Open Science and Research Software Engineering

Workshop
Center for Advanced Internet Studies (CAIS)

Quirin Würschinger

September 21, 2023

Introduction

Workshop materials

GitHub repository https://github.com/wuqui/opensciws
slides https://wuqui.github.io/opensciws/opensciws_slides.html
website version https://wuqui.github.io/opensciws/opensciws_website.html

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> `whoami`

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LMU Munich

Current work

- **research**
  - lexical innovation on the web and in social networks
  - variation and change in language use and social polarization in social networks

  - using Large Language Models (LLMs) like ChatGPT for research in linguistics and social science.

- **teaching**: corpus linguistics and research methodology

Promoting Open Science in (computational) linguistics at LMU

- teaching and applying reproducible corpuslinguistic methods
- creating and sharing corpora among researchers and students

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Topics

- **Open Science**: What is it and why does it make sense?
- **Project setup**: Learn to efficiently organize your project's files and folders.
- **Data, code, and document management**: Understand how to effectively manage and maintain your data, code, and documents.
- **Utilizing different data types**: Discover how to work with various data types, such as interviews, web, and social media data.
- **Publication process**: Learn about options for publishing your data, code, and documents.

Time table

Topic	Start	End
Intro	09:00	09:30
Open Science principles	09:30	10:30
—	10:30	10:50

Topic	Start	End
version control	10:50	11:10
project structure	11:10	12:00
data	12:00	12:30
—	12:30	13:30
code	13:30	14:00
methods	14:00	14:30
authoring	14:30	15:15
—	15:15	15:30
publishing	15:30	16:00
open issues and recap	16:00	16:30

Addressing different backgrounds and goals

Backgrounds and interests

CAIS: Forschung zu Digitalisierung und Digitale Gesellschaft

Fachrichtungen

- Politikwissenschaft
- Erziehungswissenschaft
- Kommunikationswissenschaft
- Soziologie
- …

Daten und Methoden

- qualitativen Interviews
- Textanalysen
- quantitativen Befragungen
- experimentellen Designs
- Online-Plattformen/Social Media
- …

Main interests

- reproducible workflows
  - managing files and folders
  - plain text authoring
  - programming with Python and R
- methods
  - quantitative approaches
  - text analysis
  - questionnaires
- publishing
  - papers
  - code and data

Who are you?

1. name
2. place and position
3. your research interest in about 3 sentences for someone outside your field

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Open Science principles

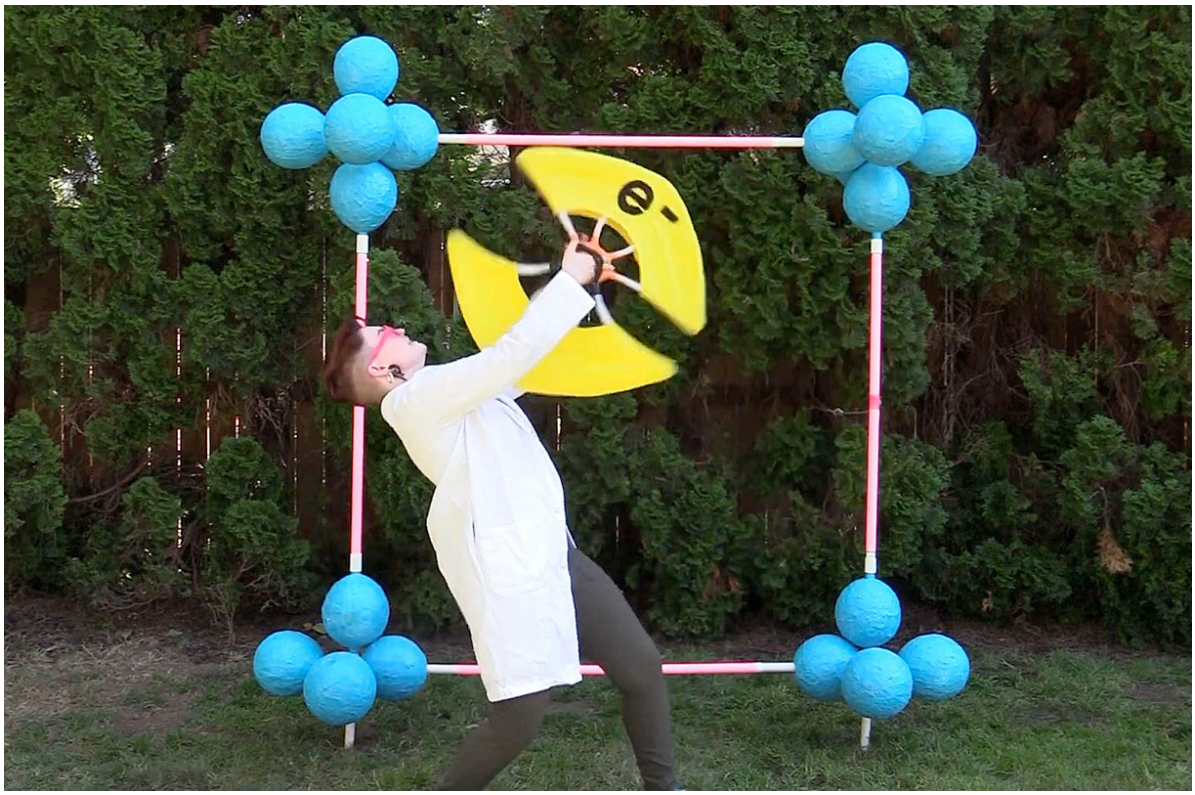
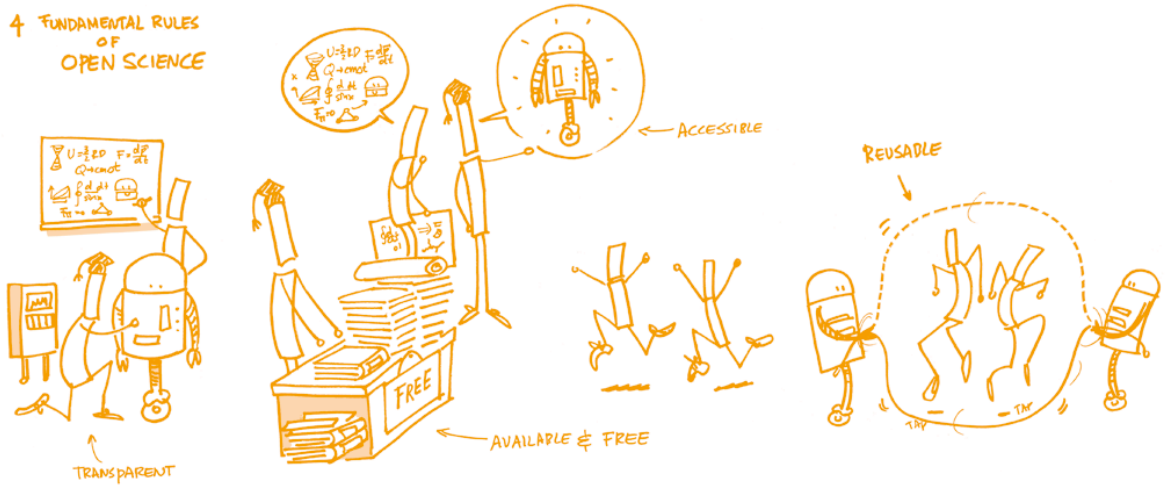


Figure 1: Dance your PhD

What is Open Science



Why should we do Open Science?

Is this what we want?

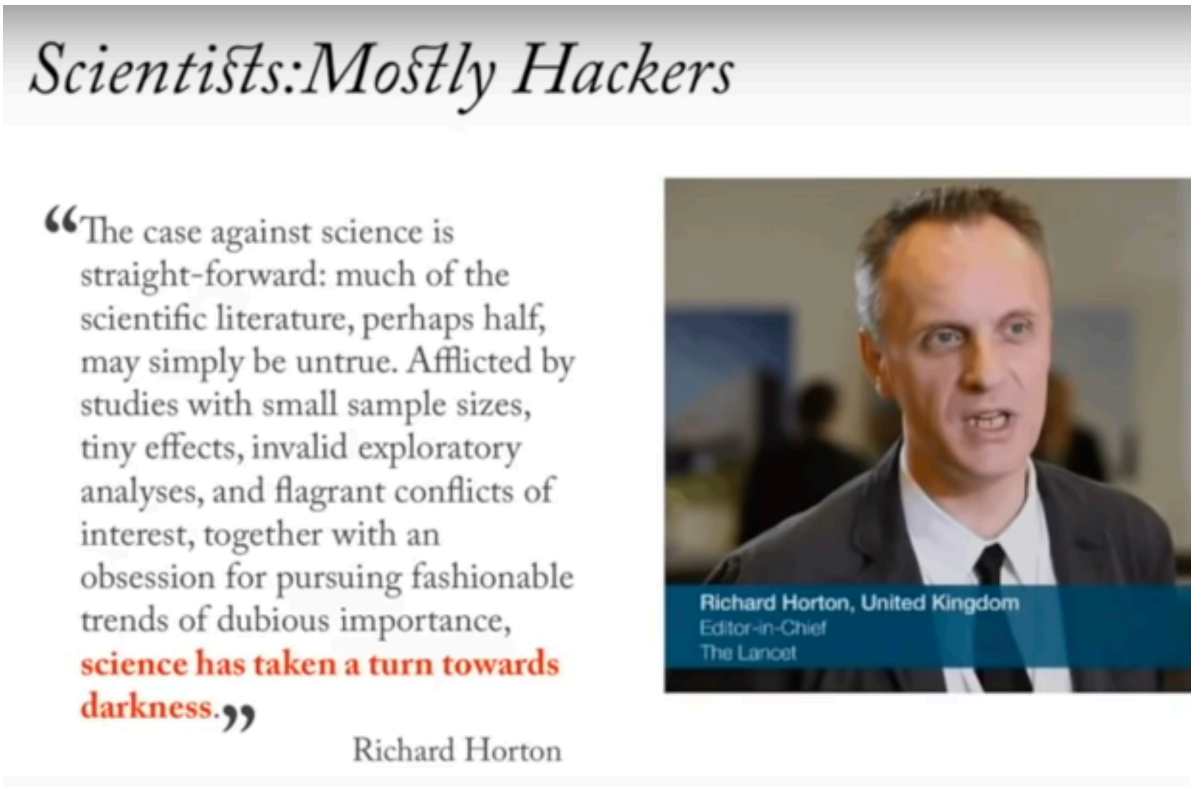


Figure 2: Richard McElreath: *Science as Amateur Software Development*

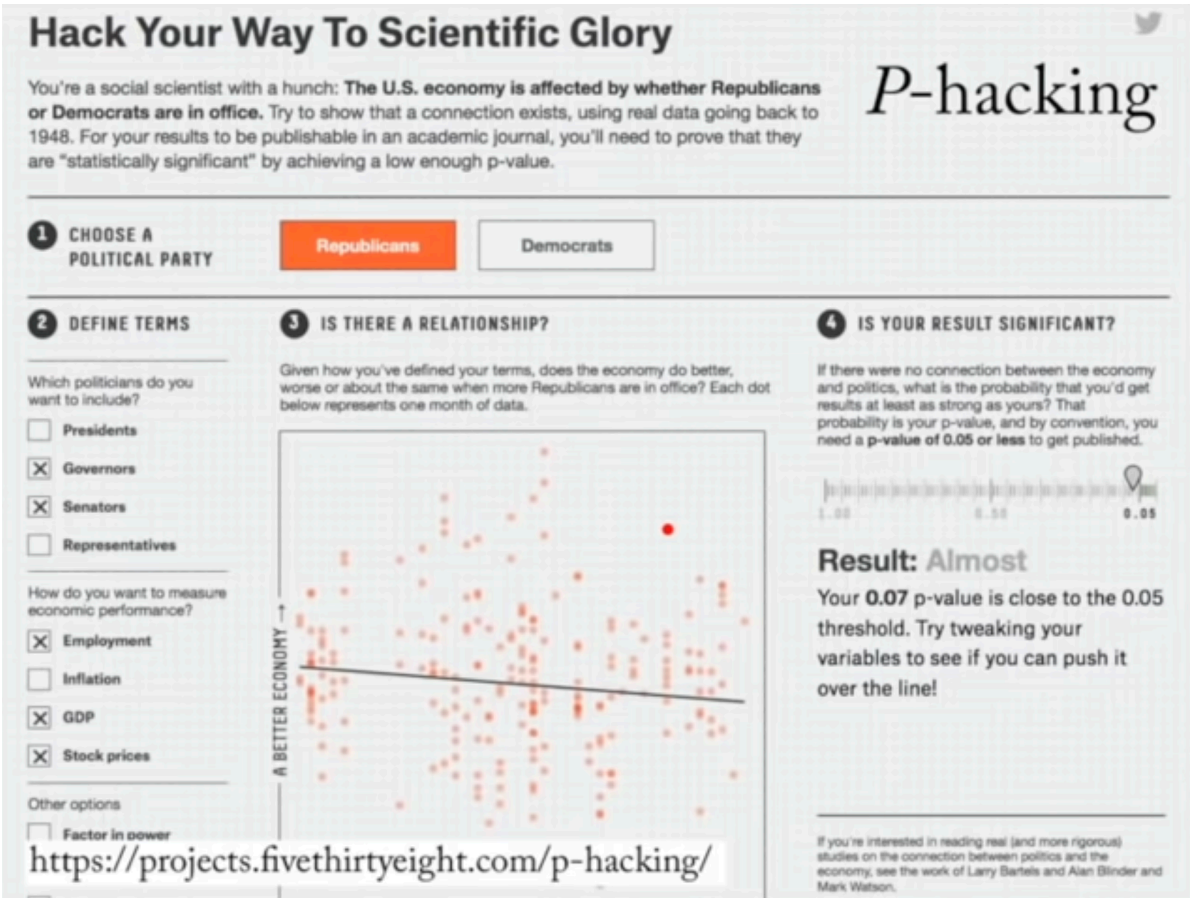


Figure 3: source

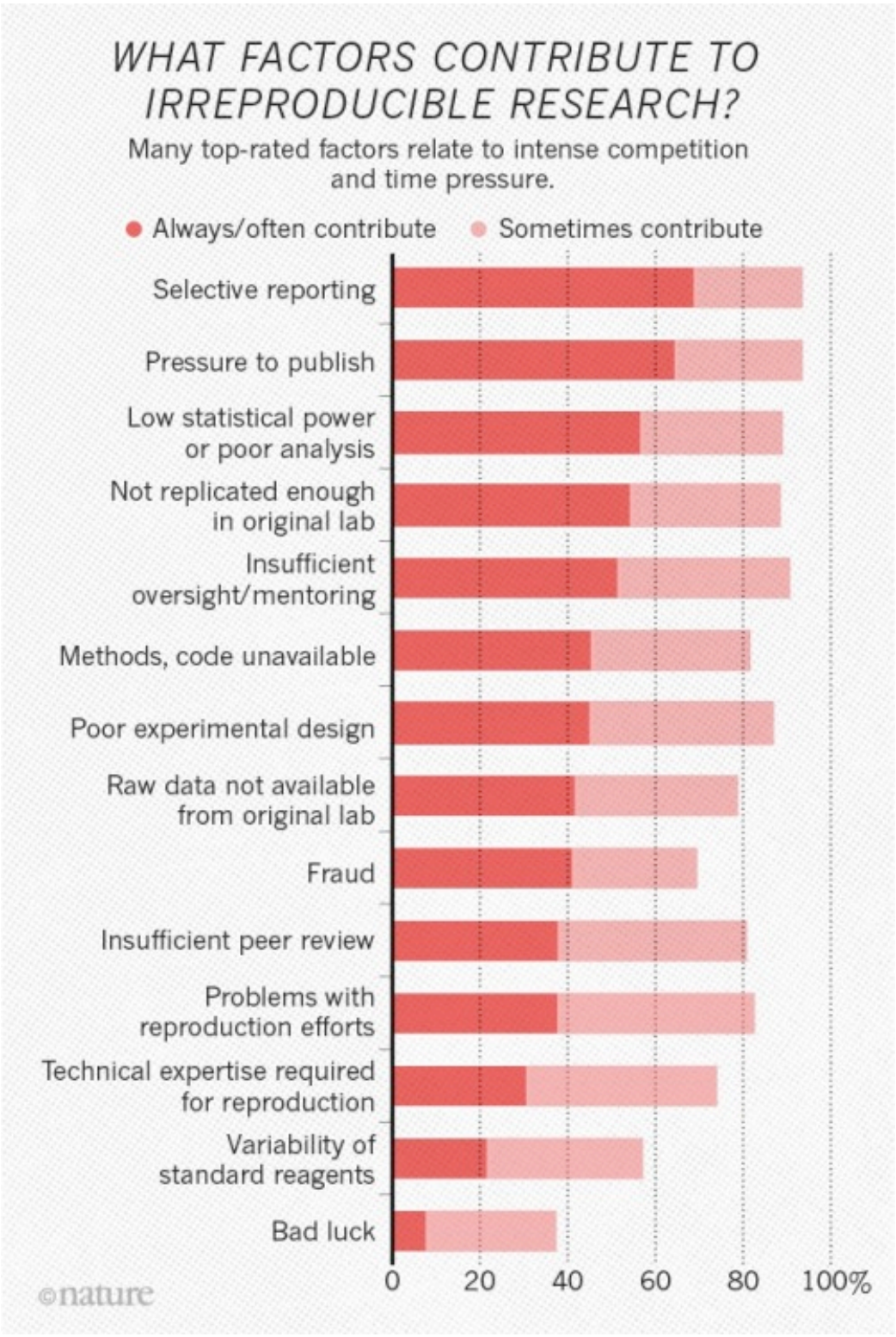


Figure 4: source

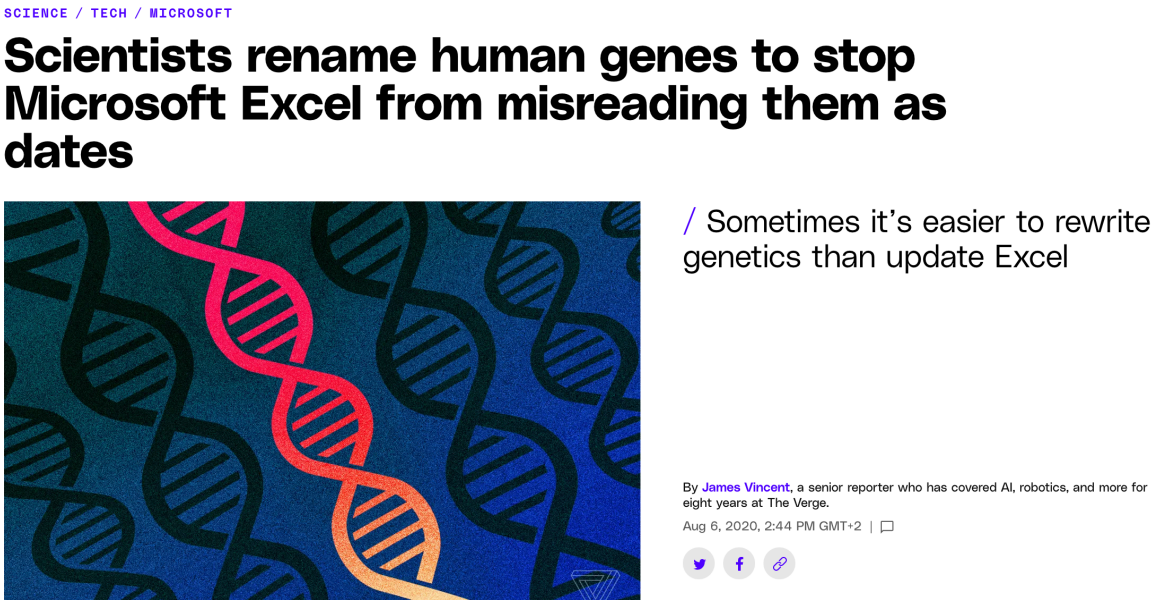


Figure 5: source

Principles of Open Science

Open Science lifecycle

Roles in Open Science

Funders make open science part of the selection process, and conditions for grantees conducting research.

Publishers make open science part of the review process, and conditions for articles published in their journals.

Institutions make open science part of academic training, and part of the selection process for research positions and evaluation for advancement and promotion.

Societies make open science part of their awards, events, and scholarly norms.

Researchers enact open science in their work and advocate for broader adoption in their communities.

[Center for Open Science]

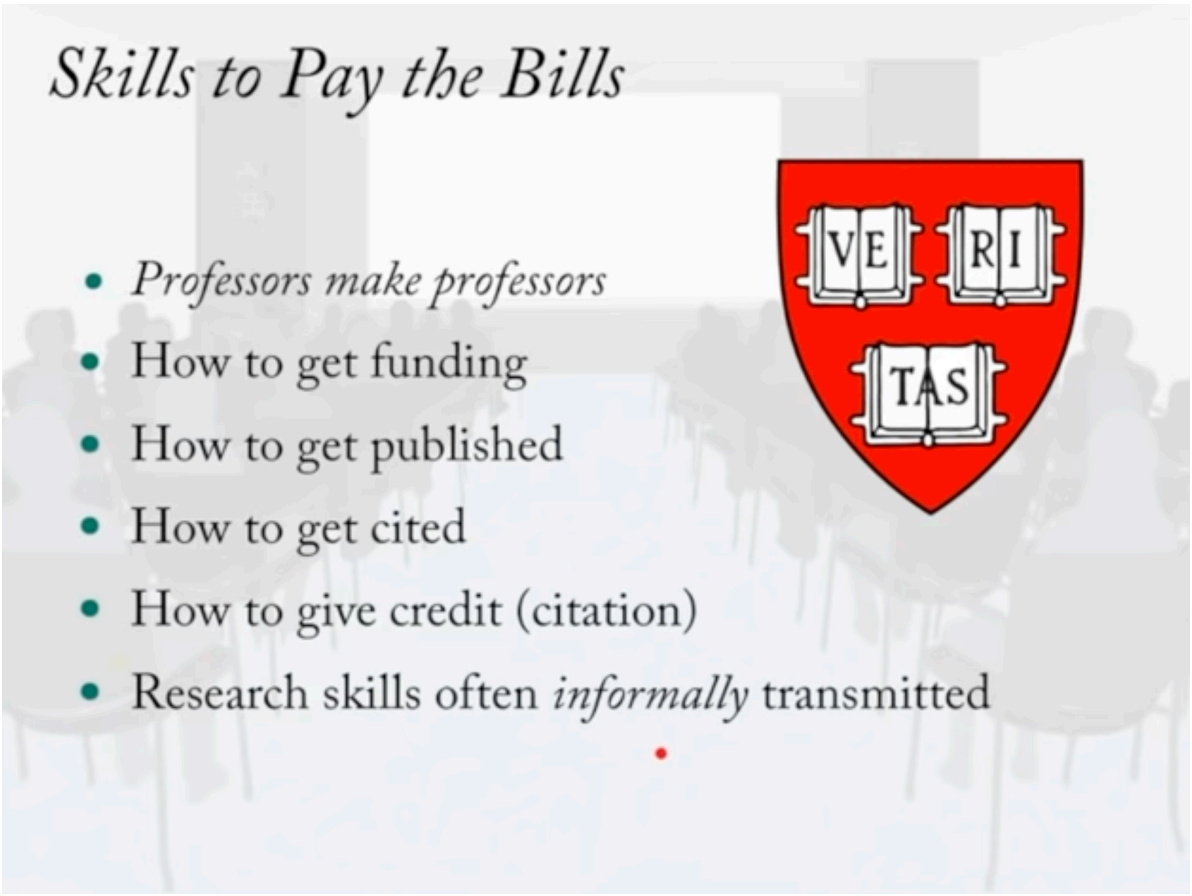
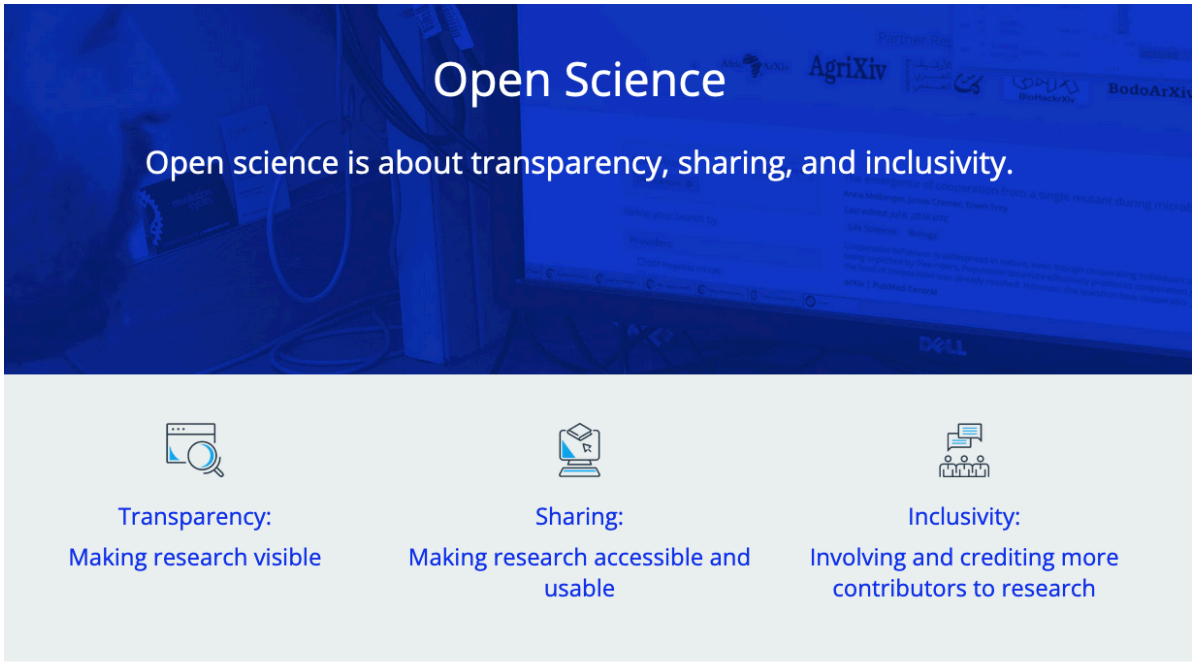


Figure 6: source



These principles aim to democratize access to research, promote equitable resource distribution, foster accountability and trustworthiness, accelerate self-correction, and improve rigor and reproducibility.

Figure 7: Center for Open Science

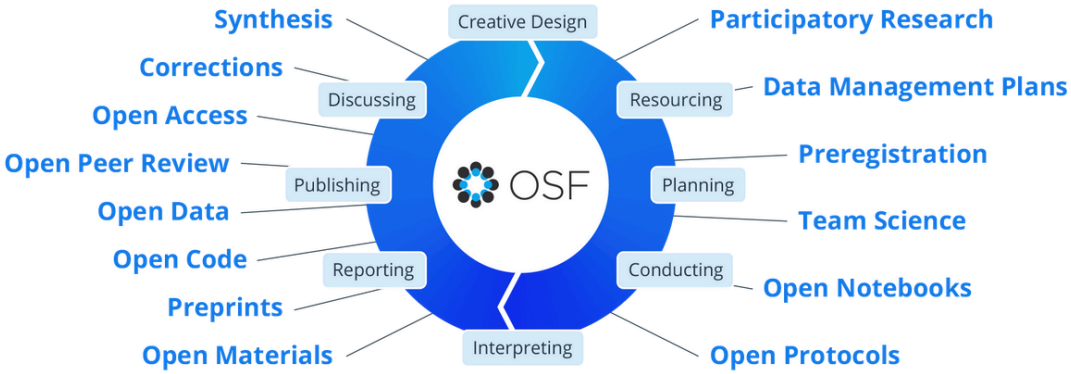


Figure 8: Center for Open Science

Who profits from Open Science?

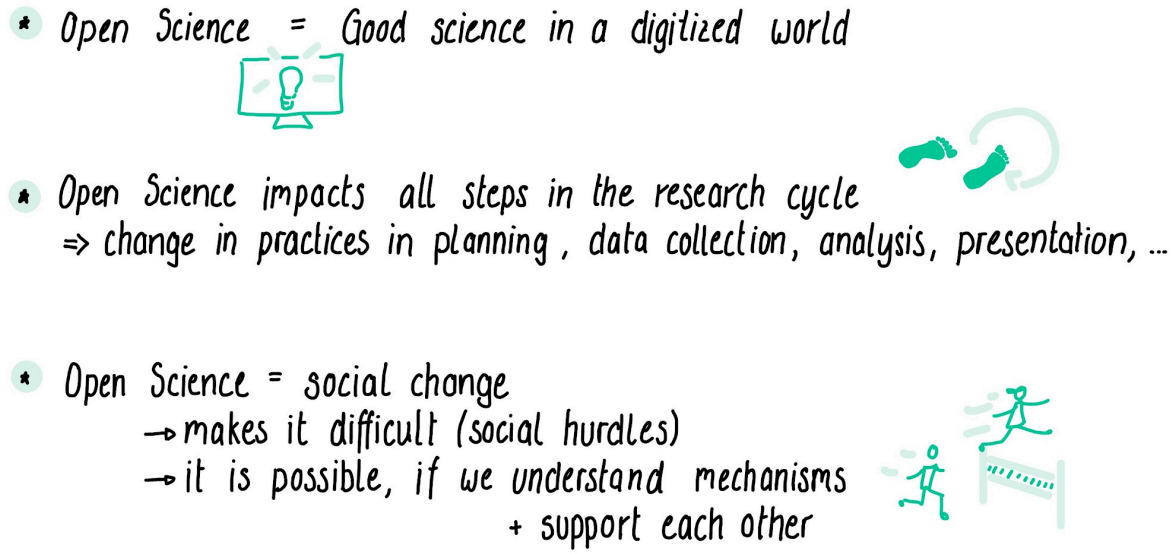
What is Open Science to you?

What do you find interesting, important, or attractive about Open Science?

https://tinyurl.com/opnsci

Figure 9: source

Learning outcomes



Implementing an open and reproducible workflow

1. version control
2. project structure
3. data
4. methods
5. code
6. authoring
7. publishing

Break

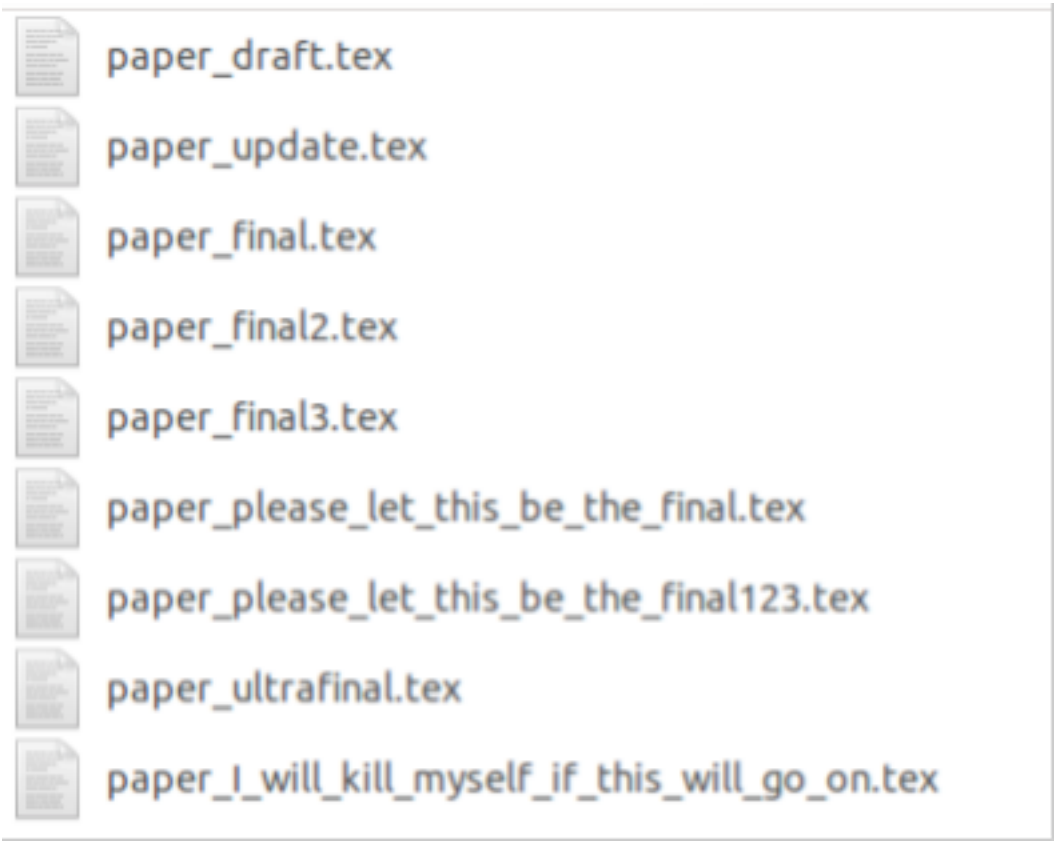
Taking notes

Networked notes

- logseq
- Obsidian

Version control

Why use version control?



Dear colleagues,

attached you find the first public version of the [redacted] protocol.
Please have a look and do comment. We can also meet to aggregate our reviews.

1 attachment: StudyProposa[redacted]_Validation_V1_250918docx.docx

source

---

git and GitHub/GitLab

git software on your machine

```
git add scr/tests.py
git commit -m 'add tests'
git push
```

GitHub and GitLab services on a remote server

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git commands

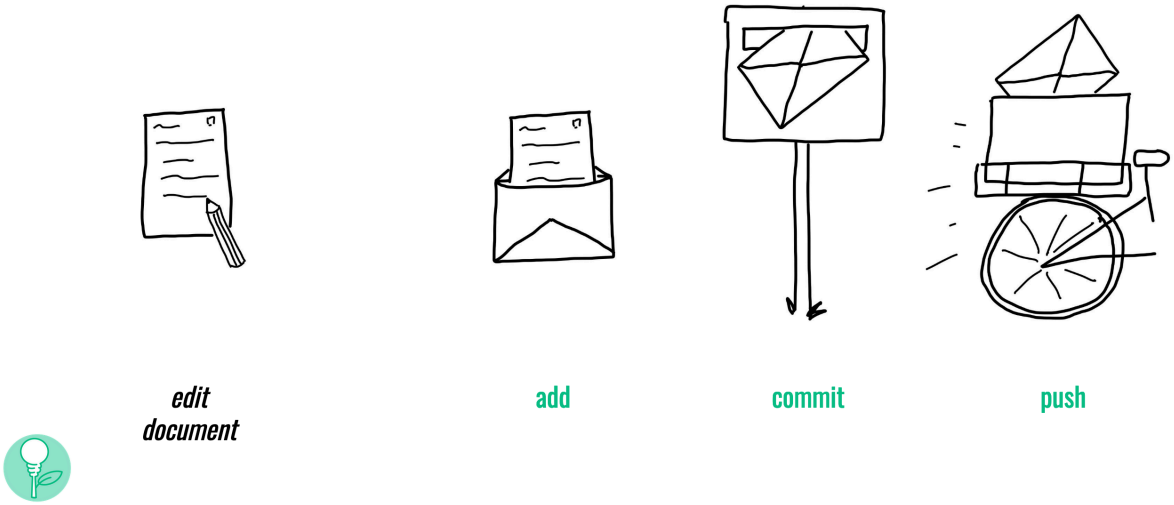

Figure 10: (source)

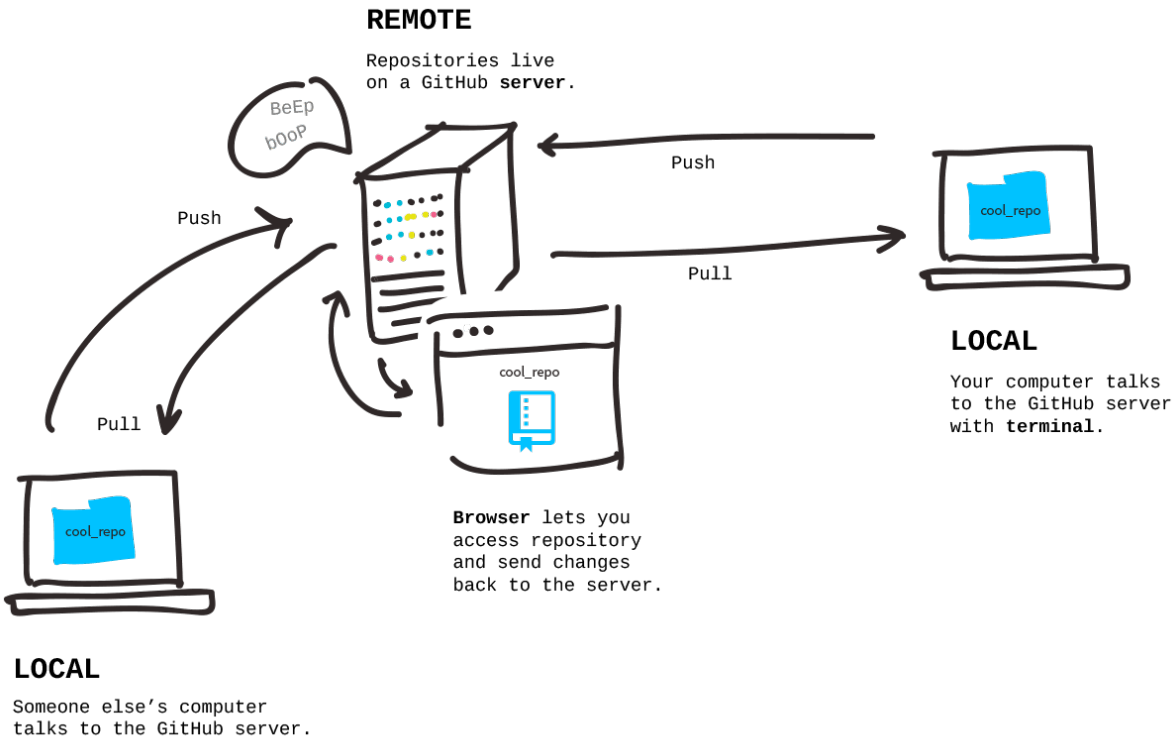

Figure 11: (source)

Collaborating using GitHub

GitHub workflow

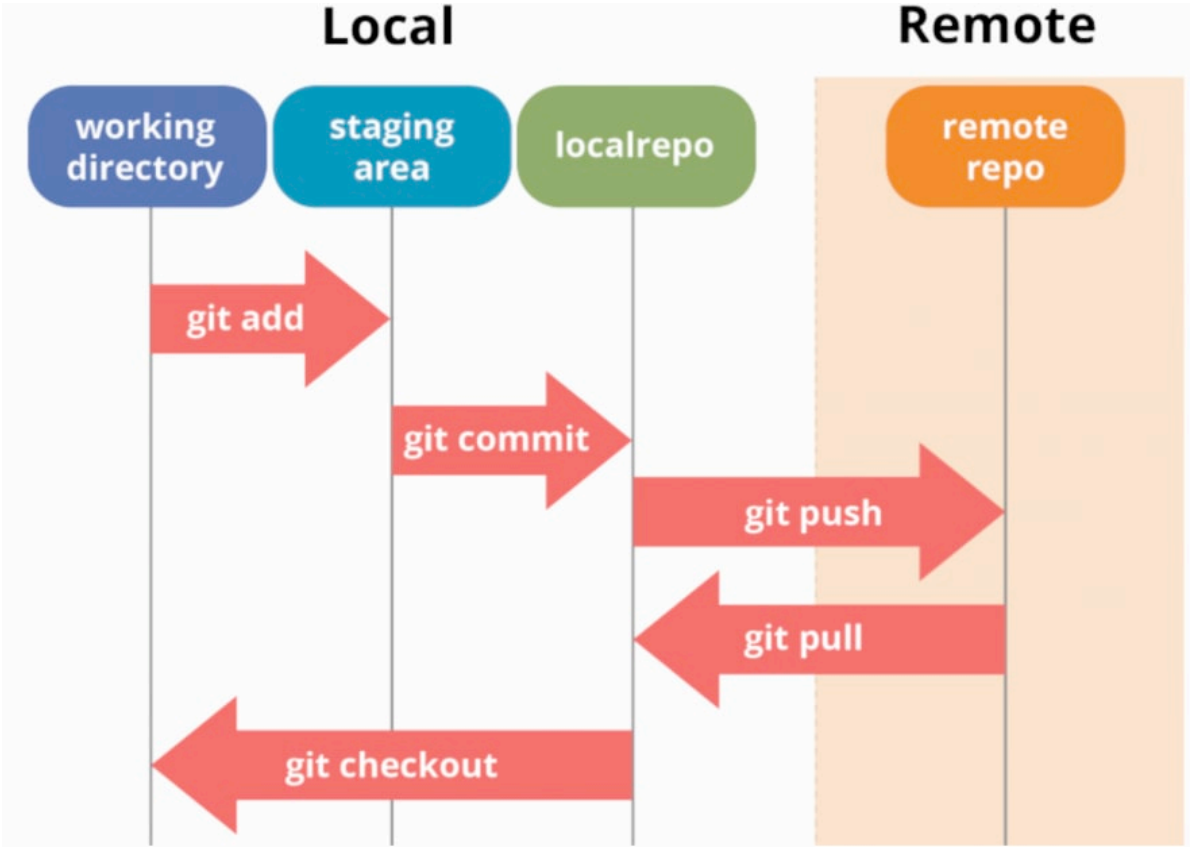

Figure 12: (source)

How to set up a GitHub repository

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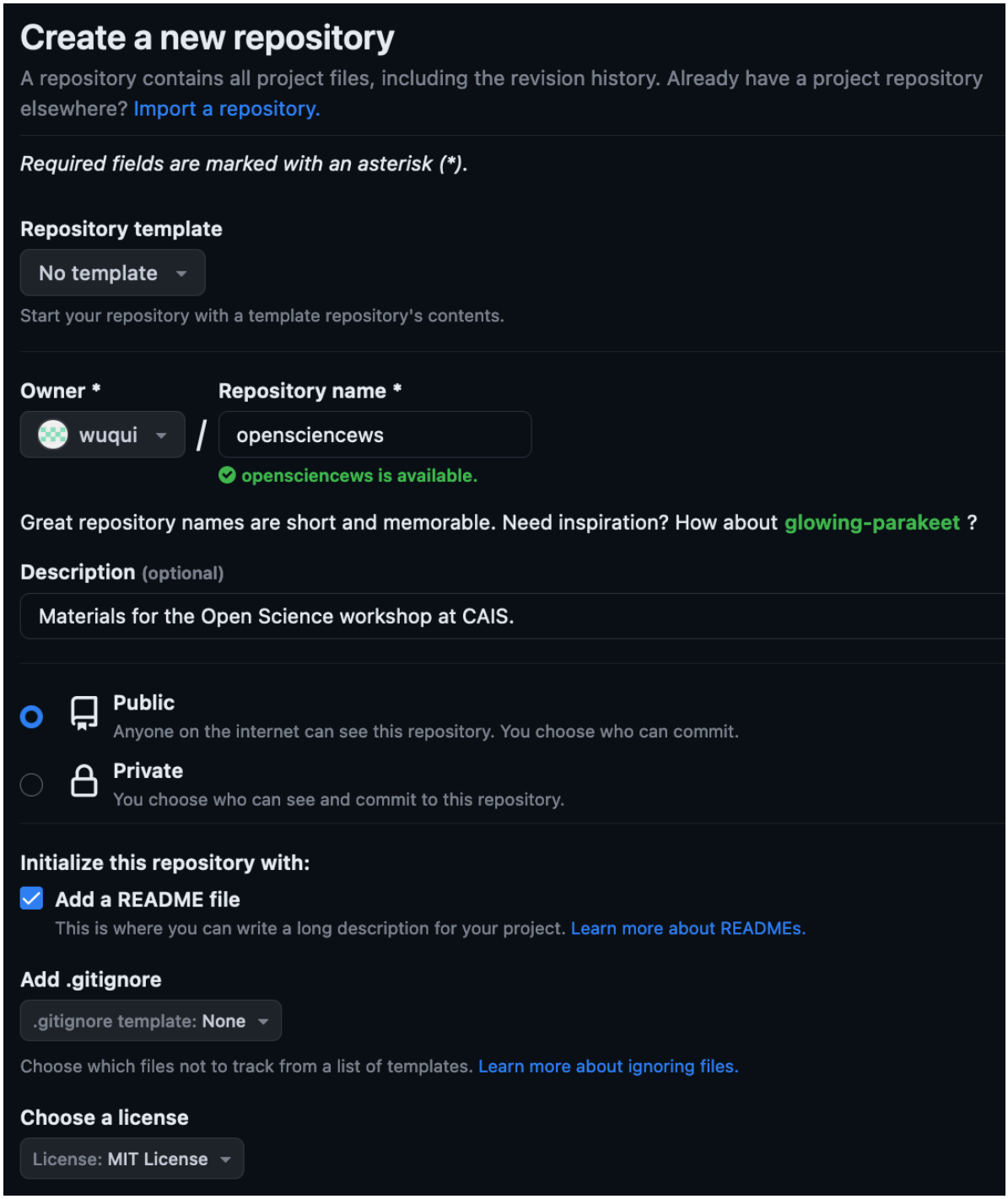
create a repository on GitHub

1. (create GitHub account)
2. click on `New` (https://github.com/new)
3. specify repo name [1]
4. specify description
5. specify visibility: private or public
6. select `Add a README file`
7. specify licence [2]

[1] safe: lowercase alphabet characters
[2] good choice for many purposes: MIT license


Create a new repository
A repository contains all project files, including the revision history. Already have a project repository elsewhere? Import a repository.
Required fields are marked with an asterisk (*).
Repository template
No template
Start your repository with a template repository's contents.
Owner *
Repository name *
wuqui
/
opensciencews
opensciencews is available.
Great repository names are short and memorable. Need inspiration? How about glowing-parakeet ?
Description (optional)
Materials for the Open Science workshop at CAIS.
Public
Anyone on the internet can see this repository. You choose who can commit.
Private
You choose who can see and commit to this repository.
Initialize this repository with:
Add a README file
This is where you can write a long description for your project. Learn more about READMEs.
Add .gitignore
.gitignore template: None
Choose which files not to track from a list of templates. Learn more about ignoring files.
Choose a license
License: MIT License

`clone` the repository

go to the folder where you want your project to live

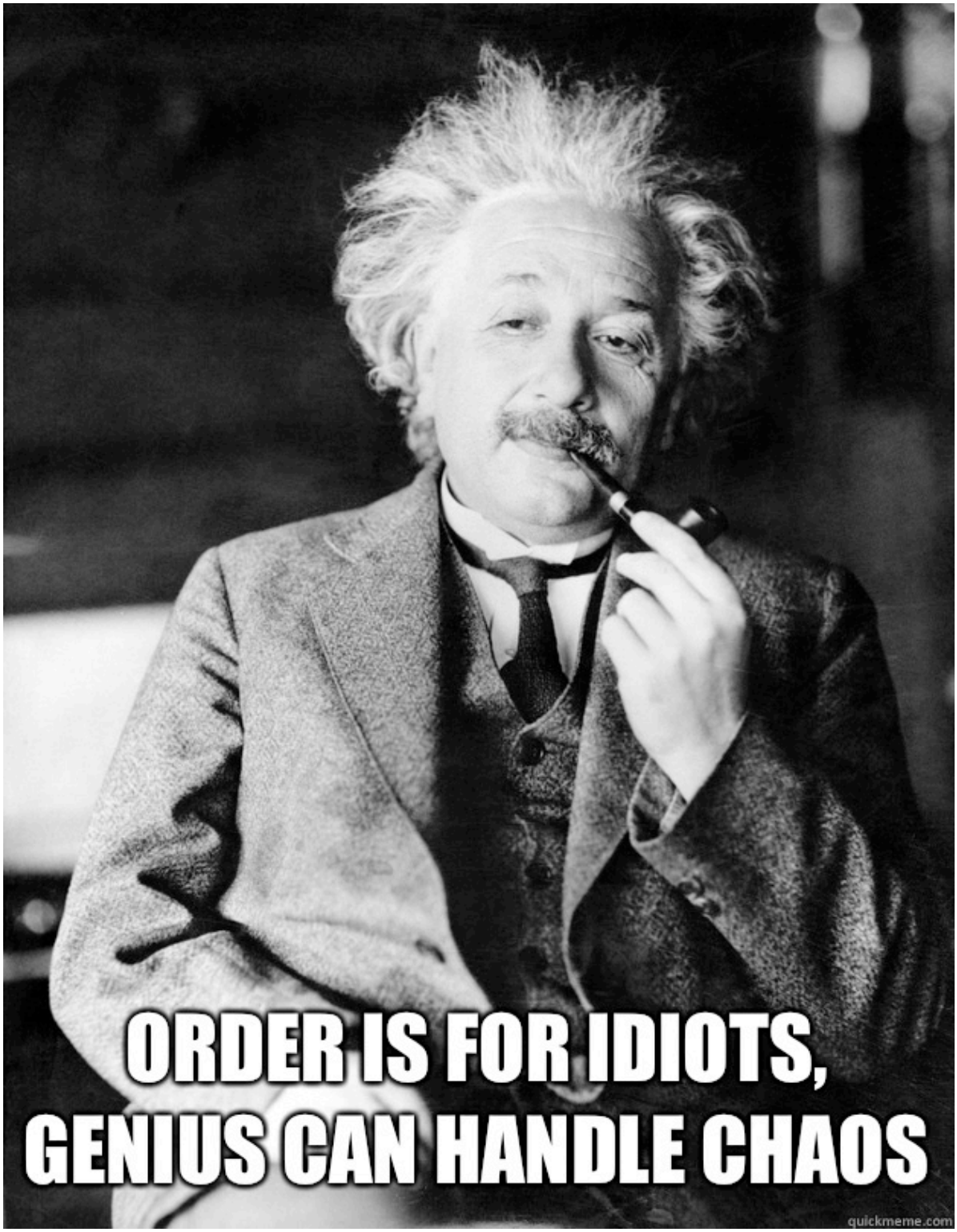

```
git clone https://github.com/wuqui/opensciws.git
```

`add` changes

`commit` changes

`push` changes

Project structure



Let's not pretend we're all geniuses ...

File names

NO

- `Myabstract.docx`
- `Joe's Filenames Use Spaces and Punctuation.xlsx`
- `figure 1.png`
- `fig 2.png`
- `JW7d^(2sl@deletethisandyourcareerisoverWx2*.txt`

YES

- `2014-06-08_abstract-for-sla.docx`
- `Joes-filenames-are-getting-better.xlsx`
- `Fig01_scatterplot-talk-length-vs-interest.png`
- `Fig02_histogram-talk-attendance.png`
- `1986-01-28_raw-data-from-challenger-o-rings.txt`

File names should be:

- Machine readable
- Human readable
- Optional: Consistent
- Optional: Play well with default ordering

File structure

```
.
   analysis            <- all things data analysis
      src              <- functions and other source files
   comm
      internal-comm    <- internal communication such as meeting notes
      journal-comm     <- communication with the journal, e.g. peer review
   data
      data_clean       <- clean version of the data
```

```
    data_raw        <- raw data (don't touch)
dissemination
    manuscripts
    posters
    presentations
documentation       <- documentation, e.g. data management plan
misc                <- miscellaneous files that don't fit elsewhere
```

```
tree DIR
```

cookie cutters

Practice: managing files and folders

Data

FAIR data

Types of data

- interviews
- questionnaires
- web
- social media

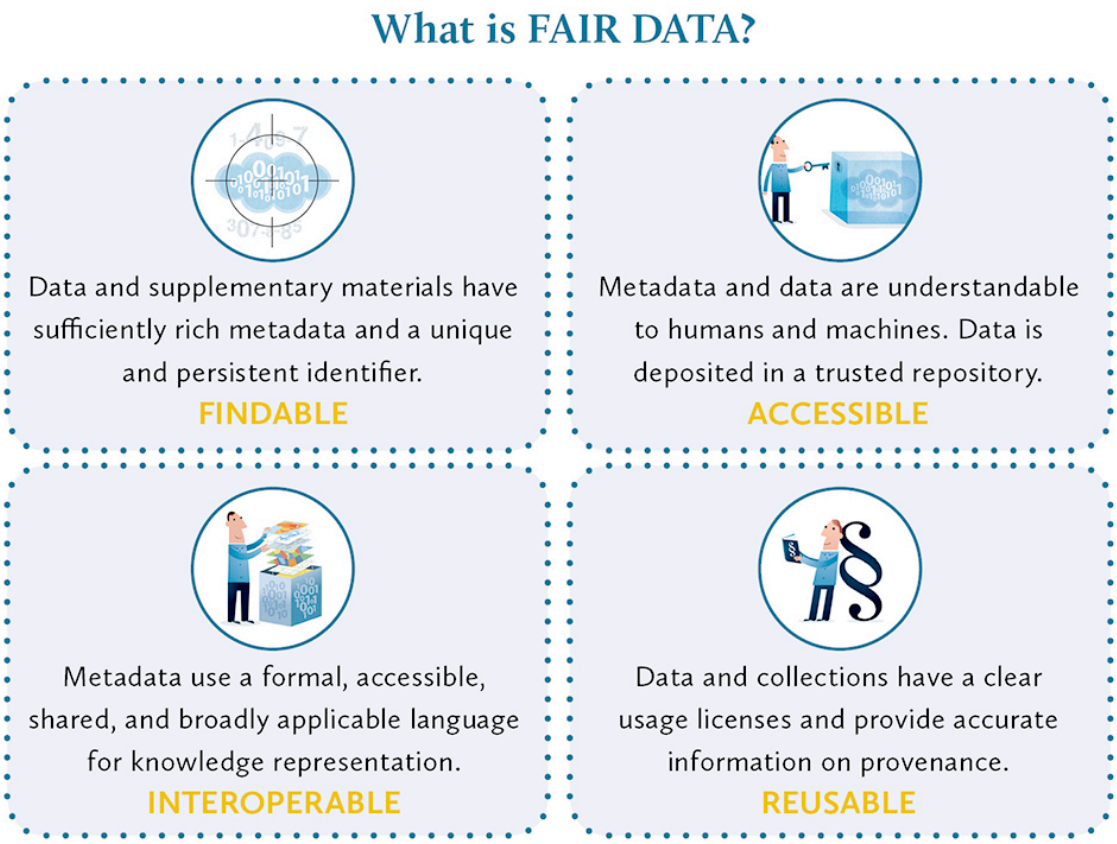


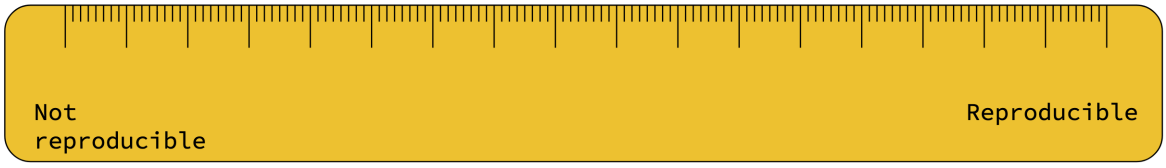
Figure 13: source

Code

Reproducibility et al.

		Data	
		Same	Different
Analysis	Same	Reproducible	Replicable
	Different	Robust	Generalisable

Figure 14: The Turing Way



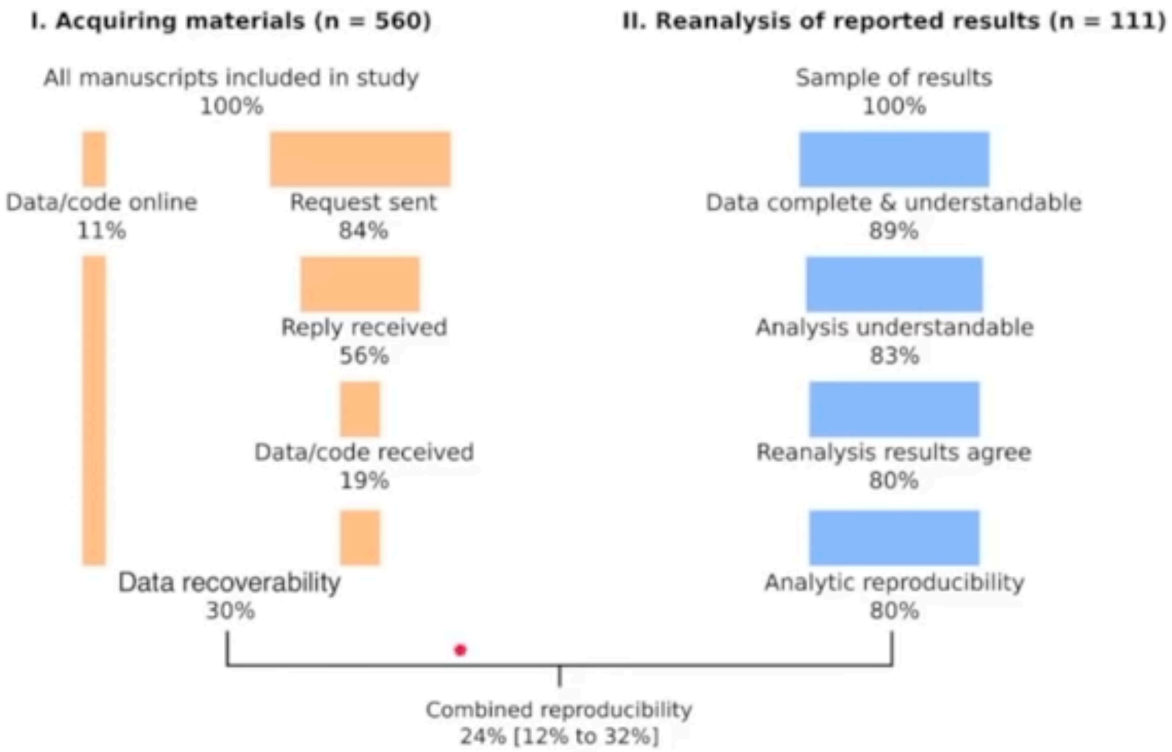


Figure 15: source

notebooks and literate programming

- Knuth
  - application
    - R
    - Python: nbdev

Licensing

Code

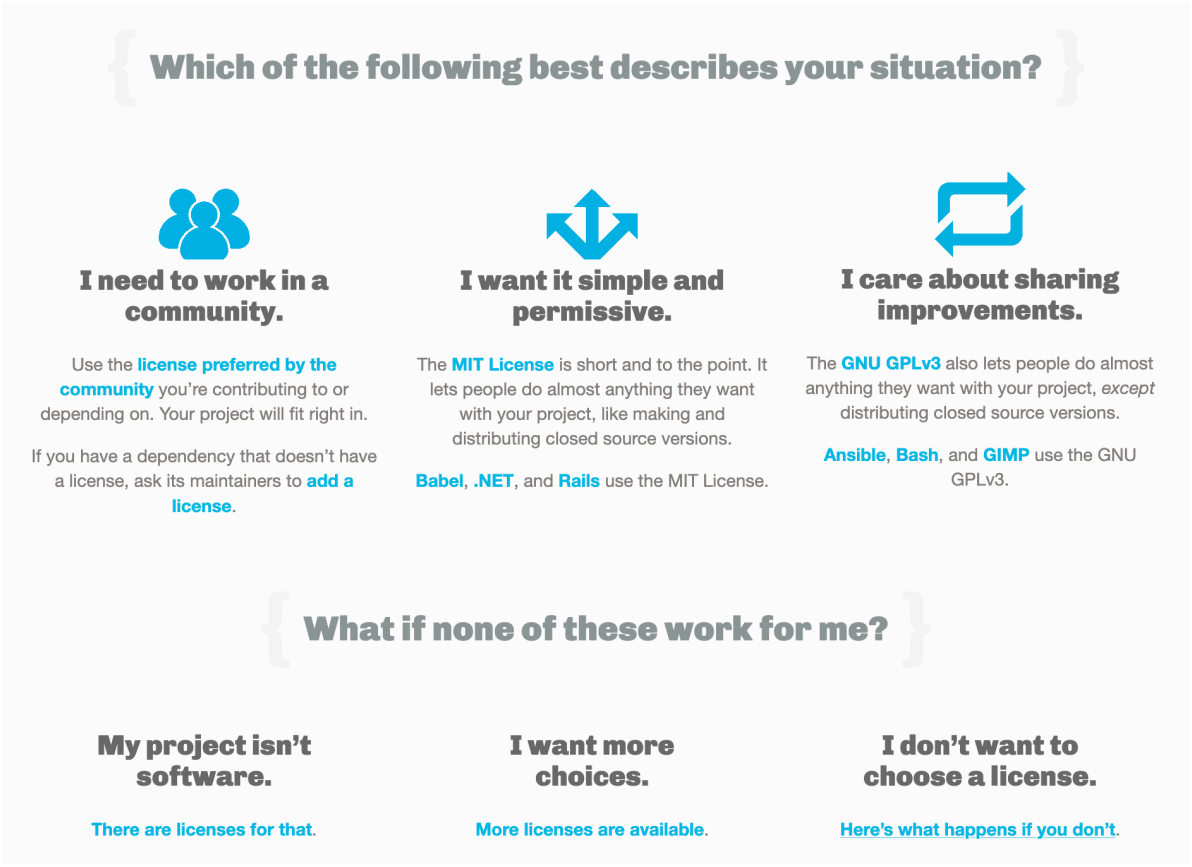


Figure 16: https://choosealicense.com

Other materials

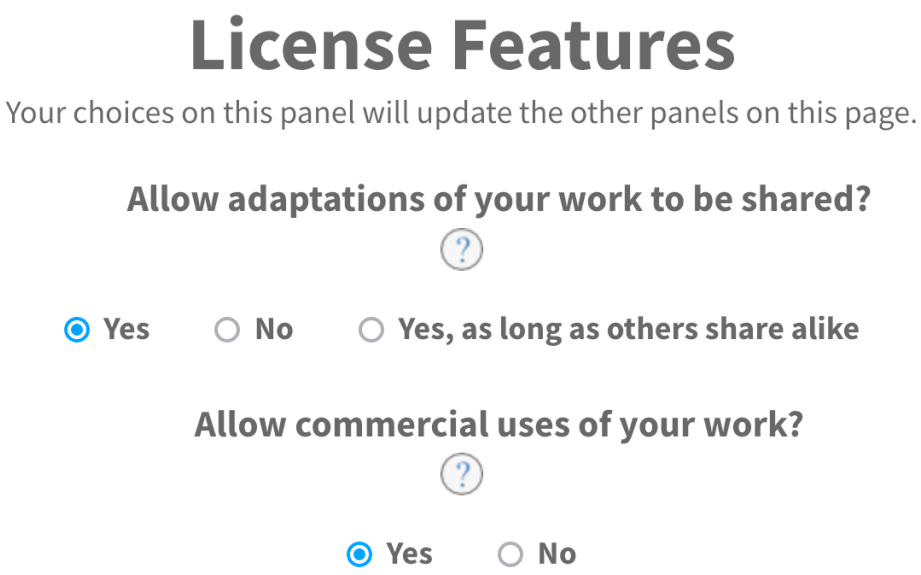


Figure 17: https://creativecommons.org/choose/

Authoring

Authoring **How** can we organise our project from the beginning so that we can publish outputs in the end?
Publishing **Where** can I publish my work (platforms, research centers infrastructure, …)?

Plain text

Quarto

- single source → multiple output formats
  - PDF for publication outlets

- blog
- website

Publishing

How: How can we organise our project from the beginning so that we can publish outputs in the end? Where: Where can I publish my work (platforms, research centers infrastructure, …)?

Pre-registration

Figure 18: source

Outlets

ArXiV preprints
Zenodo all kinds including data, code, preprints, etc.
GitHub and GitLab code, software
Open Science Framework all kinds including data, code, preprints, preregistration, etc.
Software Heritage archival of code (long-term)
Papers with Code code and data for and with papers, mostly Machine Learning

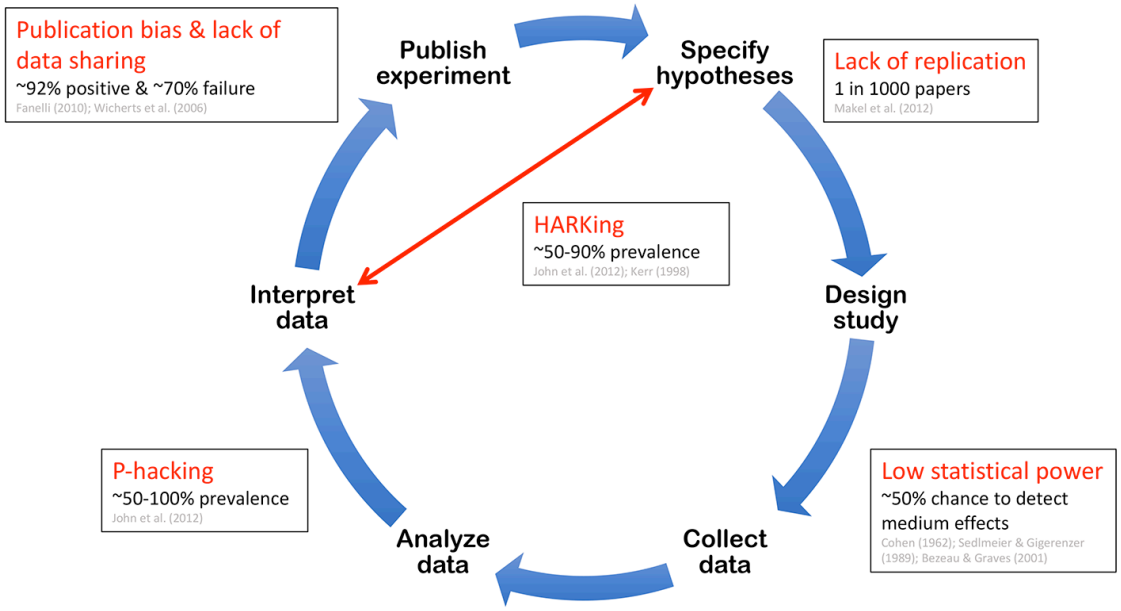


Figure 19: source

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Resources

- DRA
- The Turing Way
- Data Carpentries