



HAL
open science

Let's do open neuroimaging sciences

Camille Maumet

► **To cite this version:**

Camille Maumet. Let's do open neuroimaging sciences. GEANT 2019 - Workshop GEstion et pArtage de données en NeuroinformaTique, May 2019, Marseille, France. pp.1-54. inserm-02146290

HAL Id: inserm-02146290

<https://inria.hal.science/inserm-02146290>

Submitted on 3 Jun 2019

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution 4.0 International License

Let's do open neuroimaging sciences

Camille Maumet



Univ Rennes, Inria, CNRS, Inserm
IRISA UMR 6074, Empenn ERL U-1228



GEANT workshop
May 21st, 2019

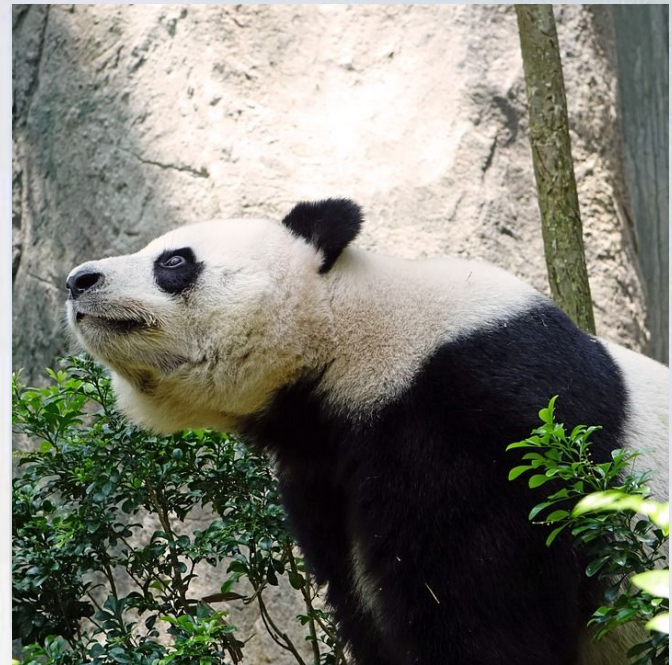
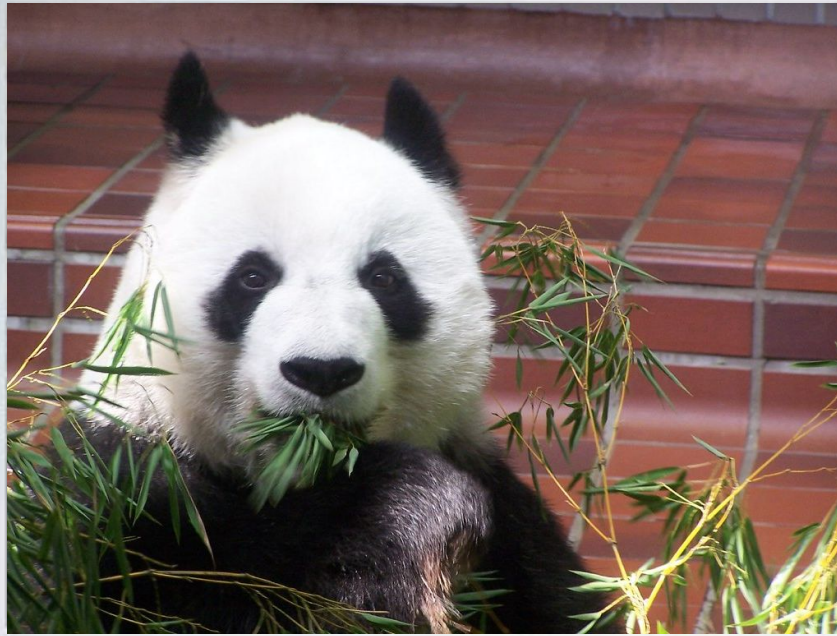


Why open?

Why open?

**Thoughts on
generalizability**

happy pandas

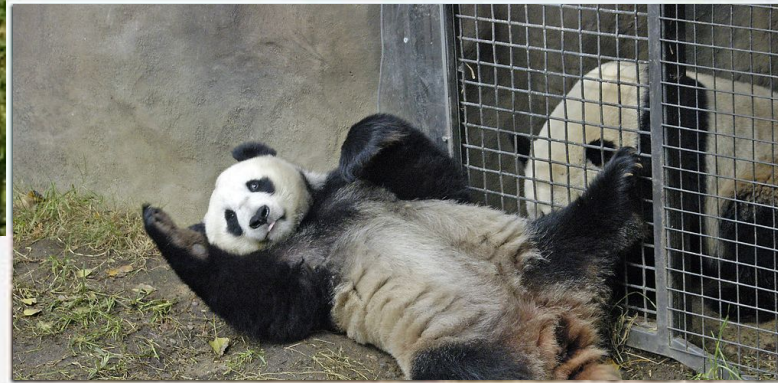


Slide by Tal Yarkoni (reused with permission), adapted.

Image credits: [Panda 1](#) by N. Rupert (CC BY-SA), [Panda 2](#) by Max Pixel (CC0), [Panda 3](#) by D. Silaraja (Free to use), [Panda 4](#) by N. Aishah (Free to use).



sad pandas



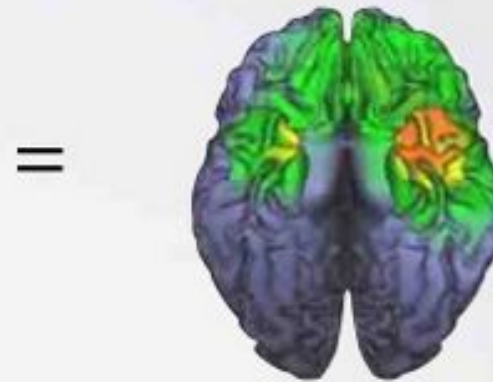
Slide by Tal Yarkoni (reused with permission), adapted.

Image credits: [Panda 1](#) by Shizhao (CC BY-SA), [Panda 2](#) by mozzercork (CC BY), [Panda 3](#) by SevenLittleThings (CC BY), [Panda 4](#) by auntie rain (CC BY-NC-SA).

Experimental manipulation



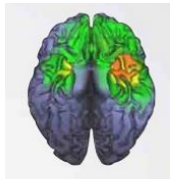
Emotion-related neural changes



Greater amygdala activation in response to affective mammalian expressions relative to neutral mammalian expressions

Sed ut perspiciatis unde omnis iste natus error sit voluptatem accusantium doloremque laudantium, totam rem aperiam, eaque ipsa quae ab illo inventore veritatis et quasi architecto beatae vitae dicta sunt explicabo. Nemo enim ipsam voluptatem quia voluptas sit aspernatur aut odit aut fugit, sed quia consequuntur magni dolores eos qui ratione voluptatem sequi nesciunt. Neque porro quisquam est, qui dolorem ipsum quia dolor sit amet.

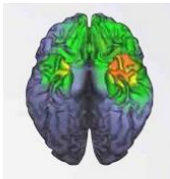
Consectetur, adipisci velit, sed quia non numquam eius modi tempora incidunt ut labore et dolore magnam aliquam quaerat voluptatem. Ut enim ad minima veniam, quis nostrum exercitationem ullam corporis suscipit laboriosam, nisi ut aliquid ex ea commodi consequatur? Quis autem vel eum iure reprehenderit qui in ea voluptate velit esse quam nihil molestiae consequatur, vel illum qui dolorem eum fugiat quo voluptas nulla pariatur?



Greater amygdala activation in response to affective mammalian expressions relative to neutral mammalian expressions

Sed ut perspiciatis unde omnis iste natus error sit voluptatem accusantium doloremque laudantium, totam rem aperiam, eaque ipsa quae ab illo inventore veritatis et quasi architecto beatae vitae dicta sunt explicabo. Nemo enim ipsam voluptatem quia voluptas sit aspernatur aut odit aut fugit, sed quia consequuntur magni dolores eos qui ratione voluptatem sequi nesciunt. Neque porro quisquam est, qui dolorem ipsum quia dolor sit amet.

Consectetur, adipisci velit, sed quia non numquam eius modi tempora incidunt ut labore et dolore magnam aliquam quaerat voluptatem. Ut enim ad minima veniam, quis nostrum exercitationem ullam corporis suscipit laboriosam, nisi ut aliquid ex ea commodi consequatur? Quis autem vel eum iure reprehenderit qui in ea voluptate velit esse quam nihil molestiae consequatur, vel illum qui dolorem eum fugiat quo voluptas nulla pariatur?

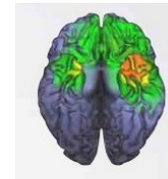


???

Greater amygdala activation in 22 UT-Austin undergraduates when viewing images **angsty_tree_panda.jpg** and **panda_delight.png** than image **pand_goes_meh.jpg**

Sed ut perspiciatis unde omnis iste natus error sit voluptatem accusantium doloremque laudantium, totam rem aperiam, eaque ipsa quae ab illo inventore veritatis et quasi architecto beatae vitae dicta sunt explicabo. Nemo enim ipsam voluptatem quia voluptas sit aspernatur aut odit aut fugit, sed quia consequuntur magni dolores eos qui ratione voluptatem sequi nesciunt. Neque porro quisquam est, qui dolorem ipsum quia dolor sit amet.

Consectetur, adipisci velit, sed quia non numquam eius modi tempora incidunt ut labore et dolore magnam aliquam quaerat voluptatem. Ut enim ad minima veniam, quis nostrum exercitationem ullam corporis suscipit laboriosam, nisi ut aliquid ex ea commodi consequatur? Quis autem vel eum iure reprehenderit qui in ea voluptate velit esse quam nihil molestiae consequatur, vel illum qui dolorem eum fugiat quo voluptas nulla pariatur?

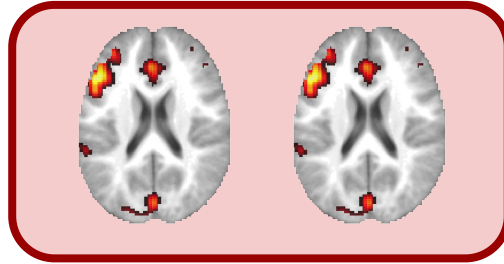


**How can we get
there?**

**How can we get
there?**

**Variations on
reproducibility**

Robustness to generalizability

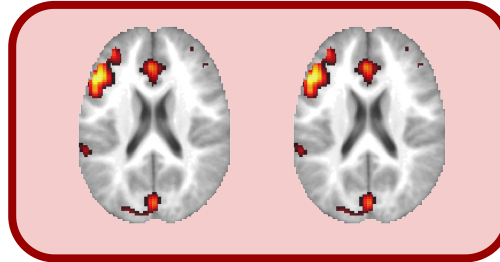


Robustness



Generalizability

Robustness to generalizability



Repeat

Same lab
Same experiment
Same settings

Reproduce

Different lab
Same experiment
Different settings

Replicate

Different lab
Same experiment
Same settings

Robustness



Generalizability

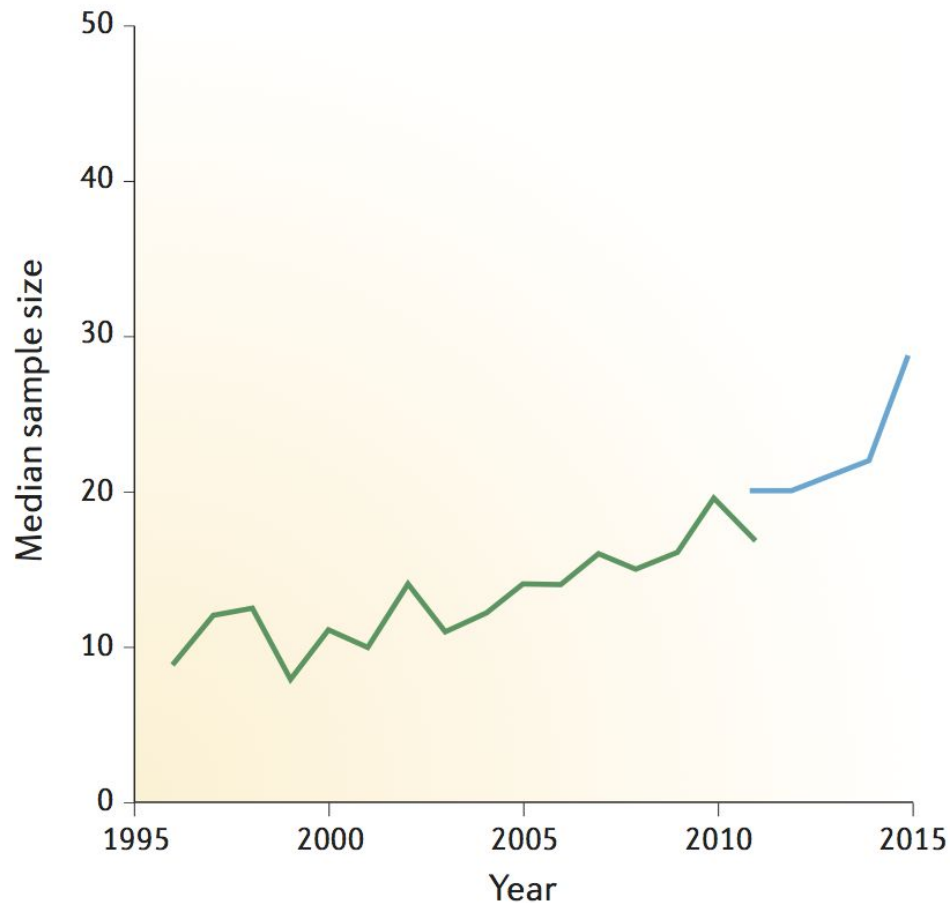
Table B1. Levels of Reproducibility

This table provides an incomplete taxonomy of types of consistency of neuroimaging results. For each type of consistency (row), the variable (column) that is held constant (•, bullet) or allowed to vary (D=different) is indicated. In each instance, a bullet (•) indicates the exact same setting; for the variable "Subject" this means the very same acquired data is used, while a double bullet (••) indicates the same subjects are scanned multiple times. Examples of different Experimental Methods include fundamental changes like an event-related design vs. a block design; examples of different Experimental Code/Stimuli, include different sets of pictures used in a visual working memory experiment, or using different paradigm software; an example of different Stimuli Type would be number vs. shape vs. image stimuli in a working memory experiment. An example of different analysis methods for intrasubject (first level) fMRI data would be a confirmatory regression-based modelling vs. an exploratory data-driven method like independent components analysis; examples of different analysis code would be intrasubject fMRI fit with a regression model in two different software packages.

| Type of Stability | Investigator | Experimental Method | Stimuli Type | Experimental Code/Stimuli | Subject Population | Subjects | Scanner | Acquisition Day | Data Analyst | Analysis Method | Analysis Code |
|--|--------------|---------------------|--------------|---------------------------|--------------------|----------|---------|-----------------|--------------|-----------------|---------------|
| Measurement Stability | | | | | | | | | | | |
| ISO Repeatability e.g. 30-minute intra-scanner reliability | • | • | • | • | • | •• | • | • | • | • | • |
| ISO Intermediate Reproducibility e.g. 7-day intra-scanner reliability | • | • | • | • | • | •• | • | D | • | • | • |
| ISO Reproducibility e.g. 7-day inter-scanner reliability | • | • | • | • | • | •• | D | D | • | • | • |
| Analytical Stability | | | | | | | | | | | |
| Analysis Replicability | • | • | • | • | • | • | • | • | • | • | • |
| Collegial Analysis Replicability | • | • | • | • | • | • | • | • | D | • | • |
| Peng's Reproducibility | D | • | • | • | • | • | • | • | D | • | • |
| Generalisability over ... | | | | | | | | | | | |
| Subjects (Near Replicability) | • | • | • | • | • | D | • | D | • | • | • |
| Labs (Intermediate Replicability) | D | • | • | D | • | D | D | D | D | • | D |
| Experimental & Analytical methods (Far Replicability) | D | D | • | D | • | D | D | D | D | D | D |
| Subject & Stimulus Populations (Hypothesis Generalisability) | D | D | D | D | D | D | D | D | D | D | D |

[Nichols et. al, Nature Neuroscience 2017]

Sample sizes in neuroimaging

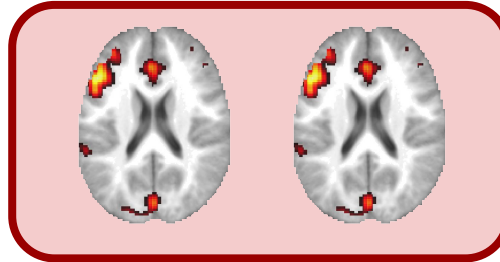


2015: 30 participants

Low diversity &
Low statistical power

[Poldrack et. al, Nature Neuroscience 2017]

Robustness to generalizability



Repeat

Same lab
Same experiment
Same settings

Reproduce

Different lab
Same experiment
Different settings

Replicate

Different lab
Same experiment
Same settings

Re-use

Different lab
Different experiment
Different settings

Robustness



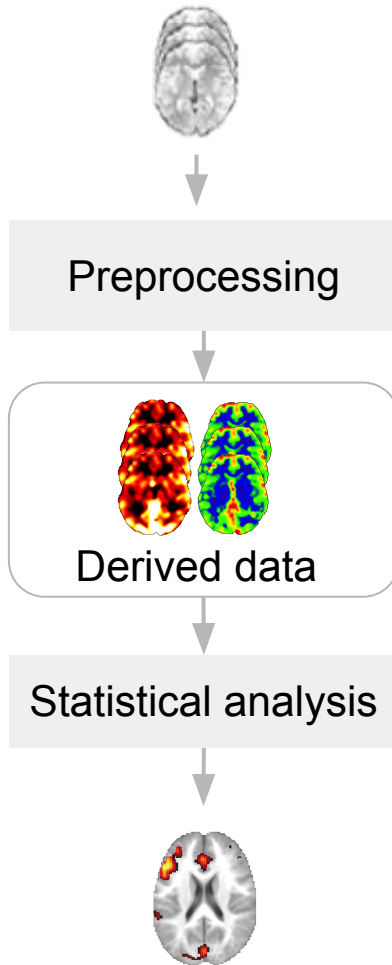
Generalizability

On our way...

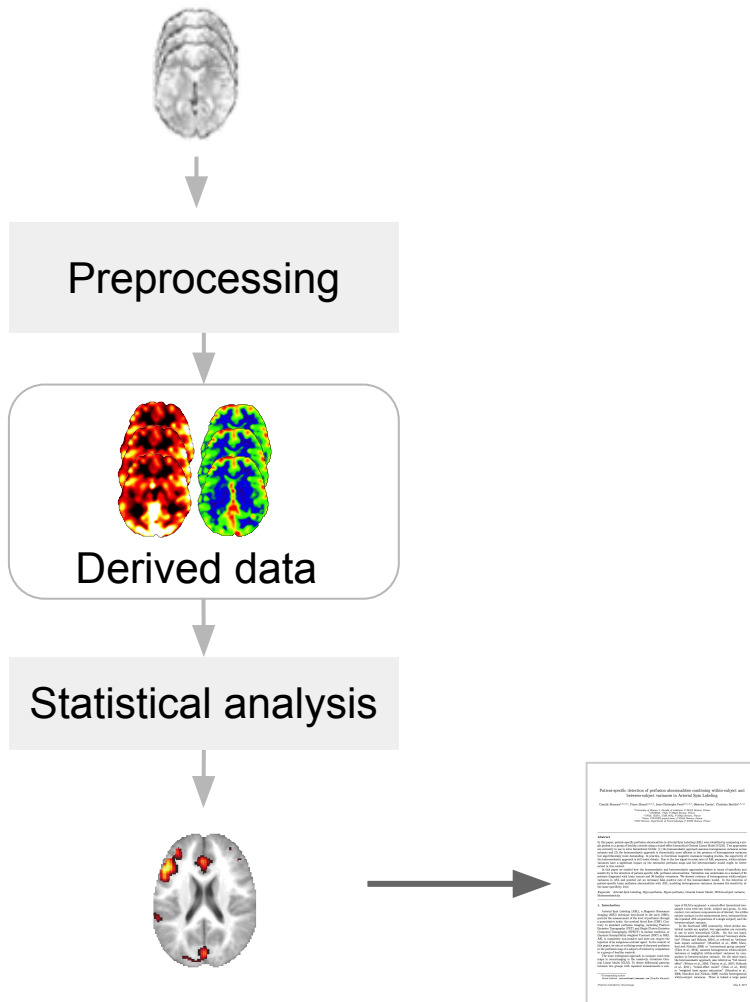
On our way...

**Tools & standards to
publish our research**

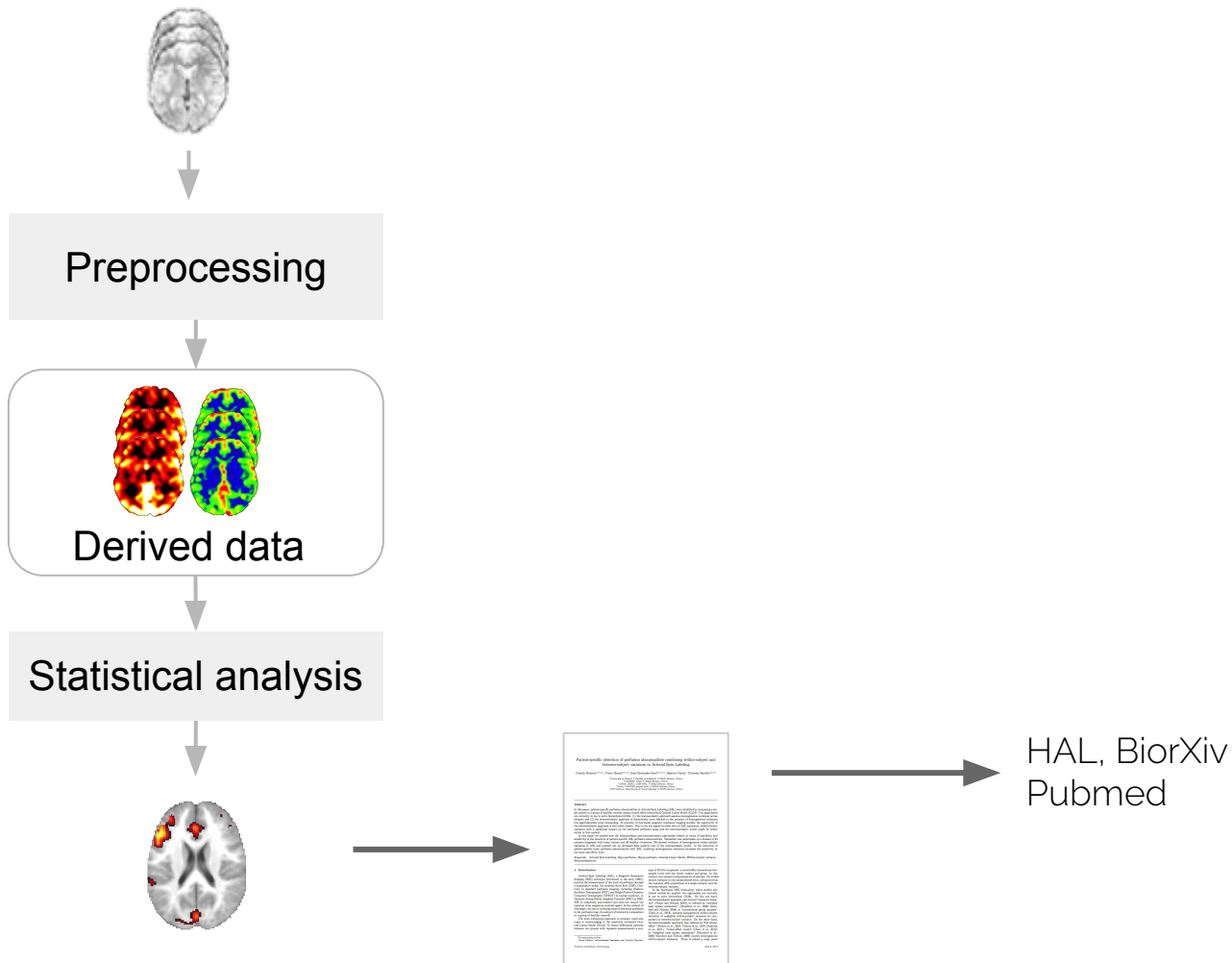
Publishing research artefacts



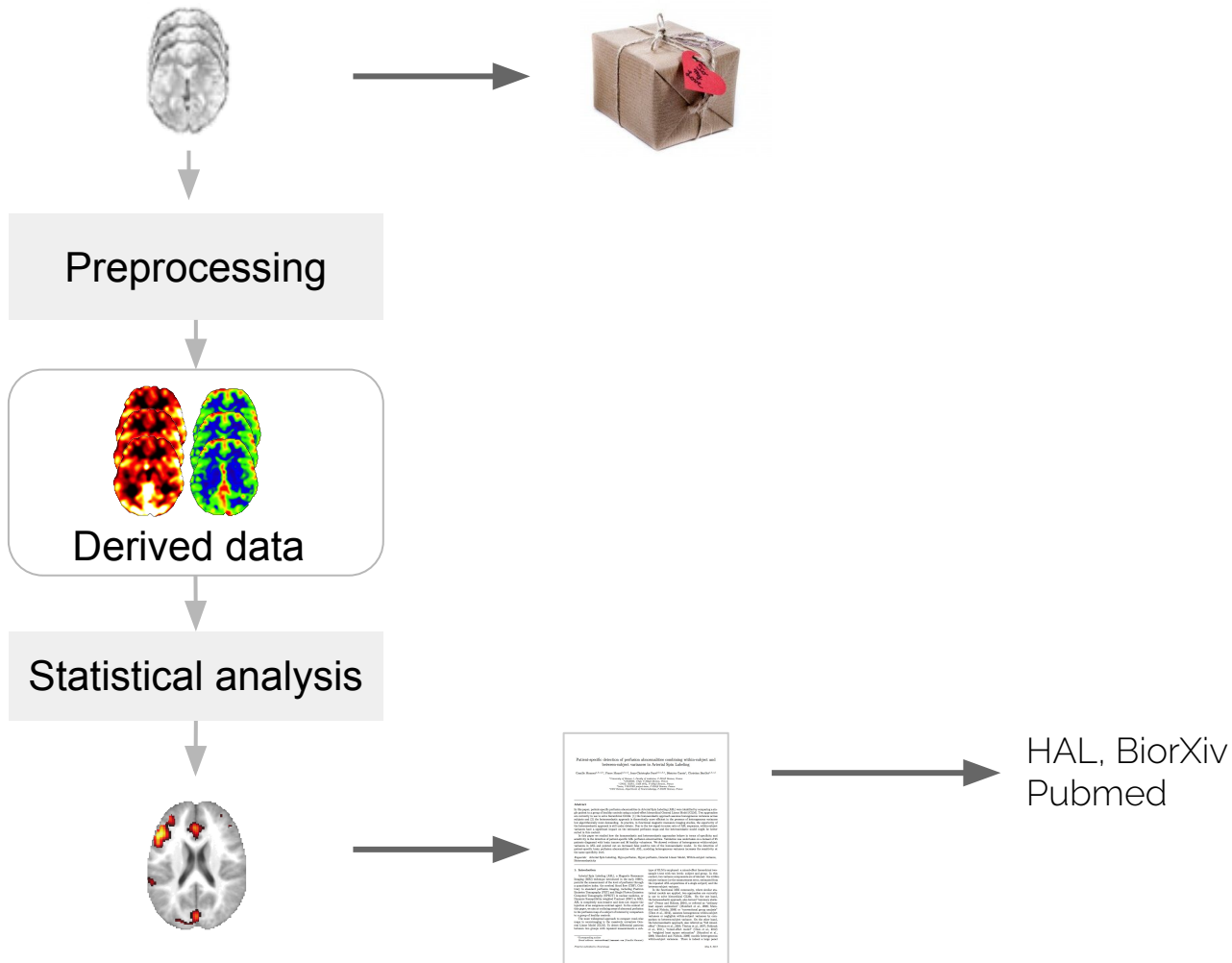
Publishing research artefacts



Publishing research artefacts



Publishing research artefacts



Brain Imaging Data Structure (BIDS)

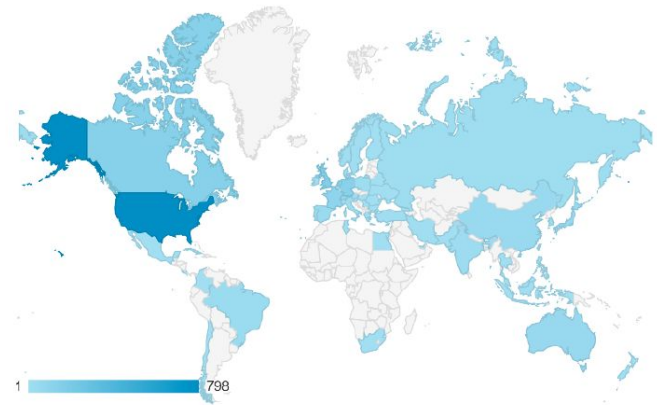
```
my_dataset/  
├── participants.tsv  
├── sub-01/  
│   ├── anat/  
│   │   └── sub-01_T1w.nii.gz  
│   ├── func/  
│   │   ├── sub-01_task-rest_bold.nii.gz  
│   │   └── sub-01_task-rest_bold.json  
│   └── dwi/  
│       ├── sub-01_dwi.nii.gz  
│       ├── sub-01_dwi.json  
│       ├── sub-01_dwi.bval  
│       └── sub-01_dwi.bvec  
├── sub-02/  
├── sub-03/  
└── sub-04/
```

[Gorgolewski et. al, Sci. Data 2016]

BIDS adoption

- Used in over 60 labs around the world
- Adopted by: FCP-INDI, Developing Human Connectome, SchizConnect and Donders Data repository.
- Anonymized data from over 20,000 participants formatted in BIDS are publicly available
- >300 members of mailing list
- Extensions: MEG, iEEG, EEG (just released)

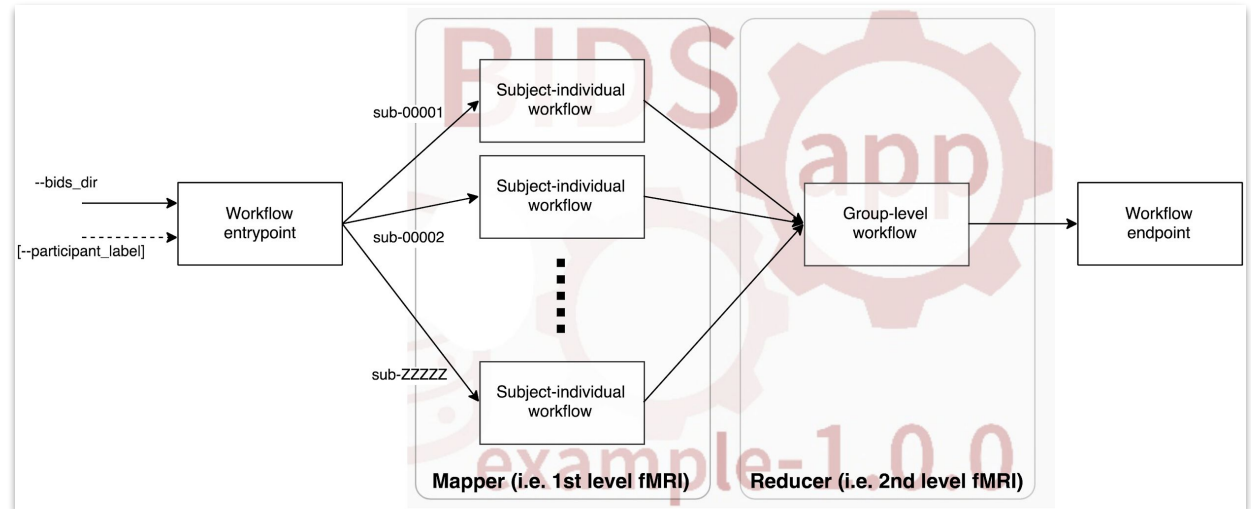
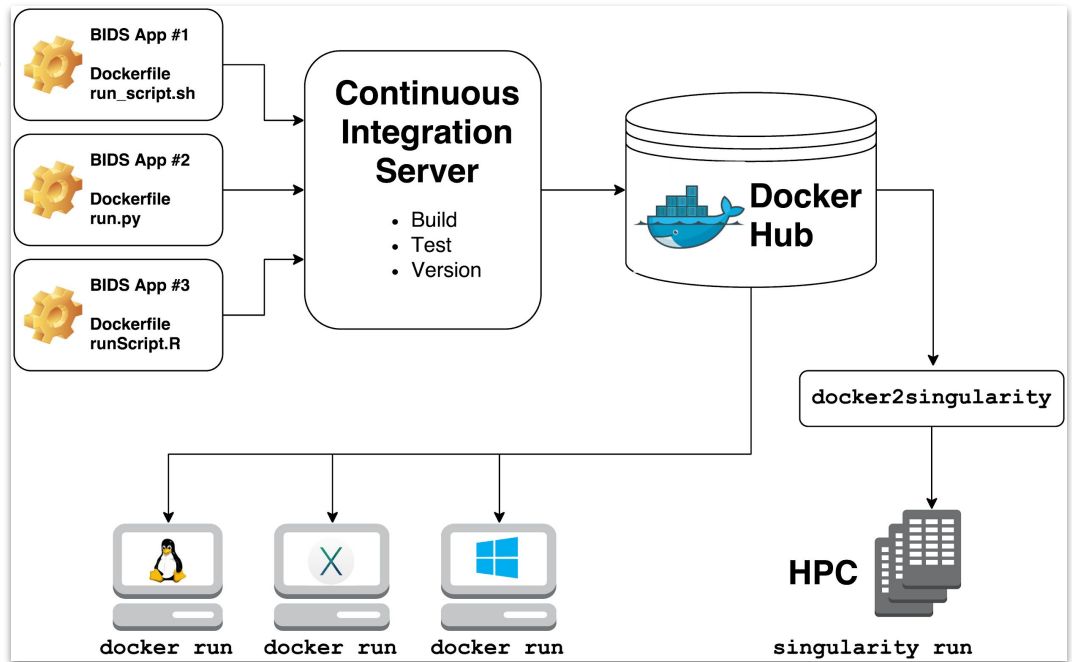
Traffic to bids.neuroimaging.io



~1.8K visitors per month

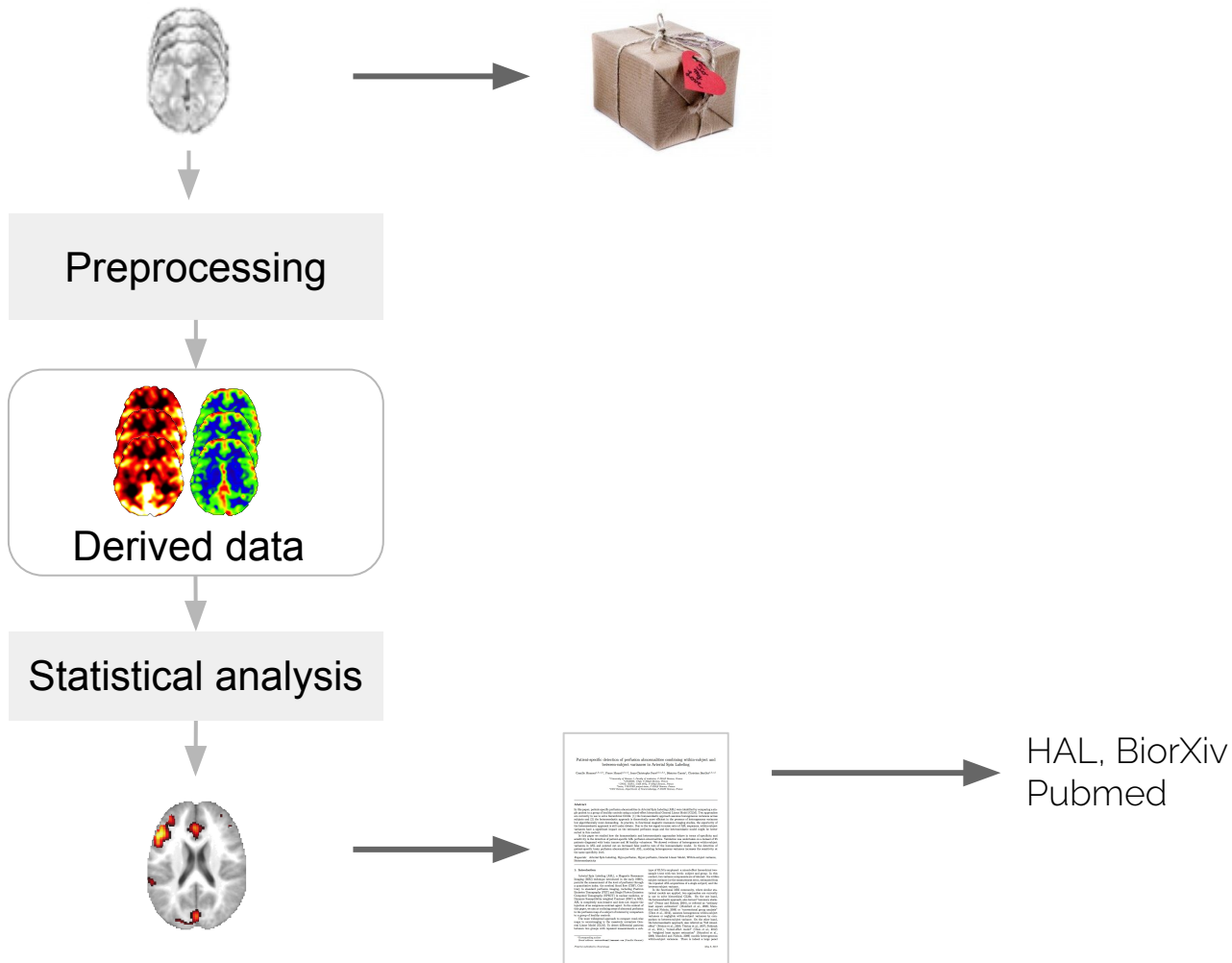
BIDS-apps

| | |
|---------------------------------------|--------------------|
| BIDS-Apps/example | version 0.0.7 |
| BIDS-Apps/freesurfer | version |
| BIDS-Apps/ndmg | version v0.1.0 |
| BIDS-Apps/BROCCOLI | version v1.0.1 |
| BIDS-Apps/FibreDensityAndCrosssection | version v0.0.1 |
| BIDS-Apps/SPM | version v0.0.15 |
| poldracklab/mriqc | version 0.15.0 |
| BIDS-Apps/QAP | Image not found |
| BIDS-Apps/CPAC | version v1.0.1a_22 |
| BIDS-Apps/hyperalignment | Image not found |
| BIDS-Apps/mindboggle | version 0.0.4-1 |
| BIDS-Apps/MRtrix3_connectome | version latest |
| BIDS-Apps/rs_signal_extract | version 0.1 |
| BIDS-Apps/aa | version v0.2.0 |
| BIDS-Apps/niak | version latest |
| BIDS-Apps/oppni | version v0.7.0-1 |
| poldracklab/fmriprep | version 1.4.1rc1 |
| BIDS-Apps/brainiak-srm | version latest |
| BIDS-Apps/nipypelines | version 0.3.0 |
| BIDS-Apps/HCPPIipelines | version v3.17.0-18 |
| BIDS-Apps/MAGeTbrain | Image not found |
| BIDS-Apps/tracula | version v6.0.0-4 |
| BIDS-Apps/baracus | Image not found |
| BIDS-Apps/antsCorticalThickness | version v2.2.0-1 |
| BIDS-Apps/DPARSF | version v4.3.12 |
| BIDS-Apps/afni-proc | Image not found |
| BIDS-Apps/rsHRF | version 1.0.0 |

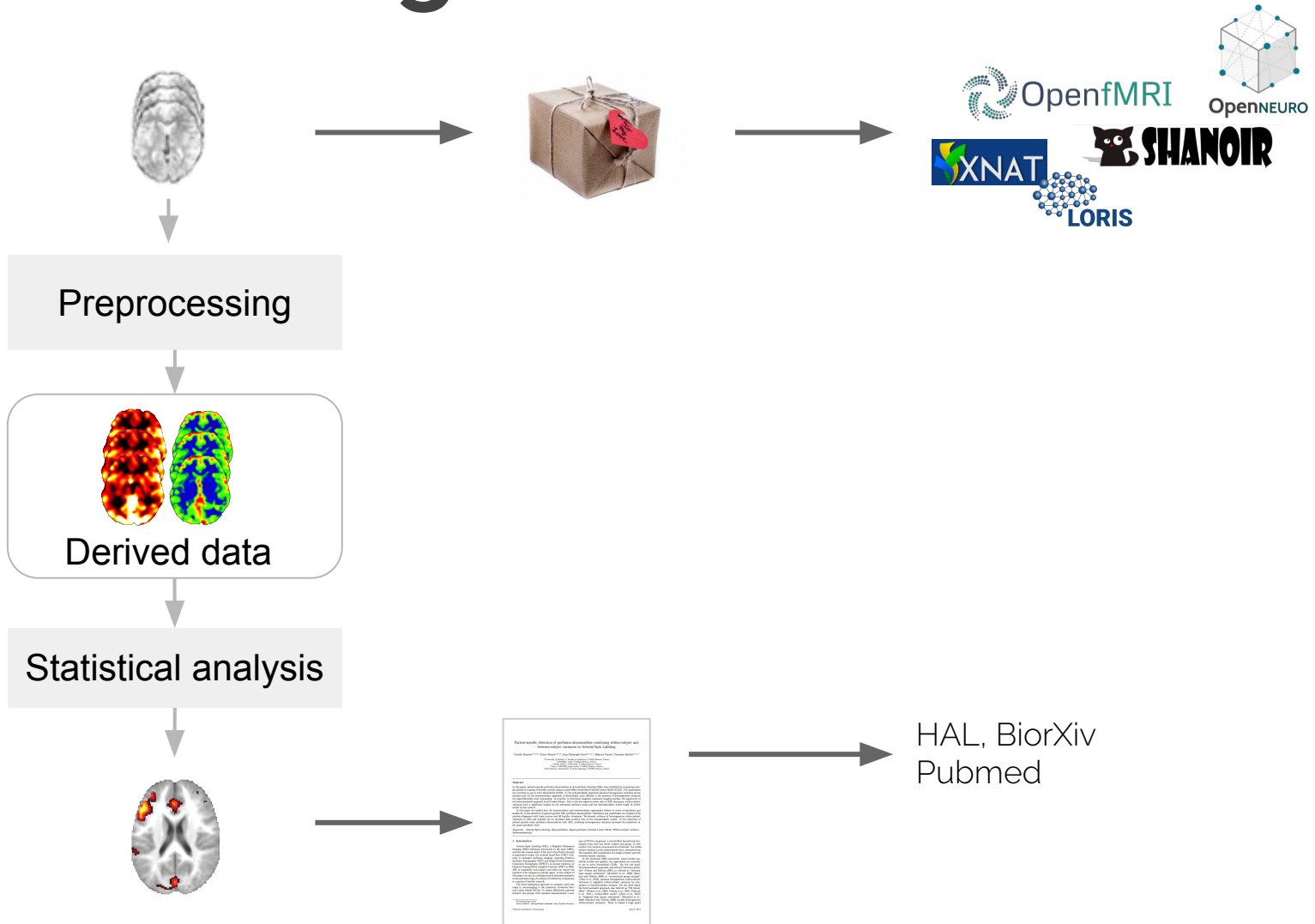


[Gorgolewski et. al, Plos Comp. Bio. 2017]

Publishing research artefacts



Publishing research artefacts



Publishing research artefacts

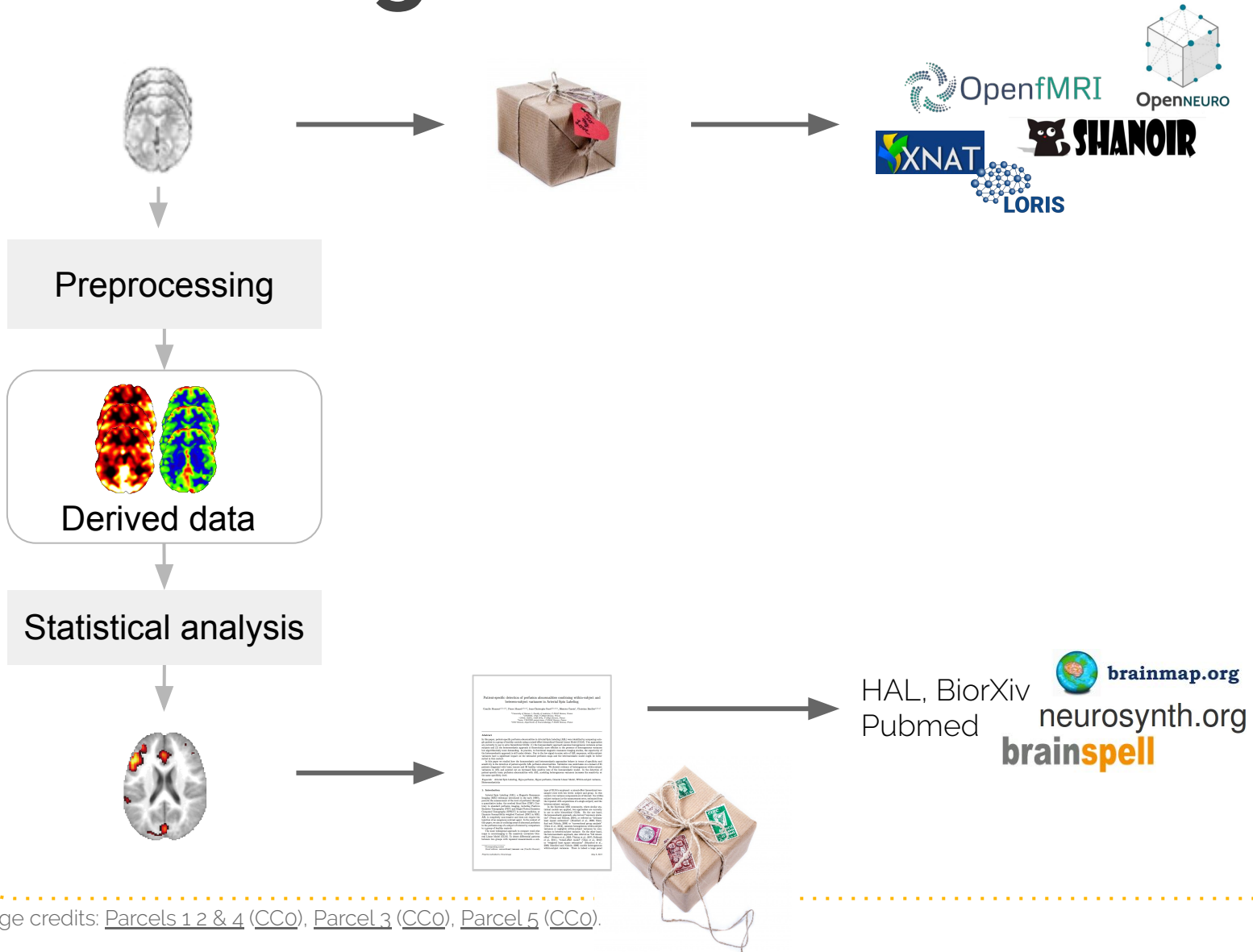
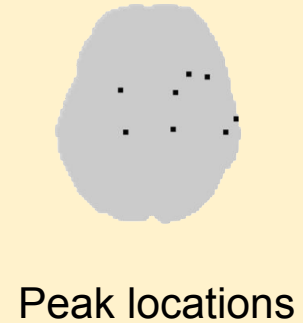
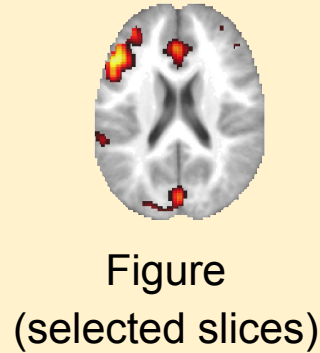


Image credits: [Parcels 1 2 & 4 \(CC0\)](#), [Parcel 3 \(CC0\)](#), [Parcel 5 \(CC0\)](#).

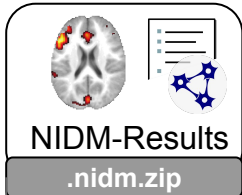
fMRI Results

Publication



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

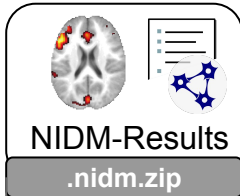
NIDM-Results pack



- 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

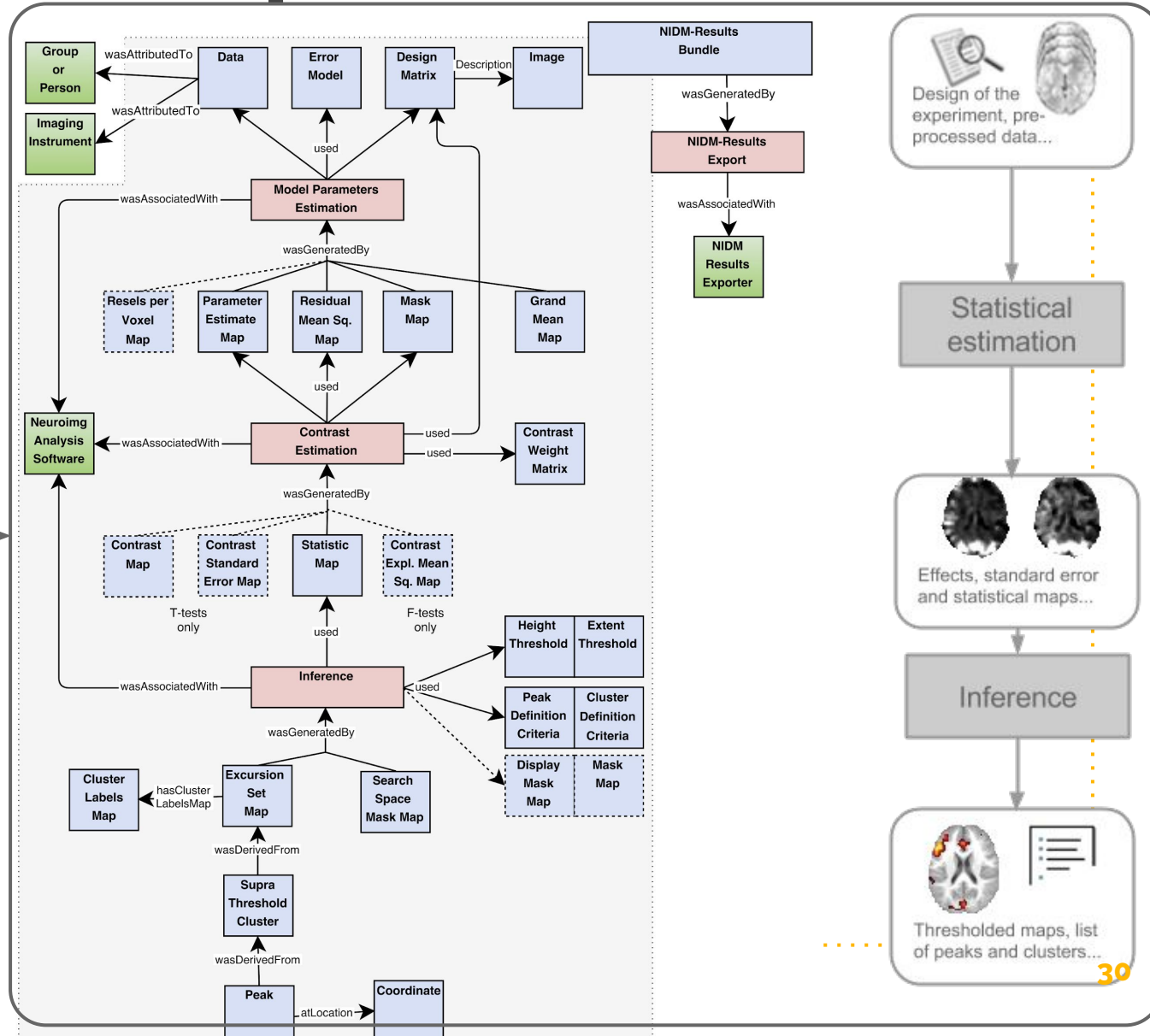
[Maumet et al.,
Sci. Data 2016]

NIDM-Results pack



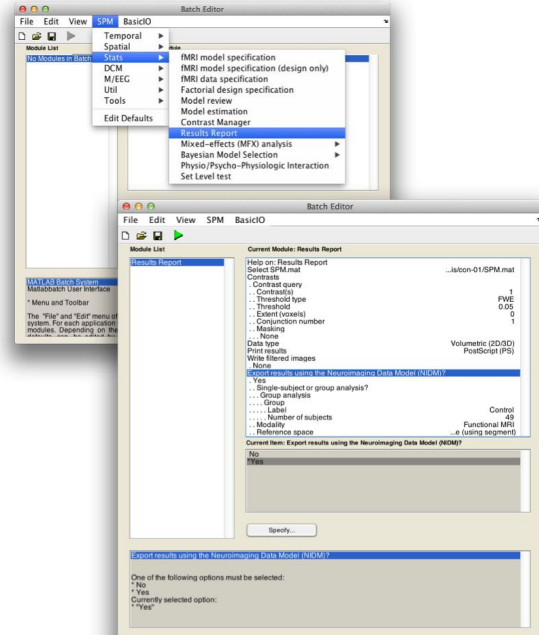
- ClusterLabels.nii.gz
- Contrast.nii.gz
- ContrastStandardError.nii.gz
- DesignMatrix.csv
- DesignMatrix.png
- ExcursionSet.nii.gz
- ExcursionSet.png
- GrandMean.nii.gz
- Mask.nii.gz
- nidm.json
- nidm.ttl
- ParameterEstimate_001.nii.gz
- ParameterEstimate_002.nii.gz
- ResidualMeanSquares.nii.gz
- SearchSpaceMask.nii.gz
- TStatistic.nii.gz
- ZStatistic.nii.gz

[Maumet et al.,
Sci. Data 2016]



NIDM in SPM, FSL & NeuroVault

SPM

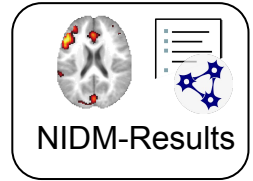


1. Export



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

2. Publication on NeuroVault



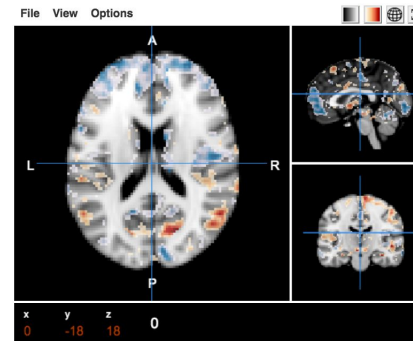
A Correspondence between Individual Differences in the Brain's Intrinsic Functional Architecture and the Content and Form of Self-Generated Thoughts

Contributed by ChrisFilioGorgolewski

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



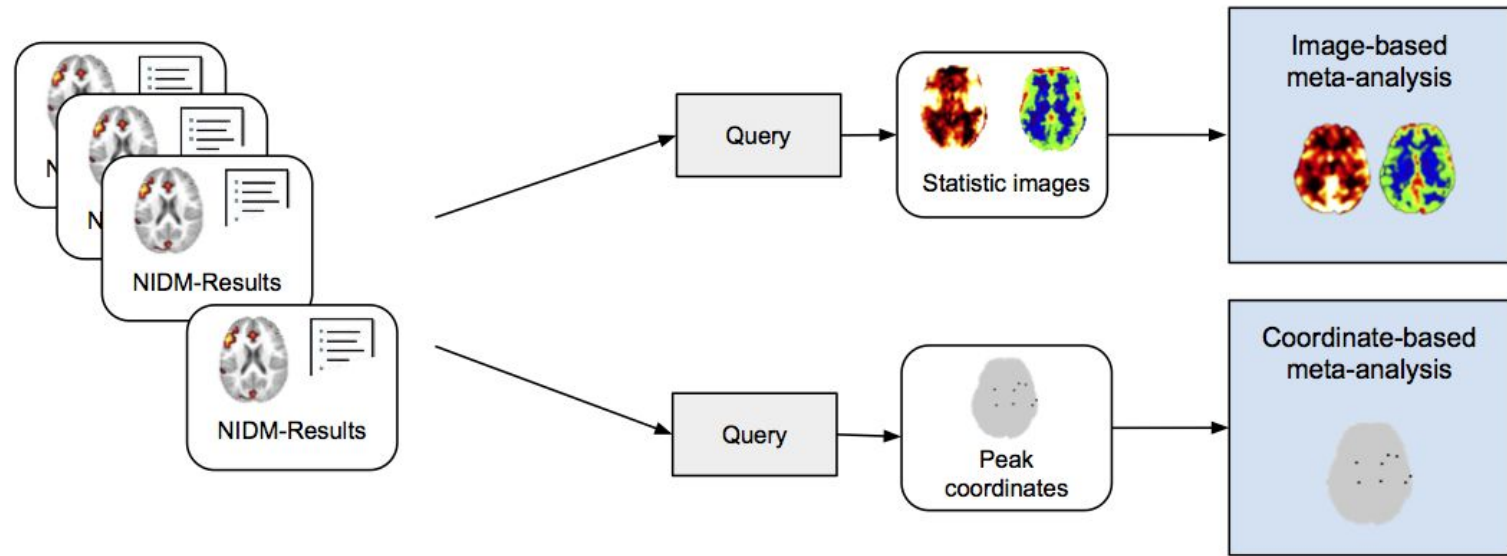
Images Details

Show 7 entries Search:

| View | ID | Name | Type |
|------|----|----------------------------|-------|
| | 25 | fALFF: Past | Z map |
| | 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

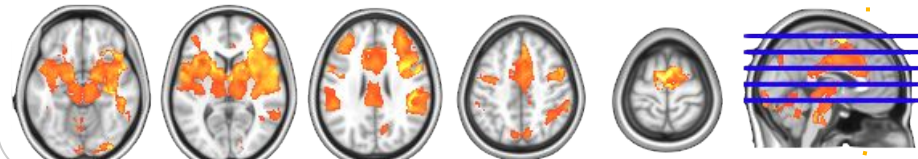
Meta-analysis w/ NIDM-Results



Coordinate-based meta-analysis



Image-based meta-analysis



Publishing research artefacts

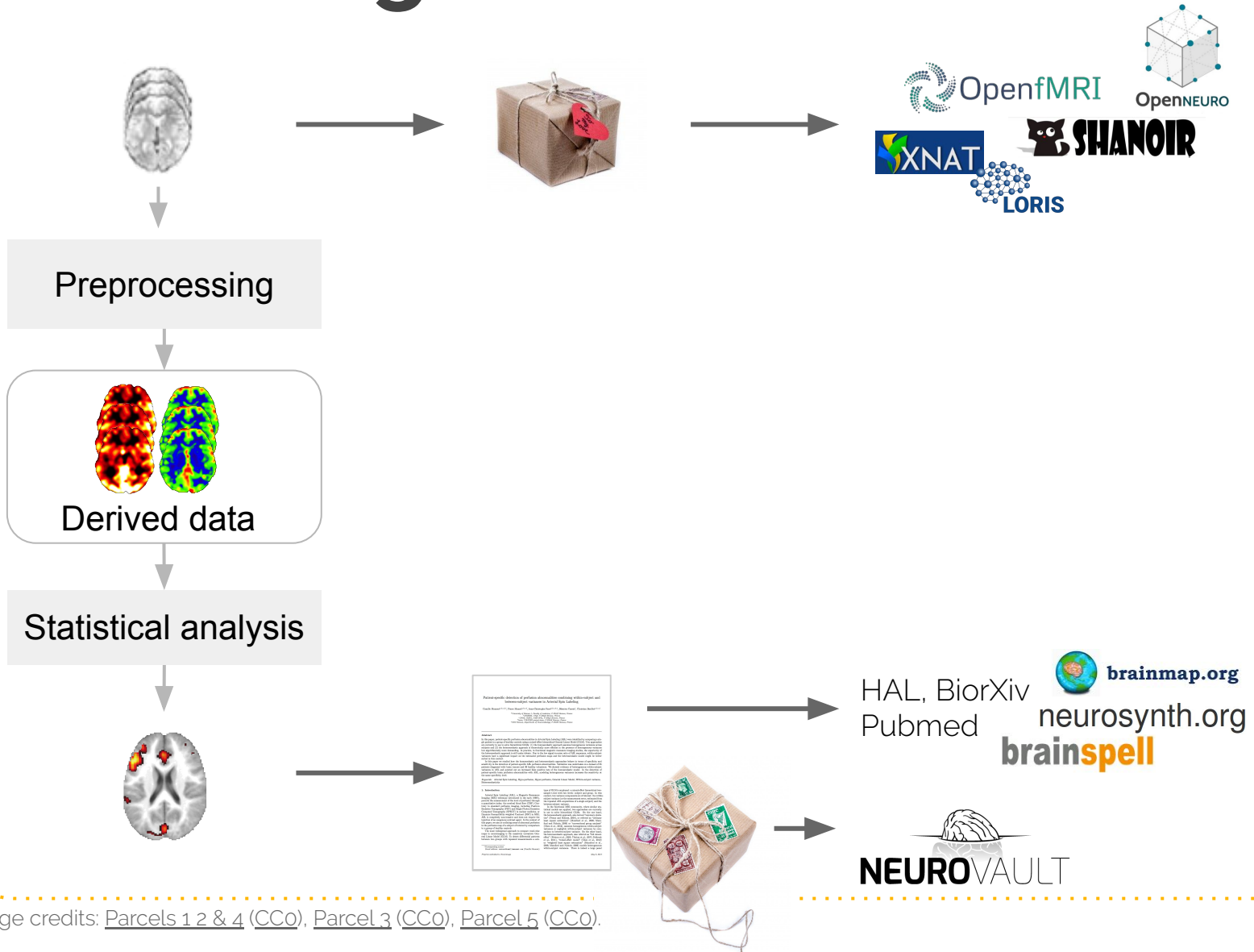


Image credits: [Parcels 1 2 & 4 \(CC0\)](#), [Parcel 3 \(CC0\)](#), [Parcel 5 \(CC0\)](#).

Publishing research artefacts

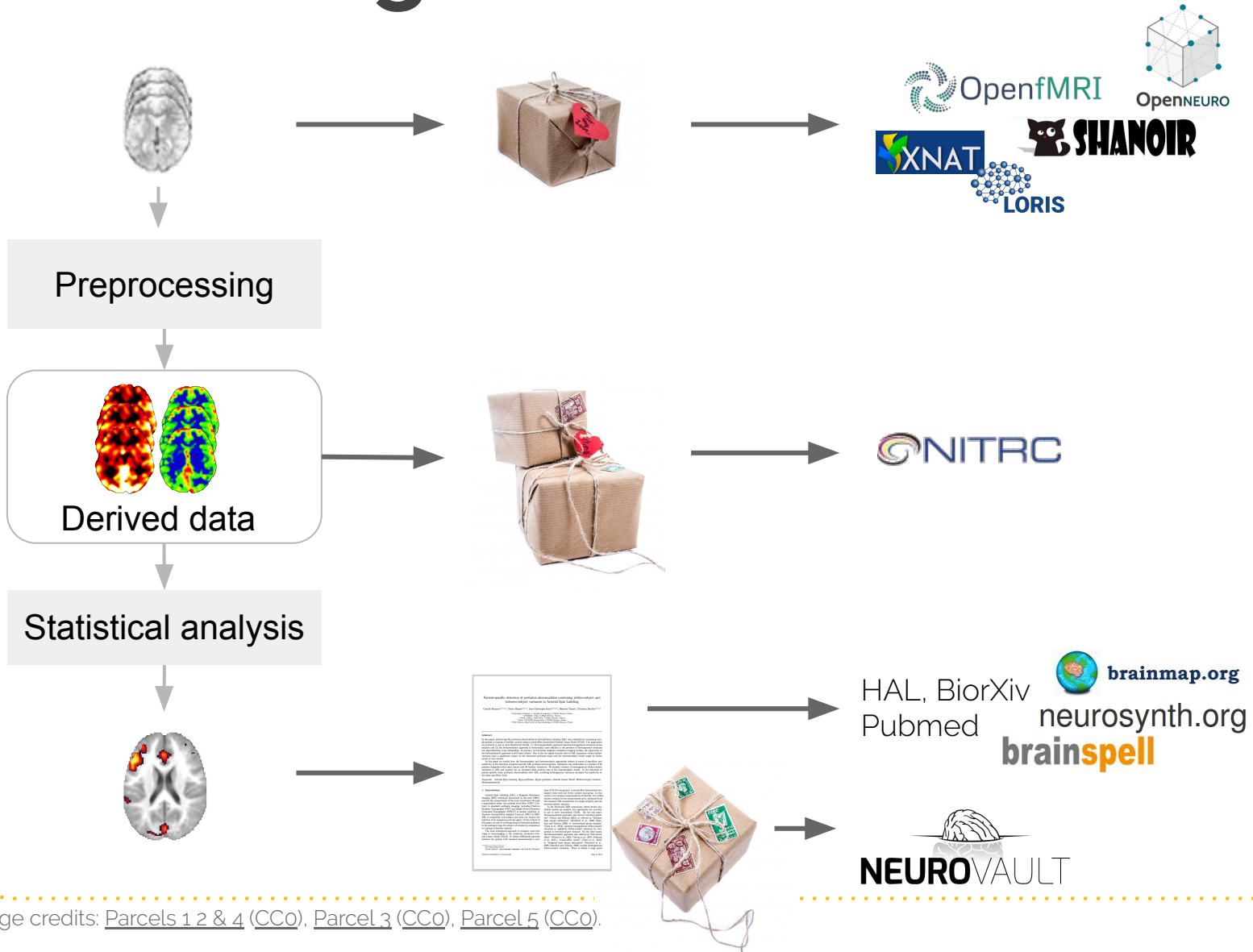
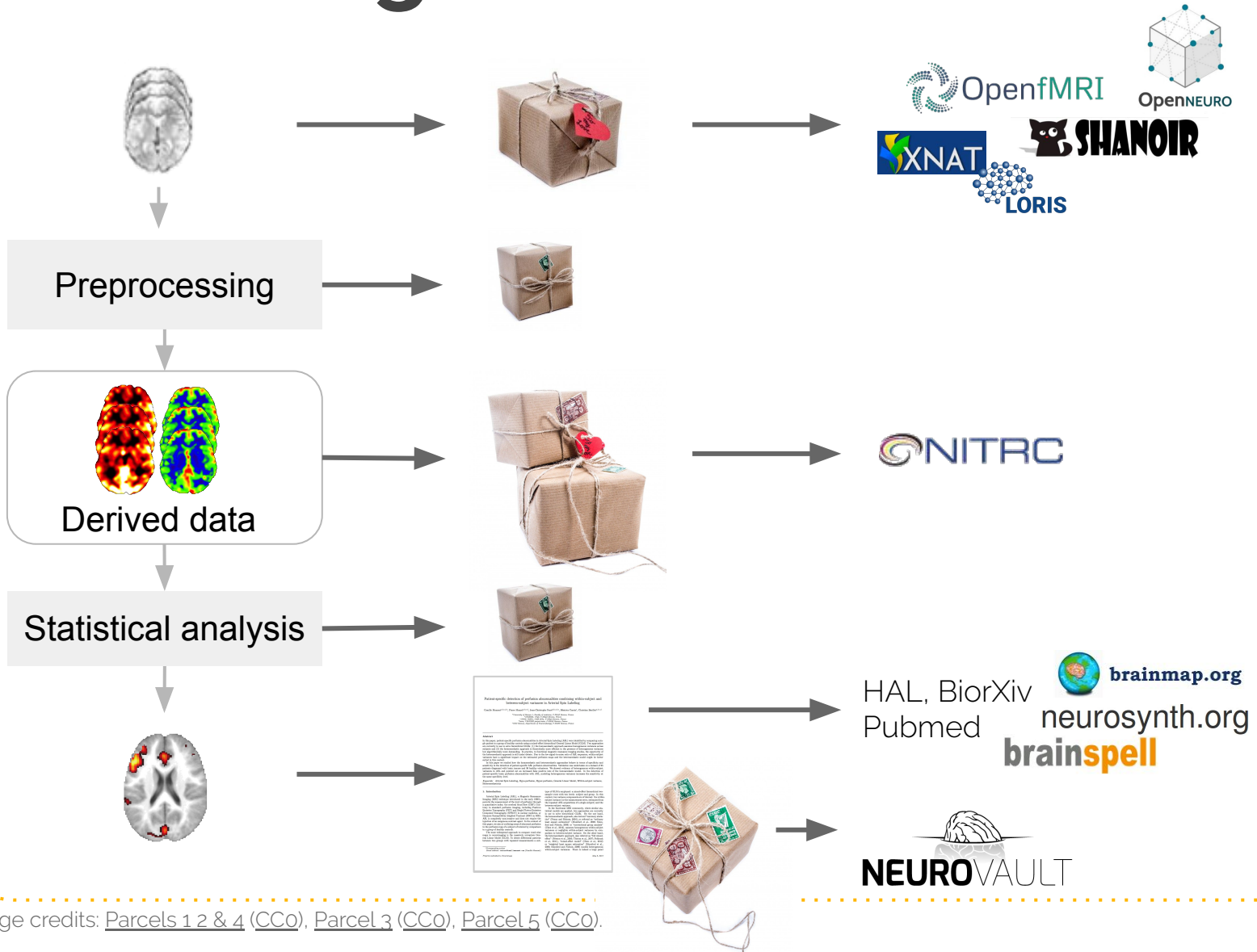
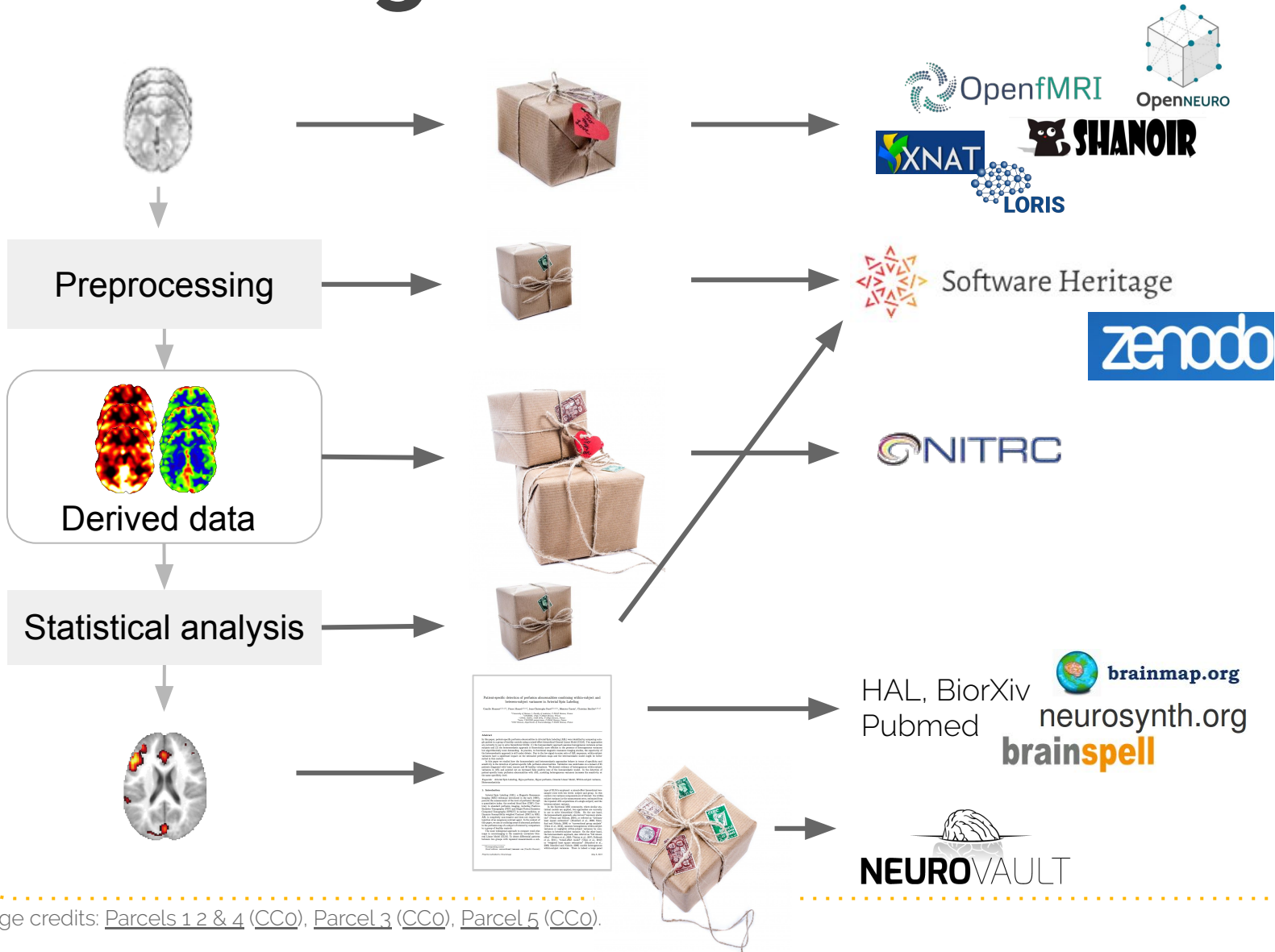


Image credits: [Parcels 1 2 & 4 \(CC0\)](#), [Parcel 3 \(CC0\)](#), [Parcel 5 \(CC0\)](#).

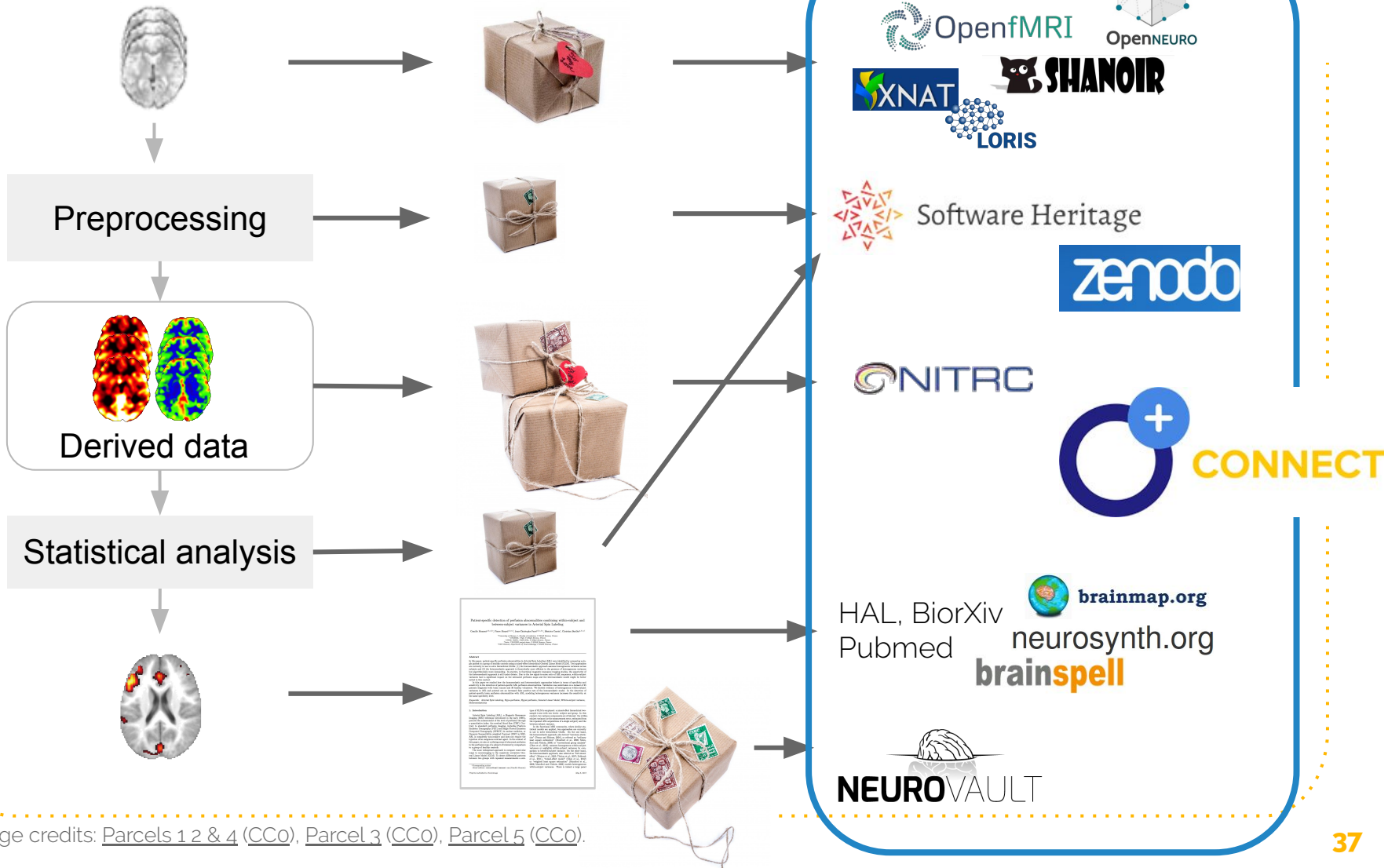
Publishing research artefacts



Publishing research artefacts



Publishing research artefacts



On our way...

**Linking it all with
openAIRE-Connect**

The background of the slide features silhouettes of several people running on a beach. The scene is overlaid with a semi-transparent blue filter. The people are captured in various dynamic poses, suggesting movement and energy. The beach and ocean are visible in the background, though slightly blurred.

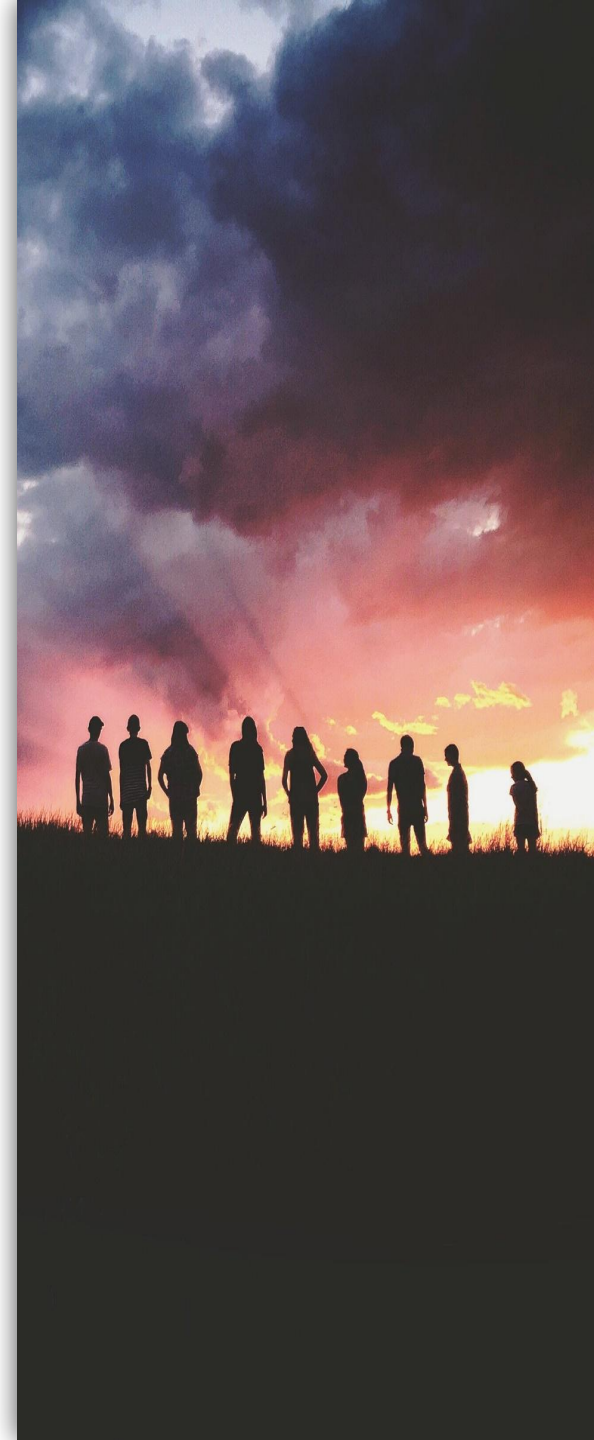
Research Community Dashboard

A window to community's research.

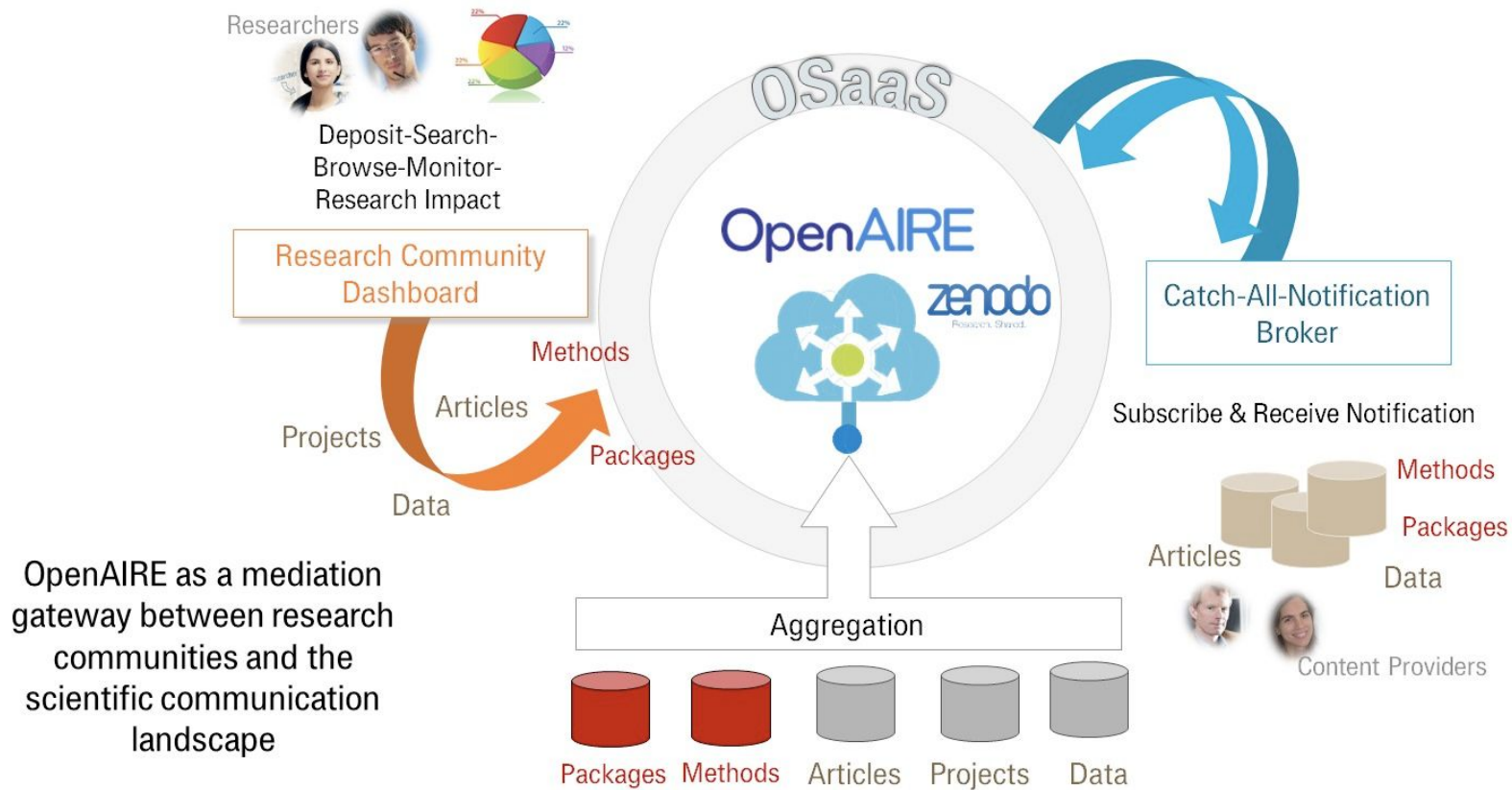
Open Science as a Service

**Open Science as-a-Service
for Research Communities**

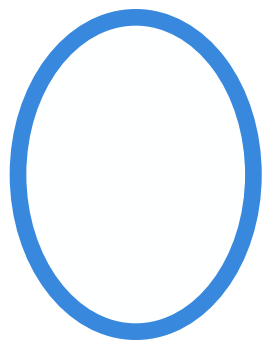
**Facilitate Research Communities
adoption of Open Science
publishing principles by supporting
artefact publishing tools
as-a-Service**



Open Science as-a-Service (OSaaS)

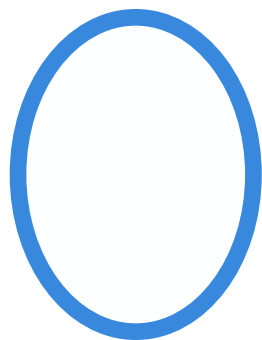


A virtual environment designed for your Community



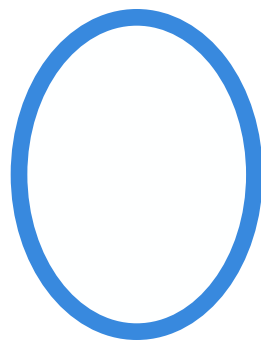
Implement

the latest Open Science trends:
FAIR data, open data



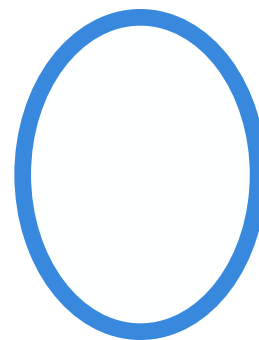
Share

all your research results:
publications, data, software, methods



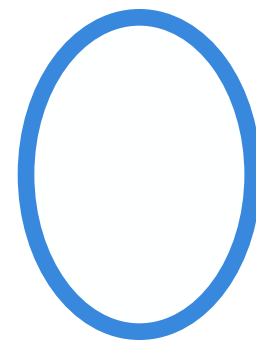
Link

all your research effectively



Gather

all your research results in one place



Monitor

and report your community's progress

Community dashboards



Sustainable Development Solutions Network - Greece

RESEARCH COMMUNITY

The Greek United Nations (UN) Sustainable Development Solutions Network (SDSN)

Subscribe



Agricultural and Food Sciences

RESEARCH COMMUNITY

The scope of this community is to provide access to publications, research data, projects and software that are related to agricultural and food sciences

Subscribe



Common Language Resources and Technology Infrastructure

RESEARCH INITIATIVE

CLARIN

Subscribe



Fisheries and Aquaculture Management

RESEARCH COMMUNITY

Conservation of marine resources for sustainable development

Subscribe



European Marine Science

RESEARCH COMMUNITY

This community was initially defined to include a very broad range of topics, with the intention to generate a number of more focused and sustainable dashboards for research communities and initiatives. As outlined in the logo of this community, we intend to setup a community dashboard for EuroMarine (a consortium of 56 research and academic organisations) and monitoring dashboards for marine research initiatives,



Neuroinformatics

RESEARCH COMMUNITY

Subscribe

Neuroinformatics: monitor

24,024

publications

5,083

research data

150

software

2,375

other research
products

8

projects

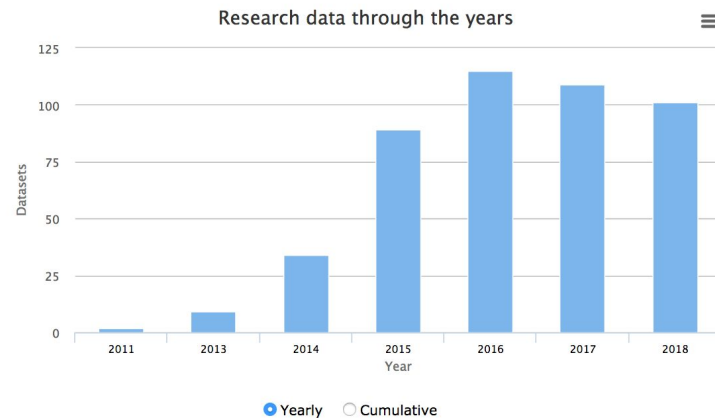
6

content providers

Research Data statistics

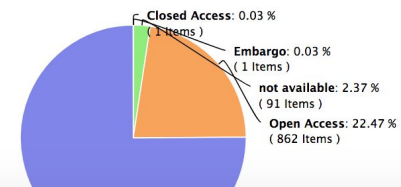
789 DATASETS LINKED TO 1 PROJECT.

681 ARE OA , 1 IS CLOSED AND 1 IS STILL IN EMBARGO.




from OpenAIRE via HighCharts (date: 20/5/2019)


Research data by access mode



Neuroinformatics: link



Neuroinformatics

SEARCH MONITOR SHARE LINK CAMILLE MAUMET 


Exploring the Impact of Analysis Software on Task fMRI Results

PREPRINT ENGLISH OPEN









Nichols, Thomas ; Maumet, Camille ; Bowring, Alexander (2018)

Publisher: HAL CCSD
Subject: [SDV.NEU] Life Sciences [q-bio]/Neurons and Cognition [q-bio.NC]



A wealth of analysis tools are available to fMRI researchers in order to extract patterns of task variation and, ultimately, understand cognitive function. However, this 'methodological plurality' comes with a drawback. While conceptually similar, two different analysis pipelines applied on the same dataset may not produce the same scientific results. Differences in methods, implementations across software packages, and even operating systems or software versions all contribute to this variability. Consequently, attention in the field has recently been directed to reproducibility and data sharing. Neuroimaging is currently experiencing a surge in initiatives to improve research practices and ensure that all conclusions inferred from an fMRI study are replicable. In this work, our goal is to understand how choice of software package impacts on analysis results. We use publically shared data from three published task fMRI neuroimaging studies, reanalyzing each study using the three main neuroimaging software packages, AFNI, FSL and SPM, using parametric and nonparametric inference. We obtain all information on how to process, analyze, and model each dataset from the publications. We make quantitative and qualitative comparisons between our replications to gauge the scale of variability in our results and assess the fundamental differences between each software package. While qualitatively we find broad similarities between packages, we also discover marked differences, such as Dice similarity coefficients ranging from 0.000-0.743 in comparisons of thresholded statistic maps between software. We discuss the challenges involved in trying to reanalyse the published studies, and highlight our own efforts to make this research reproducible.

Metrics 

Share - Bookmark


Download from


 OpenAIRE via OpenAIRE (Preprint, 2018) 




Related to

Neuroinformatics

Cite this publication

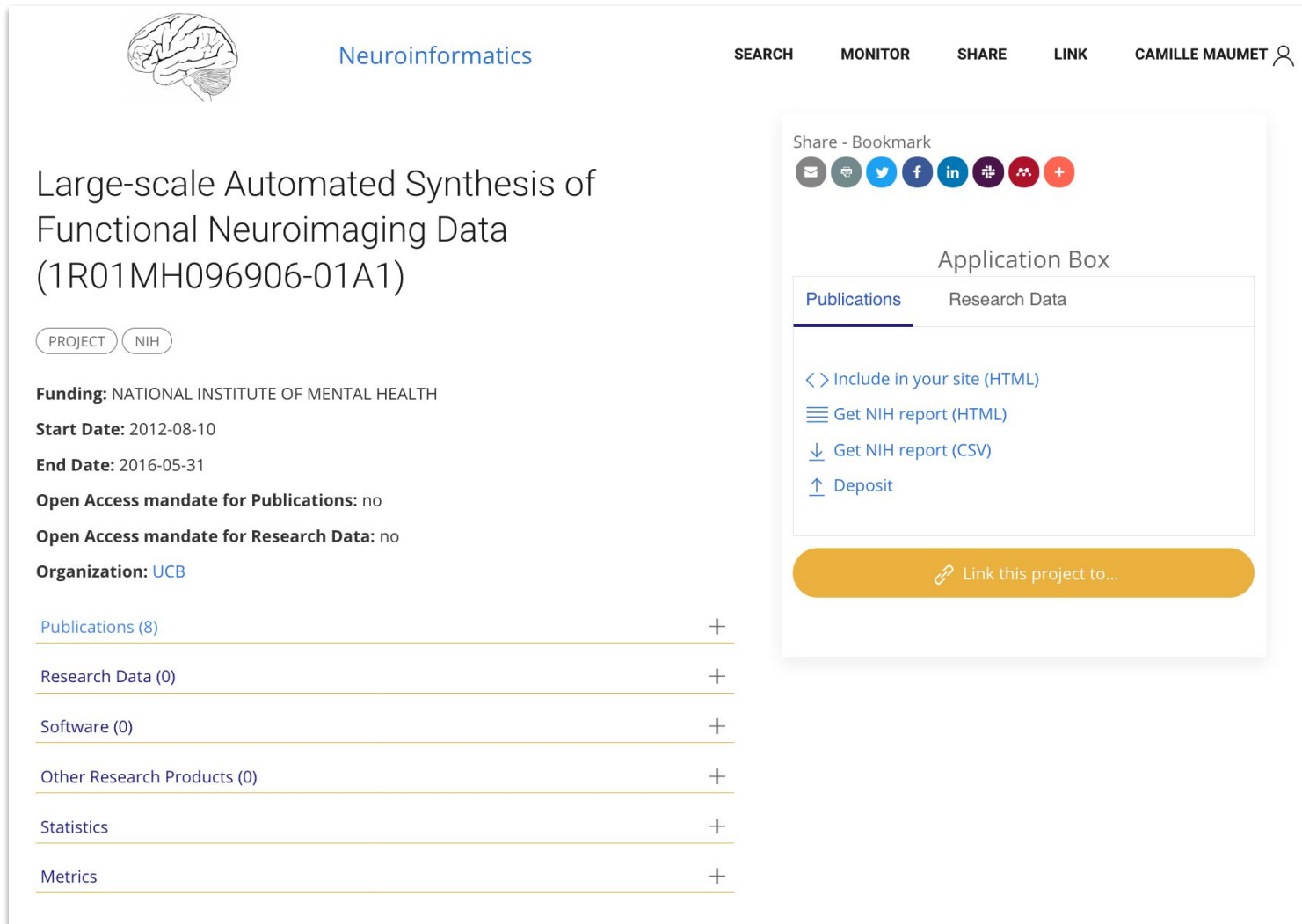
select a citation style 

 Link this publication to...


   Other research results


feedback

Neuroinformatics: project view



The image shows a screenshot of a project page on the Neuroinformatics platform. The page features a header with a brain icon, the title 'Neuroinformatics', and navigation links for 'SEARCH', 'MONITOR', 'SHARE', 'LINK', and a user profile for 'CAMILLE MAUMET'. The main content area displays the project title 'Large-scale Automated Synthesis of Functional Neuroimaging Data (1R01MH096906-01A1)' and categorizes it as a 'PROJECT' and 'NIH'. Key details include funding from the 'NATIONAL INSTITUTE OF MENTAL HEALTH', a start date of '2012-08-10', and an end date of '2016-05-31'. It also notes that there is no open access mandate for either publications or research data, and the organization is 'UCB'. A sidebar on the right offers sharing options (email, print, social media) and an 'Application Box' with links to include the project on a website, get reports in HTML or CSV, and deposit it. A prominent orange button at the bottom of the sidebar says 'Link this project to...'. At the bottom of the main content area, there is a list of expandable sections: 'Publications (8)', 'Research Data (0)', 'Software (0)', 'Other Research Products (0)', 'Statistics', and 'Metrics', each with a plus sign to its right.

 Neuroinformatics


SEARCH MONITOR SHARE LINK CAMILLE MAUMET 

Large-scale Automated Synthesis of Functional Neuroimaging Data (1R01MH096906-01A1)

PROJECT NIH

Funding: NATIONAL INSTITUTE OF MENTAL HEALTH
Start Date: 2012-08-10
End Date: 2016-05-31
Open Access mandate for Publications: no
Open Access mandate for Research Data: no
Organization: UCB

Publications (8) +
Research Data (0) +
Software (0) +
Other Research Products (0) +
Statistics +
Metrics +

Share - Bookmark


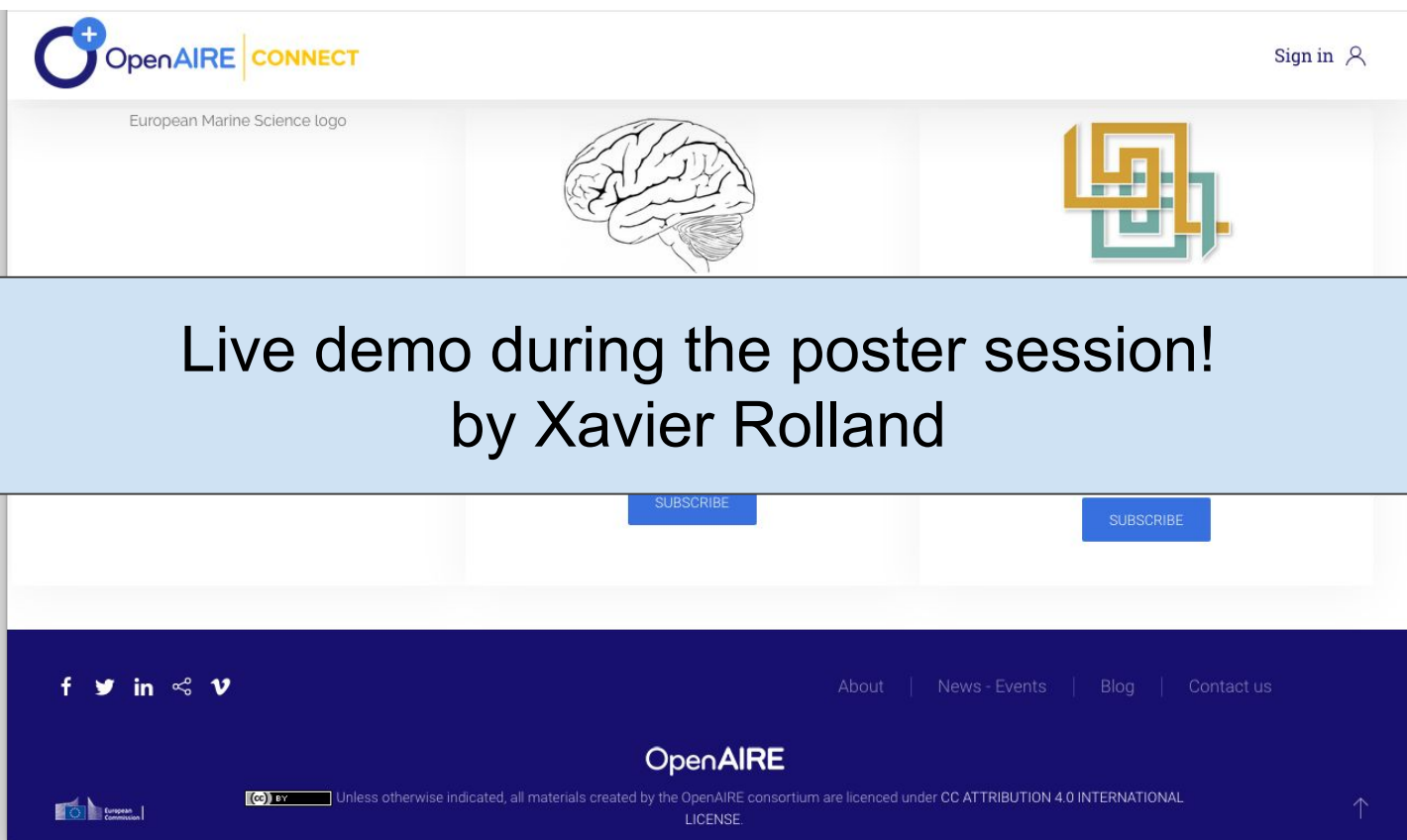
Application Box

Publications Research Data

[< > Include in your site \(HTML\)](#)
[☰ Get NIH report \(HTML\)](#)
[↓ Get NIH report \(CSV\)](#)
[↑ Deposit](#)

[Link this project to...](#)

“Gather, view and monitor all research outcomes”



Going further

Going further

Join the community!

Taking part in Standards & Best practices INCF Special Interest Groups

Active groups

The SIGs listed below are all active and open to new members. If you are interested in joining a SIG, please contact them on the listed address.

- Biophysically based Computational Models of Glial - Neuron Coupling
- Neuroinformatics for Aging
- Neuroinformatics for Cell Types
- Neuroshapes: Open SHACL schemas for FAIR neuroscience data
- Reproducibility & Best Practices in Human Brain Neuroimaging → BIDS, NIDM & more!
- Reproducible Research and Open Neuroscience
- Standardised Representations of Network Structures
- Neuroimaging Quality Control (niQC) → Survey open now!

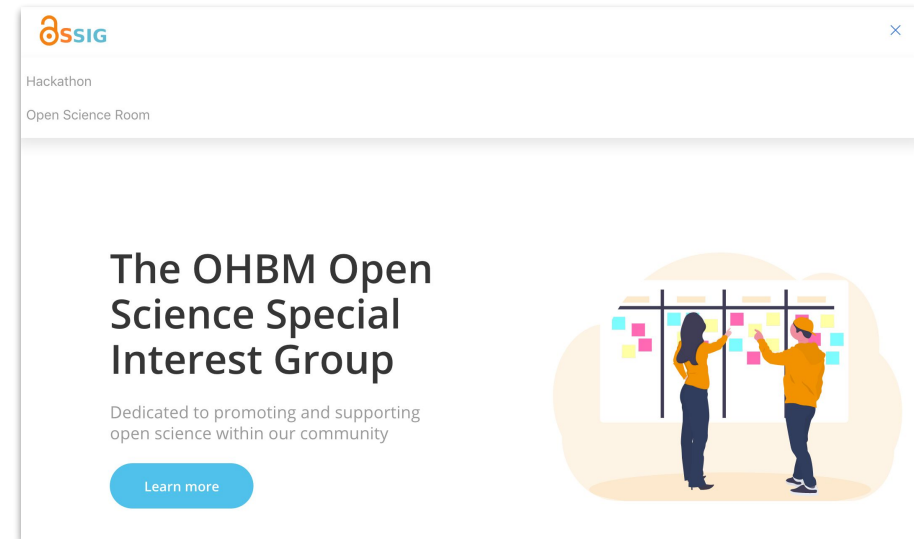
<http://tinyurl.com/WeNeedNiQC>

Create your own SIG!

Getting started & spreading open science



ReproNim: A Center for Reproducible
Neuroimaging Computation



Mozilla Open Leaders

Work Open, Lead Open

Researching collaboratively Hackathons

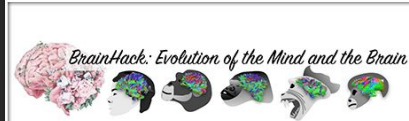
BRAIN HACK OPEN GENEVA 2019



Brainhack Open Geneva will take place from March 22-23, 2019



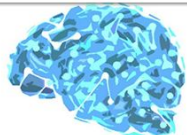
BRAIN HACK IN PADOVA: EVOLUTION



Brainhack in Padova will take place from December 5-7, 2018



LA BRAINHACK 2018



LA BRAINHACK 2018

EVENTS 2018

The LA Brainhack 2018 will take place November 18 - 19 at the Information Sciences Institute, Marina del Rey.



BRAIN HACK ZURICH 2018



EVENTS 2018

Brainhack Zurich 2018 will take place from October 24-26 at ETH Zurich & University Hospital Zurich.



2018 OHBM HACKATHON

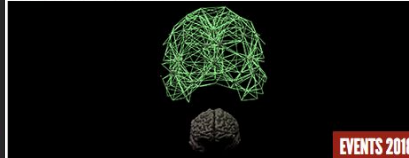


EVENTS 2018

The 2018 OHBM Hackathon will take place June 14 - 16 at the National University of Singapore, U-Town campus, Singapore.

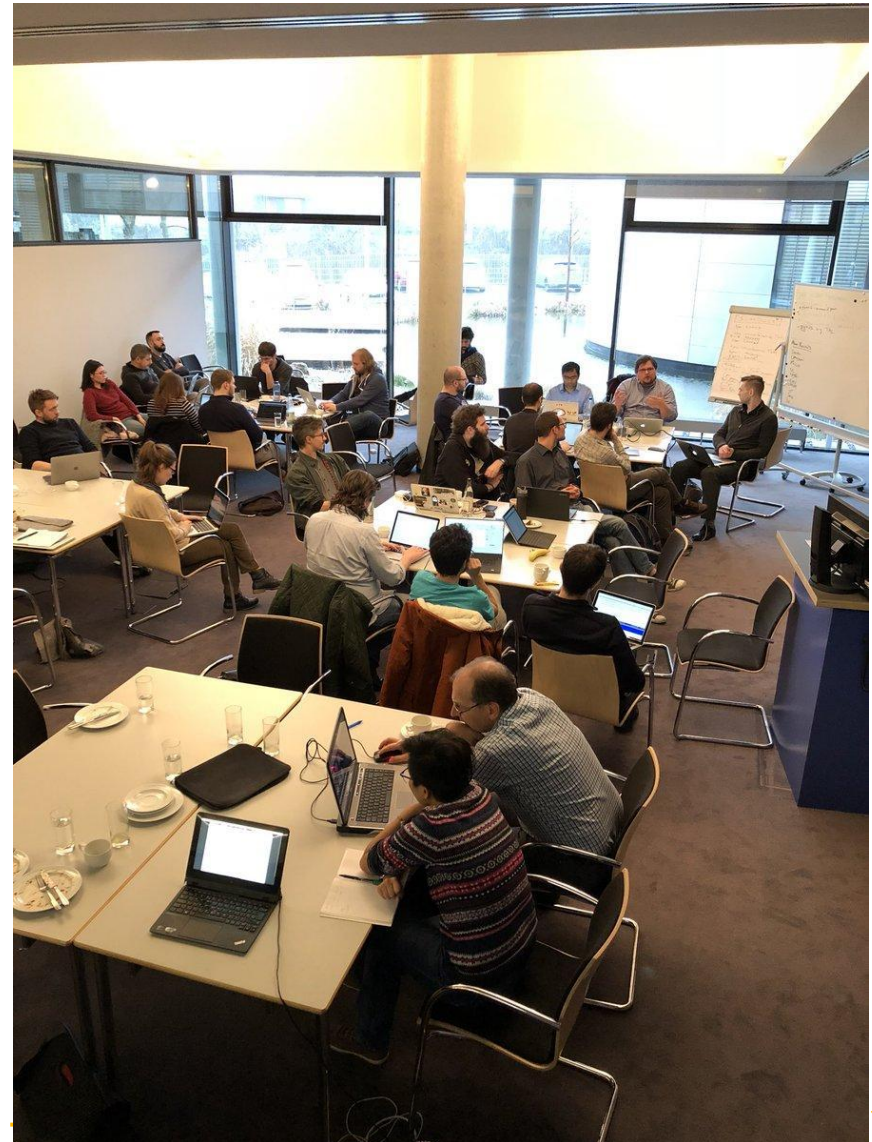


BRAIN HACK NETWORKS



EVENTS 2018

9 & 10 of June 2018, Brain and Spine Institute, Paris



Acknowledgements

Thank you!

NIDASH working group

Tibor Auer, Alexander Bowring, Samir Das, Fariba Fana, Guillaume Flandin, Satra Ghosh, Tristan Glatard, Chris Gorgolewski, Yaroslav Halchenko, Michael Hanke, Karl Helmer, Dorota Jarecka, David Keator, Tom Maullin-Sapey, Nolan Nichols, Tom Nichols, Smruti Padhy, Jean-Baptiste Poline, Vanessa Sochat, Jason Steffener, Jessica Turner & all NIDM and BIDS contributors!

Neuroimaging software teams

Gang Chen, Richard Reynolds, Robert Cox (AFNI), Mark Jenkinson, Matthew Webster, Paul McCarthy, Eugene Duff, Steve Smith (FSL), Guillaume Flandin (SPM).

Meta-analysis datasets Tracey group at FMRIB.

OpenAIRE neuroinformatics

Christian Barillot, Axel Bonnet, Xavier Rolland, Sorina Caramasu Pop.

Let's do open neuroimaging sciences



Thank you!

Any questions?

Camille Maumet

Univ Rennes, Inria, CNRS, Inserm, IRISA UMR 6074, Empenn ERL U-1228

<http://camillemaumet.com>

|  [cmaumet](#)