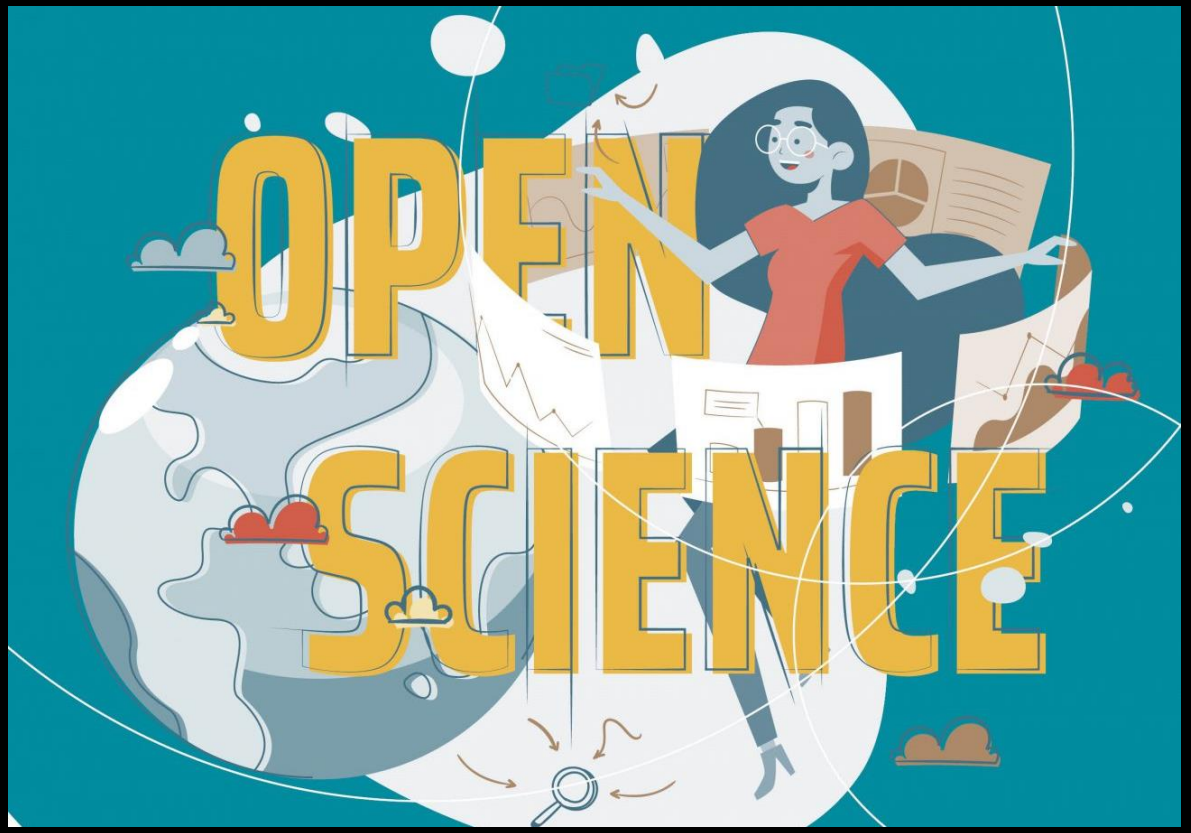

Conducting open & reproducible (human) social neuroscience
aka: practical things I wish I knew 6 years ago

Lei Zhang

Faculty of Psychology, University of Vienna

Dec. 12, 2021

S4SN Training Workshop

cover image source: nwo.nl

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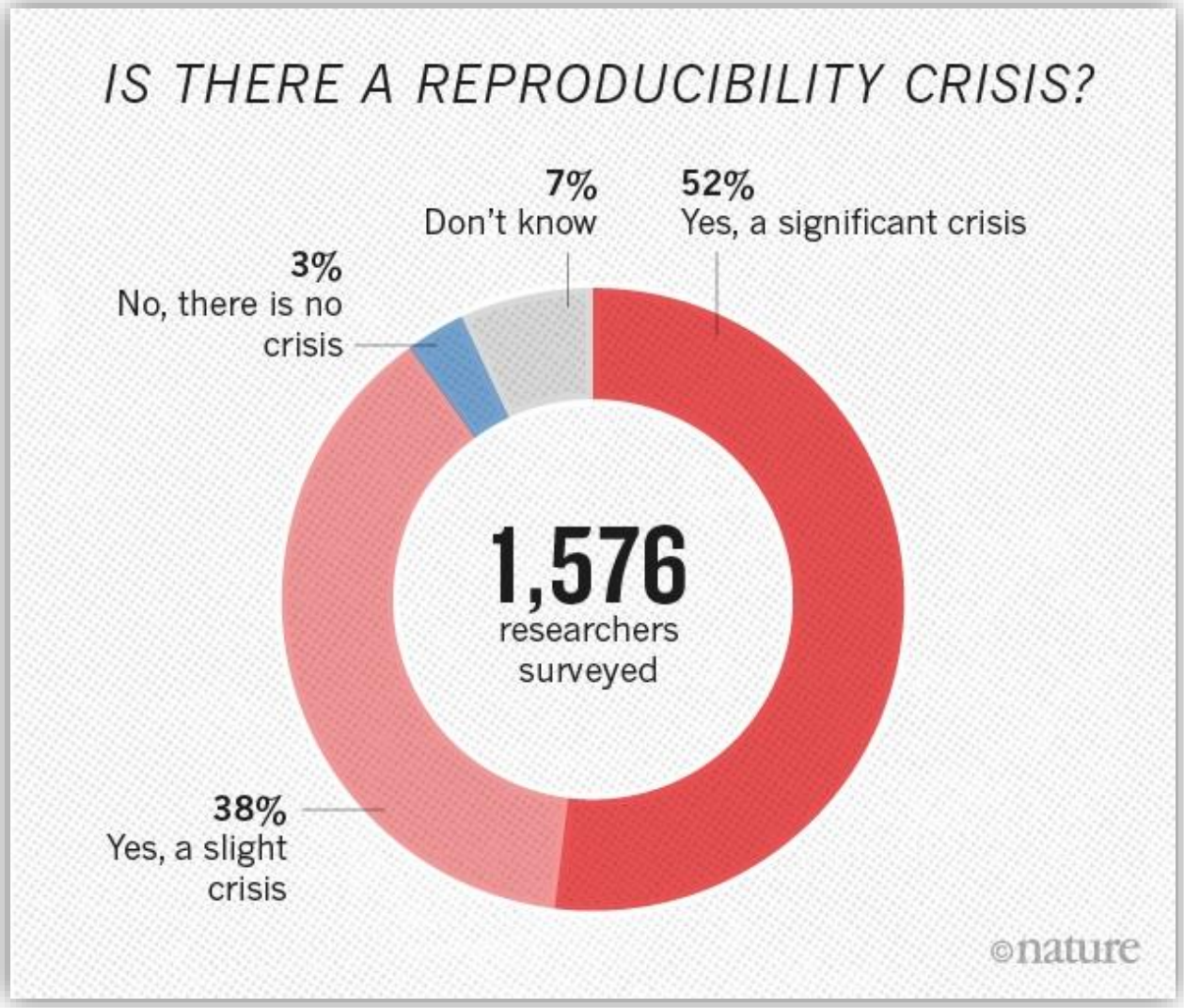
SCAN Unit

universität wien
Fakultät für Psychologie

let's talk about incentives



okay, there is a reproducibility crises

solution: Open Science!

But, research largely relies on "self-correction", so?

let's talk about incentives

More can be done …

when evaluating/hiring new people

Faculty Positions in Neuroscience

EPFL

The Ecole polytechnique fédérale de Lausanne (EPFL) invites applications for **two faculty positions** at the Tenure Track Assistant Professor level in the **Brain Mind Institute of the School of Life Sciences**. We seek candidates committed to research in the broad fields of neuroscience, neuroengineering and neurotechnology with interest in brain (dys)function, neurodegeneration, regeneration, stem cells and organoids studied from molecular, genetic, cellular, neural circuit, systems, imaging, computational and/or behavioral perspectives.

Commitment to open science and data dissemination will be positively valued.

when funding new research

wellcome

Our policy

1. We expect our researchers to maximise the availability of research data, software and materials with as few restrictions as possible. As a minimum, the data underpinning research papers should be made available to other researchers at the time of

NWO

Open (FAIR) data

‹ Open Science

› **Data management**
Data management section

Besides publications also research data that emerges from NWO-funded research should be as accessible and reusable as possible. The idea behind open science is 'Open as possible, closed if necessary.' Due

NIH

NIH Data Sharing Policy and Implementation Guidance

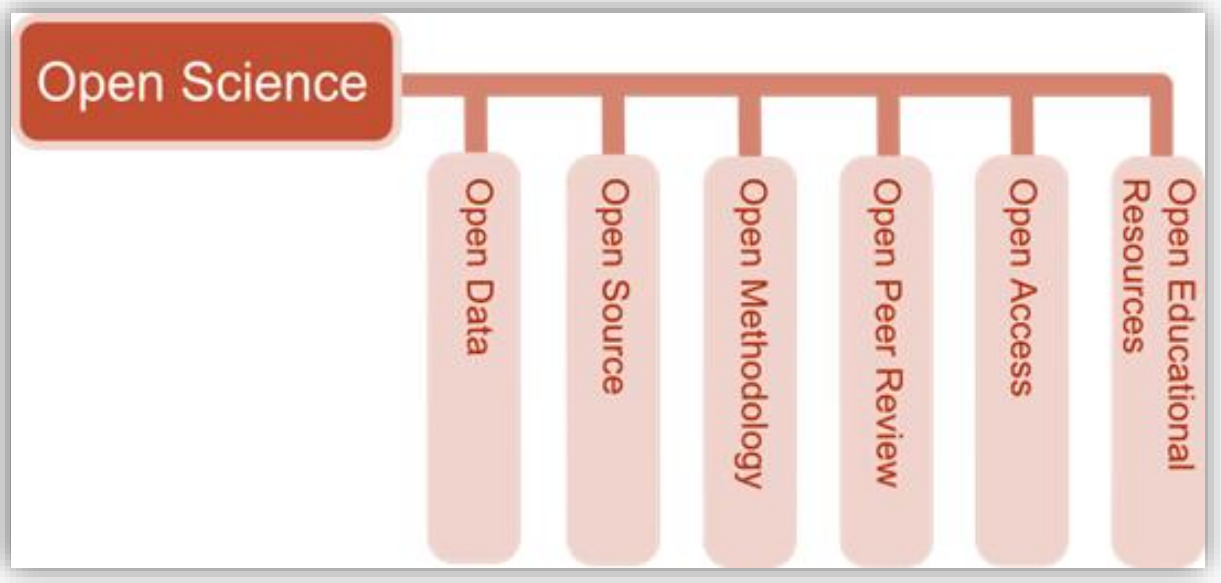
This guidance provides the National Institutes of Health (NIH) policy statement on data sharing and additional information on the implementation of this policy.

NEWS: New NIH Policy on Data Management and Sharing (effective January 25, 2023)

NIH has issued a new Final NIH Policy for Data Management and Sharing, which will require NIH funded researchers to prospectively submit a plan outlining how the new policy will come into effect and replace the 2003 NIH Data Sharing Policy currently in effect.

To help the research community prepare for implementation of the new policy, NIH also provides the following supplemental information: Elements of an NIH Da Sharing, and Selecting a Repository for Data Resulting from NIH-Supported Research. Visit the page on public access and open science to learn more.

What is Open Science?



From our survey:

- Reproducibility
- Pre-registration
- Preprints
- Data Sharing
- Resource/code sharing
- Open access

Reproducibility: Reporting clarity

During the taster session on the first day, we assessed participants' active motor threshold for the left motor cortex 'hotspot', which is the scalp location where TMS evoked the largest MEP amplitude. The active motor threshold was defined as the minimum stimulation intensity sufficient to produce a motor-evoked potential (MEP) in the contralateral small hand muscle, i.e., right first dorsal interosseous (FDI), in at least 50% of trials, when the participants exerted a constant pressure between the index finger and the thumb (20% of maximum force) (Rossini et al., 1994). Electromyographic (EMG) activity in right FDI was recorded with bipolar surface Ag-AgCl electrode montages. Responses were bandpass filtered between 10 and 1000 Hz, with additional 50 Hz notch filtering, sampled at 5000 Hz, and recorded using a CED 1902 amplifier, a CEDmicro1401 Mk.II A/D converter, and PC running Spike2 (Cambridge Electronic Design).

on a latex cap fixed on the head. For cTBS, bursts of 3 stimuli at 50 Hz were repeated with a frequency of 5 Hz for 40 seconds, resulting in a total of 600 pulses. Stimulation intensity was set to 80% of the active motor threshold. Motor threshold corresponded to the lowest TMS pulse intensity required to elicit a motor-evoked potential larger than 200 μV from the contralateral first *dorsal interosseous* muscle on more than 5 out of 10 trials while the participant maintained a contraction of about 20% maximum force [45]. The implemented cTBS protocol has been reported to reduce the excitability of the stimulated brain region for up to 60 minutes, though

Reporting guidelines for main study types

Randomised trials	CONSORT	Extensions
Observational studies	STROBE	Extensions
Systematic reviews	PRISMA	Extensions
Study protocols	SPIRIT	PRISMA-P
Diagnostic/prognostic studies	STARD	TRIPOD
Case reports	CARE	Extensions
Clinical practice guidelines	AGREE	RIGHT
Qualitative research	SRQR	COREQ
Animal pre-clinical studies	ARRIVE	
Quality improvement studies	SQUIRE	Extensions
Economic evaluations	CHEERS	

See all 485 reporting guidelines

Reproducibility: Statistics

SCIENCE FORUM

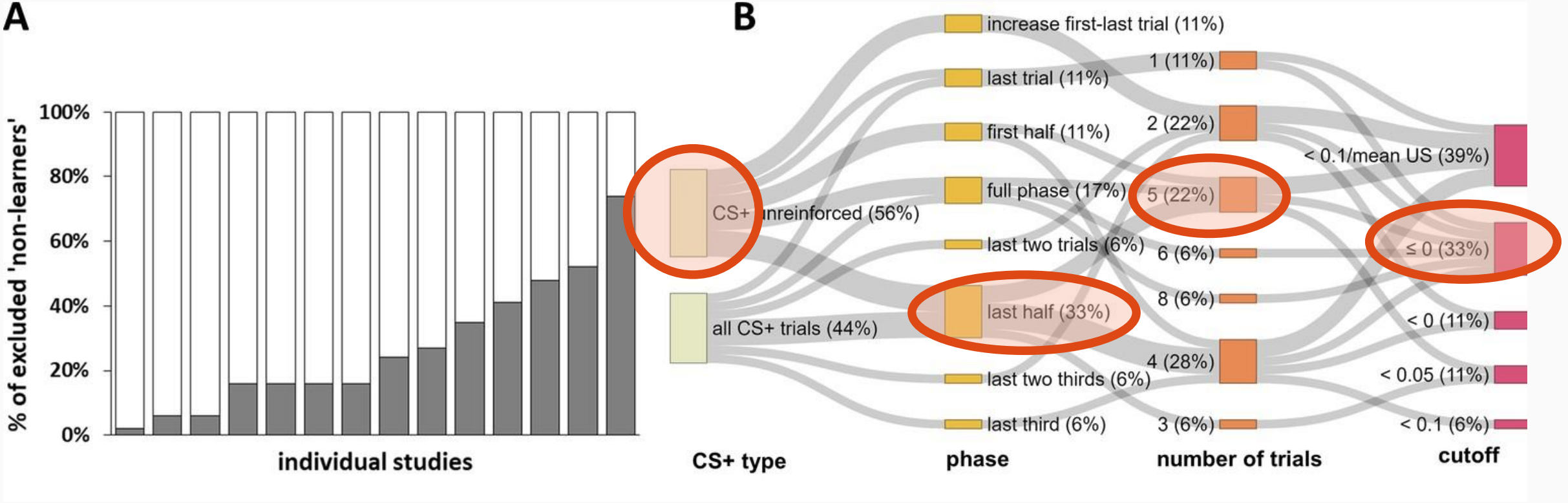
Ten common statistical mistakes to watch out for when writing or reviewing a manuscript

Abstract Inspired by broader efforts to make the conclusions of scientific research more robust, we have compiled a list of some of the most common statistical mistakes that appear in the scientific literature. The mistakes have their origins in ineffective experimental designs, inappropriate analyses and/or flawed reasoning. We provide advice on how authors, reviewers and readers can identify and resolve these mistakes and, we hope, avoid them in the future.

TAMAR R MAKIN* AND JEAN-JACQUES ORBAN DE XIVRY

https://elifesciences.org/articles/48175

Pre-registration



2 8 7 5

→ 2*8*7*5 = 560!!!

Lonsdorf et al., 2019, *eLife*

Pre-registration

what to pre-reg?

- research question
- hypotheses
- analyses plan
- etc.

prior to experiment!

https://osf.io/

https://aspredicted.org/

Persistent Identifier
https://doi.org/10.23668/psycharchives.5121

Date of first publication
2021-09-21

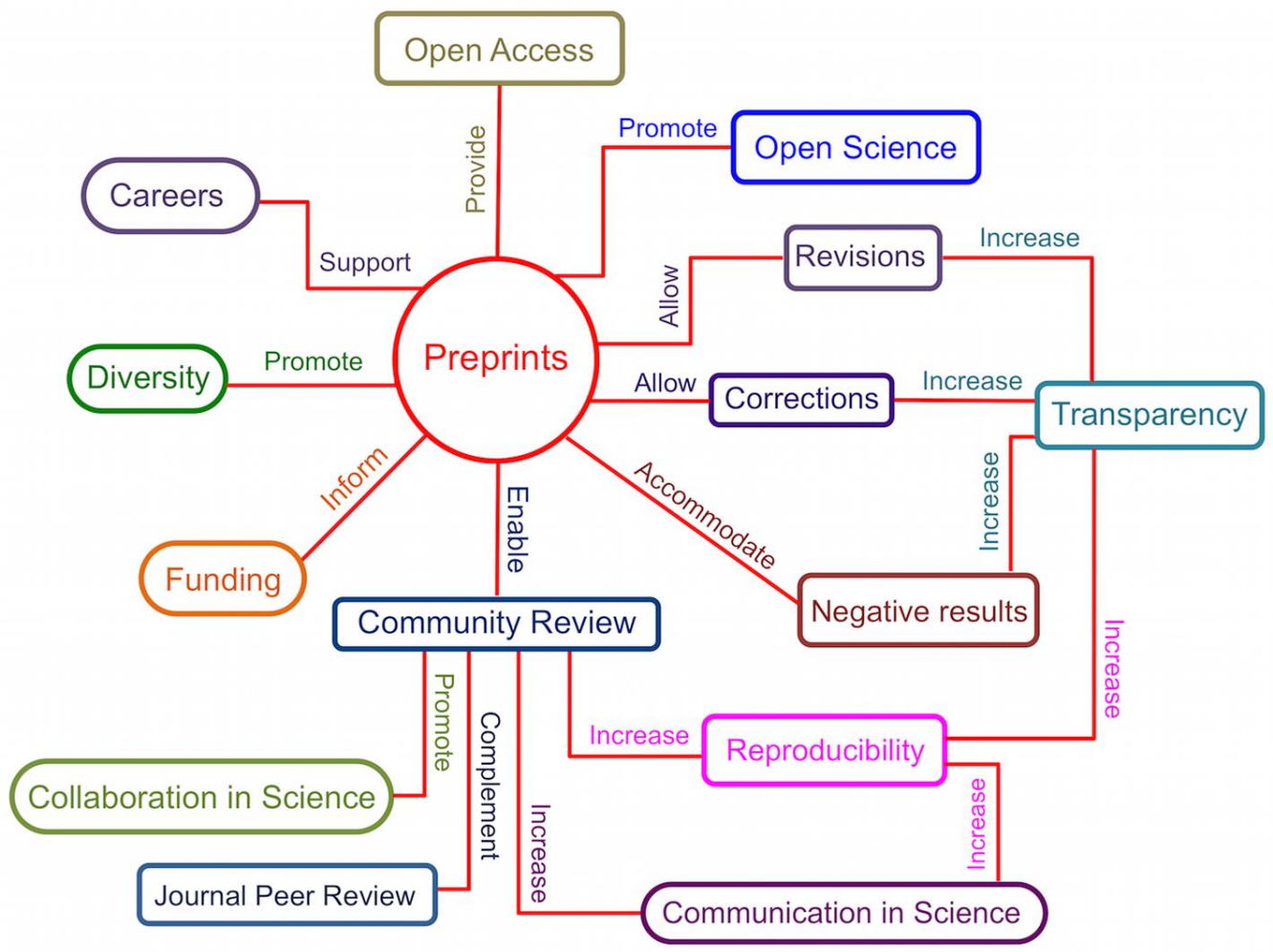
Publisher
PsychArchives

Is version of
https://osf.io/6juft/

Citation
Beyer, F., Flannery, J., Gau, R., Janssen, L., Schaare, L., Hartmann, H., Nilsonne, G., Martin, S., Khalil, A., Lipp, I., Puhlmann, L., Heinrichs, H., Mohamed, A., Herholz, P., Sicorello, M., & Panagoulas, E. (2021). A fMRI pre-registration template. PsychArchives. https://doi.org/10.23668/PSYCHARCHIVES.5121

A fMRI pre-registration template

Preprint



Sarabipouret al., 2019, *Plos Biology*

Preprint

Should I preprint?

check the Journal's policy!

eLife funders invest in 'publish, then review' model

Learn more about their ongoing support for our work

From July 2021 eLife will only review manuscripts already published as preprints, and will focus its editorial process on producing public reviews to be posted alongside the preprints.

JNeurosci
THE JOURNAL OF NEUROSCIENCE

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Sherpa Romeo

About | Search | Statistics | Help

Submitted Version

None

Institutional Repository, bioRxiv, Preprint Repository, +1

https://v2.sherpa.ac.uk/romeo/

Data sharing

Selfish scientists' reasons for data sharing

Time required
(but small compared to overall time for project?)

People will try and undermine me
(although trust typically goes *up* when sharing data)

People will nag me with questions

Stability/reuse of code
(by your future self/your lab)

Broader impact than publication alone can achieve

Increased trust/citations (especially if data/task is citable separately)

Greater care

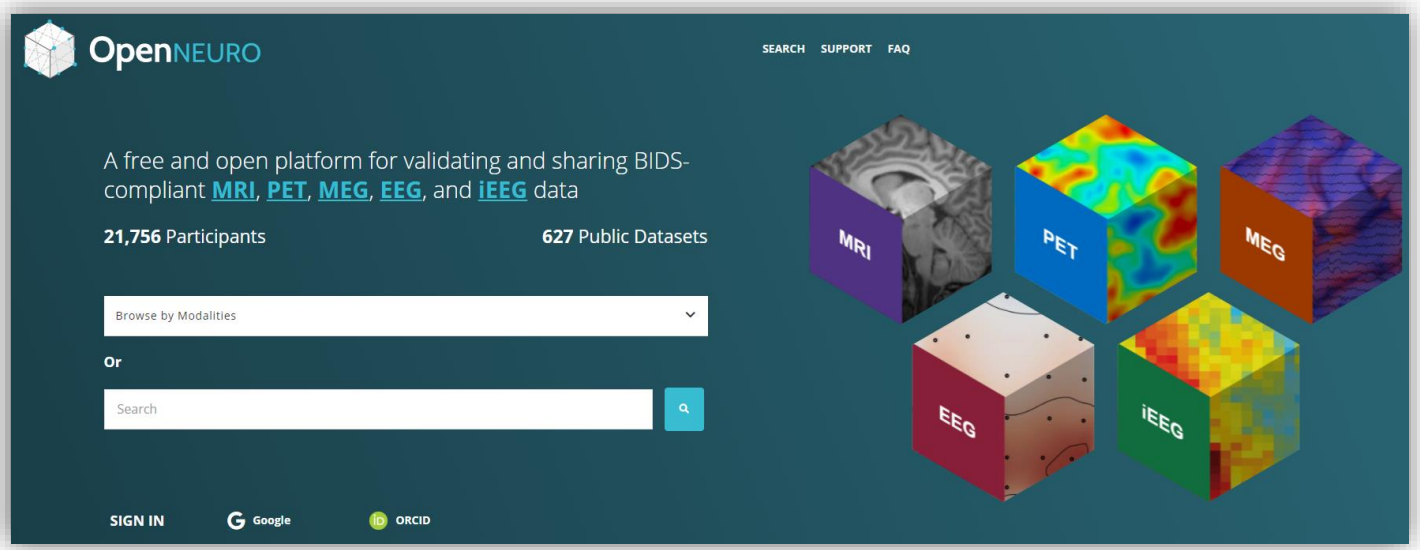
May become **mandatory** for grant panels (already for some journals)

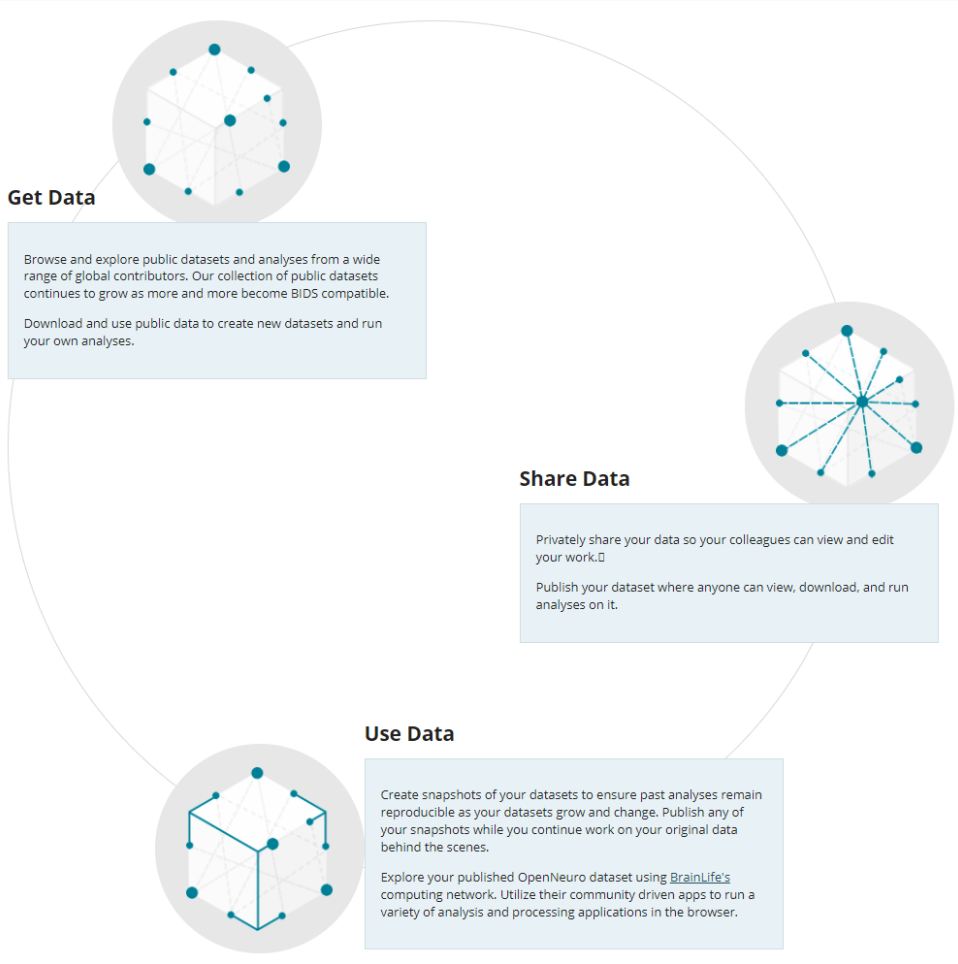
Free cash
(if you pre-register)

Reasons not to share | **Reasons to share**

slide from Laurence Hunt

Data sharing: neuroimaging





BIDS
BRAIN IMAGING DATA STRUCTURE

Validation Using BIDS

The Brain Imaging Data Structure (BIDS) is an emerging standard for the organization of neuroimaging data.

Want to contribute to BIDS?
Visit the Google discussion group to contribute.

DataLad

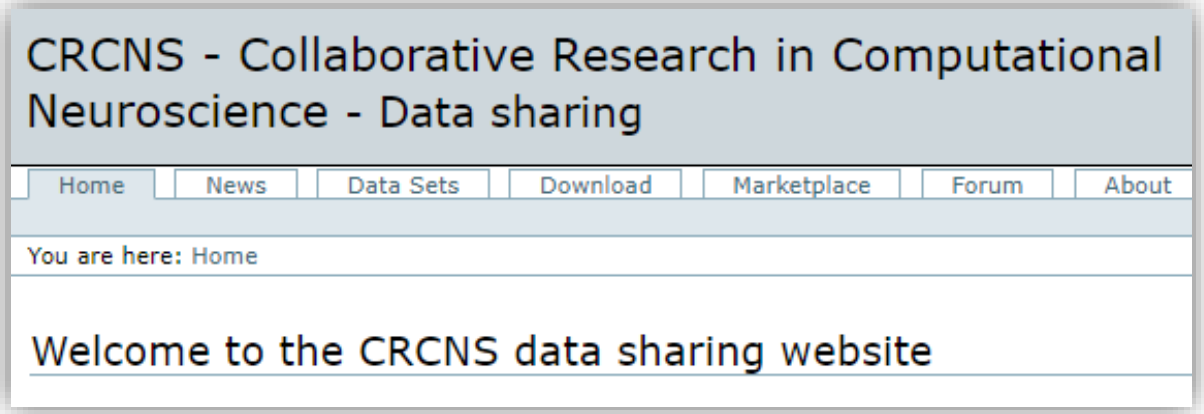
OpenNeuro Runs on DataLad

Want to access OpenNeuro datasets with DataLad? Visit the dataset collection on GitHub.

A data management solution built on Git and Git-annex. Read more about DataLad

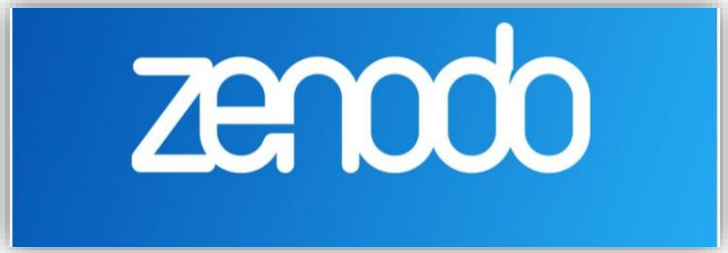
https://openneuro.org/ https://bids.neuroimaging.io/

Data sharing: others



http://crcns.org/

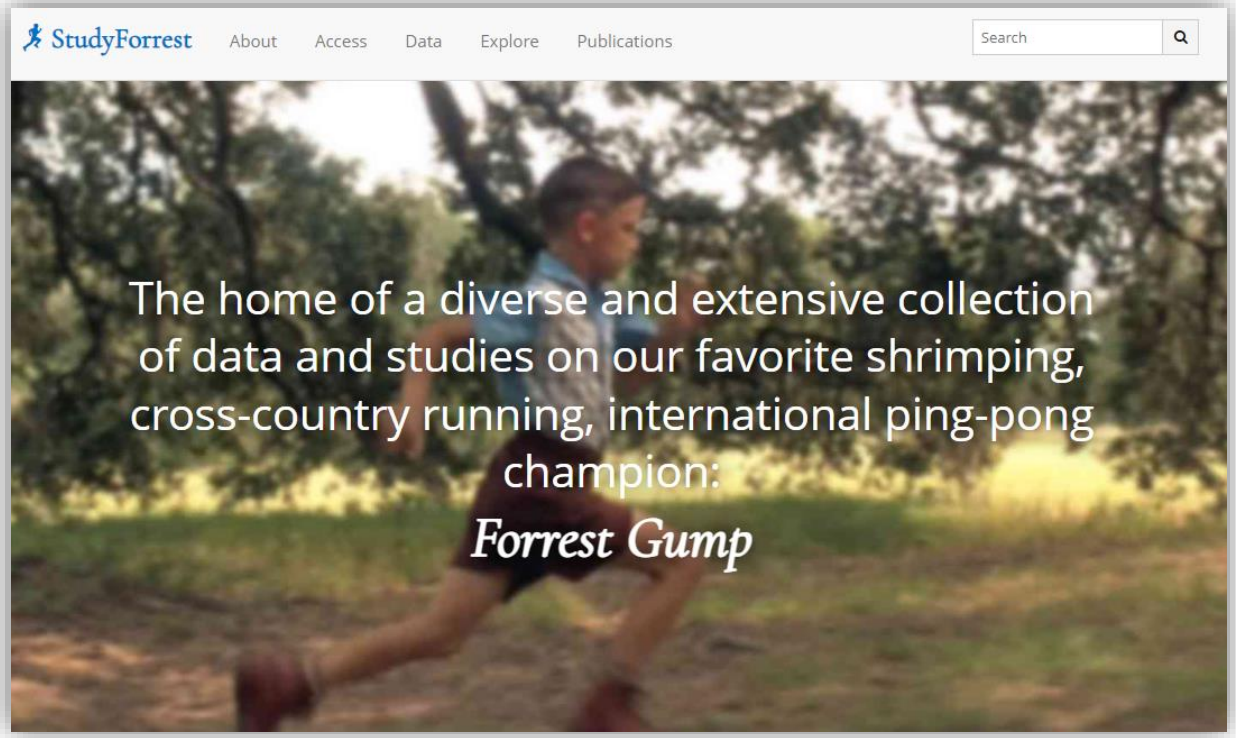
https://datadryad.org/



https://zenodo.org/

https://www.nature.com/sdata/

Data sharing: open dataset



This project centers around the use of **the movie Forrest Gump**, which provides complex sensory input that is both reproducible and is also richly laden with real-life-like content and contexts.

Since its initial release, the *StudyForrest* dataset has grown and been extended substantially, and now encompasses many **hours of fMRI scans**, structural brain scans, **eye-tracking** data, and extensive **annotations** of the movie. Explore the Data Page to more closely examine the data we have available.

https://www.studyforrest.org/

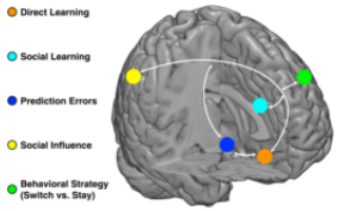
Resource/code sharing

SIT

repo size 226 MB | languages 3 | DOI 10.1126/sciadv.abb4159

last commit august 2020

@lei_zhang_lz 2.5k | @SysNeuroHamburg 657 | @ScanUnit 1.5k



Code and data for the **social influence task (SIT)**, accompanying the paper:

Zhang, L. & Gläscher, J. (2020). A brain network supporting social influences in human decision-making. *Science Advances*, **6**, eabb4159.
DOI: 10.1126/sciadv.abb4159.

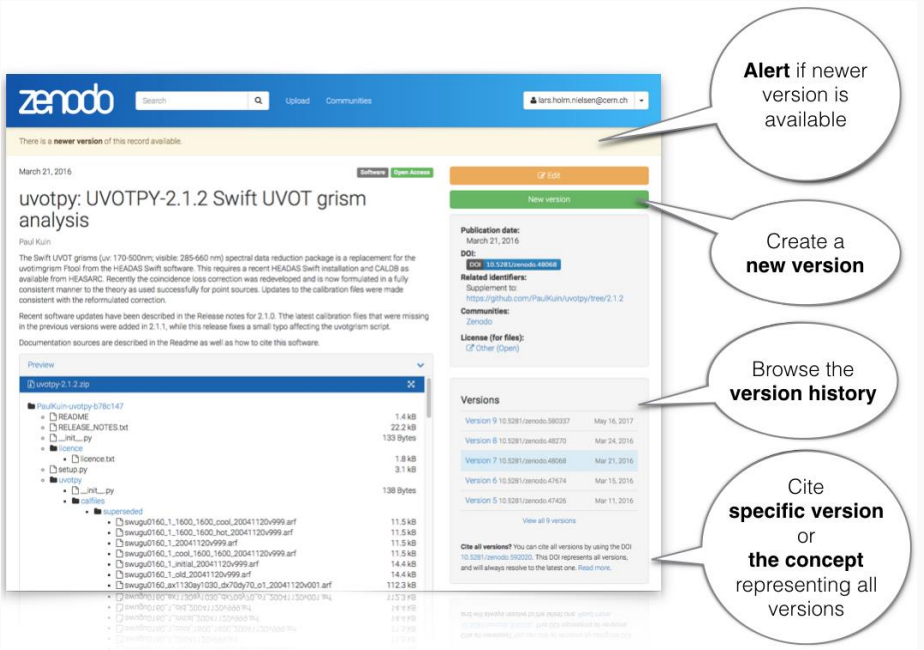
Outreach:

- A **1.4-min #SciComm** video in lay English is available on YouTube and bilibili.
- A **1-hour talk** on this paper is available on YouTube and bilibili. The slides deck is available here.
- Part of the **experimental setup** was previously covered by a European television channel Arte Xenius (in German and French).
- A **Twitter thread** is compiled to summarize the main findings; see here for an unroll version.
- **Media coverage** (selection): COSMOS, UNIVIE, UKE (German), APA.at (German), EurekAlert, ScienceDaily, medicalxpress, SingularityHub.

This repository contains:

```
root
 ├── data # Preprocessed behavioral data & fMRI BOLD time series data
 │    ├── behavioral
 │    ├── fMRI
 ├── code # Matlab, R, & Stan code to run analyses and produce figures
 │    ├── behavioral
 │    ├── fMRI
 │    ├── stanmodel
```

Zhang & Gläscher, 2020, *Science Advances* https://github.com/lei-zhang/SIT



GitHub + zenodo

= Citable Code

https://www.youtube.com/watch?v=S1qK_TA52e4

Resource/code sharing: software

hBayesDM

repo status Active | build error | CRAN 1.1.1 – 2021-05-03 | downloads 42K

DOI 10.1162/CPSY_a_00002

hBayesDM (hierarchical Bayesian modeling of Decision-Making tasks) is a user-friendly package that offers hierarchical Bayesian analysis of various computational models on an array of decision-making tasks. hBayesDM uses Stan for Bayesian inference.

Now, **hBayesDM** supports both R and Python!

Ahn, Haines, Zhang, 2017, *Computational Psychiatry*

HyPyP

The **Hy**perscanning **Py**thon **P**ipeline

pypi v0.3.0b4 | build passing | License BSD 3-Clause | chat Mattermost

⚠ This software is in beta and thus should be considered with caution. While we have done our best to test all the functionalities, there is no guarantee that the pipeline is entirely bug-free.

See our paper for more explanation and our plan for upcoming functionalities (aka Roadmap).

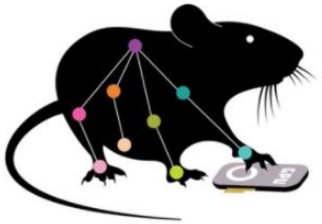
If you want to help you can submit bugs and suggestions of enhancements in our Github Issues section.

For the motivated contributors, you can even help directly in the developpment of HyPyP. You will need to install Poetry (see section below).

Ayrolles et al., 2021, *SCAN*

code style black | Python package passing | pypi package 2.2.0.3 | downloads 293k | downloads/month 5k | Star 2.5k

Contributions Welcome | License LGPL v3 | forum 972 topics | chat on gitter | DeepLabCut 7k | Fork 1.2k



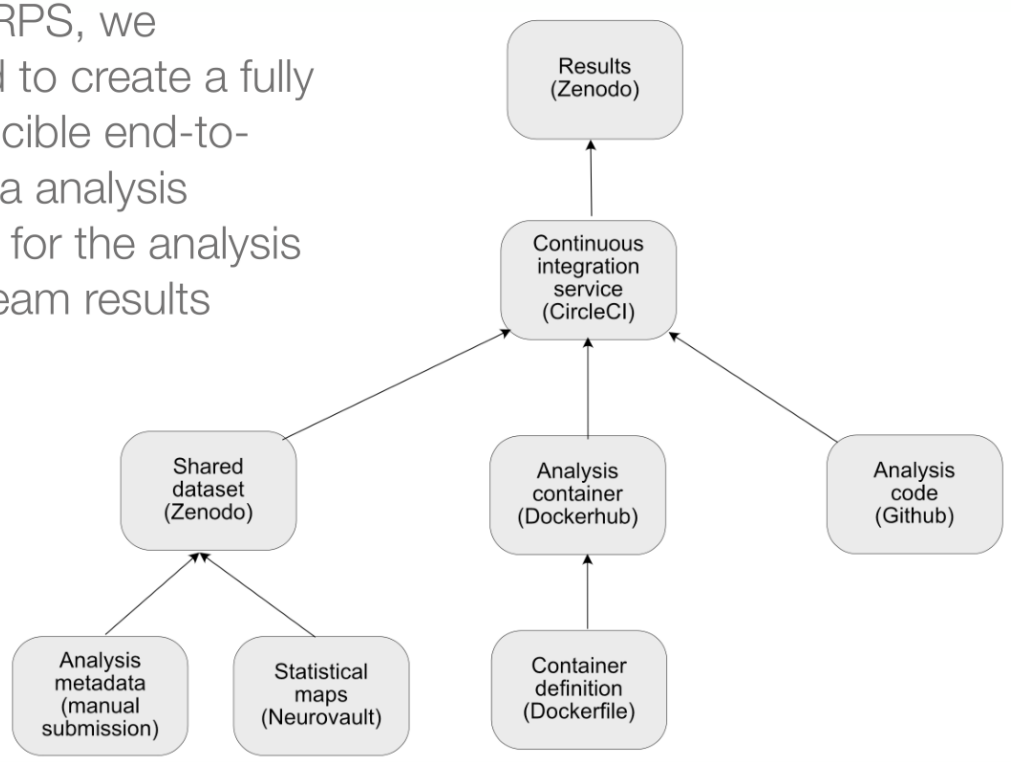
DeepLabCut™:
a software package for animal pose estimation

www.deeplabcut.org

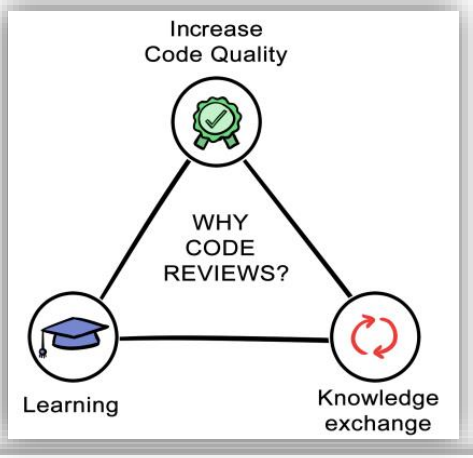
Mathis et al., 2018, *Nature Neuroscience*

Resource/code sharing: code review

For NARPS, we decided to create a fully reproducible end-to-end data analysis pipeline for the analysis of the team results



slide from Russ Poldrack



Hannah Sheahan @hannahsheahan · Jun 24

My first pull request was approved at DeepMind today 🥳 but seriously code review is so amazing for learning. Why does no one in academia do it?

106 207 3.2K

Tom Wallis
@tsawallis

Replying to @hannahsheahan

After returning to academia from industry, I had the exact same thought. My group will be doing code review! It's insane that we spend hours refining paragraphs in a manuscript, but often only the student has seen the code that produced the results!

11:22 AM · Jun 25, 2021 · Twitter Web App

Open Access

Open access policy

Published outputs that arise from our funding must be open and accessible to everyone.

Overview

The overarching aim of our open access (OA) policy is to make sure that knowledge and discoveries resulting from our funding are shared and used in a way that maximises their benefit to health.

HELMHOLTZ RESEARCH FOR GRAND CHALLENGES

5 Open science publication

By accepting funding from the Initiative and Networking Fund of the Helmholtz Association, candidates agree to make scientific publications based either entirely or in part on the results of the funded project available to everyone in a freely accessible archive (repository) no later than six months after the original publication. In well-justified cases, open science publications may be waived. Those cases must be reported to the Helmholtz Association in advance.

Open Access: APC

 Current Biology	£5,300, €5,800, $6,700
 Neuron	£7,000, €7,600, $8,900

Open Access publishing agreements

The University of Vienna has negotiated a number of **agreements for Open Access publishing**. These agreements cover subscription journals (*hybrid journals*) and/or Gold journals (*fully OA journals*) of the respective publisher. Details for the respective agreements can be found here:

- → American Chemical Society (ACS)
- → American Institute of Physics (AIP)
- → BMC/SpringerOpen
- → Brill
- → Cambridge University Press (CUP)
- → Company of Biologists
- → Elsevier
- → Emerald
- → Frontiers
- → de Gruyter
- → IOP Publishing
- → IWA Publishing
- → MDPI
- → Oxford University Press (OUP)
- → Royal Society
- → Royal Society of Chemistry
- → SAGE
- → Springer
- → Taylor & Francis
- → Wiley

https://openaccess.univie.ac.at/en/funding/oa-publishing-agreements/

eLife - the journal ✓ ···
@eLife

From April 5, we will be increasing our publication fee to help us cover the costs of publishing. We understand that fees can be a barrier for many communities so our full fee waiver will continue to be made available to anyone who requests it 🧵

elifesciences.org
eLife Latest: Changes to our publication fee
The eLife fee for publication will increase on April 5, 2021; authors may request a waiver for any reason.

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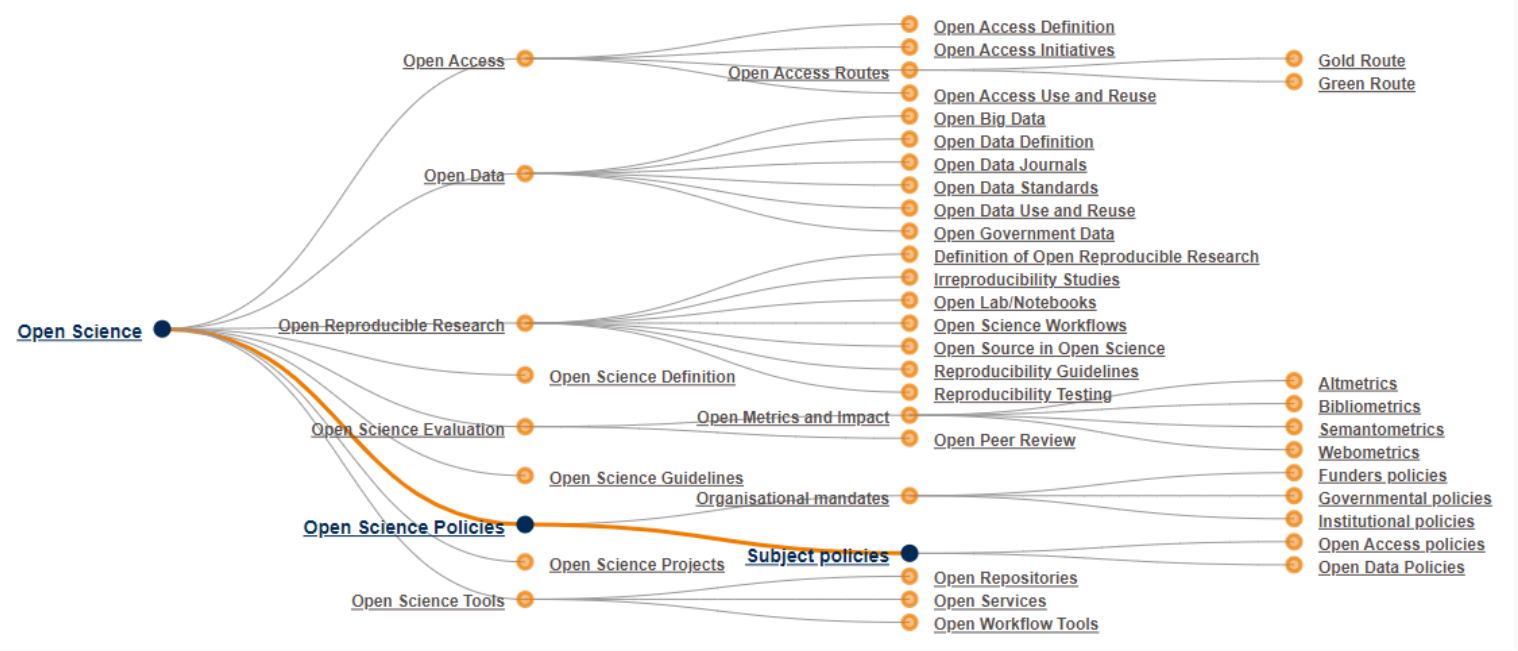
Want to learn more?



https://www.fosteropenscience.eu/

Acknowledgement

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Thank you!