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## Building a more collaborative neuroimaging science

Camille Maumet

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Submitted on 30 Jul 2020

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Think Open Rovereto Workshop 2020 - July 10, 2020

# Building a more collaborative neuroimaging science

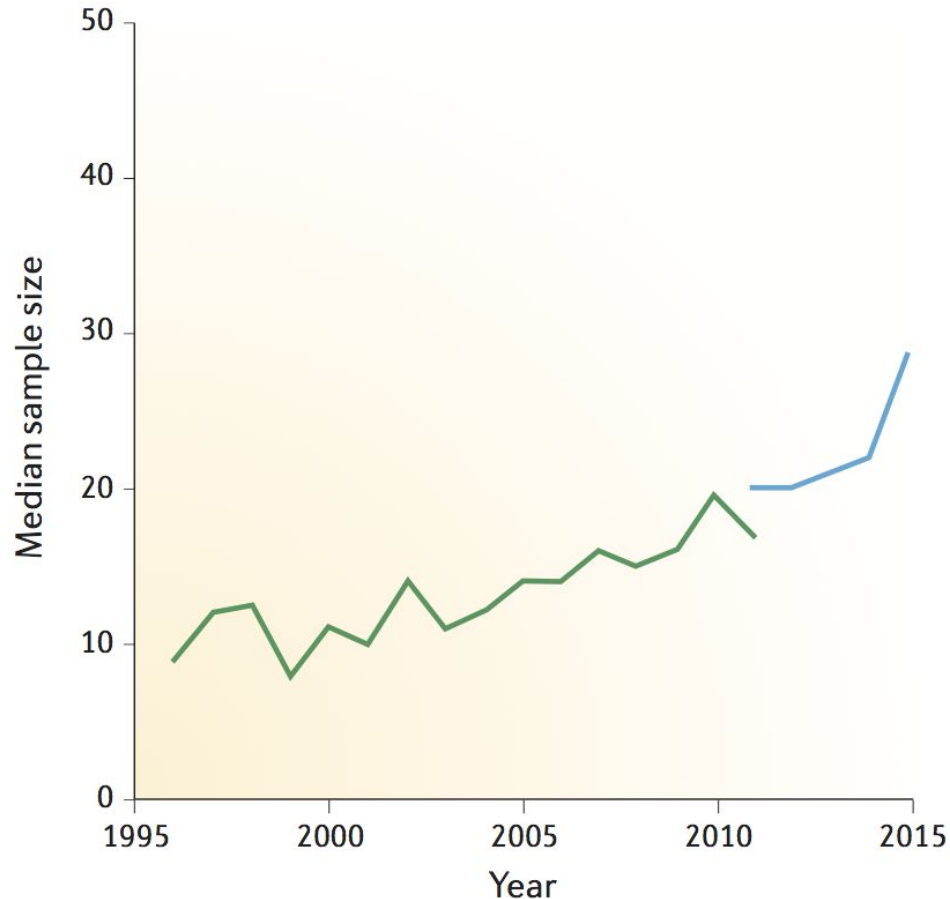


**Camille Maumet**

Univ Rennes, Inria, CNRS, Inserm



# Sample sizes in neuroimaging



2015 : 30 participants per study

[Poldrack et. al, Nature Neuroscience 2017]

SCIENCE

## A Waste of 1,000 Research Papers

Decades of early research on the genetics of depression were built on nonexistent foundations. How did that happen?

ED YONG MAY 17, 2019



SEAN NEL / SHUTTERSTOCK

In 1996, a group of European researchers found that a certain gene, called *SLC6A4*, might influence a person's risk of depression.

It was a blockbuster discovery at the time. The team found that a less active version of the gene was more common among 454 people who had mood disorders than in 570 who did not. In theory, anyone who had this particular gene variant could be at higher risk for depression, and that finding, they said, might help in diagnosing such disorders, assessing suicidal behavior, or even

**Vibration effect**



## Why are middle-aged marathon runners faster than twentysomethings?

According to new data from the running app Strava, runners in their 40s are streets ahead of younger rivals



▲ 'Middle-aged runners outperform runners in the 20s ...' Photograph: FatCamera/Getty

**A**ccording to data released by the running app Strava, middle-aged runners consistently average faster marathon times than their younger rivals, apparently defying the usual rules of athletic performance. Men in the 40-49 age bracket clock an average time of four hours and 17 minutes for a marathon, according to the recent figures. Women in the same age range typically come in at just under the five-hour mark.

Faster in their forties  
than twenties?

**Selection bias**

POLICY & ETHICS | OPINION

## Speech Recognition Tech Is Yet Another Example of Bias

Siri, Alexa and other programs sometimes have trouble with the accents and speech patterns of people from many underrepresented groups

By Claudia Lopez Lloreda on July 5, 2020



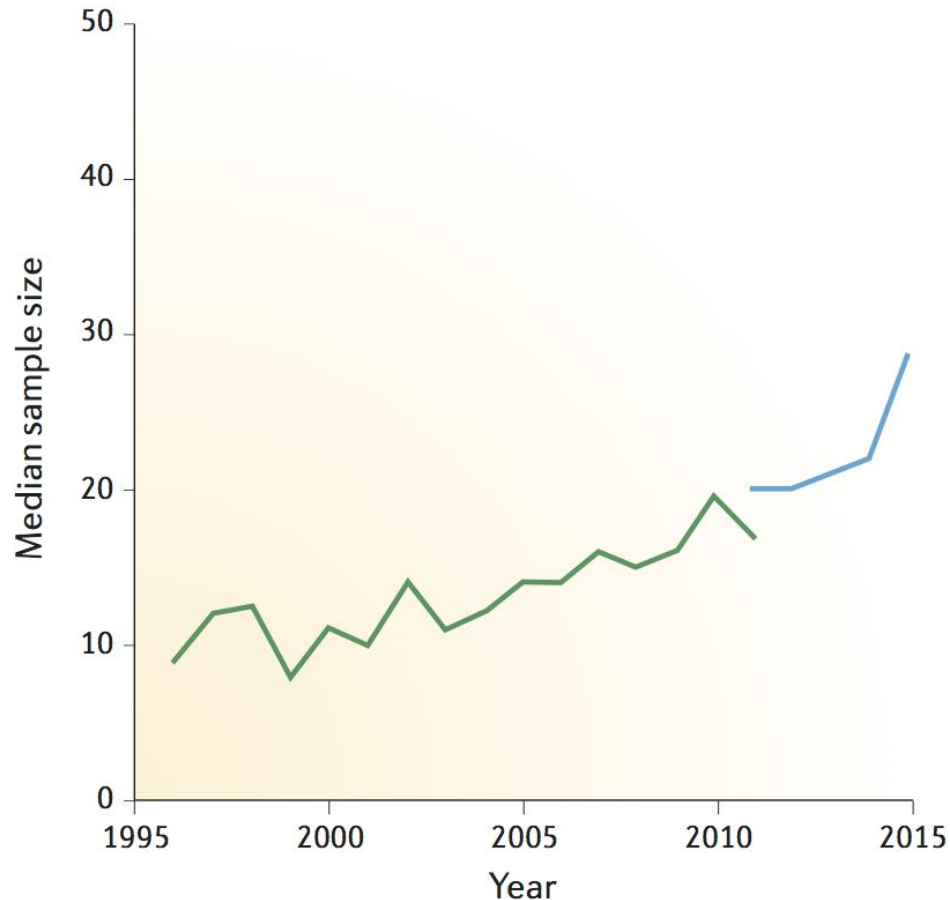
Credit: Getty Images

“Clow-dia,” I say once. Twice. A third time. Defeated, I say the Americanized version of my name: “Claw-dee-ah.” Finally, Siri recognizes it.

Having to adapt our way of speaking to interact with speech recognition technologies is a familiar experience for people whose first language is not English or who do not have conventionally American-sounding names. I have even stopped using Siri because of it.

**Lack of diversity**

# Sample sizes in neuroimaging



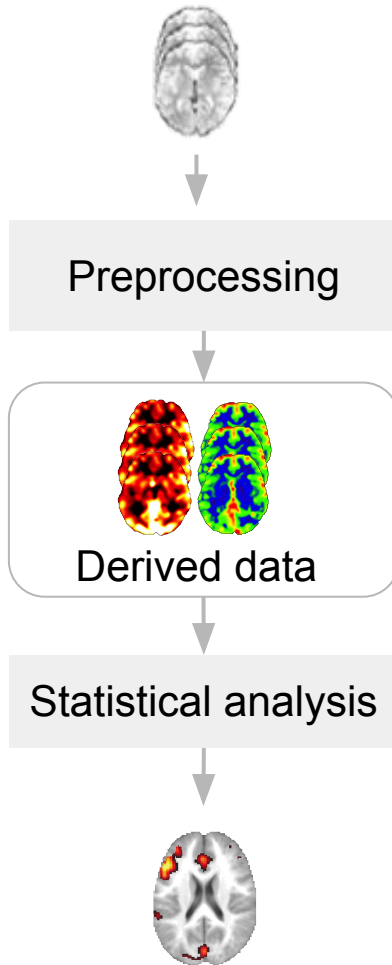
2015 : 30 participants per study

We need **bigger, more representative and more diverse** samples

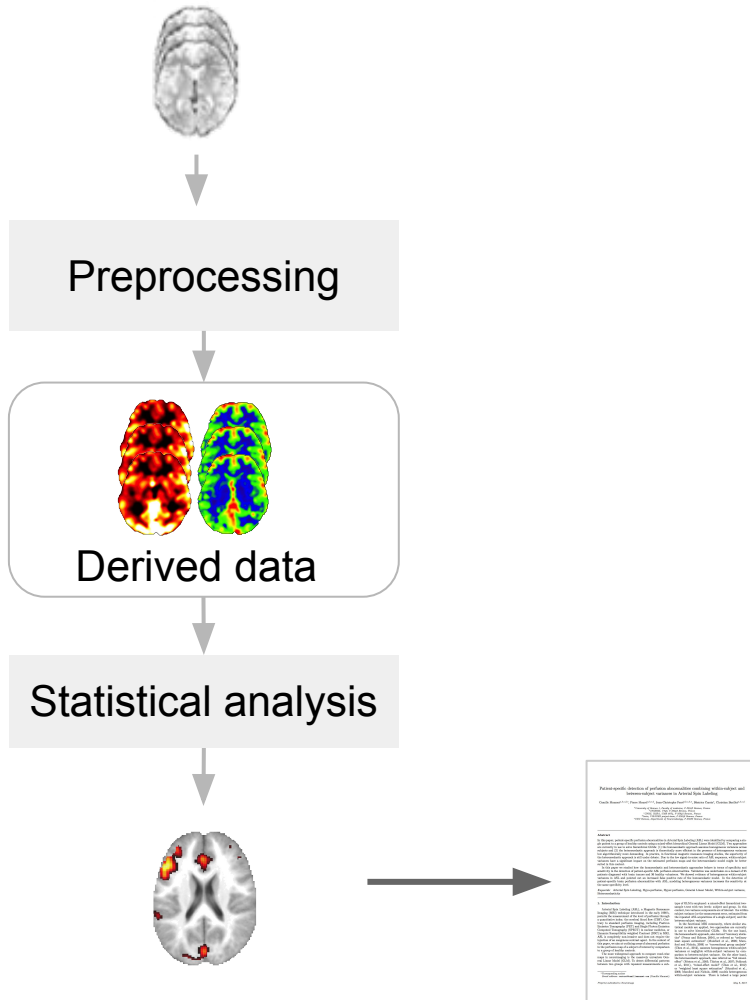
[Poldrack et. al, Nature Neuroscience 2017]

**Beyond** papers...

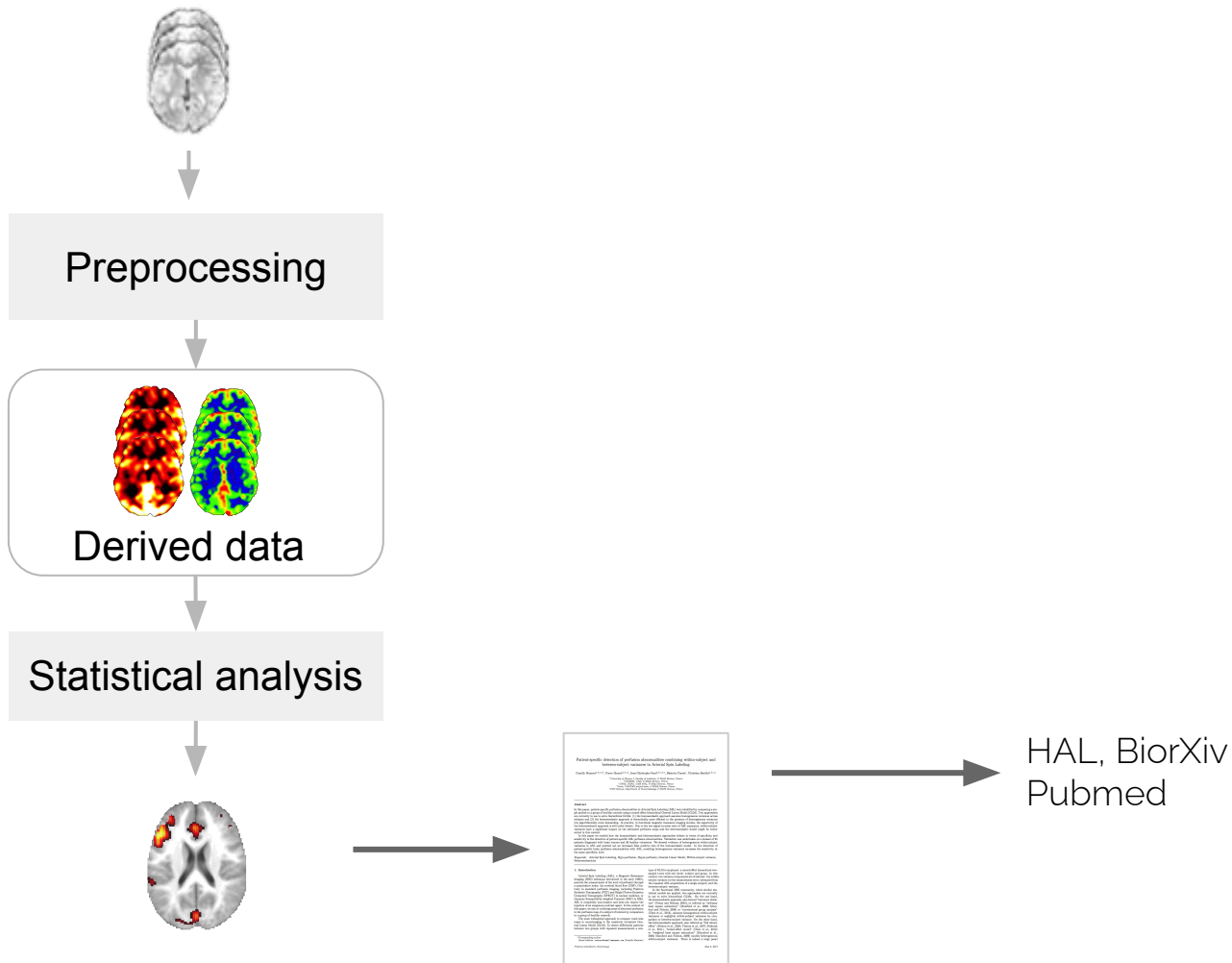
# Publishing research artefacts



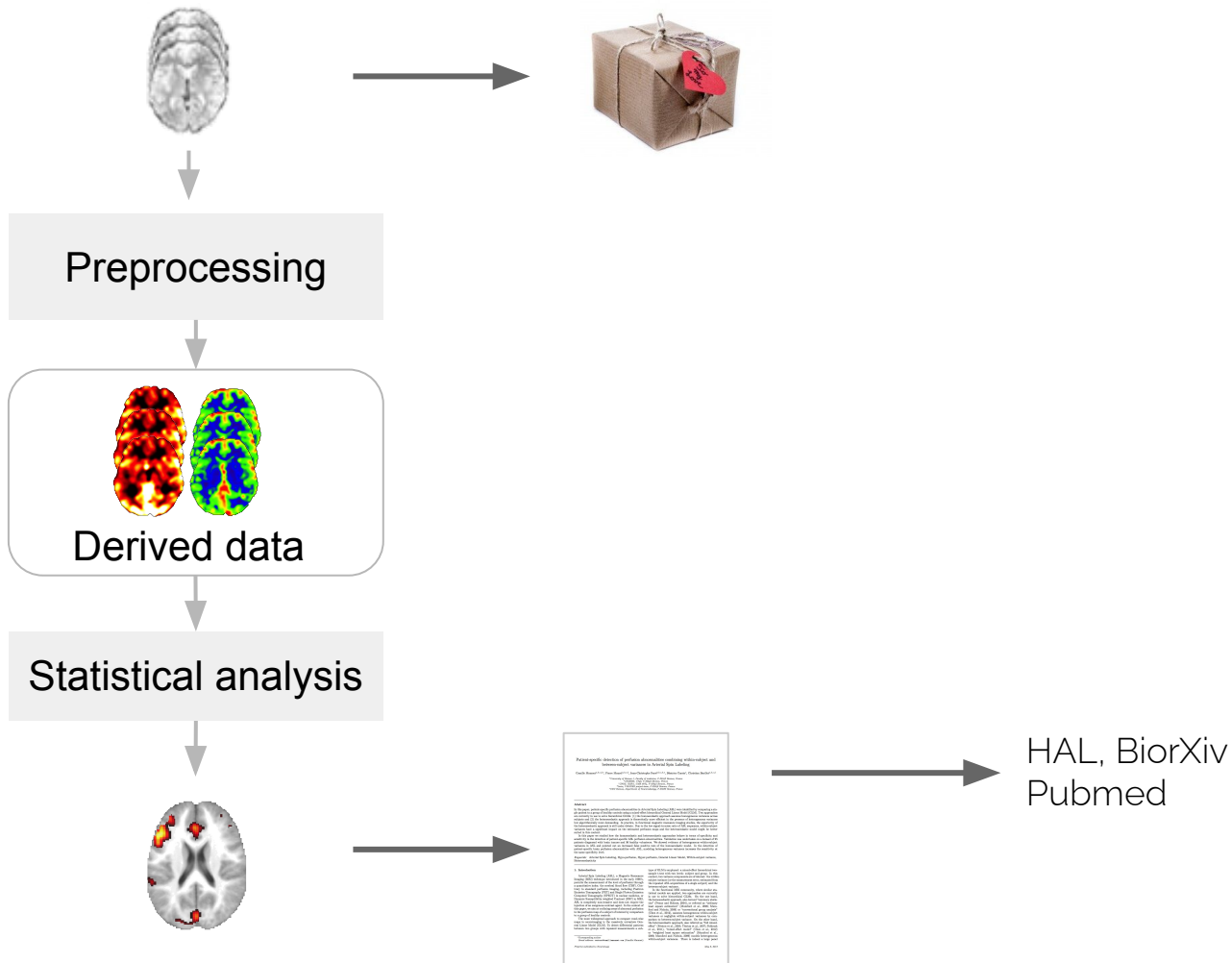
# Publishing research artefacts



# Publishing research artefacts



# Publishing research artefacts



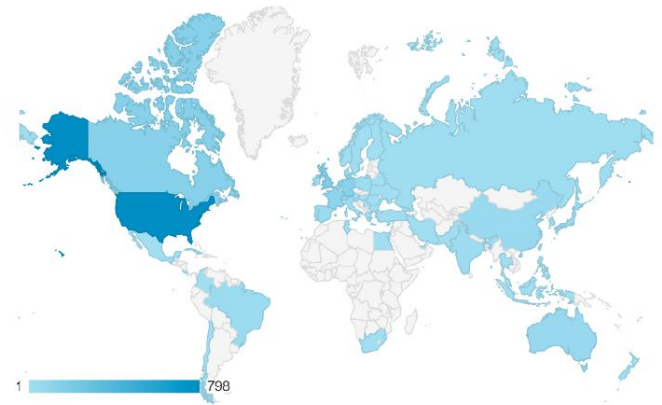


# BIDS

**July 11, 11.50** - BIDS: a data standard to support the neuroimaging community

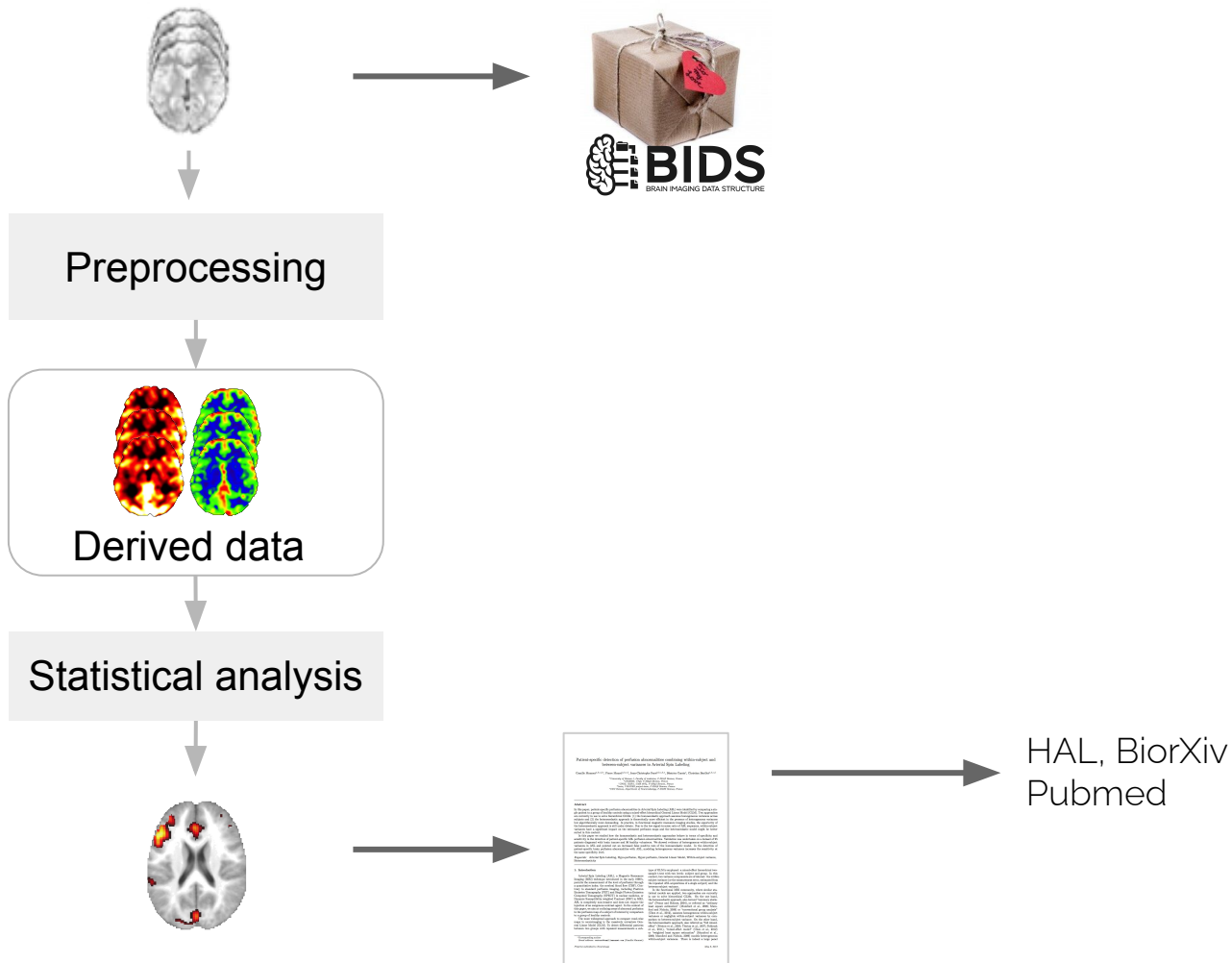
**Guiomar Niso**

- Used in over 60 labs around the world
- Adopted by: FCP-INDI, Developing Human Connectome, SchizConnect and Donders Data repository.
- Extensions: MEG, iEEG, EEG

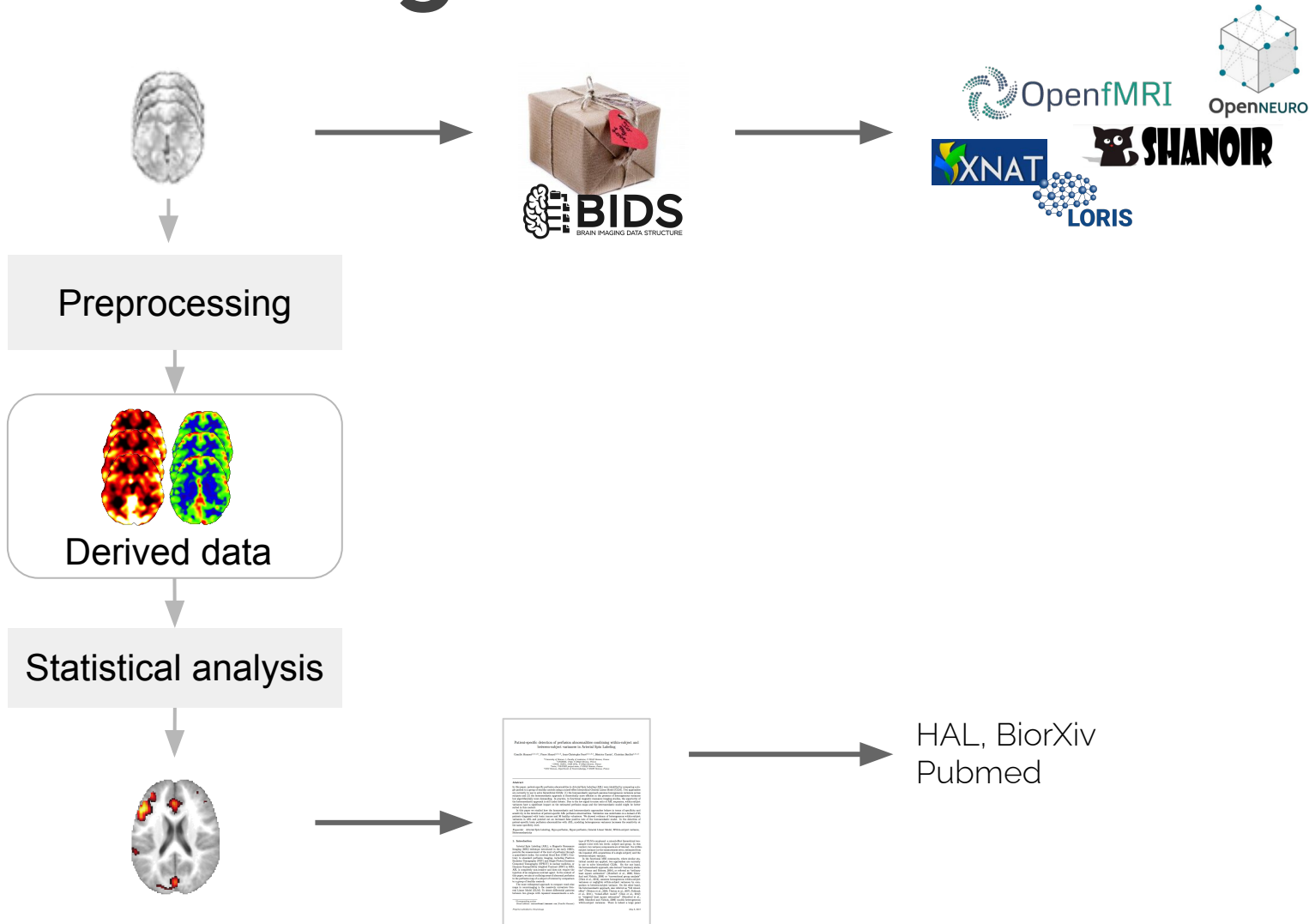


```
my_dataset/  
├── participants.tsv  
├── sub-01/  
│   ├── anat/  
│   │   └── sub-01_T1w.nii.gz  
│   └── func/  
│       ├── sub-01_task-rest_bold.nii.gz  
│       └── sub-01_task-rest_bold.json
```

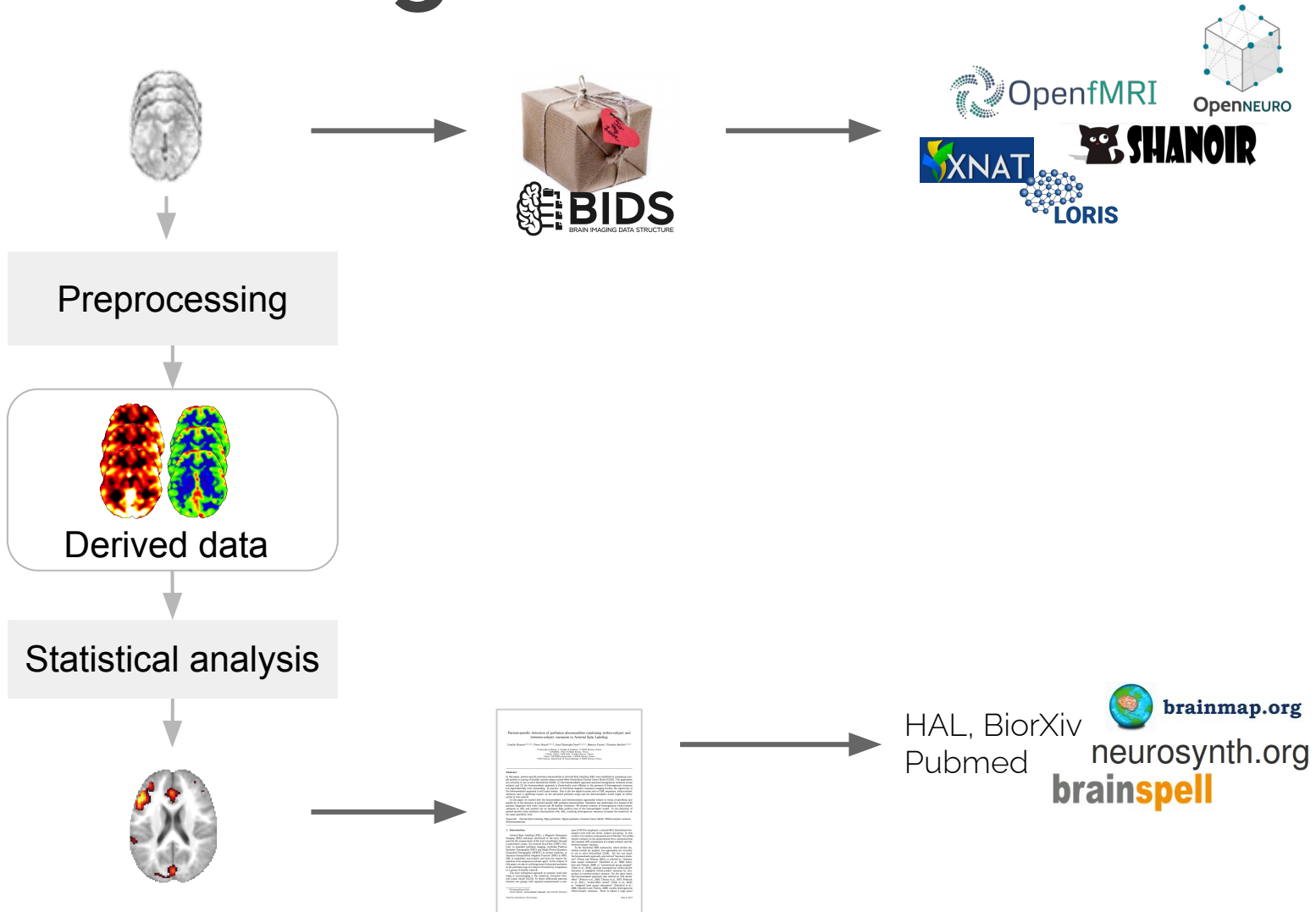
# Publishing research artefacts



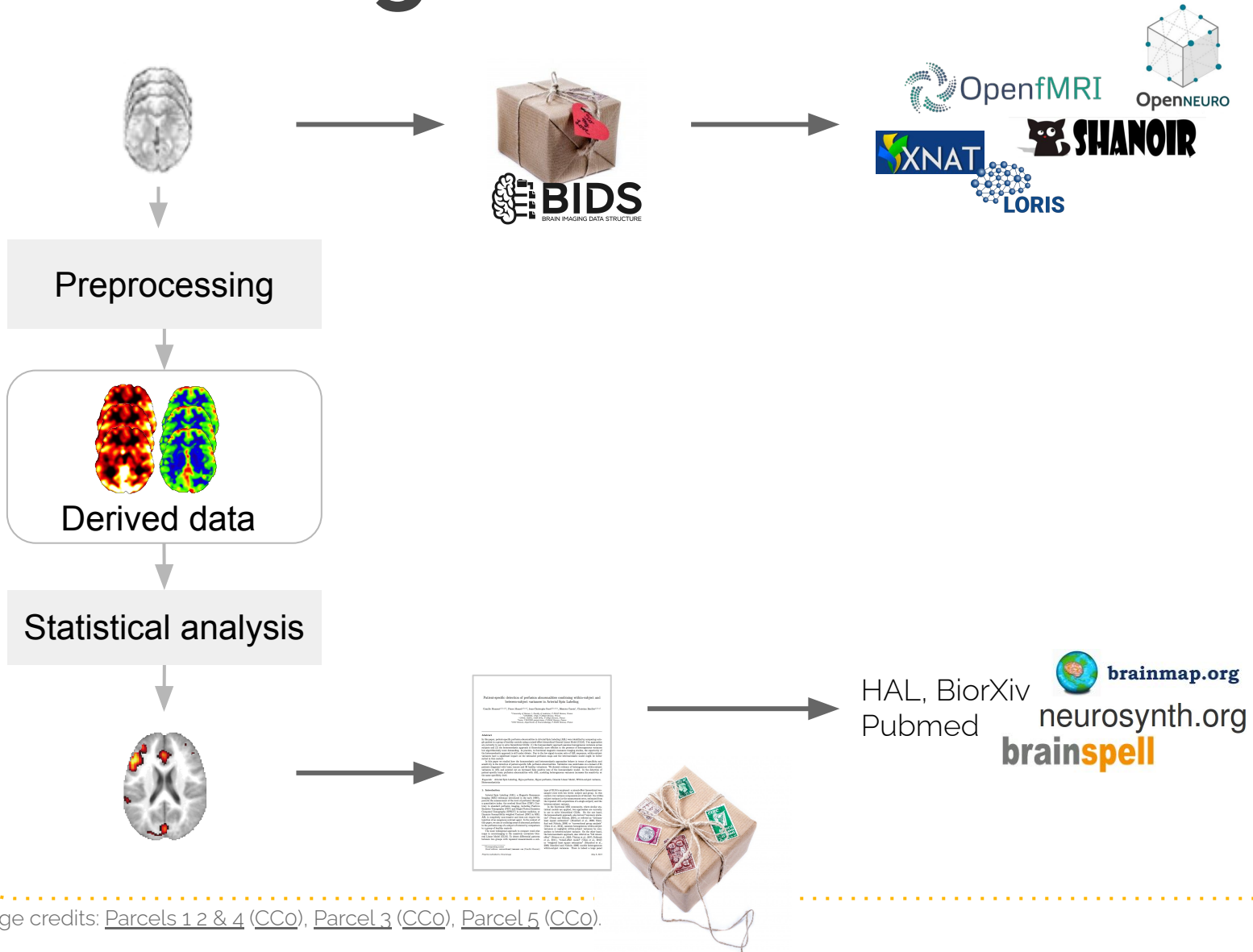
# Publishing research artefacts



# Publishing research artefacts

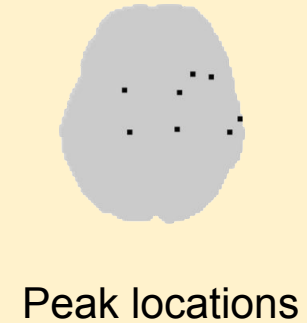
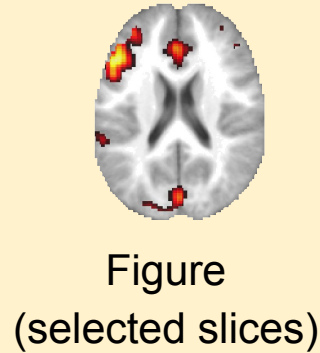
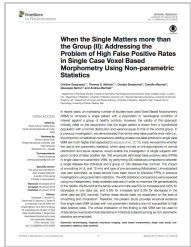


# Publishing research artefacts



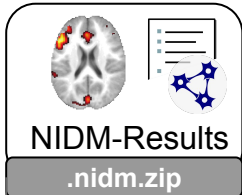
# fMRI Results

## Publication



- ✘ Incomplete statistical results
- ✘ Ambiguous/incomplete methods
- ✘ Metadata is not searchable

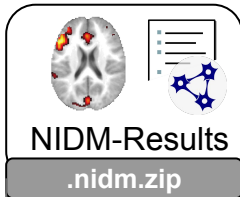
# NIDM-Results pack



- ClusterLabels.nii.gz
- Contrast.nii.gz
- ContrastStandardError.nii.gz
- DesignMatrix.csv
- DesignMatrix.png
- ExcursionSet.nii.gz
- ExcursionSet.png
- GrandMean.nii.gz
- Mask.nii.gz
- nidm.json
- nidm.ttl
- ParameterEstimate\_001.nii.gz
- ParameterEstimate\_002.nii.gz
- ResidualMeanSquares.nii.gz
- SearchSpaceMask.nii.gz
- TStatistic.nii.gz
- ZStatistic.nii.gz

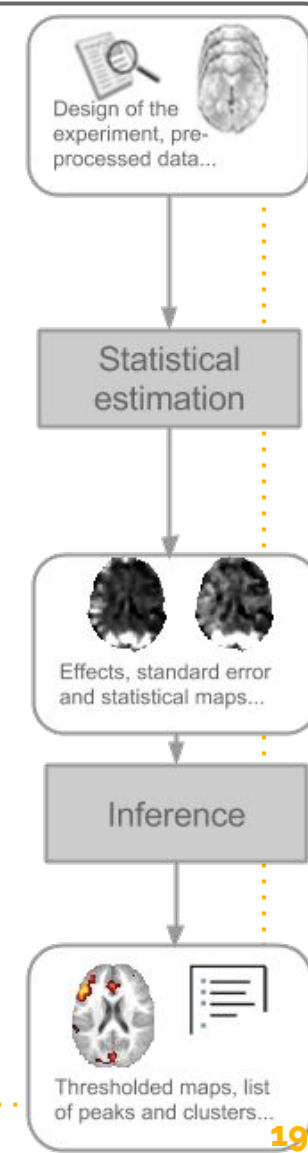
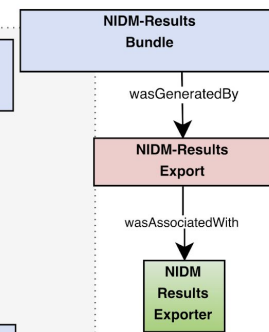
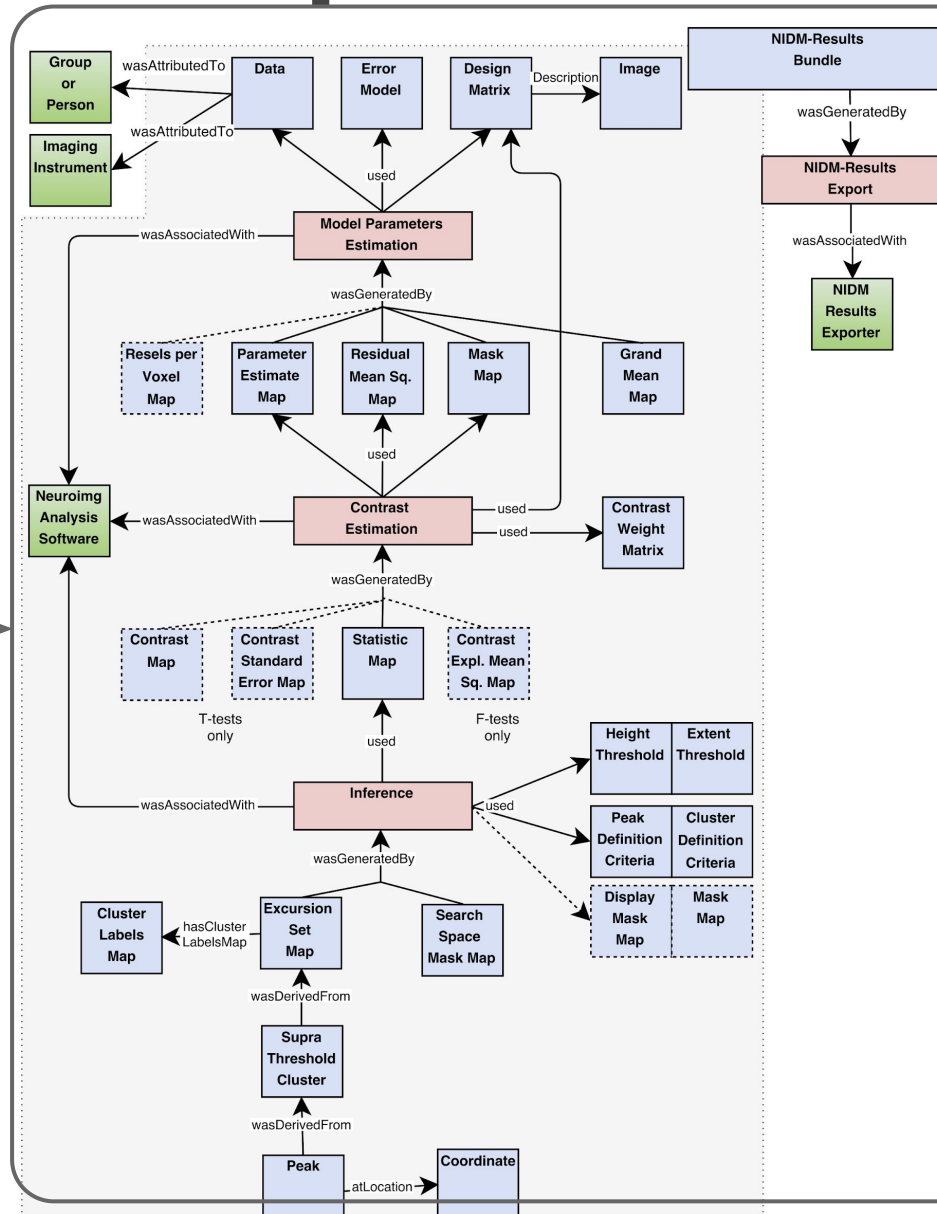
[Maumet et al.,  
Sci. Data 2016]

# NIDM-Results pack



- ClusterLabels.nii.gz
- Contrast.nii.gz
- ContrastStandardError.nii.gz
- DesignMatrix.csv
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- nidm.json
- nidm.ttl
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- ParameterEstimate\_002.nii.gz
- ResidualMeanSquares.nii.gz
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- ZStatistic.nii.gz

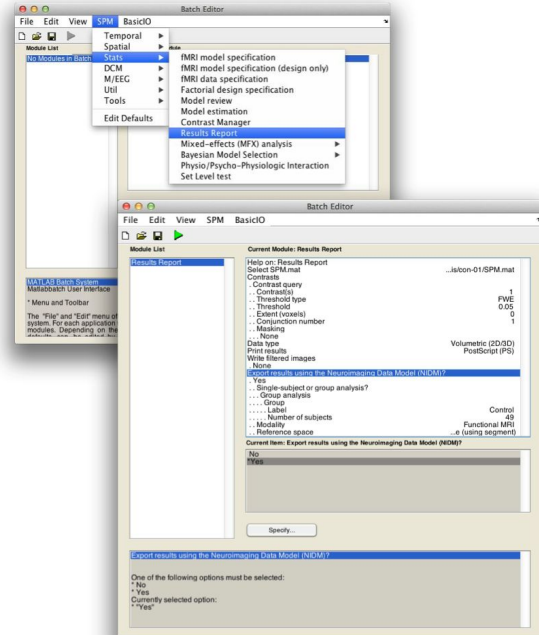
[Maumet et al.,  
Sci. Data 2016]





# NIDM in SPM, FSL & NeuroVault

SPM

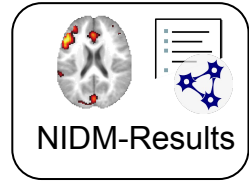


1. Export



```
$ nidmfsfsl fsl_ds107_group 49 -g Control
```

2. Publication on NeuroVault



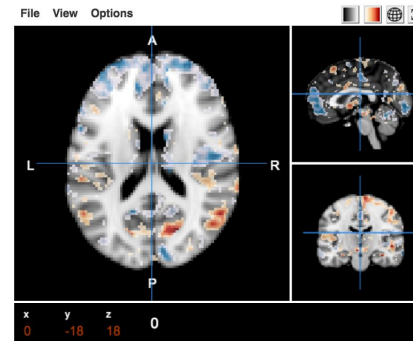
## A Correspondence between Individual Differences in the Brain's Intrinsic Functional Architecture and the Content and Form of Self-Generated Thoughts

Contributed by ChrisFiloGorgolewski

Krzysztof J. Gorgolewski, Dan Lurie, Sebastian Urchs, Judy A. Kipping, R. Cameron Craddock, Michael P. Milham, Daniel S. Margulies, Jonathan Smallwood

[Link to the paper](#)

3D View



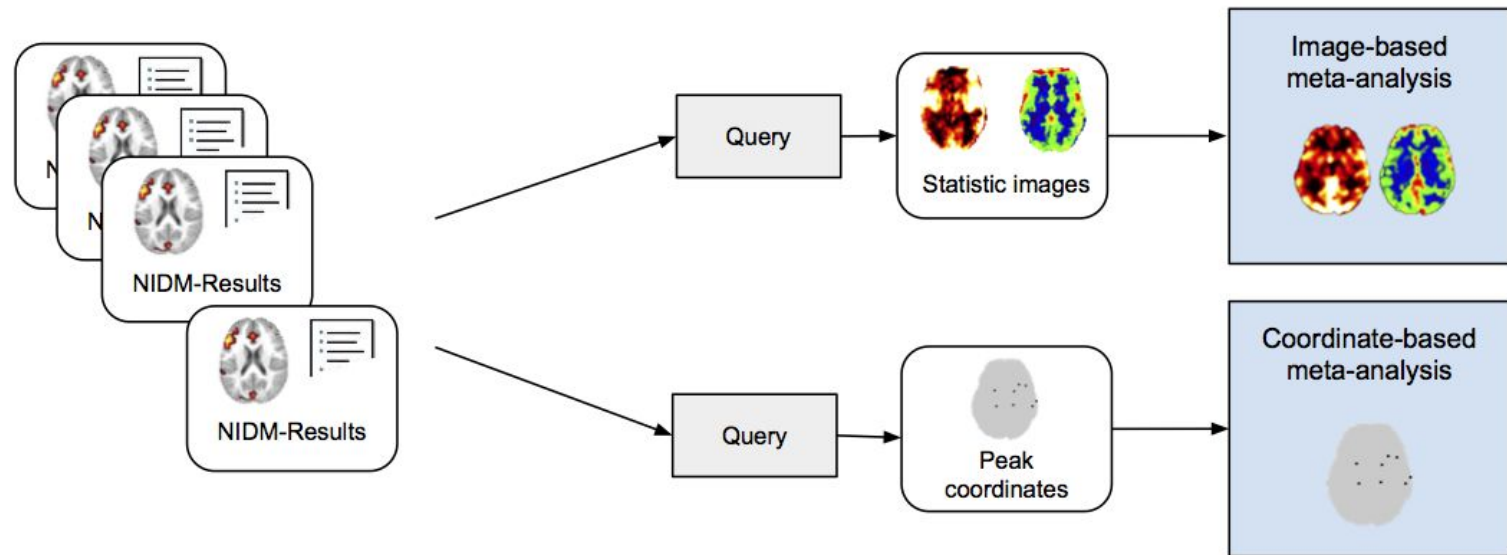
Images Details

Show 7 entries Search:

View	ID	Name	Type
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	26	fALFF: Future	Z map
	27	fALFF: Past > Future	Z map
	28	fALFF: Positive	Z map
	29	fALFF: Negative	T map
	30	fALFF: Positive > Negative	Z map
	31	fALFF: Social Cognition	Z map

Showing 1 to 7 of 30 entries First Previous Next Last

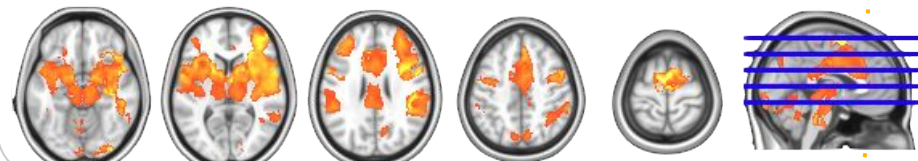
# Meta-analysis with NIDM-Results



Coordinate-based meta-analysis



Image-based meta-analysis



# Publishing research artefacts

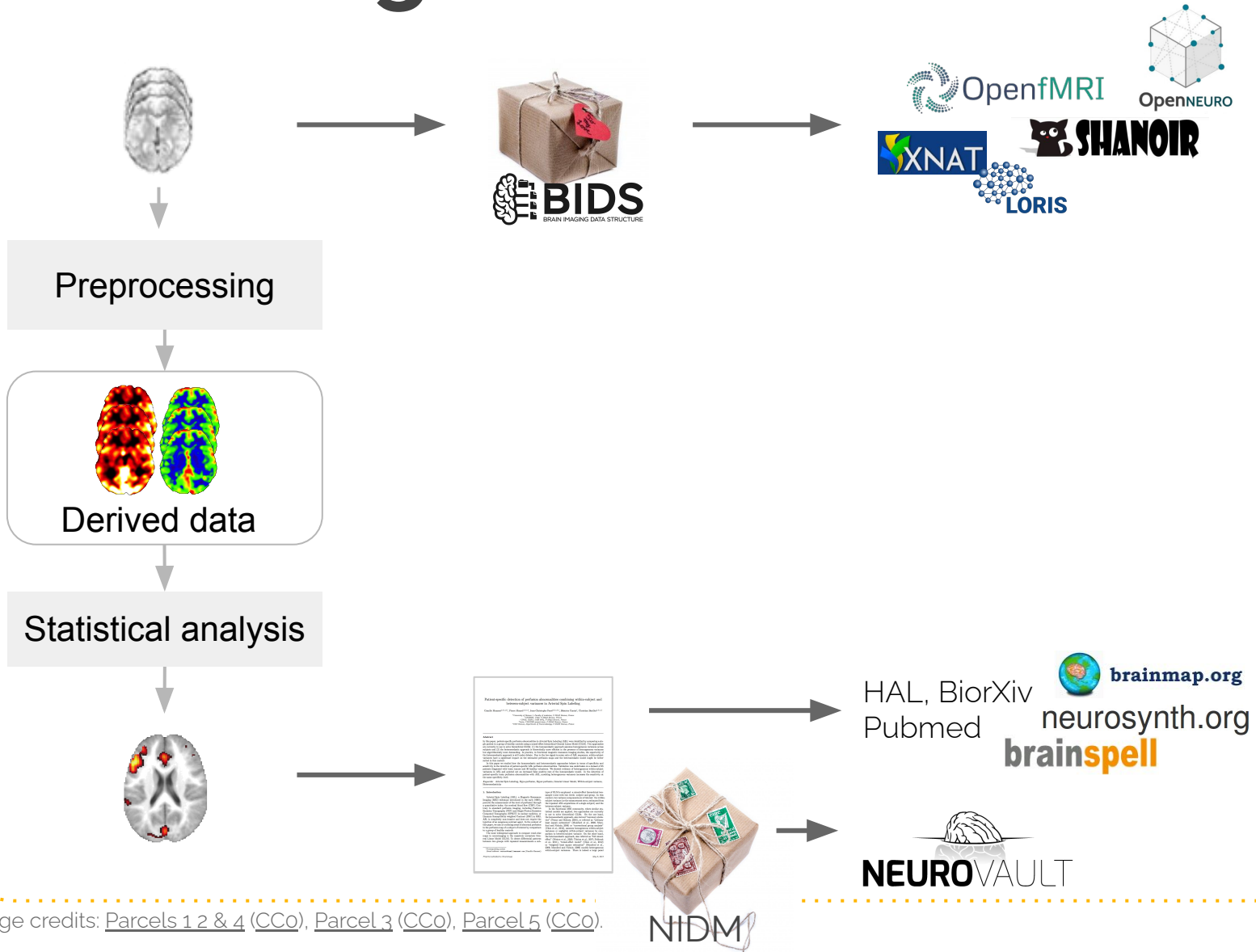
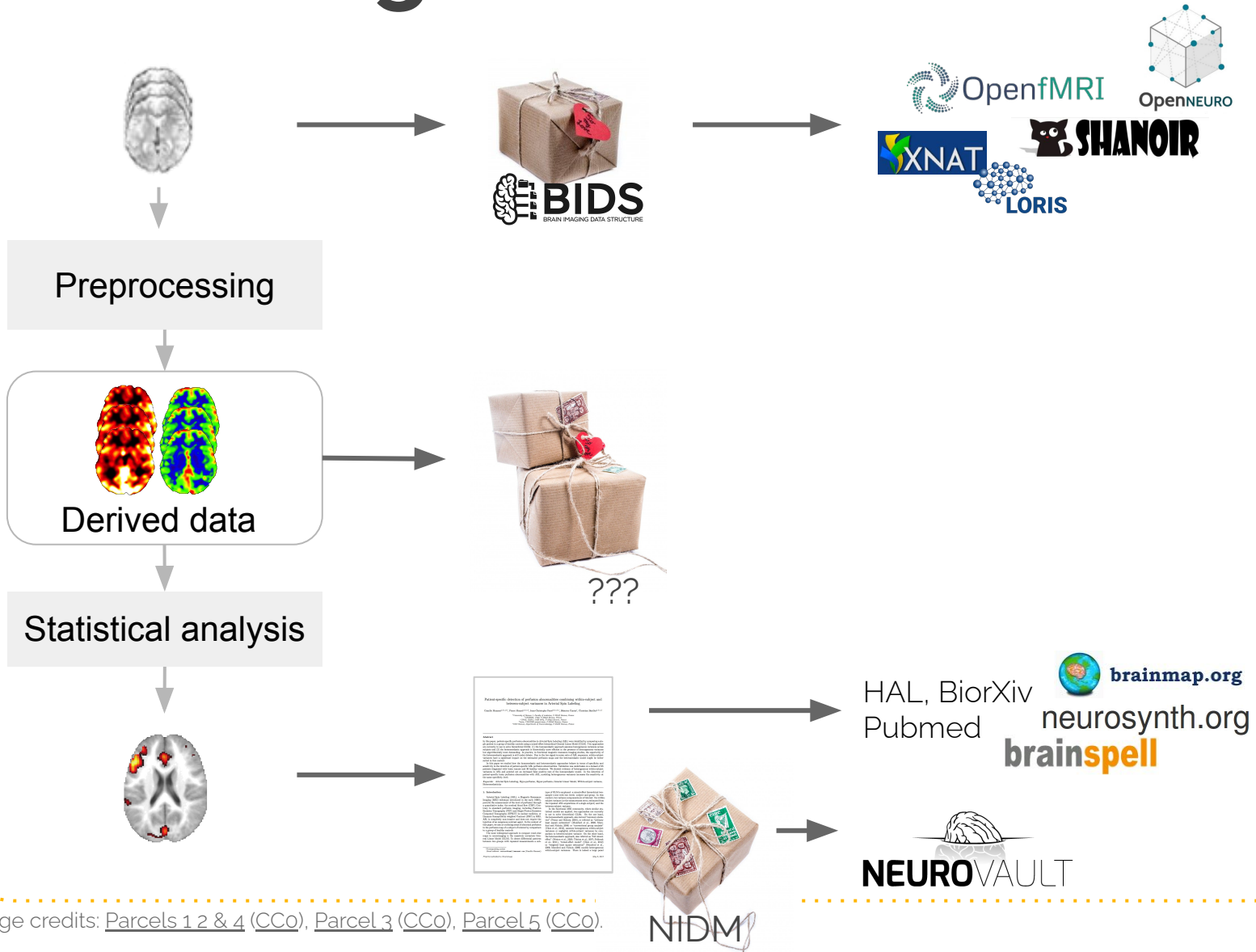


Image credits: [Parcels 1 2 & 4](#) (CC0), [Parcel 3](#) (CC0), [Parcel 5](#) (CC0).

# Publishing research artefacts



**A new challenge:**  
dealing with analytic  
variability...

# Open data

Unique study  
30 participants



OpenNEURO

studyforrest.org



NEUROVAULT

L I E L N L F T Q K T Q R V  
S M Y C O N N E C T O M E Q  
G S P K K W A R R G K E H R

NITRC

OSF

- + Images
- + Homogenous
- Datasets



# Open data

Unique study  
30 participants



OpenNEURO

studyforrest.org

Consortium  
1000 participants



ABIDE  
Autism Brain Imaging  
Data Exchange

1000 Functional  
Connectomes Project

NEUROVAULT

L I E L N L F T Q K T Q R V  
S M Y C O N N E C T O M E Q  
G S P K K W A R R G K E H R



NITRC

OSF

CORR  
CONSORTIUM FOR  
RELIABILITY AND  
REPRODUCIBILITY



- + Images
- + Homogenous
- Datasets





# Open data

Unique study  
30 participants



OpenNEURO

studyforrest.org



NEUROVAULT

L I E L N L F T Q K T Q R V  
S M Y C O N N E C T O M E Q  
G S P K K W A R R G K E H R

Consortium  
1000 participants



ABIDE  
Autism Brain Imaging  
Data Exchange

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Connectomes Project



NITRC

OSF

CORR  
CONSORTIUM FOR  
RELIABILITY AND  
REPRODUCIBILITY



Cohort  
100 000 participants



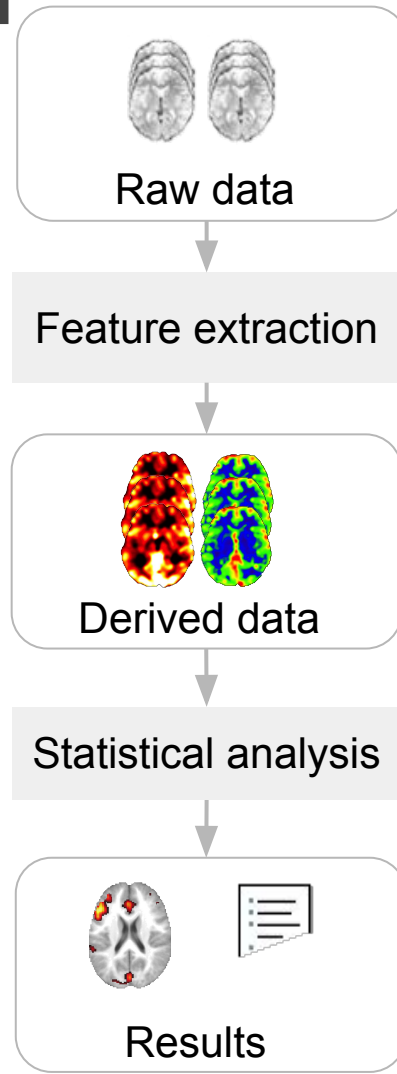
HUMAN  
Connectome  
PROJECT

biobank<sup>uk</sup>  
Improving the health of future generations

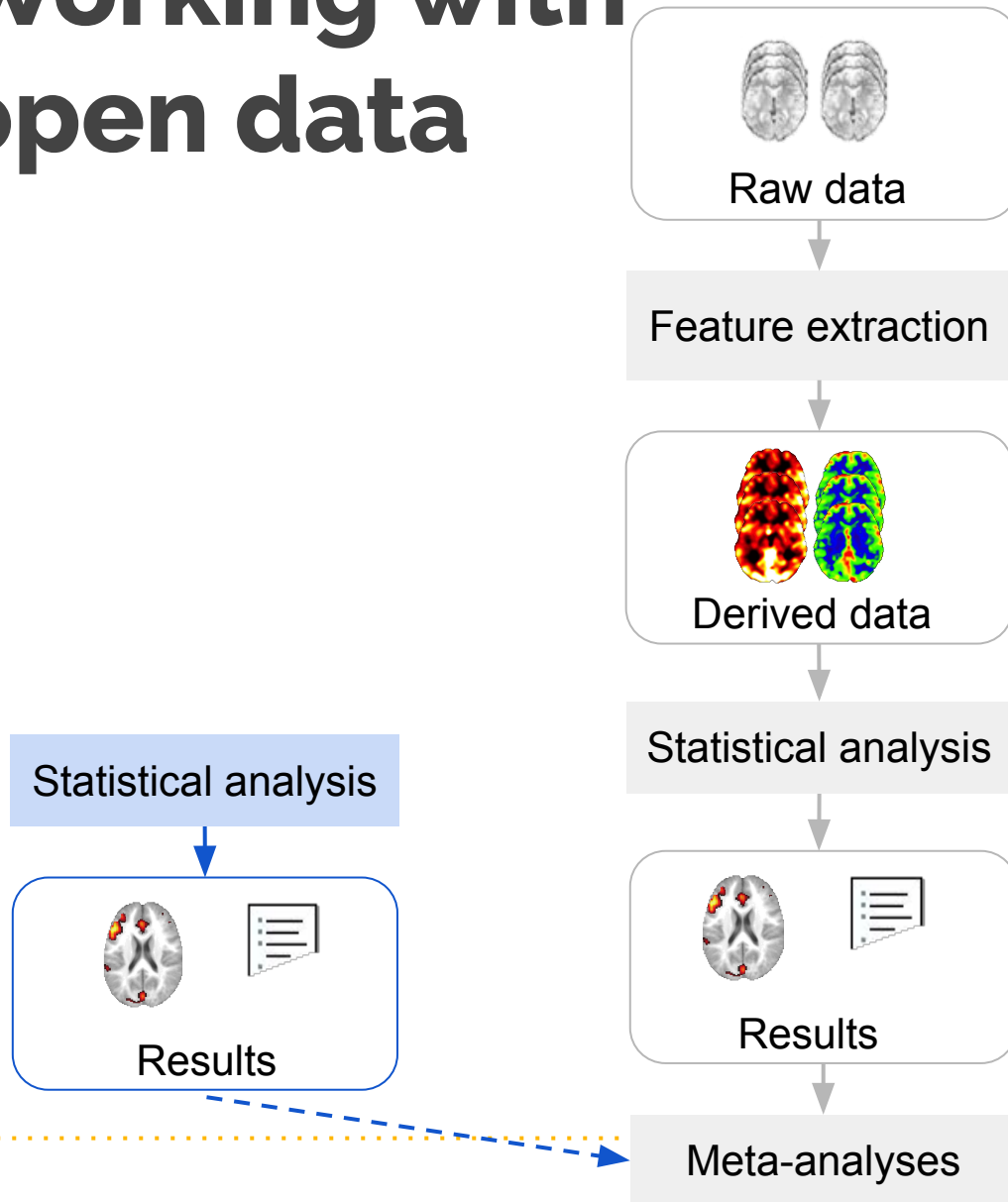
- + Images
- + Homogenous
- Datasets



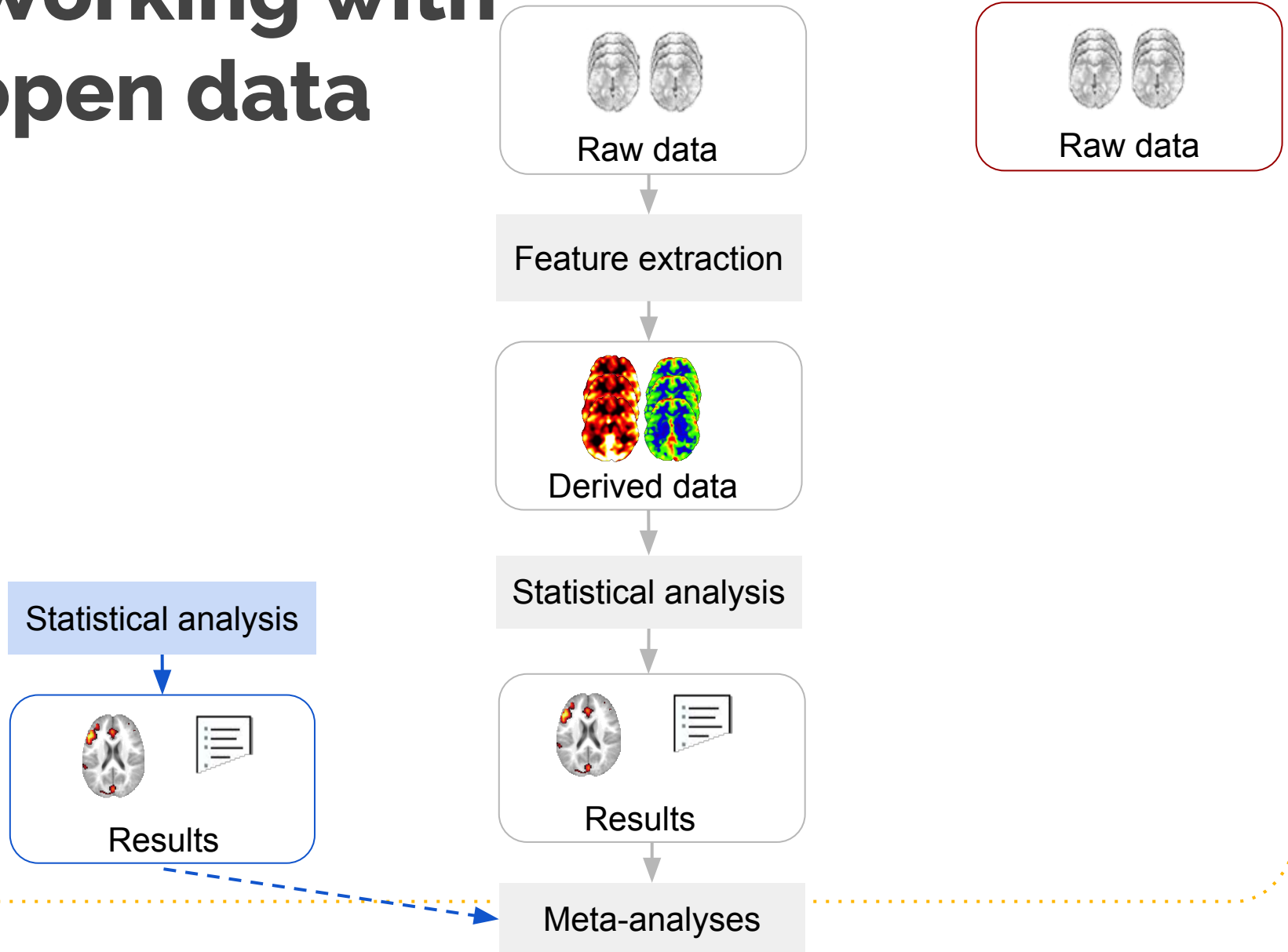
# Working with open data



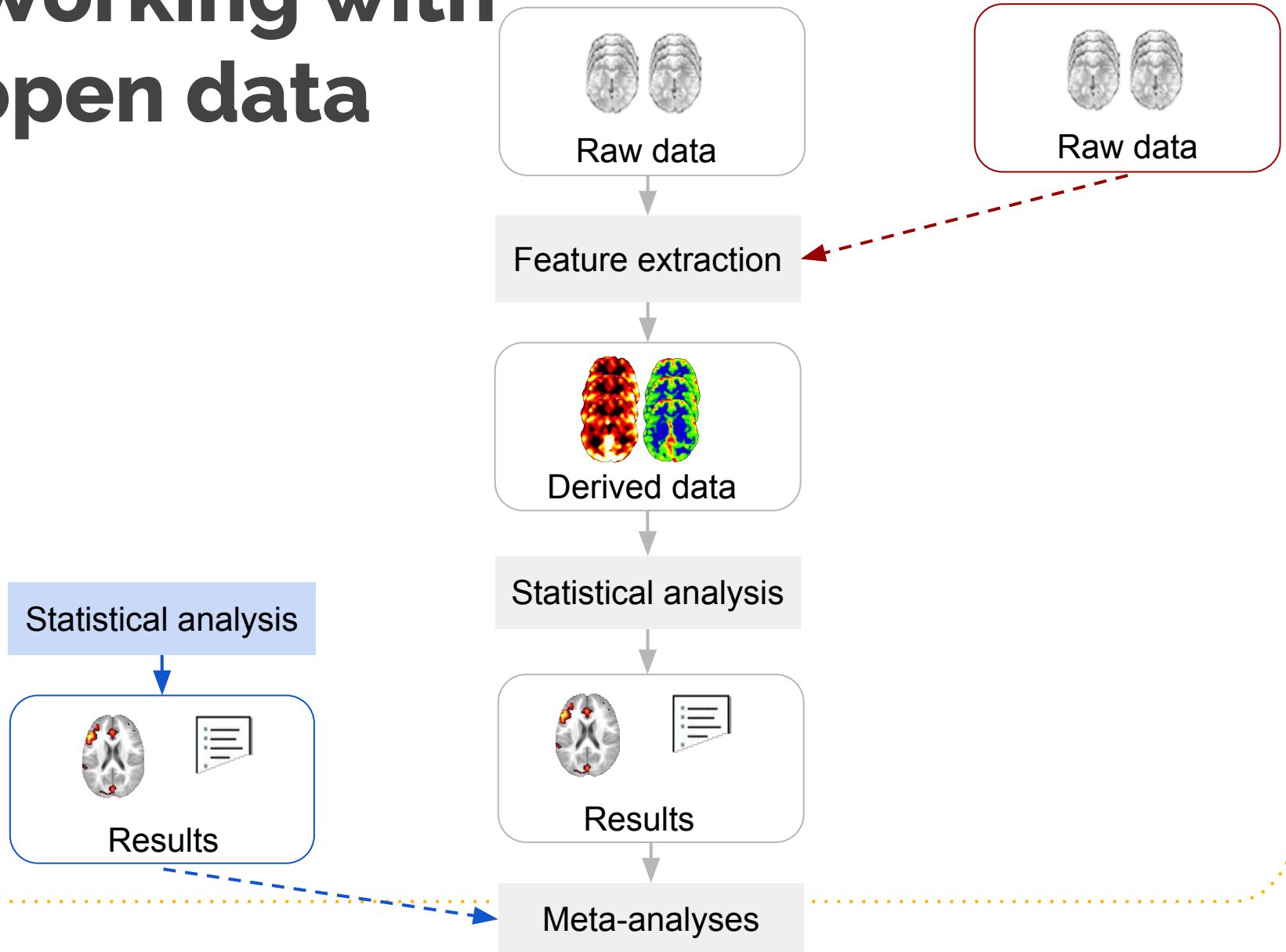
# Working with open data



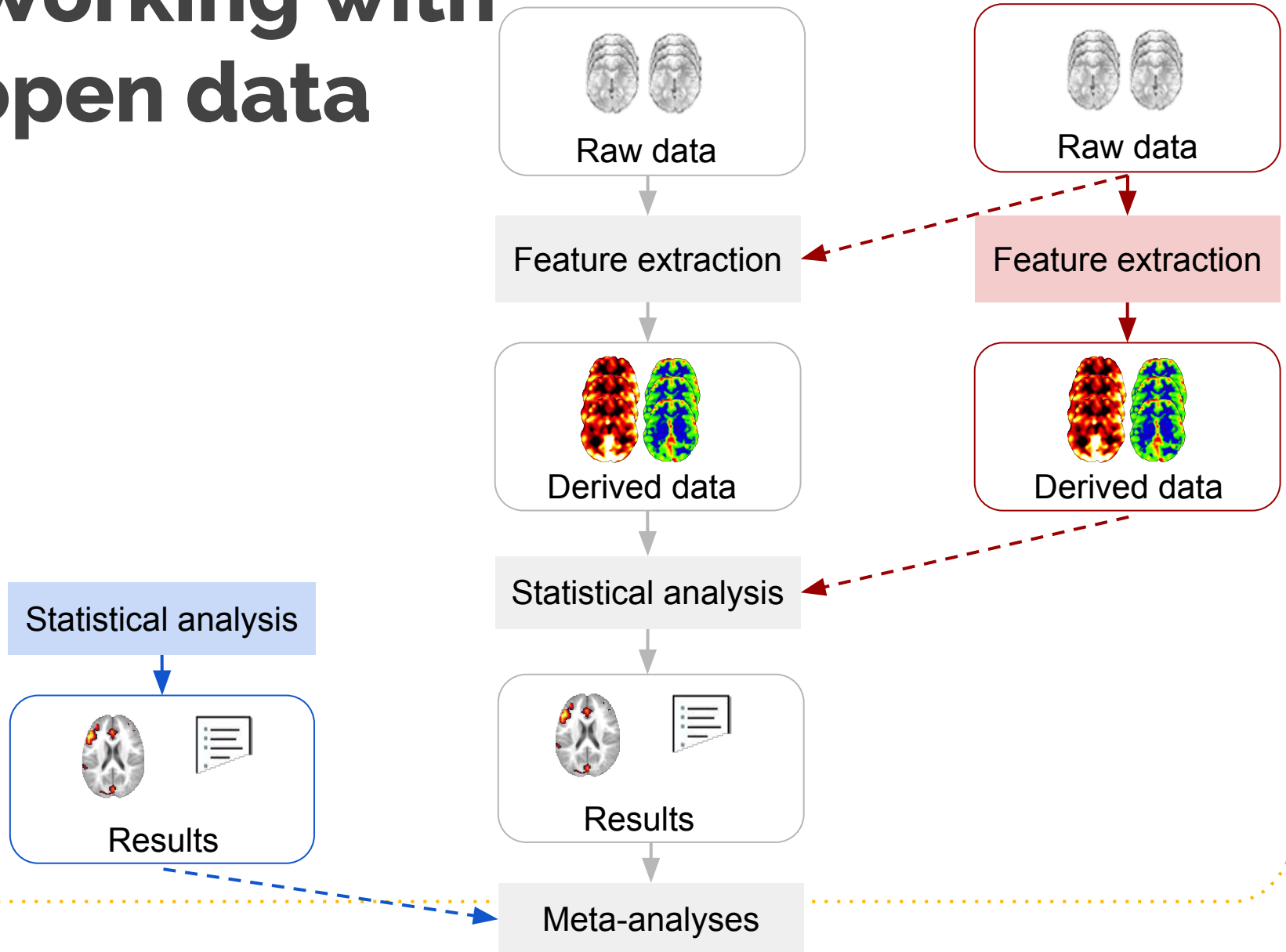
# Working with open data



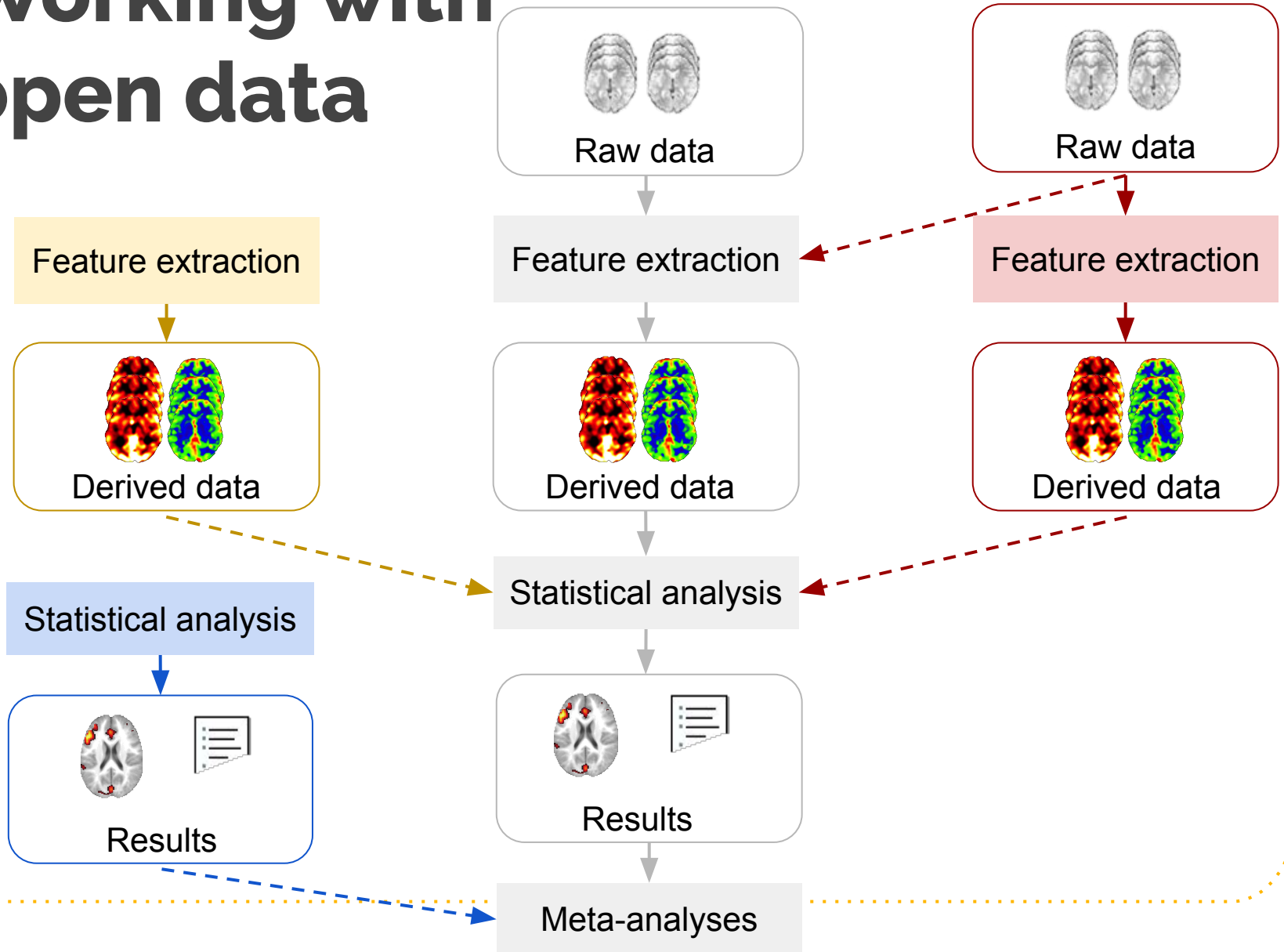
# Working with open data



# Working with open data



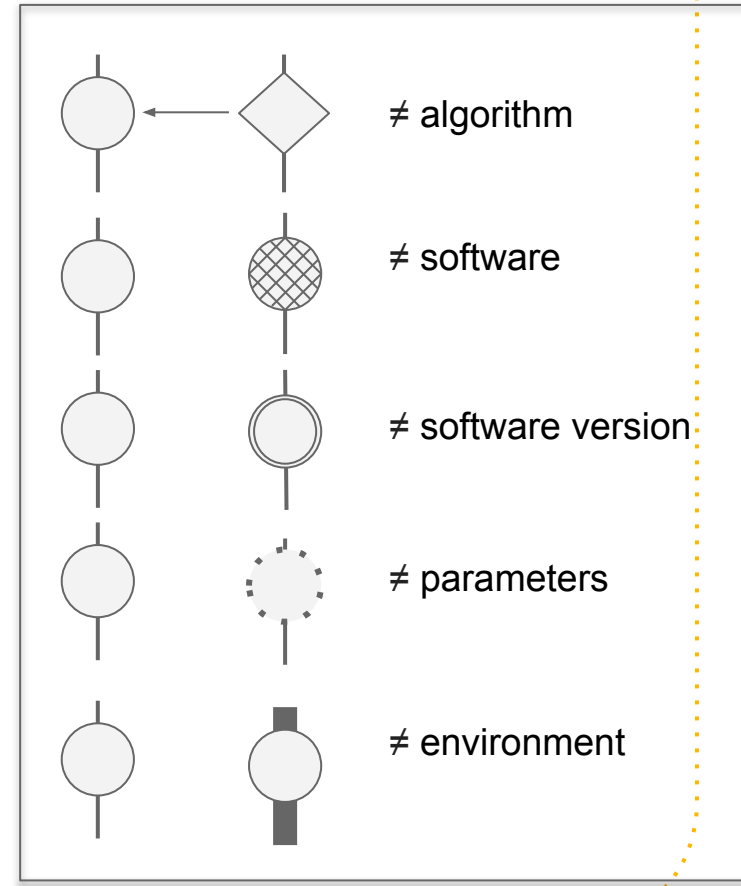
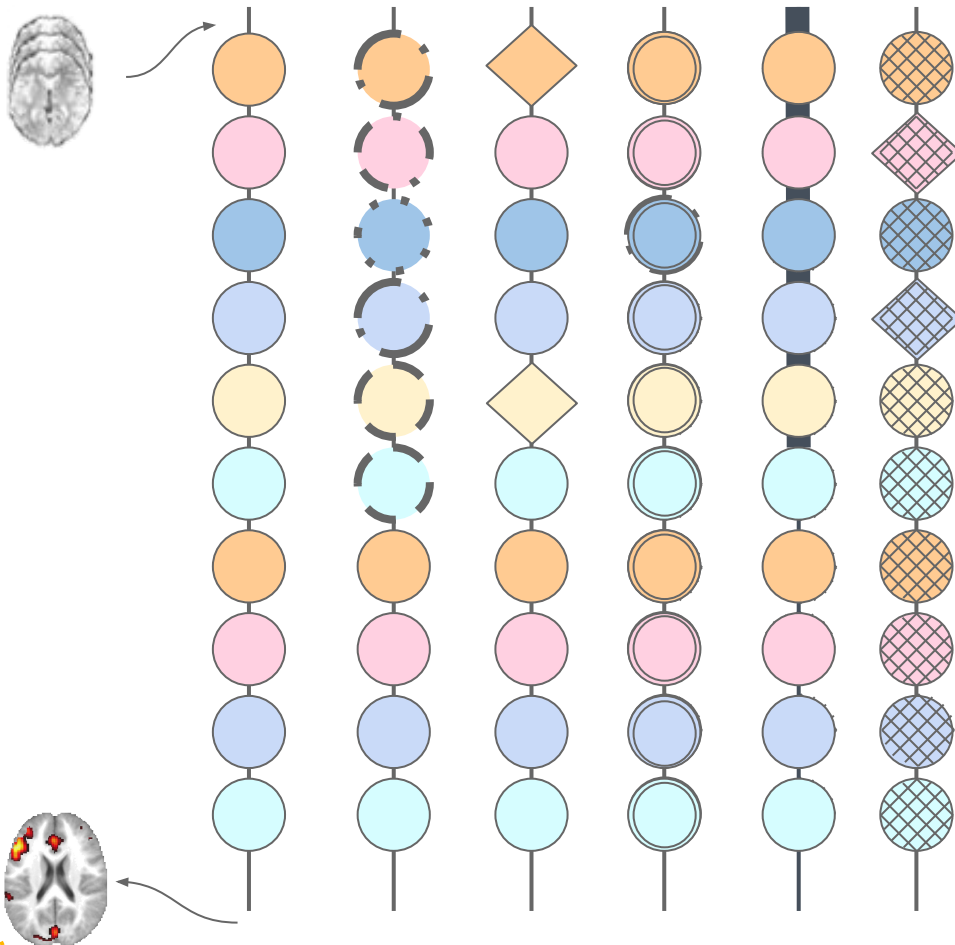
# Working with open data



# Analytic variability

“Different acceptable analysis methods”

Carp et al. (2012)





**July 10, 16.50** - The effect of analytical choices on fMRI findings

**Rotem Botvinik-Nezer**

# Question?

**How does analytic variability impact neuroimaging results?**



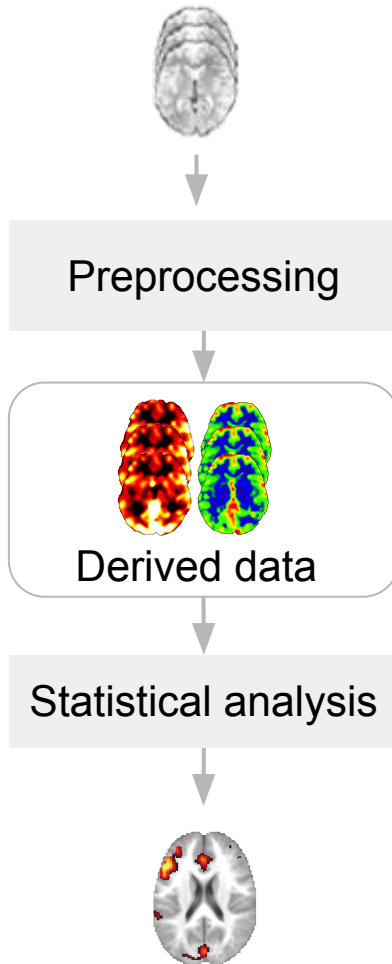
# BIDS Provenance



Satra Ghosh



Rémi Adon



BEP028	Provenance	Satra Ghosh and Camille Maumet	new BEP, actively looking for contributors and community input.
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Looking for contributors and community input

Join us!

Working together as  
a **community!**

# Brain standards by and for the community

# INCF



enabling open and  
FAIR neuroscience

## Working Groups/Special Interest Groups

Special Interest Groups are composed of users and developers from across the INCF network working collaboratively to develop, refine, and/or implement community standards. Working Groups are composed of SIG members working on short-term funded projects that aim to achieve a concrete deliverable.

### FAIR Metadata Working Group

The aim of this working group is the harmonization of Common Data Elements (CDEs) for data discovery and metadata annotation.  
[Read more](#)

### Neuroinformatics for cell types

This SIG will coordinate common efforts for defining and describing cell types across neuroscience, to reduce duplicate efforts and to improve interoperability and reuse of cell type-specific data collected across groups.  
[Read more](#)

### Reproducibility and Best Practices in Human Brain Imaging

The SIG aim is to collect, compile, synthesize and distribute information from task forces working on separate projects but with reproducibility in neuroimaging as an overarching theme.  
[Read more](#)

### Neuroimaging Quality Control (niQC)

This SIG aims to develop standards and best practices for quality control of neuroimaging data, including standardized protocols, easy to use tools and comprehensive manuals  
[Read more](#)

### Neuroinformatics for Aging

This SIG will be a community dedicated to the creation and application of neuroinformatics technologies to address clinical and wellness challenges in aging  
[Read more](#)

### Neuroshapes: Open SHACL schemas for FAIR neuroscience data

This SIG aims to coordinate community efforts for the development of open, use case driven and shared validatable data models (schemas, vocabularies) to enable the FAIR principles (Findable, Accessible, Interoperable and Reusable) for basic, computational and clinical neuroscience (meta)data.  
[Read more](#)

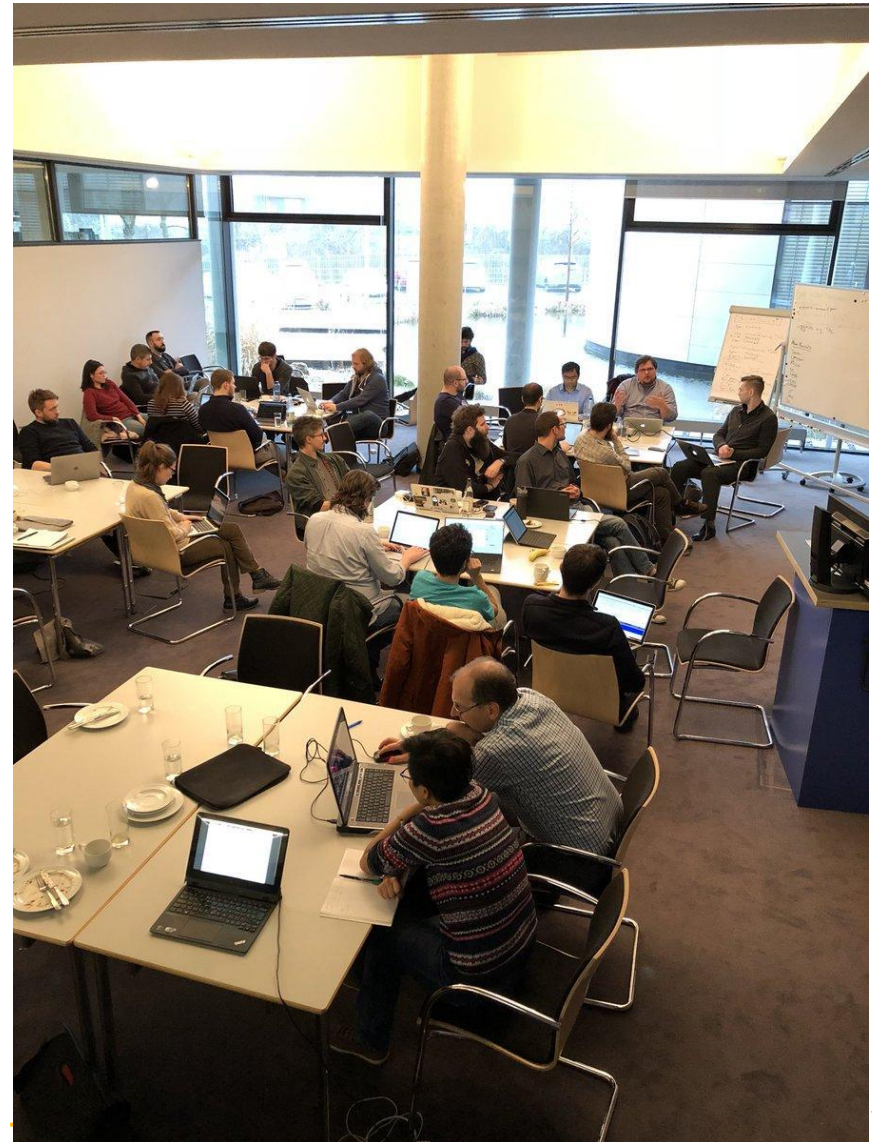
### Standardised Representations of Network Structures

This SIG deals with the various tools and formats for creating and sharing representations of biological neuronal networks, and will work towards ensuring these are as interoperable and usable as possible for computational neuroscientists.  
[Read more](#)

You can join a group or create your own!

# Researching collaboratively **brainhack.org** Hackathons

<b>BRAIN HACK OPEN GENEVA 2019</b> <b>BRAIN HACK</b> <b>OPEN GENEVA 2019</b> EVENTS 2019 Brainhack Open Geneva will take place from March 22-23, 2019 >>>	<b>BRAIN HACK IN PADOVA: EVOLUTION</b> <i>BrainHack: Evolution of the Mind and the Brain</i> EVENTS 2018 Brainhack in Padova will take place from December 5-7, 2018 >>>
<b>LA BRAINHACK 2018</b> <b>LA BRAINHACK 2018</b> EVENTS 2018 The LA Brainhack 2018 will take place November 18 - 19 at the Information Sciences Institute, Marina del Rey. >>>	<b>BRAIN HACK ZURICH 2018</b> <b>BRAIN HACK</b> Oct ZURICH 2018 EVENTS 2018 Brainhack Zurich 2018 will take place from October 24-26 at ETH Zurich & University Hospital Zurich. >>>
<b>2018 OHBM HACKATHON</b> <b>OHBM Brainhack 2018</b> Singapore June 14-16, 2018. EVENTS 2018 The 2018 OHBM Hackathon will take place June 14 - 16 at the National University of Singapore, U-Town campus, Singapore. >>>	<b>BRAIN HACK NETWORKS</b> EVENTS 2018 9 & 10 of June 2018, Brain and Spine Institute, Paris >>>





# Working open training

# Mozilla Open leaders

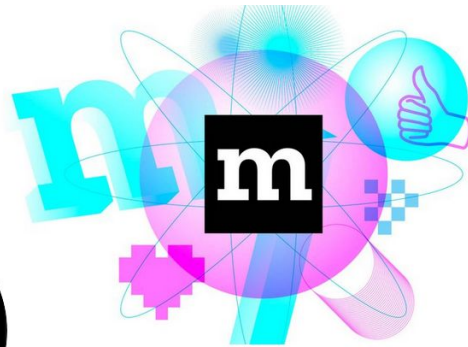


**Mozilla Open Leaders**

@MozOpenLeaders

Open Leaders are fueling the [#internethealth](#) movement.  
Work Open, Lead Open [#WOLO](#).

[mzl.la/openleaders](https://mzl.la/openleaders)  Joined October 2016



## Open Sesame (Cohort C)

Notes and full recording.



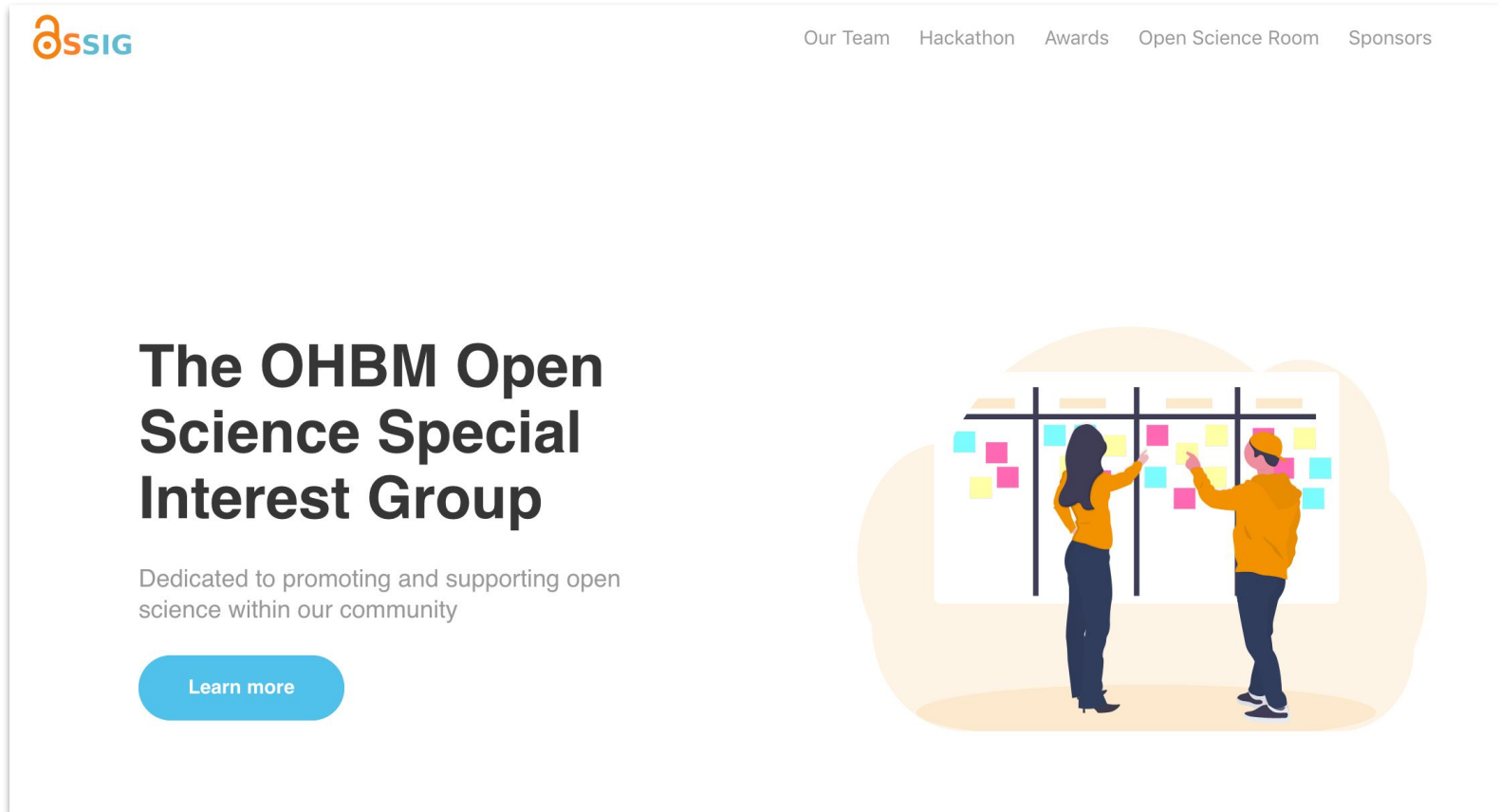
Source:

Some of the Open Sesame OL7 grads

<https://medium.com/read-write-participate/open-leaders-7-demos-recap-8cee3423dbb5>

# Developing open science in our community

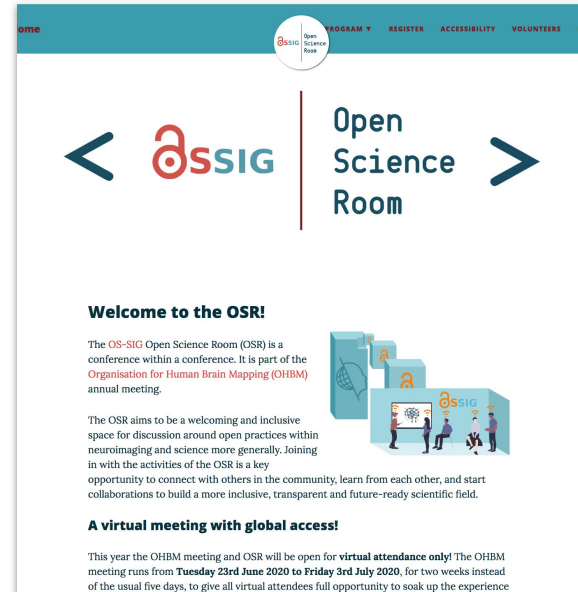
## OHBM Open Science SIG



The screenshot shows the website for the OHBM Open Science SIG. At the top left is the logo, which consists of a stylized orange 'a' followed by 'SSIG' in blue. To the right of the logo is a navigation menu with the following items: 'Our Team', 'Hackathon', 'Awards', 'Open Science Room', and 'Sponsors'. The main content area features a large heading: 'The OHBM Open Science Special Interest Group'. Below this heading is a sub-heading: 'Dedicated to promoting and supporting open science within our community'. At the bottom left of this section is a blue rounded rectangular button with the text 'Learn more'. On the right side of the page is a large illustration of two people, a woman and a man, standing in front of a whiteboard. The whiteboard is divided into a grid by black lines and is covered with various colored sticky notes (yellow, pink, blue, green). The woman is on the left, pointing at a sticky note, and the man is on the right, also pointing at a sticky note. The background of the illustration is a light orange color with a soft, cloud-like shape behind the whiteboard.

# Developing open science in our community

## OHBM Open Science SIG 2020



Rémi Gau



Liza Levitis



Cass  
Gould van Praag



Stephan  
Heunis

# Developing open science in our community

## OHBM Open Science SIG 2020



**Asia, Pacific**



**Europe, Middle East, Africa**



**Americas**



Rémi Gau



Liza Levitis



Cass  
Gould van Praag



Stephan  
Heunis



# Developing open science in our community

## OHBM Open Science SIG 2021

[Nominations are now open!](#) Details of the roles can be found [here](#) and **you can self-nominate [here](#) before July 20th 2020 at 11:59 pm anywhere on earth**

- General Chair Elect
- Secretary Elect
- Treasurer Elect
- Inclusivity Officer
- Hackathon Co-Chairs (two officers)
- Open Science Room Co-Chairs (two officers)

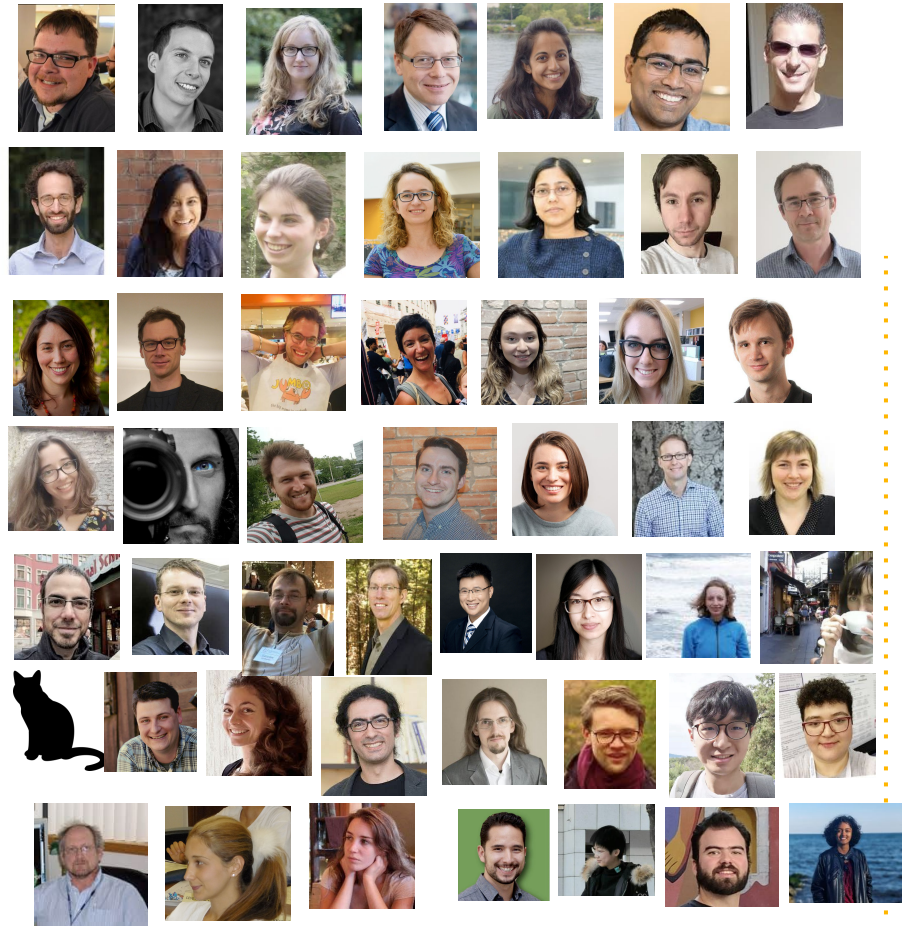


<https://ossig.netlify.app/>

# Thank you



<https://team.inria.fr/empenn/>



<https://ohbm.github.io/osr2020/volunteers/>

<https://ohbm.github.io/hackathon2020/team/>

# Building a more collaborative neuroimaging science

 @cmaumet  
camille.maumet@inria.fr

# Thank you!

Join the community:



Mozilla Open Leaders



 brainhack.org



enabling open and  
FAIR neuroscience