# Welcome to our course on Introduction to Neuroscience

# Who are we?

**Dr. Lavinia Carmen Uscătescu**

I will be your lecturer.

Please call me **Lavinia**.

My research interests mainly cover **autism, schizophrenia**, and **visual perception**.

I mainly use **fMRI**, **eye-tracking**, and **psychophysics**.

My CV at a glance

| | |
|---|---|
| Jan. 2024 – … | Research Assistant Professor, Virginia Tech (department of Psychology), USA |
| 2020 – Dec. 2023 | Postdoctoral researcher at the Olin Neuropsychiatry Research Center (Hartford Healthcare and Yale University), USA |
| 2015 – 2020 | PhD in Cognitive Neuroscience, University of Salzburg, Austria |
| 2013 – 2015 | MSc in Neuro-Cognitive Psychology, LMU Munich, Germany |
| 2010 – 2012 | MA in Clinical Psychology, UBB Cluj-Napoca, Romania |
| 2007 – 2010 | BA in Psychology, UBB Cluj-Napoca, Romania |

Dr.Ichim Ana Maria

We will meet during seminars.

Electrophysiologist by training, my research interests are Alzheimer's disease, Gamma Oscillations, Schizophrenia and much more.

Bachelor degree in Economic Sciences

University of Brescia

Master's degree in Applied Cognitive Neuroscience

University of Milan

PhD in Electronics, Telecommunication and Information Technology

Technical University of Cluj-Napoca

PostDoc at Transylvanian Institute of Neuroscience

Cluj-Napoca

2012 2015 2018 Today

# Andrei Ciuparu

- Thesis: Dumneavoastra sau tu? Cine ne motiveaza mai mult? Un studiu care sa verifice efectul mediat al limbajului formalizat asupra motivatiei elevilor
- Coneural internship

- Thesis: Ciuparu, A., van der Geugten, D., & Rheinheimer, N. (2017). Low frequency effects of targeted memory reactivations on subsequent recall processes.

- Thesis: Advanced processing methods and machine learning algorithms applied on neurobiological signals
- Coordinators:
  - Prof. Dr. Ing. CORNELIU RUSU
  - Dr. Ing. RAUL MURESAN

# What will be covered in this course?

| 1st Semester | | 2nd semester | |
|---|---|---|---|
| *Oct. 9th* | *The replicability crisis in Cognitive Neuroscience* | Feb. 26th | An introduction to Cognitive Neuroscience and methods |
| Oct. 16th | *Introduction and Brief History* | March 4th | Human lesion studies |
| Oct. 23rd | *Nervous system structure and organization* | March 11th | Electrophysiology |
| Oct. 30th | *Neural signalling, I* | March 18th | Brain stimulation methods |
| Nov. 6th | *Neural signalling, II* | March 25th | Structural and functional neuroimaging |
| Nov. 13th | Nervous system development | April 1st | Eye-tacking and pupillometry |
| Nov. 20th | Nervous system anatomy | April 8th | Memory |
| Nov. 27th | Visual Neuroscience | April 15th | Language processing |
| Dec. 4th | Auditory Neuroscience | April 22nd | Cognitive mechanisms of reading and writing |
| Dec. 11th | Movement, motor control and motor learning | April 29th | Emotions |
| Dec. 18th | Multisensory Integration | May 13th | Social cognition |
| Jan. 8th | Sleep | May 20th | Attention & spatial orientation |
| Jan. 15th | Smell, Taste, and Touch<br>+ recap and feedback | May 27th | Executive functions |
| | | June 3rd | Computational neuroscience and computational psychiatry + recap and feedback |

# Let’s set some expectations

# What I expect of you during this course

- **ENGAGE** – ask questions and feel free to interrupt me any time if anything is unclear.
- Read the assigned materials; I **HIGHLY ADVISE** you to read the papers/chapters marked as "required" BEFORE each lecture. In your "Assigned reading" folder in Teams, the required reading materials will be prefixed by "REQ", while the optional ones by "OPT".
- We will start each lecture with a few **revision questions** from the previous topic; questions will be asked via Slido, and **answers will be anonymous**.
- **ALL** the required, optional or recommended reading materials will be uploaded for you in our Teams group; if you find yourselves wanting to read anything else that is not open access, please reach out to either of us and we will get it for you. Links to additional materials will also be provided throughout the slides (for further independent, curiosity-driven exploration).

# What do YOU expect of me/us?

- I highly encourage you to always reach out directly with feedback or suggestions; however, if you'd prefer to do so anonymously, you can use this google doc:

- DISCLAIMER: even if you choose to give feedback anonymously, you are still expected to be respectful.

This course is a two-way interaction, and the more you engage, the more you benefit

# About last year

1. The grades in the 2nd semester of last year were very good!

More than half (i.e., 36 out of 56) got at least 8.

| Grade | Frequency |
|---|---|
| 10 | 8 |
| 9 | 19 |
| 8 | 9 |
| 7 | 6 |
| 6 | 5 |
| 5 | 2 |
| 4 | 1 |
| absent | 6 |

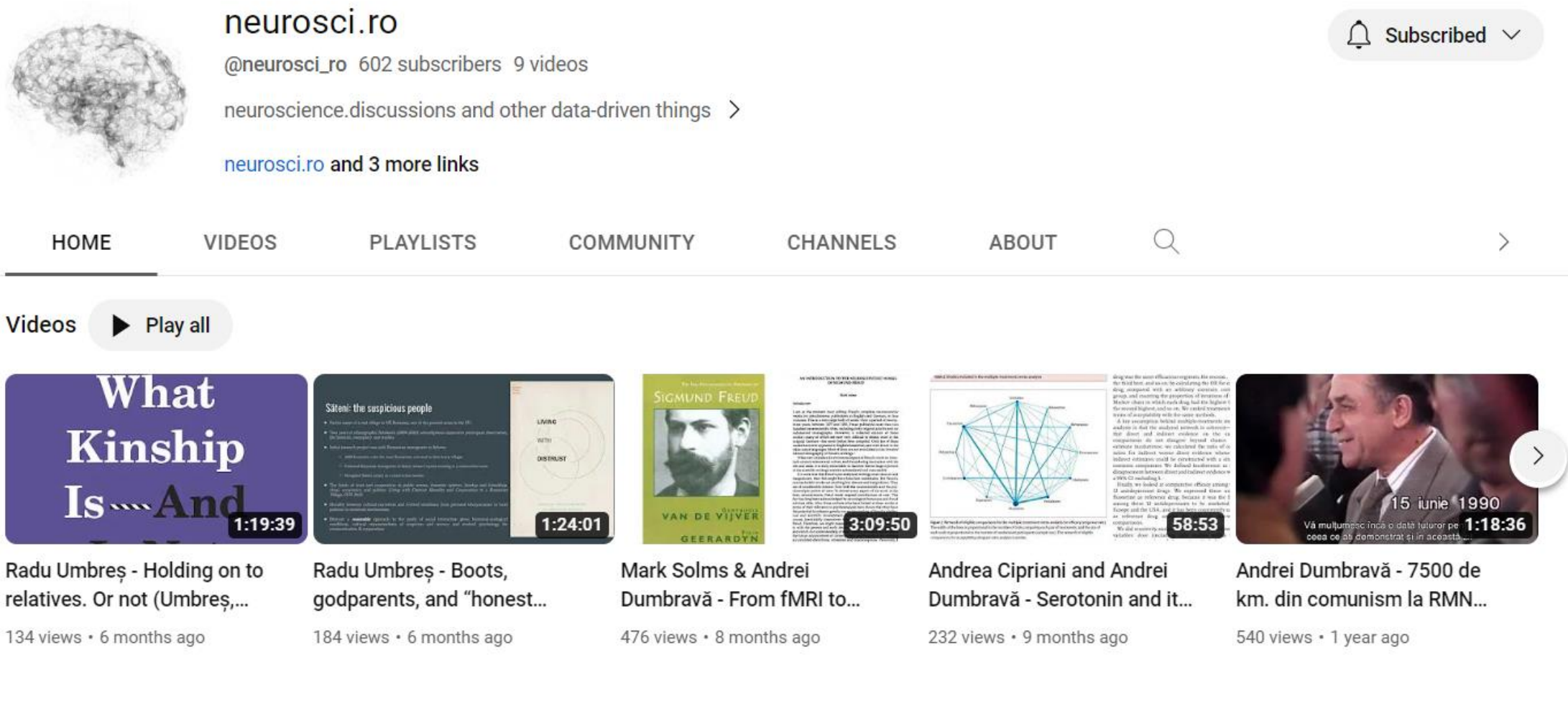
2. We recorded the lectures and uploaded them afterwards (in Teams); your colleagues found this very useful. Would you like to do this again this year? Please answer YES or NO

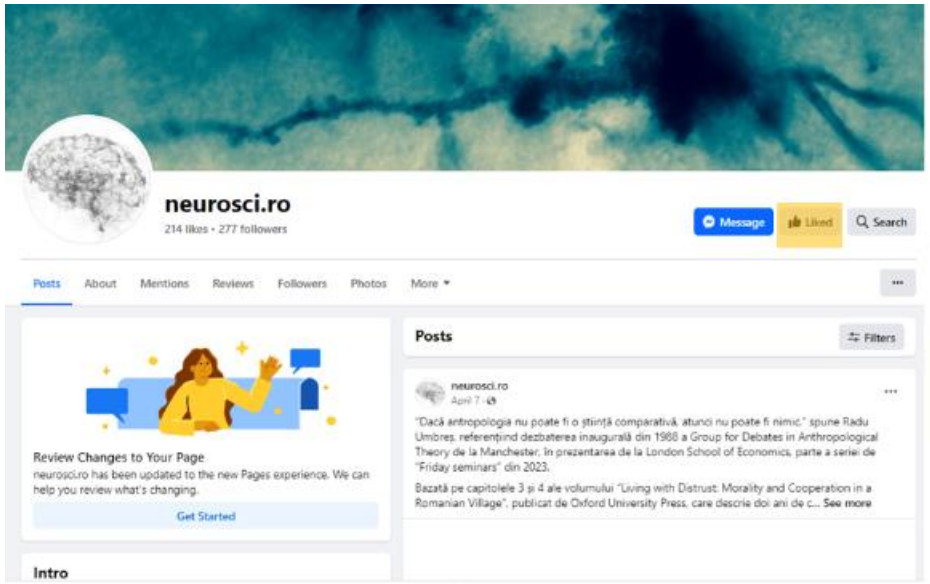
slido

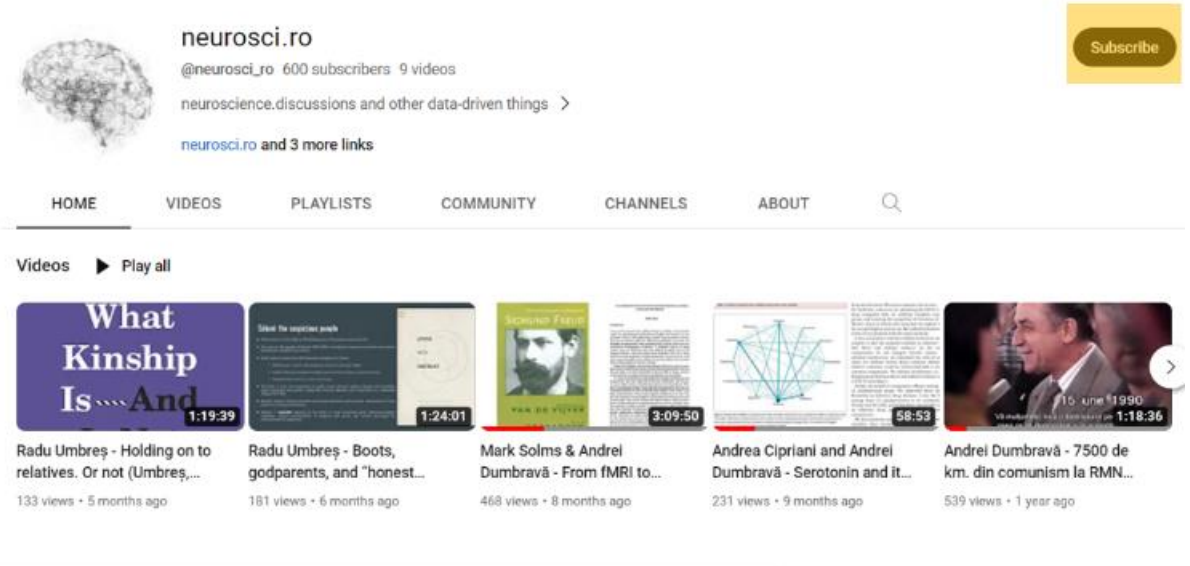
# Record lectures?

ⓘ Start presenting to display the poll results on this slide.

In the spirit of **Open Science**, this year we would like to upgrade our recordings – edit them for clarity, add timestamps, and upload them to the **neurosci.ro** YouTube channel, where you can also share them with other friends and colleagues.







On the condition that **NONE of your faces, voices, or any other personal identifiers** would be shown, do you agree to this? Please answer YES or NO.

slido

# Do you agree with making our lecture recordings open source?

ⓘ Start presenting to display the poll results on this slide.

# Our grading system

**Exam**: two main examination dates to choose from, and one additional exam in case you (1) fail the first one, or (2) would like to retake the initial exam and try to obtain a better grade.

**Seminar**: one group project where you can obtain additional bonus points. Participation in this group project is optional. You can earn max 1.5 points which will be added to your exam grade **ONLY IF** you (1) take the exam on one of the two main dates, and (2) obtain a passing grade (min 5) in the exam. Participation in the group project and other details related to dates, topics, etc., will be arranged with Ana and Andrei.

*DISCLAIMER: I am new to being in charge of this course, so I may not know all the administrative details that you may ask about, but will find out for you, so please DO ask if you have questions.*

Any questions/remarks before we begin our first lecture?

# The replicability crisis in Cognitive Neuroscience

Dr. Lavinia Carmen Uscătescu

October 9th 2023

slido

# Have you ever heard of the replicability/reproducibility crisis?

ⓘ Start presenting to display the poll results on this slide.

# What you can gain from this course

- Knowledge about one of of the “burning” issue in modern Cognitive Neuroscience;
- Knowledge about efforts that are being made to improve scientific practices and therefore replicability;
- A critical “lens” through which to analyse scientific literature;
- A “taste” of critical thinking at work in Cognitive Neuroscience.

# Outline

1. Replicability and Reproducibility
2. Why does it matter?
3. What has the scientific community been doing about it?
4. What can **you** do about it?
5. Assignment for the upcoming seminar

# Replicability and Reproducibility

nature › communications psychology › perspectives › article

Perspective | Open access | Published: 25 July 2023

# The replication crisis has led to positive structural, procedural, and community changes

Max Korbmacher, Flavio Azevedo, Charlotte R. Pennington, Helena Hartmann, Madeleine Pownall, Kathleen Schmidt, Mahmoud Elsherif, Nate Breznau, Olly Robertson, Tamara Kalandadze, Shijun Yu, Bradley J. Baker, Aoife O'Mahony, Jørgen Ø. -S. Olsnes, John J. Shaw, Biljana Gjoneska, Yuki Yamada, Jan P. Röer, Jennifer Murphy, Shilaan Alzahawi, Sandra Grinschgl, Catia M. Oliveira, Tobias Wingen, Siu Kit Yeung, Meng Liu, Laura M. König, Nihan Albayrak-Aydemir, Oscar Lecuona, Leticia Micheli & Thomas Evans

— Show fewer authors

*Communications Psychology* **1**, Article number: 3 (2023) | Cite this article

**4516** Accesses | **50** Altmetric | Metrics

https://www.nature.com/articles/s44271-023-00003-2

## DEFINING REPRODUCIBILITY AND REPLICABILITY

Different scientific disciplines and institutions use the words reproducibility and replicability in inconsistent or even contradictory ways: What one group means by one word, the other group means by the other word.[4] These terms—and others, such as repeatability—have long been used in relation to the general concept of one experiment or study confirming the results of another. Within this general concept, however, no terminologically consistent way of drawing distinctions has emerged; instead, conflicting and inconsistent terms have flourished. The difficulties in assessing reproducibility and replicability are complicated by this absence of standard definitions for these terms.

(National Academies of Sciences, Engineering, and Medicine., 2019, p. 42)

| | |
|---|---|
| Replicability | An umbrella term, used differently across fields, covering concepts of: direct and conceptual replication, computational reproducibility/replicability, generalizability analysis and robustness analyses. Some of the definitions used previously include: a different team arriving at the same results using the original author's artefacts; a study arriving at the same conclusion after collecting new data; as well as studies for which any outcome would be considered diagnostic evidence about a claim from prior research. |
| Replication Crisis | The finding, and related shift in academic culture and thinking, that a large proportion of scientific studies published across disciplines do not replicate (e.g., ref. [5]). This is considered to be due to a lack of quality and integrity of research and publication practices, such as publication bias, questionable research practices and a lack of transparency, leading to an inflated rate of false positive results. Others, starting with Vazire[17], have described this process as a 'Credibility Revolution' towards improving these practices. |
| Reproducibility | A minimum standard on a spectrum of activities ("reproducibility spectrum") for assessing the value or accuracy of scientific claims based on the original methods, data, and code. For instance, where the original researcher's data and computer codes are used to regenerate the results, often referred to as computational reproducibility. Reproducibility does not guarantee the quality, correctness, or validity of the published results. In some fields, this meaning is, instead, associated with the term "replicability" or 'repeatability'. |

Korbmacher et al., 2023, Table 1

Published: 27 August 2015

# Over half of psychology studies fail reproducibility test

Monya Baker

*Nature* (2015) | Cite this article



**Largest replication study to date casts doubt on many published positive results.**

Don't trust everything you read in the psychology literature. In fact, two thirds of it should probably be distrusted.

In the biggest project of its kind, Brian Nosek, a social psychologist and head of the Center for Open Science in Charlottesville, Virginia, and 269 co-authors repeated work reported in 98 original papers from three psychology journals, to see if they independently came up with the same results.

Brian Nosek's team set out to replicate scores of studies.

Discussions on the replicability and reproducibility of scientific findings are neither new, nor specific to Psychology or Neuroscience.

Reproducibility and replicability as they relate to data and computation-intensive scientific work received attention as the use of computational tools expanded. In the 1990s, Jon Claerbout launched the "reproducible research movement," brought on by the growing use of computational workflows for analyzing data across a range of disciplines (Claerbout and Karrenbach, 1992). Minor mistakes in code can lead to serious errors in interpretation and in reported results; Claerbout's proposed solution was to establish an expectation that data and code will be openly shared so that results could be reproduced. The assumption was that reanalysis of the same data using the same methods would produce the same results.

(National Academies of Sciences, Engineering, and Medicine., 2019, p. 41)

*An update on this has been presented at the Metascience 2019 symposium (you can watch it here, from minute 7:42 https://www.youtube.com/watch?v=gxPYNOTjkxg&list=PLsSlQOyfbMHZN5N3Jl06ZX13Fb1cyZxTT&t=461s*

# Seventy Teams of Scientists Analysed the Same Brain Data, and It Went Badly

What the latest fMRI "crisis" means for the rest of science

Mark Humphries · Follow

Published in The Spike · 7 min read · Jul 1, 2020

https://tinyurl.com/54h3p572

# Variability in the analysis of a single neuroimaging dataset by many teams

Rotem Botvinik-Nezer, Felix Holzmeister, Colin F. Camerer, Anna Dreber, Juergen Huber, Magnus Johannesson, Michael Kirchler, Roni Iwanir, Jeanette A. Mumford, R. Alison Adcock, Paolo Avesani, Blazej M. Baczkowski, Aahana Bajracharya, Leah Bakst, Sheryl Ball, Marco Barilari, Nadège Bault, Derek Beaton, Julia Beitner, Roland G. Benoit, Ruud M. W. J. Berkers, Jamil P. Bhanji, Bharat B. Biswal, Sebastian Bobadilla-Suarez, ... Tom Schonberg + Show authors

*Nature* **582**, 84–88 (2020) | Cite this article

**54k** Accesses | **404** Citations | **2058** Altmetric | Metrics

## Abstract

Data analysis workflows in many scientific domains have become increasingly complex and flexible. Here we assess the effect of this flexibility on the results of functional magnetic resonance imaging by asking 70 independent teams to analyse the same dataset, testing the same 9 ex-ante hypotheses[1]. The flexibility of analytical approaches is exemplified by the fact that no two teams chose identical workflows to analyse the data. This flexibility resulted in sizeable variation in the results of hypothesis tests, even for teams whose statistical maps were highly correlated at intermediate stages of the analysis pipeline. Variation in reported results was related to several aspects of analysis methodology. Notably, a meta-analytical approach that aggregated information across teams yielded a significant consensus in activated regions. Furthermore, prediction markets of researchers in the field revealed an overestimation of the likelihood of significant findings, even by researchers with direct knowledge of the dataset[2,3,4,5]. Our findings show that analytical flexibility can have substantial effects on scientific conclusions, and identify factors that may be related to variability in the analysis of functional magnetic resonance imaging. The results emphasize the importance of validating and sharing complex analysis workflows, and demonstrate the need for performing and reporting multiple analyses of the same data. Potential approaches that could be used to mitigate issues related to analytical variability are discussed.

https://www.nature.com/articles/s41586-020-2314-9

nature › news › article

NEWS | 26 July 2022

# Could machine learning fuel a reproducibility crisis in science?

**'Data leakage' threatens the reliability of machine-learning use across disciplines, researchers warn.**

Elizabeth Gibney

https://www.nature.com/articles/d41586-022-02035-w

## What is reproducibility?

Kapoor and Narayanan's definition of reproducibility is wide. It says that other teams should be able to replicate the results of a model, given the full details on data, code and conditions – often termed computational reproducibility, something that is already a concern for machine-learning scientists. The pair also define a model as irreproducible when researchers make errors in data analysis that mean that the model is not as predictive as claimed.

**AI Snake Oil**

Home | A sneak peek into the book | About

https://www.aisnakeoil.com/about

# About the book and this substack

AI is everywhere, and so is hype around AI. That's why we are launching a book project on AI snake oil—to dispel hype, remove misconceptions, and clarify the limits of AI.

But this is not a typical book project; we plan to share our ideas with you every step of the way.

If you want to better understand the capabilities and limits of AI, if you are skeptical of the hype surrounding AI, and if you are looking to avoid getting duped by snake oil, then this substack is for you.

Sayash Kapoor

https://twitter.com/sayashk
https://bsky.app/profile/sayash.bsky.social

Arvind Narayanan

https://twitter.com/random_walker
https://bsky.app/profile/randomwalker.bsky.social

# Snake oil

Article Talk

From Wikipedia, the free encyclopedia

*For other uses, see Snake oil (disambiguation).*

**Snake oil** is a term used to describe deceptive marketing, health care fraud, or a scam. Similarly, **snake oil salesman** is a common label used to describe someone who sells, promotes, or is a general proponent of some valueless or fraudulent cure, remedy, or solution.[1] The term comes from the "snake oil" that used to be sold as a cure-all elixir for many kinds of physiological problems. Many 19th-century United States and 18th-century European entrepreneurs advertised and sold mineral oil (often mixed with various active and inactive household herbs, spices, drugs, and compounds, but containing no snake-derived substances whatsoever) as "snake oil liniment", making claims about its efficacy as a panacea. Patent medicines that claimed to be a panacea were extremely common from the 18th century until the 20th, particularly among vendors masking addictive drugs such as cocaine, amphetamine, alcohol, and opium-based concoctions or elixirs, to be sold at medicine shows as medication or products promoting health.

https://en.wikipedia.org/wiki/Snake_oil


So what can we do to prevent “selling snake oil” when doing science?

# Why does it matter?

The New York Times

SUBSCRIBE FOR $1

# The 'Nation's Psychiatrist' Takes Stock, With Frustration

In a new book, Thomas Insel, who led research into psychiatric disease for 13 years, says that advances in neuroscience have yet to benefit patients.

Share full article


In a new book, Dr. Thomas Insel, who led the National Institute of Mental Health for 13 years, chronicles failures at nearly every level of the United States' mental health system. Carolyn Fong for The New York Times

https://www.nytimes.com/2022/02/22/us/thomas-insel-book.html

1. Because research is expensive, so it should be done right to avoid high costs and no benefits to patients.

Dr. Insel rose through the ranks at a time of optimism that advances in neurobiology would lead to new treatments, and as head of N.I.M.H., as he put it, he "bet big on genomics." But 20 years later, he said the role that genes play in schizophrenia and bipolar disorder has proven to be extraordinarily complex.

"Each of those variants that have been discovered just account for a tiny, tiny amount of risk, so in aggregate, they're probably significant, but you have to put a hundred of them together," he said. "So we started doing bigger and bigger studies to find smaller and smaller effects."

In an interview, he said he didn't regret making genetic research a priority — "at the time, how could you not?" he said — but he acknowledged that the diminishing returns nagged at him.

"I don't think focusing on finding these very small effect signals for common diseases, I mean — it's not how I want to spend my time, I'll put it this way," he said. He added, "I realized, wow, I mean, we could continue doing research until I'm in my 90s, but if we can't get this stuff actually implemented, if people aren't doing it, what's the point?"

# How Obama Is Using the Science of Change

It's more than a campaign slogan. Inside the White House's plan to employ behavioral economics to promote its agenda — and fundamentally alter the way Americans live

By Michael Grunwald | Thursday, Apr. 02, 2009

Like 0 Tweet Share Read Later

**Correction Appended: April 2, 2009**

Two weeks before Election Day, Barack Obama's campaign was mobilizing millions of supporters; it was a bit late to start rewriting get-out-the-vote (GOTV) scripts. "BUT, BUT, BUT," deputy field director Mike Moffo wrote to Obama's GOTV operatives nationwide, "What if I told you a world-famous team of genius scientists, psychologists and economists wrote down the best techniques for GOTV scripting?!?! Would you be interested in at least taking a look? Of course you would!!"


Scott Tufankjian / Polaris

https://content.time.com/time/subscriber/article/0,33009,1889153,00.html

2. Because the results that we publish can have real-world impact, for example, when influencing politicians' decisions.

The existence of this behavioral dream team — which also included best-selling authors Dan Ariely of MIT (*Predictably Irrational*) and Richard Thaler and Cass Sunstein of the University of Chicago (*Nudge*) as well as Nobel laureate Daniel Kahneman of Princeton — has never been publicly disclosed, even though its members gave Obama white papers on messaging, fundraising and rumor control as well as voter mobilization. All their proposals — among them the famous online fundraising lotteries that gave small donors a chance to win face time with Obama — came with footnotes to peer-reviewed academic research. "It was amazing to have these bullet points telling us what to do and the science behind it," Moffo tells TIME. "These guys really know what makes people tick."

**Do they?!**

3. Because recovering from some unfortunate outcomes can be very hard (and expensive).

# Behavioral researcher says he ‘undoubtedly made a mistake’ in false data scandal

Dan Ariely insists his actions were innocent, defends other controversial moves, believes his reputation will recover

By TOI STAFF
4 September 2021, 11:29 am | 8

Prof. Dan Ariely (Channel 12 screenshot)

https://shorturl.at/IMQT3

SCIENCEINSIDER | PEOPLE & EVENTS

## Honesty researcher facing fraud concerns sues Harvard and accusers for $25 million

Lawsuit filed on Wednesday includes allegations of defamation and sex-based discrimination

3 AUG 2023 · 2:10 PM ET · BY MATTHEW WARREN

https://shorturl.at/xHMTX

# Academics Raise More Than $315,000 for Data Bloggers Sued by Harvard Business School Professor Gino

https://shorturl.at/nwxO9

Read the entire account of this lawsuit and what caused it here: https://datacolada.org/109

# What has the scientific community been doing about it?

Luckily for us, science is self-correcting …or is it?!

## Where Are the Self-Correcting Mechanisms in Science?

Simine Vazire and Alex O. Holcombe View all authors and affiliations

Volume 26, Issue 2 | https://doi.org/10.1177/10892680211033912

Contents | Get access | Cite article | Share options

https://tinyurl.com/4ntks8m5

## Why Science Is Not Necessarily Self-Correcting

John P. A. Ioannidis View all authors and affiliations

Volume 7, Issue 6 | https://doi.org/10.1177/1745691612464056

Contents | PDF / ePub

https://tinyurl.com/yf5ftz7y

## Self-correction in science at work

Improve incentives to support research integrity

BRUCE ALBERTS, RALPH J. CICERONE, STEPHEN E. FIENBERG, ALEXANDER KAMB, MARCIA MCNUTT , ROBERT M. NEREM, RANDY SCHEKMAN, RICHARD SHIFFRIN, VICTORIA STODDEN, [...], AND KATHLEEN HALL JAMIESON +3 authors Authors Info & Affiliations

*SCIENCE* · 26 Jun 2015 · Vol 348, Issue 6242 · pp. 1420-1422 · DOI: 10.1126/science.aab3847

https://www.science.org/doi/10.1126/science.aab3847

## Replicability-Index

*Improving the replicability of empirical research*

About Z-Curve.2.0 Z-Curve Webinar Princeton Talk About Z-Curve Z-Curve: An even better p-curve Z-

False Psychology Glossary A Meta-Psychological Perspective on the Decade of Replication Failures in Social Psychology

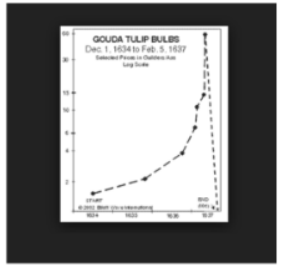
2022 Replicability Rankings of Psychology Journals Replicability Rankings of Psychology Departments

Estimating the False Discovery Risk of Psychology Science Personalized P-Values for Social/Personality Psychologists

A Meta-Scientific Perspective on "Thinking: Fast and Slow Most published results in medical journals are not false

Replicability Reports of Psychology Journals

https://tinyurl.com/3xxn59fr




## Psychological Science is Self-Correcting

March 4, 2019 Uncategorized

What has the scientific community been doing about it?

# 1. Retracting published research that has been found to be flawed or questionable

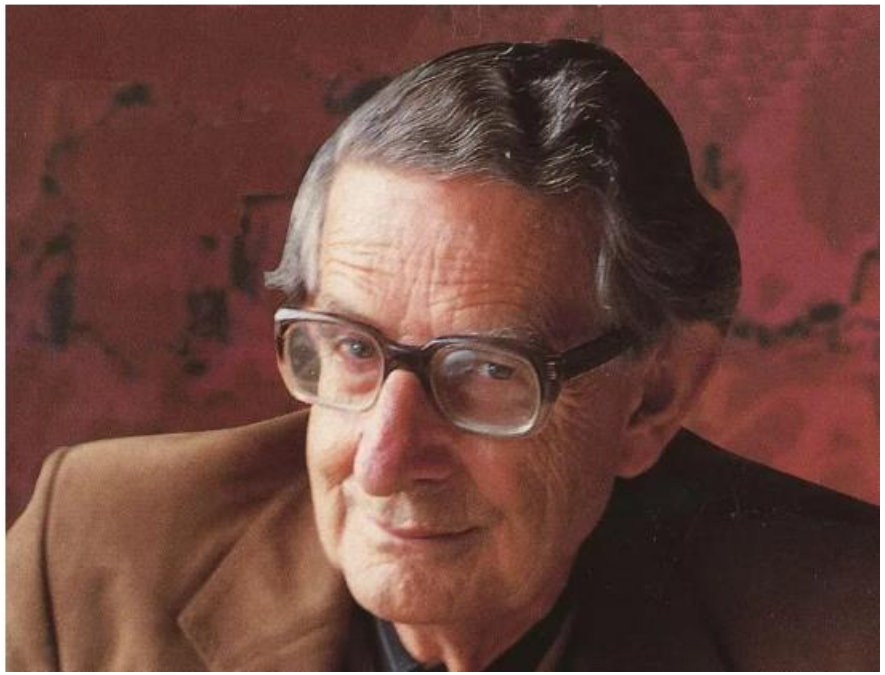
**Retraction Watch**

Tracking retractions as a window into the scientific process

**PAGES**

- How you can support Retraction Watch
- Meet the Retraction Watch staff
  - About Adam Marcus
  - About Ivan Oransky
- Our Editorial Independence Policy
- Papers that cite Retraction Watch
- Privacy policy
- Retracted coronavirus (COVID-19) papers
- Retraction Watch Database User Guide

## Journals retract 13 papers by Hans Eysenck, flag 61, some 60 years old



Two journals have retracted 13 papers co-authored by the late — and controversial — psychologist Hans Eysenck, following a university investigation that found dozens of his papers to be "unsafe."

> *The following articles have been retracted as a result of King's College London's review of certain publications authored by Hans J. Eysenck with Ronald Grossarth-Maticek on the subject of personality and certain health outcomes. The King's College London review committee recommended that the articles in their review be retracted due to finding they are unsafe, specifically noting the following:*
>
> *— Concerns with the validity of the datasets, including the "recruitment of participants, administration of measures, reliability of outcome ascertainment, biases in data collection, absence of relevant covariates, and selection of cases analysed in each article."*
>
> *— The results reported by Eysenck and Grossarth-Maticek were implausible and incompatible with modern clinical science and the understanding of disease processes.*

https://tinyurl.com/4w8tvrta

What has the scientific community been doing about it?

# Retraction Watch

Article Talk

From Wikipedia, the free encyclopedia

**Retraction Watch** is a blog that reports on retractions of scientific papers and on related topics.[1] The blog was launched in August 2010[2] and is produced by science writers Ivan Oransky (Former Vice President, Editorial *Medscape*)[3] and Adam Marcus (editor of *Gastroenterology & Endoscopy News*).[4] Its parent organization is the Center for Scientific Integrity, a US 501(c)(3) nonprofit organization.

https://en.wikipedia.org/wiki/Retraction_Watch

**Metascience** (also known as **meta-research**) is the use of scientific methodology to study science itself. Metascience seeks to **increase the quality of scientific research** while reducing inefficiency. It is also known as "research on research" and "the science of science", as it uses research methods to study how research is done and **find where improvements can be made**.

You can check out Retraction Watch here: https://retractionwatch.com/

or follow them here:

https://twitter.com/RetractionWatch?ref_src=twsrc%5Egoogle%7Ctwcamp%5Eserp%7Ctwgr%5Eauthor

# 2. Establishing the Open Science Framework

J Med Libr Assoc. 2017 Apr; 105(2): 203–206. PMCID: PMC5370619
doi: 10.5195/jmla.2017.88

## Open Science Framework (OSF)

Reviewed by Erin D. Foster, MSLS and Ariel Deardorff, MLIS

**Open Science Framework (OSF).** Center for Open Science, 210 Ridge McIntire Road, Suite 500, Charlottesville, VA, 22903-5083, email, contact@cos.io, website: https://osf.io.



### GENERAL DESCRIPTION

Go to:

The Open Science Framework (OSF) is a tool that promotes open, centralized workflows by enabling capture of different aspects and products of the research lifecycle, including developing a research idea, designing a study, storing and analyzing collected data, and writing and publishing reports or papers. It is developed and maintained by the Center for Open Science (COS), a nonprofit organization founded in 2013 that conducts research into scientific practice, builds and supports scientific research communities, and develops research tools and infrastructure to enable managing and archiving research [1]. As an organization, the COS encourages openness, integrity, and reproducibility in research across scientific disciplines [2]. The OSF supports a variety of tools and services to assist in the research process. This review focuses primarily on the core functionality of the OSF, with brief descriptions of some of the other existing tools and services.

https://tinyurl.com/2p97y4rc

# How OSF supports your research

https://osf.io/


**Search and Discover**

Find papers, data, and materials to inspire your next research project. Search public projects to build on the work of others and find new collaborators.

**Design Your Study**

Start a project and add collaborators, giving them access to protocols and other research materials. Built-in version control tracks the evolution of your study.

**Collect and Analyze Data**

Store data, code, and other materials in OSF Storage, or connect your Dropbox or other third-party account. Every file gets a unique, persistent URL for citing and sharing.

**Publish Your Reports**

Share papers in OSF Preprints or a community-based preprint provider, so others can find and cite your work. Track impact with metrics like downloads and view counts.

## What is Preregistration?

When you preregister your research, you're simply specifying your research plan in advance of your study and submitting it to a registry.

Preregistration separates *hypothesis-generating* (exploratory) from *hypothesis-testing* (confirmatory) research. Both are important. But the same data cannot be used to generate *and* test a hypothesis, which can happen unintentionally and reduce the credibility of your results. Addressing this problem through planning improves the quality and transparency of your research. This helps you clearly report your study and helps others who may wish to build on it. For instructions on how to submit a preregistration on OSF, please visit our help guides.

For additional insight and context, you can read The Preregistration Revolution. (preprint)

Preregistration discourages “HARKing” (i.e., hypothesizing after the results are known), therefore promoting ethical research practices.

Read more on this here: https://tinyurl.com/nhjynwte

What has the scientific community been doing about it?

## 3. Standardize preprocessing and analysis pipelines

Deep learning has been widely applied in neuroimaging, including **predicting brain-phenotype relationships from magnetic resonance imaging (MRI) volumes**. MRI data usually **requires extensive preprocessing prior to modeling but variation introduced by different MRI preprocessing pipelines may lead to different scientific findings**, even when using identical data. Meanwhile, the machine learning community has emphasized the importance of **shifting from model-centric to data-centric** approaches considering the essential role of data quality in deep learning applications.

Motivated by the recent data-centric perspective, **we first evaluate how preprocessing pipeline selection can affect the downstream performance** of a supervised learning model.

**We next propose two pipeline-invariant representation learning methodologies**, *Multi-Pipeline Supervised Learning (MPSL)* and *Pipeline-based Contrastive Learning (PXL)*, **to improve robustness** in classification performance and to capture similar neural network representations. Using a wide range of sample sizes from the **UK Biobank dataset**, we demonstrate that two models present common advantages, in particular that MPSL and PXL can be used to improve within-sample prediction performance and out-of-sample generalization.

Both PXL and MPSL can learn more similar between-pipeline representations. These results suggest that our proposed models can be applied to mitigate pipeline-related biases, and to improve prediction robustness in brain-phenotype modeling. (Li et al., 2022,https://arxiv.org/abs/2208.12909)

Published: 05 January 2017

# Scanning the horizon: towards transparent and reproducible neuroimaging research

Russell A. Poldrack, Chris I. Baker, Joke Durnez, Krzysztof J. Gorgolewski, Paul M. Matthews, Marcus R. Munafò, Thomas E. Nichols, Jean-Baptiste Poline, Edward Vul & Tal Yarkoni

*Nature Reviews Neuroscience* **18**, 115–126 (2017) | Cite this article



## Key Points

https://www.nature.com/articles/nrn.2016.167

- There is growing concern about the reproducibility of scientific research, and neuroimaging research suffers from many features that are thought to lead to high levels of false results.
- Statistical power of neuroimaging studies has increased over time but remains relatively low, especially for group comparison studies. An analysis of effect sizes in the Human Connectome Project demonstrates that most functional MRI studies are not sufficiently powered to find reasonable effect sizes.
- Neuroimaging analysis has a high degree of flexibility in analysis methods, which can lead to inflated false-positive rates unless controlled for. Pre-registration of analysis plans and clear delineation of hypothesis-driven and exploratory research are potential solutions to this problem.
- The use of appropriate corrections for multiple tests has increased, but some common methods can have highly inflated false-positive rates. The use of non-parametric methods is encouraged to provide accurate correction for multiple tests.
- Software errors have the potential to lead to incorrect or irreproducible results. The adoption of improved software engineering methods and software testing strategies can help to reduce such problems.

Published: 11 August 2022

# Researcher degrees of freedom in statistical software contribute to unreliable results: A comparison of nonparametric analyses conducted in SPSS, SAS, Stata, and R

Cooper B. Hodges, Bryant M. Stone, Paula K. Johnson, James H. Carter III, Chelsea K. Sawyers, Patricia R. Roby & Hannah M. Lindsey

*Behavior Research Methods* **55**, 2813–2837 (2023) | Cite this article



## Abstract

https://tinyurl.com/y8y2vezw

Researcher degrees of freedom can affect the results of hypothesis tests and consequently, the conclusions drawn from the data. Previous research has documented variability in accuracy, speed, and documentation of output across various statistical software packages. In the current investigation, we conducted Pearson's chi-square test of independence, Spearman's rank-ordered correlation, Kruskal–Wallis one-way analysis of variance, Wilcoxon Mann–Whitney *U* rank-sum tests, and Wilcoxon signed-rank tests, along with estimates of skewness and kurtosis, on large, medium, and small samples of real and simulated data in SPSS, SAS, Stata, and R and compared the results with those obtained through hand calculation using the raw computational formulas. Multiple inconsistencies were found in the results produced between statistical packages due to algorithmic variation, computational error, and statistical output. The most notable inconsistencies were due to algorithmic variations in the computation of Pearson's chi-square test conducted on 2 × 2 tables, where differences in *p*-values reported by different software packages ranged from .005 to .162, largely as a function of sample size. We discuss how such inconsistencies may influence the conclusions drawn from the results of statistical analyses depending on the statistical software used, and we urge researchers to analyze their data across multiple packages to check for inconsistencies and report details regarding the statistical procedure used for data analysis.

What has the scientific community been doing about it?

# *fMRIPrep*: A Robust Preprocessing Pipeline for fMRI Data

*fMRIPrep* is a *NiPreps (NeuroImaging PREProcessing toolS)* application (www.nipreps.org) for the preprocessing of task-based and resting-state functional MRI (fMRI).

docker nipreps/fmriprep | Open in Code Ocean | circleci failing | docs passing | pypi v23.1.4

doi 10.1038/s41592-018-0235-4 | RRID SCR_016216

## Principles

*fMRIPrep* is built around three principles:

1. **Robustness** - The pipeline adapts the preprocessing steps depending on the input dataset and should provide results as good as possible independently of scanner make, scanning parameters or presence of additional correction scans (such as fieldmaps).
2. **Ease of use** - Thanks to dependence on the BIDS standard, manual parameter input is reduced to a minimum, allowing the pipeline to run in an automatic fashion.
3. **"Glass box"** philosophy - Automation should not mean that one should not visually inspect the results or understand the methods. Thus, *fMRIPrep* provides visual reports for each subject, detailing the accuracy of the most important processing steps. This, combined with the documentation, can help researchers to understand the process and decide which subjects should be kept for the group level analysis.

https://fmriprep.org/en/stable/

# Welcome to *MRIQC*'s documentation!

doi 10.1371/journal.pone.0184661 | DOI 10.5281/zenodo.2630889 | pypi v23.1.0 | python 3.8 | 3.9 | 3.10

status stable | license Apache-2.0 | docs passing | circleci failing

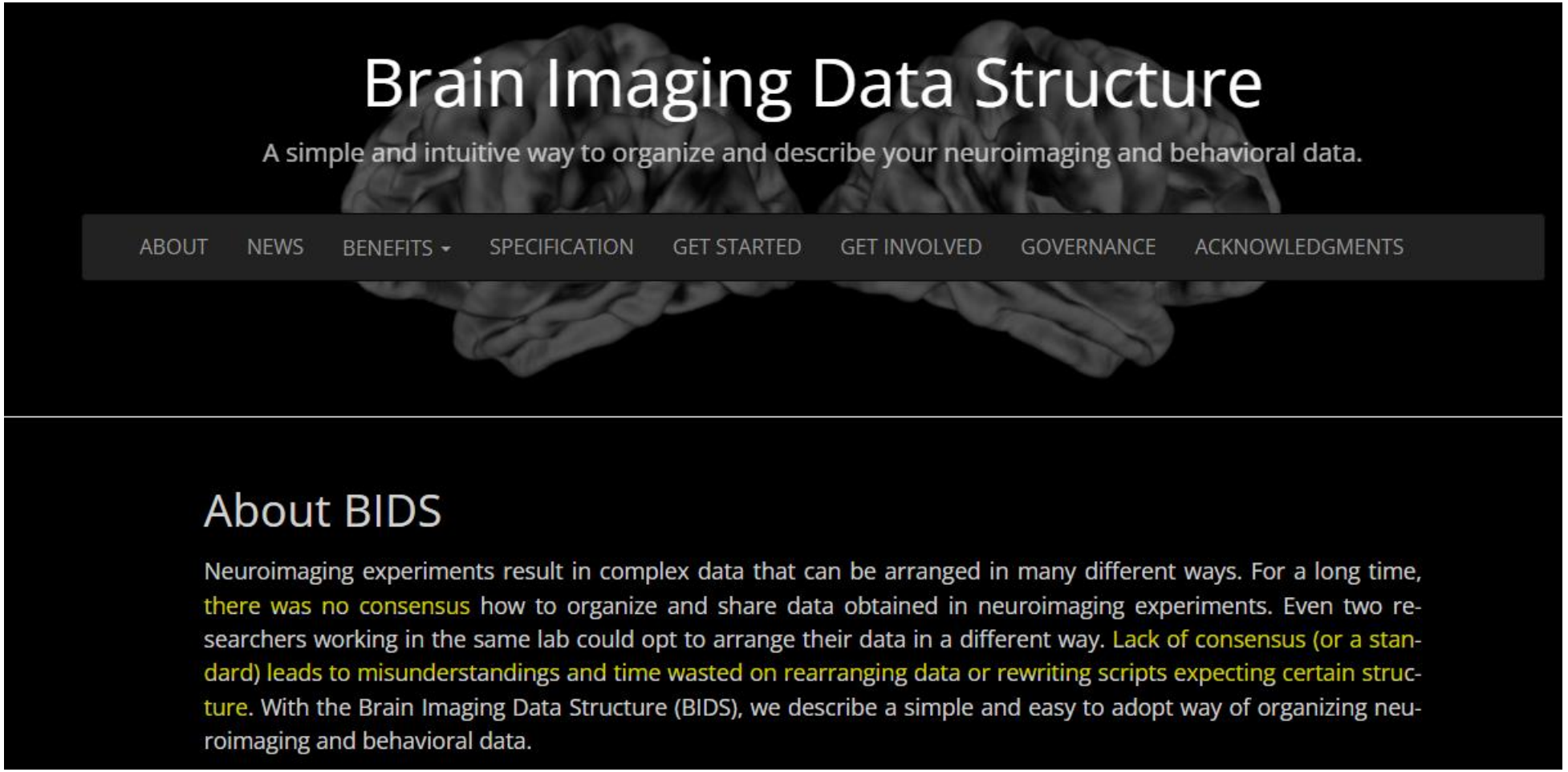
MRIQC extracts no-reference IQMs (image quality metrics) from structural (T1w and T2w) and functional MRI (magnetic resonance imaging) data.

MRIQC is an open-source project, developed under the following software engineering principles:

1. **Modularity and integrability**: MRIQC implements a nipype workflow to integrate modular sub-workflows that rely upon third party software toolboxes such as ANTs and AFNI.
2. **Minimal preprocessing**: the MRIQC workflows should be as minimal as possible to estimate the IQMs on the original data or their minimally processed derivatives.
3. **Interoperability and standards**: MRIQC follows the the brain imaging data structure (BIDS), and it adopts the BIDS-App standard.
4. **Reliability and robustness**: the software undergoes frequent vetting sprints by testing its robustness against data variability (acquisition parameters, physiological differences, etc.) using images from OpenfMRI. Its reliability is permanently checked and maintained with CircleCI.

https://mriqc.readthedocs.io/en/latest/

What has the scientific community been doing about it?




https://bids.neuroimaging.io/

What has the scientific community been doing about it?

# 4. Collect data into large scale, open access repositories

## Welcome to the NIMH Data Archive

The National Institute of Mental Health Data Archive (NDA) makes available human subjects data collected from hundreds of research projects across many scientific domains. NDA provides infrastructure for sharing research data, tools, methods, and analyses enabling collaborative science and discovery. De-identified human subjects data, harmonized to a common standard, are available to qualified researchers. Summary data are available to all.

The NDA mission is to accelerate scientific research and discovery through data sharing, data harmonization, and the reporting of research results.

**NIMH common data elements now available: Go to NIMH Common Data Elements**

https://nda.nih.gov/

biobank uk

Enabling scientific discoveries that improve human health

**UK Biobank is a large-scale biomedical database and research resource, containing in-depth genetic and health information from half a million UK participants. The database is regularly augmented with additional data and is globally accessible to approved researchers undertaking vital research into the most common and life-threatening diseases. It is a major contributor to the advancement of modern medicine and treatment and has enabled several scientific discoveries that improve human health.**

https://www.ukbiobank.ac.uk/

# Bipolar – Schizophrenia Network on Intermediate Phenotypes

B-SNIP

About B-SNIP | Volunteer | Study Sites | The Buzz | Contact

## Study Sites

Athens & Augusta, GA ›

Boston, MA ›

Chicago, IL ›

Dallas, TX ›

Hartford ›

I'm here ☺

http://b-snip.org/study-sites/

What has the scientific community been doing about it?

# What can **you** do about it?

1. As students, you can start by training to **read and think critically** about science. Even if you do not become researchers, you are already **consumers** of research content. You will train these skill during your seminar, through group projects and discussions (more on this from Ana and Andrei on Thursday).

Open access | Review article | First published online September 25, 2023

History repeating: guidelines to address common problems in psychedelic science

Michiel van Elk and Eiko I. Fried View all authors and affiliations

All Articles | https://doi.org/10.1177/20451253231198466

Contents | PDF / ePub | Cite article | Share options | Information, rights and permissions

## Abstract

Research in the last decade has expressed considerable optimism about the clinical potential of psychedelics for the treatment of mental disorders. This optimism is reflected in an increase in research papers, investments by pharmaceutical companies, patents, media coverage, as well as political and legislative changes. However, psychedelic science is facing serious challenges that threaten the validity of core findings and raise doubt regarding clinical efficacy and safety. In this paper, we introduce the 10 most pressing challenges, grouped into easy, moderate, and hard problems. We show how these problems threaten internal validity (treatment effects are due to factors unrelated to the treatment), external validity (lack of generalizability), construct validity (unclear working mechanism), or statistical conclusion validity (conclusions do not follow from the data and methods). These problems tend to co-occur in psychedelic studies, limiting conclusions that can be drawn about the safety and efficacy of psychedelic therapy. We provide a roadmap for tackling these challenges and share a checklist that researchers, journalists, funders, policymakers, and other stakeholders can use to assess the quality of psychedelic science. Addressing today's problems is necessary to find out whether the optimism regarding the therapeutic potential of psychedelics has been warranted and to avoid history repeating itself.

2. Be careful with trends and overhyped/oversold topics that have not yet been sufficiently explored. One such example is the use of psychedelics for treating mental disorders; while preliminary results look promising, we still do **not know enough** about their mechanisms and efficacy.

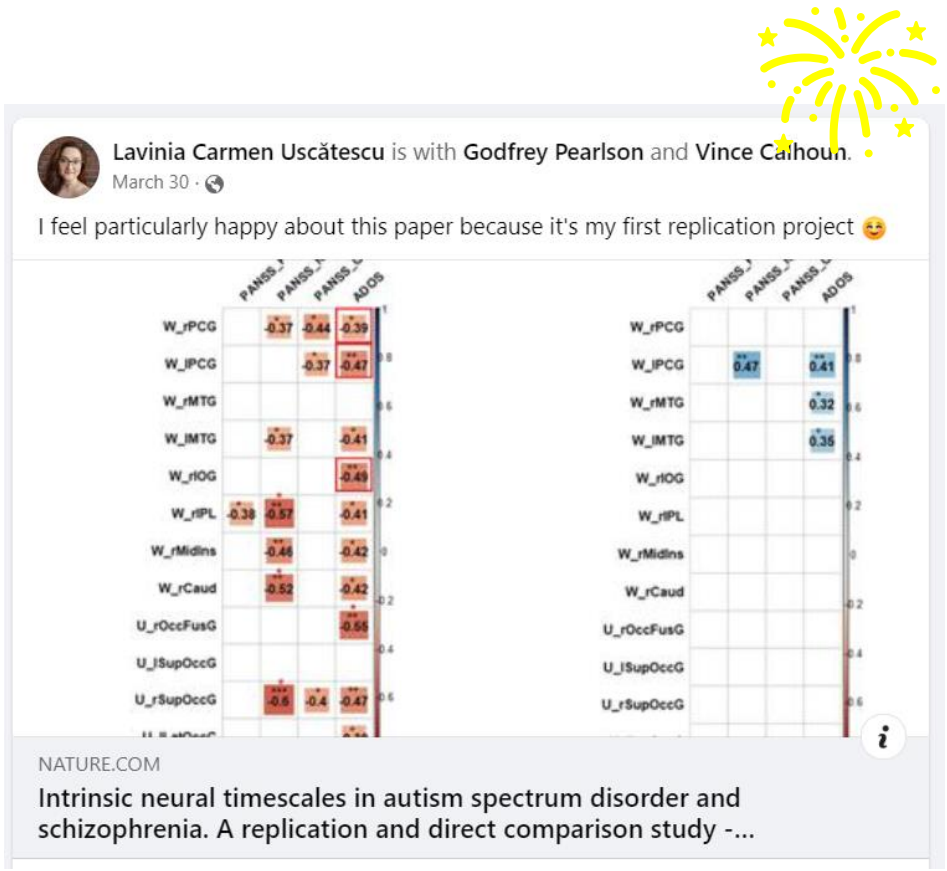
Eiko Fried

https://twitter.com/EikoFried
https://bsky.app/profile/eikofried.bsky.social

3. Whenever in doubt, **replicate** (your own) prior research.

Then celebrate (**regardless** of results; in this paper,

we only replicated 2 out of 13 previous results)!




4. Promote open science and enable replicability efforts

by sharing your code (and data).

Request: Research on intrinsic neural timescales in schizophrenia Inbox ×

**Dr. Venkatasubramanian**
to me, Lavinia.Uscatescu

Dear Dr. Lavinia Carmen Uscătescu,
Greetings!
I hope you are doing well.

I work as a professor of psychiatry at the National Institute of Mental Health And Neurosciences, Schizophrenia is one of my key research interests.

These weblinks give more information about my work.

I read your exciting research on intrinsic neural timescales in schizophrenia (Reduced intrinsic neural timescales in schizophrenia along p
In your article, it has been mentioned that "The R code that we used for analysing this data will also be made available upon request."

I am interested in using this code in academic research studies to perform similar analyses in the fMRI data collected in my centre.
I request you to please share the R code.

Thanks for your kind consideration.
Regards,
Venkat.

**Lavinia** <lavinia.carmen.u@gmail.com>
to Venkatasubramanian

Dear Venkat,

Thank you for your email and for your interest in our research. I am gladly sending you the R code I used to analyze the data for that paper.


I WANT YOU
TO PROMOTE
OPEN SCIENCE
AND REPLICABILITY
Made with PosterMyWall.com

# Assignment for the upcoming seminar

During the seminar, we will emphasize

**team work and collaboration**.

We will also practice giving and receiving feedback

**openly and kindly**.

The whole point of what we do here is to

**learn while being supportive** of each-other.

Your first reading assignment will be this very recent paper published in Nature's career feature section.

CAREER FEATURE | 02 October 2023

# Engaged in collaborative research? Try a touch of intellectual humility

**Being open to the limitations of their knowledge can help researchers to foster interdisciplinary and cross-cultural collaborations.**

Jane Palmer

Find a new job

https://tinyurl.com/yv5resr2

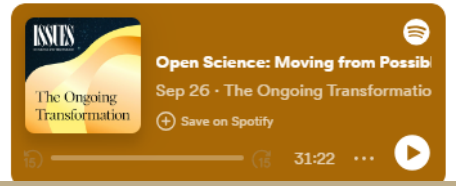
# In addition, please listen to the following two podcasts:

SEPTEMBER 26, 2023 PODCAST

## Episode 36: Open Science: Moving From Possible to Expected to Required

BY BRIAN NOSEK, MONYA BAKER

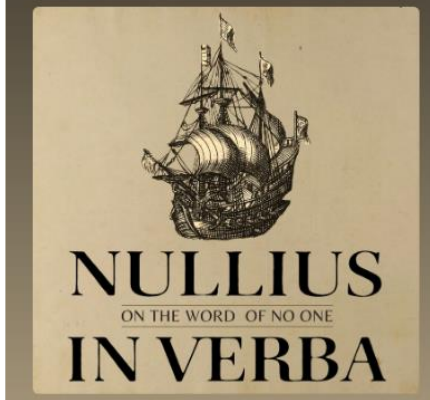
A decade ago, University of Virginia psychology professor **Brian Nosek** cofounded an unusual nonprofit, the Center for Open Science. It's been a cheerleader, enabler, and nagger to convince scientists that making their methods, data, and papers available to others makes for better science.




Brian Nosek

https://bsky.app/profile/briannosek.bsky.social
https://twitter.com/BrianNosek

*https://tinyurl.com/yh63kzkb*




Friday Aug 25, 2023

## Episode 15: Novum Crisi Replicati

Likes 2 Download 2.1K Share

*In this episode, we discuss the replication crisis in psychology which has been an important topic of discussion for the last decade. We revisit some key events from the start of the replication crisis, such as the publication of Daryl Bem's studies on precognition, the paper False Positive Psychology, and the Reproducibility Project and share personal anecdotes about how it was to live through the replication crisis.*

Daniël Lakens

https://bsky.app/profile/lakens.bsky.social
https://twitter.com/lakens

*https://nulliusinverba.podbean.com/e/new-replication-crisis/*

If you would like to read more on the **Open Science Movement**, I recommend that you check out this **open access** book. Chapter seven is the most immediately relevant to this lecture ("*Transition to Open Science*").

You can find in our Teams group, or download it yourselves from: https://link.springer.com/chapter/10.1007/978-94-024-2115-6_3

Feel free to also share it.

Finally, in the spirit of **Open Science**,

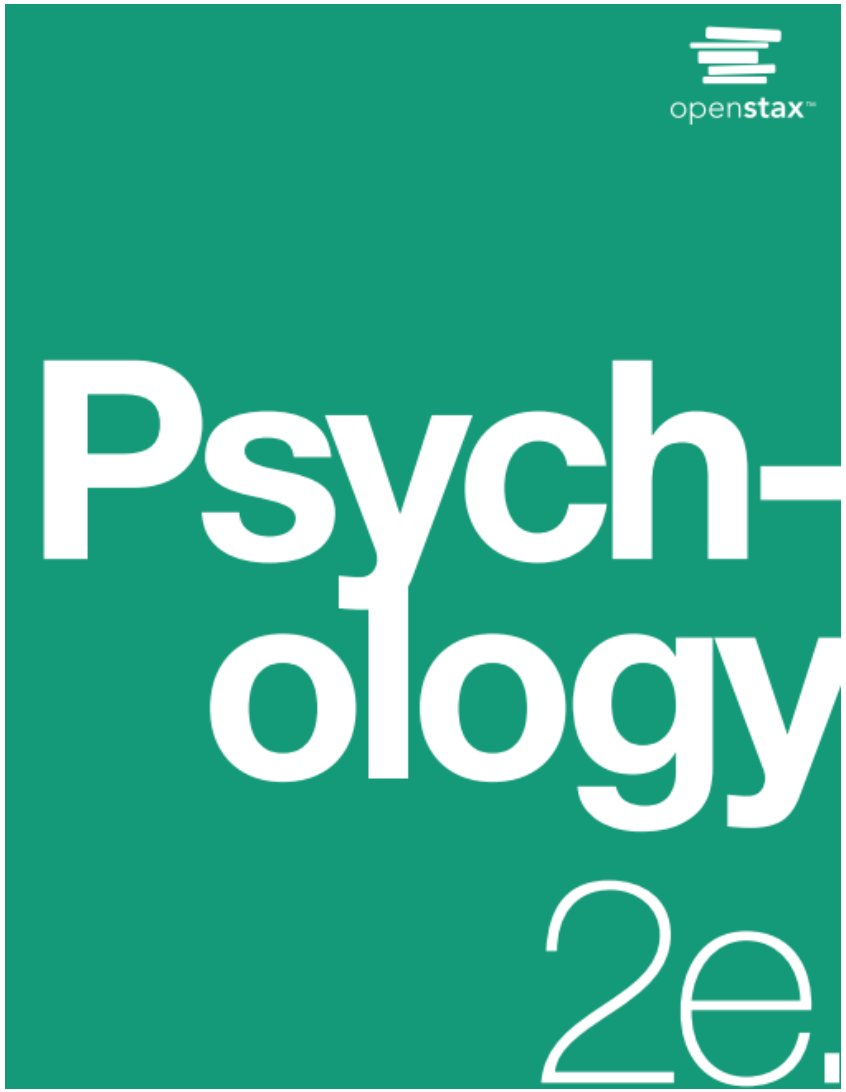
I recommend that you keep this

comprehensive **open access** book close by; it

covers most of the topics you will need to

learn about in most of your courses

throughout this program.




You can find in our Teams group, or download

it yourselves from: https://openstax.org/details/books/psychology-2e

Also feel free to share it (isn't Open Science great?!)