

The Alan Turing Institute

Open science for enabling reproducible,
ethical and collaborative research:

Insights from The Turing Way

Malvika Sharan

Pronouns: she/her



Shared spaces create shared experiences



Shared spaces create shared experiences

Commons (*noun*)



Shared spaces create shared experiences

Commons (*noun*)

Land or resources belonging to or affecting the whole of a community.



Participatory processes to manage the Commons



The Commons Movement - Schumacher Center for New Economics. <https://centerforneweconomics.org/apply/the-commons-program/movement>
Verdun's Ethel Parking Lot – rooftop for local culture, Montréal's participatory budget. <https://www.makingmtl.ca/participatorybudget>

Participatory processes to manage the Commons



The Commons Movement - Schumacher Center for New Economics. <https://centerforneweconomics.org/apply/the-commons-program/movement>
Verdun's Ethel Parking Lot – rooftop for local culture, Montréal's participatory budget. <https://www.makingmtl.ca/participatorybudget>

Governing the Commons: Elinor Ostrom



Extensively researched communities and provided principles for how commons can be governed equitably and sustainably – debunking “Tragedy of the Commons”.

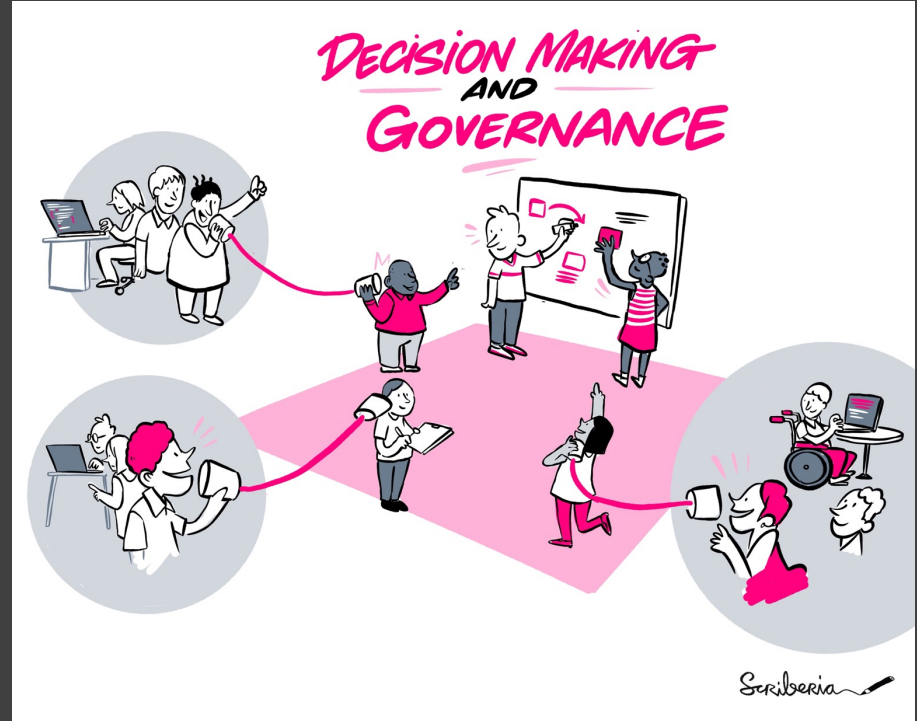
2009 Nobel Laureate

(1933-2012)

Ostrom, E. (1990). *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge University Press. doi: 10.1017/CBO9780511807763, | Kenneth, J. A., Robert, O. K., & Simon, A. L. (2012). Elinor Ostrom: An uncommon woman for the commons. *PNAS*, 109(33), 13135–13136. doi: 10.1073/pnas.1210827109

Collective benefits

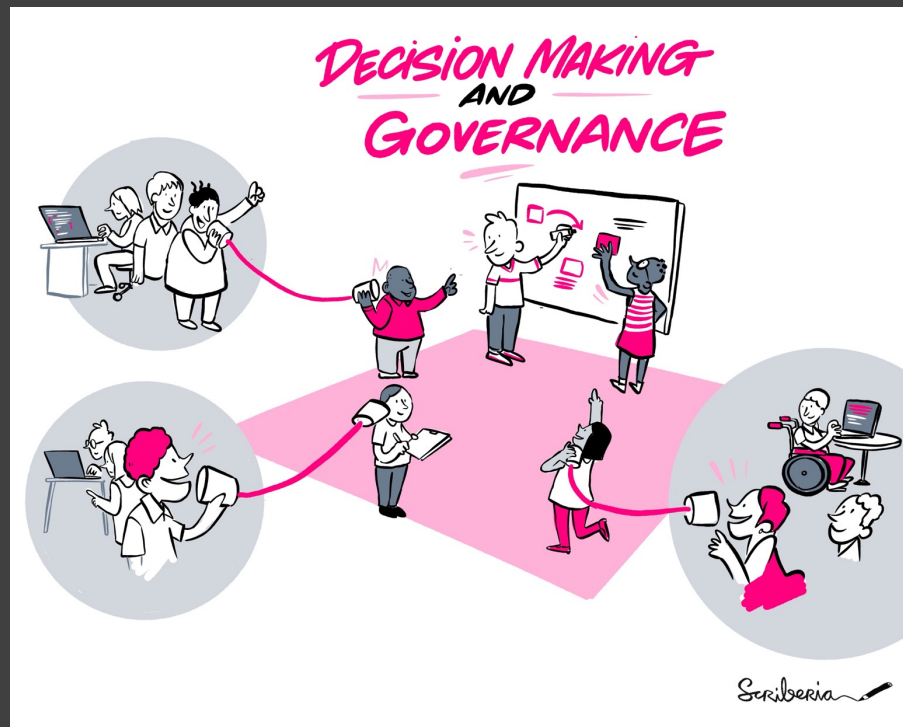
Digital Commons include free and open source software, open access journals, community-led projects and platforms – part of **Open Science**.



Collective benefits

You are already practicing openness.

Open Science as a common language merely validates what others may consider marginal or inconsequential.



Open Science

Everyone can **freely access, reuse, reproduce, build upon and distribute** research objects.



Open Science

Everyone can **freely access, reuse, reproduce, build upon and distribute** research objects.

Community framework for **collaboration, peer production and sustainability.**



elly, Anthony, "With Head, Heart and Hand: Dimensions of Community Building" (Boolarong Press) ISBN 978-0-86439-076-9,
Wenger, McDermott, Snyder, A Guide to Managing Knowledge: Cultivating Communities of Practice. HBS (2002)
@malvikasharan, Image by Scriberia for The Turing Way, Shared under CC-BY 4.0, DOI: 10.5281/zenodo.6587260



UNESCO regards science as a human right -- the greatest collective endeavour -- that has significant value as a common good.



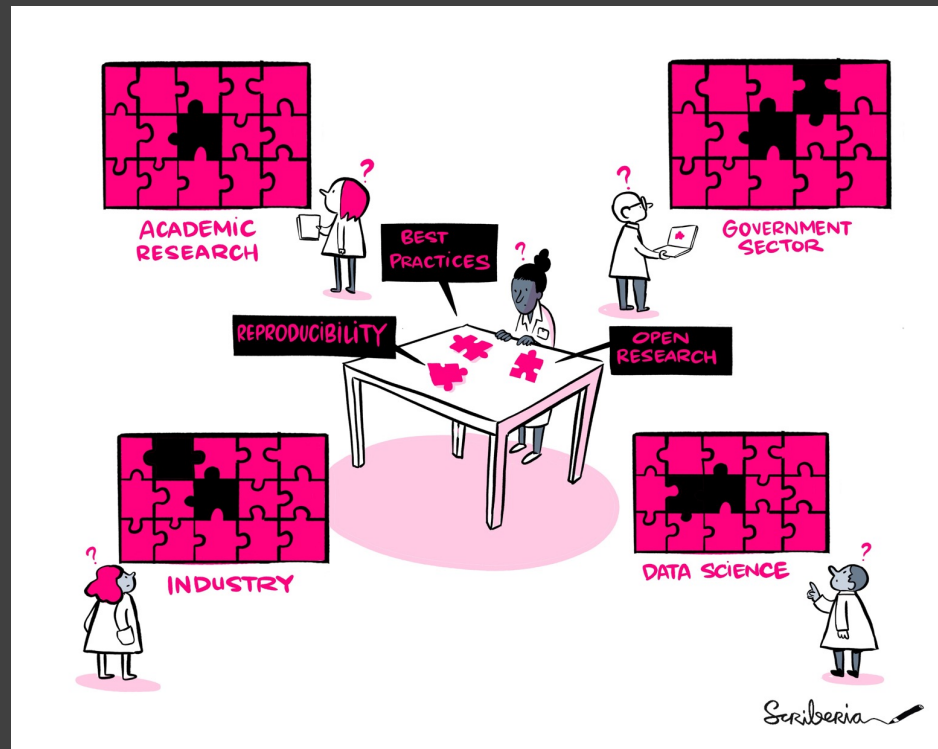
UNESCO regards science as a human right -- the greatest collective endeavour -- that has significant value as a common good.

... aims to turn right to Open Science into duty to be exercised by researchers, institutions, educators, publishers, employers, libraries, and policymakers, facilitated by Member States.

Integrating open science

Open Science means different things in different contexts, and hence, there is no fixed “best practice”.

Many barriers to openness.



The Turing Way



The Turing Way

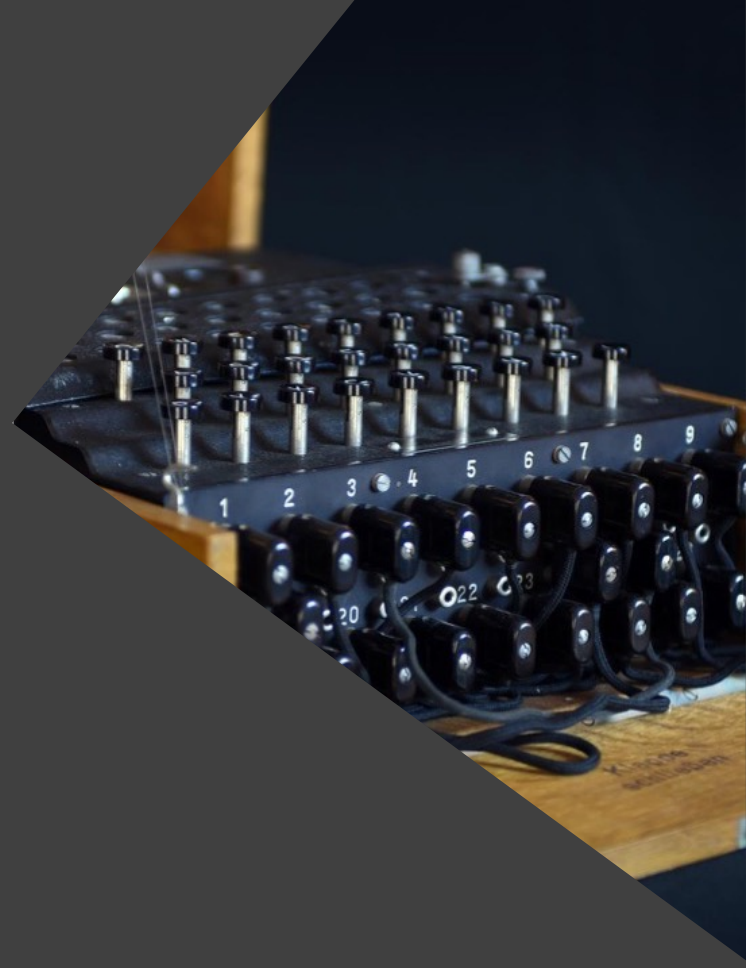
An Open Science and community lead guide on Data Science.

*We involve and support a **diverse community** to make research **reproducible, ethical, and collaborative** for everyone.*



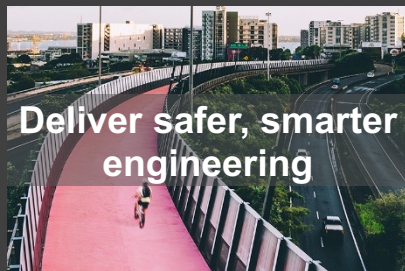
The Alan Turing Institute

The national institute
for data science and
artificial intelligence



Challenges

Advance data science and artificial intelligence to...



Tools, Practices and Systems

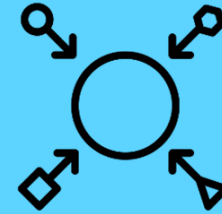
- Trustworthy systems
- Transparent reporting
- Inclusive interoperable design
- Ethical integrity
- Respectful co-creation
- Leadership in open research



Trust



Transparency



Inclusivity



Integrity



Respect



Leadership

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.

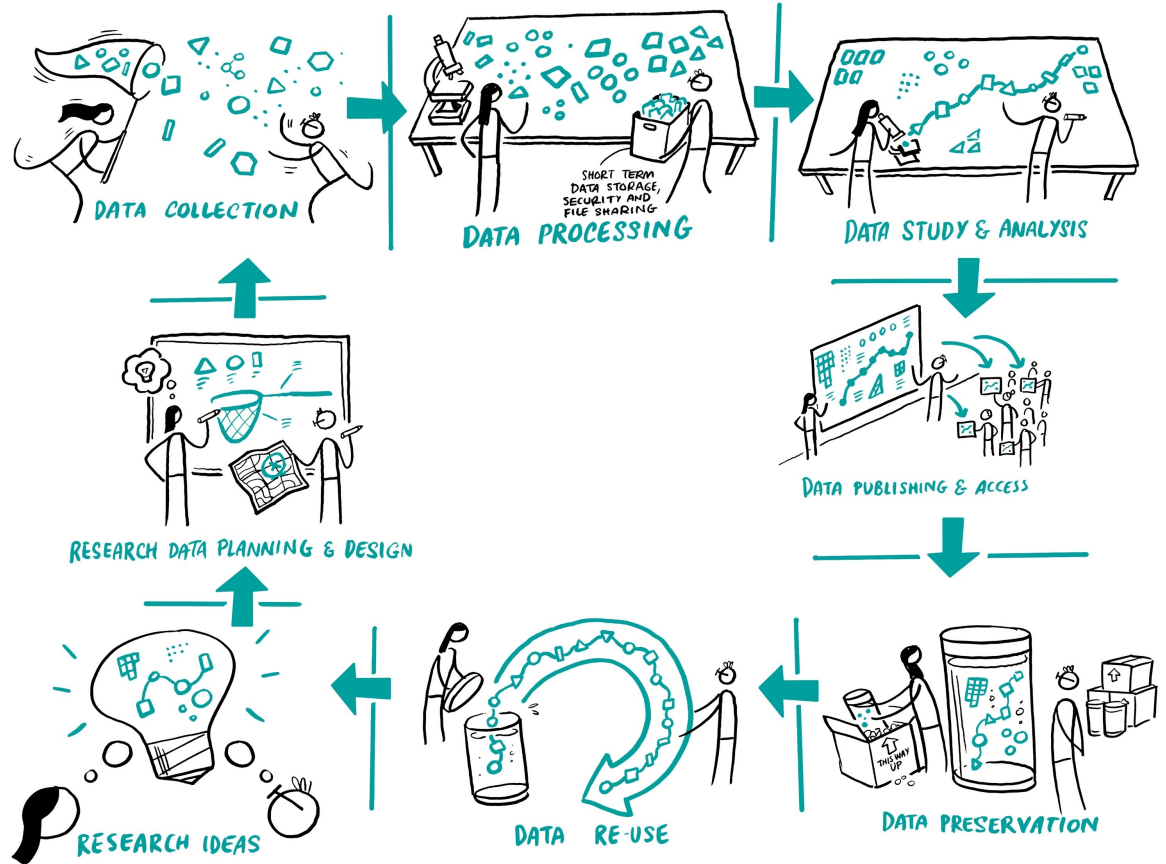


Reproducibility

		Data	
		Same	Different
Analysis	Same	Reproducible	Replicable
	Different	Robust	Generalisable

Reproducibility

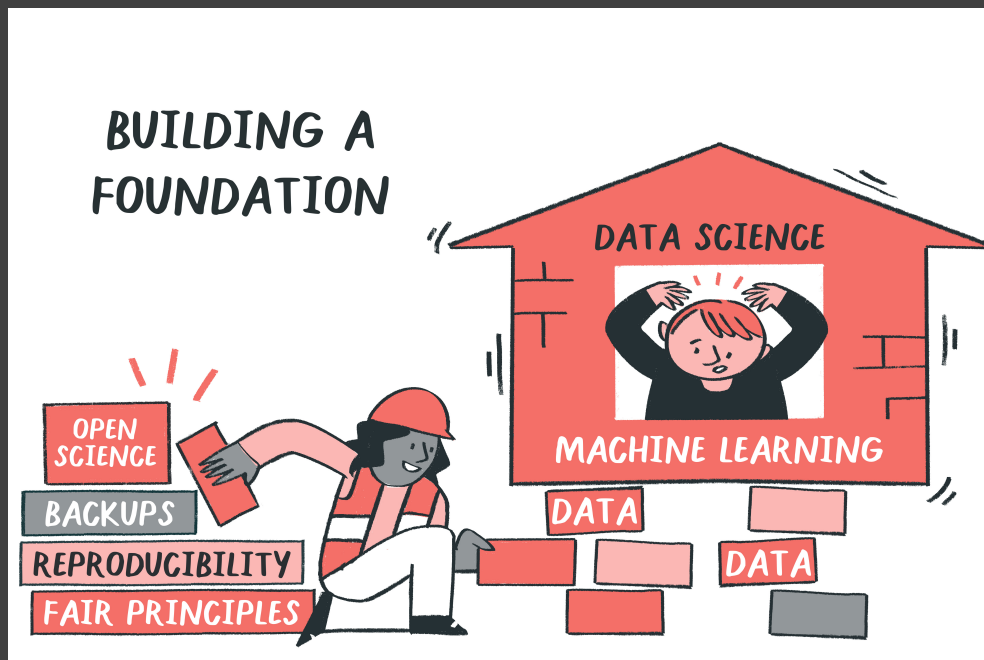
		Data	
		Same	Different
Analysis	Same	Reproducible	Replicable
	Different	Robust	Generalisable



Scriberia

Open Science as a foundational skill

Purpose of openness is to ensure **reproducible, ethical and collaborative research** process and outcome.

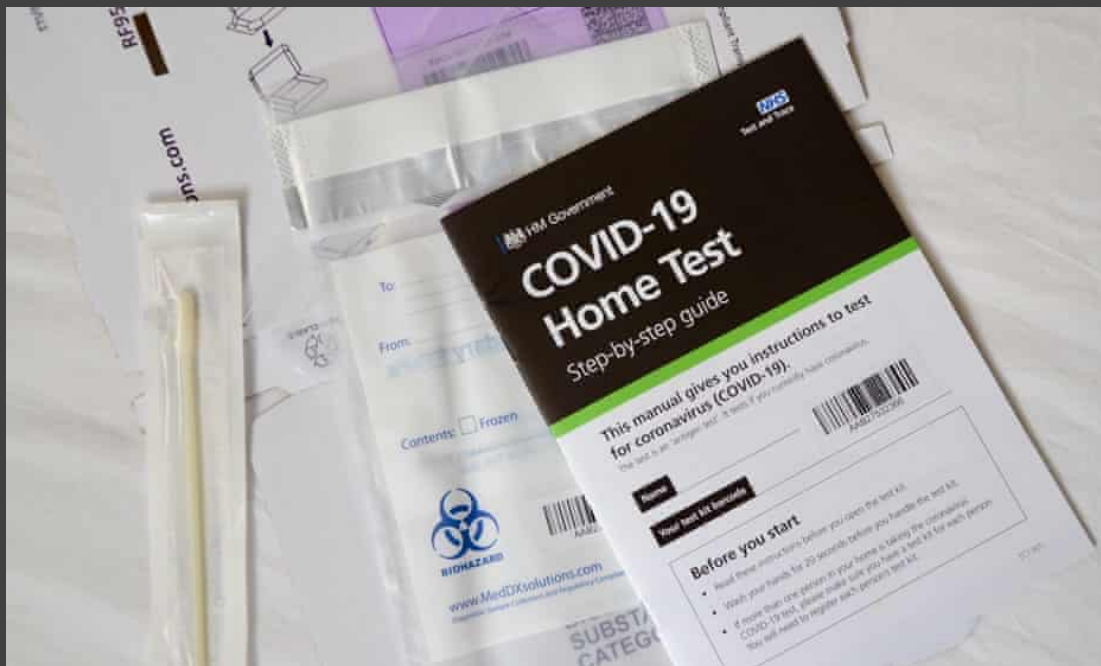


Scientific errors have real world effects

Researchers have an obligation to build understanding of practices in research (right actions) and their impact on society.



Scientific errors have real world effects



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 [↗](#)

Hern, A. (2020). Covid: how Excel may have caused loss of 16,000 test results in England. the Guardian. <https://www.theguardian.com/politics/2020/oct/05/how-excel-may-have-caused-loss-of-16000-covid-tests-in-England>, <https://www.bbc.com/news/technology-54423988>

@malvikasharan, @turingway, CC-BY 4.0,
The Turing Way, DOI: 10.5281/zenodo.6587260

Price of Popularity

Researchers in Australia used unreliable COVID-19 data 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.5568007

Peer Review Can Catch Error, 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

Open Science + Reproducibility

Open and reproducible research save valuable time in verifying and building upon widely beneficial solutions.



Guide for Reproducible Research

Overview

Open Research

Version Control

Licensing

Research Data Management

Reproducible Environments

BinderHub

Code quality

Code Testing

Code Reviewing Process

Reusable Code

Continuous Integration (CI)

Reproducible Research with

Make

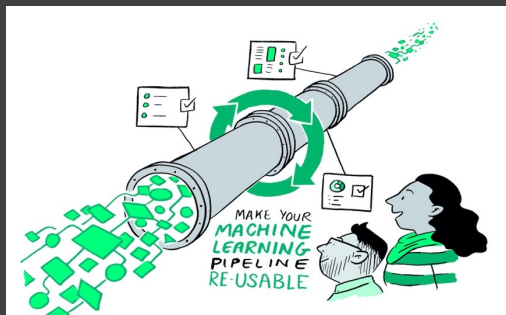
Research Compendia



Fig. 3 The Turing Way project illustration by Scriberia. Used under a CC-BY 4.0

licence. DOI: [10.5281/zenodo.3332807](https://doi.org/10.5281/zenodo.3332807).

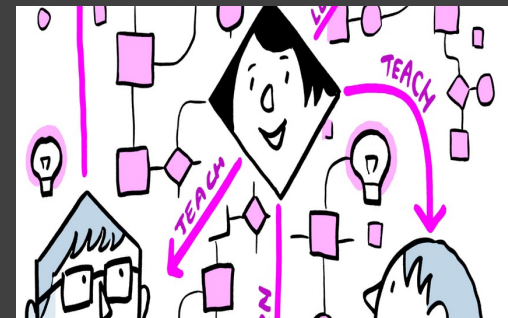
The Turing Way Guides



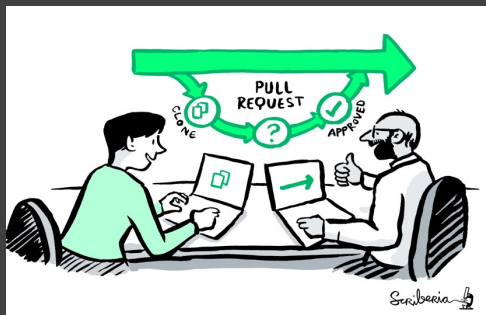
Reproducibility



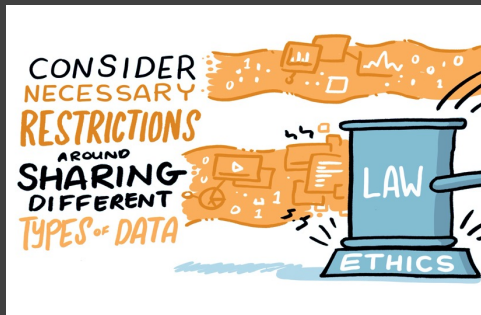
Project Design



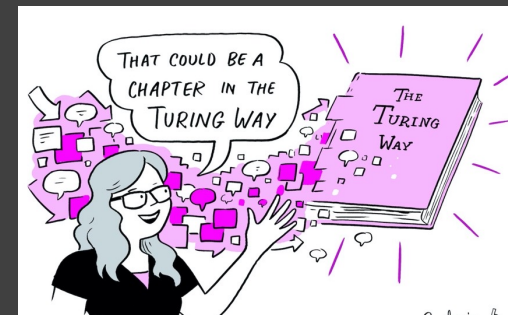
Communication



Collaboration



Ethical Research



Community Handbook



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

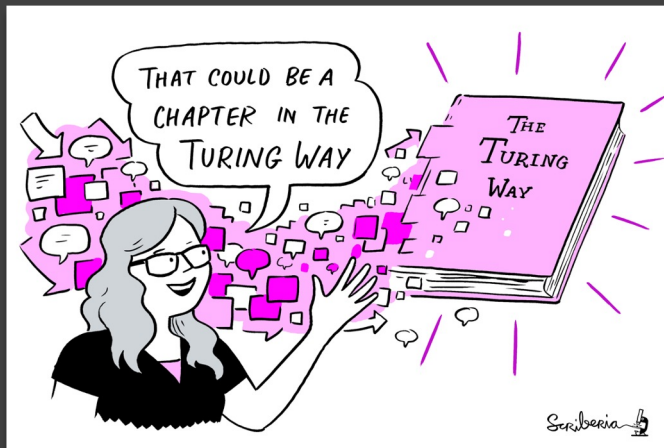
GitHub:
github.com/alan-turing-institute/the-turing-way

Twitter:
twitter.com/turingway

Email:
theturingway@gmail.com

CC-BY 4.0, *The Turing Way*

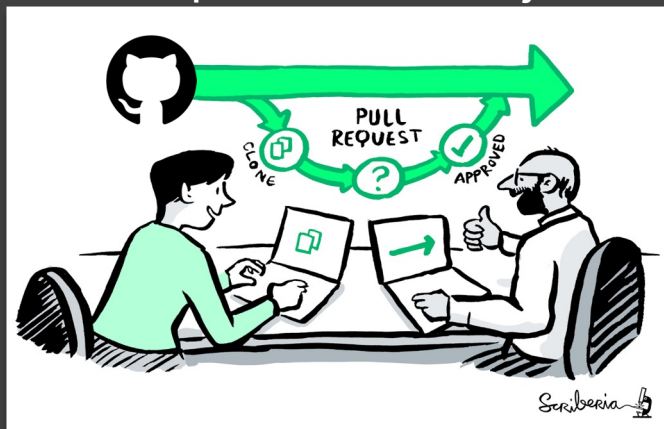
A Book



A Community



An Open Source Project



A Culture of Collaboration



The Turing Way: Book



The Turing Way

🔍 Search this book...

Welcome

Guide for Reproducible
Research

Guide for Project Design

Guide for Communication

Guide for Collaboration

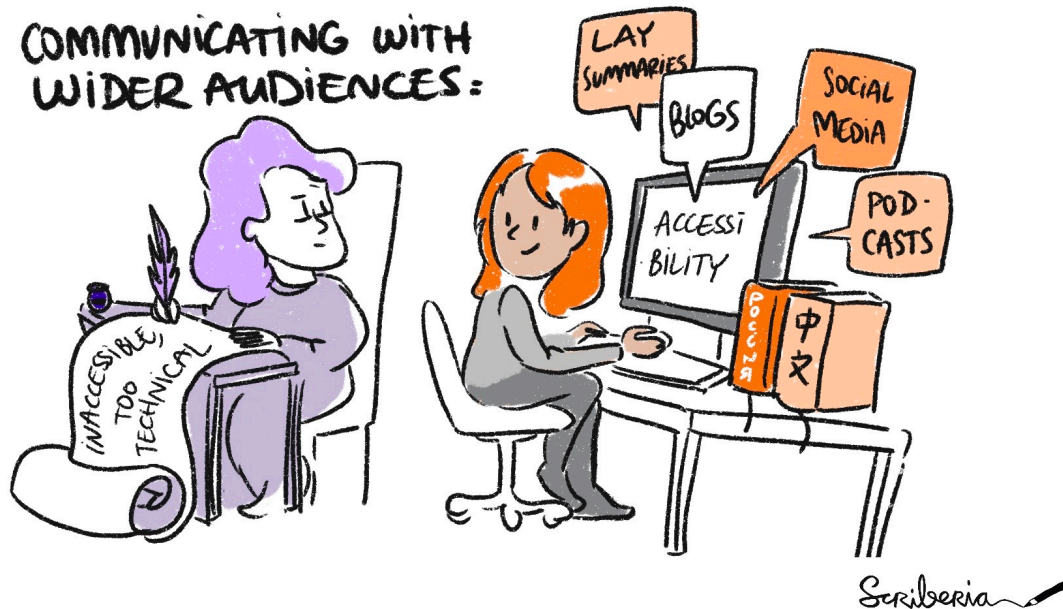
Guide for Ethical Research

Community Handbook



Guide for Communication

COMMUNICATING WITH
WIDER AUDIENCES:



Overview of Guide for
Communication

Open Scholarship

Blogs for Research

Communication

Social Media for Research
Communications

Making Research Objects
Citable

Publishing Different Article
Types

Communications in Open
Source Projects

Authorship and
Contributions on Academic
Articles

Peer Review

Guide for Collaboration

Getting Started With GitHub

Maintainers and Reviewers
on GitHub

Managing a New
Community and Team

Leadership in Data Science

Research Infrastructure
Roles

Remote Collaboration

Shared Ownership in Open
Source Projects



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

Self-Reflection



Guide for Project Design

Overview of Project Design

Planning for Project Design

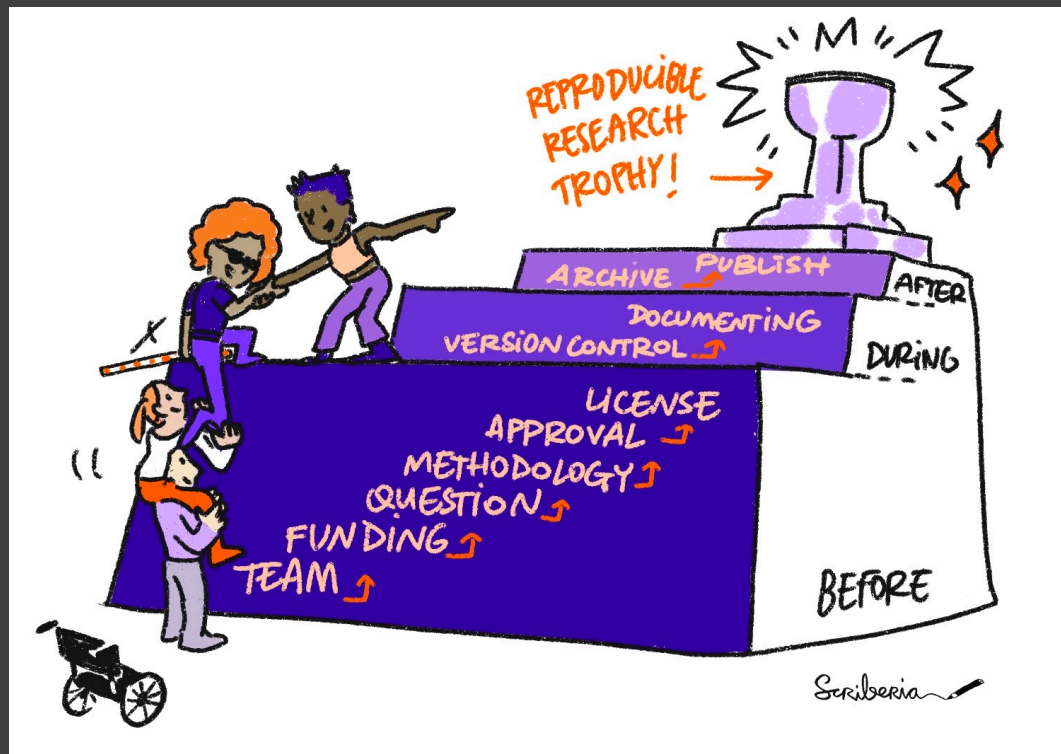
Communication and
Collaboration

Reproducibility Methods

Version Control and
Documentation

Sharing Your Research
Work

Creating Project Repositories





Book:
[the- turing-way.netlify.app/](https://the-turing-way.netlify.app/)

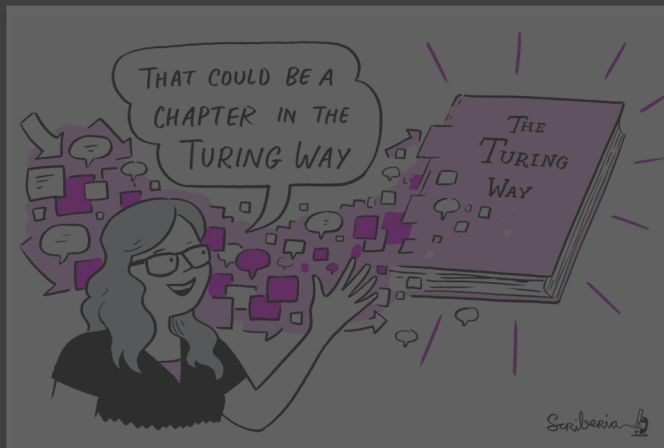
GitHub:
[github.com/alan-turing-institute/the- turing-way](https://github.com/alan-turing-institute/the-turing-way)

Twitter:
twitter.com/turingway

Email:
theturingway@gmail.com

CC-BY 4.0, *The Turing Way*

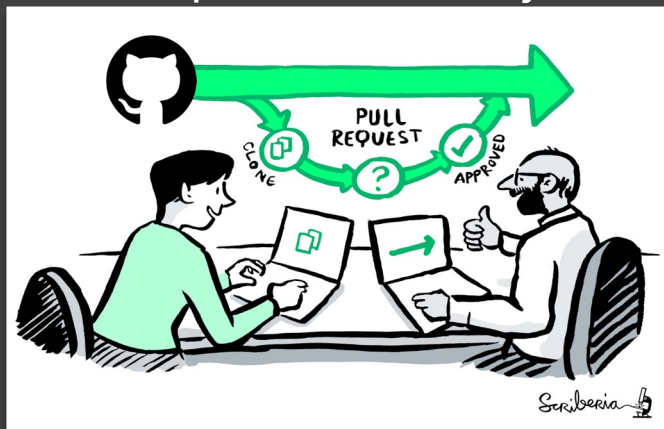
A Book



A Community



An Open Source Project

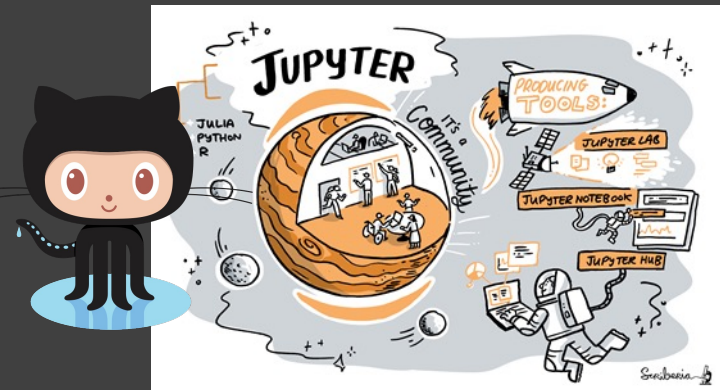
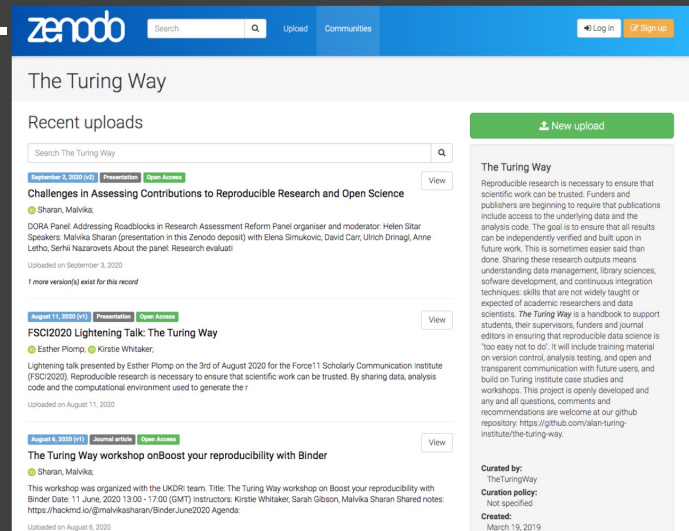


A Culture of Collaboration



An open source project

- Everyone can freely read, reuse, distribute, modify and help develop.
- The project belongs to *The Turing Way* community.
- Built on open source infrastructure:
 - Git, Jupyter Book, Binder, project bots etc.
 - Nelfy: the-turing-way.[netlify](https://zenodo.org/communities/the-turing-way).app/welcome



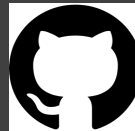
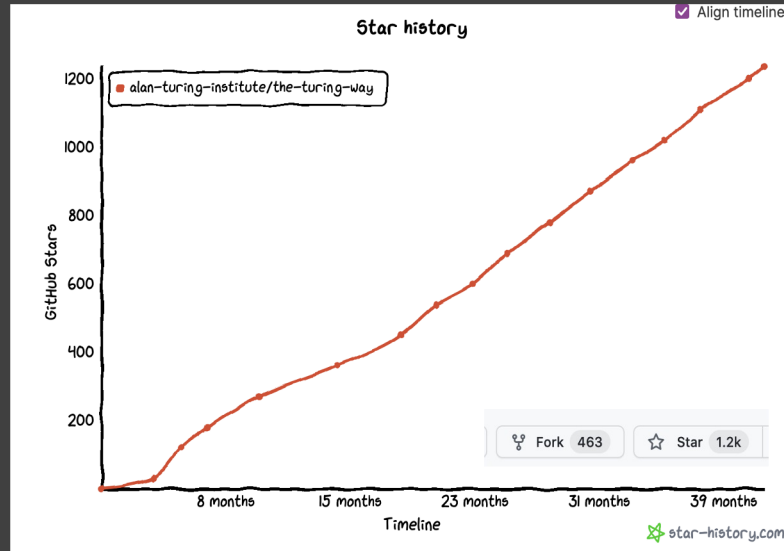
Project and Community Growth

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

<https://zenodo.org/record/3332807>



8,944	11,065
 views	 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)
- CodeRefinery and Library Carpentries **training materials**
- Cited by **30+ peer-reviewed articles** & 100+ online publications

Notable Impacts Beyond the project

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 for London (policy)
- Innovation Scholars: UKRI grant 2020 (funding)
- CodeRefinery and Library Carpentries (training)
- Cited by peer-reviewed articles & open source projects



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

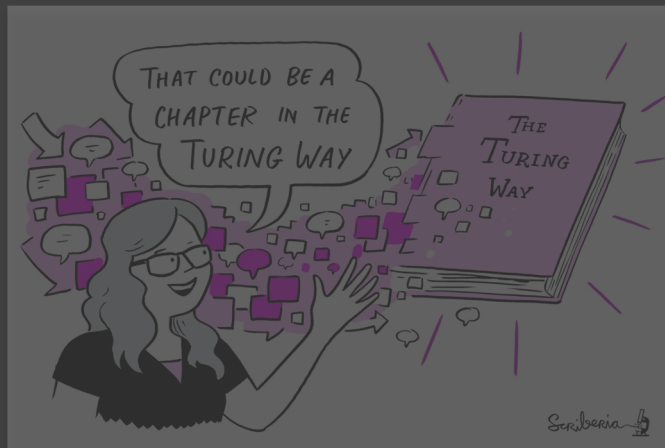
GitHub:
github.com/alan-turing-institute/the-turing-way

Twitter:
twitter.com/turingway

Email:
theturingway@gmail.com

CC-BY 4.0, *The Turing Way*

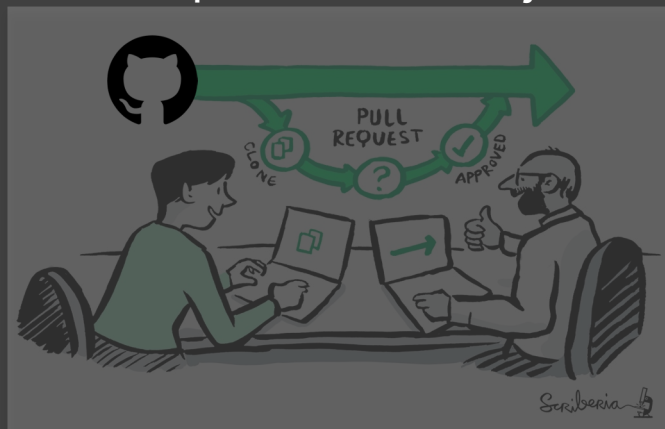
A Book



A Community



An Open Source Project



A Culture of Collaboration

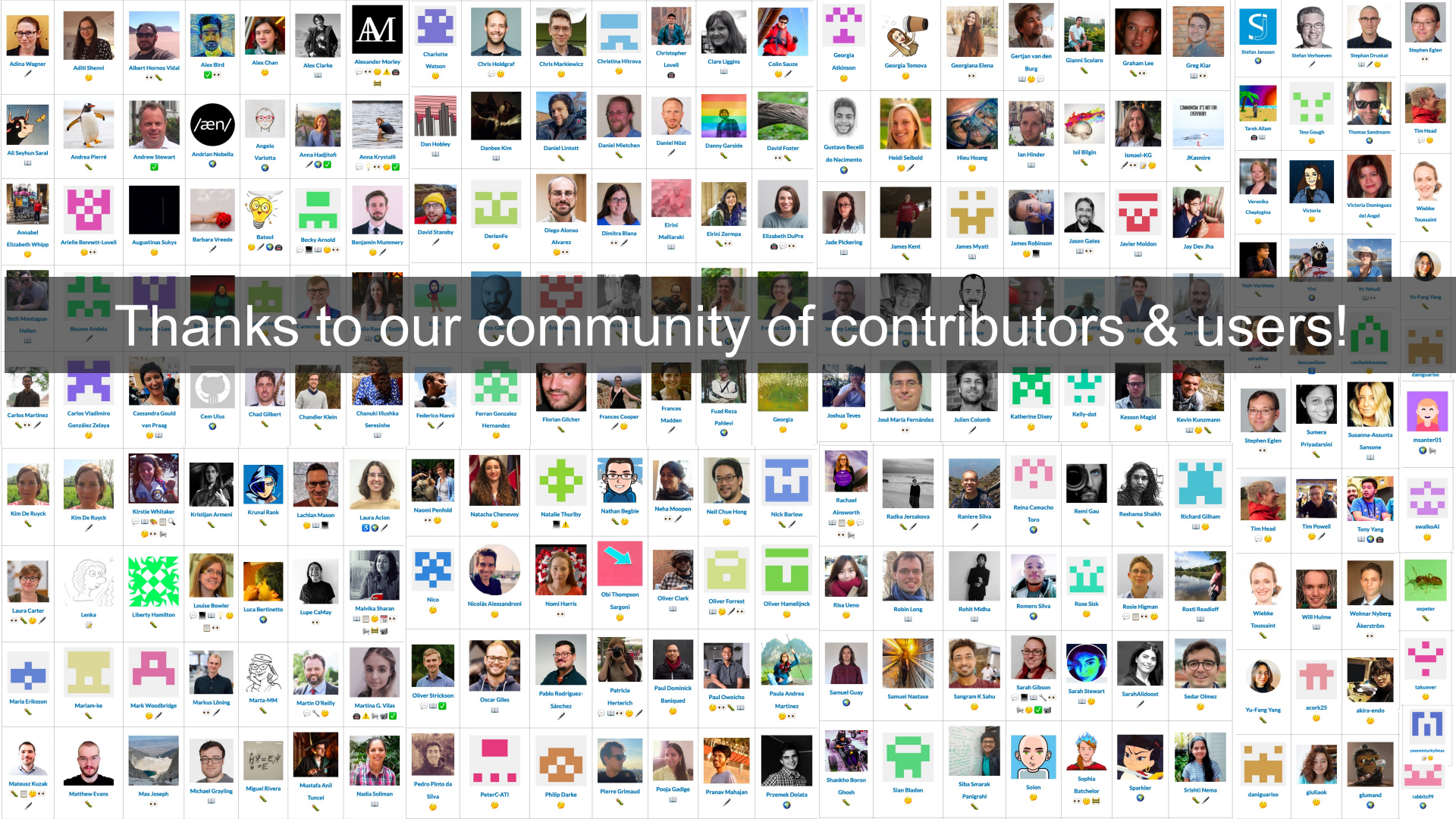


📁 .github	Remove prettier configuration
📁 book	minor update
📁 communications	Fix typos
📁 conferences	Add KW formatting pedantry
📁 project_management	Update online-collaboration-cafe.md
📁 templates	Updating Github templates
📁 tests	Add "et cetera" as a deprecated Latinism
📁 workshops	Remove mis-pasted text



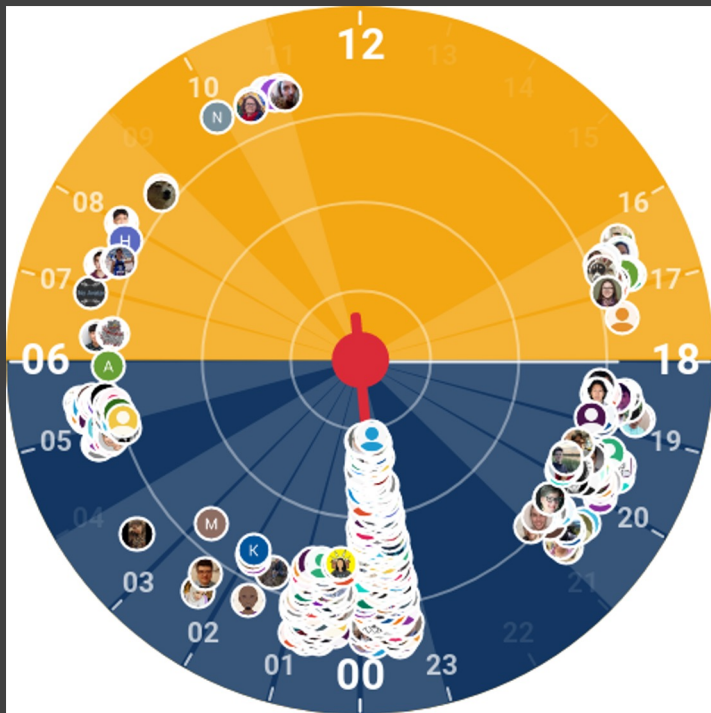
📄 .all-contributorsrc	Merge pull request #991 from alan-turing-institute/all-contributors/a...	5 days ago
📄 .gitignore	ignore pptx in workshop folder	9 months ago
📄 .travis.yml	add html-proof file again	last month
📄 <u>CODE_OF_CONDUCT.md</u>	her -> their	6 months ago
📄 <u>CONTRIBUTING.md</u>	Update CONTRIBUTING.md	2 months ago
📄 GOVERNANCE.md	Read through months later	5 months ago
📄 LICENSE.md	Fix typo in licence	2 months ago
📄 <u>README.md</u>	Merge pull request #991 from alan-turing-institute/all-contributors/a...	5 days ago
📄 book_skeleton.md	Update book_skeleton.md	13 months ago
📄 <u>contributors.md</u>	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

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



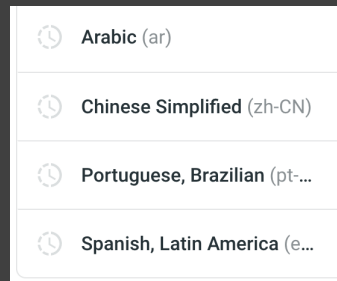
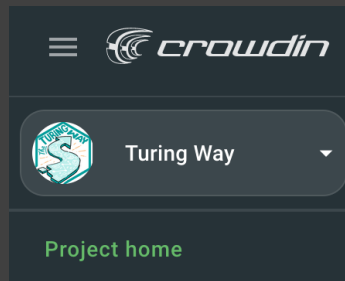
Thanks to our community of contributors & users!

Global Community: Translation & Contextualisation

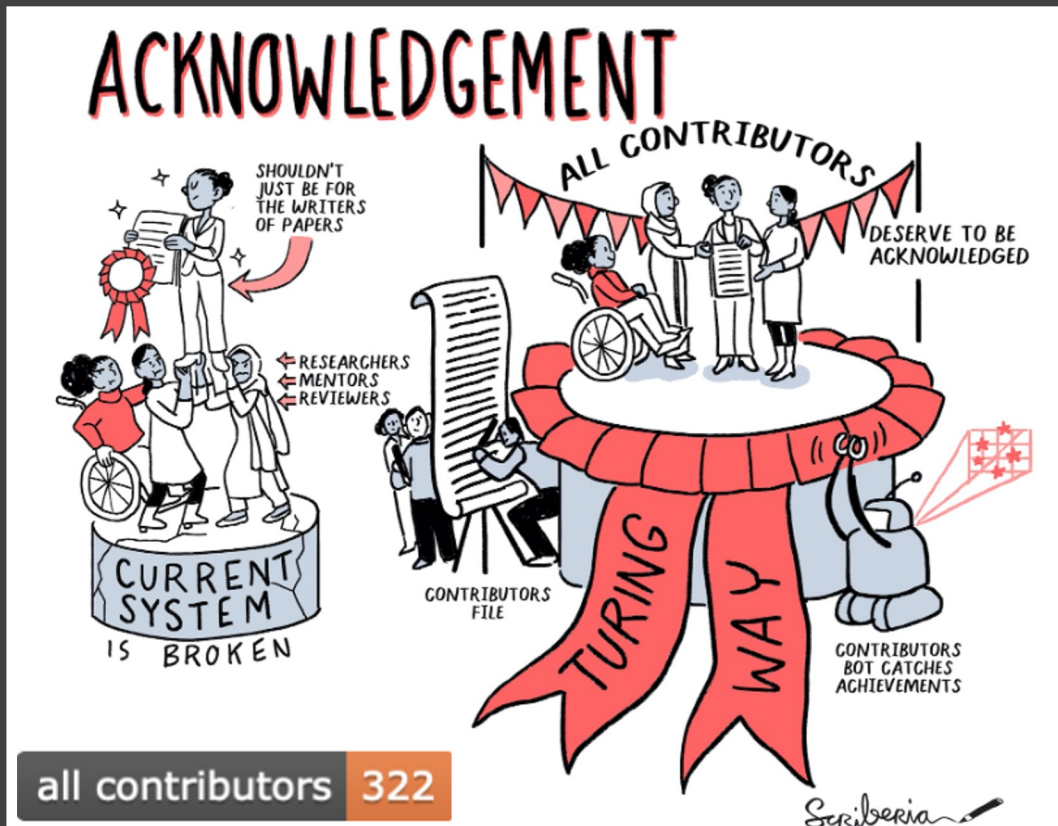


all contributors 322

Camila Rangel-Smith (crangelsmith)	Senior Research Data Scientist, The Alan Turing Institute	The Turing Way Translation and Localisation Co-Lead
Batool Almarzouq (BatoolMM)	Postdoctoral Researcher, KAIMRC and Honorary Research Fellow, The University of Liverpool	The Turing Way Translation and Localisation Co-Lead
Alejandro Coca Castro (acocac)	Postdoctoral Research Associate, The Alan Turing Institute	The Turing Way Translation and Localisation Co-Lead
Andrea Sánchez-Tapia (AndreaSanchezTapia)	Independent researcher	The Turing Way Translation and Localisation Co-Lead



Recognition for all Contributors



Record of Contributions

Personal Highlights from *The Turing Way* Contributors

A

Achintya Rao

Alejandro Coca

Alexander Morley

Andrea Sanchez Tapia

Andreea Avramescu

Ankur Kumar

Anna Krystalli

Arielle Bennett

Collaborating Organisations and Projects

Delft University of
Technology - Faculty of
Applied Sciences
Netherlands eScience
Center
FAIR Cookbook
Open Life Science
Remote Computational
Project Resource

Cite as: *The Turing Way Community*.
(2021). *The Turing Way: A handbook for
reproducible, ethical and collaborative
research (1.0.1)*. Zenodo.
<https://doi.org/10.5281/zenodo.5671094>

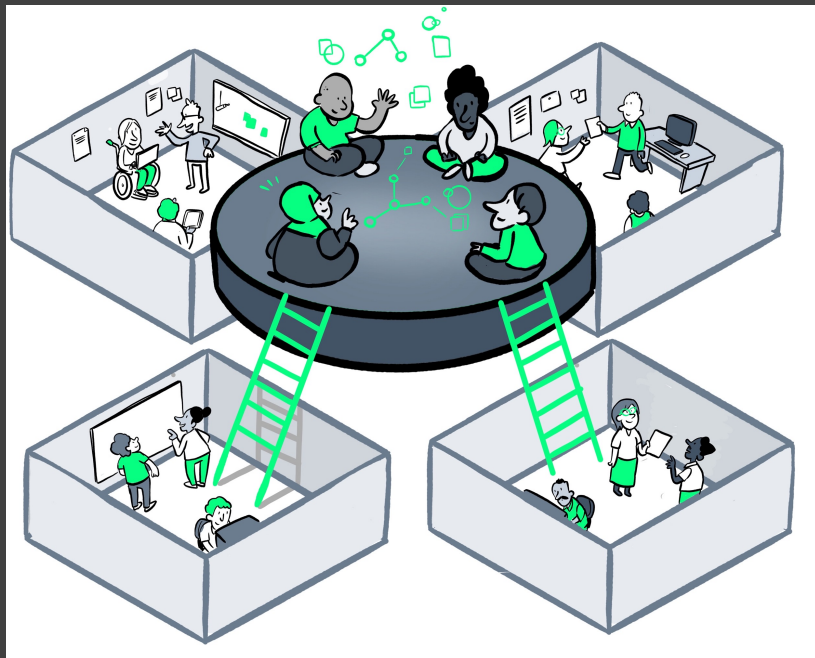
Evidence of Successful Replication or Extension

- [Quality Assurance of Code for Analysis and Research](#), Office for National Statistics , UK
- [Turing Data Stories](#) 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

Open Governance for Democratic Decision-Making



Anne Lee Steele
Community Manager,
The Turing Way





Book:
[the- turing-way.netlify.app/](https://the-turing-way.netlify.app/)

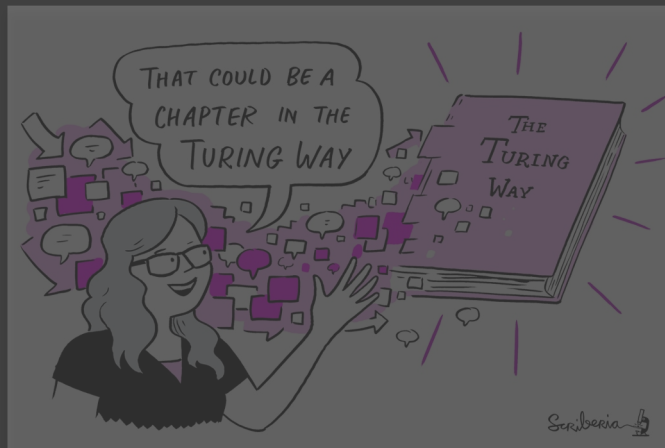
GitHub:
[github.com/alan-turing-institute/the- turing-way](https://github.com/alan-turing-institute/the-turing-way)

Twitter:
twitter.com/turingway

Email:
theturingway@gmail.com

CC-BY 4.0, *The Turing Way*

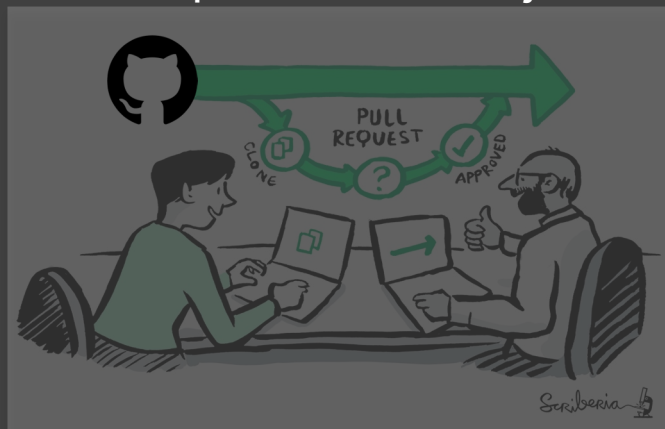
A Book



A Community



An Open Source Project



A Culture of Collaboration



MENTORED CONTRIBUTIONS

The illustration depicts a mentorship cycle. On the left, a 'NEW CONTRIBUTOR' (a man with a star above his head) is shown holding a document and a pen, looking towards the right. On the right, an 'EXPERIENCED CONTRIBUTOR' (a woman) is shown gesturing with her hands, looking towards the left. A large, stylized arrow points from the experienced contributor to the new contributor, with a clock icon above it, indicating a time-based or ongoing process. Below the new contributor, the text 'EMPOWERING NEW CONTRIBUTORS' is written. Below the experienced contributor, the text 'REAL TIME INTERACTIONS WITH EXPERIENCED CONTRIBUTORS' is written. At the bottom center, there is a stylized representation of a server or database with horizontal lines and a small square at the bottom, with radiating lines above it.

NEW CONTRIBUTOR

EXPERIENCED CONTRIBUTOR

EMPOWERING NEW CONTRIBUTORS

REAL TIME INTERACTIONS WITH EXPERIENCED CONTRIBUTORS

Co-Creation

Opportunities for Connections



Co-working Calls & Collaboration Cafés



Biannual Book Dash Events

A note on the name

- This is **not** a Turing project (although it has great support from the Institute)
- We are creating guidance together, **the way** is a journey not a set of rules



Organisation-wide collaboration

Afterword

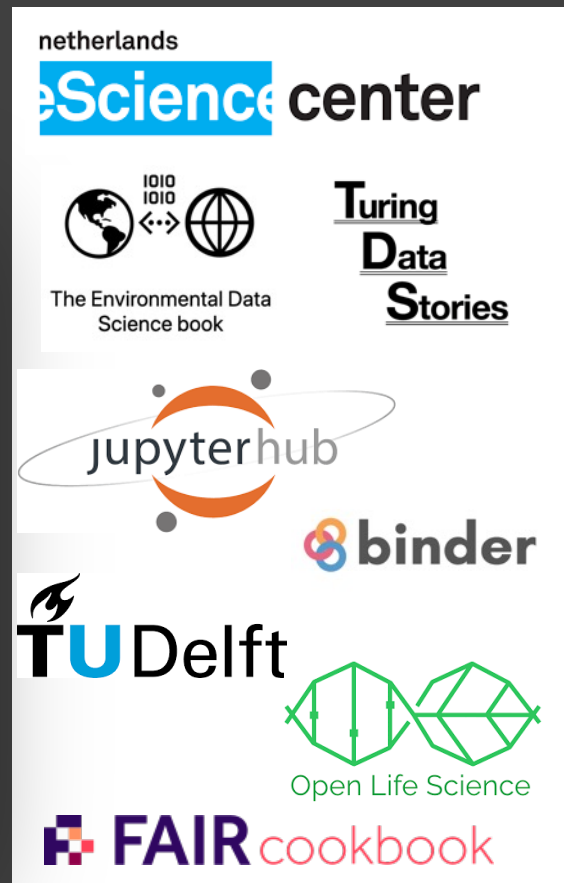
Glossary

Bibliography

Contributors Record

Collaborating Organisations

When members participate in The Turing Way community with the in-kind support of their funders and organisation, we acknowledge each member individually and list their organisations as “Collaborating organisations”. Such organisational supports are applicable when one or multiple members from a project or community collaborate to build resources in The Turing Way.



Fireside Chat: Monthly

Online hosted informal discussions on topics of shared interests.

Led in collaborations with other open research communities.

A Friday of each month.

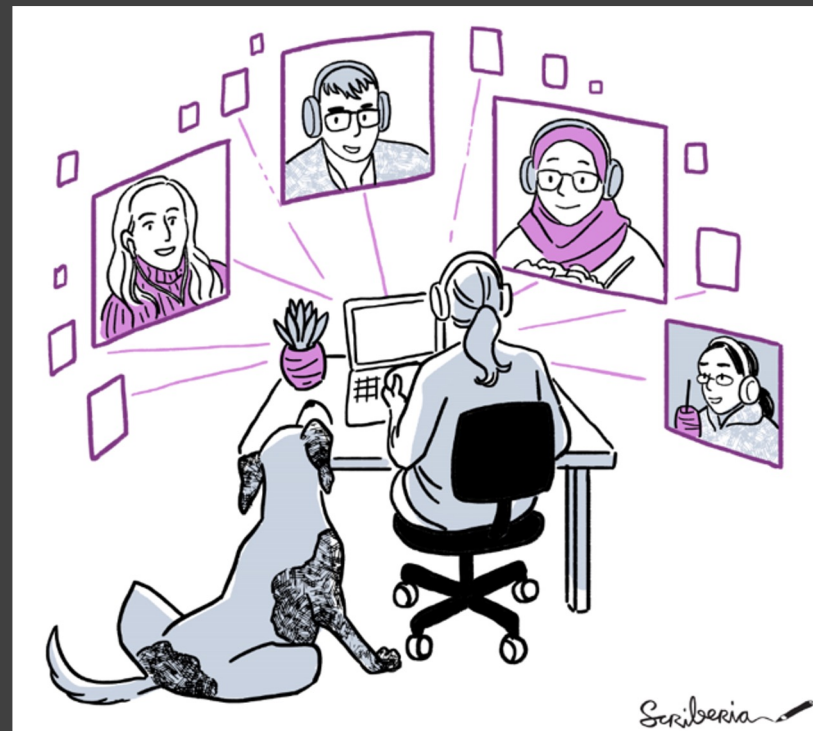
bit.ly/turingway



Book Dash: 16-20 May

- Less intense version of Book Sprints
- Flexibly attend 2.5 hours collaborative session
- Community Share outs
- Accessibility and participation grants
- Social events and collaborations

bit.ly/turingway



<https://the-turing-way.netlify.app/community-handbook/bookdash.html>

CC-BY image by The Turing Way & Scriberia, @turingway, @malvikasharan, CC-BY 4.0, DOI: 10.5281/zenodo.6587260

The Turing Way Community Handbook

Community Handbook

Code of Conduct

Ways to Enter the Project

Style Guide

Maintaining Consistency

Chapter Templates and

Contribution Workflow

Acknowledging Contributors

Monthly Newsletters

Book Dash Events

Community Coworking Calls

Template Collection



Research Integrity: Sustainability & Adoption

Community Handbook

Code of Conduct

Style Guide

Maintaining Consistency

Contributing and

Developing Chapters -

Templates and Workflow

Acknowledging Contributors

Monthly Newsletters

Book Dash Events

Community Coworking Calls

Template Collection

Researchers and collaborators



Arielle Bennett
Programme Manager,
Tools, Practices &
Systems



Emma Karoune
Senior Community
Manager for Turing
RSS Lab and
DECOVID



**Dr Aida
Mehonic**
TPS Senior
Researcher -
Research
Applications



**Dr Martin
O'Reilly**
Director of Research
Engineering



Mishka Nemes
Skills and Training
Manager



Aaron Lacey
Researcher, Tools,
Practices and
Systems



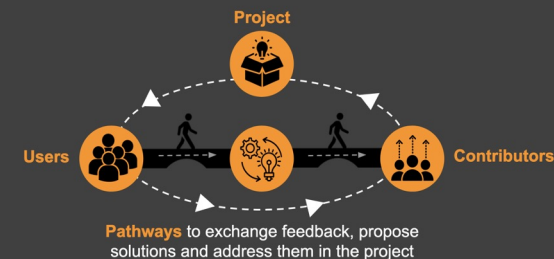
**Patricia
Herterich**
University of
Birmingham



Vicky Hellon
Community Manager,
Turing-Roche
Partnership

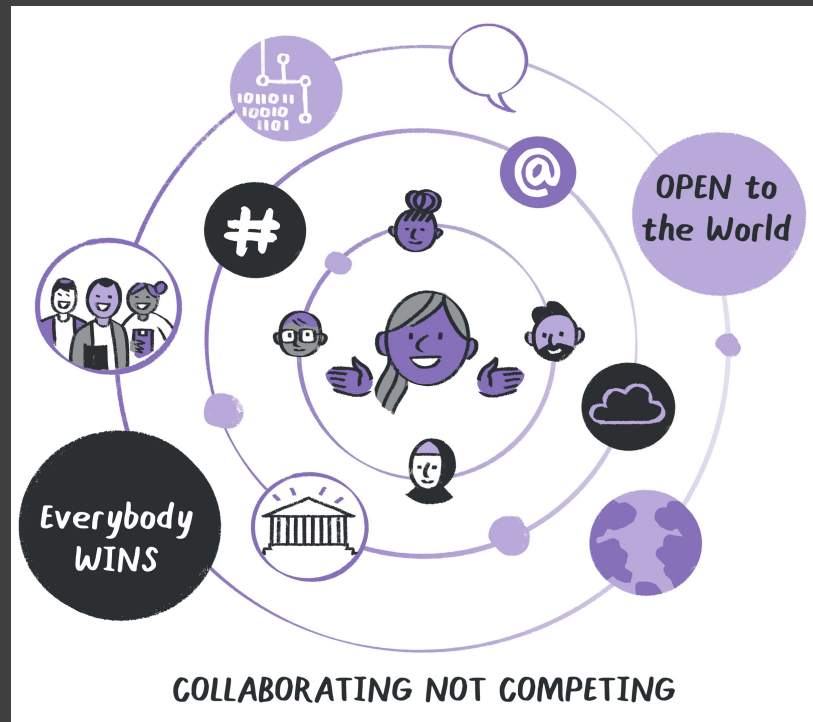


Achintya Rao
Community Manager



What does open mean to You?

- Learning from the ‘**Commons**’
- Open for **reproducibility, ethics and collaboration**
- Understanding how research have **real-world consequences**
- Building open science skills in with a **global community**



Many goals, common mission

Different goals of openness, but
common mission:

1. *to produce public good for reuse,*
2. *encourage collaboration,*
3. *broaden the diversity of members at decision making*



Open Science Community Building

Open is by default not:

- Inclusive
- Accessible
- Community-led

Intentional designing



Take possible steps towards openness

“Openness is not a binary condition, but highly situational, contingent and dependent on the privilege and context of knowledge makers and gatekeepers.”



**Knowledge
Equity Lab**

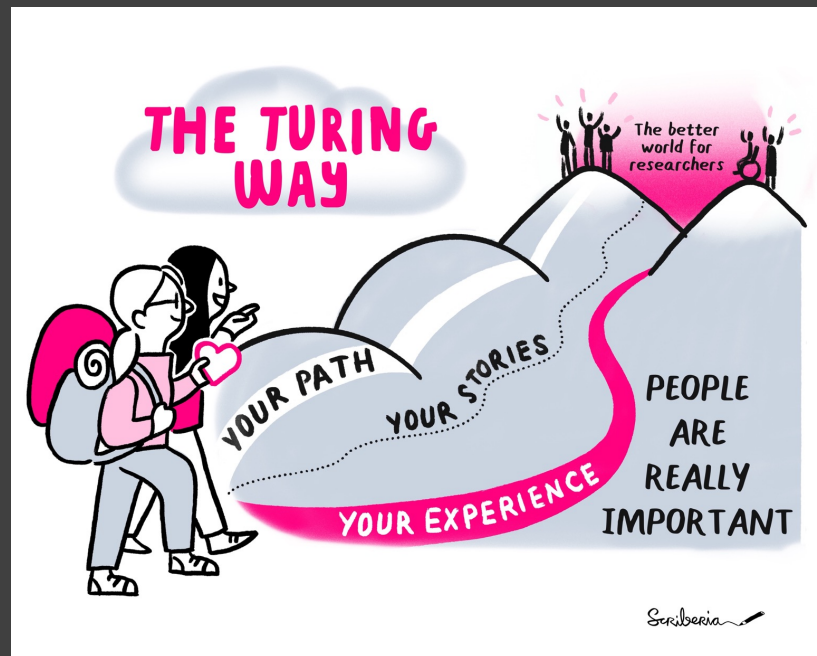


Leslie Chan, Associate Professor,
Department of Arts, Culture and Media and
the Centre for Critical Development
Studies, University of Toronto Scarborough

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

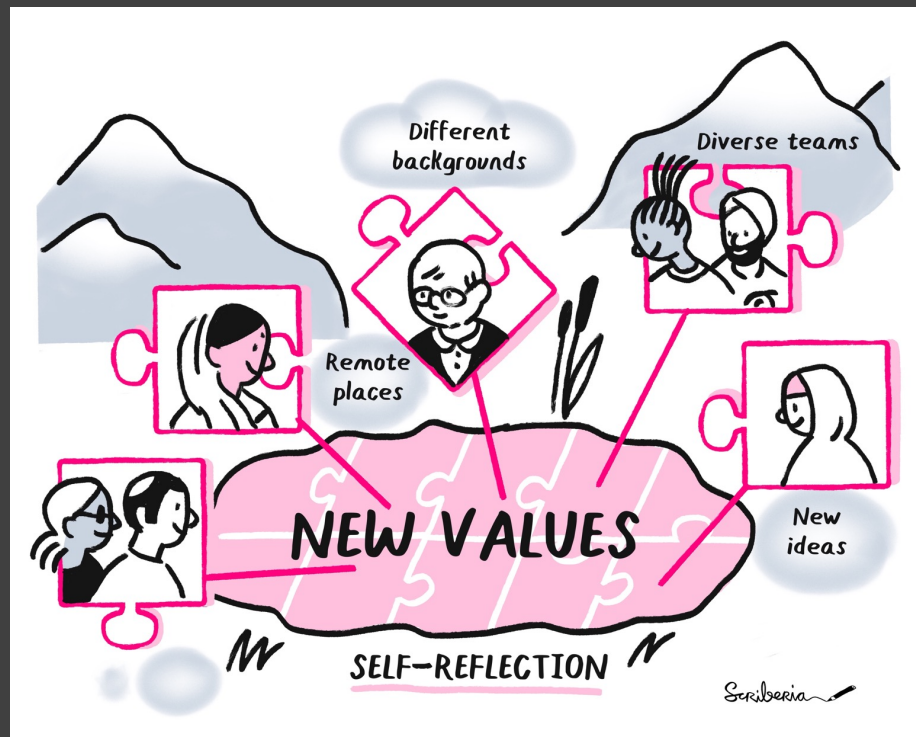
We value your participation!



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





A mentoring & training program for Open Science Ambassadors in Life Science



Yo Yehudi
@yoyehudi

Sharing

Connecting

Empowering

Join the program



1:1 mentoring



Training calls on Open Science

Talks from experts

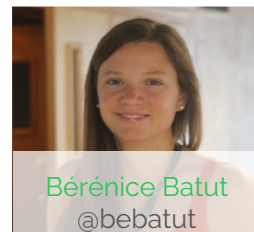
Break out discussions



Training for mentors



Malvika Sharan
@malvikasharan



Bérénice Batut
@bebatut

OLS-6 applications open in June

Apply individually or in a team to join the cohort



Emmy Tsang
@emmy_ft



Visit our website: openlifesci.org



A mentoring & training program
for **Open Science Ambassadors**



<https://osumontreal.ca>

[Accueil](#)

[Blogue](#)

[À Propos](#)

[EN](#)

Open Science UMontréal

Qu'est-ce qu'Open Science UMontréal ?

Open Science UMontréal (OSUM) est une jeune initiative étudiante née à l'Université de Montréal qui oeuvre à favoriser l'intégration de méthodes de travail collaboratives et des outils en science ouverte dans le quotidien des membres de la communauté de recherche UdeMienne et d'ailleurs.



Visit our website: openlifesci.org

Emmy Tsang
@emmy_ft

Reimagining Openness

Open Science is not a radical approach, but a **tool to learn, unlearn, challenge, dismantle and reimagine research infrastructure** that prioritises equitable participation, co-creation and culture change.



Acknowledgements & Links

The
Alan Turing
Institute

The Turing Way

- Kirstie Whitaker, Anne Lee Steele, The Turing Way community
- **Book:** the-turing-way.netlify.com, **Twitter:** twitter.com/turingway
- **GitHub:** github.com/alan-turing-institute/the-turing-way



Open Life Science

- Open Life Science community; Yo Yehudi, Bérénice Batut, Emmy Tsang
- **Website:** openlifesci.org/, **Twitter:** twitter.com/openlifesci
- **GitHub:** github.com/open-life-science/open-life-science.github.io



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