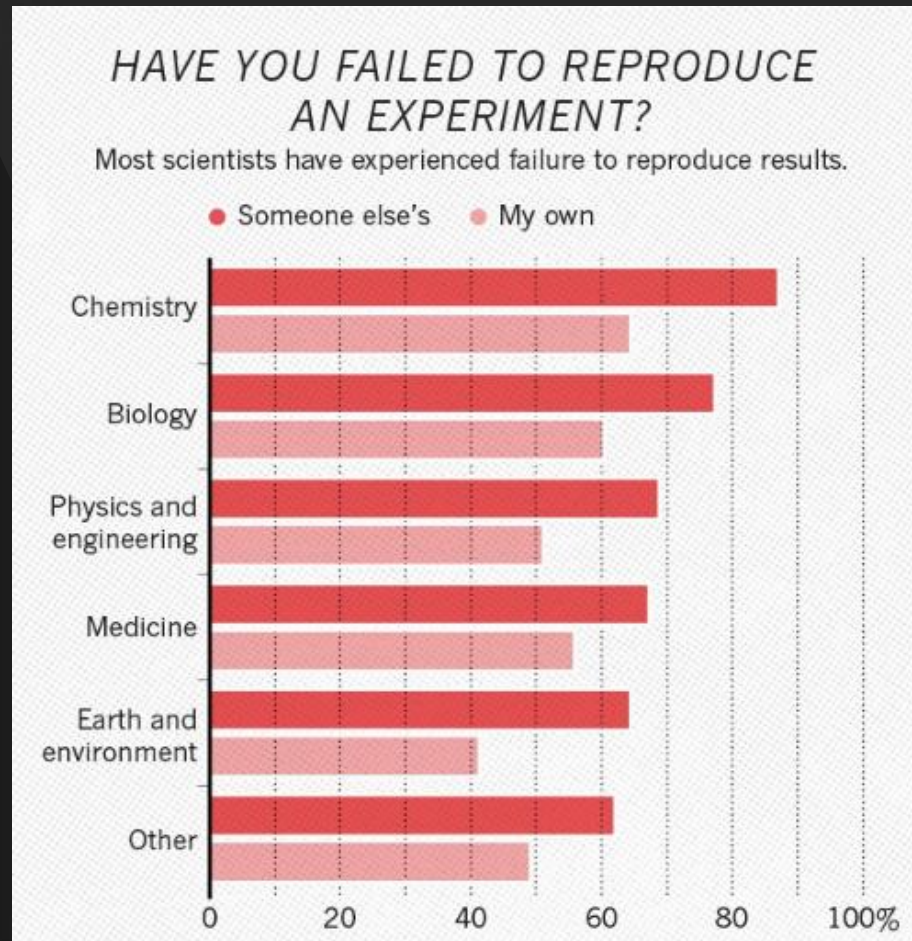
Technical issues: The code of two papers ran without any issues, 33 had resolvable issues, and two were partially executable, i.e. the code produced output but also had issues that we could not resolve. We classified four papers as being irreproducible, as we could not solve all issues. The code

<https://doi.org/10.3758/s13428-015-0664-2>

<https://doi.org/10.1098/rsos.201494>

<https://doi.org/10.1080/13658816.2018.1508687>

The reproducibility crisis



<https://media.giphy.com/media/z1GQ9t8FxiPnG/giphy.gif>

Baker, M. (2016). 1,500 scientists lift the lid on reproducibility. *Nature News*, 533(7604), 452.

Why is unreproducible research a problem?



Difficult to find errors in the analysis



Reviewers cannot verify but need to trust the results



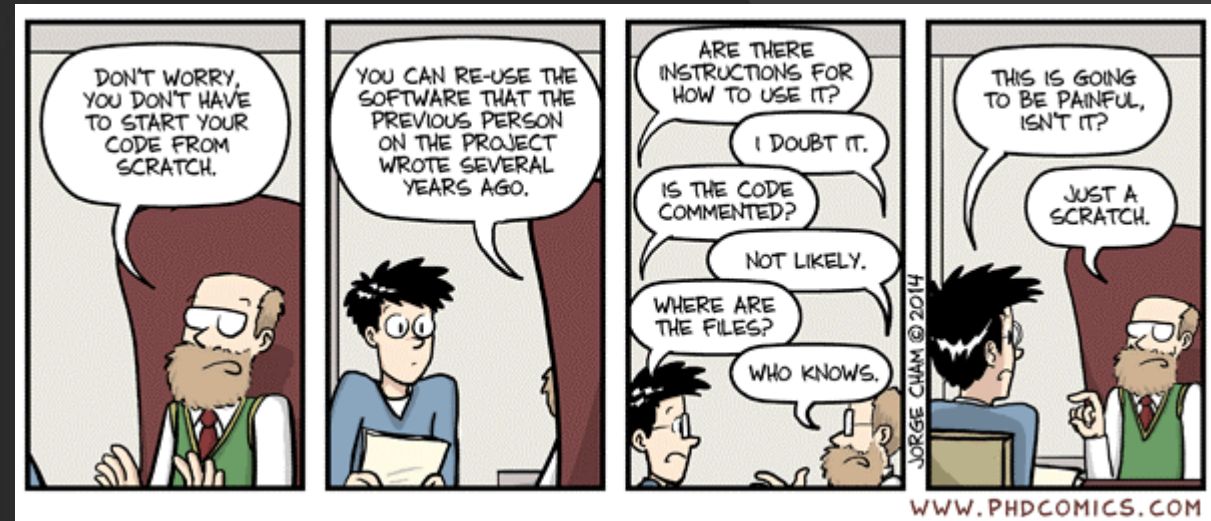
Extra effort from authors and reviewers required



Analysis not fully understandable



Materials not reusable (sustainable)



“It's impossible to conduct research without software, say 7 out of 10 UK researchers”

- 92% of academics use research software
- 69% say their research would not be practical without it
- 56% develop their own software

Hettrick (2014): <https://www.software.ac.uk/blog/2014-12-04-its-impossible-conduct-research-without-software-say-7-out-10-uk-researchers>

Baker, M. (2016). 1,500 scientists lift the lid on reproducibility. *Nature News*, 533(7604), 452.

Reproducibility? What's in for me?

Reason number 1: reproducibility helps to avoid disaster

“How bright promise in cancer testing fell apart” titled a *The New York Times* article

Reason number 2: reproducibility makes it easier to write papers

Transparency in your analysis makes writing papers much easier. For example, in a dynamic

Reason number 3: reproducibility helps reviewers see it your way

Most of us like to moan about peer review. One of the complaints I hear most often is: the reviewers didn't even read the paper and had no idea what we were really doing.

Reason number 4: reproducibility enables continuity of your work

I would be surprised if you hadn't heard the following remarks before, maybe you have even said them yourself: “I am so busy, I can't remember all the details of all my projects” or “I did this analysis 6 months ago. Of course I can't remember all the details after such a long time” or

Reason number 5: reproducibility helps to build your reputation

For several papers, we have made our data, code and analyses available as an Experiment Package on Bioconductor [5]. When I came up for tenure, I cited all of these packages as

Why is so much work not reproducible?

What do you think?

Please go to <https://www.menti.com/> and make a suggestion. Code: 7925 8413

Why is so much work not reproducible?

Why is so much work not reproducible?

 Mentimeter

People don't publish their methods in sufficient detail

poor documentation

The data and underlying code is not available

much work to make it reproducible

It's extra work and we don't have time.

Takes effort now, while the benefits come later.

terms of service of data provider; extra effort with perceived lack of benefits

Because there is error in the code.

We don't spot our own mistakes

too complicated

Not a priority

because reproducibility does not get enough attention

Why is so much work not reproducible?

Why is so much work not reproducible?

Mentimeter

too complicated

Not all steps have been included Software version changed in the meanwhile which might lead to different solutions

Takes extra effort when documenting research

Change of context

There is not enough information to reproduce the research results.

Code not well documented

The code needs commercial software (e.g. Matlab).

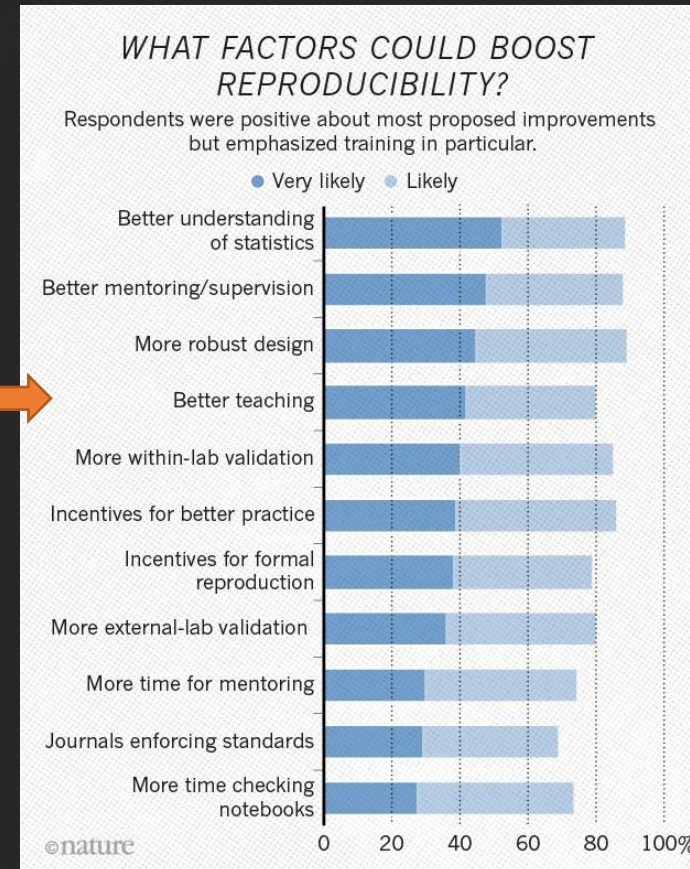
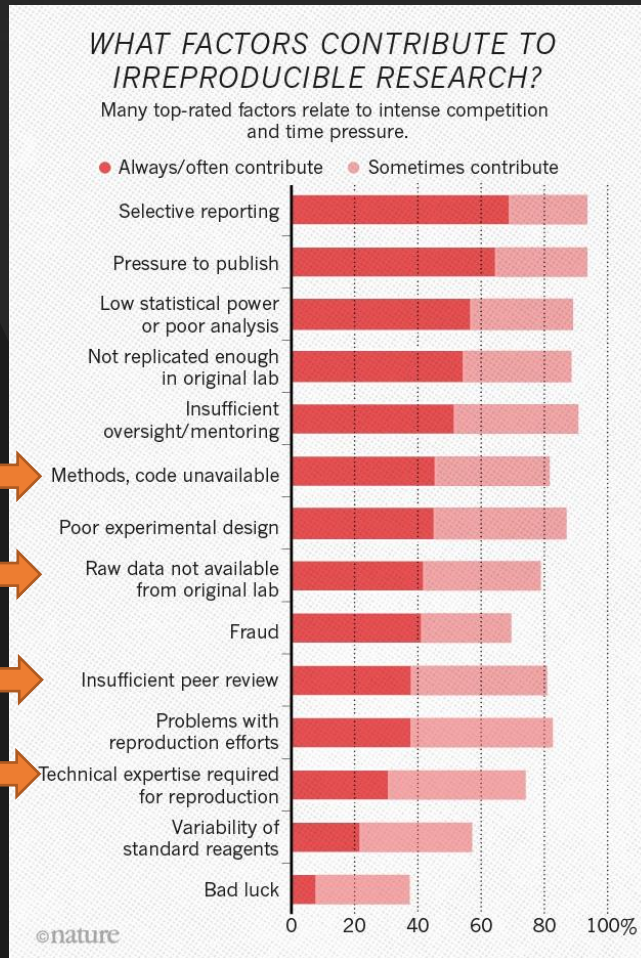
get enough attention

confidential

Lack of proper documentation

20

Why is so much work not reproducible?



Framework for
Open and
Reproducible
Research
Training



FORRT

<https://forrt.org/>

Baker, M. (2016). 1,500 scientists lift the lid on reproducibility. *Nature News*, 533(7604), 452.

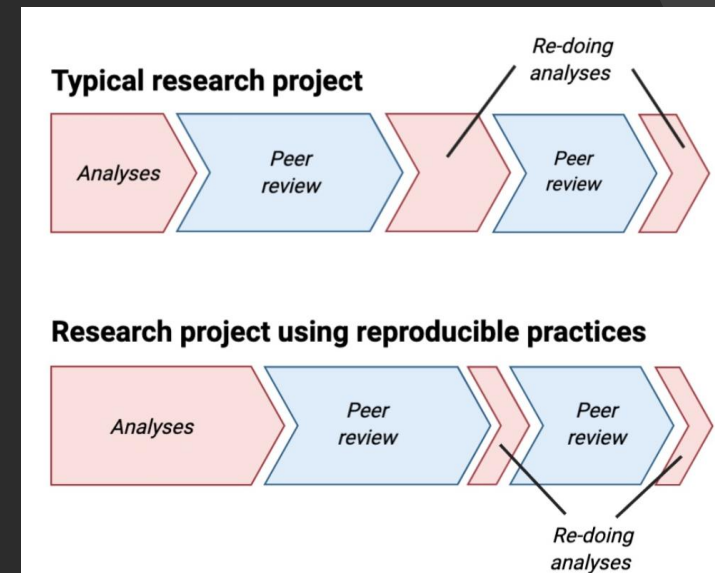
Why is so much work not reproducible?

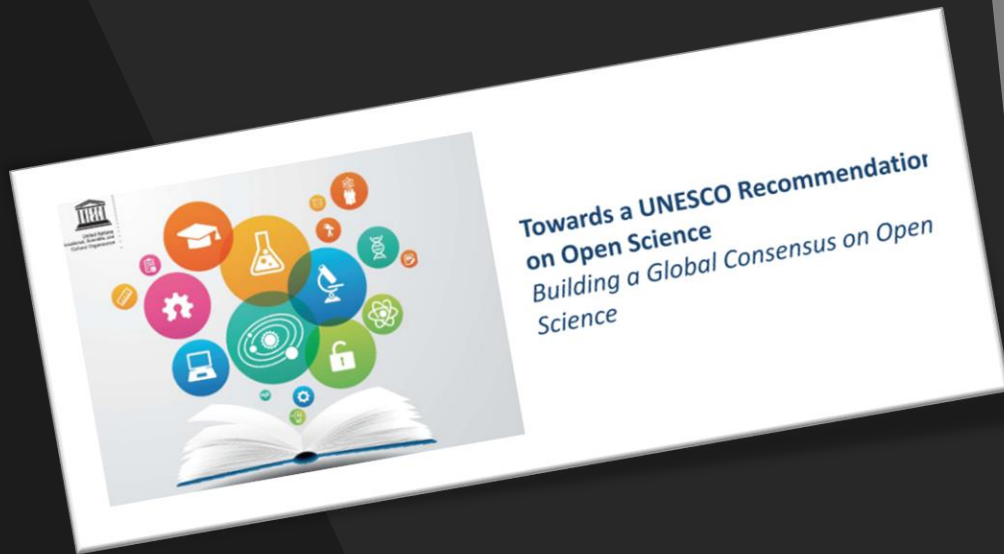
- Losing competitive advantages – publish materials after paper acceptance, use embargoes
- Prepare code and data – make it reusable to increase your impact
- Code not worth publishing – it can be gold to someone else
- Proprietary software – use open source software and scripting languages (R, Python)
- Missing supporting tools – there are quite a few
- Licensing – ask for support
- Not yet relevant – this will change!

Publish or Perish

Journal Impact Factors

h-index






Shaping Europe's digital future

POLICY

European Open Science Cloud




Horizon 2020 projects working on the 2019 coronavirus disease (COVID-19), the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), and related topics:

Guidelines for open access to publications, data and other research outputs

WORLD VIEW · 24 MAY 2018

Before reproducibility must come preproducibility

 Instead of arguing about whether results hold up, let's push to provide enough information for others to repeat the experiments, says Philip Stark.


Philip B. Stark

From time to time over the past few years, I've politely refused requests to referee an article on the grounds that it lacks enough information for me to check the work. This can be a hard thing to explain.

PDF version

RELATED ARTICLES

<https://www.openscience-twente.com/> @OSCTwente



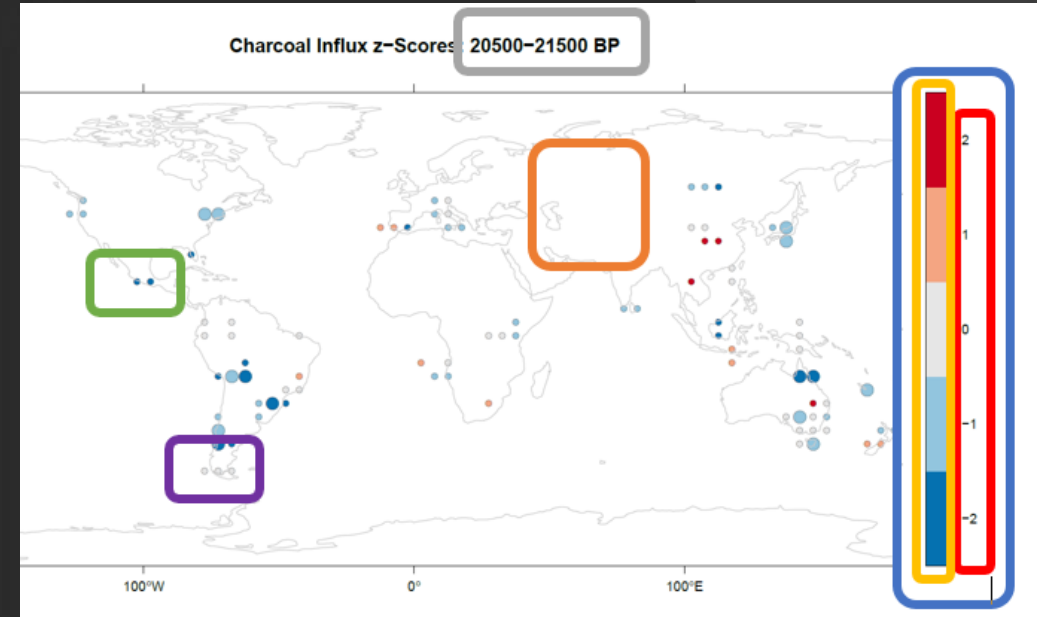
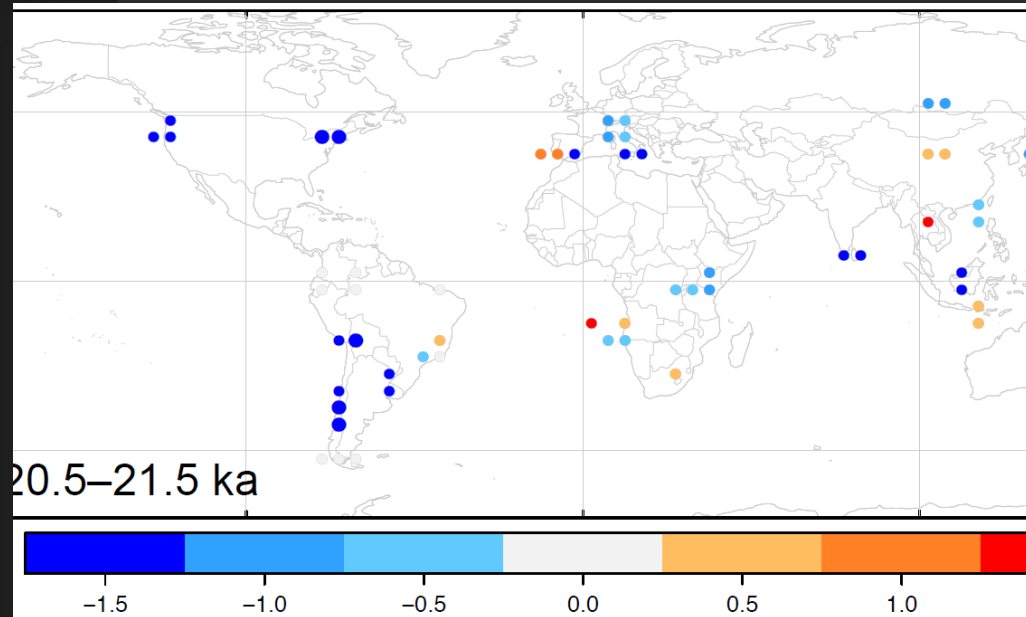
INOSC International Network of Open Science & Scholarship Communities

Map showing Open Science Communities (OSCs) across Europe:

- OSCA (Open Science Community Amsterdam)
- OSCU (Open Science Community Utrecht)
- OSCL (Open Science Community Leiden)
- OSCR (Open Science Community Rotterdam)
- OSCT (Open Science Community Twente)
- OSCN (Open Science Community Nijmegen)
- OSC/e (Open Science Community Eindhoven)
- OSCM (Open Science Community Maastricht)
- OSCG (Open Science Community Groningen)
- OSCS (Open Science Community Sweden)

Starter kit: <https://inosc-starter-kit.netlify.app/>

The status quo of ORR in the geosciences



Why are the two maps not identical?

What do you think?

Please go to <https://www.menti.com/> and make a suggestion. Code: 7925 8413

Why are the two maps not identical?

Why are the two maps not identical?

Mentimeter

The authors edited the map outside the software but did not document the edits

Different code to generate the data.

Different date/ Different options used to create the map

Probably the map for reproduction was created after the publication, and either "improved" or actually had to be reconstructed as the original was not even repeatable...

The authors did not record all the steps for using the software

The scale is different?

The reproduction was done selectively? Catering for a change of context by the researcher?

Different software versions.

many reasons: you did not run the latest version of the code, input data

I think we should only consider the

There were dependencies required that weren't loaded

Why are the two maps not identical?

Why are the two maps not identical?

Mentimeter

and either "improved" or actually had to be reconstructed as the original was not even repeatable...

The reproduction was done selectively? Catering for a change of context by the researcher?

Different software versions.

many reasons: you did not run the latest version of the code, input data got updated, the authors "cheated" (removed some results), etc. etc.

I think we should only consider the maps while comparison, and according to that they are different because they include different data points.

There were dependencies required that weren't loaded

The function has changed because the program used to create the map was updated in the meanwhile

Computational environment?

Apparently: Making the code and the data available is not enough!

```
In [1]: import numpy as np
import matplotlib.pyplot as plt

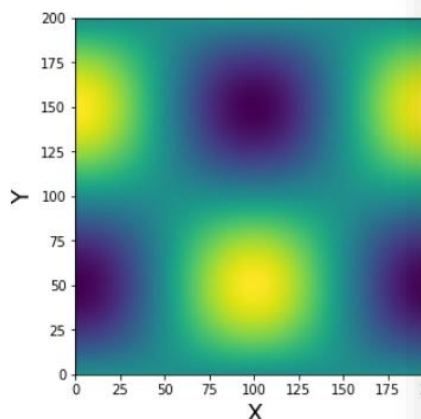
In [2]: # Make a plot
fig = plt.figure(figsize=(6, 5))
ax = fig.add_subplot(111)

N = M = 200
X, Y = np.ogrid[0:20:N*1j, 0:20:M*1j]
data = np.sin(np.pi * X*2 / 20) * np.cos(np.pi * Y*2 / 20)

im = ax.imshow(data, extent=[0, 200, 0, 200])
fig.colorbar(im, ax=ax, shrink=0.8)

ax.set_xlabel("X", fontsize=18)
ax.set_ylabel("Y", fontsize=18)
```

Out[2]: <matplotlib.text.Text at 0x7f5989e5b25>



8 lines (8 sloc) | 113 Bytes

```
1 name: CompEnv-Ex2
2 channels:
3   - defaults
4 dependencies:
5   - python=2.7.*
6   - pip
7   - pip:
8     - matplotlib==1.5.3
```

<https://mybinder.org/v2/gh/alan-turing-institute/CompEnv-Ex2/branch-a?filepath=demo.ipynb>

```
In [3]: import numpy as np
import matplotlib.pyplot as plt

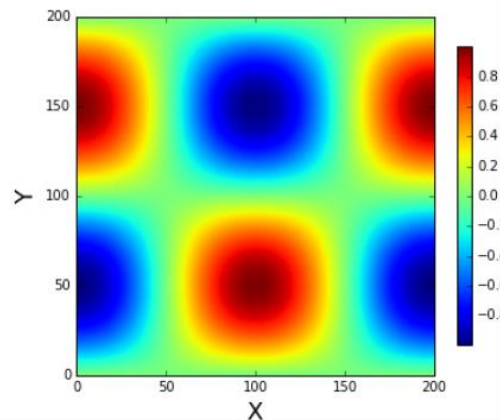
In [4]: # Make a plot
fig = plt.figure(figsize=(6, 5))
ax = fig.add_subplot(111)

N = M = 200
X, Y = np.ogrid[0:20:N*1j, 0:20:M*1j]
data = np.sin(np.pi * X*2 / 20) * np.cos(np.pi * Y*2 / 20)

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ax.set_xlabel("X", fontsize=18)
ax.set_ylabel("Y", fontsize=18)
```

Out[4]: <matplotlib.text.Text at 0x7f82e8b9c910>



8 lines (8 sloc) | 113 Bytes


```
1 name: CompEnv-Ex2
2 channels:
3   - defaults
4 dependencies:
5   - python=2.7.*
6   - pip
7   - pip:
8     - matplotlib==2.0.*
```

<https://mybinder.org/v2/gh/alan-turing-institute/CompEnv-Ex2/branch-b?filepath=demo.ipynb>

Publishing computational research – a review of infrastructures

 AUTHOREA


 binder

 CODE OCEAN

 eLife

 Galaxy
COMMUNITY HUB

 gigantum

 MANUSCRIPTS

 o2r opening
reproducible
research

 reana

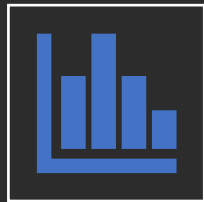
 ReproZip

 WHOLETALE

The concept of a research compendium



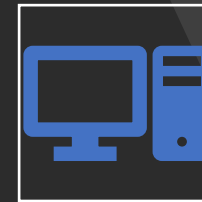
Text



Data



Code

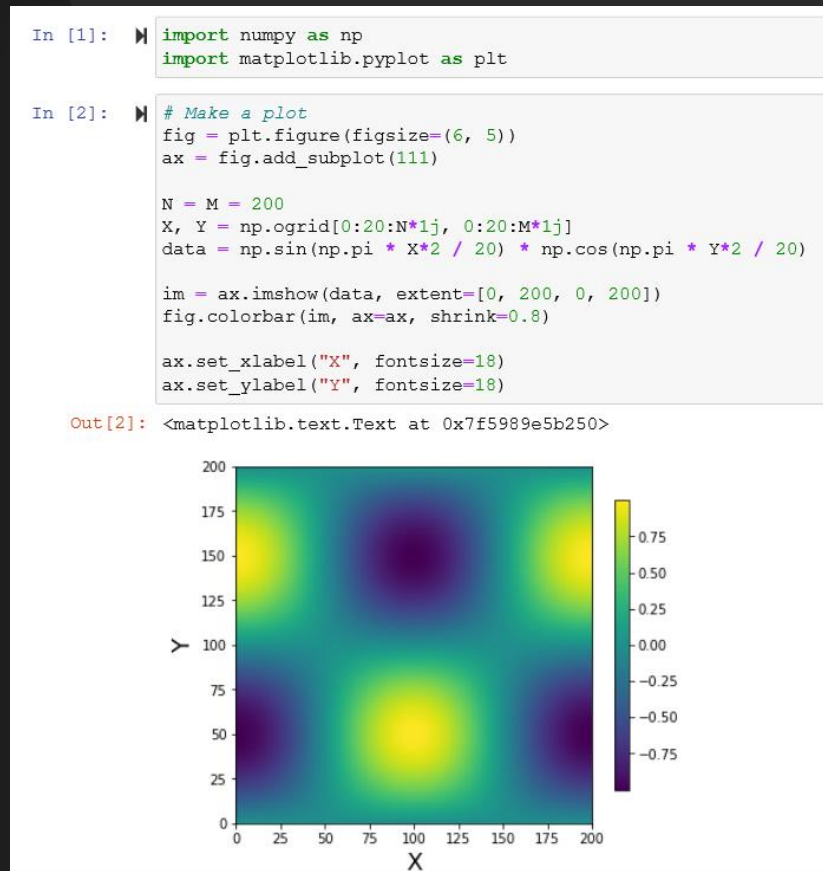


Computational
environment

Literate Programming:

Combining text, data, and code in one document, e.g., R Markdown and Jupyter Notebooks

The concept of a research compendium



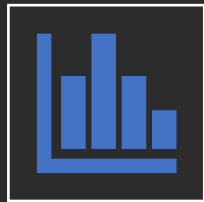
```
agile-rr-paper-corpus.Rmd x
103 {r data_path}
104 data_path <- "paper-corpus"
105
106
107 ### Data
108
109 The data for the analysis is required in form of a directory with PDF files.
110 Add the PDFs to a directory called `r data_path` (path automatically inserted here based on
111 above variable) next to the file `agile-rr-paper-corpus.Rmd` (this file).
112
113 You can contact the original paper authors and ask for the test dataset to reproduce the full
114 analysis.
115 Alternatively, you can download a selection of AGILE short papers to test the workflow using the
116 code below which is _not_ executed by default.
117
118 {r demo_data,eval=FALSE}
119 dir.create(here::here(data_path))
120
121 # harvest links to PDFs, select more years for more data,
122 # e.g. c(2003:2017) and increase max_files_per_year
123 years <- c(2015:2017)
124 max_files_per_year <- 10
125 base_url <- "https://agile-online.org/index.php/conference/proceedings/proceedings-"
126 proceedings_urls <- sapply(X = as.character(years),
127 FUN = function(x) { paste0(base_url, x) }, USE.NAMES=TRUE)
128 proceedings_html <- lapply(X = proceedings_urls, FUN = read_html)
129
130 # papers, posters, abstracts of full papers, keynotes - we don't care as long it is pdf
131 # we might also catch both abstract of a poster and the poster itself
132 get_links <- function(page){
133 all_links <- page %>%
134 html_nodes(css = "a") %>%
135 html_attr("href") %>%
136 as.list()
137 pdf_links <- tibble(links = all_links) %>%
138 filter(str_detect(links, pattern = "pdf$"))
139 return(pdf_links)
140 }
```

1:1 Analysis and visualisations for "Reproducible research and GIScience: an evaluation using AGILE conference papers" R Markdown

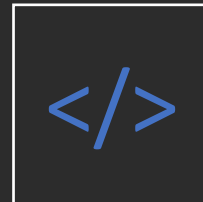
The concept of a research compendium



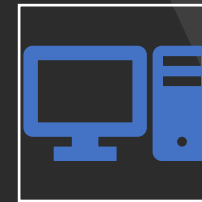
Text



Data



Code



Computational
environment

Literate Programming:

Combining text, data, and code in one document, e.g., R Markdown and Jupyter Notebooks

Which applications consider the computational environment?

?

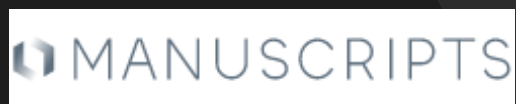
AUTHOREA



?



?



Which infrastructures support Literate programming?

R Markdown 

 Jupyter

R Markdown  +  Jupyter

 opening
reproducible
research

AUTHOREA

 Galaxy
COMMUNITY HUB


 reana

 ReproZip

 binder

 CODE OCEAN

 eLife

 WHOLE TALE

 gigantum



Turn a Git repo into a collection of interactive notebooks

Have a repository
executable environment

New to Binder?

Build and launch a

GitHub repository name or

GitHub repository

GitHub

Gist

Git repository

GitLab.com

Zenodo DOI

Figshare DOI

Hydroshare resource

Dataverse DOI

Copy the text below, then

jupyter

Files

Running

Clusters

Select items to perform actions on them.

0

bin

kitematic

agile-rr-paper-corpus.pdf

agile-rr-paper-corpus.Rmd

binder-screenshot-01.png

binder-screenshot-02.png

binder-screenshot-03.png

Dockerfile

install.R

LICENSE

Paper_Evaluation.csv

README.md

Reproducibility_Survey.csv

```
File Edit Code View Plots Session Build Debug Profile Tools Help
Go to file/function Addins
agile-rr-paper-corpus.Rmd
1 ---
2 title: 'Analysis and visualisations for "Reproducible research and GIScience: an evaluation using
3 AGILE conference papers"'
4 author: "Daniel Nüst, Barbara Hofer"
5 date: "r format(Sys.time(), '%d %B, %Y')%"
6 output:
7   pdf_document:
8     keep_tex: yes
9     latex_engine: xelatex
10    toc: yes
11   html_document:
12     df_print: paged
13     toc: yes
14   uricolor: blue
15   # add lscap package to support kableExtra::landscape() for PDF output
16   header-includes: |
17     \usepackage{lscap}
18 ---
19 ## License
20
21 This document is licensed under a [Creative Commons Attribution 4.0 International
22 License](https://creativecommons.org/licenses/by/4.0/).
23
24 All contained code is licensed under the [Apache License
25 2.0](https://choosealicense.com/licenses/apache-2.0/).
26
27 The data used is licensed under a [Open Data Commons Attribution
28 License](https://opendatacommons.org/licenses/by/4.0/).
29
30 Analysis and visualisations for "Reproducible research and GIScience: an evaluation using AGILE conference papers"
31 R Markdown
32
33 Console Terminal
34 ~/
35 citation() on how to cite R or R packages in publications.
36
37 Type 'demo()' for some demos, 'help()' for on-line help, or
38 'help.start()' for an HTML browser interface to help.
39 Type 'q()' to quit R.
```

Visit repo

Copy Binder link

Upload

New

Refresh

Notebook:

jovyan Project: (None)

Environment History Connections

Global Environment

Environment is empty

Files Plots Packages Help Viewer

New Folder Upload Delete Rename More

Name	Size	Modified
.gitignore	591 B	Oct 26, 2020, 10:31 PM
agile-rr-paper-corpus.pdf	153.3 KB	Oct 26, 2020, 10:31 PM
agile-rr-paper-corpus.Rmd	34.4 KB	Oct 26, 2020, 10:31 PM
bin		
binder-screenshot-01.png	57.4 KB	Oct 26, 2020, 10:31 PM
binder-screenshot-02.png	61.7 KB	Oct 26, 2020, 10:31 PM
binder-screenshot-03.png	276.6 KB	Oct 26, 2020, 10:31 PM
Dockerfile	896 B	Oct 26, 2020, 10:31 PM
install.R	777 B	Oct 26, 2020, 10:31 PM
kitematic		
LICENSE	280 B	Oct 26, 2020, 10:31 PM
Paper_Evaluation.csv	6.5 KB	Oct 26, 2020, 10:31 PM
README.md	5.4 KB	Oct 26, 2020, 10:31 PM
Reproducibility_Survey.csv	16.4 KB	Oct 26, 2020, 10:31 PM

▶ RUN DOCUMENT

🔗 SOURCE



Replication

L Michelle Lewis, Meredith

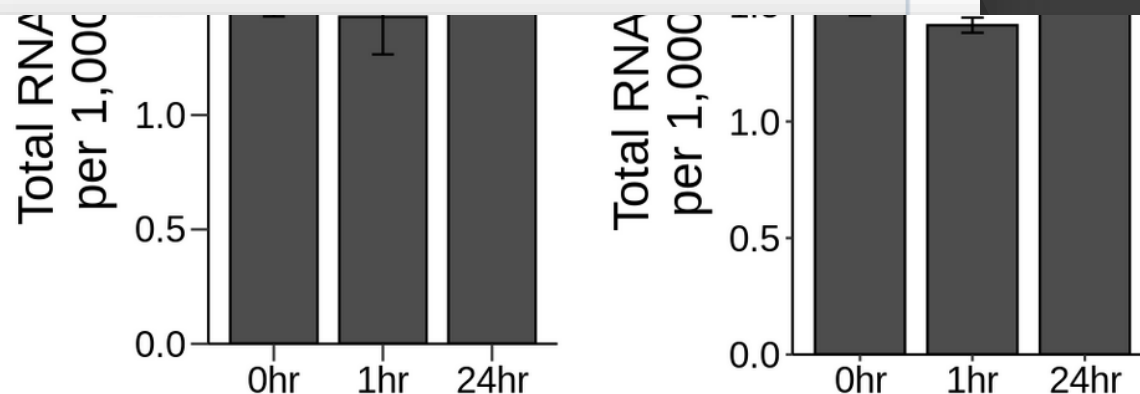
University of Georgia, Bioexpress
Facility, Maryland, U

Abstract

As part of the Reproducibility
intended to replicate select

Figure 1B

```
1 #' @width 17
2 #' @height 10
3
4 #creates new column calculating RNA in 1
5 data2$RNA.100uL <- data2$Average.RNA.Con
6
7 ##calculates RNA per cell
8 data2$RNA.per.cell <- data2$RNA.100uL/da
9
10 #calculates RNA per 1000 cells
11 data2$value <- data2$RNA.per.cell*1000
12
13 #classifies time as character
14 data2$Time <- as.character(data2$Time)
15
16 ##### subsets and summarizes Data #
17
18 #subsets data on lot 1
19 lot1dat <- data2[which(data2$Lot=="1"),]
20 #subsets data on lot 2
21 lot2dat <- data2[which(data2$Lot=="2"),]
22
```



Induction of c-Myc in P493-6 cells and impact on total RNA levels.

P493-6 cells were grown in the presence of tetracycline (Tet) for 72 hr and switched into Tet-free growth medium to induce c-Myc expression. Cells were cultured in two separate lots of serum. (B) Quantification of total RNA levels (ng of total RNA per 1,000 cells) for cells at 0, 1, and 24 hr after release from Tet. Means reported and error bars represent s.e.m. from 3 independent biological repeats. For serum lot one, one-way ANOVA on total RNA levels of all groups; $F(2, 6) = 1.25$, $p = .353$. Planned contrast between 0 hr and 24 hr; $t(6) = 1.02$, $p = .347$ with a priori alpha level = .05. For serum lot two, one-way ANOVA on total RNA levels of all groups; $F(2, 6) = 21.87$, $p = .00176$. Planned contrast between 0 hr and 24 hr; $t(6) = 5.03$, $p = .0024$ with a priori alpha level = .05. Additional details for this experiment can be found at <https://osf.io/tfd57/>.

Editorial On Writing Reproducible and Interactive Papers

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Abstract

Document Sections

- I. Introduction
- II. Sharing Code and Data Sets
- III. Research Notebooks As Papers
- IV. Conclusion

Figures

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Keywords

Abstract:

While most publishers of scientific journals provide online archives of paper replacement for printed issues, the versions available online remain static. The advantage of the richness of interactivity that the digital world can offer. Those who submit their work for publication in the IEEE Journal of Oceanic Engineering have options that will allow them to provide a richer experience to readers and produce their results. Adoption of such technologies will also help in producing which is important for addressing growing concerns on reproducibility of developing an interactive publication, this editorial is written as a Jupyter notebook. The print version. The notebook can be modified and the results regenerated through the development of this notebook, for readers who wish to adopt

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Page(s): 560 - 562

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Date of Publication: 12 July 2018

Publisher: IEEE

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Code & Datasets

Code

Dataset

This article includes code hosted on Code Ocean, a computational reproducibility platform that allows users to view, modify, run, and download code included with IEEE *Xplore* articles. NOTE: A Code Ocean user account is required to access functionality in the capsule below.

Code: Python On Writing

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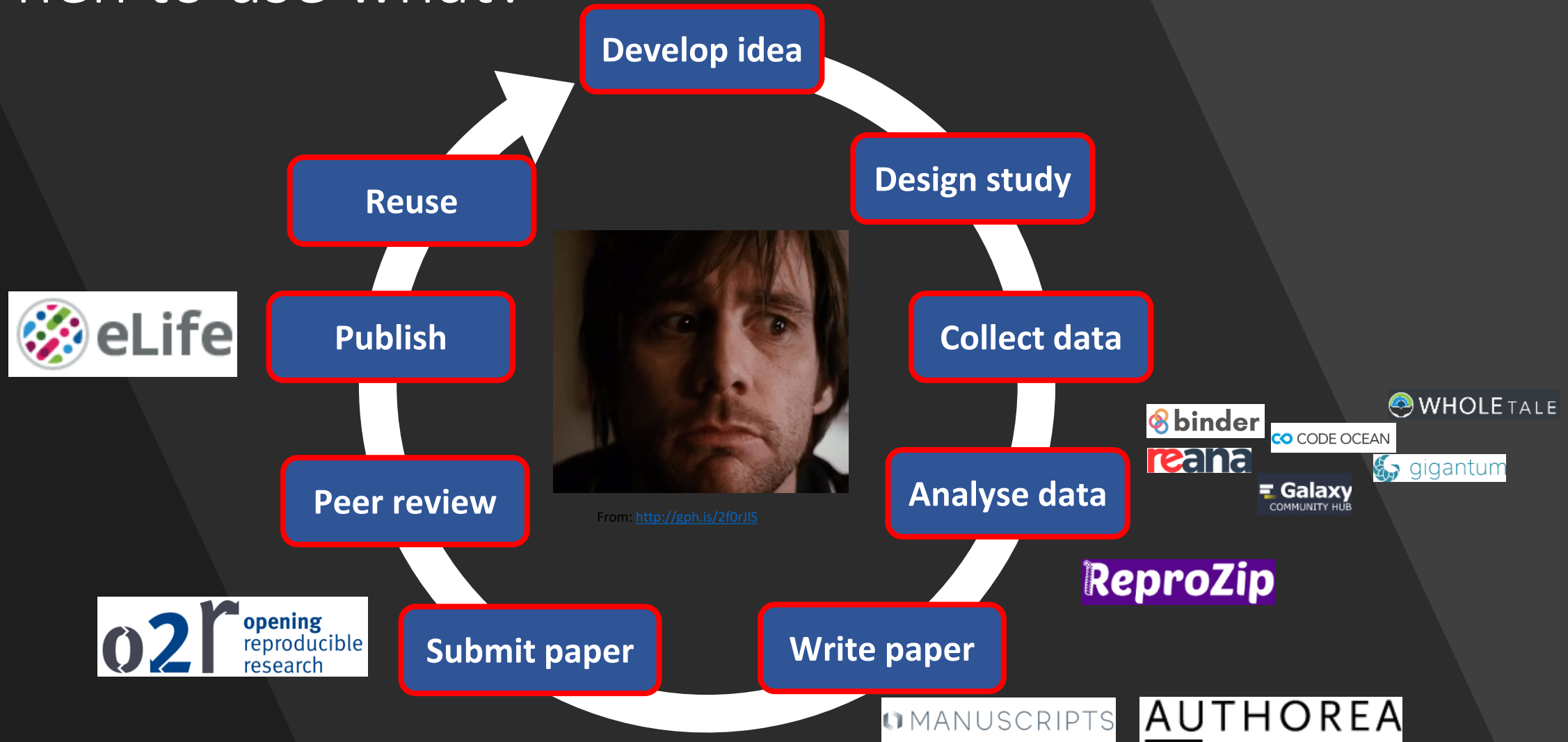
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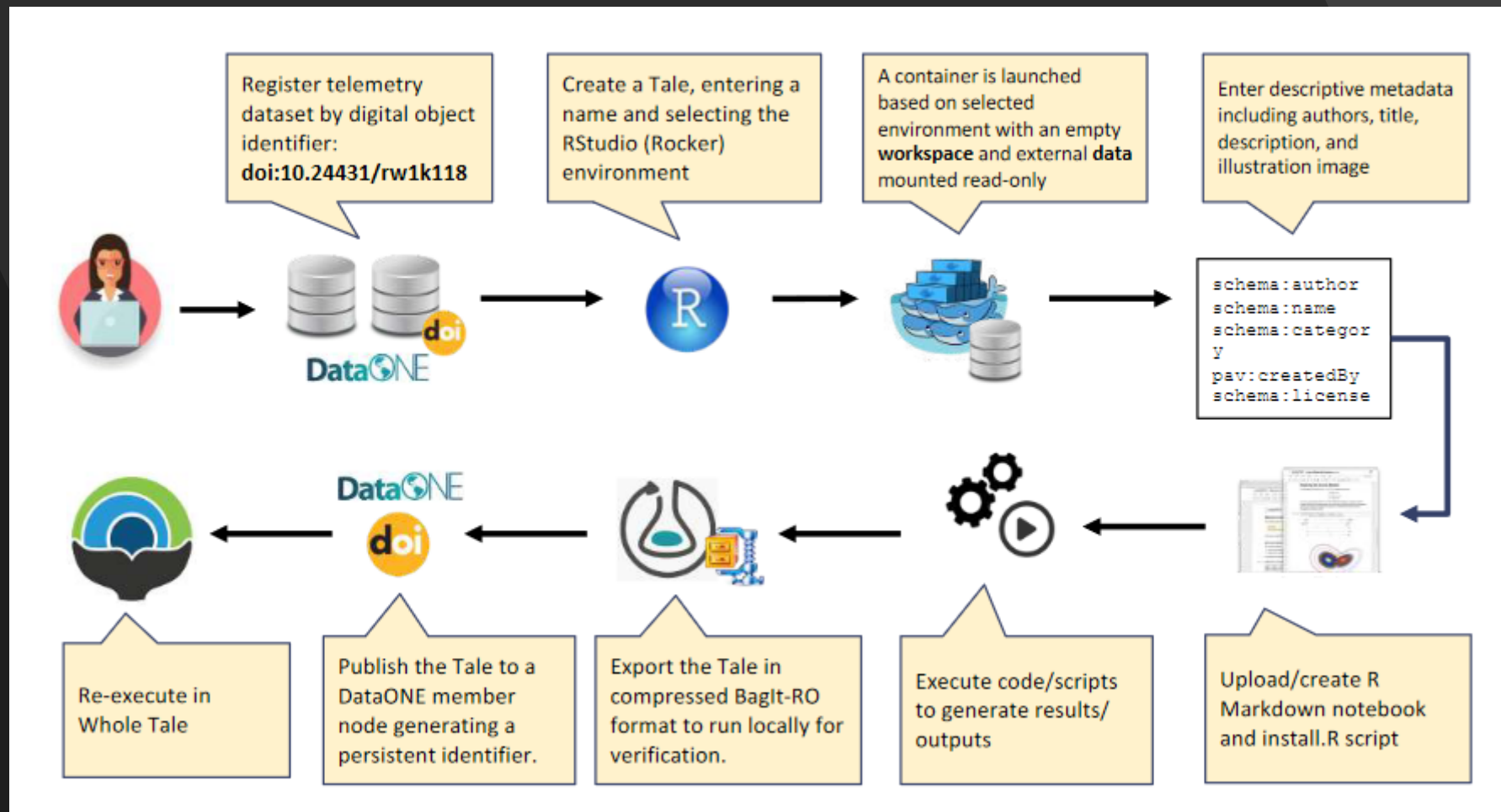
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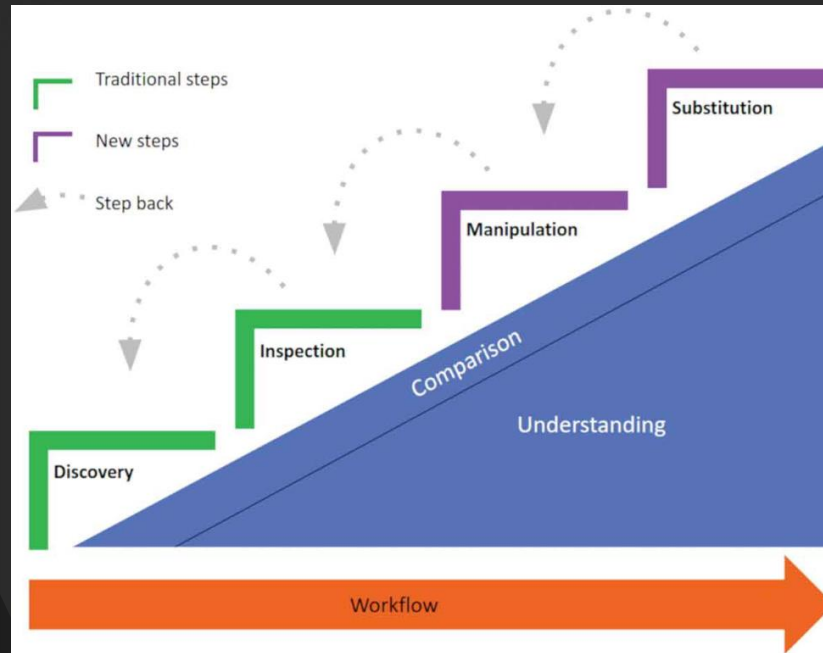
 WHOLE TALE

When to use what?





Which infrastructures support in-depth investigation?



	Authorea	Binder	Code Ocean	eLife RDS	Galaxy	Gigantum	Manuscripts	o2r	REANA	Repro Zip	Whole Tale
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Inspection	+	+	+	+	+	+	+	+	-	-	+
Execution	+	+	+	+	+	+	+	+	+	+	+
Manipulation	+	+	+	+	+	+	+	+	+	+	+
Substitution	-	-	-	-	-	-	-	+	-	+	-

INSYDE: a synthetic probabilistic flood damage model based on

Francesco Dottori
European Commission, Joint Research Centre
Rui Figueiredo
Scuola Universitaria Superiore IUSS Pavia, Pz
Mario L. V. Martina
Scuola Universitaria Superiore IUSS Pavia, Pz
Daniela Molinari
Dipartimento di Ingegneria Civile e Ambientale
Anna Rita Scorzini
Dipartimento di Ingegneria Civile, Edile-Archit
02 Dec 2016

Methodologies to estimate economic damage in flood management plans. Synthetic models adopt actual knowledge of hazard and vulnerability functions to estimate economic damage in flood management plans. Synthetic models adopt actual knowledge of hazard and vulnerability functions to estimate economic damage in flood management plans.

Introduction
Flood damage evaluation today is a crucial task for flood management plans. Synthetic models adopt actual knowledge of hazard and vulnerability functions to estimate economic damage in flood management plans.

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Parameter 1: duration = 24; Parameter 2: velocity = 0.5; Parameter 3: sediment_concentration = 0.5;

Building damage

Damage (€)

Water depth (m)

damage total
cleanup
removal
non structural
structural
finishing+WD
systems

Building damage

Damage (€)

Water depth (m)

damage total
cleanup
removal
non structural
structural
finishing+WD
systems

Differences

Differences

Modifying content after publishing

	Authorea	Binder	Code Ocean	eLife RDS	Galaxy	Gigantum	Manuscripts	o2r	REANA	Repro Zip	Whole Tale
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Shared via DOI	+	–	+	+	–	–	–	–	–	–	+
Shared via URL	+	+	+	+	+	+	+	+	–	+	–

Review | [Open Access](#) | [Published: 14 July 2020](#)

Publishing computational research - a review of infrastructures for reproducible and transparent scholarly communication

[Markus Konkol](#)  [Daniel Nüst](#) & [Laura Goulier](#)

Research Integrity and Peer Review 5, Article number: 10 (2020) | [Cite this article](#)

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The code and data are available under:

<https://github.com/MarkusKonk/testbinder>

Commits on Mar 3, 2021

Add files via upload

 MarkusKonk committed on 3 Mar

Update requirements.txt

 MarkusKonk committed on 3 Mar

Create postBuild

 MarkusKonk committed on 3 Mar

Add files via upload

 MarkusKonk committed on 3 Mar

Delete notebook.ipynb

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How to get ready for ORR?

- Start with your own workspace (e.g. naming of files, folder structure)
- Learn a scripting language (R, Python)
- Learn a notebook format (R Markdown/Jupyter Notebooks)
- Learn a software for versioning (git)
- Some effort at the beginning, pays off for the rest of your career

“Openness is not all-or-nothing [...] Fully open research is a long-term goal, not a switch we should expect to flip overnight.” (MCKIERNAN, 2016)

Open Reproducible Research

Challenges and Opportunities

Dr. Markus Konkol,
Open Science Officer

 @MarkusKonkol

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