The Alan Turing Institute

The Turing Way Workshop

Shared document:
hackmd.io/@turingway/2022-09-cdt

Malvika Sharan
Pronouns: she/her/hers

Learning Objectives

- **Setting the tone:** *Scientific errors have real world effect!*
- Define reproducible and open research
- How reproducible and open principles relate to ethics
- Reflect on your own work (current or future)
- Collaborate to develop case studies

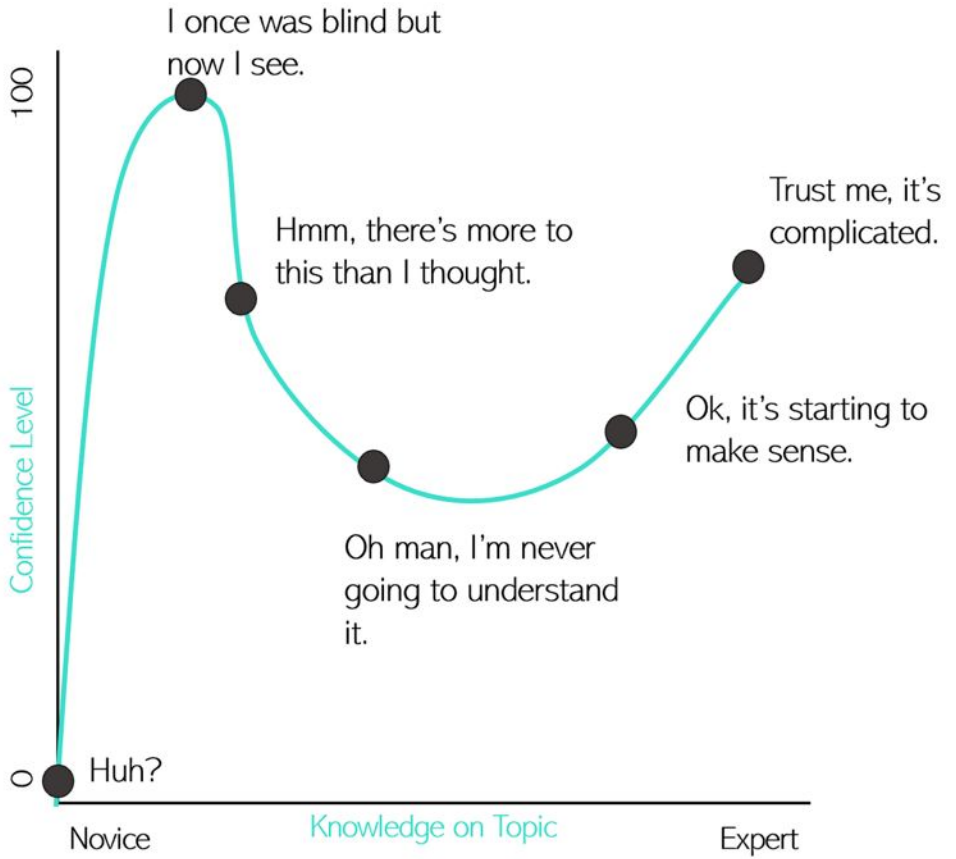
Discuss best practices & share resources for future use.

Response from pre-workshop survey

- Process of collaborating with others: Not → Sometimes difficult
- Aspects of Open Science you are aware of: Open (Access, Source, Data), *These are all jargon*
- Comfortable with using GitHub: Never used → Very comfortable
- *"Learn more about maintaining open projects, creating communities, skill set for infrastructure roles, ethical considerations, career paths"*
- *"I'd like to find out more about how people from 'non-traditional' domains find their places and work with others in the field of AI."*

Disclaimer:

You probably already know all about it!



Adapted from: Squad. (2018, December 13). Dunning-Kruger Effect: Definition, Test, Examples & Quiz. Science Terms. https://scienceterms.net/psychology/dunning-kruger-effect/

Kaylee Somerville, The Hidden Power of Intellectual Humility - The Decision Lab. 2020. https://thedecisionlab.com/insights/society/the-hidden-power-of-intellectual-humility

Scientific errors have real world effects

Researchers have an obligation to consider the ethical standards (right actions) and their impact on society.

Scientific errors have real world effects

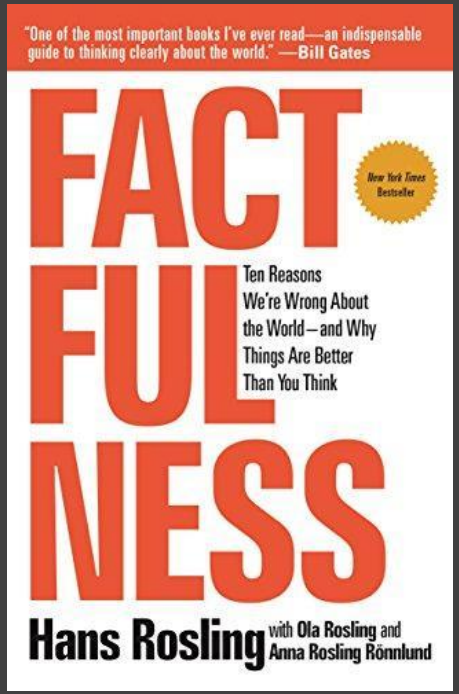
	B	C	I	J	K	L	M
2			Real GDP growth				
3			Debt/GDP				
4	Country	Coverage	30 or less	30 to 60	60 to 90	90 or above	30 or less
26			3.7	3.0	3.5	1.7	5.5
27	Minimum		1.6	0.3	1.3	-1.8	0.8
28	Maximum		5.4	4.9	10.2	3.6	13.3
29							
30	US	1946-2009	n.a.	3.4	3.3	-2.0	n.a.
31	UK	1946-2009	n.a.	2.4	2.5	2.4	n.a.
32	Sweden	1946-2009	3.6	2.9	2.7	n.a.	6.3
33	Spain	1946-2009	1.5	3.4	4.2	n.a.	9.9
34	Portugal	1952-2009	4.8	2.5	0.3	n.a.	7.9
35	New Zealand	1948-2009	2.5	2.9	3.9	-7.9	2.6
36	Netherlands	1956-2009	4.1	2.7	1.1	n.a.	6.4
37	Norway	1947-2009	3.4	5.1	n.a.	n.a.	5.4
38	Japan	1946-2009	7.0	4.0	1.0	0.7	7.0
39	Italy	1951-2009	5.4	2.1	1.8	1.0	5.6
40	Ireland	1948-2009	4.4	4.5	4.0	2.4	2.9
41	Greece	1970-2009	4.0	0.3	2.7	2.9	13.3
42	Germany	1946-2009	3.9	0.9	n.a.	n.a.	3.2
43	France	1949-2009	4.9	2.7	3.0	n.a.	5.2
44	Finland	1946-2009	3.8	2.4	5.5	n.a.	7.0
45	Denmark	1950-2009	3.5	1.7	2.4	n.a.	5.6
46	Canada	1951-2009	1.9	3.6	4.1	n.a.	2.2
47	Belgium	1947-2009	n.a.	4.2	3.1	2.6	n.a.
48	Austria	1948-2009	5.2	3.3	-3.8	n.a.	5.7
49	Australia	1951-2009	3.2	4.9	4.0	n.a.	5.9
50							
51			4.1	2.8	2.8	=AVERAGE(L30:L44)	

https://statmodeling.stat.columbia.edu/2013/04/16/memo-to-reinhart-and-rogoff-i-think-its-best-to-admit-your-errors-and-go-on-from-there
https://www.bbc.co.uk/news/magazine-22223190

Scientific errors have real world effects

"We will redouble our efforts to avoid such errors in the future …" - Reinhart & Rogoff

"Our problem is that we don't know what we don't know, and even our guesses are informed by unconscious and predictable biases." - Hans Rosling



https://www.gapminder.org/, Rosling, H., Rönnlund, A. R., & Rosling, O. (2018). Factfulness: Ten Reasons We're Wrong About the World--and Why Things Are Better Than You Think. https://www.bbc.co.uk/news/magazine-22223190

Price of Popularity

Researchers in Australia publishes unreliable COVID-19 data with their preprint and misreported that an anti-parasite drug could stop the virus from replicating in cells.

In a desperate attempt to save dying patients, doctors began justifying the drug's use against COVID-19 as the virus spread aggressively throughout Latin America.

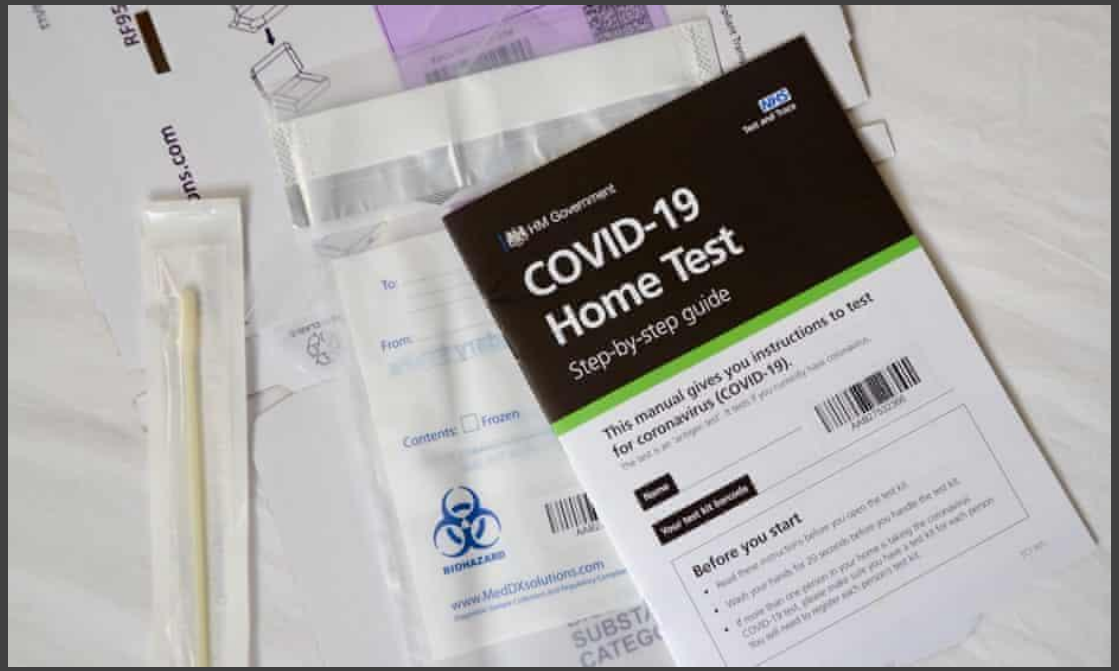
Reardon, S. (2021). Flawed ivermectin preprint highlights challenges of COVID drug studies. Nature, 596, 173–174. doi: 10.1038/d41586-021-02081-w. Mega, E. R. (2020). Latin America's embrace of unproven COVID treatment hinders drug trials. Nature, 586, 481–482. doi: 10.1038/d41586-020-02958-2, Slides under DOI: 10.5281/zenodo.7050678

Post-publication Peer Review is Important, But …

To consult the [experts] after an experiment is finished is often merely to ask to conduct a post mortem examination. […] can perhaps say what the experiment died of. - Ronald Fisher

https://statmodeling.stat.columbia.edu/2013/04/16/memo-to-reinhart-and-rogoff-i-think-its-best-to-admit-your-errors-and-go-on-from-there
https://www.bbc.co.uk/news/magazine-22223190

Public Scrutiny is Important for Accountability



Under-reported figures

From 25 Sept to 2 Oct

50,786

Cases initially reported by PHE

15,841

Unreported cases, missed due to IT error

8 days of incomplete data

1,980 cases per day, on average, were missed in that time

48 hours Ideal time limit for tracing contacts after positive test

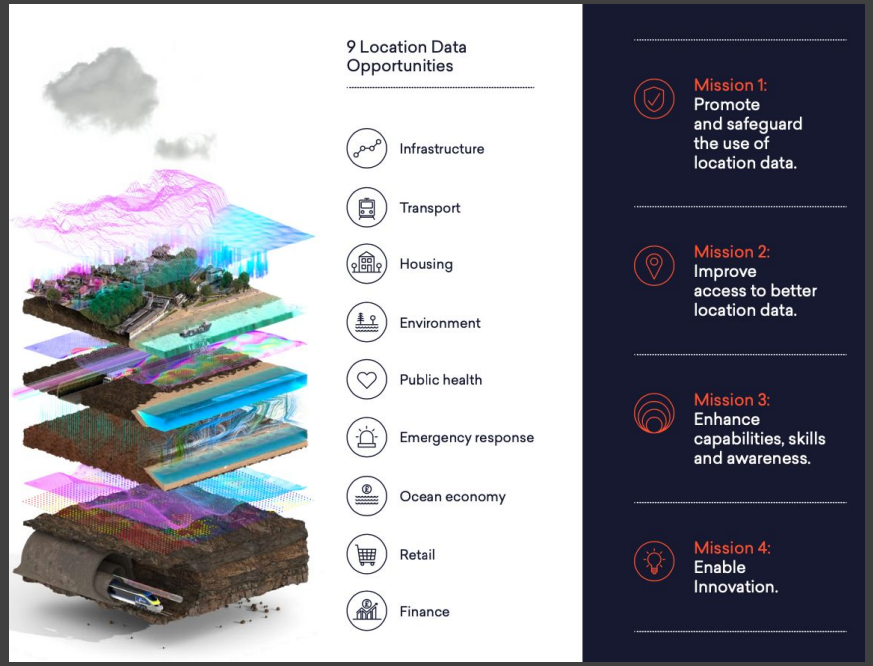
Source: PHE and gov.uk

Kelion, B. L. (2020). Excel: Why using Microsoft's tool caused Covid-19 results to be lost. BBC News. https://www.bbc.co.uk/news/technology-54423988

‘That’s what you would expect there’

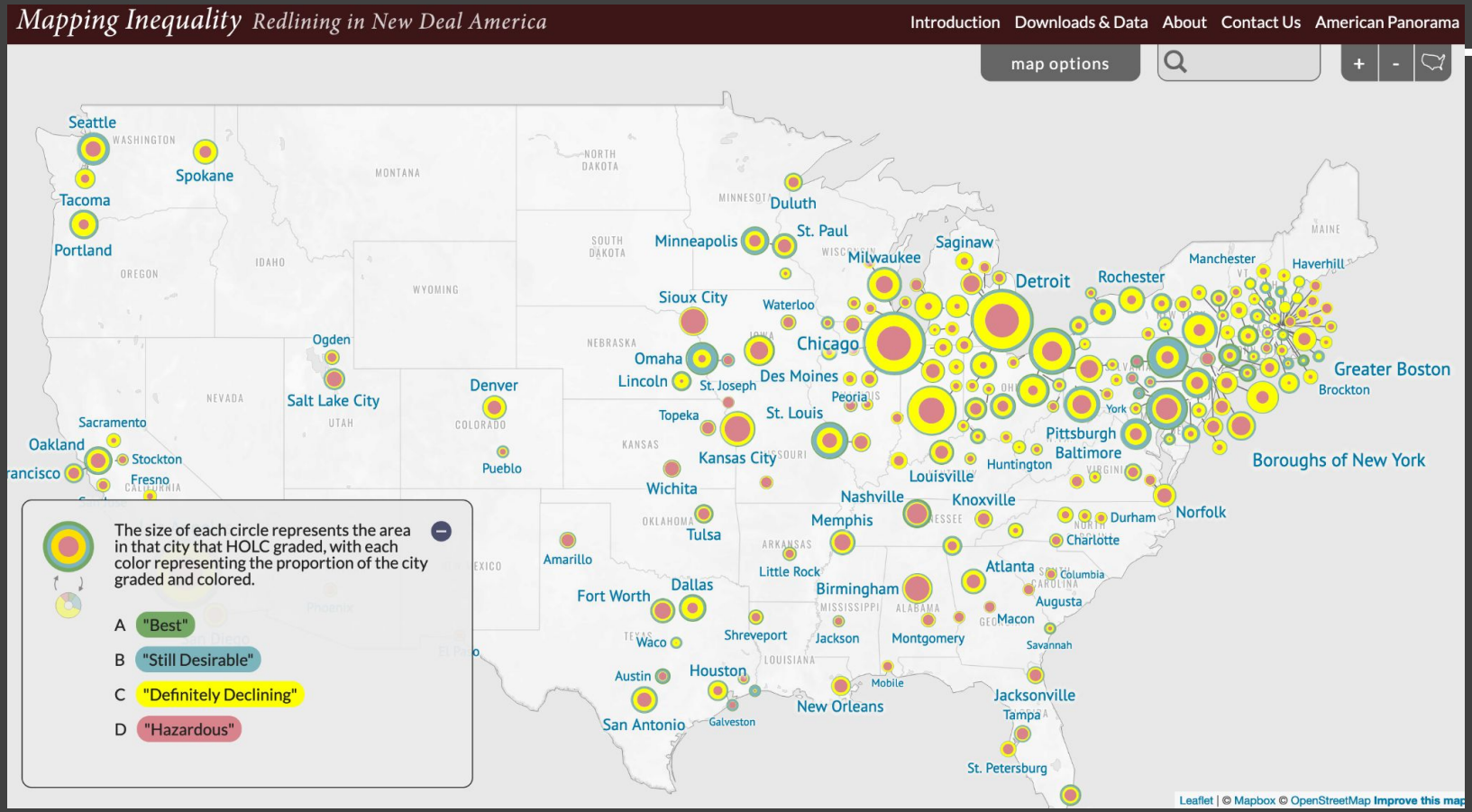
Data about location, or ‘geospatial’ data, is the record of what we do, and where we do it. - GOV

There is a danger that [...] how it is analysed, can reflect inherent biases about a location and, equally, can influence how the findings of a project are interpreted. - UKSA

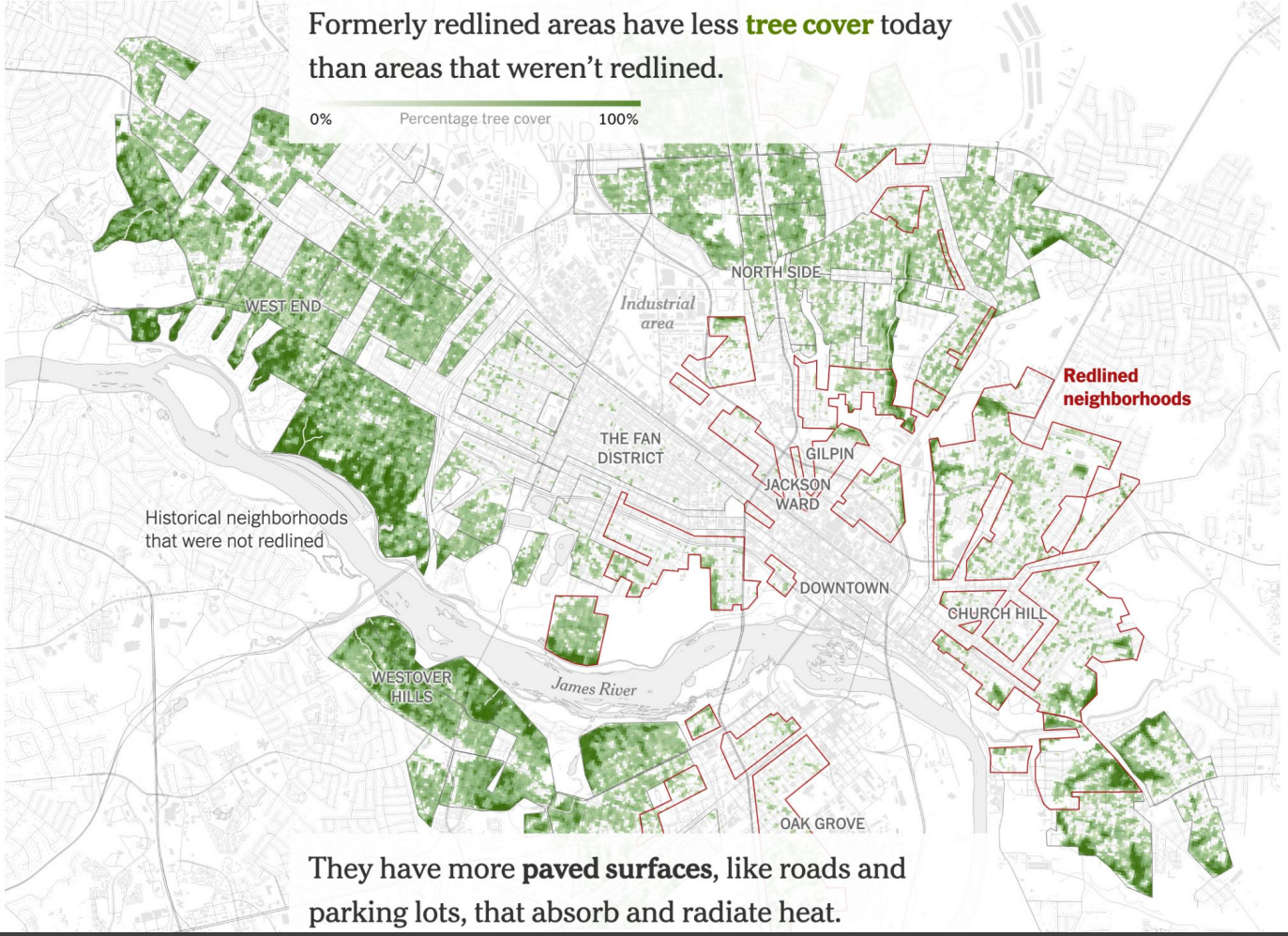


Unlocking the power of location:The UK’s geospatial strategy. (2020) GOV. https://www.gov.uk/government/publications/unlocking-the-power-of-locationthe-uks-geospatial-strategy

Ethical considerations in the use of geospatial data for research and statistics. (2022, March 01). UK Statistics Authority. uksa.statisticsauthority.gov.uk/publication/ethical-considerations-in-the-use-of-geospatial-data-for-research-and-statistics/pages/5. Office, C.



The term 'redlining' was coined by the sociologist John McKnight in the 1960s, to define the discriminatory practice of avoiding investment in communities with unfavourable or high-risk demographics, typically with large minority and immigrant populations. ***Interactive map:*** ***https://dsl.richmond.edu/panorama/redlining/#loc=5/39.1/-94.58***



Redlining was outlawed by the 1970s - but the practice has left lasting marks.

Low access to housing finance, less investment, more paved surfaces, reduced tree cover → influencing extreme heat and worse impact of climate change.

Plumer, B., Popovich, N., & Palmer, B. (2022). How Decades of Racist Housing Policy Left Neighborhoods Sweltering. New York Times. https://www.nytimes.com/interactive/2020/08/24/climate/racism-redlining-cities-global-warming.html

Avoid Errors Before the Harm Occurs

1. Mistaken research design or analysis processes
    - **Design for reproducible, ethical and collaborative research**

Allison, D. B., Brown, A. W., George, B. J., & Kaiser, K. A. (2016). Reproducibility: A tragedy of errors. Nature, 530(7588), 27. doi: 10.1038/530027a

Avoid Errors Before the Harm Occurs

1. Mistaken research design or analysis processes
    - **Design for reproducible, ethical and collaborative research**
2. Lack of diverse tools, methods and expertise to draw from
    - **Data handling/management, analysis, collaboration process**

Allison, D. B., Brown, A. W., George, B. J., & Kaiser, K. A. (2016). Reproducibility: A tragedy of errors. Nature, 530(7588), 27. doi: 10.1038/530027a

Avoid Errors Before the Harm Occurs

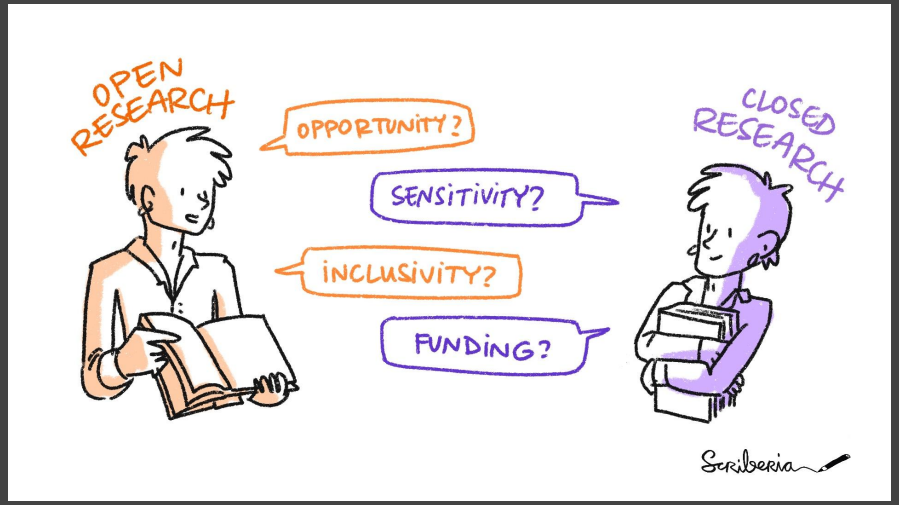
1. Mistaken research design or analysis processes
    - **Design for reproducible, ethical and collaborative research**
2. Lack of diverse tools, methods and expertise to draw from
    - **Data handling/management, analysis, collaboration process**
3. Inappropriate baseline comparison and assumption of future use
    - **Lack of technical understanding and their social impact**

Allison, D. B., Brown, A. W., George, B. J., & Kaiser, K. A. (2016). Reproducibility: A tragedy of errors. Nature, 530(7588), 27. doi: 10.1038/530027a

Reflection Exercise

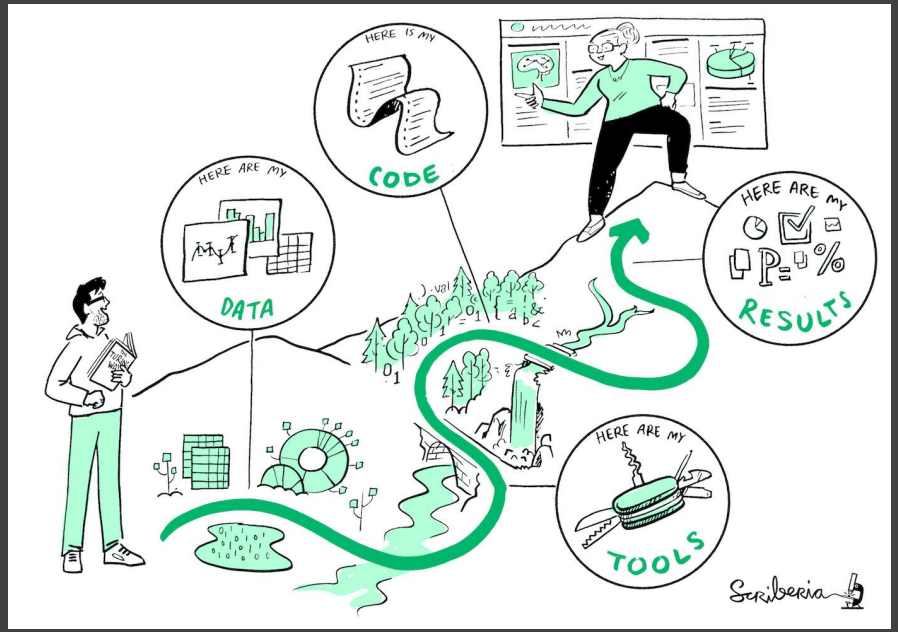
What are the some technical or ethical concerns you have about your work?

- Who are impacted by your work?
- What resources or expertise you need but don't have access to?
- What tools and practices you have yet to learn about?



Research Reproducibility

Reproducible research save valuable time in verifying and building upon existing solutions.



		Data	
		Same	Different
Analysis	Same	Reproducible	Replicable
	Different	Robust	Generalisable

https://the-turing-way.netlify.app/reproducible-research/overview/overview-definitions.html

DOI: 10.5281/zenodo.7050678

Why do reproducible research?

https://the-turing-way.netlify.app/reproducible-research/overview/overview-benefit.html, DOI: 10.5281/zenodo.7050678

Barriers to reproducible research

Is not considered for promotion

Held to higher standards than others

Publication bias towards novel findings

Requires additional skills

Plead the 5th

Support additional users

Takes time

https://doi.org/10.6084/m9.figshare.5537101
#TuringWay @turingway, DOI: 10.5281/zenodo.7050678

Held to higher

Is not co

for pro

ation bias

ds novel

dings

Requir

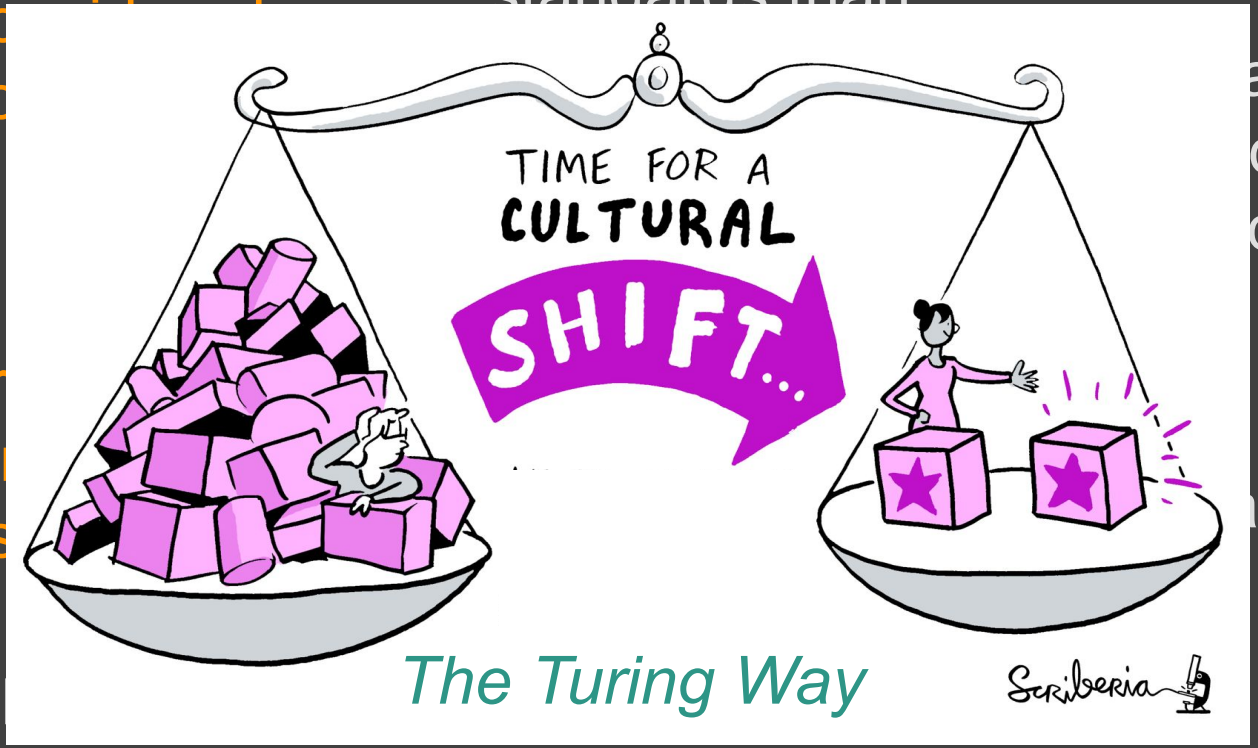
additio

skills

d the 5th

Sup

users



https://doi.org/10.6084/m9.figshare.5537101
#TuringWay @turingway, DOI: 10.5281/zenodo.7050678

The Turing Way

An open Source, community-led guide on Data Science.

*We involve and supports a **diverse community** to make research **reproducible, ethical, open and inclusive** for everyone.*

The Alan Turing Institute

The national institute for data science and artificial intelligence

Research Programmes

Sector specific research

Integration of best practices

https://www.turing.ac.uk/, DOI: 10.5281/zenodo.7050678

Tools, Practices and Systems

- Trustworthy systems
- Transparent reporting
- Inclusive interoperable design
- Ethical integrity
- Respectful co-creation
- Leadership in open research

The Turing Way Book on Reproducibility

Kirstie Whitaker

Director: Tools, Practices & Systems Programme (TPS)

Malvika Sharan

TPS Senior Researcher: Open Research & Community

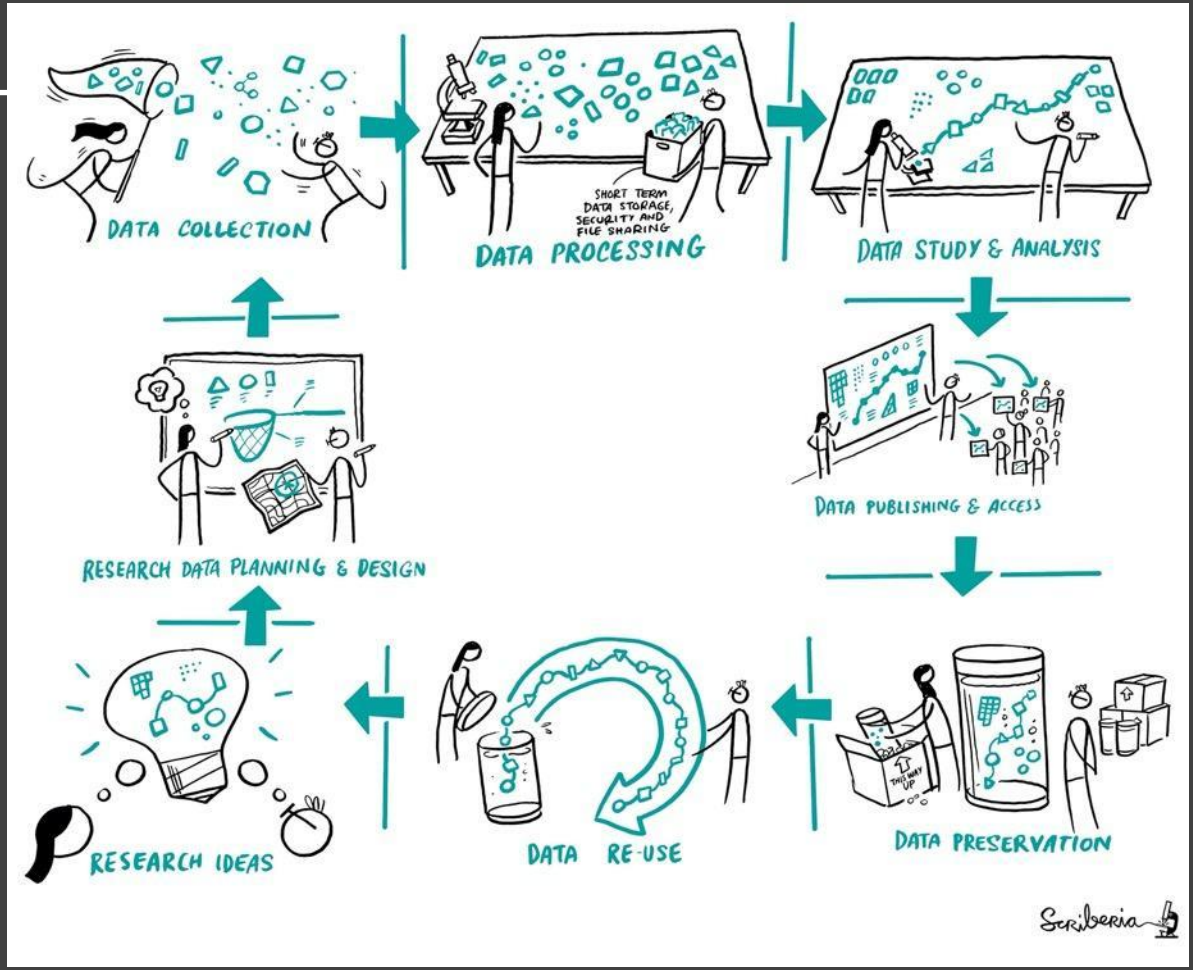
The Turing Way is a lightly opinionated guide to reproducible data science.

Our goal is to provide all the information that researchers need at the start of their projects to ensure that they are easy to reproduce at the end.

This also means making sure PhD students, postdocs, PIs, and funding teams know which parts of the "responsibility of reproducibility" they can affect, and what they should do to nudge data science to being more efficient, effective, and understandable.

Reproducible Research Workflows

		Data	
		Same	Different
Analysis	Same	Reproducible	Replicable
	Different	Robust	Generalisable



"An article about computational science in a scientific publication is not the scholarship itself, it is merely advertising of the scholarship. The actual scholarship is the ***complete software development environment*** *and the complete set of instructions which generated the figures."*

— Buckheit and Donoho (paraphrasing John Claerbout)

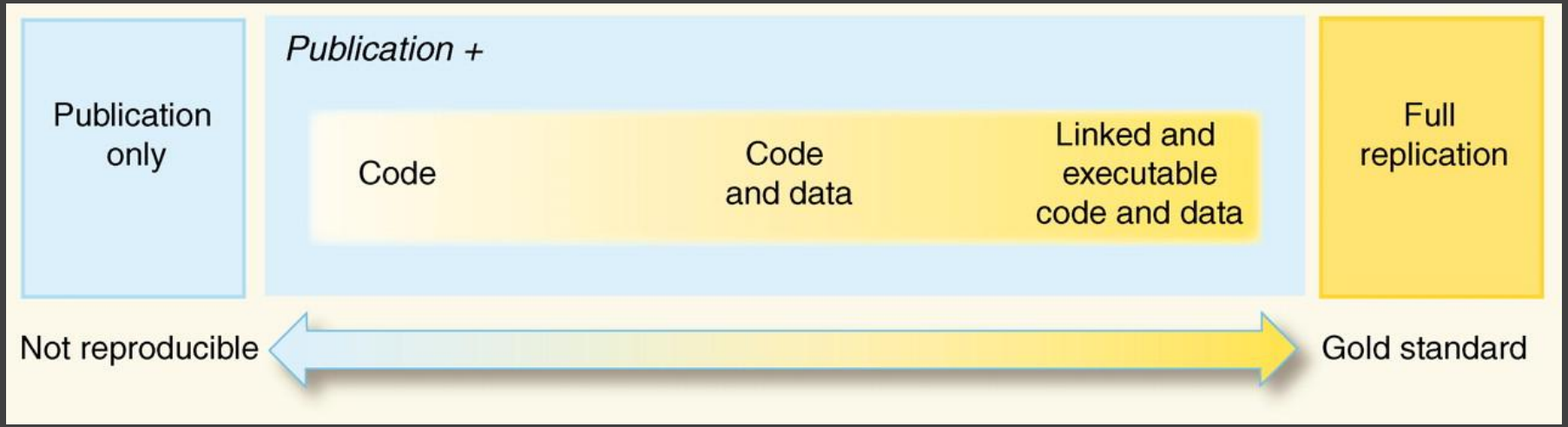
WaveLab and Reproducible Research, 1995

(slide courtesy of Chris Holdgraf and the Jupyter Team)

Take home message

Sharing your code and data isn’t enough

We need research environment and guidelines too!



Peng, 2011, doi: 10.1126/science.1213847

We need research environment and guidelines too!

Peng, 2011, doi: 10.1126/science.1213847

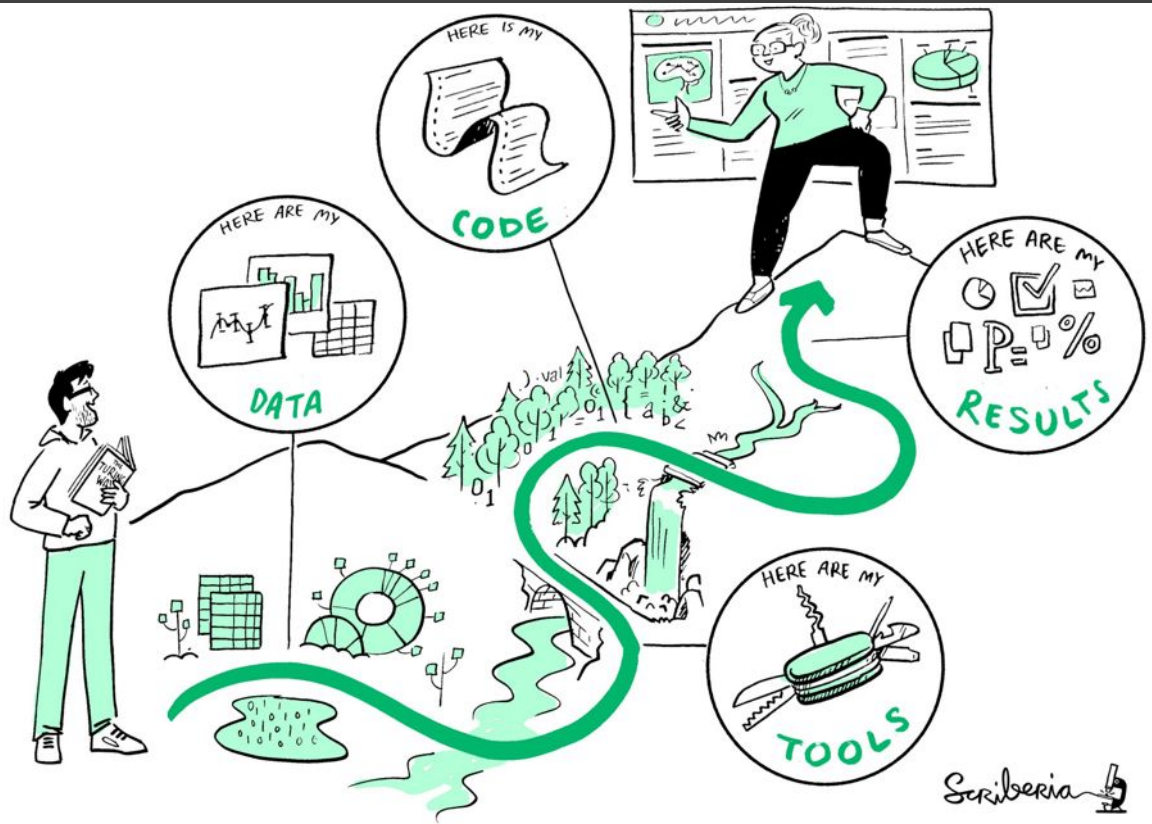


Fig. 3 *The Turing Way* project illustration by Scriberia. Used under a CC-BY 4.0 licence. DOI: 10.5281/zenodo.3332807.

Computational Reproducibility

→ Track changes to your code/resource (version control)

→ Write clean, understandable and error free code

→ Save and share your workflow and computational environment

→ Make your code open for others to test, use and collaborate on

Computational Reproducibility

→ Track changes to your code/resource (version control)

→ Write clean, understandable and error free code

→ Save and share your workflow and computational environment

→ Make your code open for others to test, use and collaborate on

Version Control

- Records changes to a file or set of files over time
- Provides access to any specific version

https://the-turing-way.netlify.app/reproducible-research/vcs.html

Version Control

- changes are recorded using snapshots
- distributed version control system
- Git is very complex, don’t need to learn everything
- Start with the parts you need (commit, push, pull)

https://the-turing-way.netlify.app/reproducible-research/vcs.html

Version Control

- Web and Desktop App GUI interface
- most Open Source software hosted here
- TODO: Create a GitHub account (if you don't already have one!)

https://the-turing-way.netlify.app/reproducible-research/vcs.html

Product Solutions Open Source Pricing

Search GitHub /

Sign in Sign up

github.com

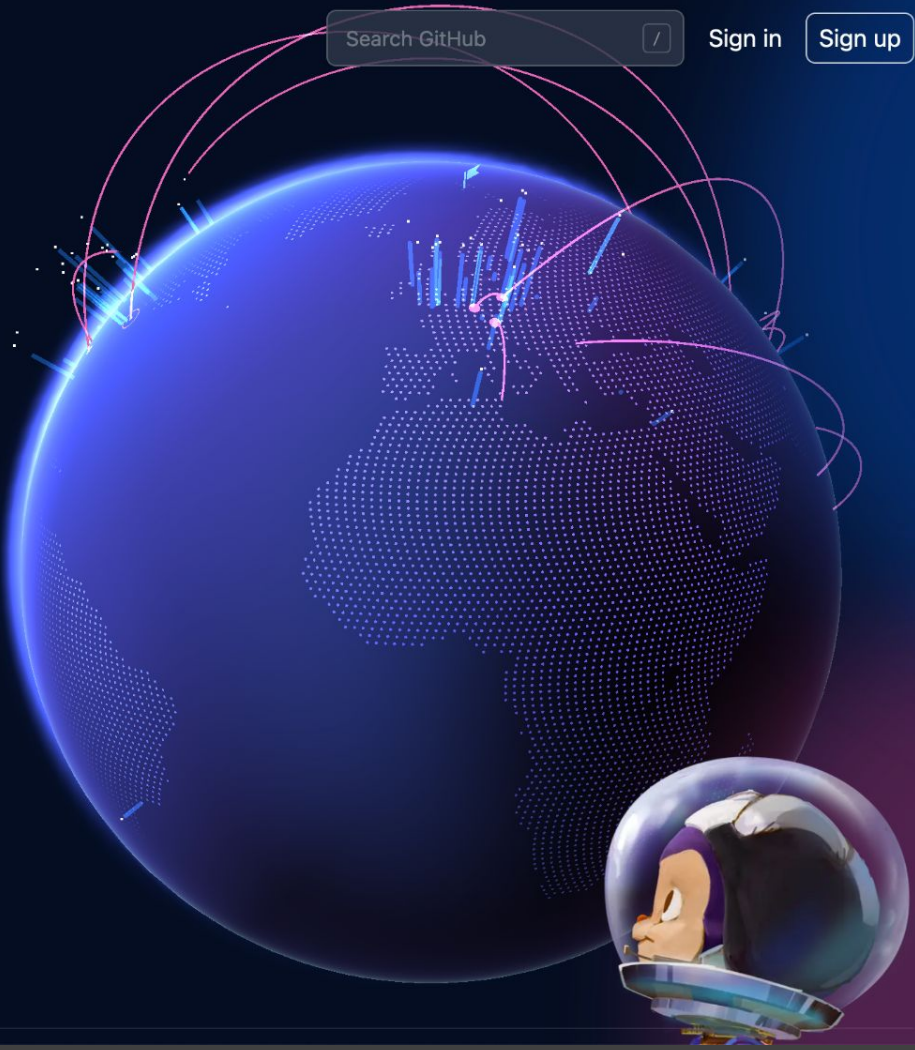
GitHub Universe: A global developer event
Register now to get early bird passes 20% off

Let's build from here, together.

The complete developer platform to build, scale, and deliver secure software.

Email address

Sign up for GitHub



Computational Reproducibility

→ Track changes to your code/resource (version control)

→ Write clean, understandable and error free code

→ Save and share your workflow and computational environment

→ Make your code open for others to test, use and collaborate on

Code Style Guide

- Set of conventions on how to format code
- For example
  - ✔ Indentation
  - ✔ Comments
  - ✔ Imports
  - ✔ Naming

https://the-turing-way.netlify.app/reproducible-research/code-quality/code-quality-style.html

Code Style Guide

PEP 8

For example: imports

```
# Correct:
import os
import sys
```

```
# Wrong:
import sys, os
```

https://www.python.org/dev/peps/pep-0008/

Code Style Guide

PEP 8

Spaces

```
# Correct:
i = i + 1
submitted += 1
x = x*2 - 1
hypot2 = x*x + y*y
c = (a+b) * (a-b)
```

```
# Wrong:
i=i+1
submitted +=1
x = x * 2 - 1
hypot2 = x * x + y * y
c = (a + b) * (a - b)
```

```
>>> import this
The Zen of Python, by Tim Peters

Beautiful is better than ugly.
Explicit is better than implicit.
Simple is better than complex.
Complex is better than complicated.
Flat is better than nested.
Sparse is better than dense.
Readability counts.
Special cases aren't special enough to break the rules.
Although practicality beats purity.
Errors should never pass silently.
Unless explicitly silenced.
In the face of ambiguity, refuse the temptation to guess.
There should be one-- and preferably only one --obvious way to do it.
Although that way may not be obvious at first unless you're Dutch.
Now is better than never.
Although never is often better than *right* now.
If the implementation is hard to explain, it's a bad idea.
If the implementation is easy to explain, it may be a good idea.
Namespaces are one honking great idea -- let's do more of those!
>>>
```

https://www.python.org/dev/peps/pep-0008/

Code Review

- Have another programmer look over your code and assess it

https://the-turing-way.netlify.app/reproducible-research/reviewing.html

Code Review

Types

- synchronous
  - lab meetings presentations
- asynchronous
  - GitHub

https://the-turing-way.netlify.app/reproducible-research/reviewing.html

Code Testing

“You should not skip writing tests because you are short on time, you should write tests because you are short on time”

https://the-turing-way.netlify.app/reproducible-research/testing.html

Code Testing

“You should not skip writing tests because you are short on time, you should write tests because you are short on time”

- You probably are already doing it …

```
data = np.random.randint(0, 10, size=(4, 6))

print(data)
```

```
[[3 4 4 3 3 8]
 [5 7 5 6 8 8]
 [0 0 8 2 9 8]
 [4 4 1 8 7 4]]
```

https://the-turing-way.netlify.app/reproducible-research/testing.html

Assert

```
expected_n_rows = 3
assert data.shape[0] == expected_n_rows, "shape mismatch"
```

```
---------------------------------------------------------------------------
AssertionError                            Traceback (most recent call last)
<ipython-input-3-c9f3f4600ddd> in <module>
      1 expected_n_rows = 3
----> 2 assert data.shape[0] == expected_n_rows, "shape mismatch"

AssertionError: shape mismatch
```

Assert

```
expected_n_rows = 3
assert data.shape[0] == expected_n_rows, "shape mismatch"
```

```
expected_n_rows = 3
real_n_rows = data.shape[0]
assert real_n_rows == expected_n_rows, (
    f"shape mismatch, data has {real_n_rows} rows, expected {expected_n_rows} rows"
)
```

```
---------------------------------------------------------------------------
AssertionError                            Traceback (most recent call last)
<ipython-input-22-1d999f81fff0> in <module>
      2 real_n_rows = data.shape[0]
      3 assert real_n_rows == expected_n_rows, (
----> 4     f"shape mismatch, data has {real_n_rows} rows, expected {expected_n_rows} rows"
      5 )

AssertionError: shape mismatch, data has 4 rows, expected 3 rows
```

Unit Testing

```python
def take_fifth_power(x):
  result = x * x * x * x * x
  return result
```

```python
def test_take_fifth_power():
  assert take_fifth_power(1.5) == 7.59375
```

https://the-turing-way.netlify.app/reproducible-research/testing/testing-types.html

Other Types of Testing

Smoke test

- initial checks designed to ensure very basic functionality

Integration test

- individual units are combined and tested as a group

and more!

Testing frameworks automate the code testing through a set of rules.

https://the-turing-way.netlify.app/reproducible-research/testing/testing-types.html

Computational Reproducibility

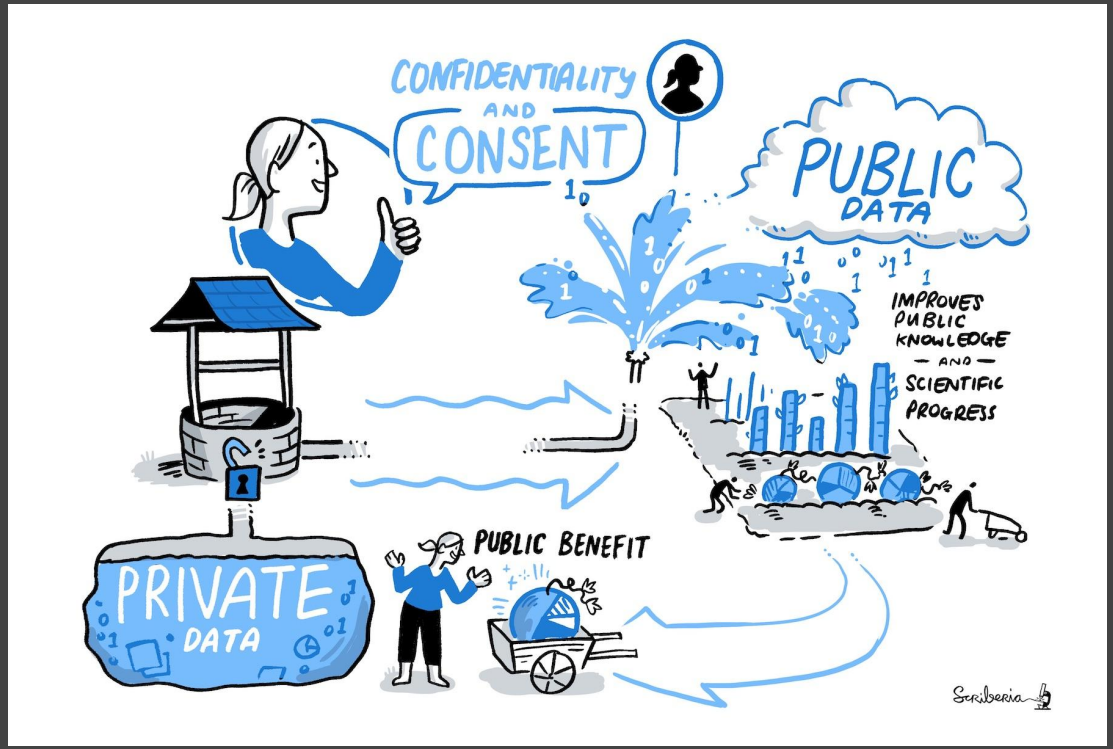
→ Track changes to your code/resource (version control)

→ Write clean, understandable and error free code

→ Save and share your workflow and computational environment

→ Make your code open for others to test, use and collaborate on

Reproducible Research Workflows



Inner Source vs Open Source

Book: https://the-turing-way.netlify.app/welcome, @turingway, CC-BY 4.0, DOI: 10.5281/zenodo.7050678

Privacy and Sensitivity concerns

Is my data too sensitive to share?

I'm not sure I want others to see all my work?

Do I have permission to share my work openly?

I don't have time or can't see how to share my work

What is a computational environment?

- hardware (e.g. CPU)
- software
  - operating system
  - programming languages
  - packages

their versions and their configuration

and their interaction

Reproducible Computational Environments

Interaction style

What is reproduced?

	Graphical	Command line
Software and versions	binder	CONDA
Entire system		docker

https://the-turing-way.netlify.app/reproducible-research/renv/renv-options.html

Computational Reproducibility

→ Track changes to your code/resource (version control)

→ Write clean, understandable and error free code

→ Save and share your workflow and computational environment

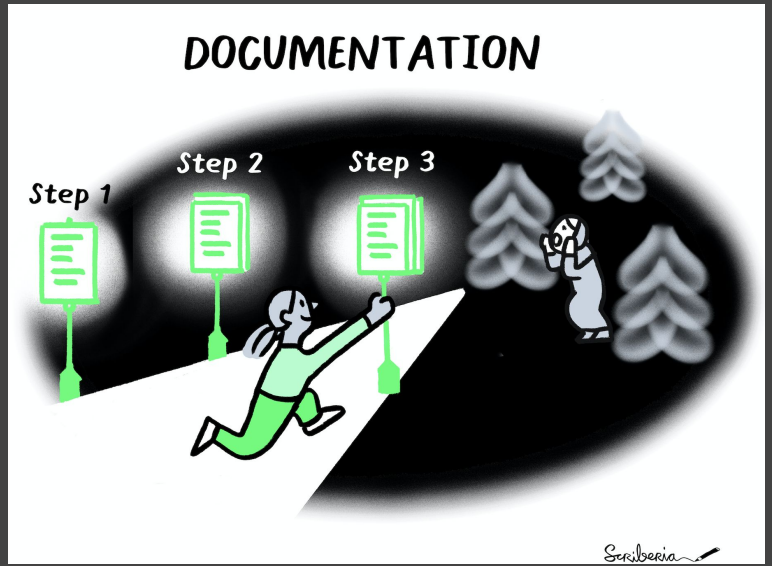
→ Make your code open for others to test, use and collaborate on

Open source projects are for people!

Publicly accessible code that anyone can (re)use, modify, and distribute for any purpose.

Documentation

- README, online repository
- Contribution guideline, license
- Style guide, community guidelines
- Recommended practices, accessibility
- Technical needs, learning & mentoring
- Roles & rewards, support, policies
- Transparent reporting, feedback
- Publications, outputs, workflow



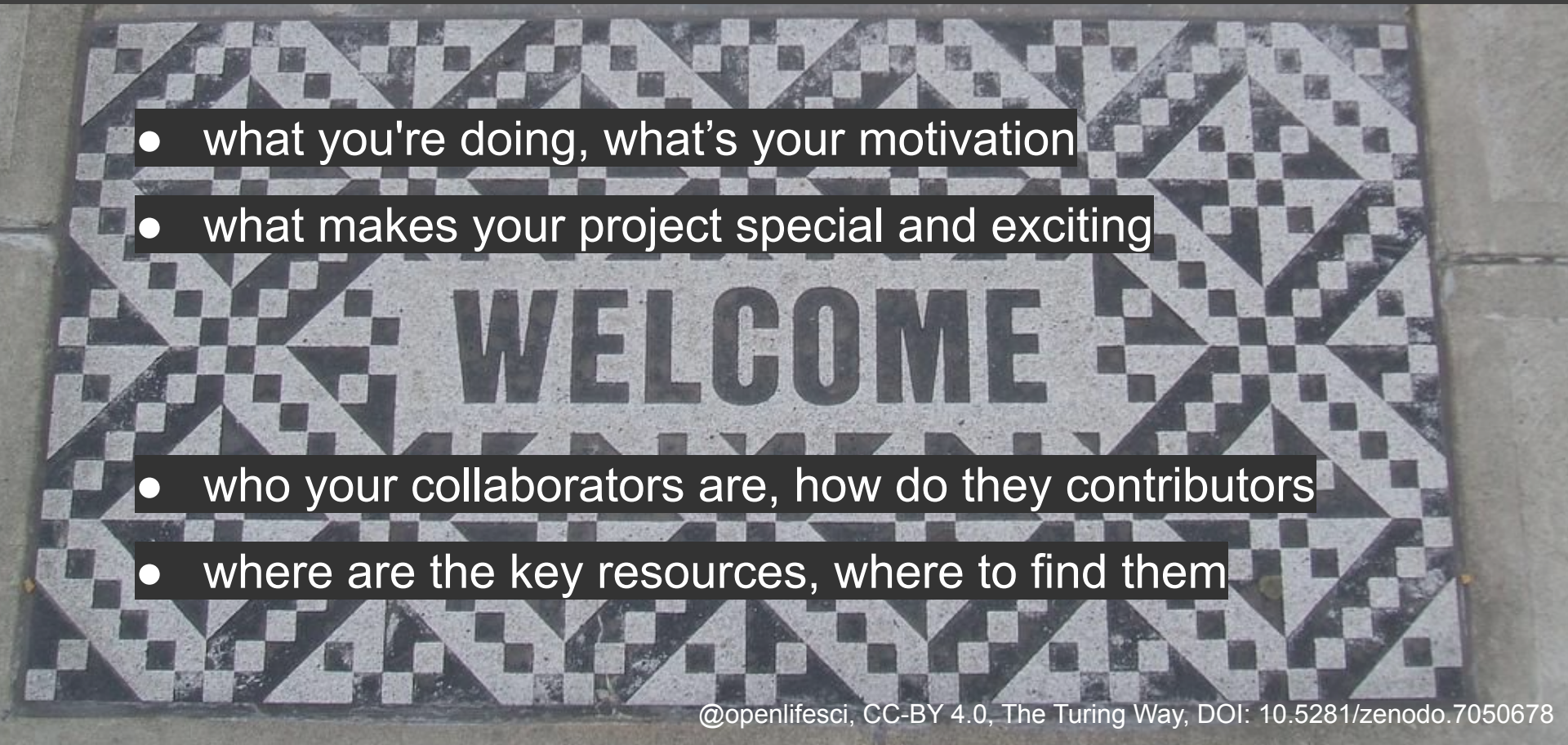
What is a README?

- Beginning of your project documentation
- Found in the root directory of your repository
- In ALL CAPS, a request for all to “read me!”
- First stop for your collaborators

Could also be: website landing page, list of bullet points

Details in The Turing Way chapter for README

In your README, show:



- what you're doing, what's your motivation
- what makes your project special and exciting
- who your collaborators are, how do they contributors
- where are the key resources, where to find them

README = Project Documentation

README.md

The Turing Way

read the book | receive our newsletter ❤️ | chat on gitter | DOI 10.5281/zenodo.3233853 | TuringWay I want to contribute!

all contributors 243

This README.md file in also available in Dutch (README-Dutch), French (README-French.md), German (README-German.md), Indonesian (README-Indonesian), Italian (README-Italian), Korean (README-Korean), Portuguese (README-Portuguese), and Spanish (README-Spanish) (listed alphabetically).

The Turing Way is a lightly opinionated guide to reproducible data science. You can read it here: https://the-turing-way.netlify.com You're currently viewing the project GitHub repository where all of the bits that make up the guide live, and where the process of writing/building the guide happens.

Our goal is to provide all the information that researchers need at the start of their projects to ensure that they are easy to reproduce at the end.

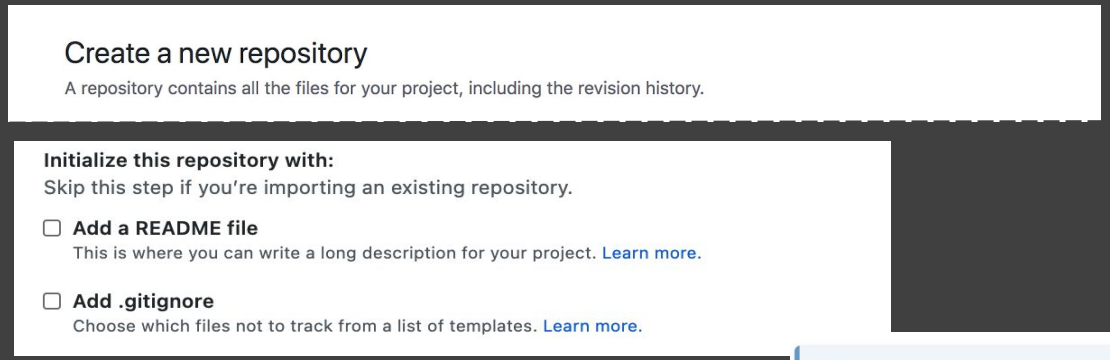
This also means making sure PhD students, postdocs, PIs and funding teams know which parts of the "responsibility of reproducibility" they can affect, and what they should do to nudge data science to being more efficient, effective and understandable.

Table of contents:

- About the project
- The team
- Contributing
- Citing *The Turing Way*
- Get in touch
- Contributors

- project description and features
- installation instructions
- tutorials and requirements
- how to run associated tests
- list of authors/contributors
- contact information
- links to related material

TO-DO: Create a GitHub Repository with README file



Note

Three lessons about README

- Know your users and what they need
- Get users doing powerful things quickly
- Watch out for jargon!

Source: Hao Ye. (2021, March). Collaborations Workshop 2021 Mini-Workshop: README tips to make your project more approachable (Version v1.0.0). Zenodo. http://doi.org/10.5281/zenodo.4647391

Open Source License

Motivation: Allow others to use, remix and share your work.

Process: Add an open license for use, remixing and sharing.

Details: Licensing Chapter in The Turing Way

Disclaimer: We are not lawyers - always consult your data officer.

Addressing Common Concerns

- Sharing something on online does NOT automatically make it reusable.
- Sharing with a license does NOT give away your rights to publish, sell, etc.
- Work shared with an open license NOT to be used without attribution.
- *Not attributing to authors violates academic ethics.*

Truly Open Licenses: common elements

use

Anyone can use the work for any purpose

modify

Anyone can modify the work

share

Anyone can redistribute both the original and modified work

Open source software is software that can be freely used, modified, and shared (in both modified and unmodified form) by anyone.

- GitHub Glossary, Open Source

Attribution

Most open licenses require crediting the authors of the work.

Non-copyleft: Permissive, non-reciprocal - CC BY, MIT, BSD

- **do not require** derivative works to shared with the same license

Copyleft: Viral, reciprocal - CC BY-SA, GPLv3, MPL-2.0

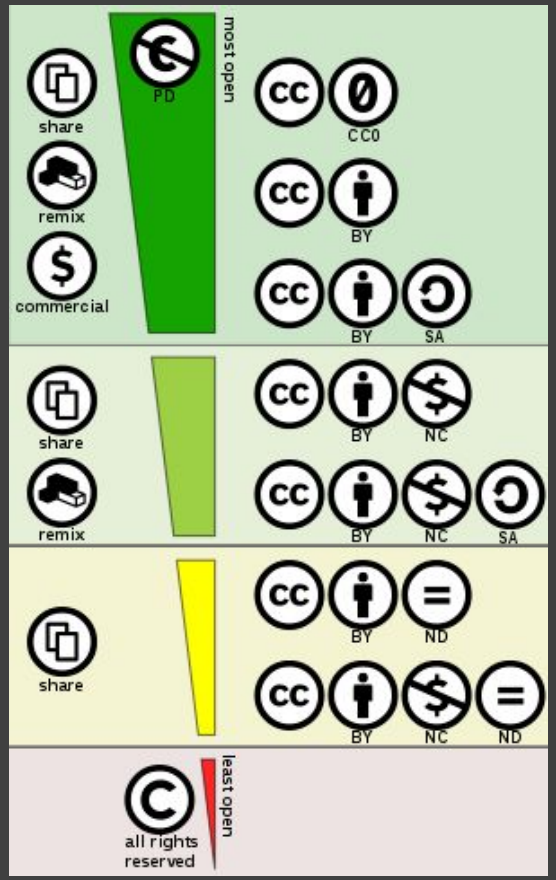
- **require** derivative works to shared with the same license

Exception: CC0 (public domain, no copyright holder)

Assignment: Add a License

Use a different license for content, code and data. For example

- Writing/docs/images/metadata: CC-BY
- Code: MIT License
- Data will also have different license based on what you can/can't share!



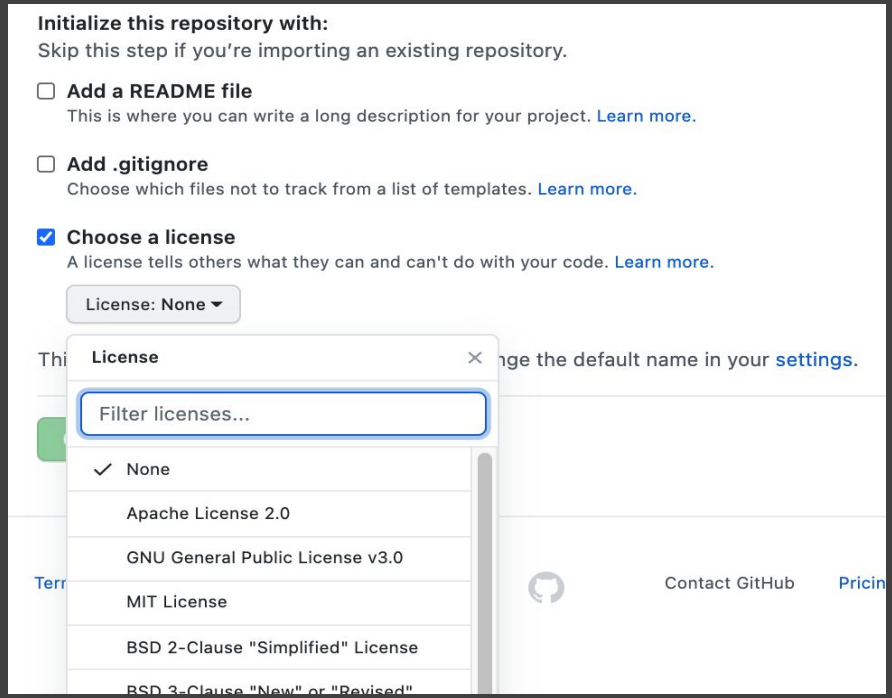
How to Apply License

Place the **full text of the license in a file named LICENSE** in the root directory.

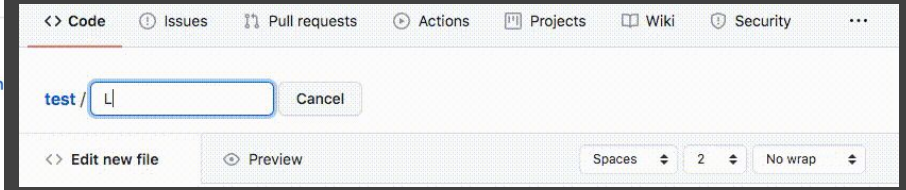
Apply licenses to all components: Base recommendations for content: CC-BY, software: MIT, data: CC0

Describe in README which license applies to which parts of your work.

TO-DO: Add a license on your repository



GitHub can add a license for you.



when creating a new repository

when adding a new file named LICENSE...

Open Science aims to transform research by making it more transparent → accessible → reliable → reproducible → reusable → collaborative → beneficial to society.

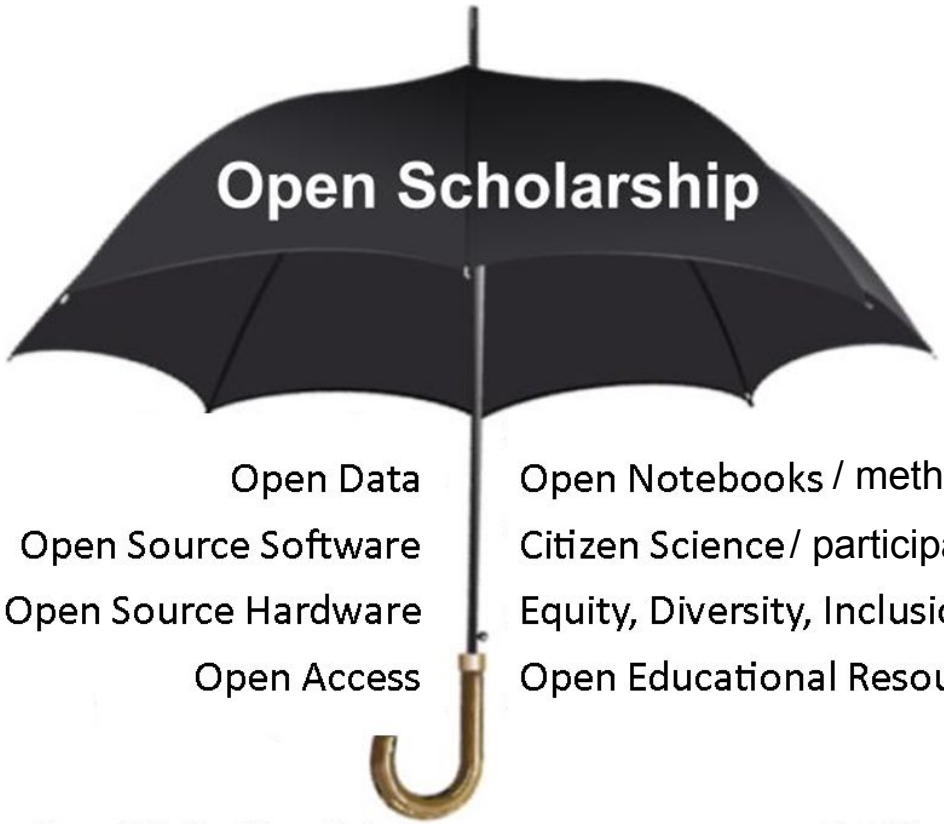
To achieve this openness in research, we need to make each element of the research process ...

- *publicly available,*
- *with permission to view, use, modify and distribute, and*
- *description for how one can collaborate.*

Open Science is an umbrella term for open research practices

Open science allows everyone to freely and transparently read, reuse, distribute, modify and build on -- without any price or accessibility barriers.

What are some barriers we should work to remove?



Transparency →
Reproducibility →
Research Quality →
Sustainability

+

Collaboration →
Inclusive Research →
Equity and Diversity →
Global Accessibility

.meetup.com/Berlin-Open-Science-Meetup/

Robin Champieux and Danielle Robinson

Open Science

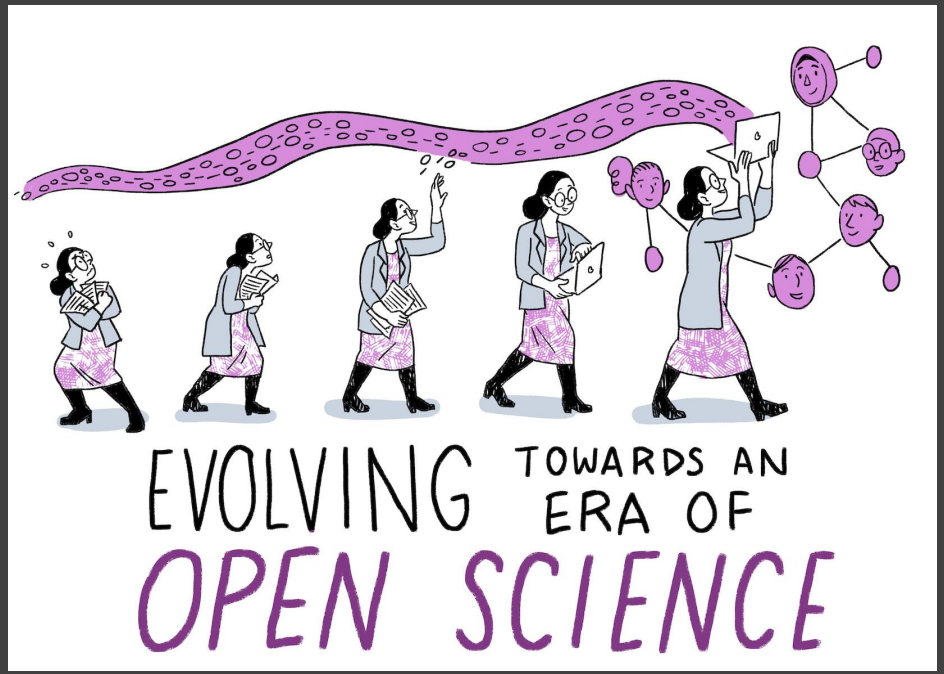
Open Research

Open Scholarship

We often use these terms interchangeably - all mean the same open practices and considerations for you!

Book: https://the-turing-way.netlify.app/welcome, @turingway, CC-BY 4.0, DOI: 10.5281/zenodo.7050678

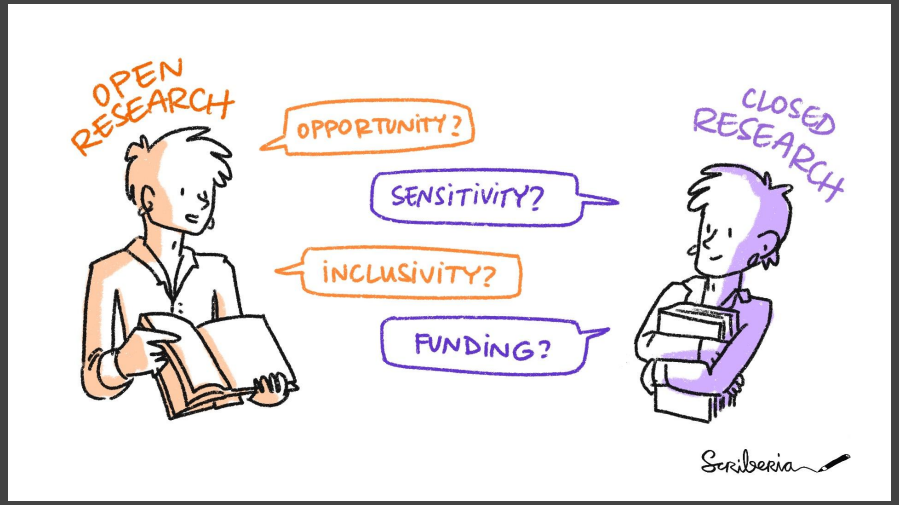
Open Science to enable Collaboration and Transparency



- Practices to remove barriers from sharing and using scientific resources at all stage.
- Make research findings accessible to all rather than keeping them locked away (such as, *behind a paywall*).

Reflection Exercise

- What concerns do you have about sharing your work?
- What collaborations will make that easier?
- Are there any research objects you should not share?



Applying best practices in our research requires intention, resources, time and collaboration, which can be overwhelming.

Blog post: https://www.software.ac.uk/blog/2020-12-17-ten-arguments-against-open-science-you-can-win,
DOI: 10.5281/zenodo.7050678

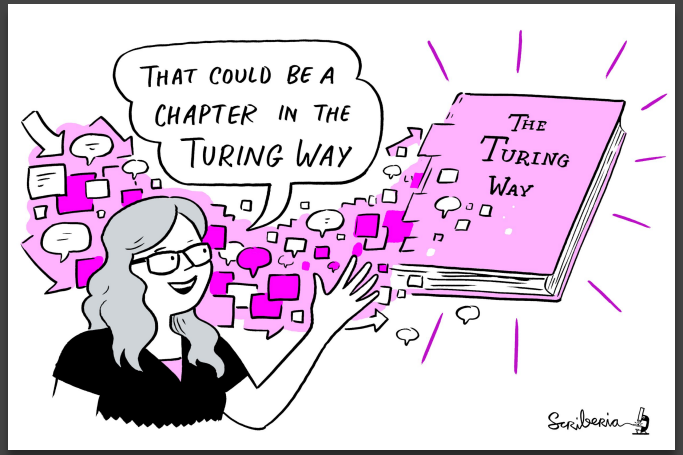
Book:
the- turing-way.netlify.app/

GitHub:
github.com/alan-turing-institute/the- turing-way

Twitter:
twitter.com/turingway

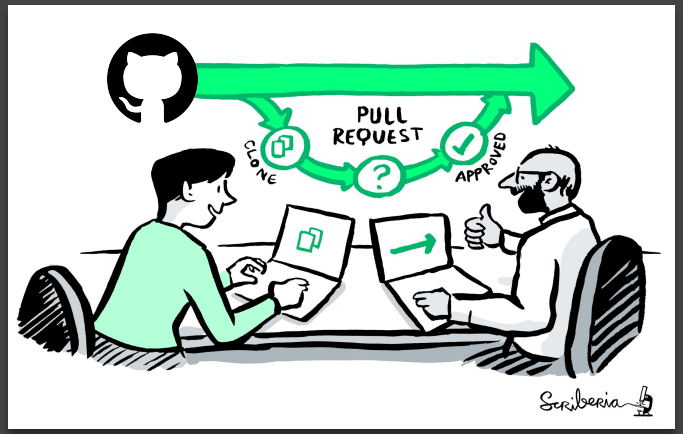
Email:
theturingway@gmail.com

A Book



A Community

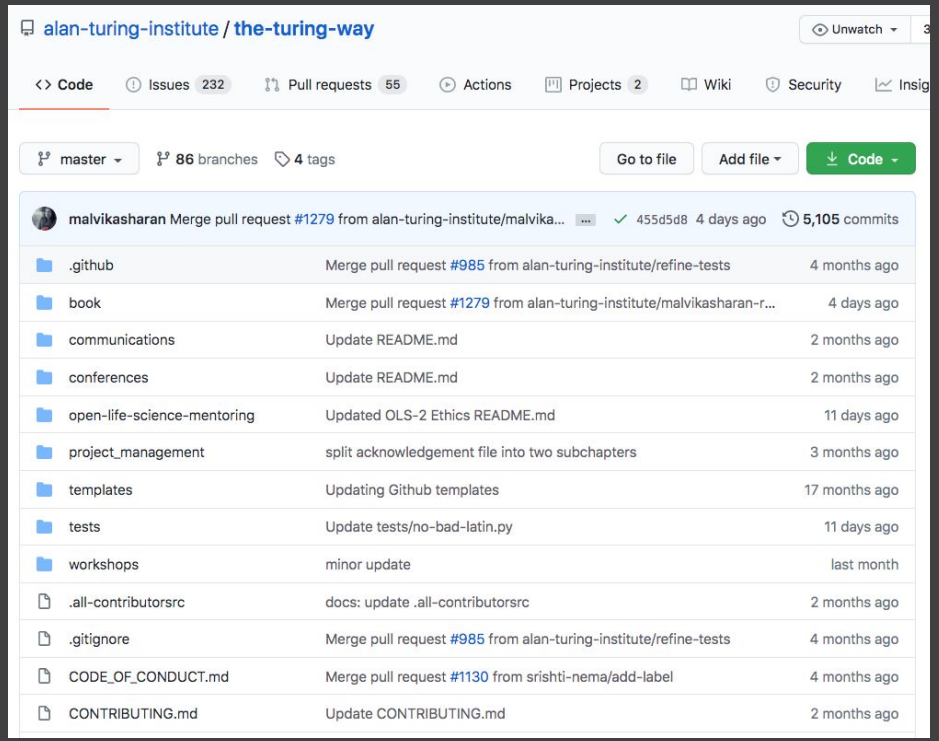
An Open Source Project



A Culture of Collaboration

A Collaborative, Version Controlled and Open Project

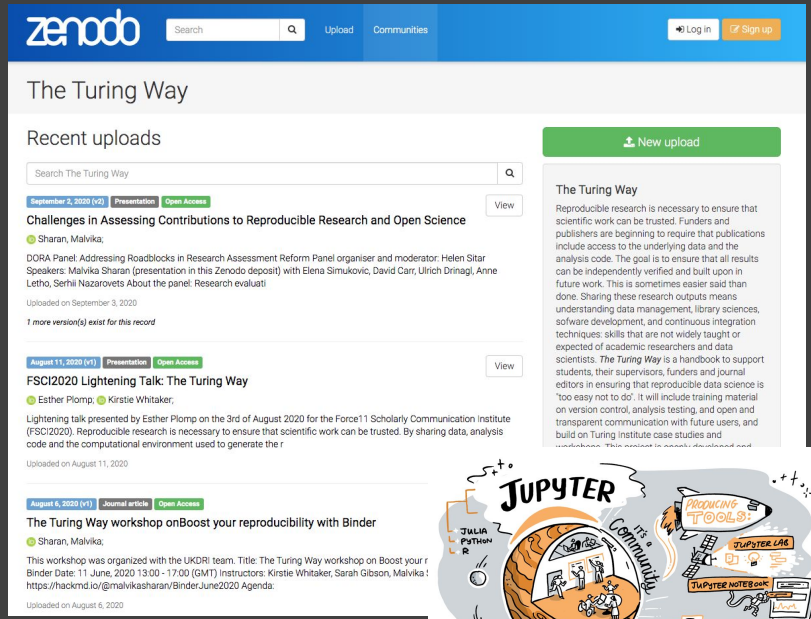
- Shared online
- Designed for open collaboration
- Hosted on GitHub with history and versions
- Described with open license
- Community oriented



.github	Remove prettier configuration	
book	minor update	
communications	Fix typos	
conferences	Add KW formatting pedantry	
project_management	Update online-collaboration-cafe.md	
templates	Updating Github templates	
tests	Add "et cetera" as a deprecated Latinism	
workshops	Remove mis-pasted text	
.all-contributorsrc	Merge pull request #991 from alan-turing-institute/all-contributors/a...	5 days ago
.gitignore	ignore pptx in workshop folder	9 months ago
.travis.yml	add html-proof file again	last month
CODE_OF_CONDUCT.md	her -> their	6 months ago
CONTRIBUTING.md	Update CONTRIBUTING.md	2 months ago
GOVERNANCE.md	Read through months later	5 months ago
LICENSE.md	Fix typo in licence	2 months ago
README.md	Merge pull request #991 from alan-turing-institute/all-contributors/a...	5 days ago
book_skeleton.md	Update book_skeleton.md	13 months ago
contributors.md	Add myself to contributors.md	11 months ago
tips_and_tricks_survey.md	Update tips_and_tricks_survey.md	14 months ago
ways_of_working.md	Adjust team contact section	5 months ago

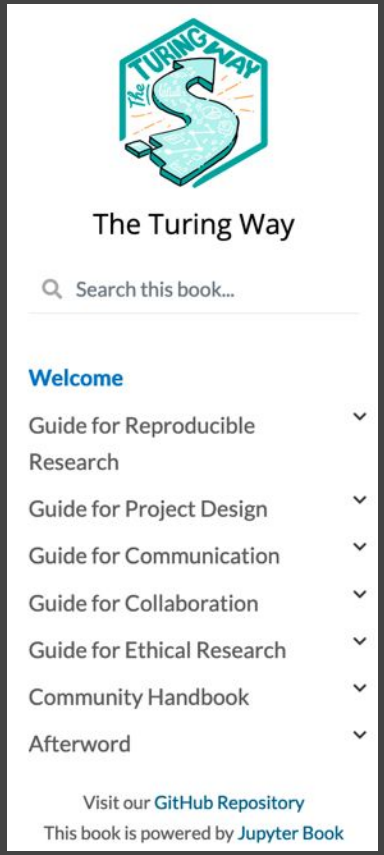
An Open Science project

- everyone can freely read, reuse, distribute, modify and help develop
- the project belongs to the research community (CC-BY license)
- Builds in collaboration with other projects



@turingway, CC-BY 4.0, The Turing Way, DOI: 10.5281/zenodo.7050678

A book: “Work in Progress”

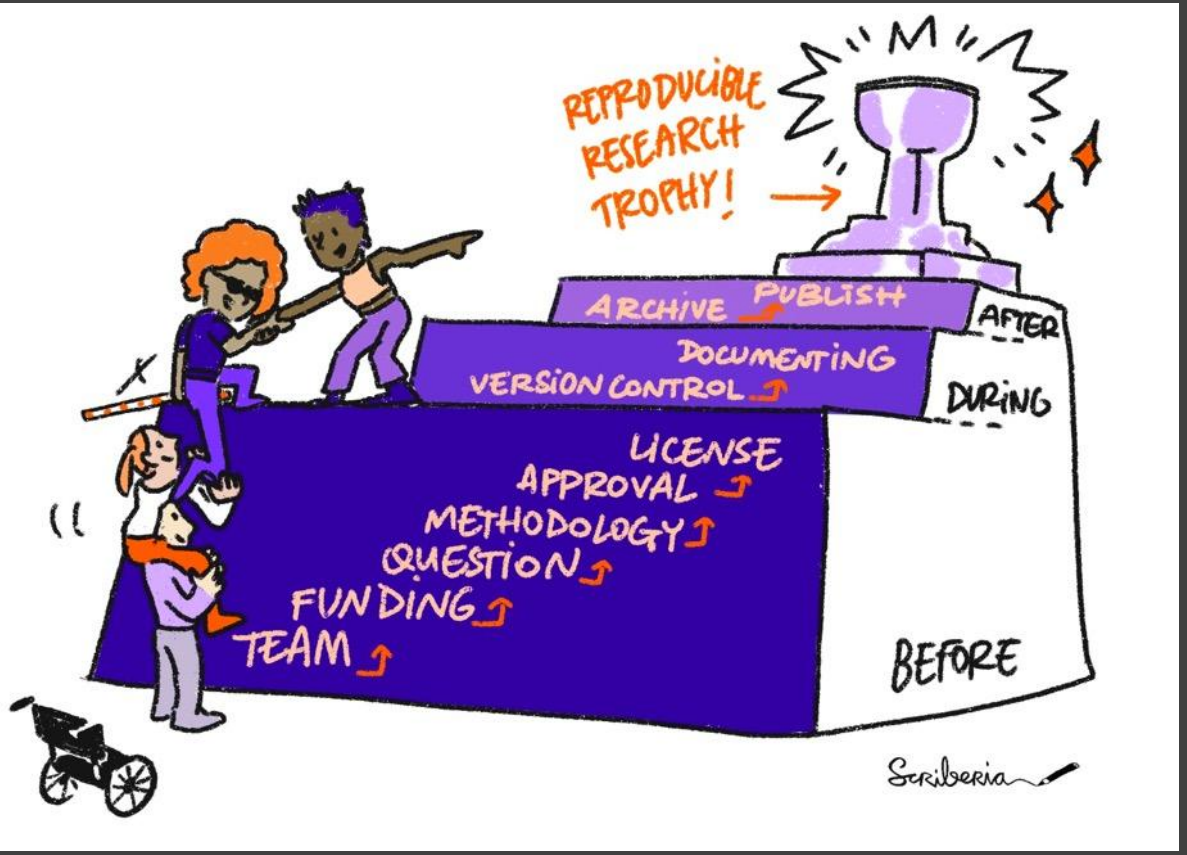


Book: https://the-turing-way.netlify.app/welcome, @malvikasharan @turingway, Slides: 10.5281/zenodo.7050678

Overview of Project Design

- Planning for Project Design
- Communication and Collaboration
- Reproducibility Methods
- Version Control and Documentation
- Sharing Your Research Work

Creating Project Repositories



Guide for Communication

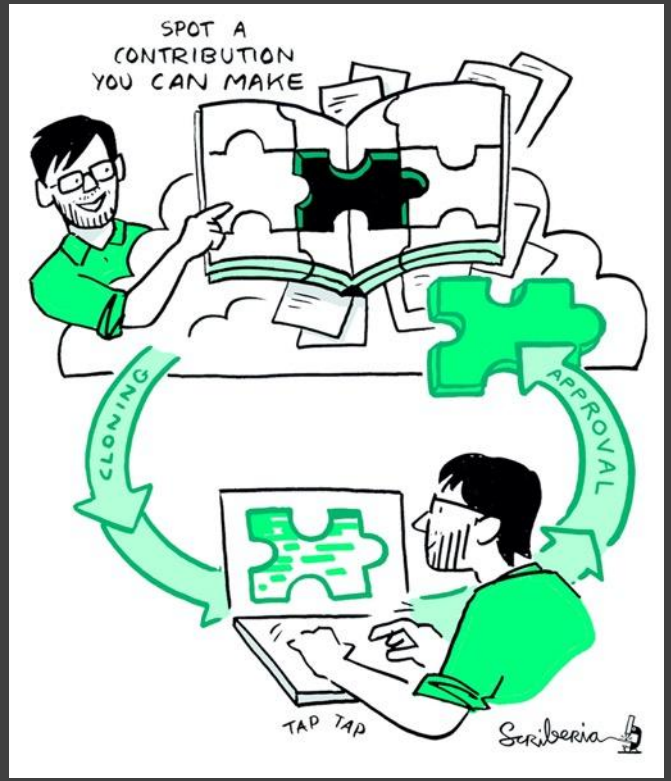
Guide for Communication

- Overview of Guide for Communication
- Blogs for Research Communication
- Lay Summaries
- Podcasts for Research Communication
- Presenting Posters and Conference Talks
- Social Media for Research Communications
- Making Research Objects Citable
- Communications in Open Source Projects

Guide for Collaboration

Guide for Collaboration

- Getting Started With GitHub
- Maintainers and Reviewers on GitHub
- Managing a New Community and Team
- Leadership in Data Science
- Remote Collaboration
- Shared Ownership in Open Source Projects



Guide for Ethical Research

Guide for Ethical Research

- Introduction to Research Ethics
- Research Ethics Committees Workflows
- Ethical Decisions in Preclinical Research
- Law, Policy and Human Rights in Ethics
- Activism for Researchers
- Internal Policy Advocacy

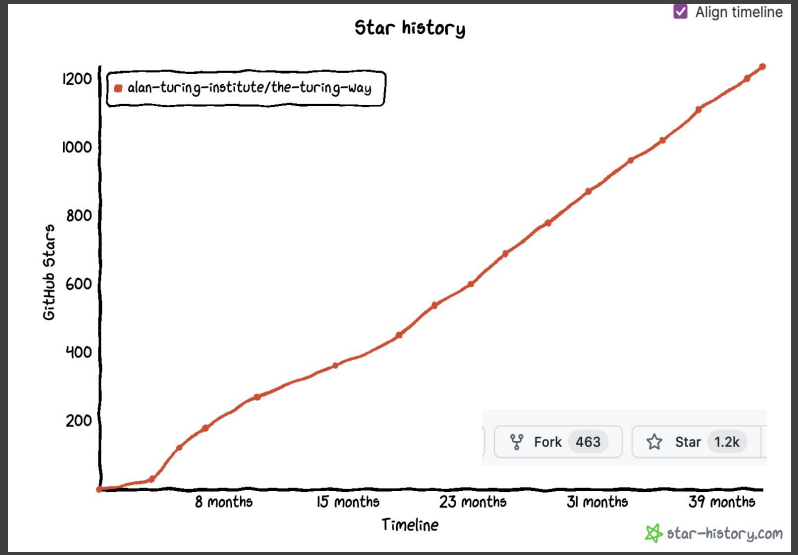
Ethical and Collaborative Research

1. Project Design
2. Data and Methodology
3. Equity, diversity, accessibility
4. Consent, privacy and security
5. Further Societal Consequences

Factor	RRI	Research Integrity
Perception of ethical questions	Outward (for example: how does the public perceive scientific output?)	Inward (for example: how do researchers conduct themselves?)
Who researchers interact with	With research subjects (for example: do we treat them with respect?)	With fellow researchers (for example: do we adhere to a code of conduct?)
What shapes research	Shaped by society (for example: how is AI as a solution generally understood?)	Shaped by institutional norms (for example: what research questions are being funded?)

Project and community growth

- 3 years, >250 Live Chapters
- Community resources, events, guidance, templates, training
- 350+ direct GitHub contributors and thousands of users



https://zenodo.org/record/3332807

zenodo

13,940 views

13,856 downloads

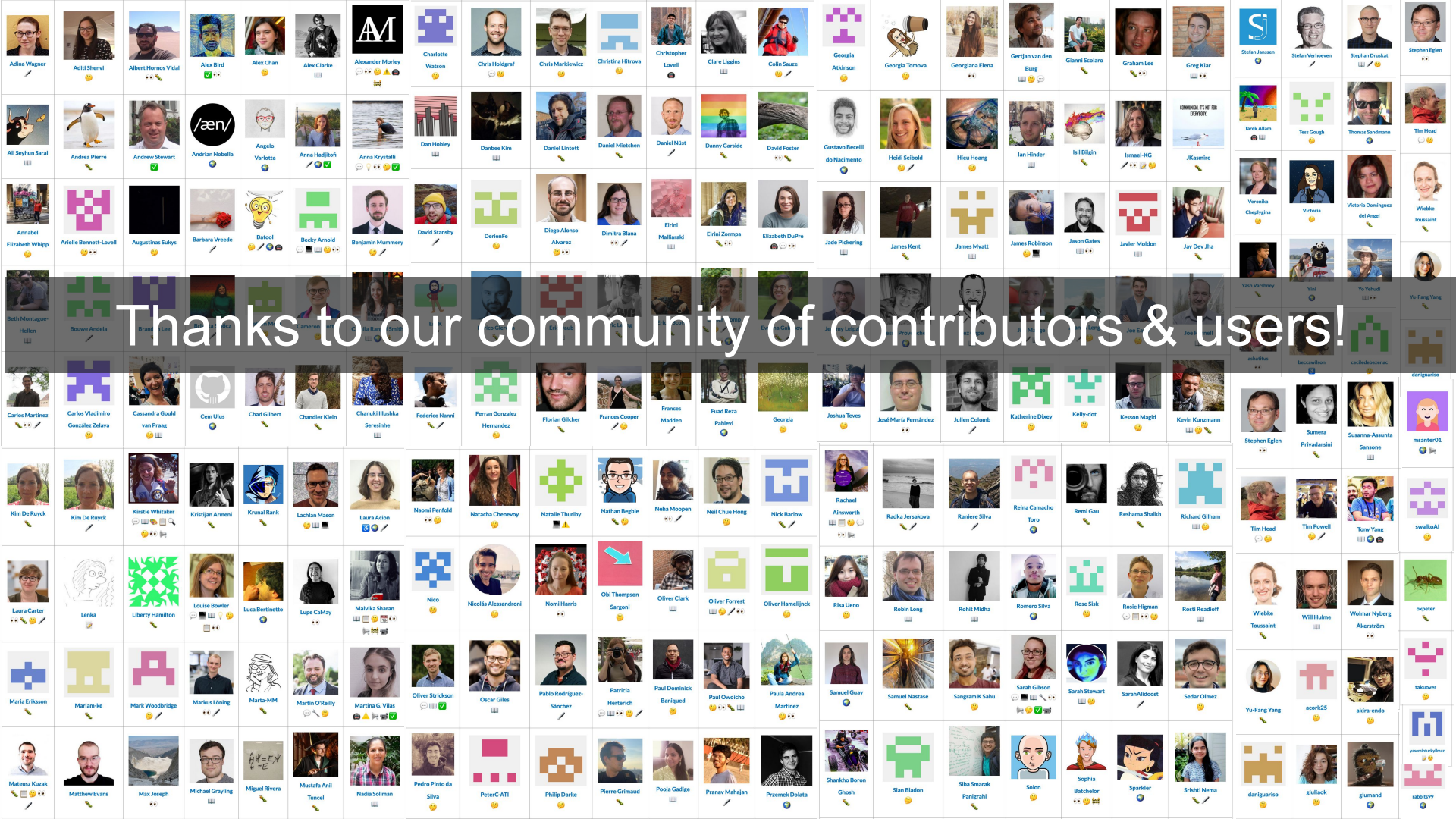
Qualitative/notable impacts

Resources are being used by learners, educators, community builders, policy makers and researchers globally

- Reproducibility of scientific results in the EU 2020 (report)
- An Emerging Technology Charter by Mayor of London (policy)
- Innovation Scholars: UKRI grant 2020 (funding call)
- NASA TOPS, CodeRefinary and Library Carpentries training materials
- Recommended in Goldacre Review for modern open working into health data
- Cited by 30+ peer-reviewed articles & 100+ online publications
- Highly commended by HiddenRef and Royal Society Athena Awards

Evidence of successful replication or extension

- Quality Assurance of Code for Analysis and Research, Office for National Statistics , UK
- Turing Data Stories, Turing Commons and The Environmental Data Science book, The Alan Turing Institute
- FAIR Cookbook by researchers at University of Oxford, Novartis, FAIRplus Consortia
- UCL Institute of Health Informatics Coding Club Handbook, University College London
- A Citizen Science Guide for Research Libraries, LIBER Citizen Science Working Group


Thanks to our community of contributors & users!

Group Activity: Case Study

- Select and read a case study of your interest
- Form groups based on the case studies

Group discussion:

- Nominate a chair, a note-taker and a post discussion reporter
- Discuss the case study (prompts provided on the HackMD)
- Report out: Verbally summarise your notes
- Collaborative structuring of your notes for sharing
- Share your notes on The Turing Way (GitHub)
- Get attributed, share feedback, open discussion

Reproducibility

- Is my code/data **correct**?
- Can others **read and test** it?
- Is my **workflow robust**?
- Have I provided **guidance**?
- Is my work **citable**?

Reproducibility should ensure higher scientific standards allowing others to test and reuse your work ...

Open Science

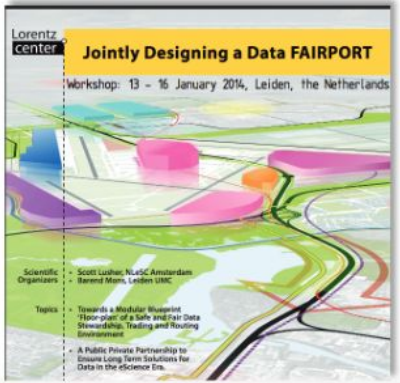
- Is my code/data **freely available**?
- Can others **modify and share** it?
- Is my **workflow reusable**?
- Have I provided **permission**?
- Is my work **open for collaboration**?

… and Open Science should allow anyone to reuse, report errors, fix issues, build on and collaborate

So many things to consider: *Where can I start?*

FAIR principles

- Findable,
- Accessible
- Interoperable
- Reusable



2014

2016

SCIENTIFIC DATA

SPRINGER NATURE

OPEN

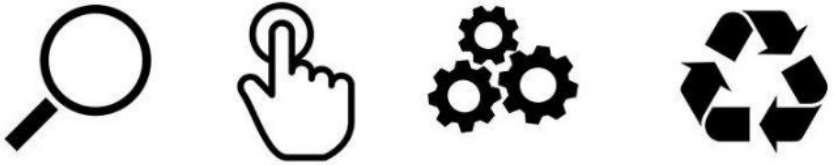
SUBJECT CATEGORIES
» Research data
» Publication characteristics

Comment: The FAIR Guiding Principles for scientific data management and stewardship

Mark D. Wilkinson, Michel Dumontier, IJsbrand Jan Aalbersberg, Gabrielle Appleton, Myles Axton, Arie Baak, Niklas Blomberg, Jan-Willem Boiten, Luiz Bonino da Silva Santos, Philip E Bourne, Jildau Bouwman, Anthony J Brookes, Tim Clark, Mercè Crosas, Ingrid Dillo, Olivier Dumon, Scott Edmunds, Chris T Evelo, Richard Finkers, Alejandra Gonzalez-Beltran, Alasdair J G Gray, Paul Groth, Carole Goble, Jeffrey S. Grethe, Jaap Heringa, Peter A.C. 't Hoen, Rob Hooft, Tobias Kuhn, Ruben Kok, Joost Kok, Scott J. Lusher, Maryann E. Martone, Albert Mons, Abel L. Packer, Bengt Persson, Philippe Rocca-Serra, Marco Roos, Rene van Schaik, Susanna-Assunta Sansone, Erik Schultes, Thierry Sengstag, Ted Slater, George Strawn, Morris A. Swertz, Mark Thompson, Johan van der Lei, Erik van Mulligen, Jan Velterop, Andra Waagmeester, Peter Wittenburg, Katherine Wolstencroft, Jun Zhao, and Barend Mons

SCIENTIFIC DATA | 3:160018 | DOI: 10.1038/sdata.2016.18

Findable **A**ccessible **I**nteroperable **R**eusable



A set of principles to enhance the value of all digital resources

Developed and **endorsed** by *researchers, service providers, publishers, funding agencies and industry partners*

FAIR principles from **Wilkinson *et al*. (2016)**
DOI: 10.1038/sdata.2016.18

FAIR data analogy: *You would not buy food with no labels!*

Annotation makes it easier to find important things

FAIR doesn't require data to be open, but needs Metadata information along with detailed research process.

Metadata: "data descriptors" that facilitate cataloguing data and data discovery

Adapted from talk by Philippe Rocca-Serra (2020)

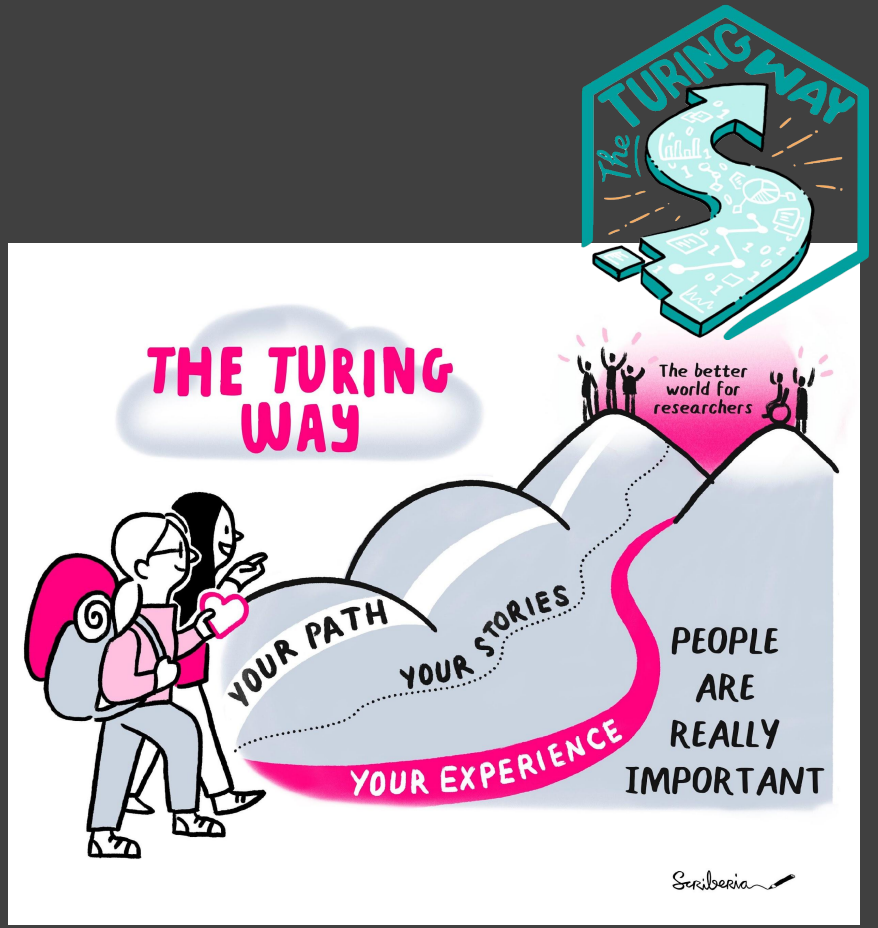
Open and reproducibility enable ethical research

- Reproducibility can be facilitated by open, but open is a choice
- Best practices should be considered at all stages for ethical integrity
- As open as possible, as closed as necessary
    - Open principles should be applied when you can
    - NEVER for private, confidential or sensitive data (ethically)
- Start with FAIR (**F**indable, **A**ccessible, **I**nteroperable, **R**eusable)

Meeting you where you are!

i. Join the community
ii. Learn a new skill
iii. Share your skills
iv. Collaborate with others
v. Mentor others' contributions
vi. Represent this community

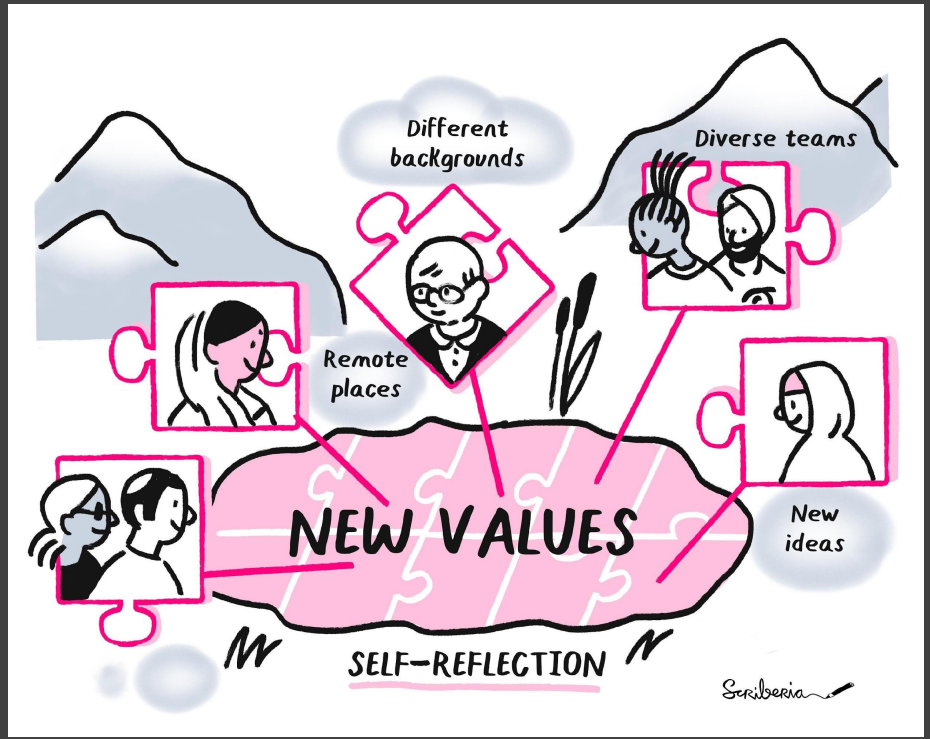
We value your participation!



The Turing Way Events

- *Collaboration Cafes*
  - 1st & 3rd Wednesdays (14:00 UTC)
- *Coworking Calls*
  - Mondays (10:00 UTC)
- *Fireside Chats*
  - Monthly on Friday
- *More ways to connect*

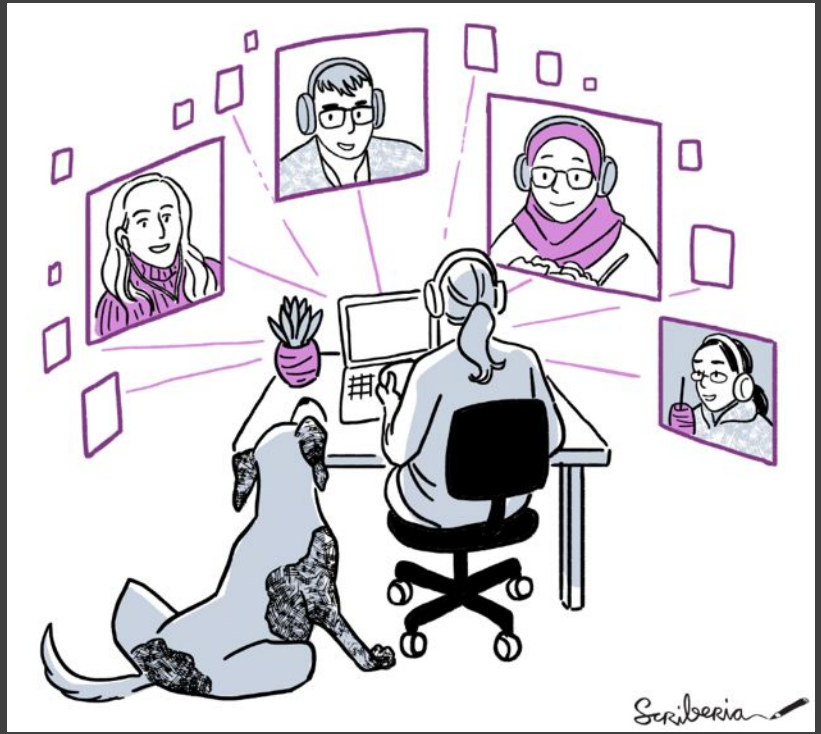
bit.ly/turingway



Attend a Book Dash

Virtual week-long Hackathon like event to work with others on The Turing Way: **14 - 18 November 2022**

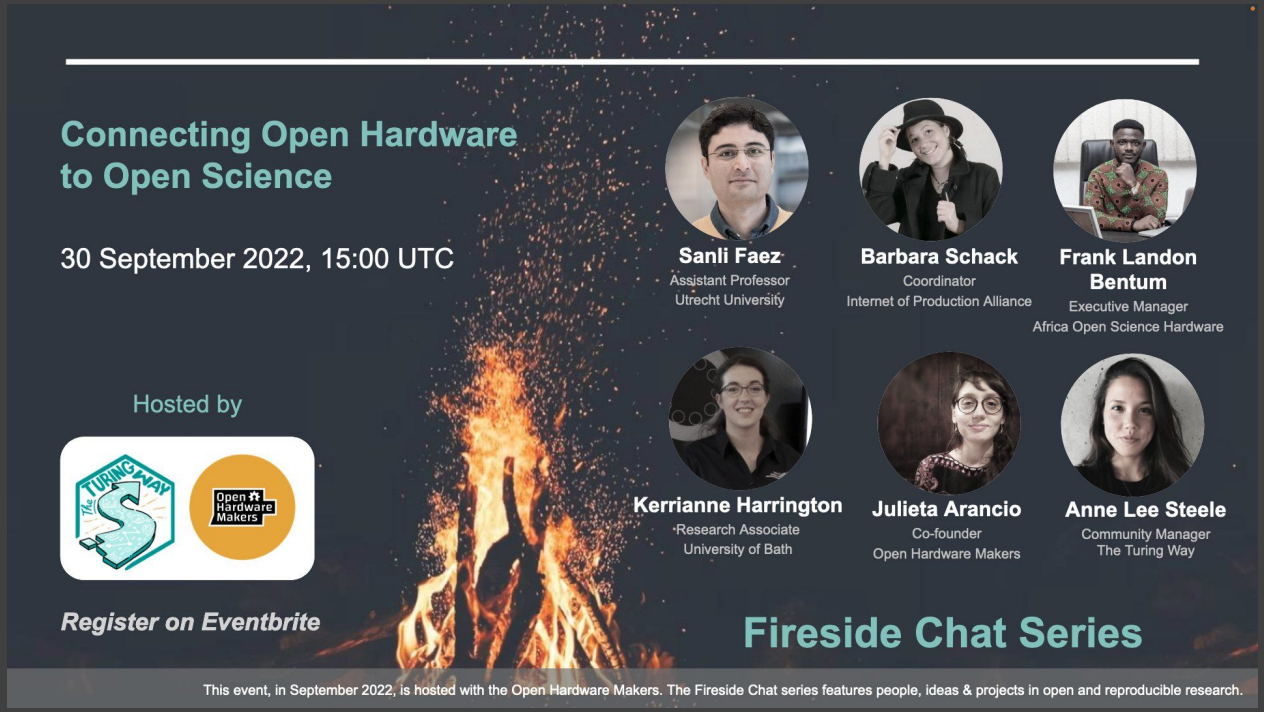
- Applications open for participation: tinyurl.com/tw-bookdash-template.
- Host a local hub: bit.ly/turingway



Community Support for Open Collaboration

Community Handbook

- Code of Conduct
- Style Guide
- Maintaining Consistency
- Acknowledging Contributors
- Monthly Newsletters
- Book Dash Events
- Community Coworking Calls
- Fireside Chat Series
- Template Collection



Community Handbook: https://the-turing-way.netlify.app/community-handbook, Register to attend Fireside Chat: https://www.eventbrite.co.uk/e/connecting-open-hardware-to-open-science-tickets-423284805247, DOI: 10.5281/zenodo.7050678

Acknowledgements & Links

- Eirini Zormpa, Aaron Lacey, Sophia Batchelor
- The Turing Way community members

- Book: the-turing-way.netlify.com
- Twitter: twitter.com/turingway
- GitHub: github.com/alan-turing-institute/the-turing-way

Useful links & opportunities are listed here: https://bit.ly/turingway

Illustrations by Scriberia for The Turing Way community:
https://zenodo.org/record/3332807