

Open science efforts for PET imaging - From standards to processing

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Quick outline of my data showcase

- PET BIDS format
- how to convert a positron emission tomography dataset into PET BIDS format using the PET2BIDS converter
 - A much more extended version of the conversion part of this tutorial can be found in the BIDS Starter Kit.
- how to run a single PET analysis with a processing pipeline developed based on PETSurfer
 - A more extensive description of the tutorial is given in the PET pipelines repository.

Standard nomenclature

- PET is much more than clinical scans with [^{18}F]FDG
- PET can visualize and quantitatively measure the function of biological and cellular processes in vivo

Journal of Cerebral Blood Flow & Metabolism (2007) 27, 1533–1539
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www.jcbfm.com



Review Article

Consensus nomenclature for *in vivo* imaging of reversibly binding radioligands

Robert B Innis¹, Vincent J Cunningham², Jacques Delforge³, Masahiro Fujita¹, Albert Gjedde⁴, Roger N Gunn⁵, James Holden⁶, Sylvain Houle⁷, Sung-Cheng Huang⁸, Masanori Ichise⁹, Hidehiro Iida¹⁰, Hiroshi Ito¹¹, Yuichi Kimura¹², Robert A Koeppe¹³, Gitte M Knudsen¹⁴, Juhani Knuuti¹⁵, Adriaan A Lammertsma¹⁶, Marc Laruelle², Jean Logan¹⁷, Ralph Paul Maguire¹⁸, Mark A Mintun¹⁹, Evan D Morris²⁰, Ramin Parsey⁹, Julie C Price²¹, Mark Slifstein⁹, Vesna Sossi²², Tetsuya Suhara¹¹, John R Votaw²³, Dean F Wong²⁴ and Richard E Carson²⁵

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Consensus on publishing PET experiments

- Replication in science can be improved with standards for reporting and sharing of primary research data

Opinion

Guidelines for the content and format of PET brain data in publications and archives: A consensus paper

Gitte M Knudsen¹, Melanie Ganz¹, Stefan Appelhoff², Ronald Boellaard³, Guy Bormans⁴, Richard E Carson⁵, Ciprian Catana⁶, Doris Doudet⁷, Antony D Gee⁸ , Douglas N Greve⁶, Roger N Gunn⁹, Christer Halldin¹⁰, Peter Herscovitch¹¹, Henry Huang⁵, Sune H Keller¹², Adriaan A Lammertsma³, Rupert Lanzenberger¹³, Jeih-San Liow¹⁴, Talakad G Lohith¹⁵, Mark Lubberink¹⁶, Chul H Lyoo¹⁷, J John Mann¹⁸, Granville J Matheson¹⁰, Thomas E Nichols¹⁹ , Martin Nørgaard¹ , Todd Ogden²⁰, Ramin Parsey²¹, Victor W Pike¹⁴, Julie Price⁶, Gaia Rizzo⁹, Pedro Rosa-Neto^{22,23}, Martin Schain²⁰, Peter JH Scott²⁴, Graham Searle⁹, Mark Slifstein²¹, Tetsuya Suhara²⁵, Peter S Talbot²⁶, Adam Thomas²⁷, Mattia Veronese²⁸, Dean F Wong²⁹, Maqsood Yaqub³, Francesca Zanderigo³⁰, Sami Zoghbi¹⁴ and Robert B Innis¹⁴

JCBFM

Journal of Cerebral Blood Flow & Metabolism

2020, Vol. 40(8) 1576–1585

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DOI: 10.1177/0271678X20905433

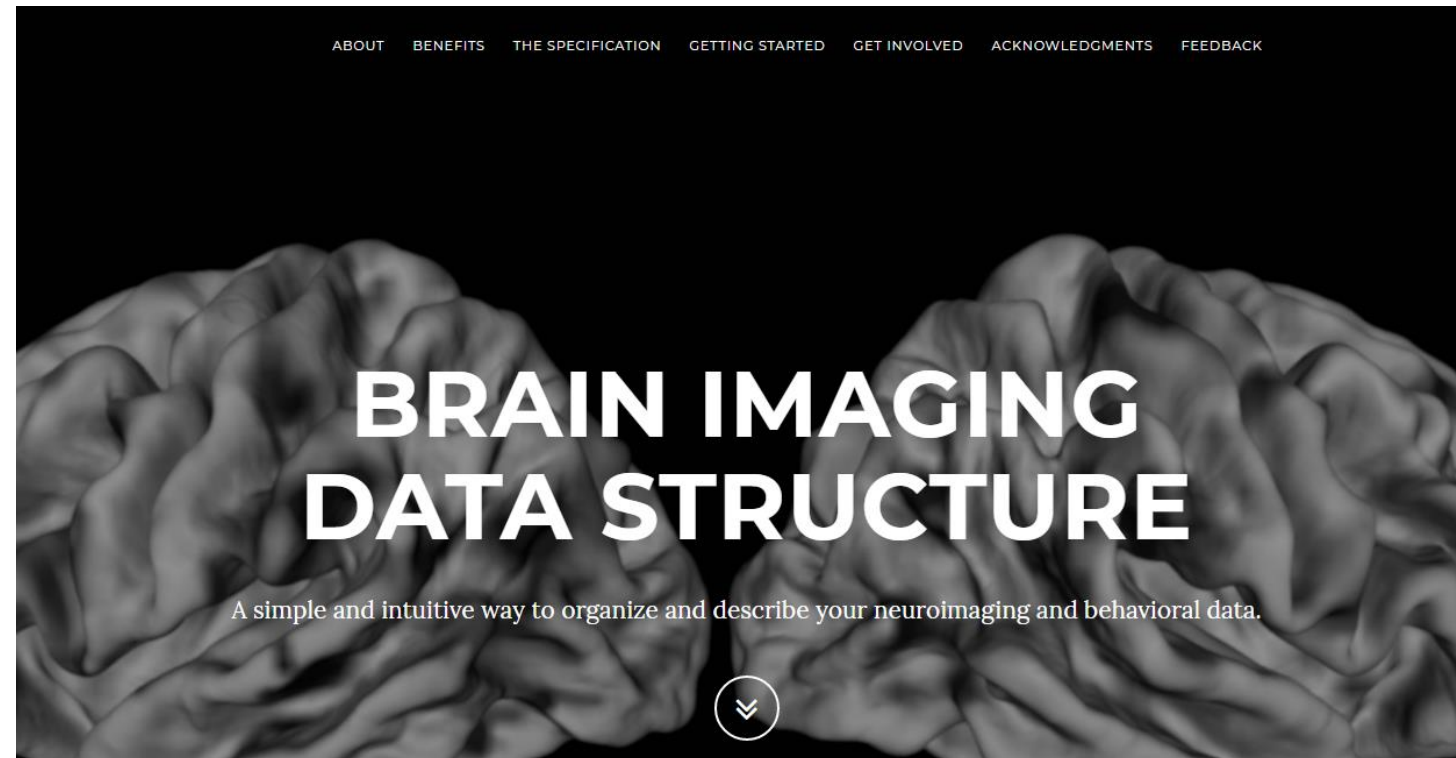
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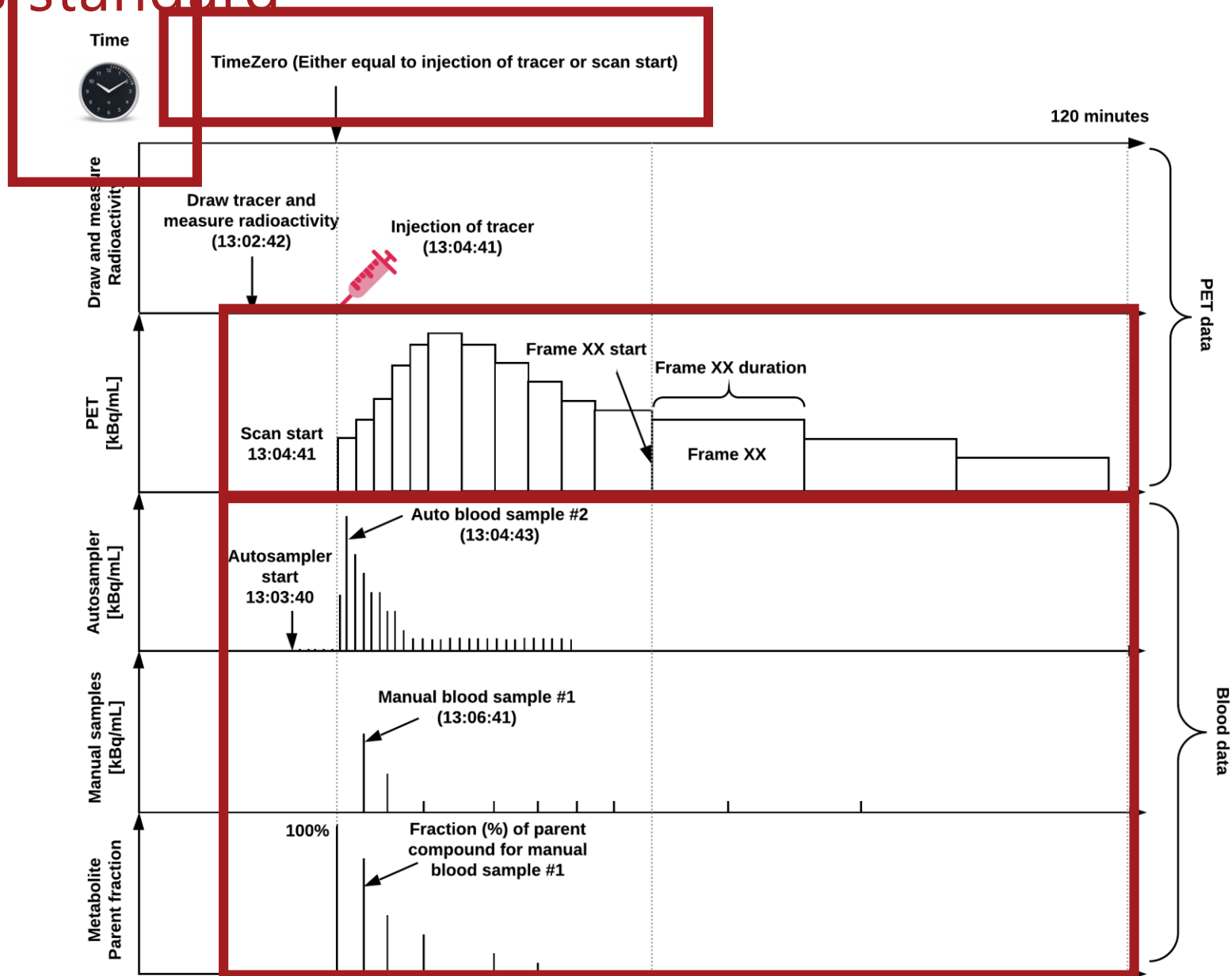
Brain Imaging Data Structure (BIDS)

- It's a data structure ; nothing to do with format per se
- It's about:
 - how you organize data
 - how you name files
 - how you document metadata
 - uses community standards

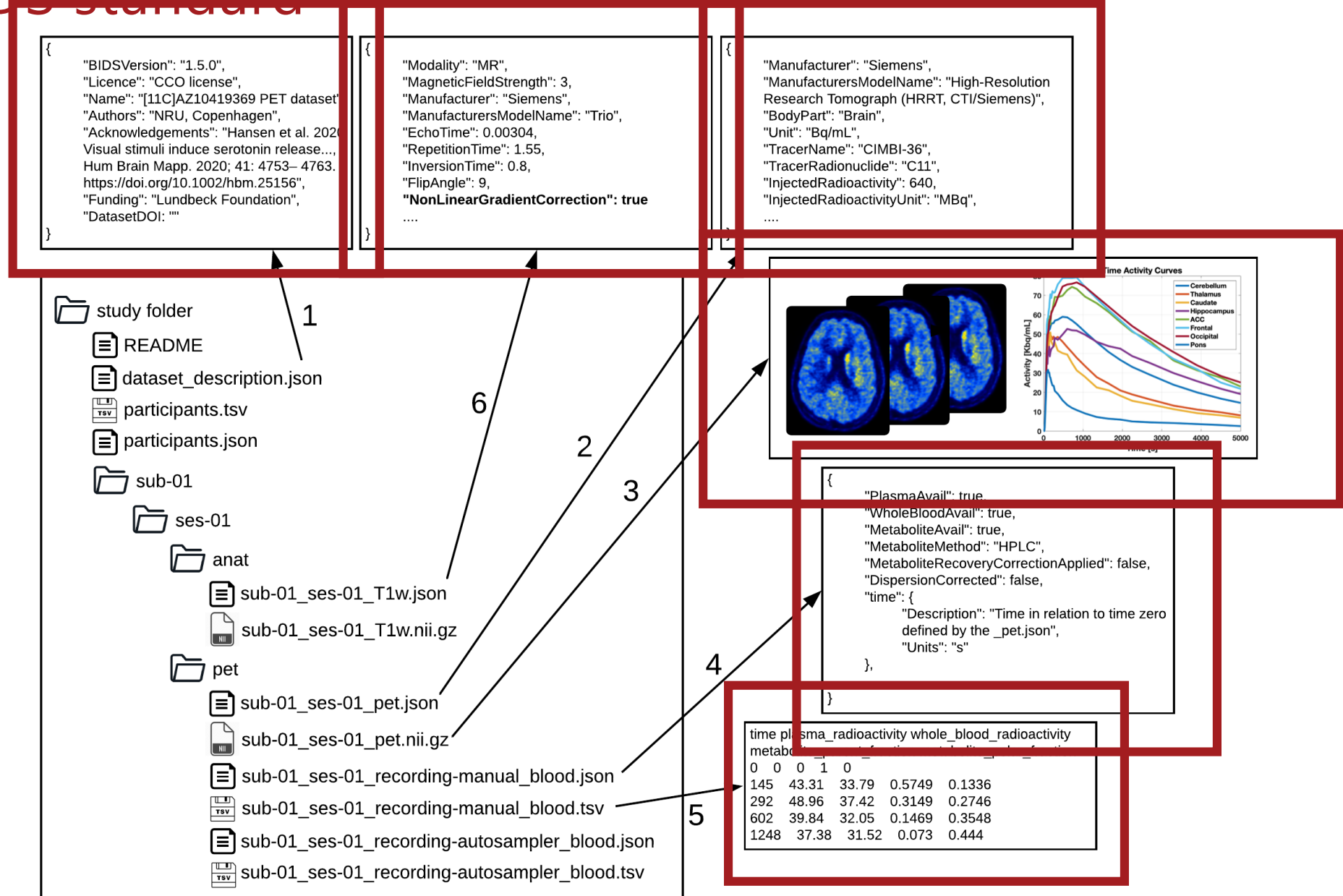
bids.neuroimaging.io



PET-BIDS standard



PET-BIDS standard



PET-BIDS standard scientific **data**

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PET-BIDS, an extension to the brain imaging data structure for positron emission tomography

[Martin Norgaard](#), [Granville J. Matheson](#), ... [Melanie Ganz](#)  [+ Show authors](#)

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[ENH] Bep 009: Positron Emission Tomography #633

[Open](#) melanieganz wants to merge 171 commits into [master](#) from [bep-009](#) 

 Conversation **393**  Commits **171**  Checks **8**  Files changed **12**



melanieganz commented on 1 Oct 2020 • edited by sappelhoff ▾





Member  ...

This PR incorporates BEP 009 - Positron Emission Tomography.

We have rebased bep009 with master before including all our BEP 009 changes into the bep009 branch and there are no direct conflicts. Hence, we would like to open this up to community comment.

Moderators: @melanieganz @mnoergaard

link to rendered draft: <https://bids-specification.readthedocs.io/en/bep-009/>

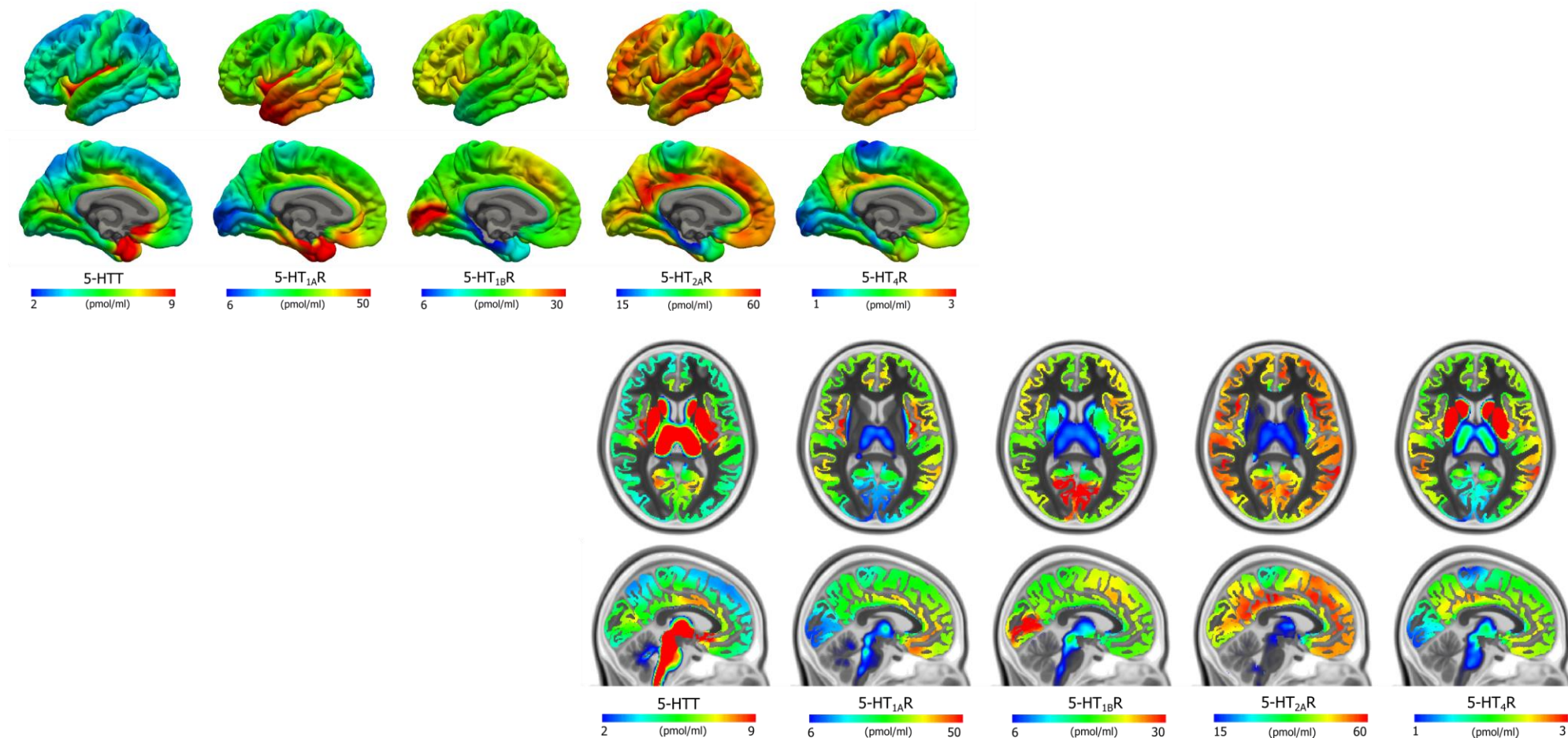
 6  3  3  2

Data conversion

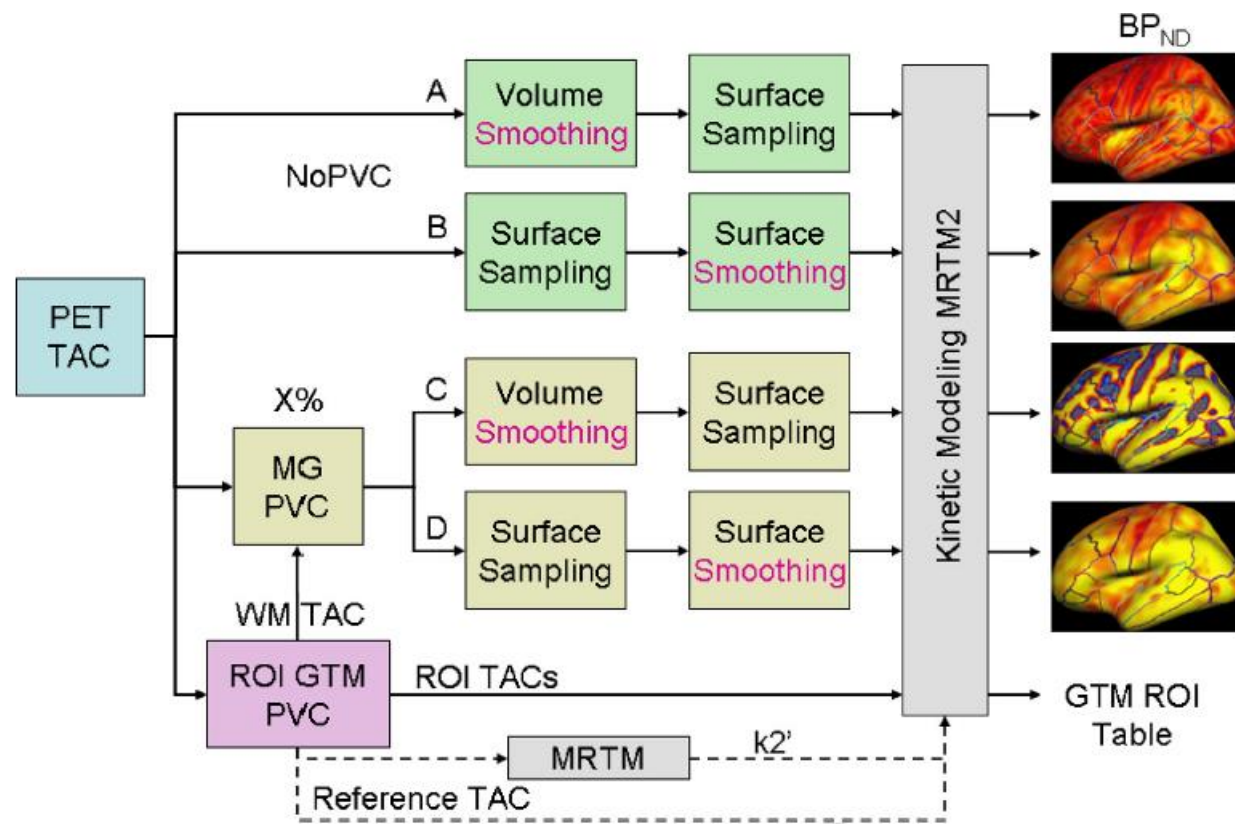
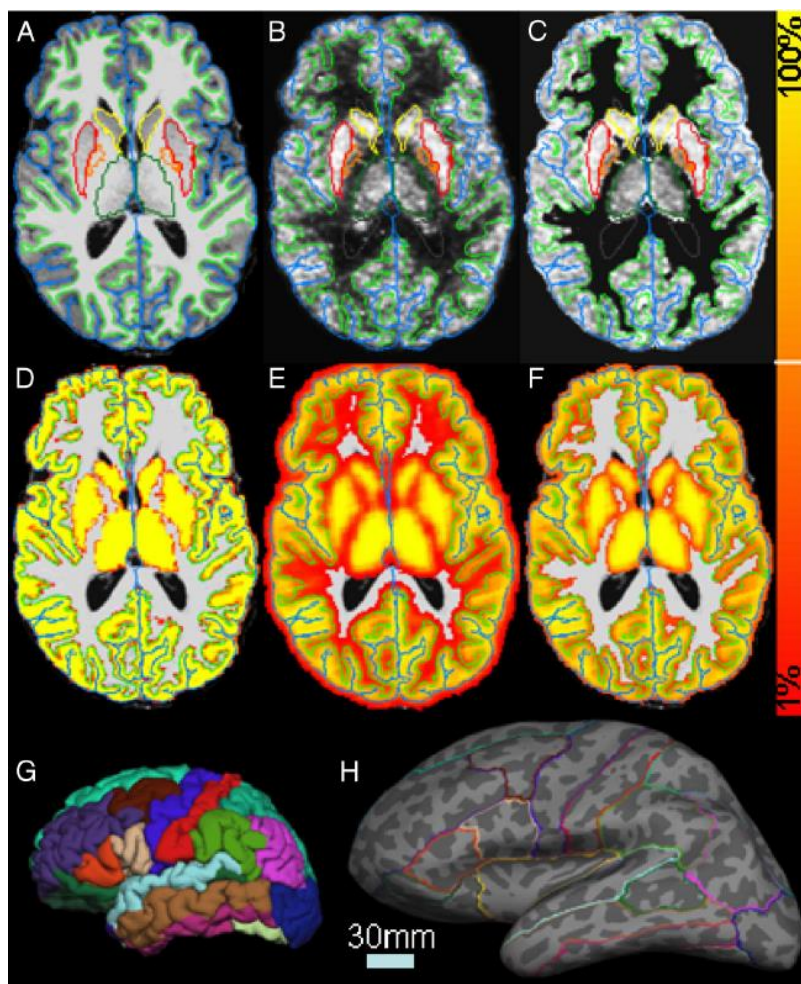
- PET2BIDS
- Different imaging formats on PET scanners (e.g. DICOM, ECAT)
- Phantom data set collection
- Let's do this!

PET data processing

- Motivation: Building a High Resolution Serotonin (5-HT) PET atlas

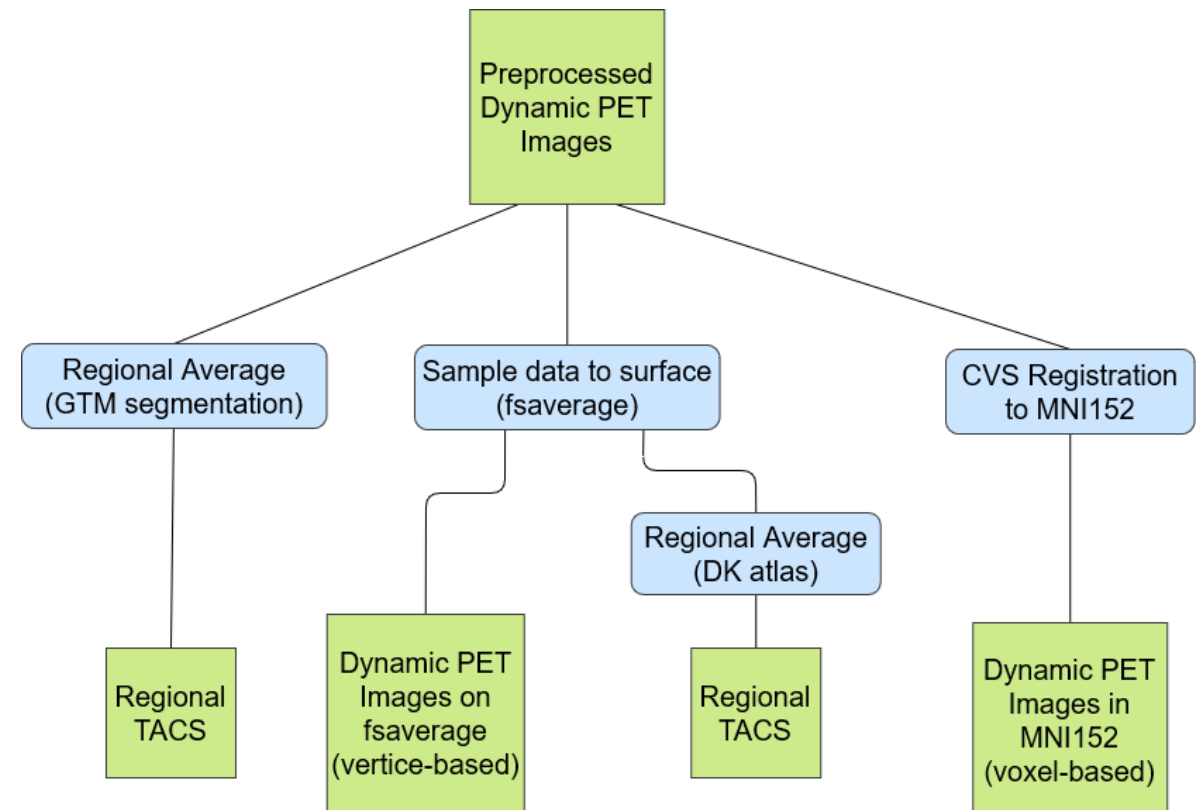
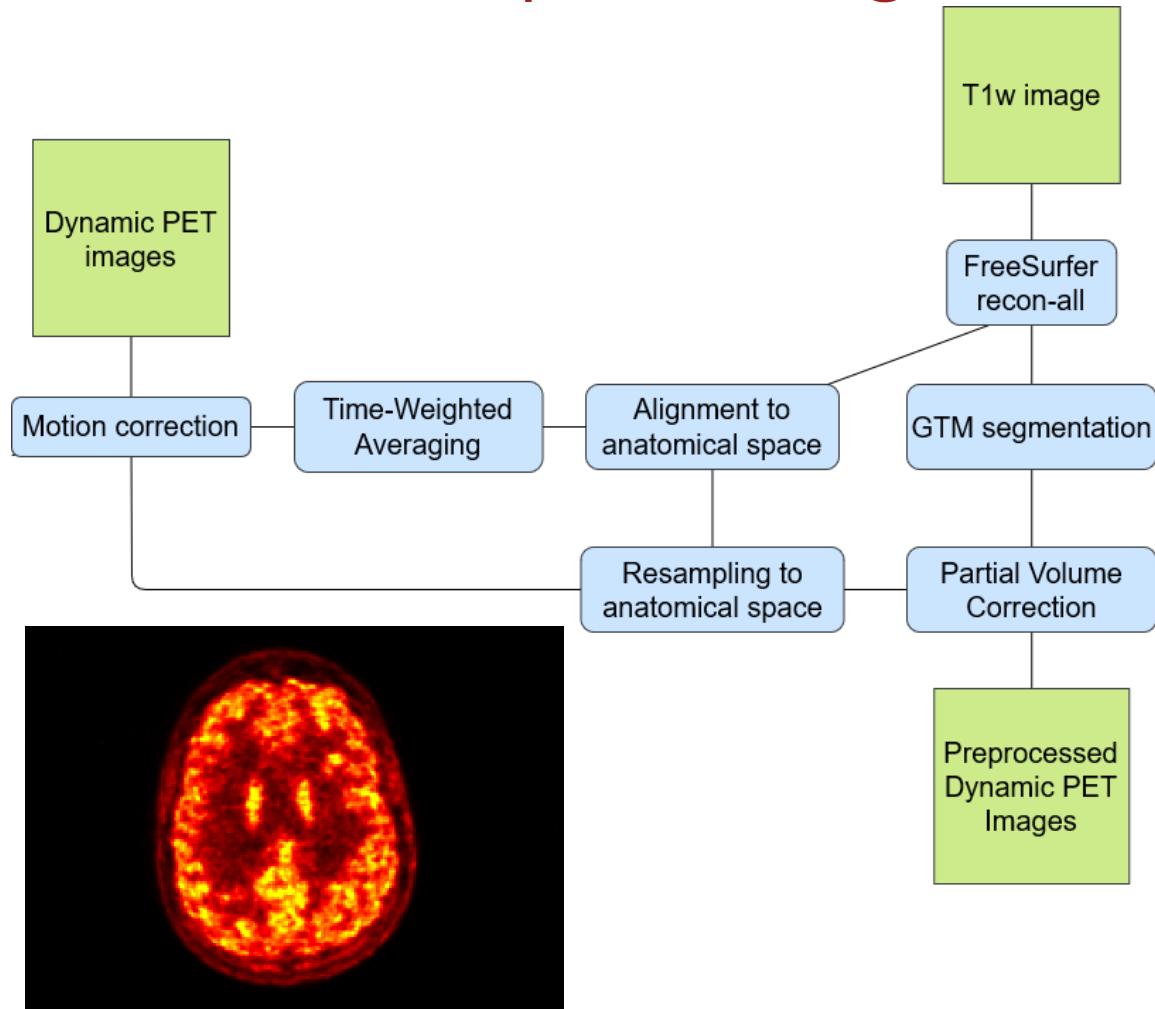


PetSurfer

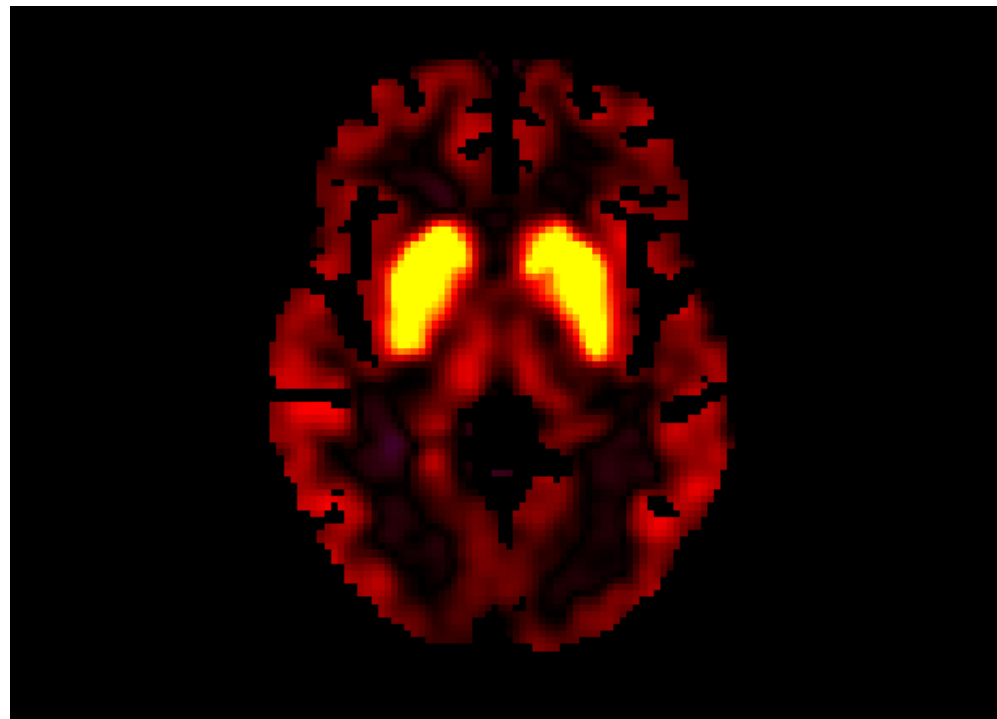
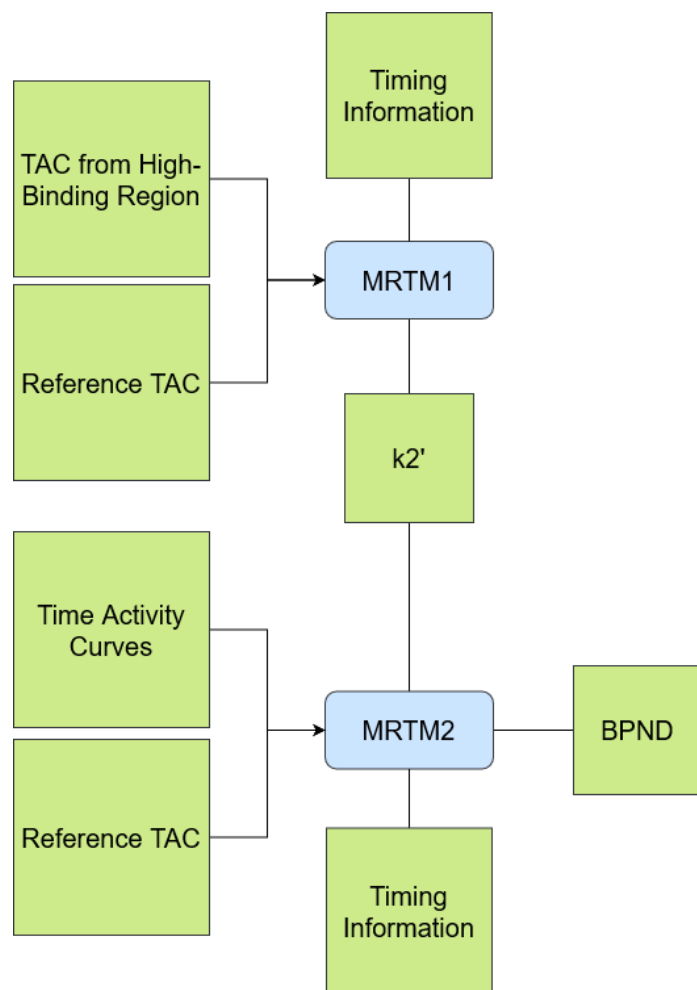


Greve et al., Neuroimage 2014

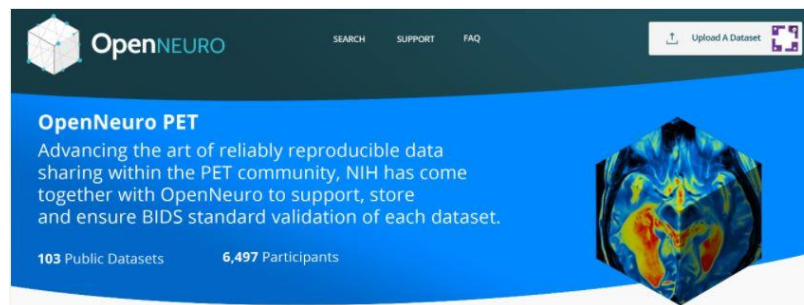
PetSurfer Preprocessing I



Kinetic Modeling (MRTM1 & 2)



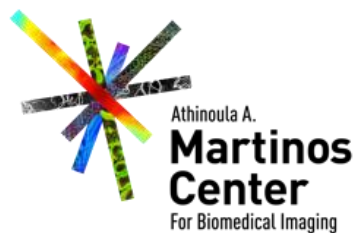
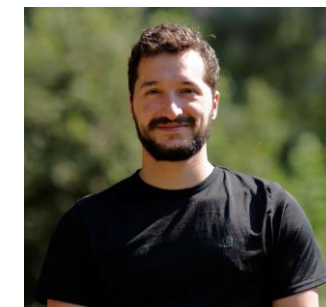
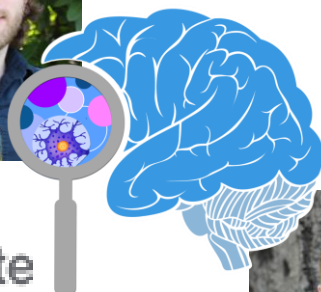
Thank you!



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