The Alan Turing Institute

The Turing Way

Making Reproducible Research

"Too Easy Not To Do"

Kirstie Whitaker

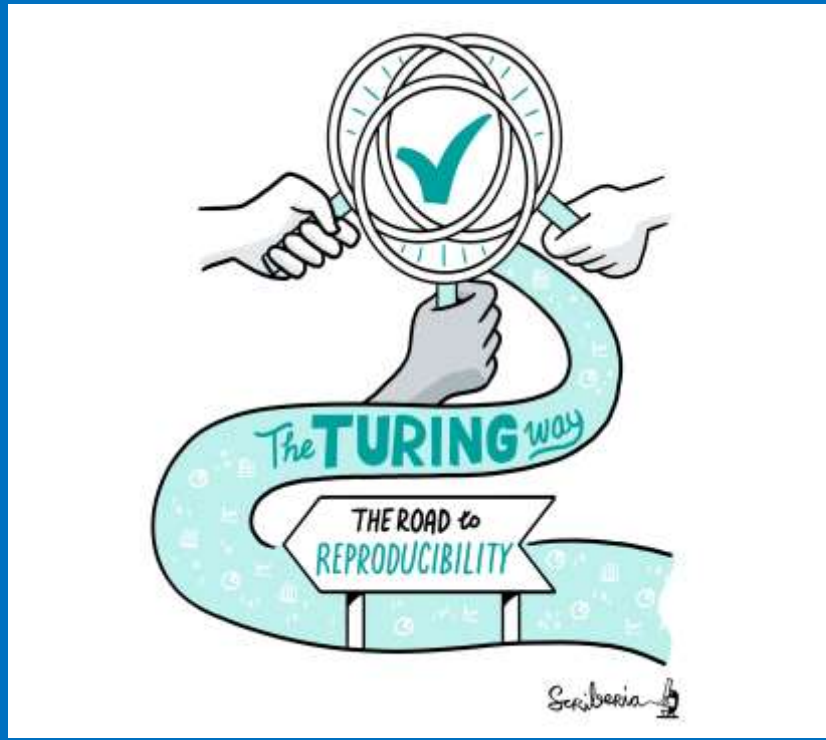
Pronouns: she/her

@TuringWay @kirstie_j

https://doi.org/10.5281/zenodo.4139831

The Turing Way is:

- a book
- a community
- a global collaboration
- a whole tonne of work



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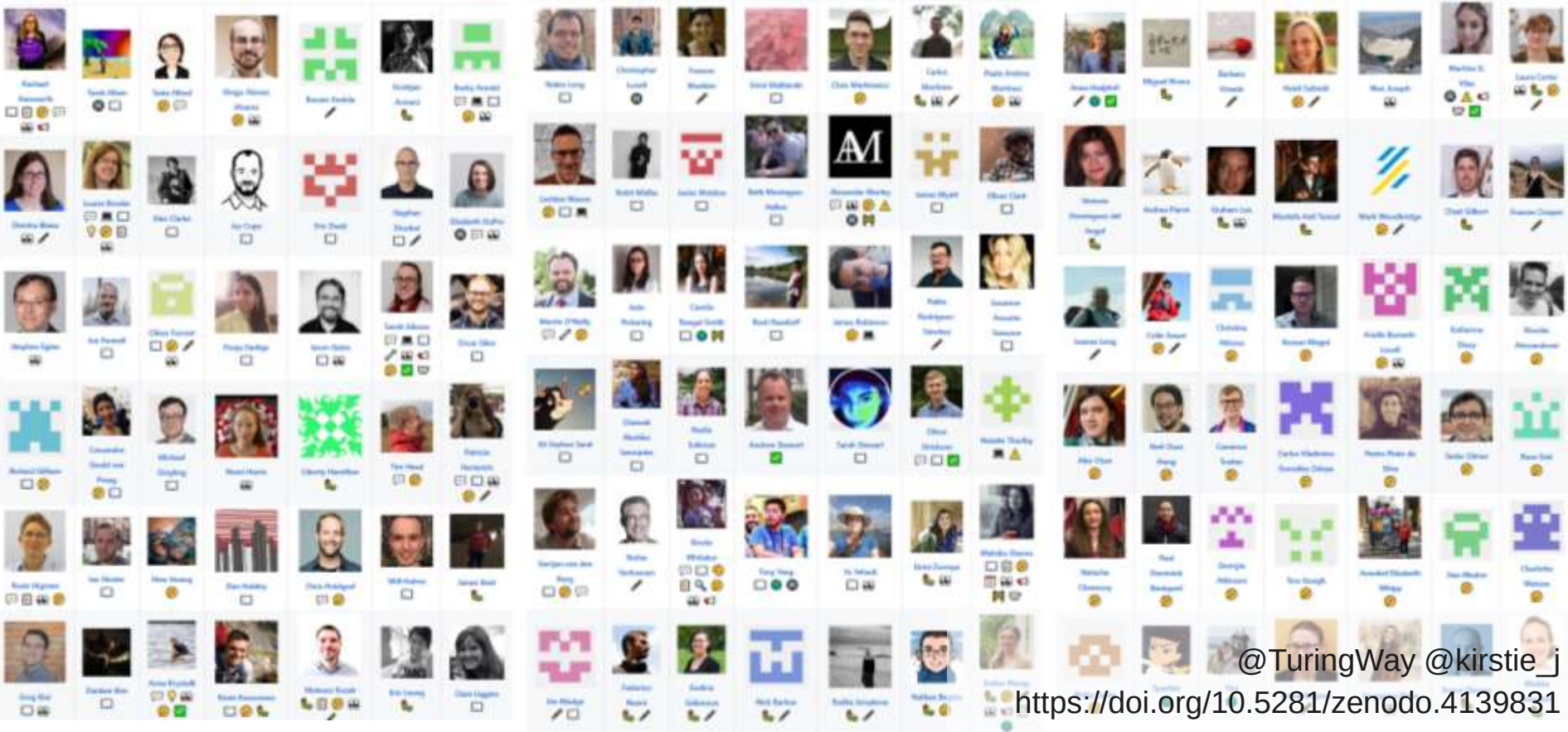
Thank you to our 200+ contributors



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An introduction to me

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Picture credit: Chris Gorgolewski
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Academic 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

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https://www.bbc.co.uk/news/magazine-22223190

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The humans are the hardest part of reproducibility

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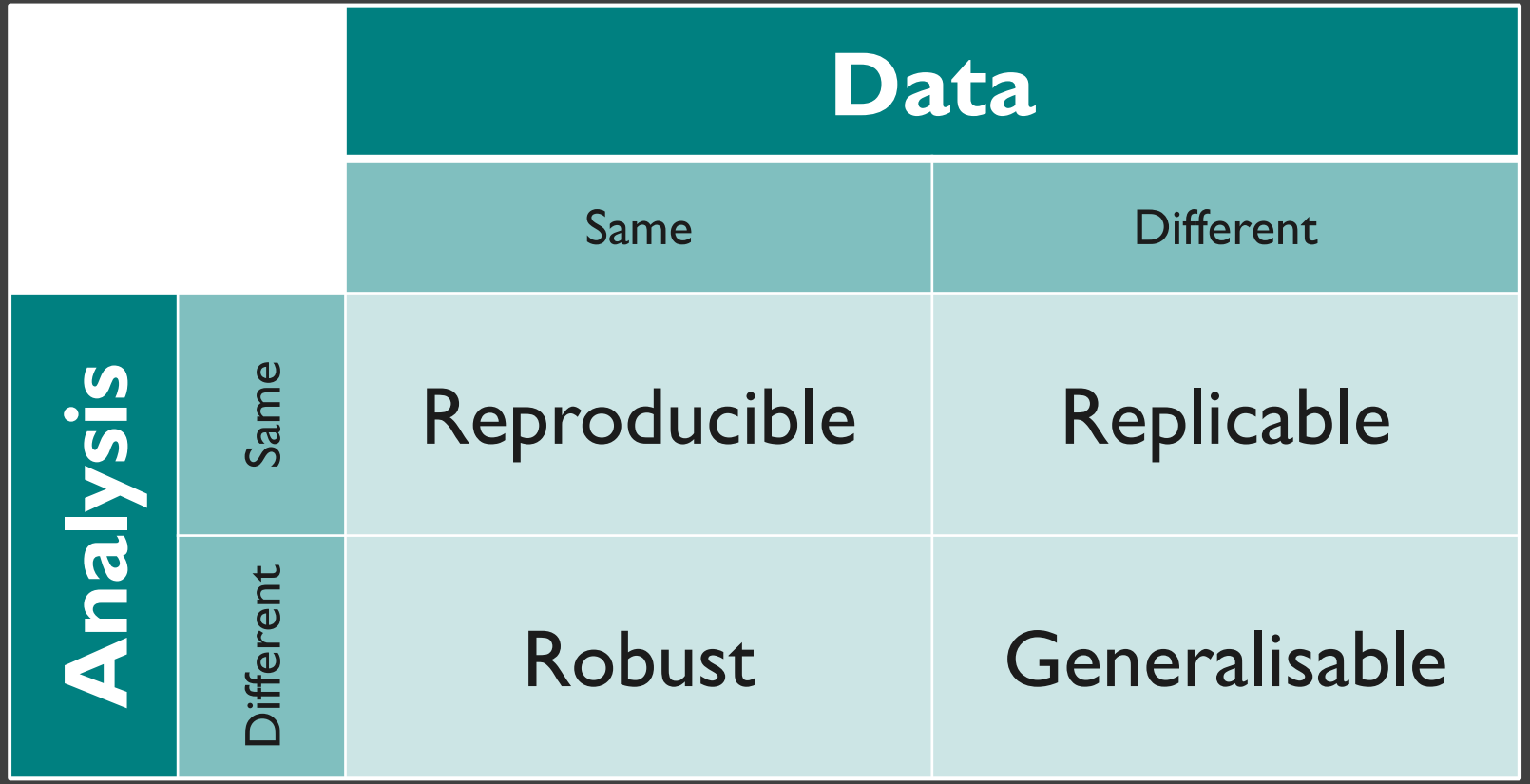

https://the-turing-way.netlify.app/reproducible-research/overview/overview-definitions.html

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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

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https://www.turing.ac.uk/news/enigma-machine-goes-display-alan-turing-institute

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https://www.bbc.co.uk/programmes/p0704h04
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https://bletchleypark.org.uk
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University network

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The Institute's partners and collaborators

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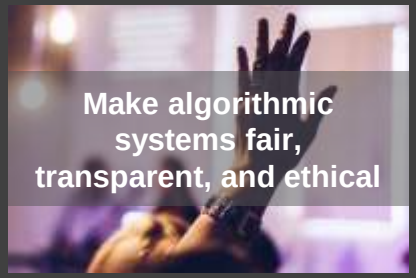
Challenges

Advance data science and artificial intelligence to…



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

https://www.turing.ac.uk/research/research-programmes/tools-practices-and-systems

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Martin O’Reilly

“Make reproducible research too easy not to do.”

https://www.turing.ac.uk/people/researchers/martin-oreilly
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The Turing Way

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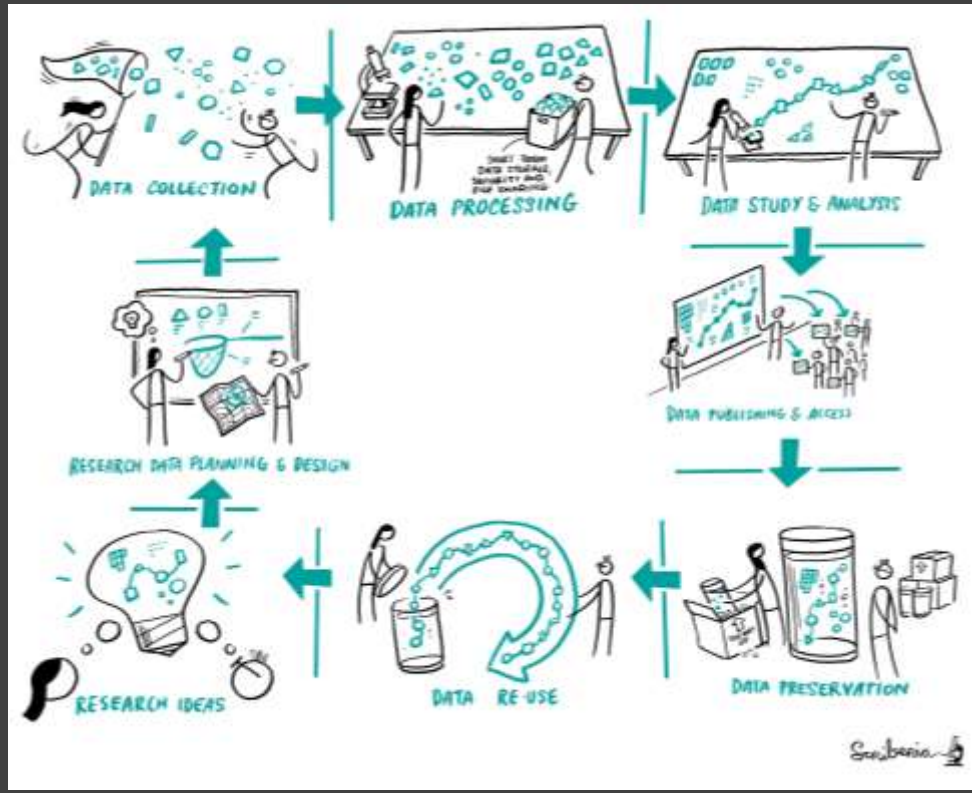
To be fully reproducible we have to cover all the steps of the research cycle

And that is super overwhelming…but we're here to help



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The Turing Way

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Guide for Reproducible Research

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Open Research

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Code Reviewing Process

Continuous Integration

Reproducible Research with Make

Research Compendia

Credit for Reproducible Research

Risk Assessment

Case Studies

Guide for Reproducible Research

This guide covers topics related to skills, tools and best practices for research reproducibility.

The Turing Way defines reproducibility in data research as data and code being available to fully rerun the analysis.

There are several definitions of reproducibility in use, and we discuss these in more detail in the Definitions of Reproducibility section of this chapter. While it it absolutely fine for us each to use different words, it will be useful for you to know how *The Turing Way* defines *reproducibility* to avoid misunderstandings when reading the rest of the handbook.

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The Turing Way is an **open source book project** that involves and supports a **diverse research community** in ensuring that reproducible and ethical **data science** is accessible and comprehensible **for everyone.**

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Version control

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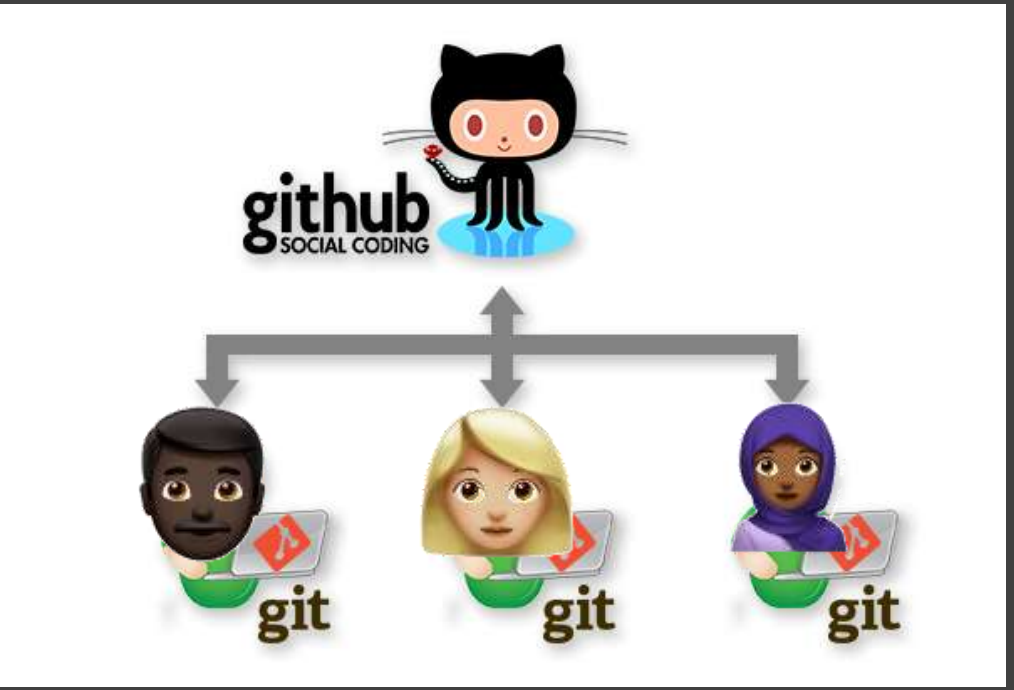

https://the-turing-way.netlify.com/collaboration/github-collaboration.html
https://the-turing-way.netlify.com/reproducible-research/vcs.html

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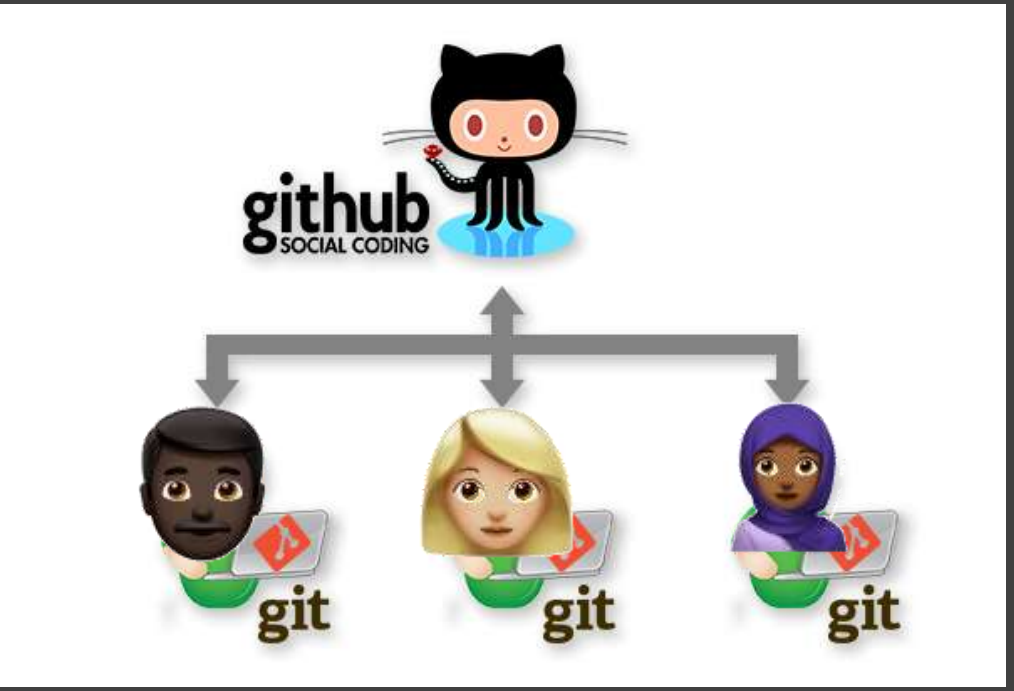

https://the-turing-way.netlify.com/collaboration/github-collaboration.html
https://the-turing-way.netlify.com/reproducible-research/vcs.html
https://neurohackademy.org

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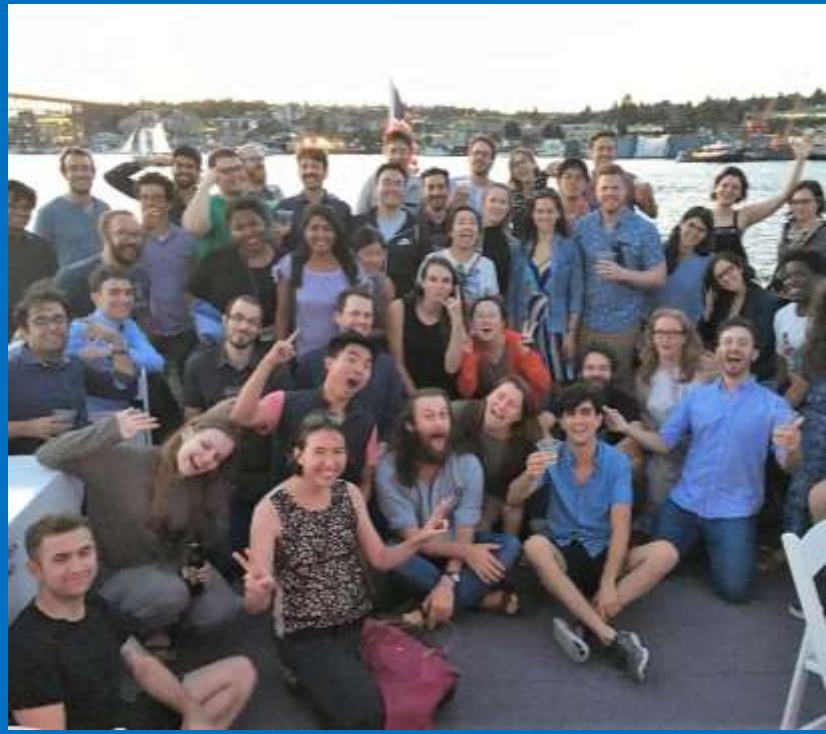
Neurohackademy

“Every hackathon should have a gong that you can ring when you complete your first pull request.”



https://neurohackademy.org
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Travelling together

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Martina Vilas

“The co-working hours are friendly for introverts who might be intimidated working with new people. These personal interactions are also crucial for staying motivated!”

https://martinagvilas.github.io
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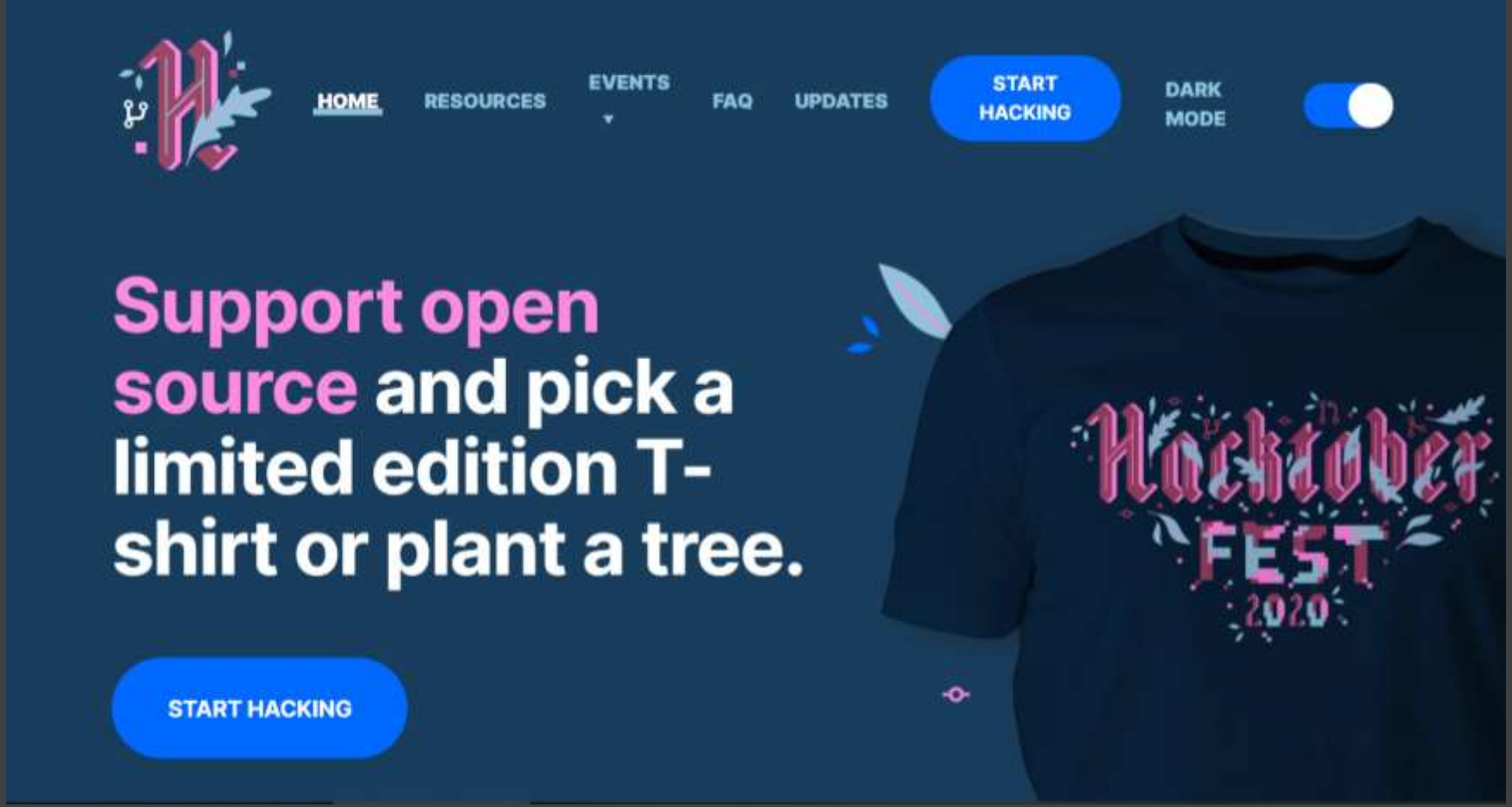

https://hacktoberfest.digitalocean.com

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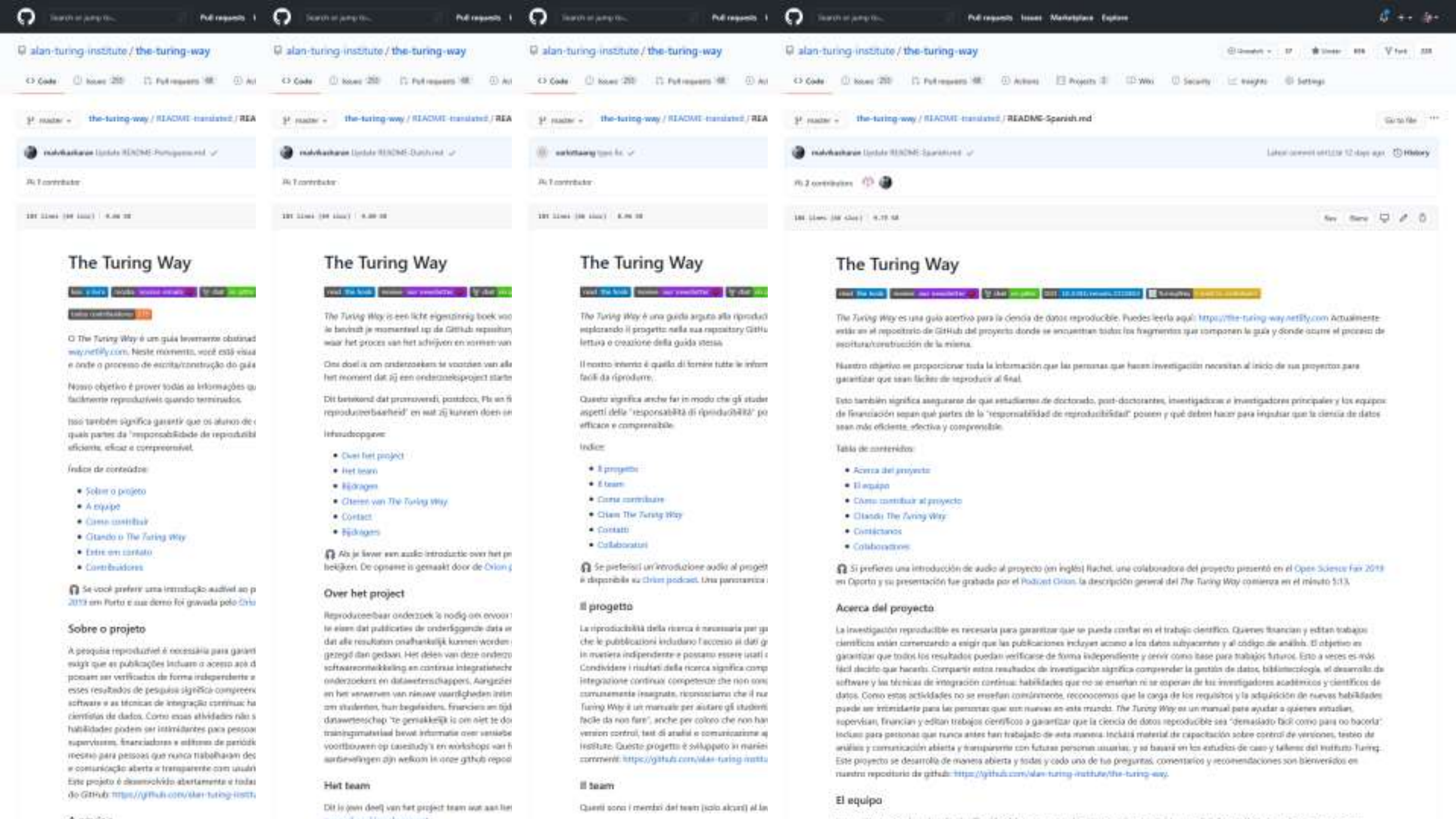
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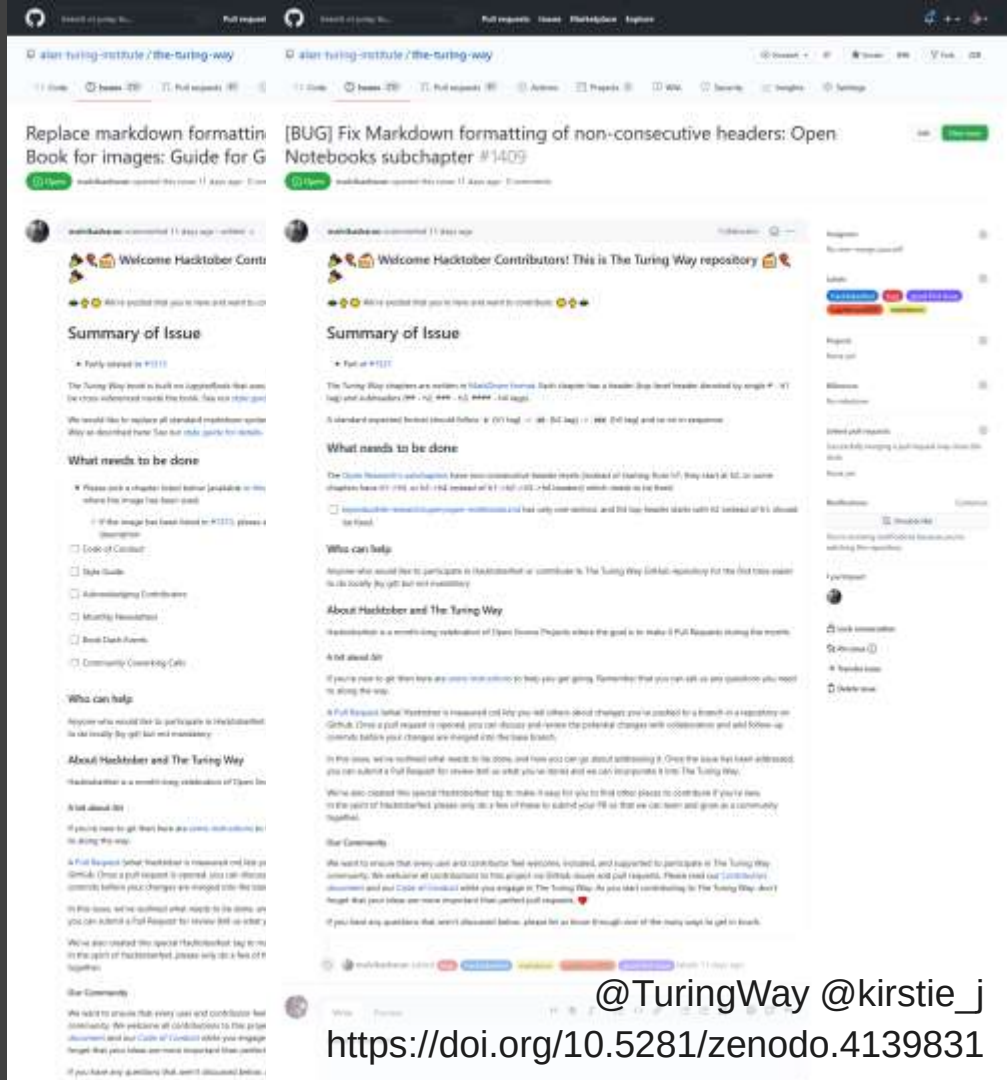
– A good first issue should take longer to write than it does to fix
– The goal is to welcome people more than “just” to fix the bug



https://github.com/alan-turing-institute/the-turing-way/issues/1409 & issues/1414

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Paul Owoicho

“There are lots of distracting formatting inconsistencies in the book that I can turn into ‘good first issues’ for new community members.”

https://developers.google.com/season-of-docs

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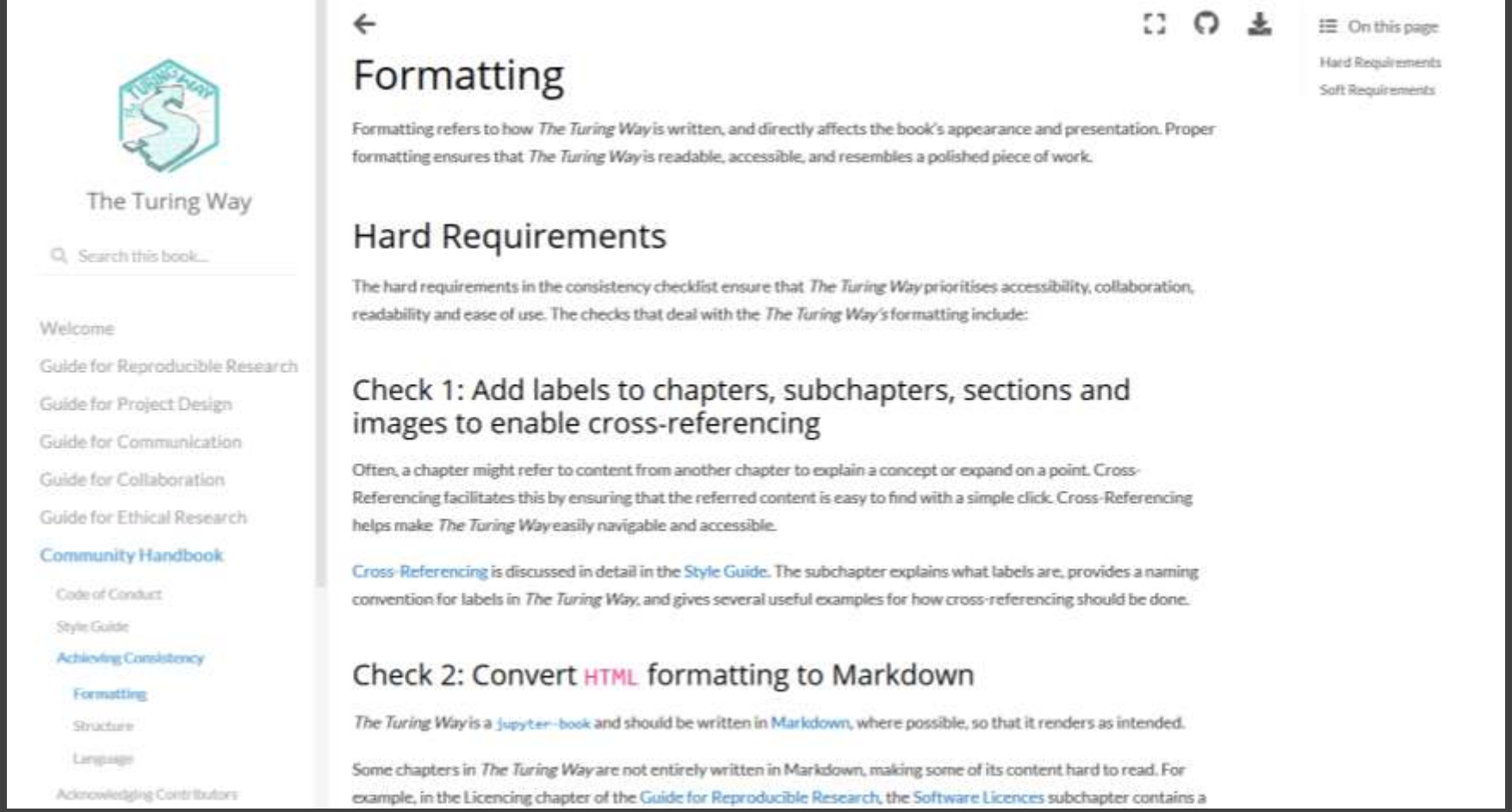

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https://github.com/alan-turing-institute/the-turing-way/pull/1459

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Beyond reproducibility

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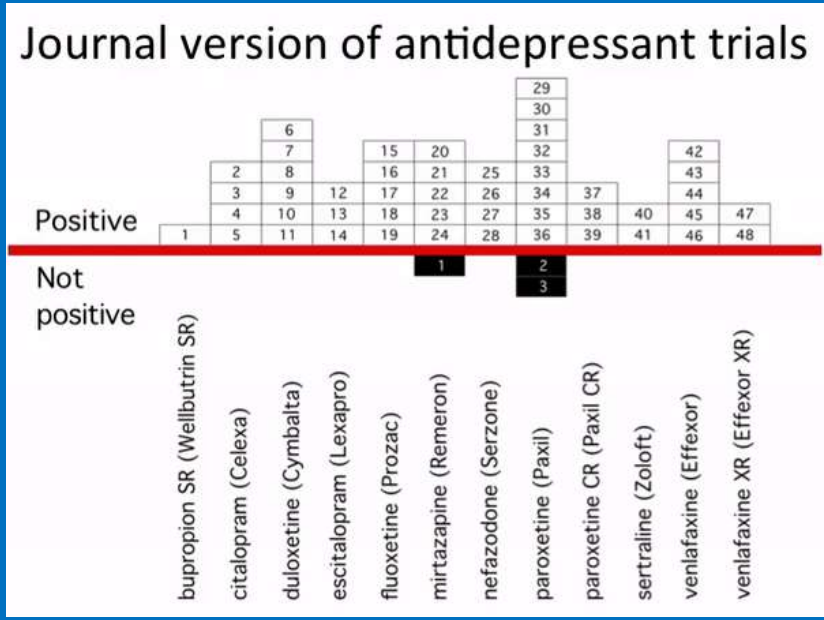
Ethical and transparent research goes beyond reproducibility



https://twitter.com/eturnermd1/status/737436322344927232
https://doi.org/10.6084/m9.figshare.3381379

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Every project has a culture

- Whose work is valued?
- Who is glue?
- Beware a tyranny of structurelessness

https://noidea.dog/glue
https://www.wired.com/story/silicon-valley-tyranny-of-structurelessness/
https://www.jofreeman.com/joreen/tyranny.htm

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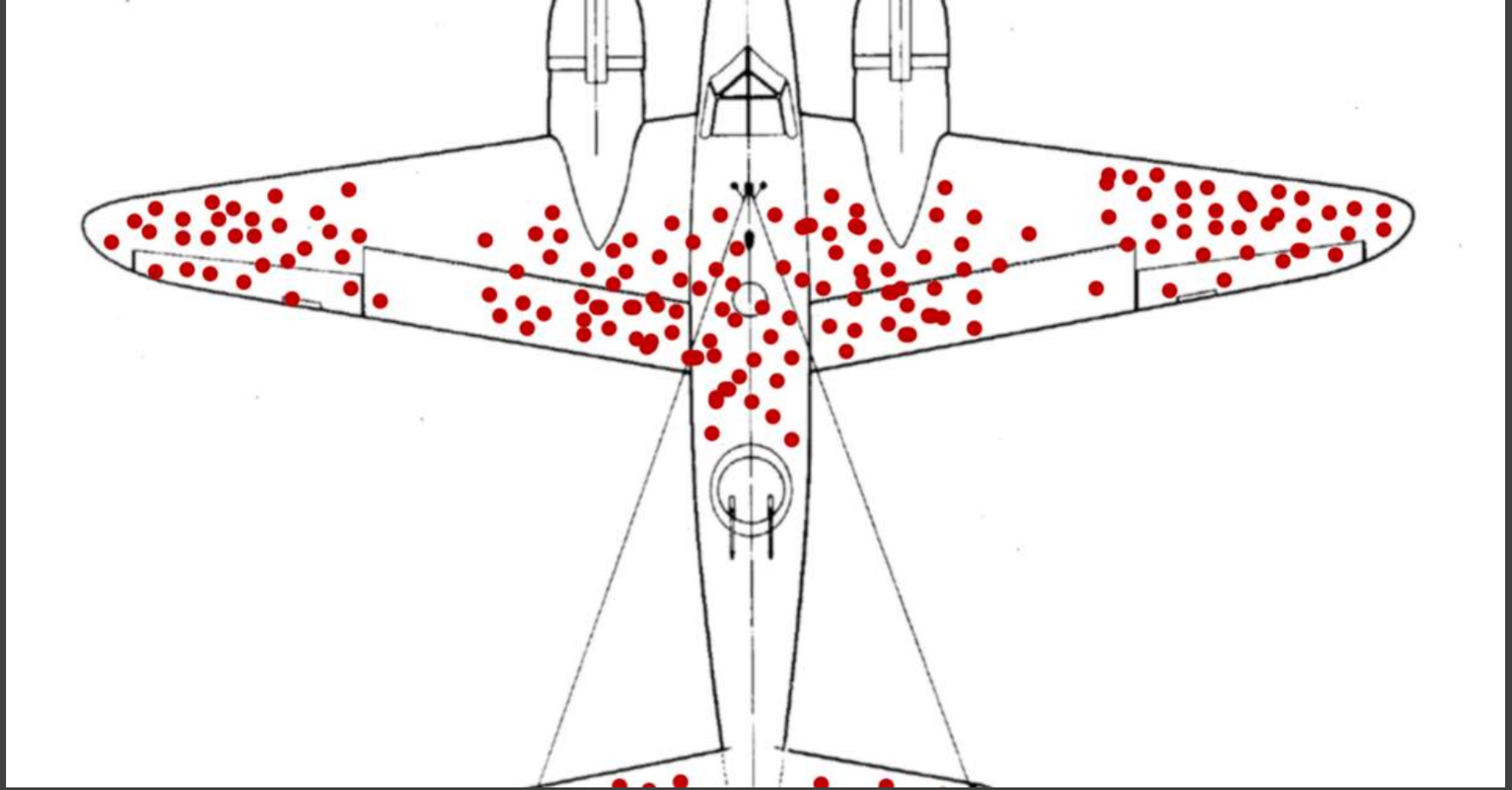

https://medium.com/@penguinpress/an-excerpt-from-how-not-to-be-wrong-by-jordan-ellenberg-664e708cfc3d

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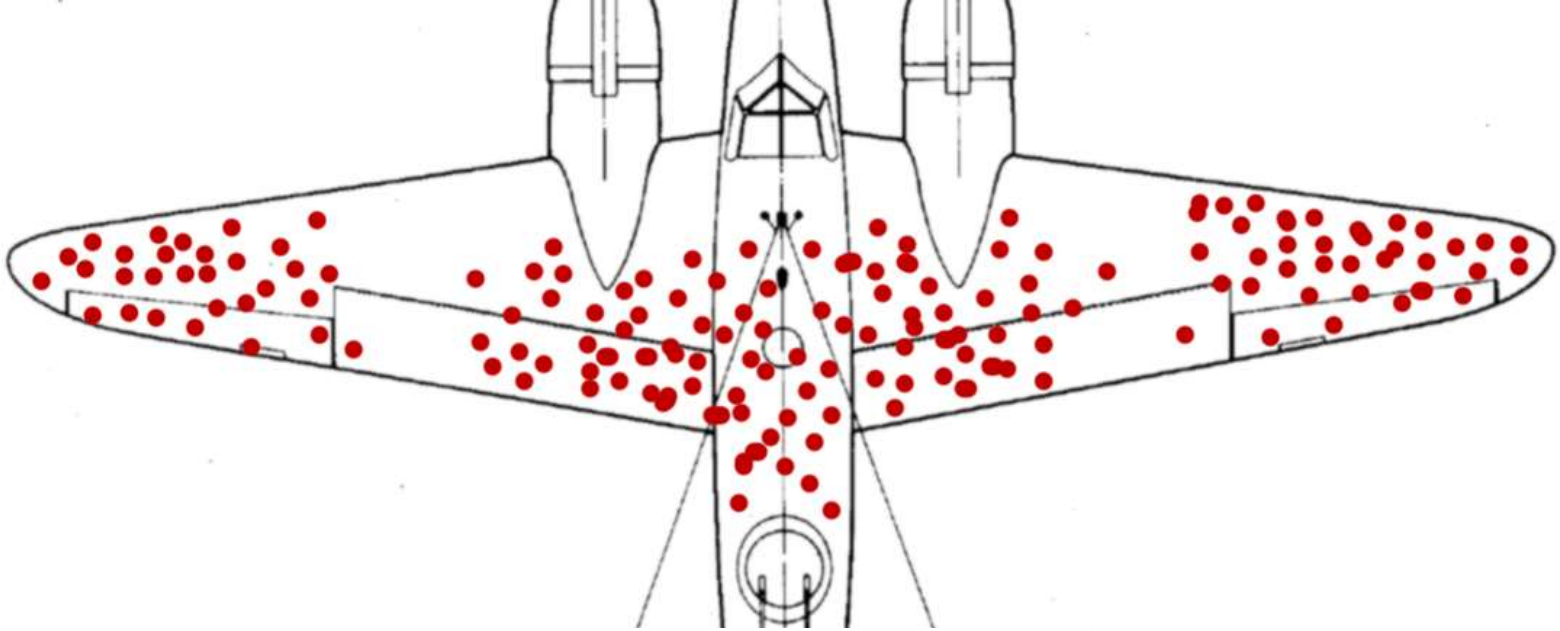

The armor, said Wald, doesn't go where the bullet holes are. It goes where the bullet holes aren't: on the engines.

https://medium.com/@penguinpress/an-excerpt-from-how-not-to-be-wrong-by-jordan-ellenberg-664e708cfc3d

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Whose voices are missing?

- In this room
- In your friend group
- At open science events

https://thepsychologist.bps.org.uk/volume-33/november-2020/bropenscience-broken-science

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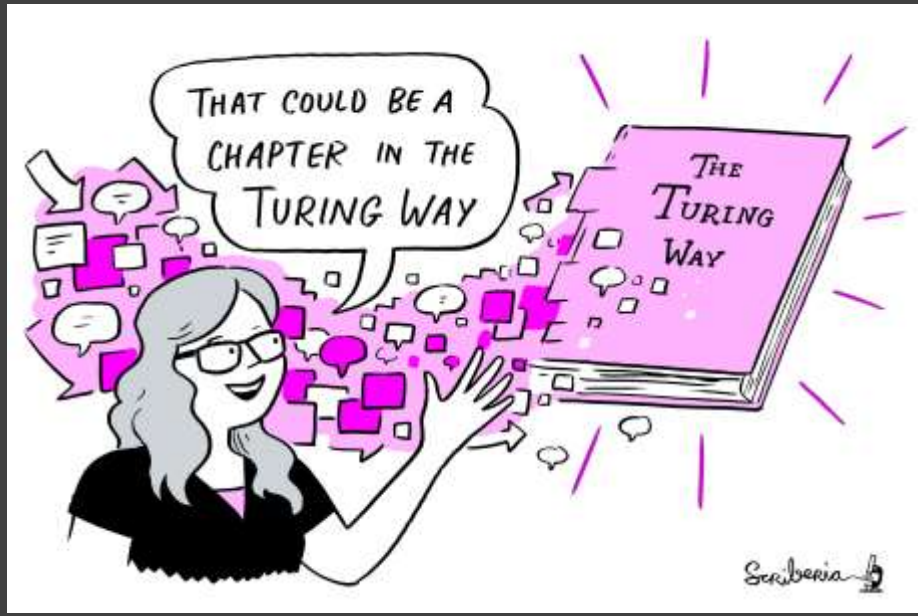
Join us!

- You can help in so many ways!
  - Editing
  - Writing
  - Linking
  - Automating
  - Curating
  - Translating
  - Promoting



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Thank you

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- Book: https://the-turing-way.netlify.com
- Newsletter: https://tinyletter.com/TuringWay
- GitHub: https://github.com/alan-turing-institute/the-turing-way
- Slack: https://tinyurl.com/jointuringwayslack
- Next Collaboration Café: 4 November at 3pm UK, 4pm CET
- This work was supported by The UKRI Strategic Priorities Fund under the EPSRC Grant EP/T001569/1, particularly the "Tools, Practices and Systems" theme within that grant, and by The Alan Turing Institute under the EPSRC grant EP/N510129/1. Unsplash photos by Adolfo Felix,Daniil Silantev, James Pond, Kinson Leung, Mateo Vrbnjak, Toa Heftiba, Thomas Q, Waldemar Brandt. Noun Project icons by Aybige, Luis Prado, Edward Boatman, Becris, Rose Alice Design, Hyemm.work. Original artwork by Scriberia: https://doi.org/10.5281/zenodo.3332807

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