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# Boost your research reproducibility with Binder

The #TuringWay team

University of Manchester workshop, 1<sup>st</sup> March 2019

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# Agenda

9.30 - 10.00: Registration, coffee and introductions

10.00 - 10.30: Introduction to the workshop and The Turing Way

10.30 - 12.00: Why you need a reproducible computing environment and how Binder can help

12.00 - 1.00: Lunch

1.00 - 2.00: Zero to Binder, a guided tour of building a Binder resource

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# Founding the Institute

“We will found The Alan Turing Institute to ensure Britain leads the way again in the use of big data and algorithm research”

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**George Osborne, Chancellor of the Exchequer**  
Budget Speech, March 2014

**The  
Alan Turing  
Institute**

**EPSRC**

Engineering and Physical Sciences  
Research Council

Network of industry,  
charity, government  
partners

Network of  
university members

Strategic  
government  
investment

# The Institute's partners and collaborators



# Our university network



# The Alan Turing Institute to spearhead new cutting-edge data science and AI research after £48 million government funding boost

Tuesday 18 Dec 2018

Learn more ↓

<https://www.turing.ac.uk/news/alan-turing-institute-spearhead-new-cutting-edge-data-science-and-artificial-intelligence>



### Urban analytics

Developing data science and AI focused on the process, structure, interactions and evolution of agents, technology and infrastructure within and between cities.



### Data-centric engineering

Bringing together world-leading academic institutions and major industrial partners from across the engineering sector, to address new challenges in data-centric engineering.



### Data science for science

Ensuring that research across science and the humanities can make effective use of state of the art methods in artificial intelligence and data science.



### Health

Accelerating the scientific understanding of human disease and improving human health through data-driven innovation in AI and statistical science.



### Public policy

Working with policy makers on data-driven public services and innovation to solve policy problems, and developing ethical foundations for data science and AI policy-making.



### Research Engineering

Connecting research to applications, helping create usable and sustainable tools, practices and systems.

# Cross cutting theme: Tools, systems and practices

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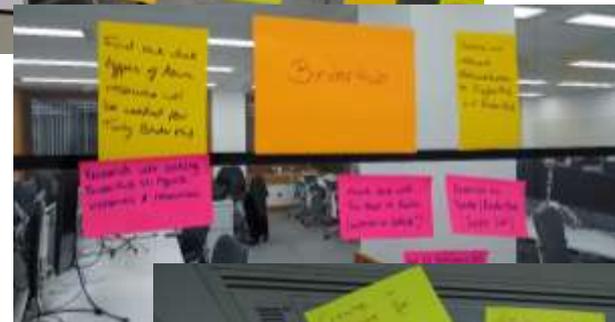
# The Turing Way

A lightly opinionated handbook  
for reproducible data science

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

# Including chapters on:

- Research data management
- Open science
- Reproducibility
- Version control with git
- Your working environment
- Capturing your compute environment
- Testing for research
- Continuous integration
- Collaborating through GitHub/GitLab



# Checklists for researcher, PI and admin team



- Researcher
  - Version control
  - Capturing compute environment
  - Writing and running the code
- PI
  - Results presented are those from the final run of the analysis
  - Check that another researcher can run the code
- Admin
  - Version control
  - Data and code archive
  - Open access publication

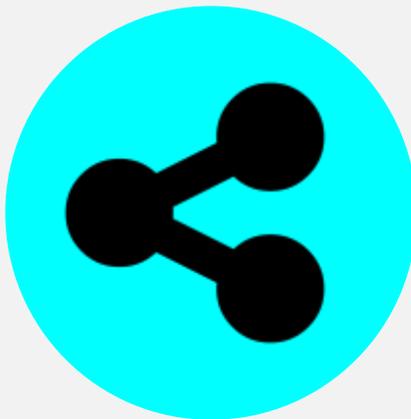
## Open Leadership Principles



**Understanding**  
You make the work  
accessible and clear

**Read more**

<https://mozilla.github.io/olm-whitepaper>



**Sharing**  
You make the work  
easy to adapt,  
reproduce, and spread



**Participation & Inclusion**  
You build shared  
ownership and agency to  
make the work inviting  
and sustainable for all.

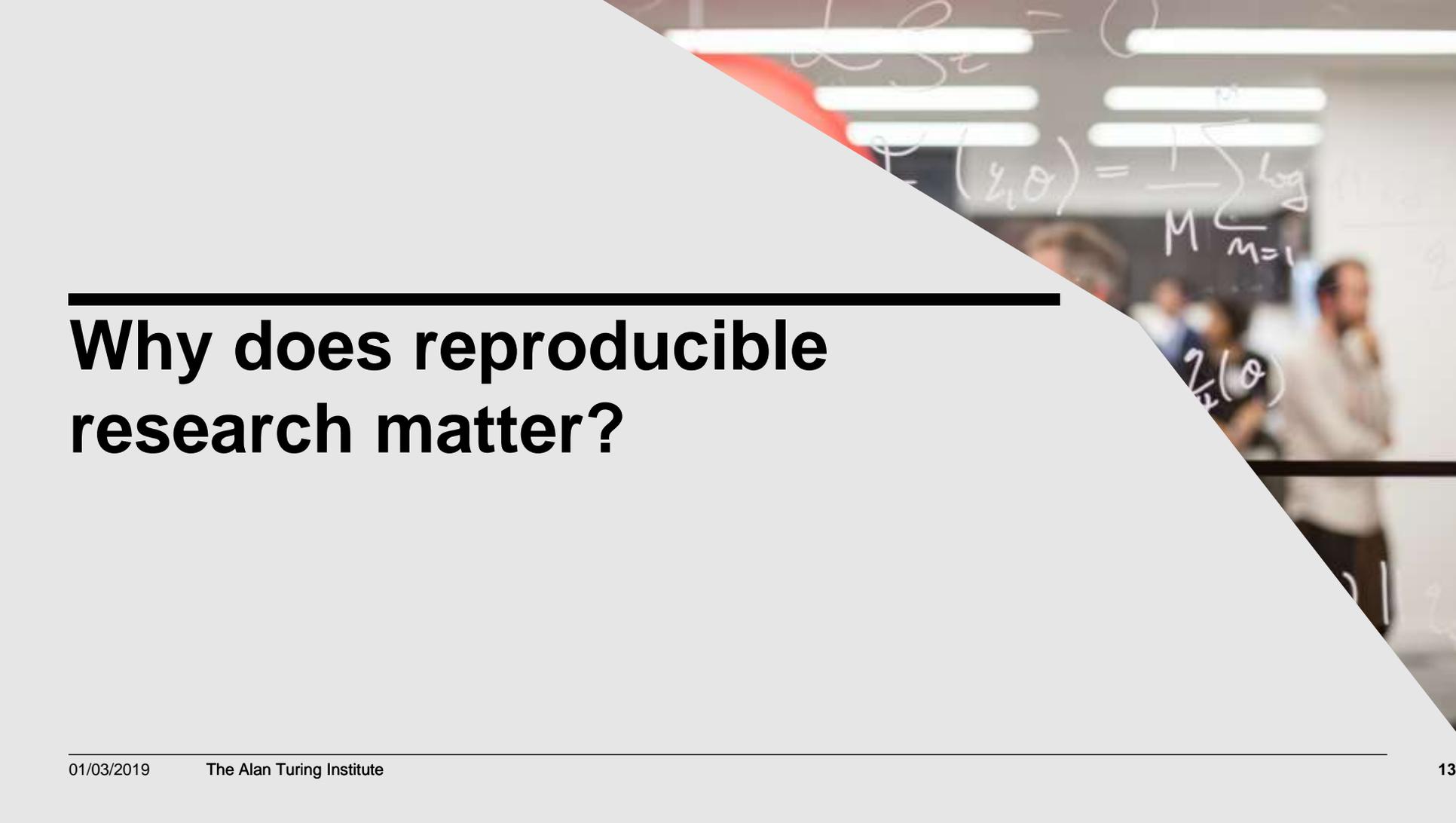
[@kirstie\\_j](#)

<https://doi.org/10.6084/m9.figshare.7564682>

# Built by a team....and you!

- Becky Arnold
- Louise Bowler
- Sarah Gibson
- Patricia Herterich
- Rosie Higman
- Anna Krystalli
- Alex Morley
- Martin O'Reilly
- Kirstie Whitaker
- ...



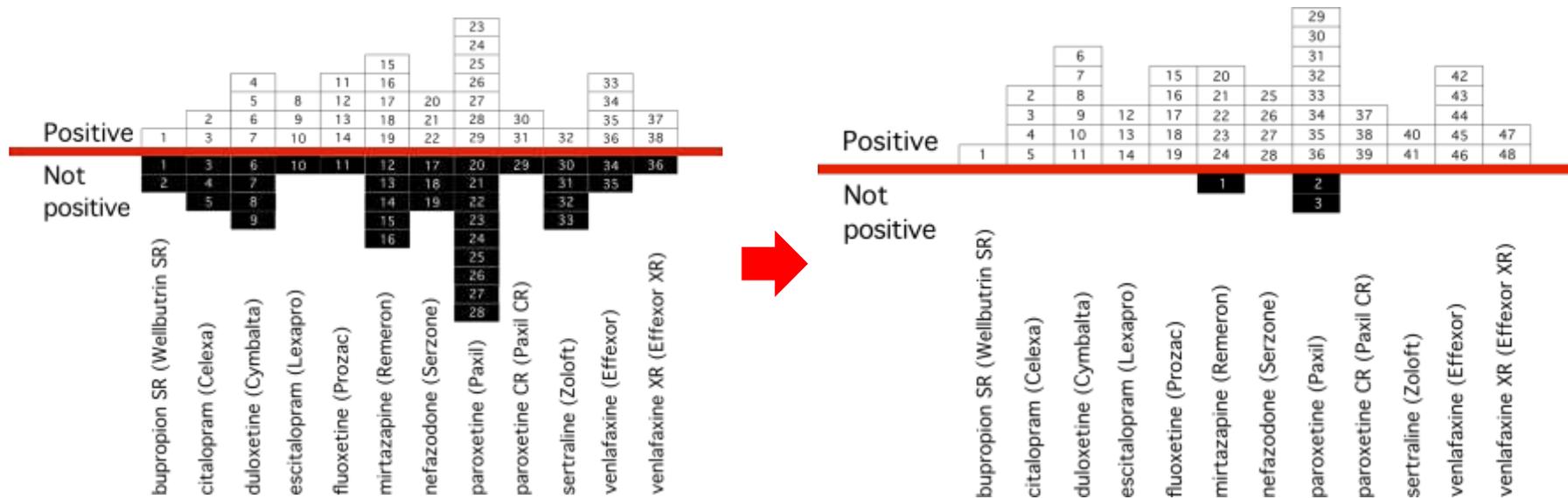


# Why does reproducible research matter?

# What does reproducible mean?

		Data	
		Same	Different
Analysis	Same	Reproducible	Replicable
	Different	Robust	Generalisable

# Why does this matter?



<https://doi.org/10.6084/m9.figshare.3381379.v1>

# Why does this matter?



REUTERS

Dutch psychologist admits he made up research data

SCIENCE NEWS | Wed Nov 2, 2011 | 9:50am EDT

## Dutch psychologist admits he made up research data



By Kate Kelland | LONDON

A Dutch psychologist has admitted making up data and faking research over many years in studies which were then published in peer-reviewed scientific journals.

Diederik Stapel, a psychologist working at Tilburg University in the Netherlands, said he had "failed as a scientist" and was ashamed of what he had done, but had been driven to falsifying research by constant pressure to perform.

The respected journal Science, which published some of Diederik Stapel's work earlier this year, issued an "expression of concern" editorial in which it said it now had serious concerns about the validity of Stapel's findings.

			4		1
			5	8	1
Positive		2	6	9	1
	1	3	7	10	1
Not positive	1	3	6	10	1
	2	4	7		
		5	8		
			9		
bupropion SR (Wellbutrin SR)					
citalopram (Celexa)					
duloxetine (Cymbalta)					
escitalopram (Lexapro)					
fluoxetine (Prozac)					

						29
						30
						31
						32
						33
						34
	37					35
	38					36
	39	40				2
			42			3
			43			
			44			
			45	47		
			46	48		

paroxetine (Paxil)  
paroxetine CR (Paxil CR)  
sertraline (Zoloft)  
venlafaxine (Effexor)  
venlafaxine XR (Effexor XR)

<https://doi.org/10>



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# Why don't people do this already?

Is not considered for  
promotion

Takes time

Publication bias  
towards novel  
findings

## **Barriers to reproducible research**

Requires  
additional skills

Plead the 5th

Support additional users

Held to higher standards  
than others

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# How can the Turing Way help?

*Make  
reproducibility,  
“too easy  
not to do”*

*Share the  
responsibility  
of  
reproducibility*

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# Plan for today

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

# Goals

- Understand how your computational environment impacts upon reproducibility
- Learn what Binder is and how it can help
- Build your own Binder!
- ...

**In a supportive and friendly environment!**



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# Code of Conduct

“The Turing Way team are dedicated to providing a welcoming and supportive environment for all people...we do not tolerate behaviour that is disrespectful to our community members or that excludes, intimidates, or causes discomfort to others.”

[https://github.com/alan-turing-institute/the-turing-way/blob/master/CODE\\_OF\\_CONDUCT.md](https://github.com/alan-turing-institute/the-turing-way/blob/master/CODE_OF_CONDUCT.md)

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# Code of Conduct

- Be respectful of different viewpoints and experiences.
- Use welcoming and inclusive language.
- Do not harass people.
- Respect the privacy and safety of others – stickers available if you don't want your photo taken
- Be considerate of others' participation.
- Don't be a bystander.

[https://github.com/alan-turing-institute/the-turing-way/blob/master/CODE\\_OF\\_CONDUCT.md](https://github.com/alan-turing-institute/the-turing-way/blob/master/CODE_OF_CONDUCT.md)

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# The Turing Way



#TuringWay



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



[gitter.im/alan-turing-institute/the-turing-way](https://gitter.im/alan-turing-institute/the-turing-way)