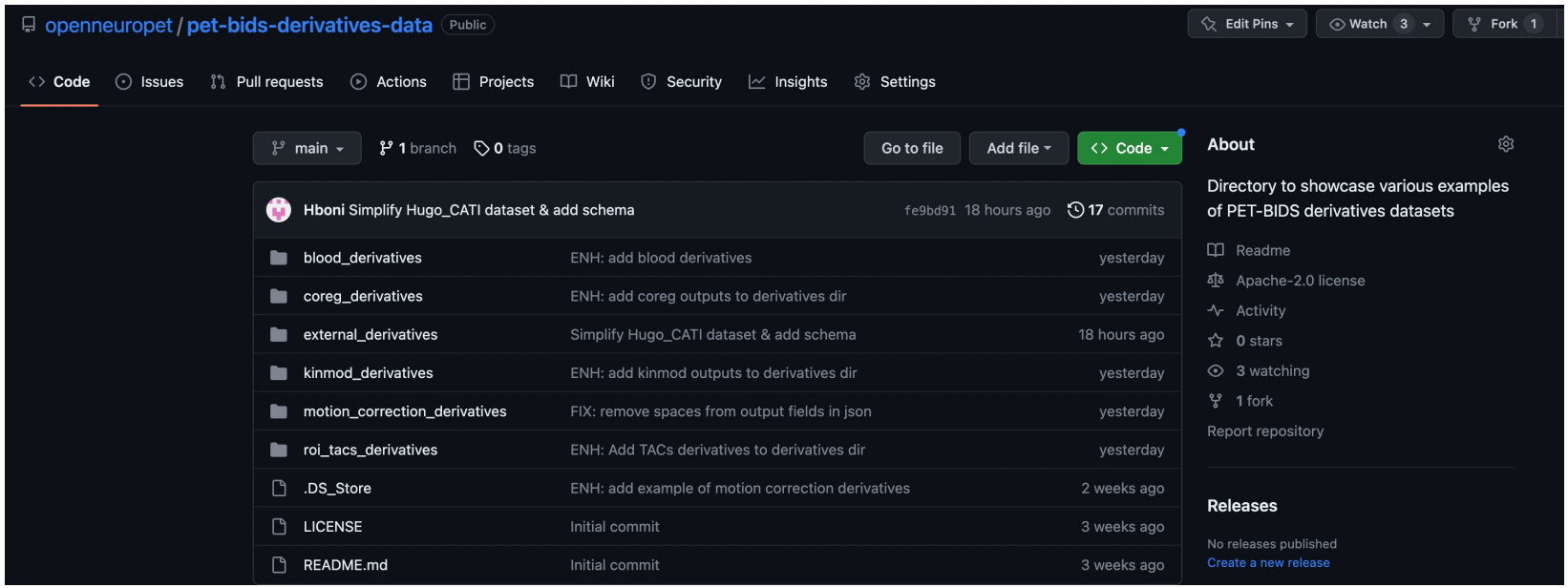
The Brain Imaging Data Structure (BIDS)
PET Derivatives

PET Derivatives joint meeting #2

07/06/2023

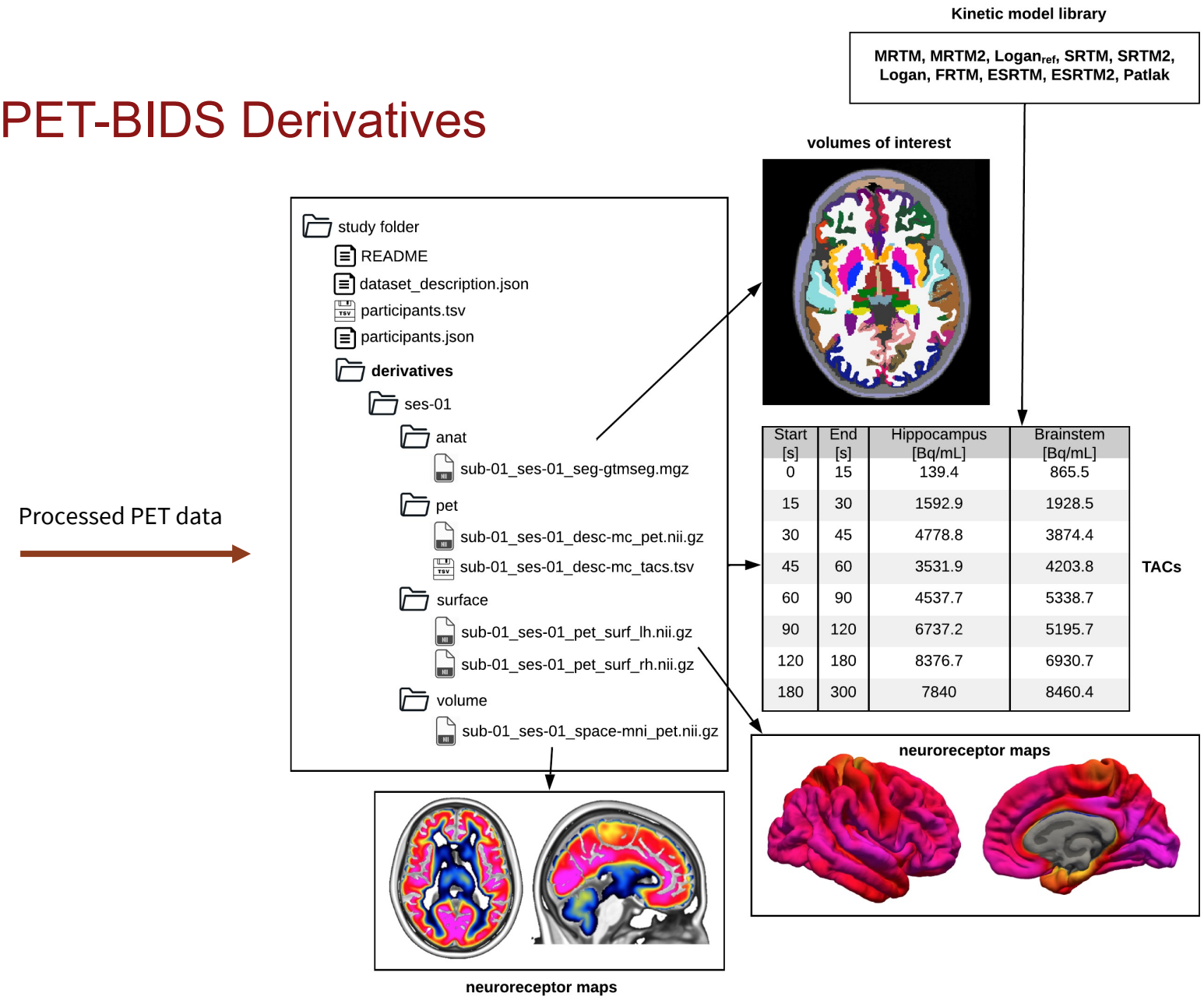
Agenda

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



PET-BIDS Derivatives

Processed PET data



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 `Sources`, and B should only list A in `Sources`. However, in case both X and Y are directly used in the creation of Z, then Z should list X and Y in `Sources`, 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

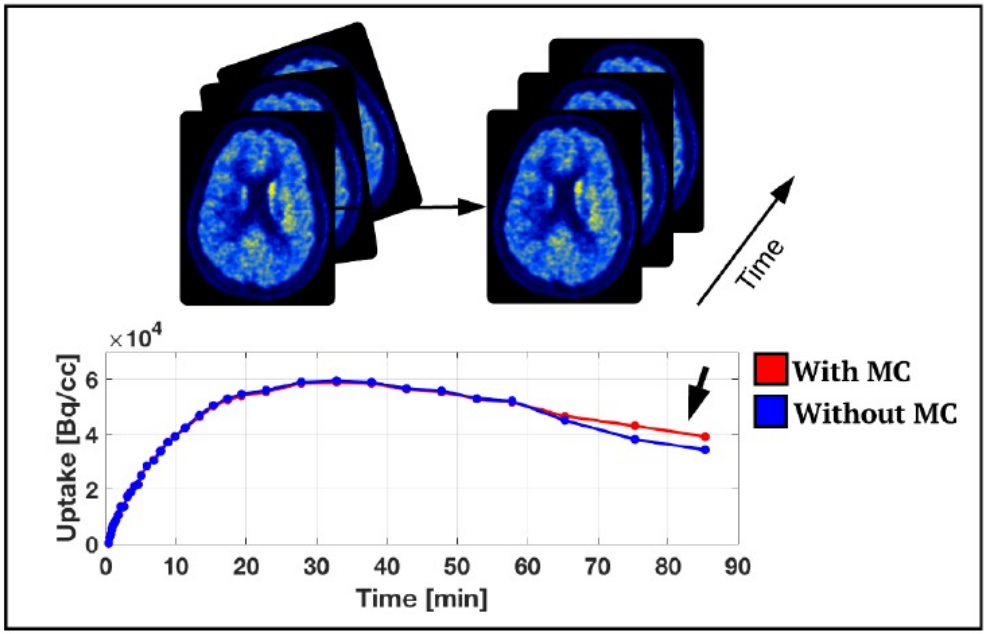
PET-BIDS Derivatives

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:

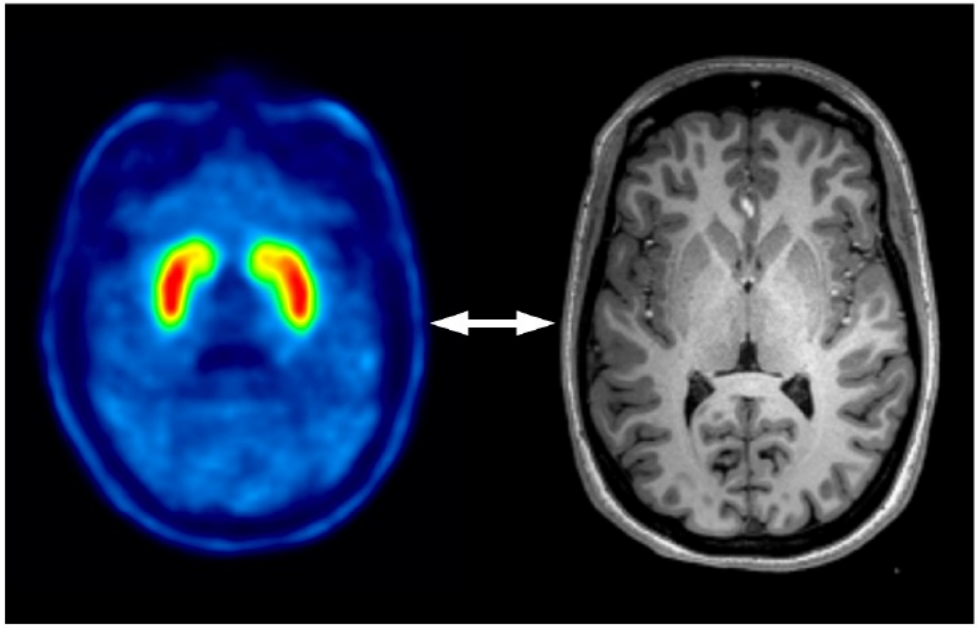
petsurfer/

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

PET-BIDS Derivatives

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.

Template:

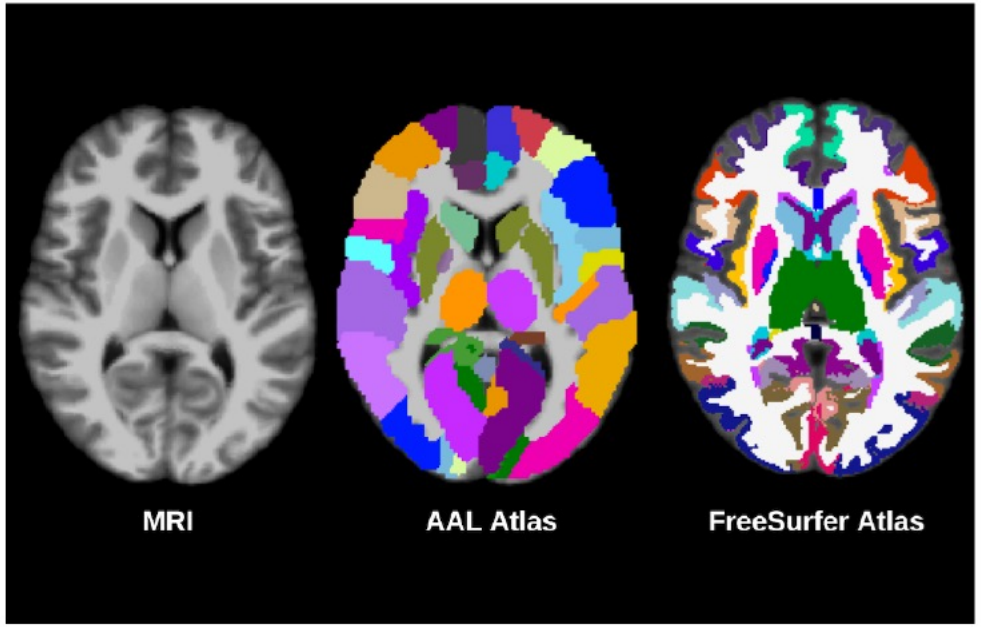
petsurfer/

sub-01/

pet/

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

sub-01_space-T1w_desc-gtmseg_dseg.json



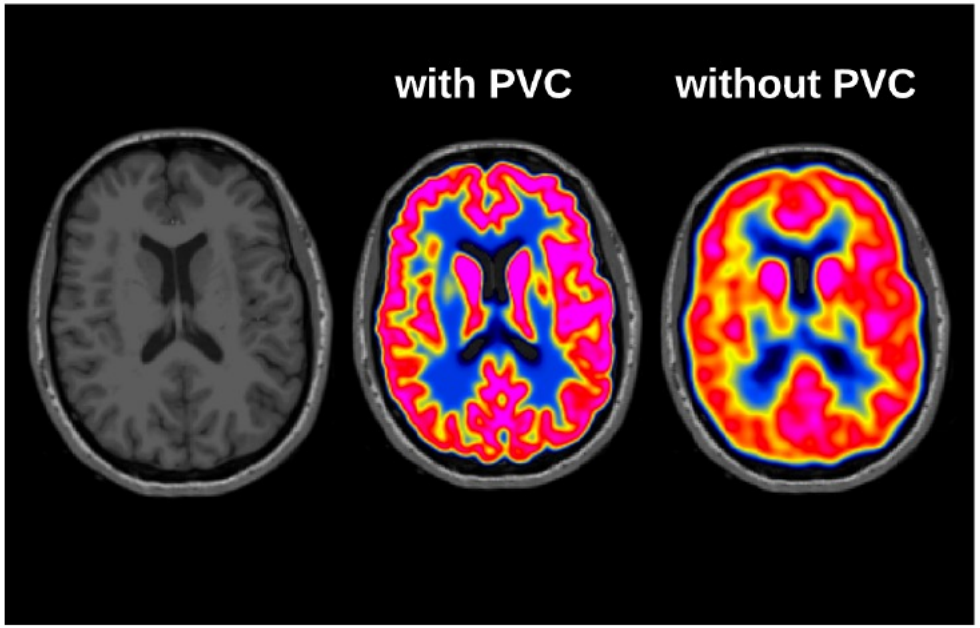
Delineation of volumes of interest

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

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

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

www.jcbfm.com

Review Article

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

Robert B Innis[1], Vincent J Cunningham[2], Jacques Delforge[3], Masahiro Fujita[1], Albert Gjedde[4], Roger N Gunn[5], James Holden[6], Sylvain Houle[7], Sung-Cheng Huang[8], Masanori Ichise[9], Hidehiro Iida[10], Hiroshi Ito[11], Yuichi Kimura[12], Robert A Koeppe[13], Gitte M Knudsen[14], Juhani Knuuti[15], Adriaan A Lammertsma[16], Marc Laruelle[2], Jean Logan[17], Ralph Paul Maguire[18], Mark A Mintun[19], Evan D Morris[20], Ramin Parsey[9], Julie C Price[21], Mark Slifstein[9], Vesna Sossi[22], Tetsuya Suhara[11], John R Votaw[23], Dean F Wong[24] and Richard E Carson[25]

Discussion of feedback on the current derivative proposal

Moving forward