

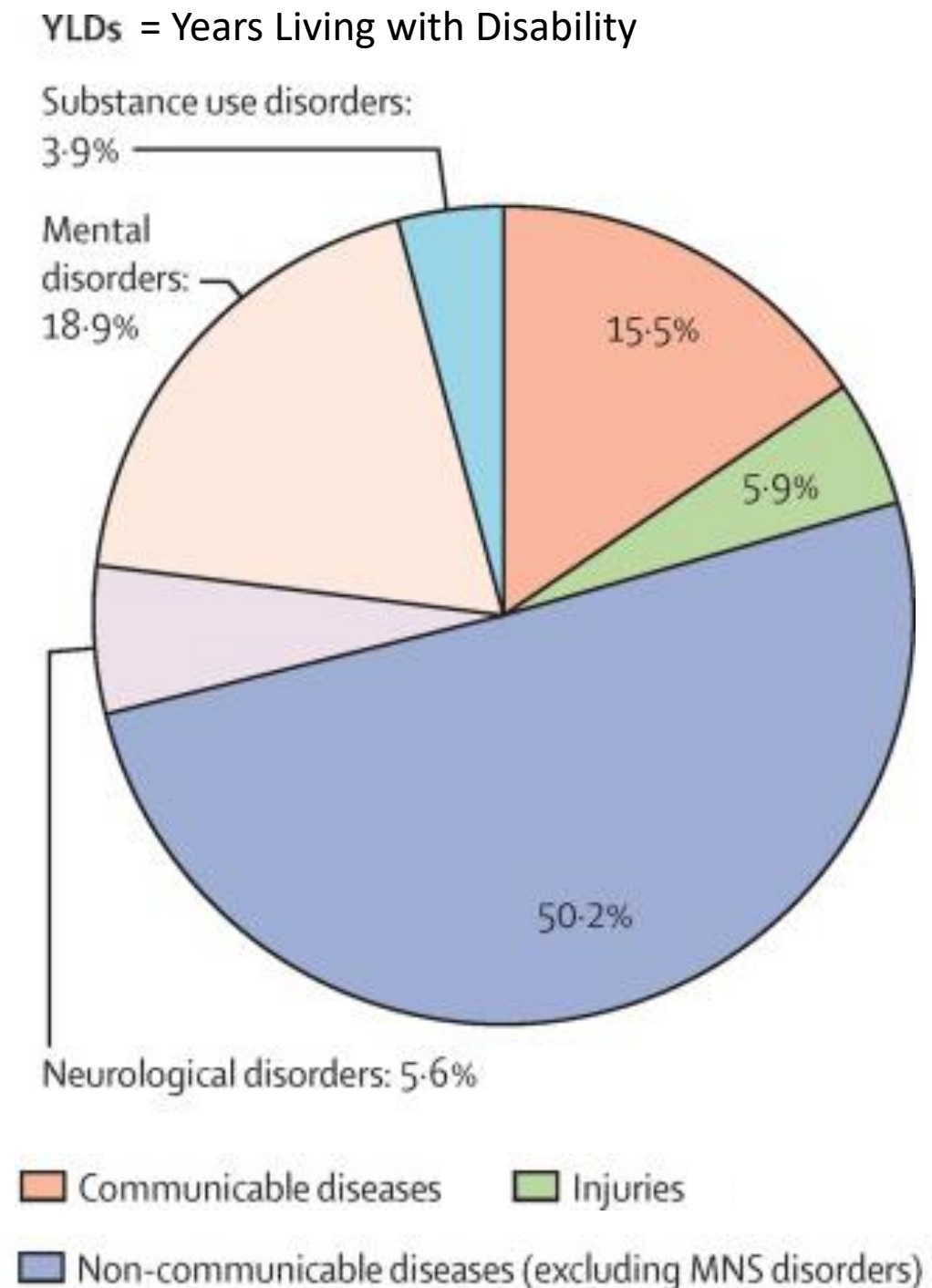
Open Neuroscience

Practical suggestions for conducting open neuroscience research

Presented by Danielle Lauren Kurtin, PhD

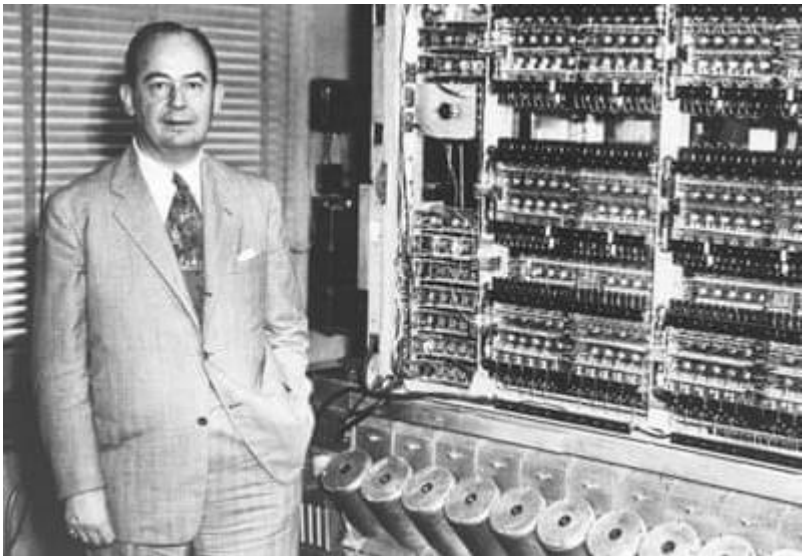
Why care about neuroscience?

- We all have brains, and they often don't work how we'd like them do
- Neurological and neuropsychiatric disorders are often debilitating and are one of the greatest contributors (28%) to Global Burdens of Disease ([Patel et al., 2016](#))
- Better neuroscience = better health



Why am I presenting this to non-neuro-nerds?

- Neuroscience is extremely computationally intensive and interdisciplinary
 - Computers and brains have been learning from each other since the inception of both fields.



John von Neumann

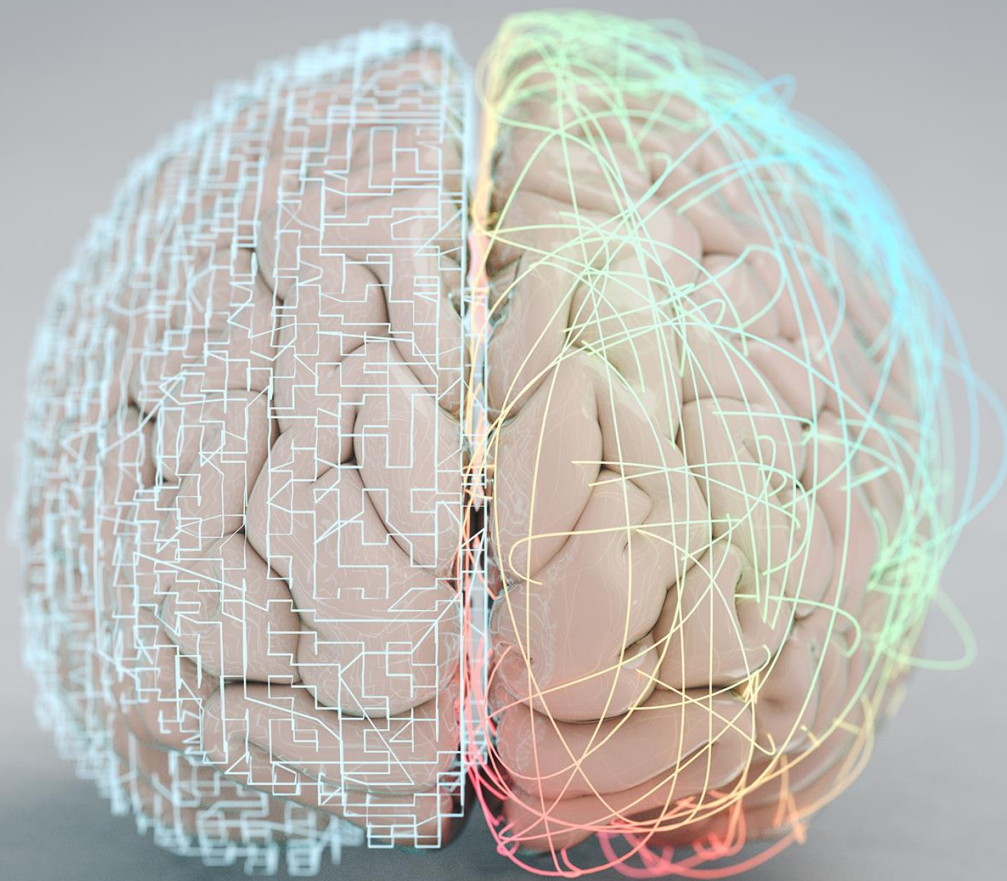


Rafael Lorente de Nó

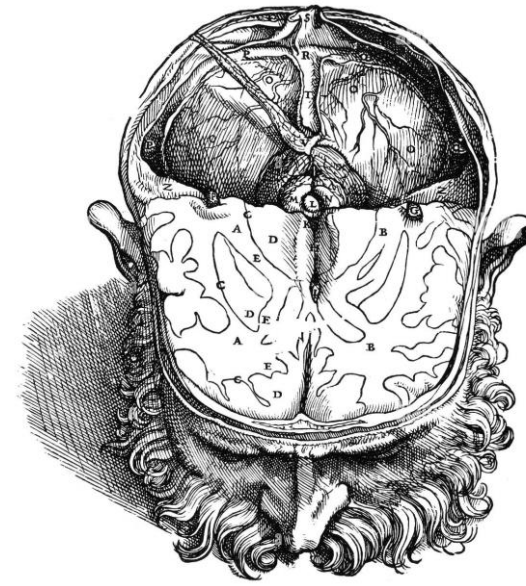
Why am I presenting this to non-neuro-nerds?

- Neuroscience is extremely computationally intensive and interdisciplinary
 - Computers and brains have been learning from each other since the inception of both fields.
- Why **Open** Neuroscience?
 - Reproducibility crisis – bad neuroscience = delays in treatment
 - Funders require/like it ([Spires-Jones et al., 2016](#))
 - Synergy between industry and academia
 - Many principals I'll discuss today are transdisciplinary

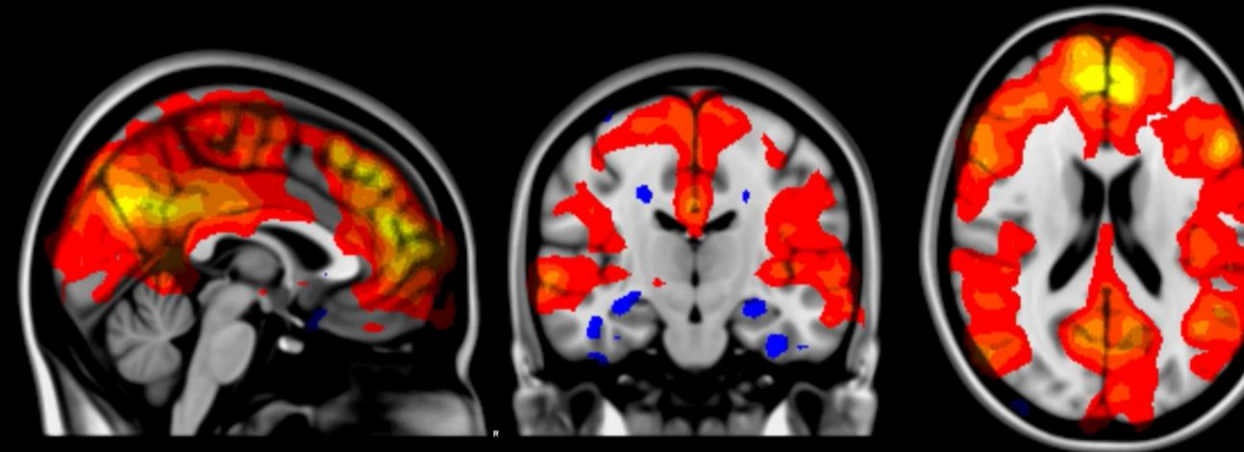
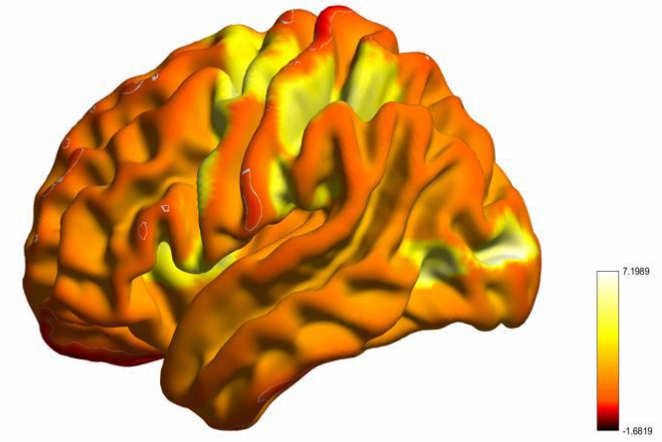
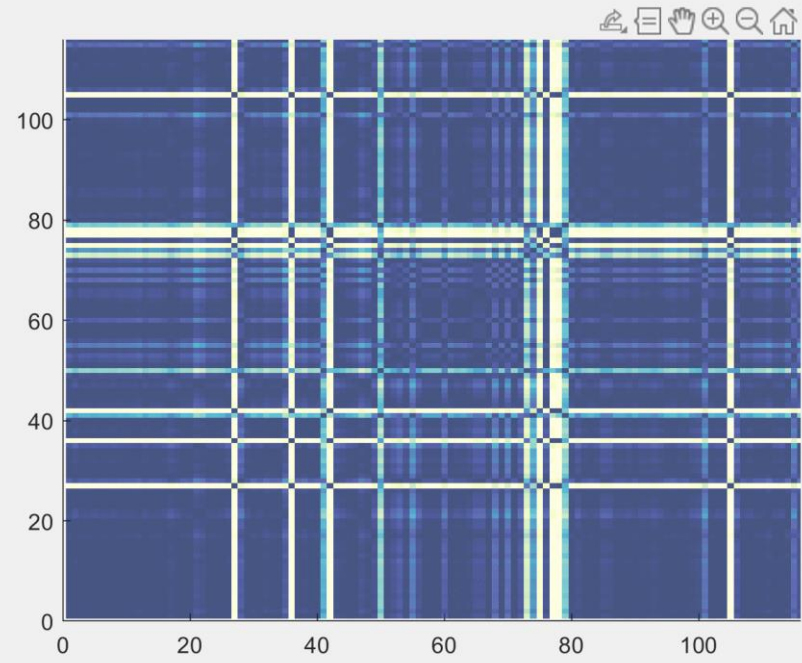
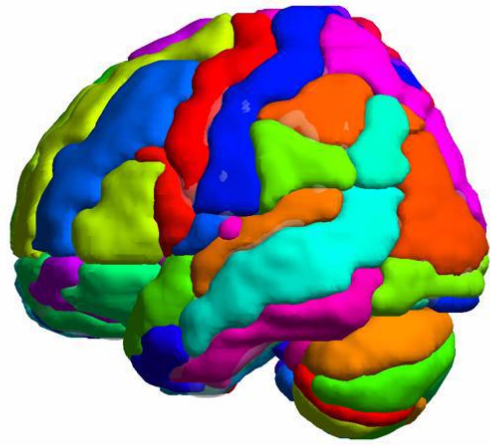
Data



Neuroimaging data

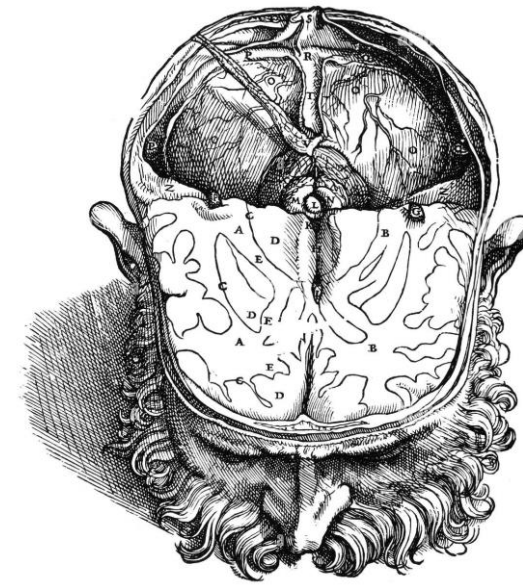


Enables in-vivo
measurement of
brain function

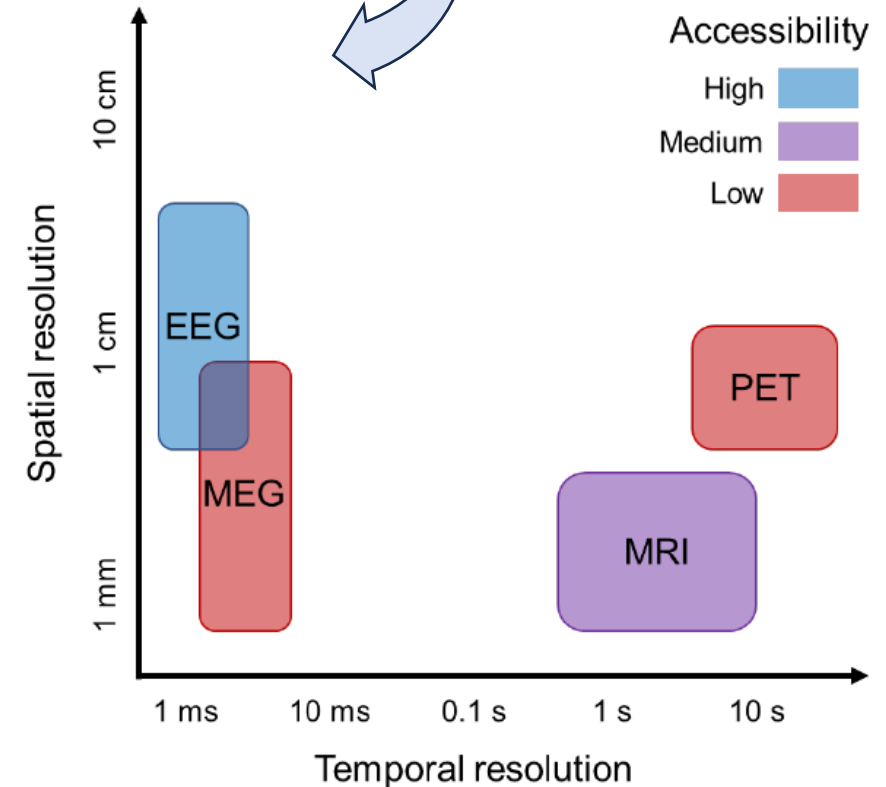
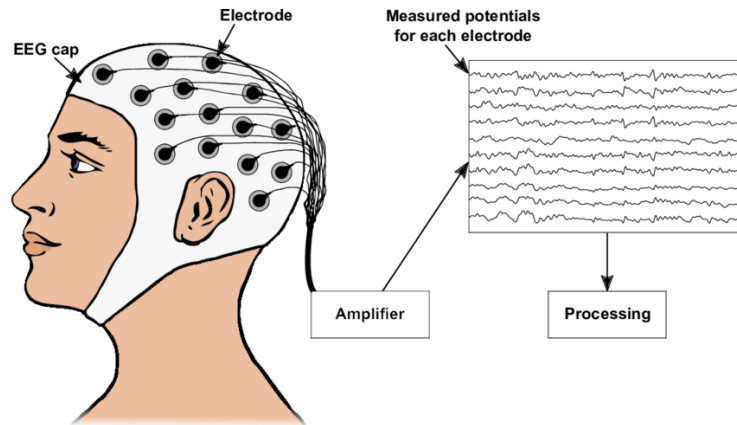


Neuroimaging data

- Common measurements: EEG, MRI, MEG



Enables in-vivo measurement of brain function



- Challenges: differing spatiotemporal scales of measurement, accessibility, interpretability

Option 1 – collecting data

Collect in an open and reproducible manner

- Include a section about data sharing in your consent forms ([Gorgolewski and Poldrack, 2016](#))
- Address gender bias in research samples (unless you should!)
- Break the WEIRD cycle – champion diverse recruitment
 - Use census data for demographic and education proportions
 - Advertise beyond your university or research institution
 - Break barriers to participation – extra remuneration for BAME participants

Pros and cons of collecting data

Pros

Customisable to your
paradigm/research
question

Intimate knowledge of
your data



Cons

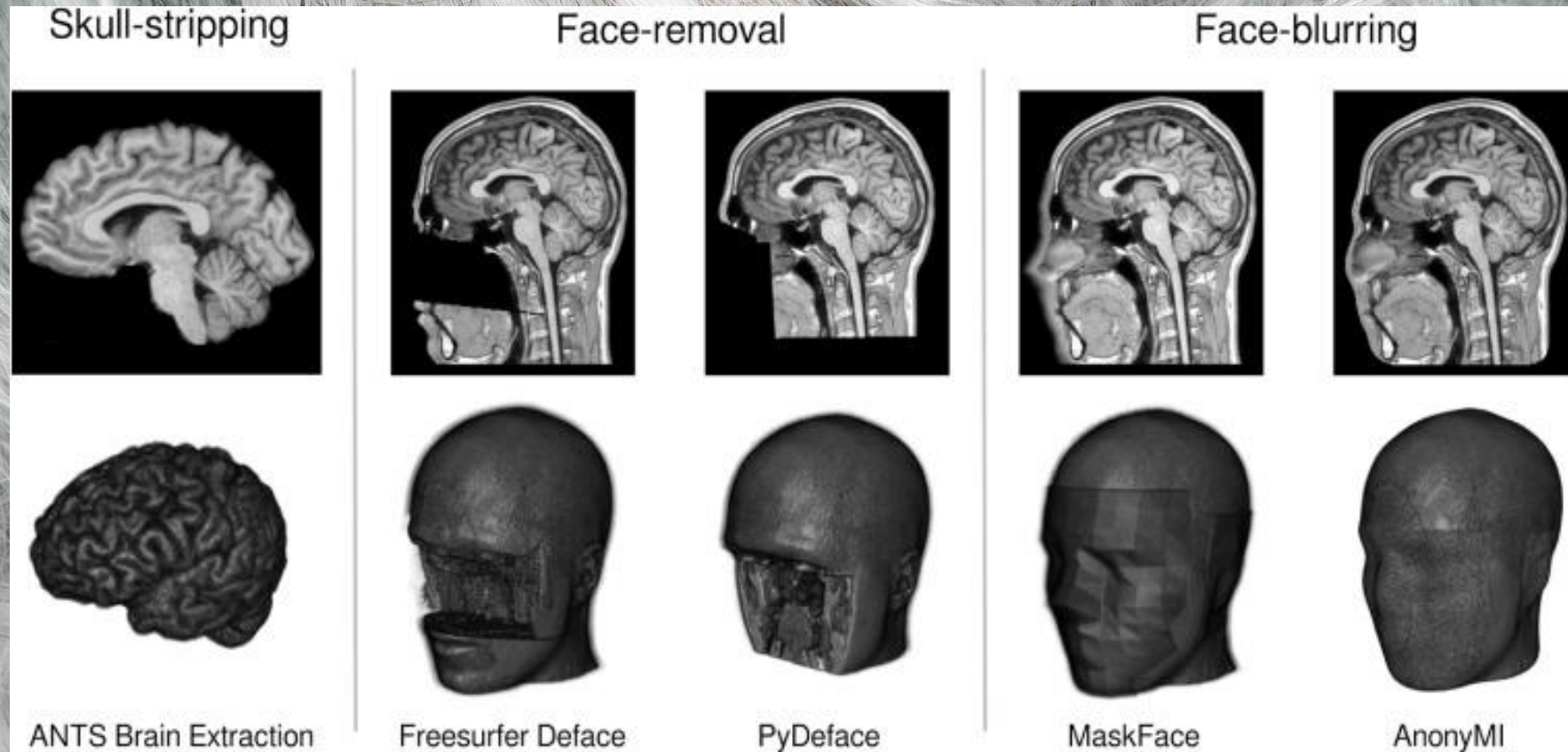
Time and resource
expensive

Tip!

Test your analysis pipeline using a pilot cohort before
conducting full data collection!

GOOD FOR REGISTERED REPORTS!

Data anonymisation



(Eke et al 2021)

Excellent resource ([White et al 2020](#))

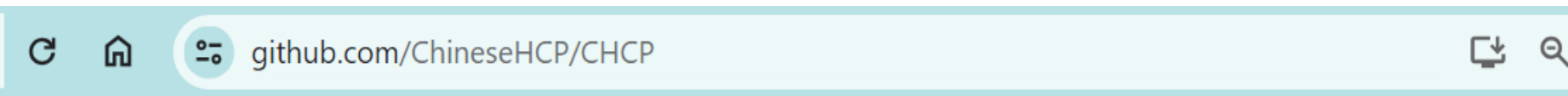
Option 2 – available data

Pros

- Plug-and-play
- Well-validated
- Easily citable

Cons

- Limited study populations and imaging conditions, modalities, behavioural measures, etc.

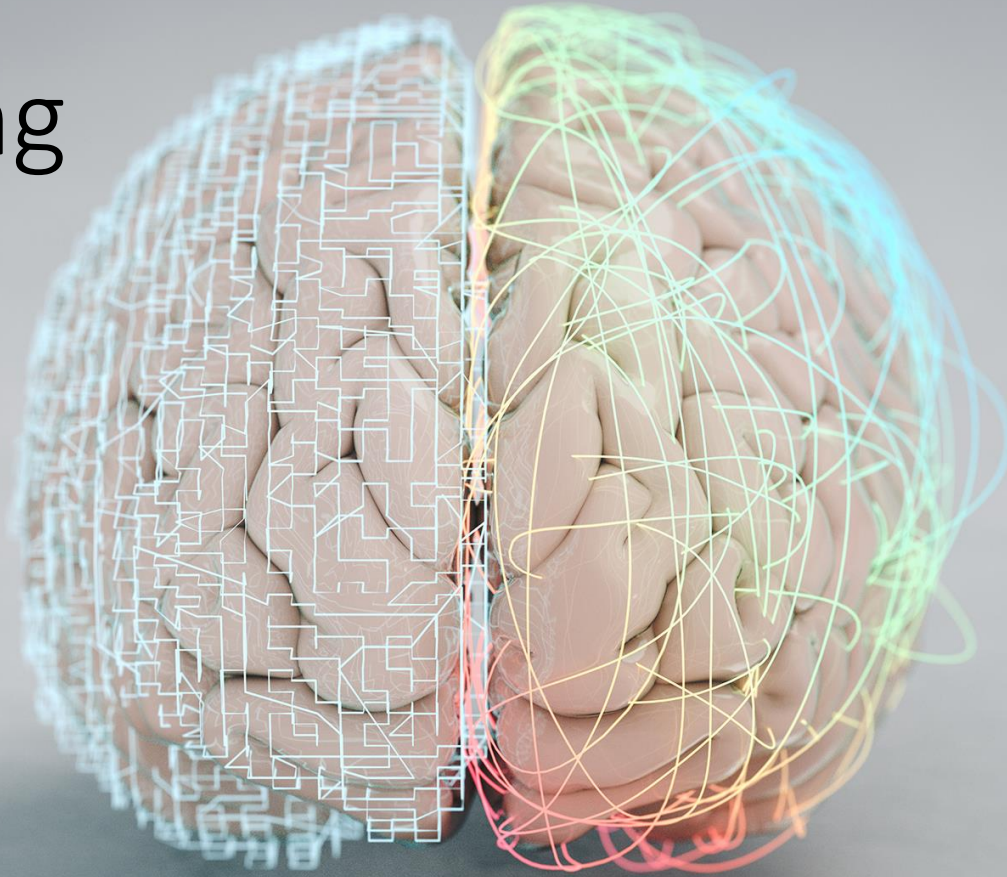


Welcome to the Chinese Human Connectome Project (CHCP) repository!

Tip!

Utilise the Human Connectome Project and Chinese Human Connectome Project as test-retest datasets.

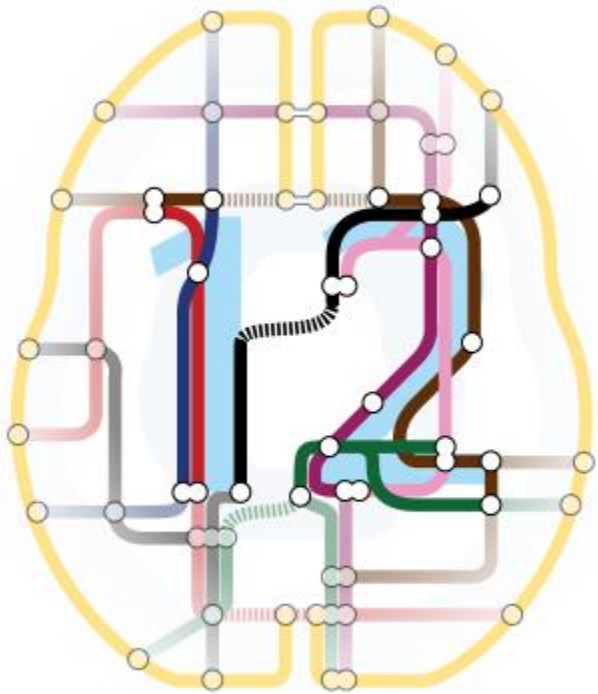
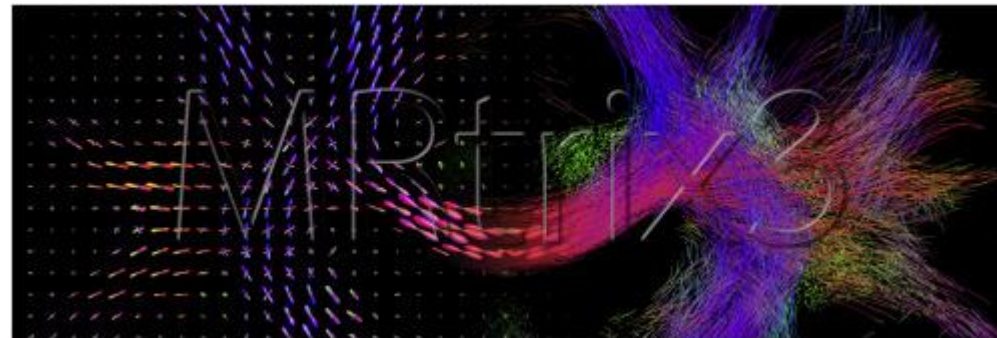
Preprocessing
and analysis



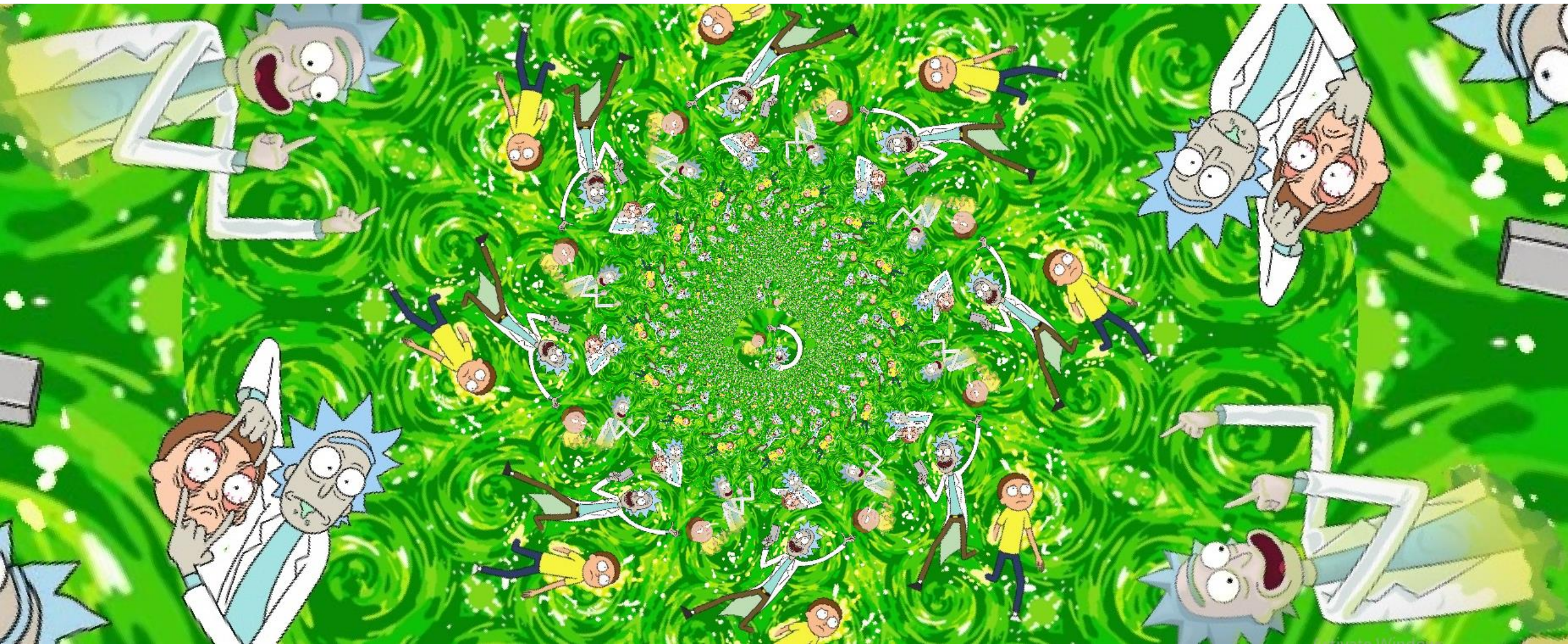
Choosing a toolbox can feel like an analysis multiverse



fMRIPrep

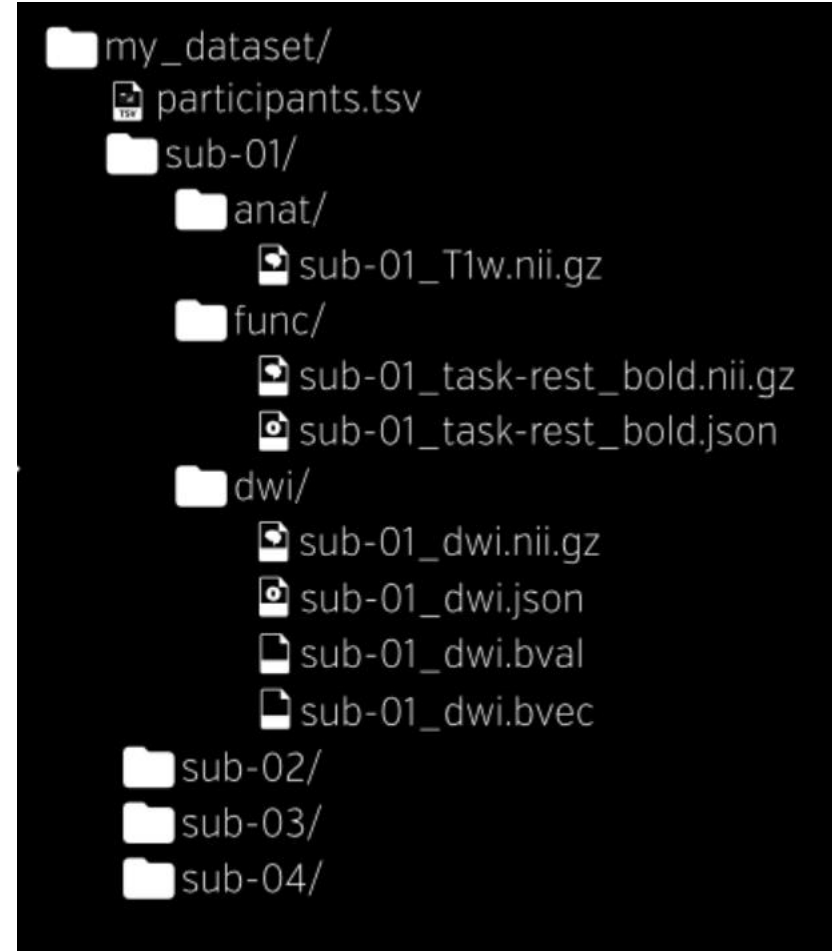


Choosing a toolbox can feel like an analysis multiverse

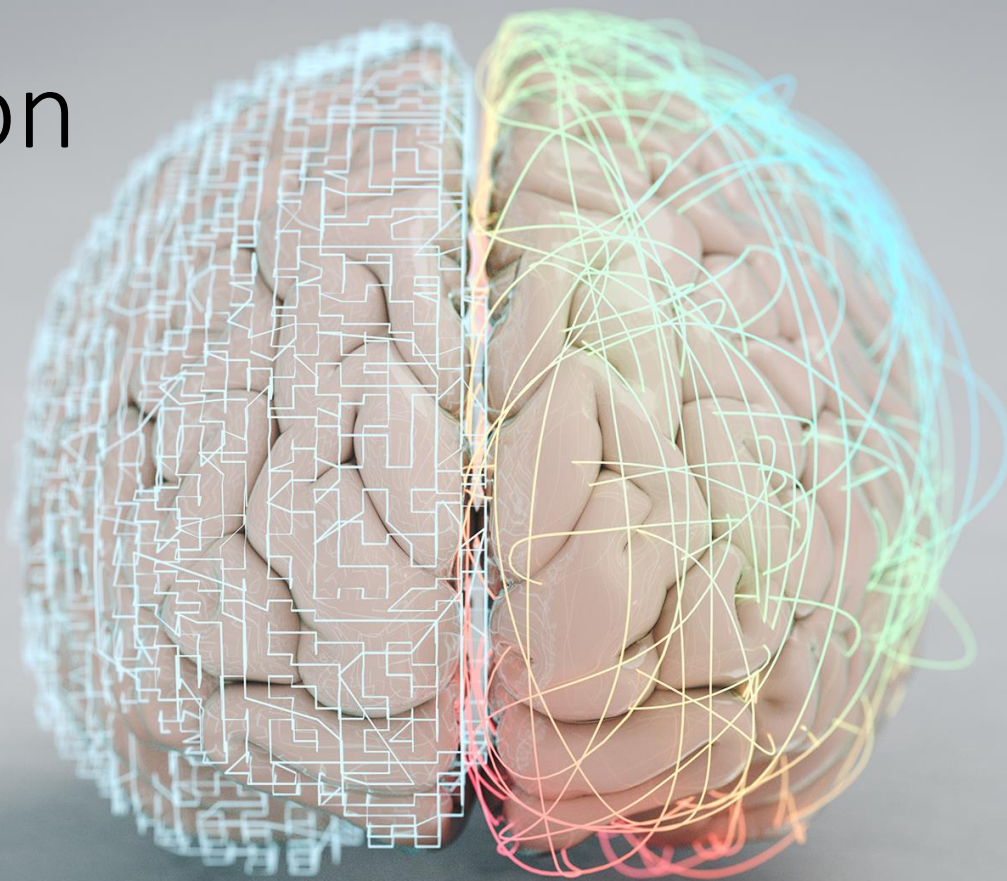


Preprocessing and analysis

- Utilise Brain Imaging Data Structure ([BIDS](#))
- Use toolboxes that use open-source software
- Cool resources: [Neurosynth](#), The Virtual Brain
 - Tip: Neurosynth is an excellent Region of Interest (ROI) selection tool!!



Dissemination



Papers

- The for-profit publishing industry is an unpleasant reality
- Non-traditional DOI generators for your hungry CV/alternative means of contributing to scientific literature:
 - Preprints
 - Protocol papers
 - Registered reports



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<https://paywallthemovie.com/>

A brief overview of open access

Gold OA

Journals do not charge subscription fees and authors pay the article processing charges (APC).

Green OA

Also known as self-archiving, authors deposit pre or post-prints to an OA digital repositories and pay no fee (with 6-24 months embargo). This can be an institutional or a disciplinary repository such as PubMed Central.

Hybrid OA

A subscription journal in which some of the articles are open access. It is mixed revenue model of subscription charges and pay-to publish options. Authors pay a subscription-based journal a publication fee to make their individual article open access immediately upon its release. Hybrid OA remains significantly more expensive than full OA (~50% more per APC).

Bronze OA

Delayed OA. Free to read on the publisher's website. The publisher controls copyrights.

Platinum/ Diamond OA

Free to the authors and free to the readers. Usually sponsored and published by nonprofit societies and associations, e.g., the [Beilstein-Institut](#) and the [Electrochemical Society](#).



the first website in the world to provide mass & public access to research papers

SCI-HUB

...to remove all barriers in the way of science

open

Example: “An Approximate Neuro-Optimal Solution of Discounted Guaranteed Cost Control Design”

<https://ieeexplore.ieee.org/abstract/document/9036048>

Other means of dissemination

Code →



Other means of dissemination

Code

Data →

TABLE 2. Popular data sharing repositories

Data format	Repository	Website
Article file	PubMed Central	http://www.ncbi.nlm.nih.gov/pmc
	ResearchGate	https://www.researchgate.net
	OpenAIRE	https://www.openaire.eu
All data formats	Figshare	https://figshare.com
	Dryad	http://datadryad.org
	Zenodo	http://zenodo.org
	Synapse	https://www.synapse.org/#
Genetic data	INSDC	http://www.insdc.org
	PGC	https://www.med.unc.edu/pgc
	GenomeRNAi	http://www.genomernai.org
Imaging data	HCP	http://www.humanconnectomeproject.org
	OpenfMRI	https://openfMRI.org
	COINS	http://coins.mrn.org
	NITRC	https://www.nitrc.org
Electrophysiological recordings	CRCNS	https://crcns.org
	Carmen	http://www.carmen.org.uk
	Neuroelectro	http://www.neuroelectro.org
Morphological reconstructions	Neuromorpho	http://neuromorpho.org
	BigNeuron	http://alleninstitute.org/bigneuron
Computational models	ModelDB	https://senselab.med.yale.edu/modeldb

(Spires-Jones et al., 2016)

Other means of dissemination

Code

Data →

(White et al., 2020)

Funding agencies

Pros:

- Better return for their money
- Increased number of scientific discoveries

Cons:

- Data sharing requires extra financial resources

Researchers

Pros:

- Can address scientific questions not possible with data from a single lab
- Allows researchers without the financial resources to conduct neuroimaging studies to analyze the data
- Fosters collaboration
- Data paper citations
- Recognition from peers for data sharing
- Seeing fruits from data collection

Cons:

- It requires considerable work to prepare the data for sharing
- Other researchers can scoop us with the data we've collected
- Other researchers receive credit for your work
- Other researchers might get grants instead of you to work with your data

Public

Pros:

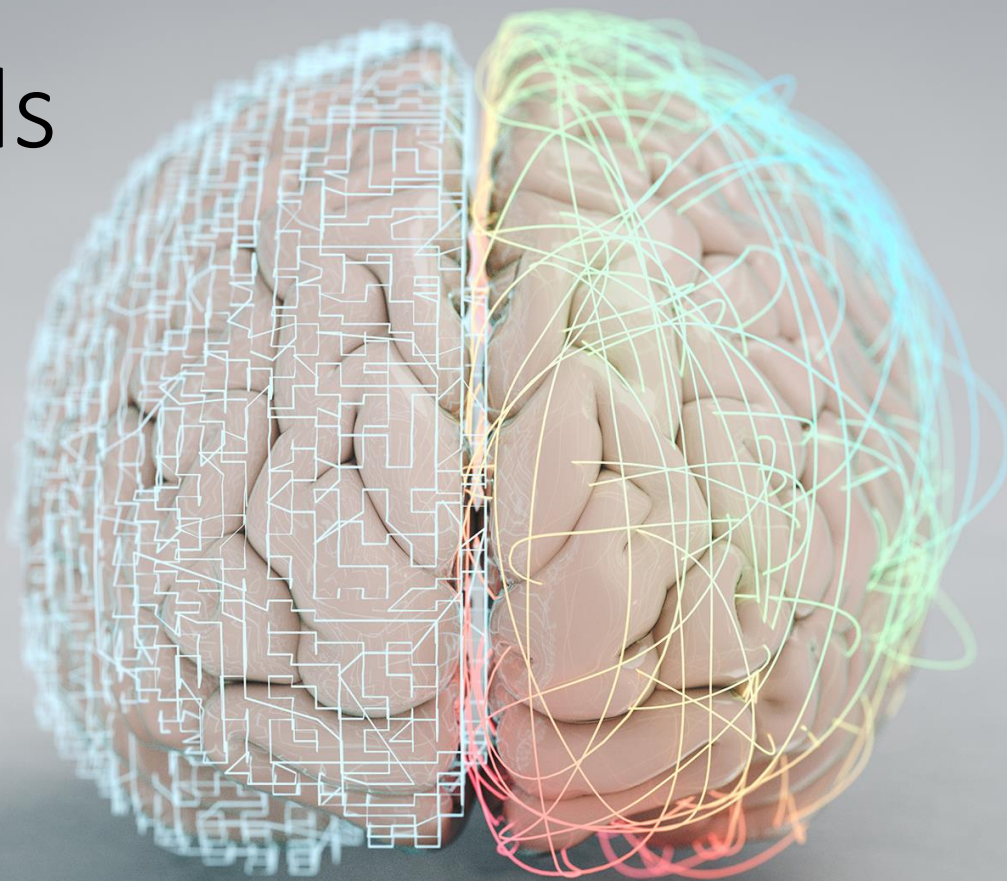
- Quicker scientific advances

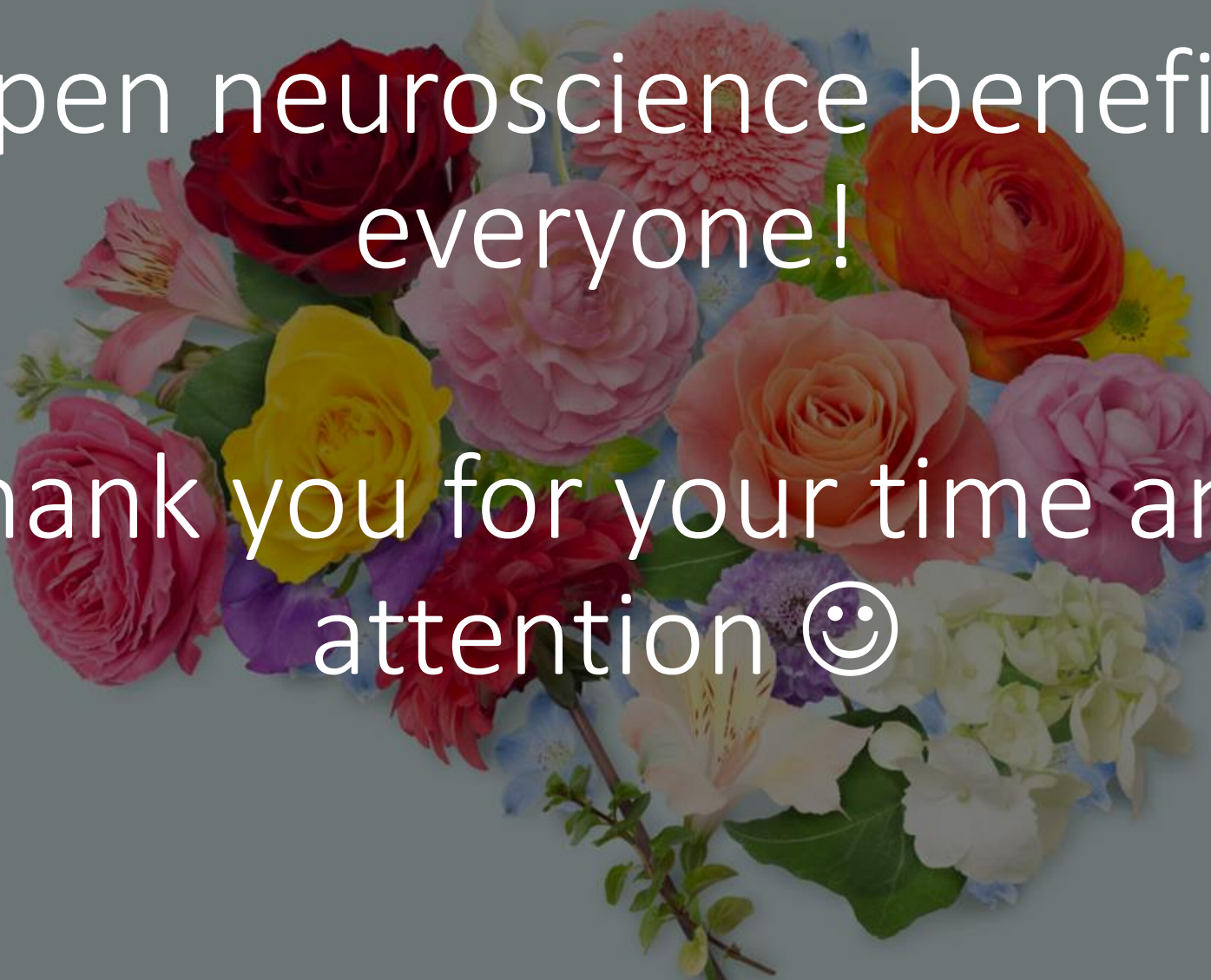
Cons:

- The data can be used to re-identify individuals
- The data can be used for harmful purposes



Parting words



A vibrant bouquet of flowers is centered in the image. It includes several red roses, a large pink rose, a yellow rose, a light pink rose, a peach-colored rose, a purple rose, and a white rose. There are also white hydrangeas, a pink lily, a yellow lily, and a purple lily. The bouquet is set against a light blue background.

Open neuroscience benefits
everyone!

Thank you for your time and
attention 😊