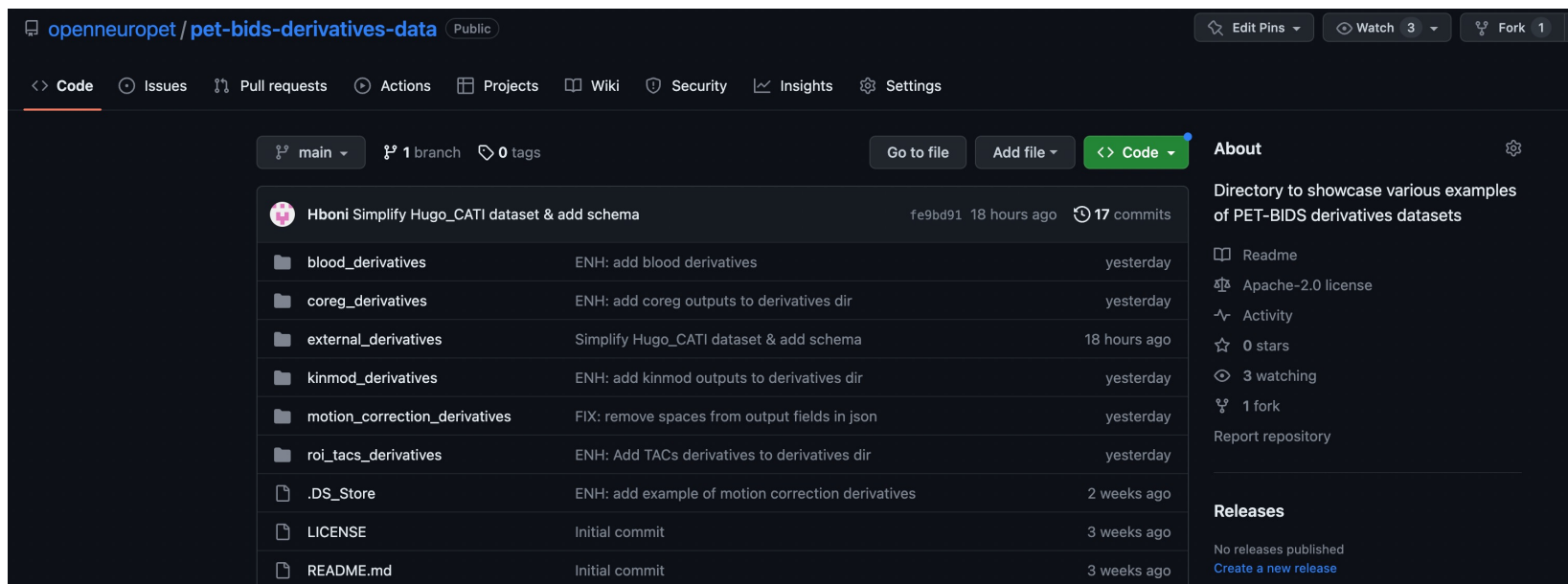


The Brain Imaging Data Structure (BIDS) PET Derivatives

PET Derivatives joint meeting #2
07/06/2023

Agenda

1. Updates to the specification since last meeting
2. Discussion of example derivatives
3. Moving forward and next meeting



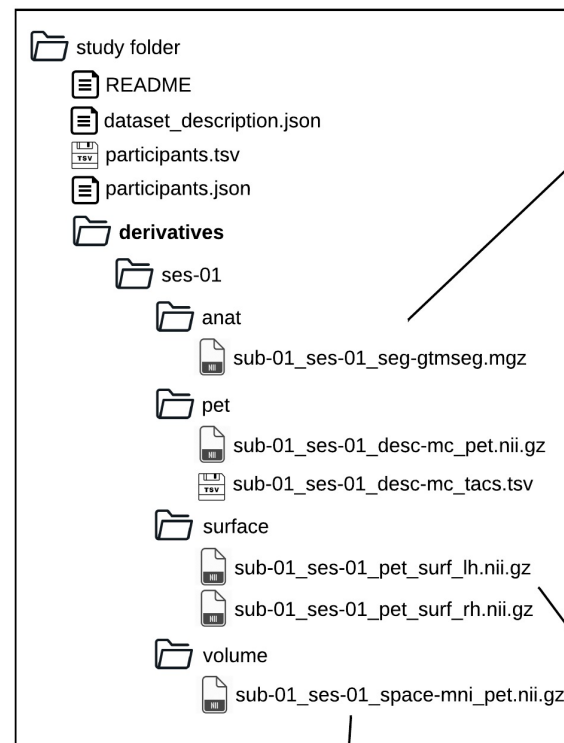
The screenshot displays the GitHub repository page for `openneuropet / pet-bids-derivatives-data`. The repository is public and has 3 watchers and 1 fork. The main branch is selected, showing 1 branch and 0 tags. The repository structure is as follows:

File/Folder	Commit Message	Commit Time
blood_derivatives	ENH: add blood derivatives	yesterday
coreg_derivatives	ENH: add coreg outputs to derivatives dir	yesterday
external_derivatives	Simplify Hugo_CATI dataset & add schema	18 hours ago
kinmod_derivatives	ENH: add kinmod outputs to derivatives dir	yesterday
motion_correction_derivatives	FIX: remove spaces from output fields in json	yesterday
roi_tacs_derivatives	ENH: Add TACs derivatives to derivatives dir	yesterday
.DS_Store	ENH: add example of motion correction derivatives	2 weeks ago
LICENSE	Initial commit	3 weeks ago
README.md	Initial commit	3 weeks ago

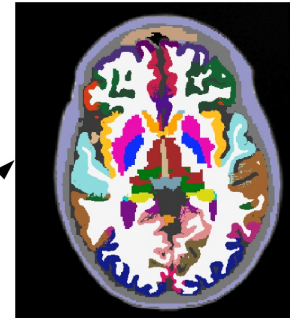
The commit history shows a recent commit by Hboni titled "Simplify Hugo_CATI dataset & add schema" with 17 commits. The repository is licensed under Apache-2.0 and has 0 stars and 1 fork. The README describes the repository as a "Directory to showcase various examples of PET-BIDS derivatives datasets".

PET-BIDS Derivatives

Processed PET data



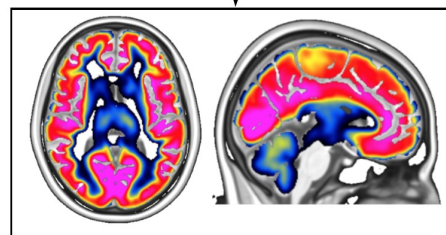
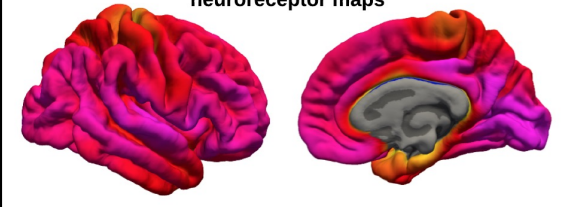
volumes of interest



Start [s]	End [s]	Hippocampus [Bq/mL]	Brainstem [Bq/mL]
0	15	139.4	865.5
15	30	1592.9	1928.5
30	45	4778.8	3874.4
45	60	3531.9	4203.8
60	90	4537.7	5338.7
90	120	6737.2	5195.7
120	180	8376.7	6930.7
180	300	7840	8460.4

TACs

neuroreceptor maps



neuroreceptor maps

Kinetic model library

MRTM, MRTM2, Logan_{ref}, SRTM, SRTM2, Logan, FRTM, ESRTM, ESRTM2, Patlak

PET-BIDS Derivatives

Template:

```
<pipeline_name>/  
  sub-<participant_label>/  
    <datatype>/  
      <source_entities>[_<suffix>.<ext>
```

<https://bids-specification.readthedocs.io/en/stable/05-derivatives/02-common-data-types.html>

PET-BIDS Derivatives (defining output files)

Motion Correction (*_desc)

Files:

- *_desc-confounds_timeseries.tsv
- *_desc-confounds_timeseries.json
- *_desc-mc_pet.nii.gz
- *_desc-mc_pet.json
- * figures/QC (redundant?)?

Registration (*_space-)

Files:

- *_from-pet_to-T1w_reg.lta (.xfm?)
- *_from-pet_to-T1w_reg.json
- *_space-T1w_desc-brain_mask.nii.gz
- *_space-T1w_desc-twa_pet.nii.gz
- *_space-T1w_desc-twa_pet.json
- *_space-T1w_pet.nii.gz

Delineation of Volumes of Interest (*_desc-)

Files:

- *_desc-gtmseg_dseg.nii.gz
- *_desc-gtmseg_dseg.tsv
- *_desc-gtmseg_tacs.tsv
- *_desc-gtmseg_volumes.tsv
- *_desc-brainstem_dseg.nii.gz
- *_desc-brainstem_dseg.tsv

Kinetic modeling (*_km-)

Files:

- *_km-mrtm2_desc-gtmseg_kinpar.tsv
- *_km-mrtm2_desc-gtmseg_kinpar.json
- *_km-srtm_desc-gtmseg_kinpar.tsv
- *_km-srtm_desc-gtmseg_kinpar.json
- *_km-srtm_desc-brainstem_kinpar.tsv
- *_km-srtm_desc-brainstem_kinpar.json ...

Smoothing (*_sm-)

Files:

- *_sm-8_pet.nii.gz
- *_sm-8_pet.json

Partial Volume Correction (*_pvc-)

Files:

- *_pvc-mg_pet.nii.gz
- *_pvc-mg_pet.json
- *_pvc-mg_desc-gm_mask.nii.gz
- *_pvc-mg_desc-wm_mask.nii.gz
- *_pvc-mg_desc-csf_mask.nii.gz

Blood derivatives

Files:

- *_config.json
- *_inputfunction.json
- *_inputfunction.tsv

km-mrtm2[R1,k2,Vt,Vnd,BPP,BPpnd].nii.gz

PET-BIDS Derivatives

Template:

petsurfer/

sub-01/

pet/

sub-01_[]_pet.nii.gz

sub-01_[]_pet.json

Common file level metadata fields

Each derivative data file SHOULD be described by a JSON file provided as a sidecar or higher up in the hierarchy of the derived dataset (according to the [Inheritance Principle](#)) unless a particular derivative includes REQUIRED metadata fields, in which case a JSON file is also REQUIRED. Each derivative type defines their own set of fields, but all of them share the following (non-required) ones:

Key name	Requirement level	Data type	Description
Description	RECOMMENDED	string	Free-form natural language description of the nature of the file.
Sources	OPTIONAL	array of strings	A list of files with the paths specified relative to dataset root; these files were directly used in the creation of this derivative data file. For example, if a derivative A is used in the creation of another derivative B, which is in turn used to generate C in a chain of A->B->C, C should only list B in <code>Sources</code> , and B should only list A in <code>Sources</code> . However, in case both X and Y are directly used in the creation of Z, then Z should list X and Y in <code>Sources</code> , regardless of whether X was used to generate Y.
RawSources	OPTIONAL	array of strings	A list of paths relative to dataset root pointing to the BIDS-Raw file(s) that were used in the creation of this derivative.

<https://bids-specification.readthedocs.io/en/stable/05-derivatives/02-common-data-types.html>

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PET-BIDS Derivatives

Template:

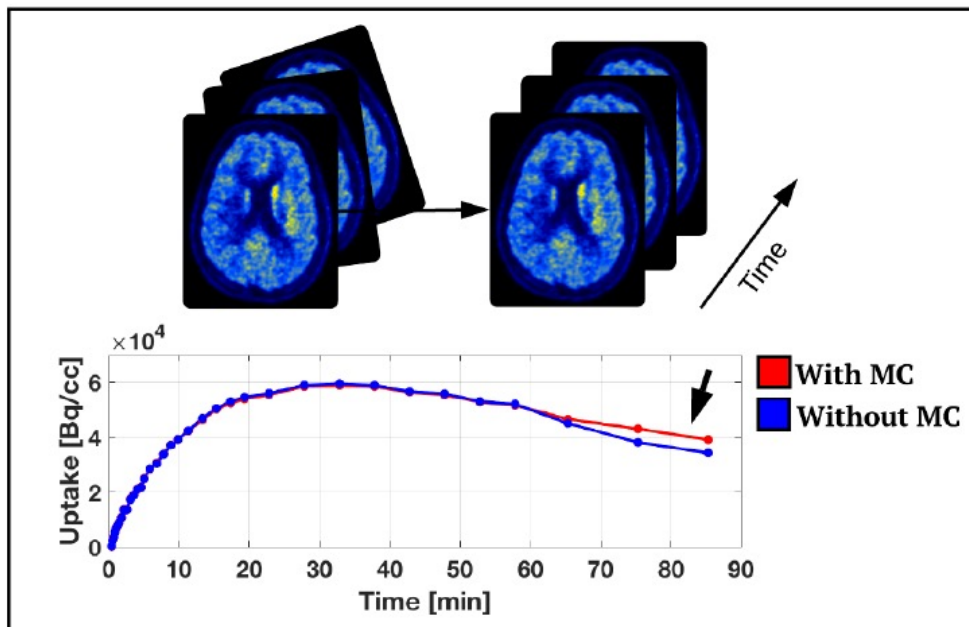
petsurfer/
sub-01/
pet/

sub-01_desc-mc_pet.nii.gz

sub-01_desc-mc_pet.json

- a. Reference image
- b. Spatial interpolation
- c. Cost function
- d. Quality control
- e. Software name / version

**Motion
correction**



PET-BIDS Derivatives

Template:

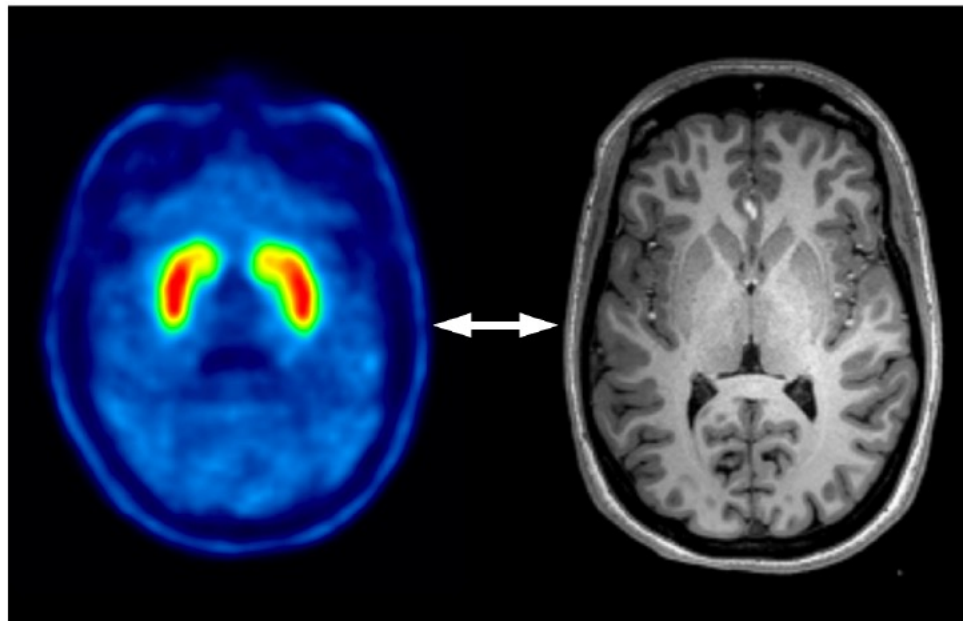
petsurfer/

sub-01/

pet/

sub-01_space-T1w_desc-mc_pet.nii.gz

sub-01_space-T1w_desc-mc_pet.json



Registration

- a. Reference image (PET / MRI / Template)
- b. Target image (PET / MRI / Template)
- c. Cost function
- d. Spatial interpolation
- e. Resolution of reference and target
- f. Quality check (visual / cost function)
- g. Software name / version

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PET-BIDS Derivatives

Template:

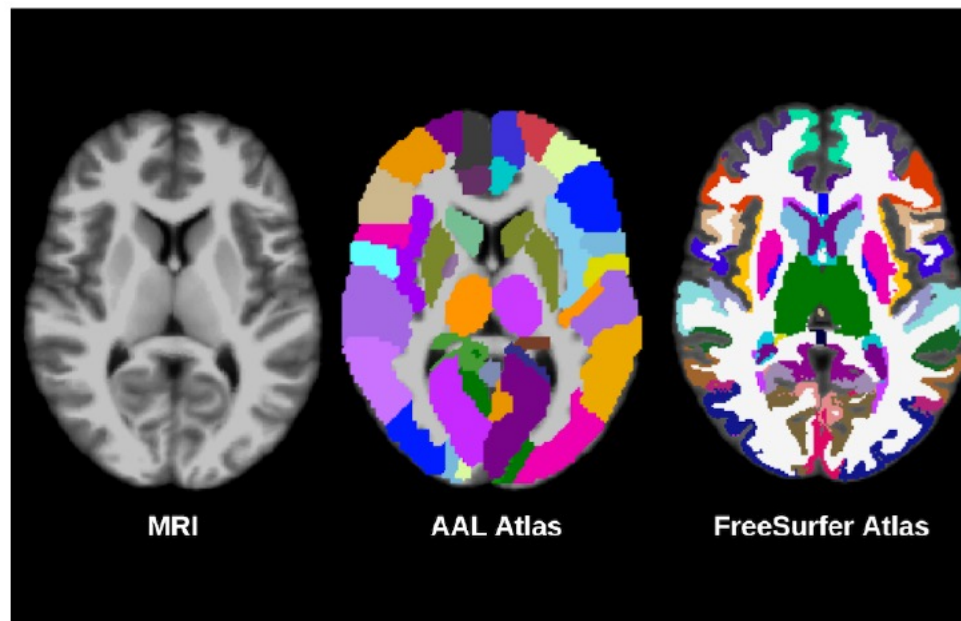
petsurfer/
sub-01/
pet/

sub-01_space-T1w_desc-gtmseg_dseg.nii.gz

sub-01_space-T1w_desc-gtmseg_dseg.json

The following metadata fields apply to all segmentation files:

Key name	Requirement level	Data type	Description
Manual	OPTIONAL	boolean	Indicates if the segmentation was performed manually or via an automated process.
Atlas	OPTIONAL	string	Which atlas (if any) was used to derive the segmentation.
Resolution	REQUIRED if res is present	string or object mapping labels to strings	Specifies the interpretation of the resolution keyword.



Delineation of volumes of interest

- a. Volumes obtained from PET / MRI / Template
- b. Operational criteria for delineation
- c. Gray / white matter mask thresholding
- d. Manual / semi-automatic / automatic
- e. Please cite methods paper

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PET-BIDS Derivatives

Template:

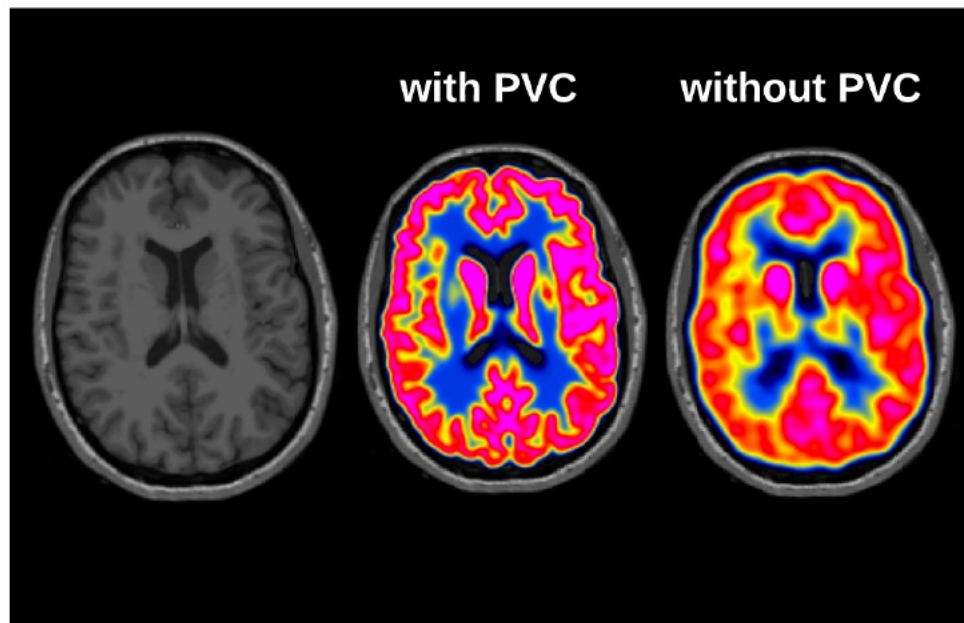
petsurfer/

sub-01/

pet/

sub-01_space-orig_pvc-gtm_desc-mc_pet.nii.gz

sub-01_space-orig_pvc-gtm_desc-mc_pet.json



- a. Technique (please cite methods paper)
b. Assumptions
c. Limitations
d. Software used (version and/or update)
e. Report results with and without PVC

**Partial volume
correction**

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PET-BIDS Derivatives

Template:

petsurfer/

sub-01/

pet/

sub-01_space-orig_pvc-gtm_desc-gtm_tacs.tsv

sub-01_space-orig_pvc-gtm_desc-gtm_tacs.json

Journal of Cerebral Blood Flow & Metabolism (2007), 1–7

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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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Discussion of feedback on the current derivative proposal



Moving forward