Open Science: An Introduction

Dr Xenia Schmalz

Ludwig-Maximilians-Universität München

xenia.schmalz@med.uni-muenchen.de

January 23, 2020

Overview

1. Why do we need Open Science?
   - What is Open Science?
   - Reproducibility and replicability
   - Four Horsemen of the Replication Crisis
2. Open Research Workflow with the Open Science Framework
   - Create projects
3. Open Access Publishing
   - Accessing papers
   - How to publish Open Access?
4. Open Science in action

Who am I?

- Post-doctoral researcher at Ludwig-Maximilians-Universität, München
- 2011-2015: PhD at Macquarie University (Sydney, Australia)
- Cognitive Psychologist (Psycholinguistics)
- Research interests: Cognitive processing during reading, dyslexia
- Good (reproducible and replicable) research ☺
- Open Science activities:
  - Workshops and seminars
  - Member of the LMU Open Science Center & its steering committee
  - Ambassador of the Center for Open Science
  - Registered Reports: Encouraging more journals to start offering this publication format
  - Open Research Workflow in my own research

What is Open Science?

- Broad concept
  - Open research workflow
    - Open Access
    - Registered Reports
    - Open Code
    - Open Peer Review
    - ...
  - Citizen Science
  - Open Education

Why do we need Open Science?

- Good research:
  - Reproducible: The research workflow needs to be documented and comprehensible (same data, same analysis)
  - Replicable: When we repeat the research procedure, we should obtain a similar result (different data, same analysis)

Image: https://commons.wikimedia.org/wiki/File:

Replicability etc. in a nutshell

		Data	
		Same	Different
Analysis	Same	Reproducible	Replicable
	Different	Robust	Generalisable

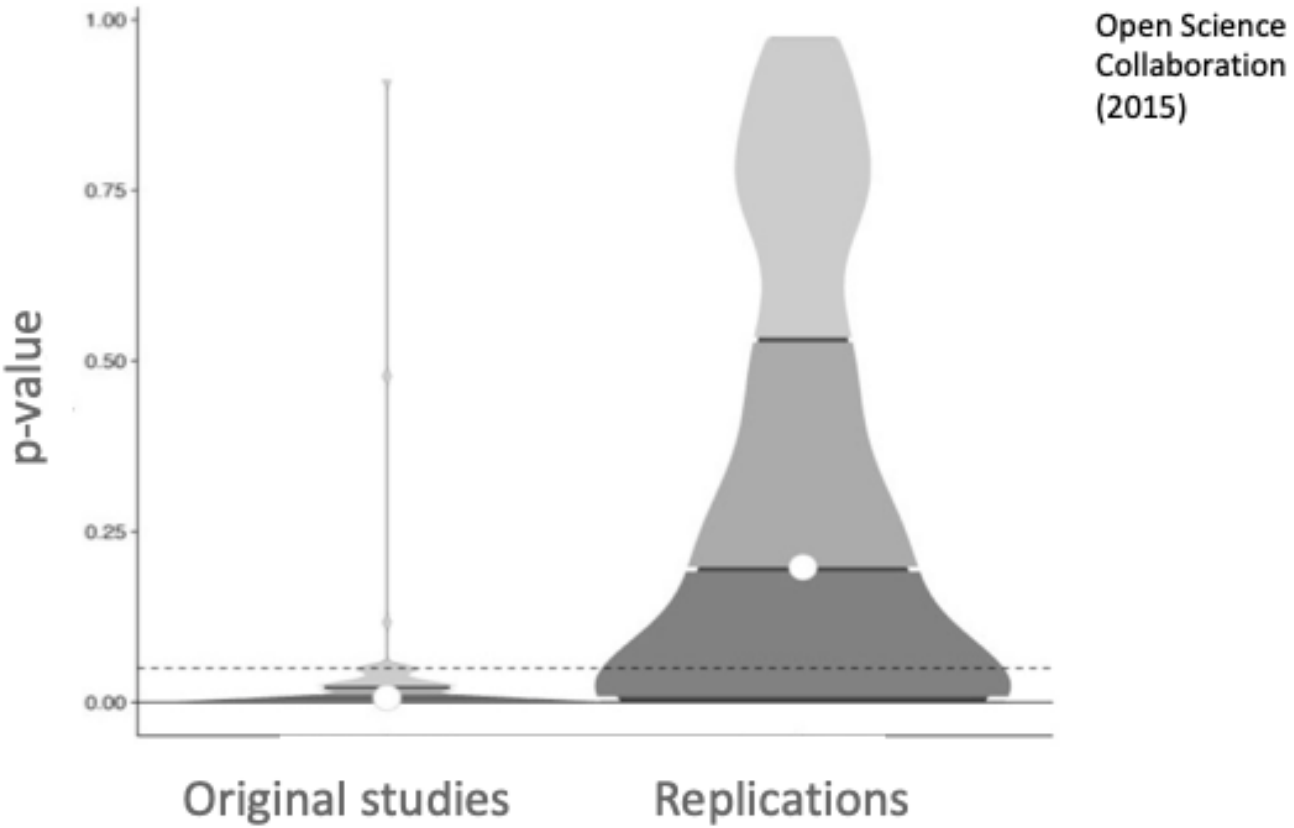
https://the-turing-way.netlify.com/reproducibility/03/definitions

Is research reproducible?

- Publication = Article (often behind a paywall)
- Materials: Often only described, not available for published articles
- Cherry-Picking: Selecting experiments and analyses that "worked"
- Analyses in point-and-click-software: often contain errors (s. Statcheck; Nujten et al., 2017)

Is research replicable?

- Psychology: for ca. 2/3 of studies: different results when the experimental procedure is repeated



WHY???

- Hypothesing After Results are Known (HARKING)
- Low statistical power
- *p*-hacking: Creative exclusion of outliers, data transformations (s. `http://flexiblemeasures.com/`), ...
- Publication bias: by researchers or journals

→ All of this increases the probability that a significant effect in the literature does not reflect a true effect

Image taken from Dorothy Bishop

p-Hacking: Coin-tossing analogy

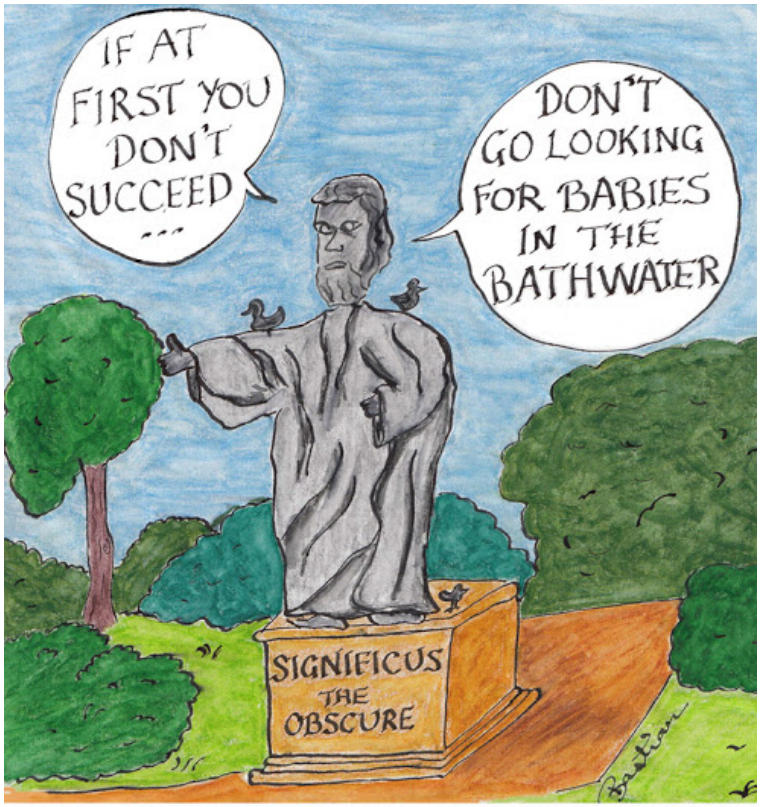
"I'll toss a coin 5 times and I'll always predict the correct outcome!"

p-Hacking: Coin-tossing analogy

"I'll toss a coin 5 times and I'll always predict the correct outcome!"

- "I'll toss the coin *until* I guess correctly 5 times in a row" → Optional stopping
- "This toss doesn't count, I'm just warming up!" → Discarding participants or experiments
- "I'm not in shape today. My clairvoyant powers are only strong when the weather is nice!" → Sub-group analysis
- "OK, I only guessed 4/5 correctly. But that's still better than chance!" → Outcome variable switching
- "A car just drove past! New hypothesis: Tossing a coin causes passing cars." → HARKing

p-Hacking and HARKing



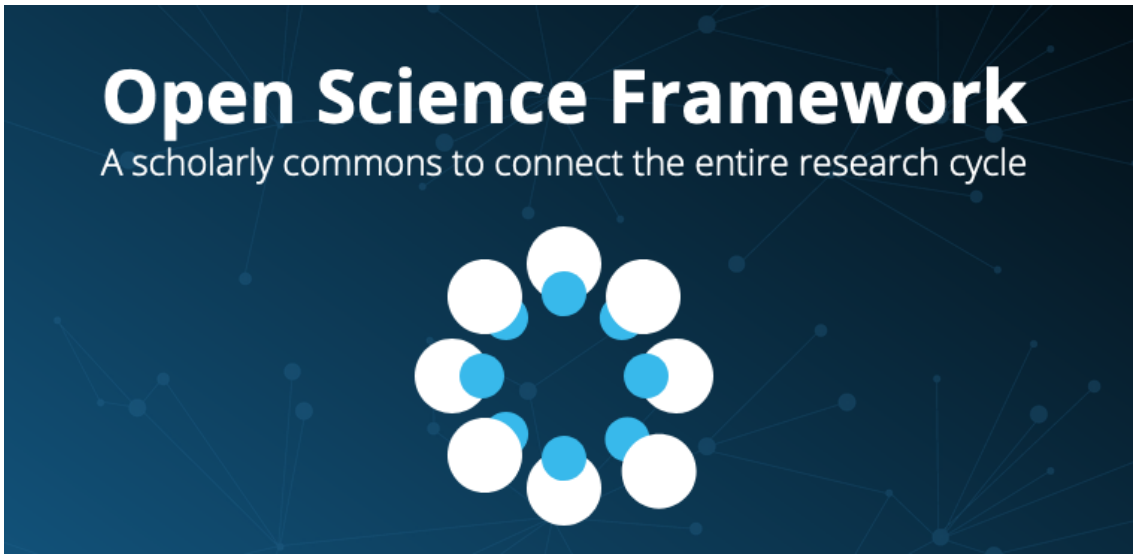
AN EARLY STATISTICAL PHILOSOPHER, SIGNIFICUS THE OBSCURE WAS KNOWN FOR MANGLED APHORISMS AND AN INTENSE HATRED OF POST HOC ANALYSES.

Image by Hilda Bastian

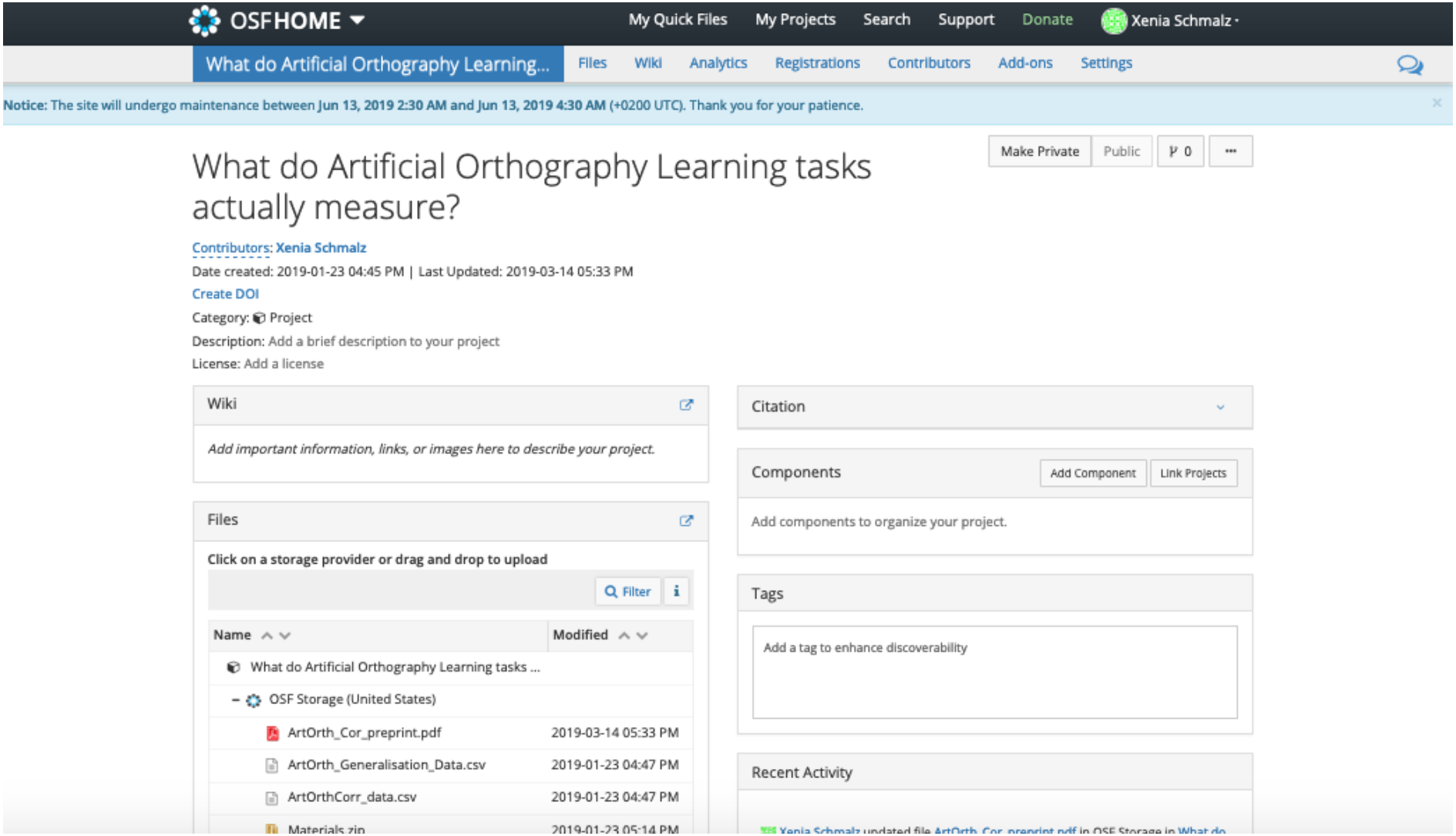
What is the Open Science Framework?

`www.osf.io`

- Online platform
- Free of charge
- Open source ☺
- Collaboration
- Sharing of materials and outputs at all stages of the research process

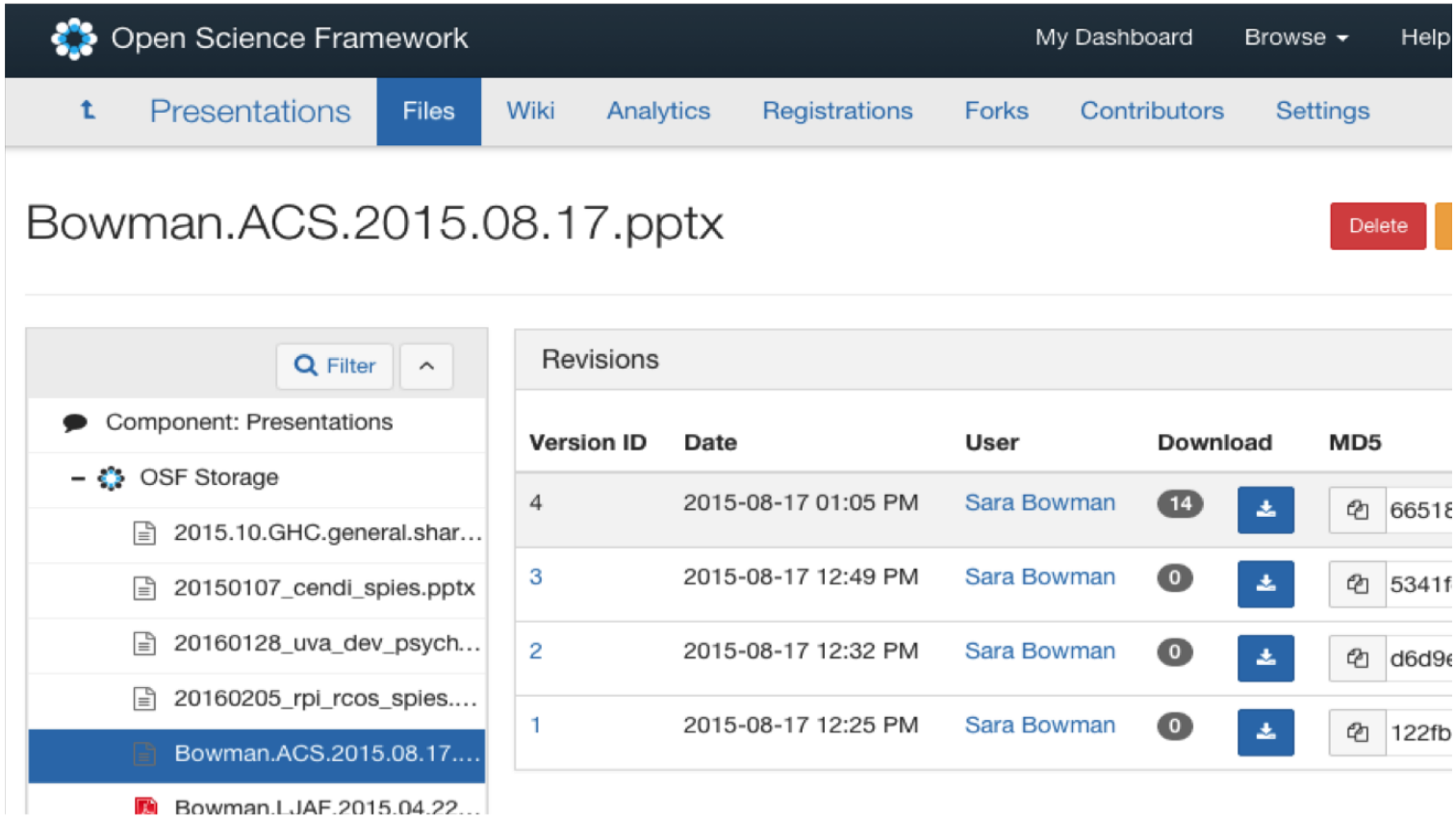


Create projects

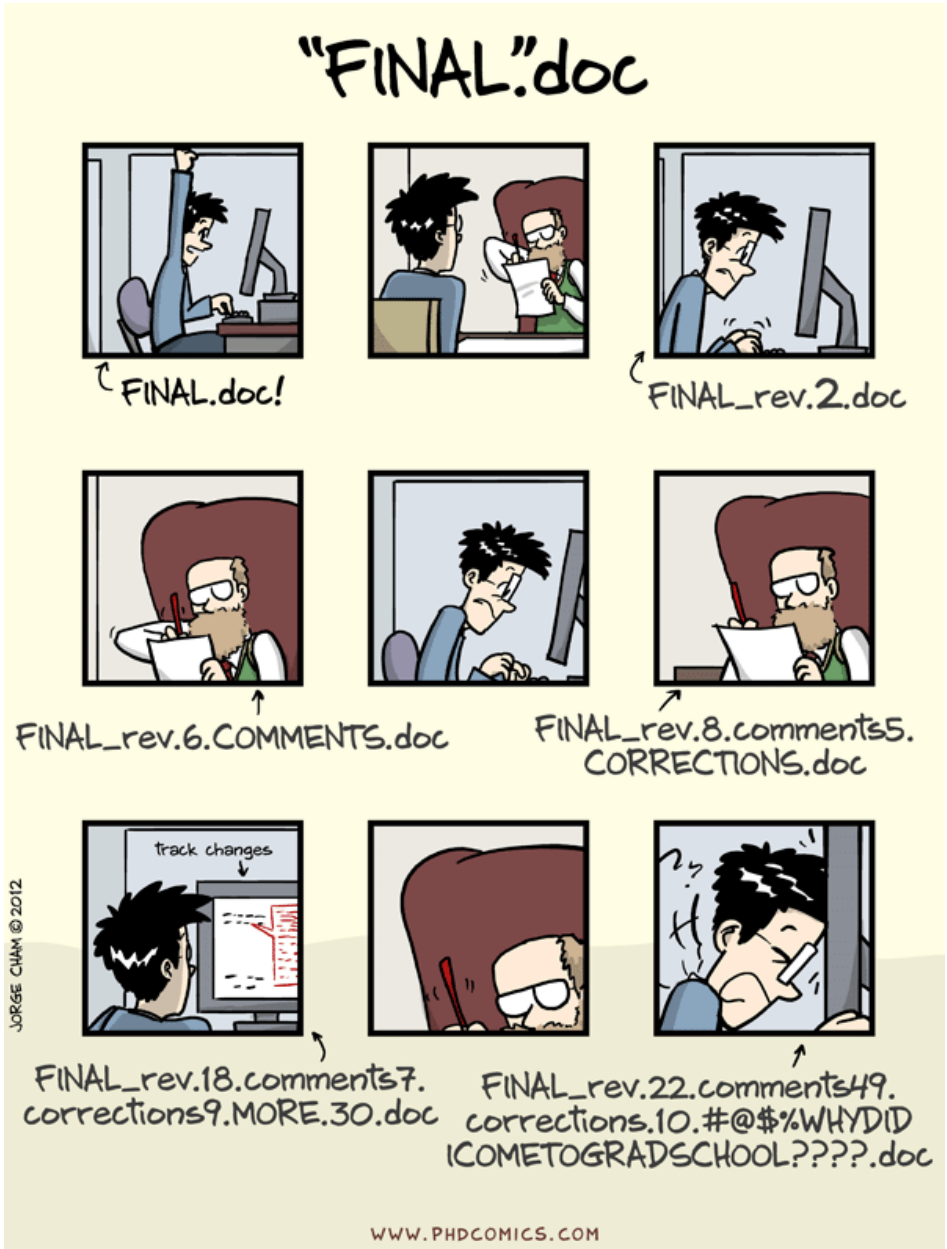


Version control!

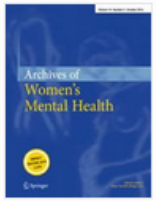
- Upload an updated version of a file with the same name → old version will be automatically replaced and archived!



Version control: Never again . . .



Who has never seen this before?



Archives of Women's Mental Health
October 2016, Volume 19, Issue 5, pp 711–720 | Cite as

A review of longitudinal studies on antenatal and postnatal depression

Authors | Authors and affiliations

Lisa Underwood, Karen Waldie, Stephanie D'Souza, Elizabeth R Peterson, Susan Morton

Review Article
First Online: 16 April 2016

3 Shares | 2.3k Downloads | 39 Citations

Log in to check access

Buy article (PDF)

EUR 37.40

- Unlimited access to the article
- Instant PDF download

Buy journal subscription

Under the hood of the paywall

Publication

Traditional journal (closed access)	Hybrid Open Access	Gold Open Access	Green Open Access
- Journals paid by library subscription fees - When authors publish, they give up the copyright to their article - Institutional log-in required to access the article	- Traditional journals - Authors pay a fee for Open Access publication (typically >1,000€) - Authors retain copyright - Anyone can access the paper - Libraries still pay	- Journals with business model where authors pay for publication (>700€) - Any paper is available OA from the beginning - Authors retain copyright	- Authors make the article available on personal website - Legal if the journal allows it! - Check journal on Sharepa/Romeo - Preprints, e.g., on OSF, PsyArXiv.com, researchgate (if you must)

What to do when you get paywalled?

- Try Unpaywall (install button) to find legal Open Access version of paper: `http://unpaywall.org/welcome`
- Install and use the Open Access Button: `https://openaccessbutton.org/`
- Write to the authors, template: `https://osf.io/4nd3w/`
- Don't use sci-hub: `sci-hub.tw` ☺ ☺ ☺ ☺ ☺

For more info (and interview with Sci-hub founder Alexandra Elbakyan), see movie "Paywall: The business of scholarship" `https://www.youtube.com/watch?v=HM_nWsdbNvQ`

Preprints

- Version of the paper *before* peer-review (as opposed to post-print)
- `PsyArXiv.com`, `osf.io`, `researchgate` (meh)
- Appear on Google Scholar
- If paper already published: check `http://sherpa.ac.uk/romeo/index.php` for Copyright policies of the journal (often: non-formatted 'Author's version' OK)

Advantages of pre-prints

- Counts as Green Open Access
- Publication of "unpublishable" work (reduces publication bias; learning about things that don't work)
- Show your productivity on your CV, even if your publication record is not the best (looks better than "manuscript in preparation")

Xenia Schmalz

FOLLOWING

Postdoctoral Researcher, Ludwig-Maximilians-Universität München
Verified email at med.uni-muenchen.de - Homepage

Psycholinguistics cognitive psychology research methods reading open science

TITLE	CITED BY	YEAR
We still need more trust in science: the need for broader adoption of Registered Reports TB Roettger, X Schmalz, C Chambers, H Fraser, D Mellor, L Ostojic, ... MetaArXiv		2019
Effectiveness of spelling treatment approaches for learners with dyslexia–A meta-analysis and systematic review K Galuschka, R Görgen, J Kalmar, S Haberstroh, X Schmalz, ... OSF Preprints		2019
Unfundierte Kritik. Eine Erwiderung auf einen Kommentar zu Schwächen von Open Access C Fischer, N Eisentraut, G Fischer, B Fecher, S Friesike, M Goller, ... OSF Preprints		2019
Getting a precise RT estimate for single items in a reading aloud task X Schmalz OSF Preprints		2019
Preregistration: Where do I start? X Schmalz Open Science Day-empowering open, transparent, and reproducible research at ...		2019

Everything is f*ed?

The Hardest Science

Everything is fucked: The syllabus

PUBLISHED ON *August 11, 2016*

PSY 607: Everything is Fucked

Prof. Sanjay Srivastava

Class meetings: Mondays 9:00 – 10:50 in 257 Straub

Office hours: Held on Twitter at your convenience (@hardsci)

In a much-discussed article at Slate, social psychologist Michael Inzlicht told a reporter, "Meta-analyses are fucked" (Engber, 2016). What does it mean, in science, for something to be fucked? Fucked needs to mean more than that something is complicated or must be undertaken with thought and

Sanjay Srivastava

About the blog

Follow new posts by email

Follow

Join 1,580 other followers

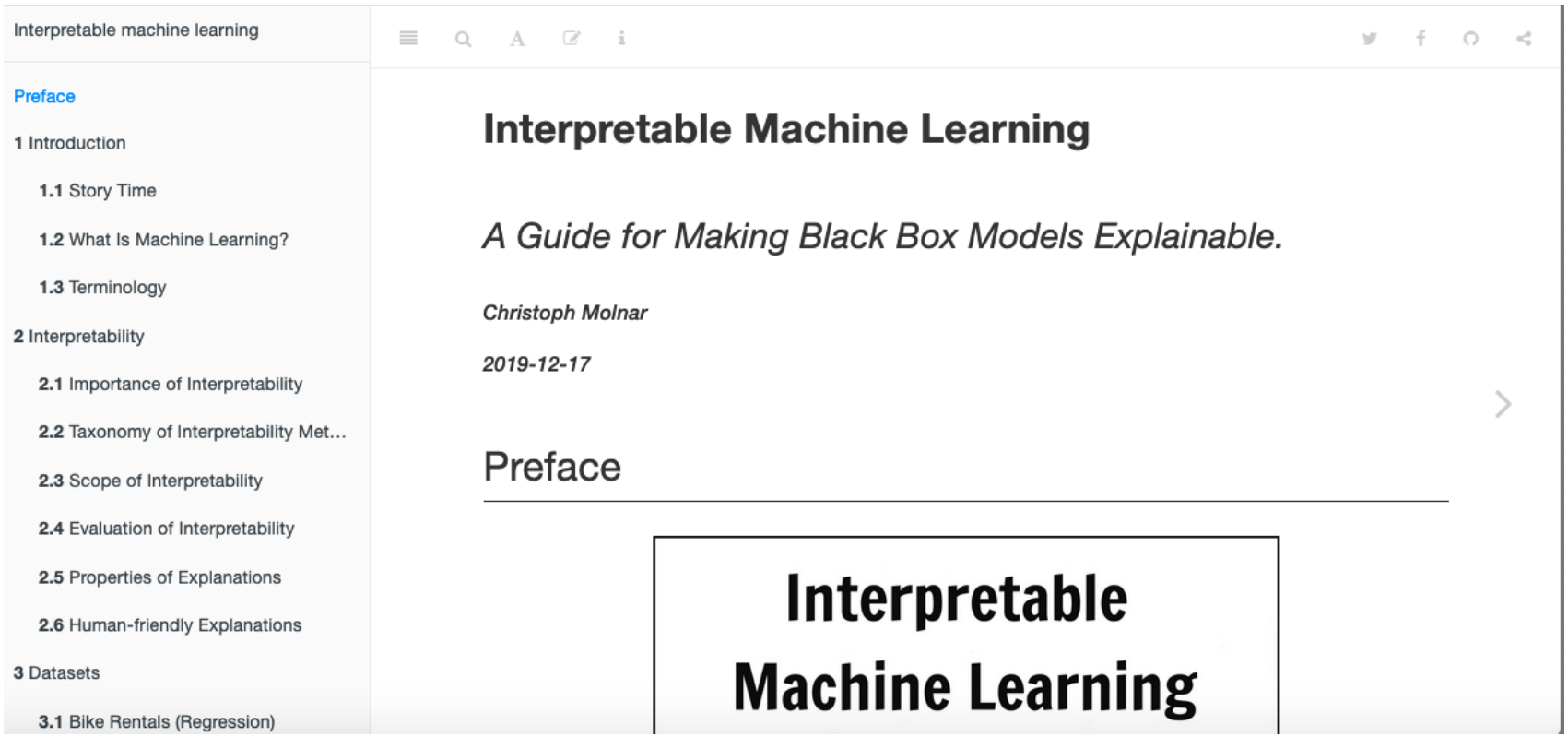
https://thehardestscience.com/2016/08/11/everything-is-fucked-the-syllabus/

Happy Open Science Thoughts

https://twitter.com/xenia_sch/status/1214564710281965569

Example 1: Open collaborative writing

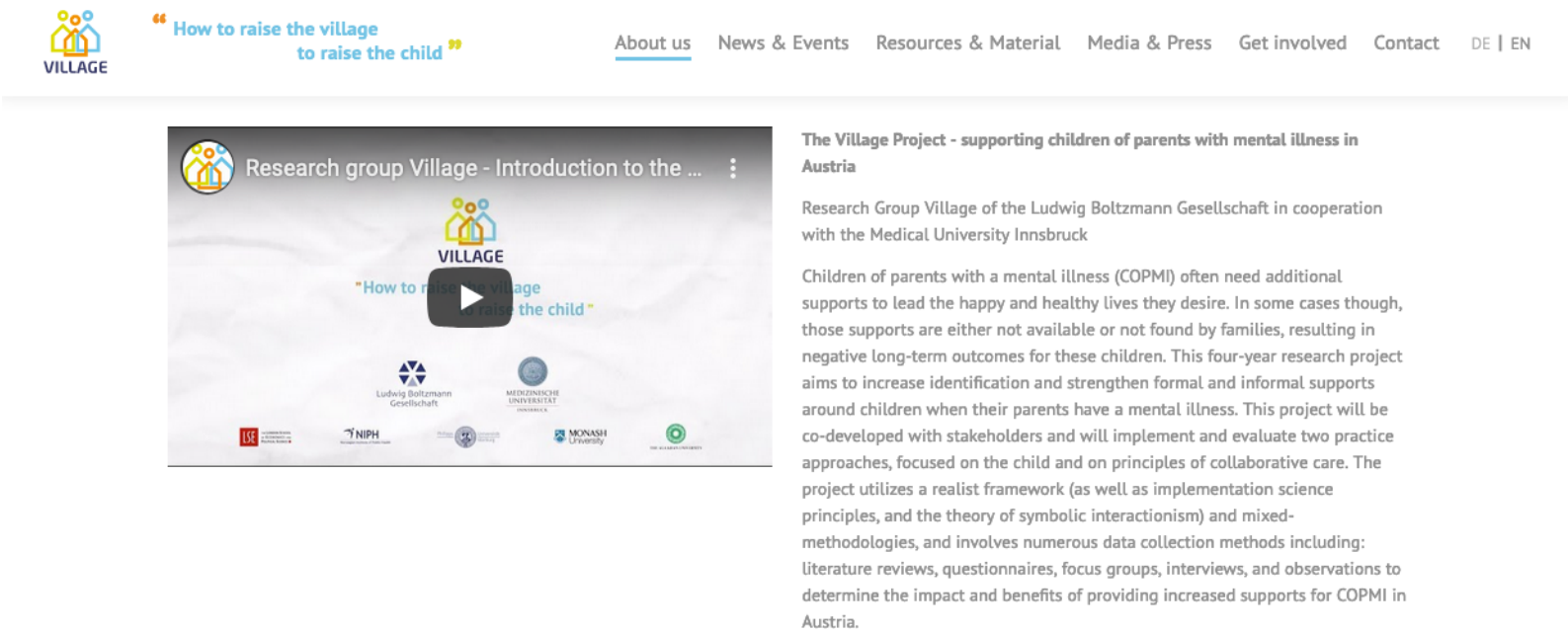
- Writing a manuscript or book with git or google documents, etc.
- Inviting others to contribute, add ideas, correct errors



https://christophm.github.io/interpretable-ml-book/, Christoph Molnar

Example 2: Crowdsourcing research questions

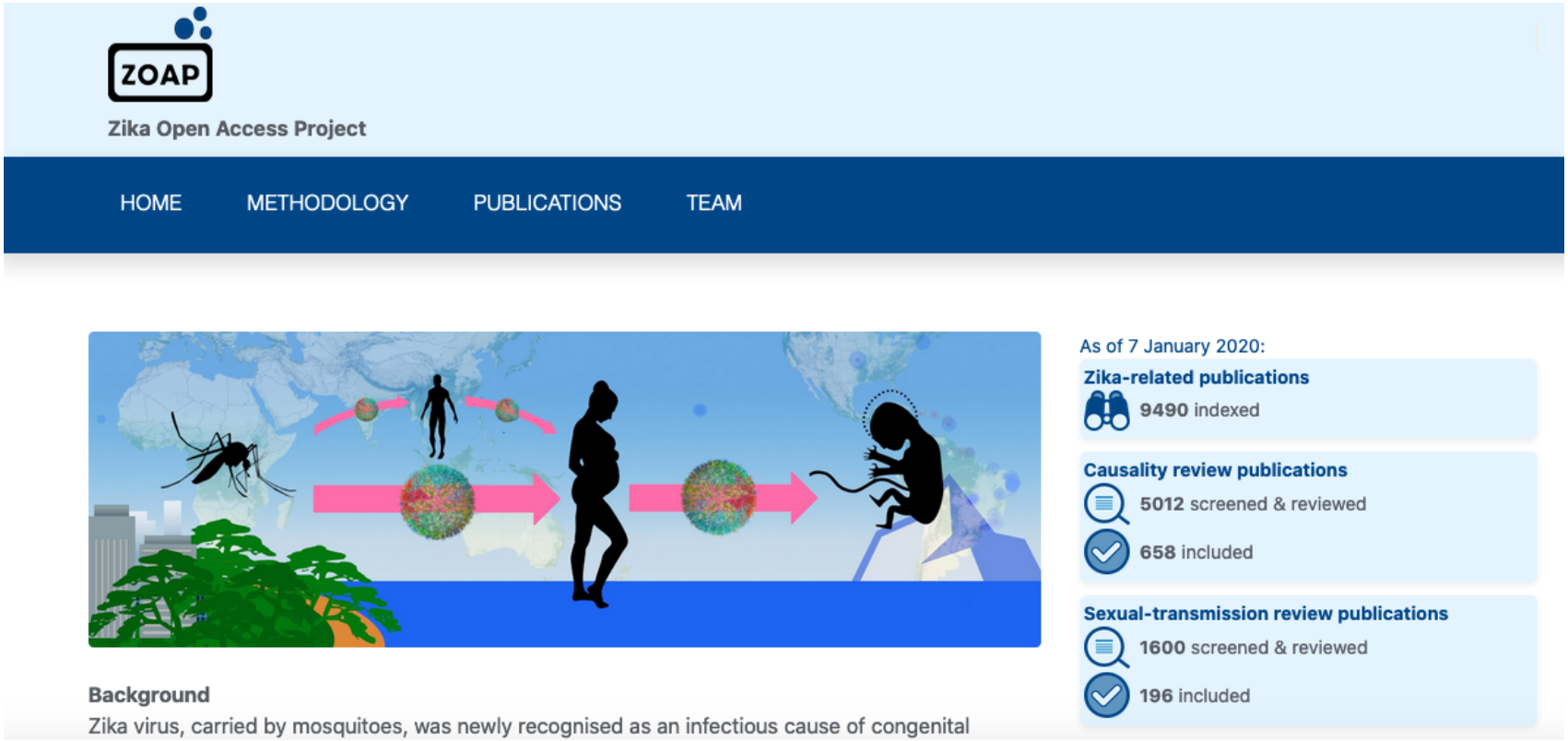
- Public call for general public to submit questions about health
- Resulted in "Village" project



`https://tell-us.online/`, `https://village.lbg.ac.at/about?lng=en`, Ludwig Boltzmann Institute, Austria

Example 3: Living systematic review

- Automatising steps which are required for a systematic review (e.g., finding literature, removing duplicates)
- Publishing results in Open Access journals



https://zika.ispm.unibe.ch/home

Want to learn more?

- Munich ROCS (Researchers for Open and Credible Science): `https://lists.lrz.de/mailman/listinfo/munichrocs`
- Open Science Beers Munich: Doodle poll for meeting in February currently open: Scan QR code and sign up to Munich ROCS mailing list or Facebook page
- ReproducibiliTea Journal Club
- Sign up to LMU Open Science Center News `https://lists.lrz.de/mailman/listinfo/lmu-osc`
- Have a look at the LMU Open Science Center website