

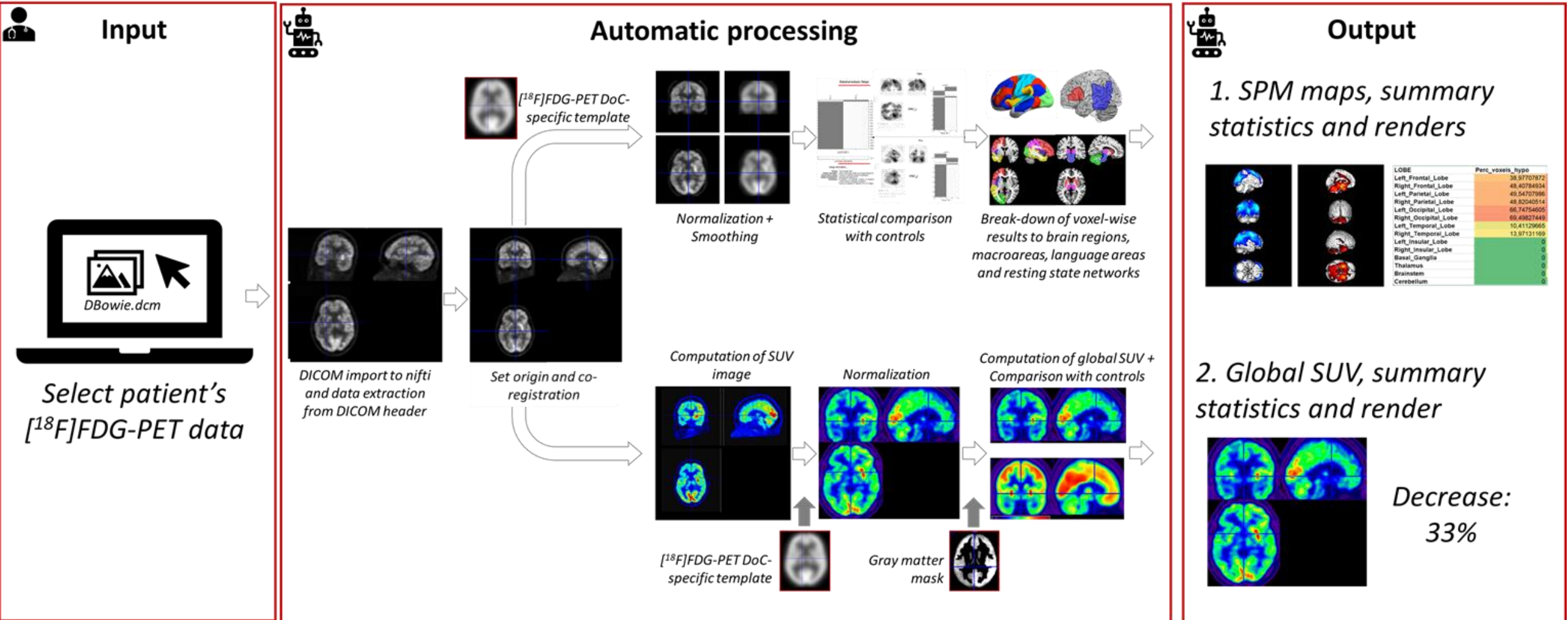
Automating Analysis: DOC-Toolbox for Quick Analysis in Disorders of Consciousness

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Clinique de la Conscience
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CHU Liege

The pipeline – step-by-step



≈ 1-2 minutes per patient

The pipeline – tutorial

- **Set up**
- **Run**
- **Quality check**
- **Interpretation**



**tinyurl.com/
DOC-TOOLBOX**

DOC_TOOLBOX

We provide an automated, fast, user-friendly and free-to-use (open-source GPL2) Statistical Parametric Mapping (SPM) pipeline, written in MATLAB, for the analysis of [18F]FDG-PET images in patients with disorders of consciousness. The pipeline is based on validated analytical procedures (Bruno et al., 2012; Thibaut et al., 2012; Thibaut et al., 2021) routinely used at the [Coma Science Group](#) and [Centre du Cerveau2](#), Liège, Belgium.

The pipeline takes in the patient's [18F]FDG-PET DICOM images and automatically performs all processing and pre-processing steps needed to estimate the patient's absolute decrease in brain glucose metabolism as well as the relative decrease vs. relative preservation of brain glucose metabolism (at voxel, region and network level).

Please refer to the material available here for a general overview on [18F]FDG-PET assessment in disorders of consciousness: [FDG-PET-2021](#)

Note: this is a preliminary version of the pipeline that still has to be extensively tested on images derived from different scanners.

An overview of the pipeline is available below



The pipeline – tutorial

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 **Setup**

1. Install Matlab & SPM12



MATLAB®



2. Download code





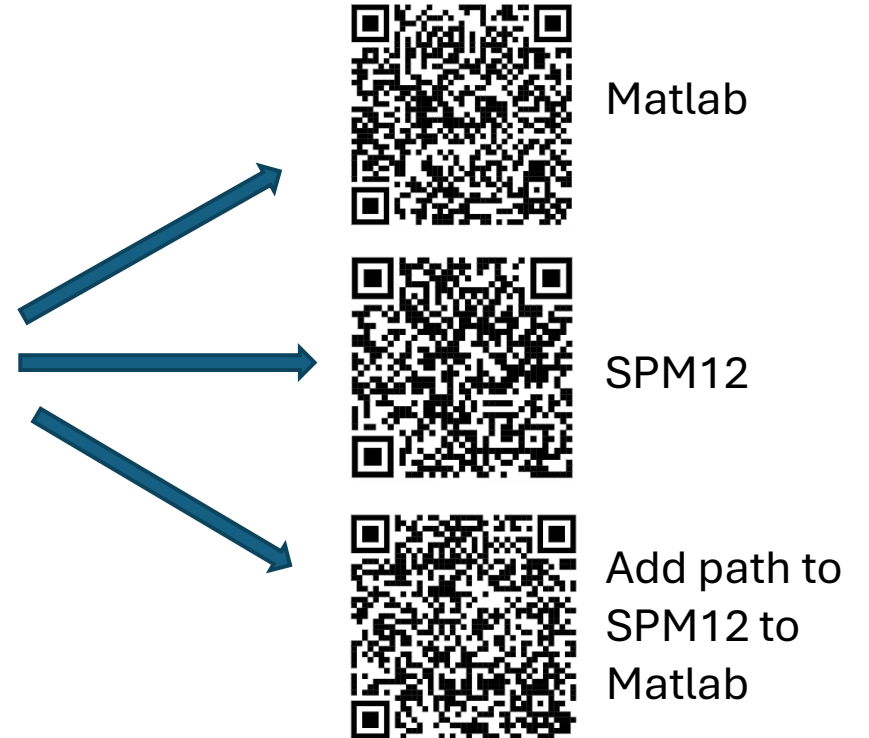
GitHub

3. Download controls' data





EBRAINS



The pipeline – tutorial

- **Set up**
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- **Quality check**
- **Interpretation**

 **Setup**

1. *Install Matlab & SPM12*

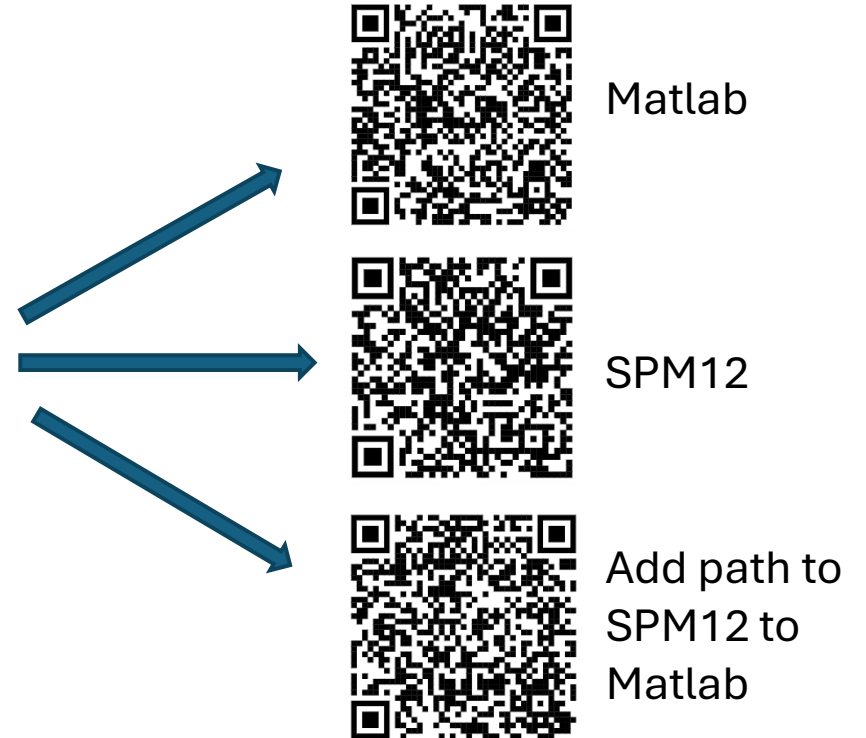
 **MATLAB** 

2. *Download code*

  **GitHub**

3. *Download controls' data*

  **EBRAINS**





COFFEE_BREAK_FDPET Public

forked from [tincala91/COFFEE_BREAK_FDPET](#)

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main 1 branch 1 tag

This branch is up to date with tincala91/COFFEE_BREAK_FDPET:main.

- tincala91 Merge pull request...
- JOB_FILES
- MASK_TEMPLATES_HC
- OTHER_FUI
- Plugins
- ROIs
- doc
- private
- COFFEE_BREAK_FDPET.m
- LICENSE
- README.md



COFFEE_BREAK_FDPET-main.zip > COFFEE_BREAK_FDPET-main

Nome	Tipo
doc	Cartella di file
JOB_FILES	Cartella di file
MASK_TEMPLATES_HC	Cartella di file
OTHER_FUNCTIONS	Cartella di file
Plugins	Cartella di file
private	Cartella di file
ROIs	Cartella di file
COFFEE_BREAK_FDPET.m	MATLAB Code
LICENSE	File
README.md	File MD

[Create a new release](#)

Packages

No packages published

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MATLAB®



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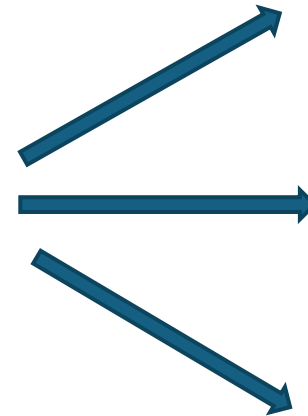
GitHub

3. Download controls' data





EBRAINS



Matlab



SPM12



Add path to
SPM12 to
Matlab

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MATLAB®



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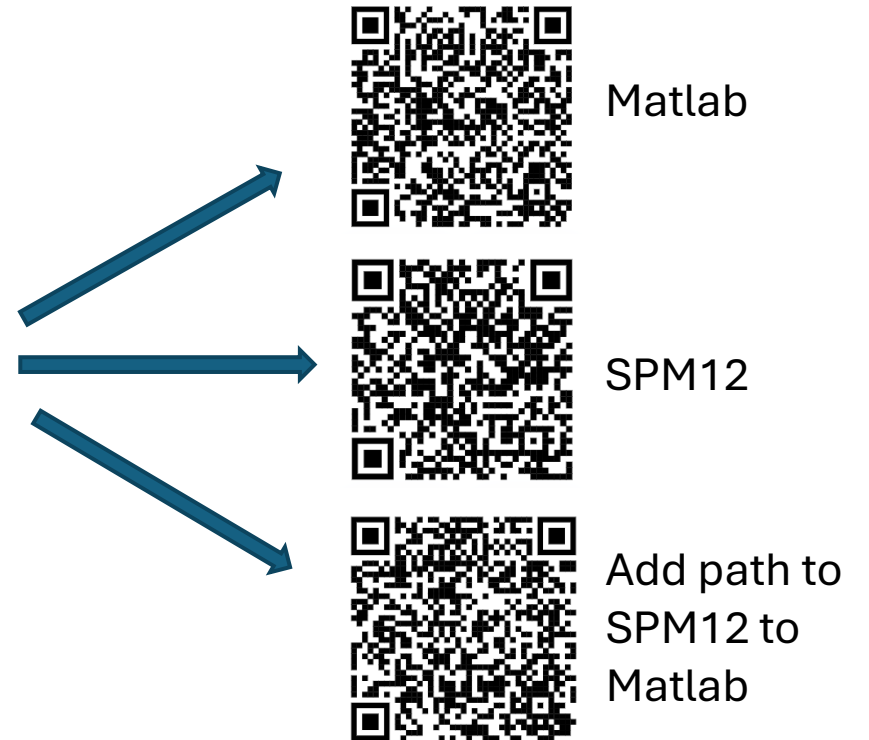
GitHub

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The pipeline – tutorial

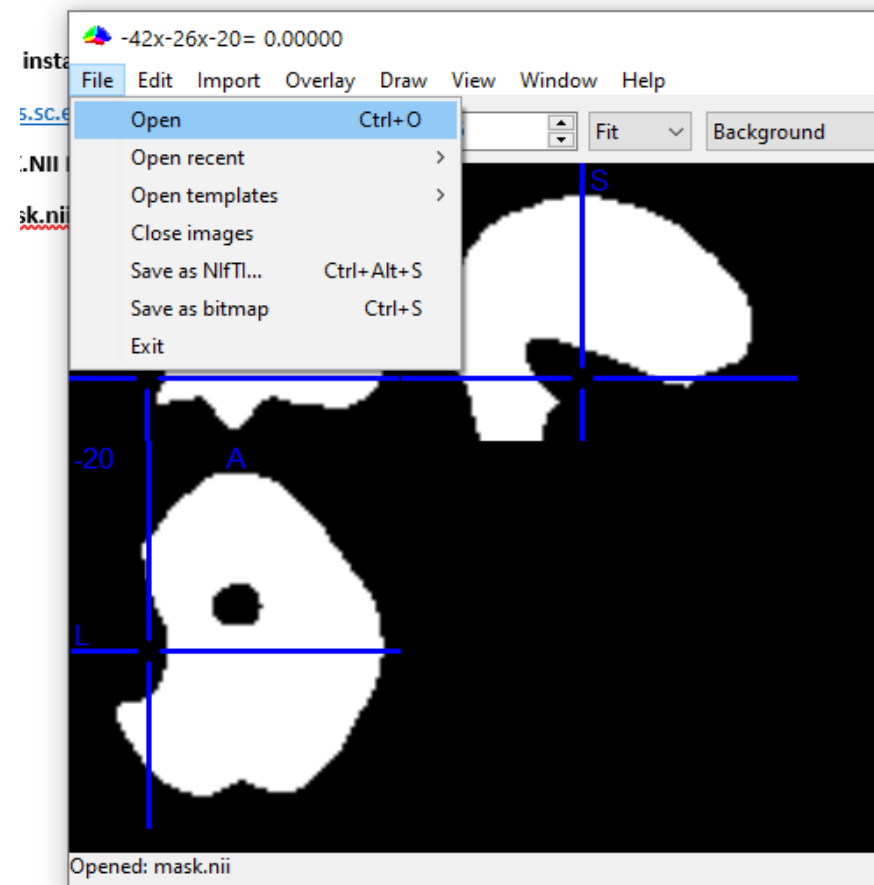
- Set up
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- **Interpretation**

The pipeline – tutorial

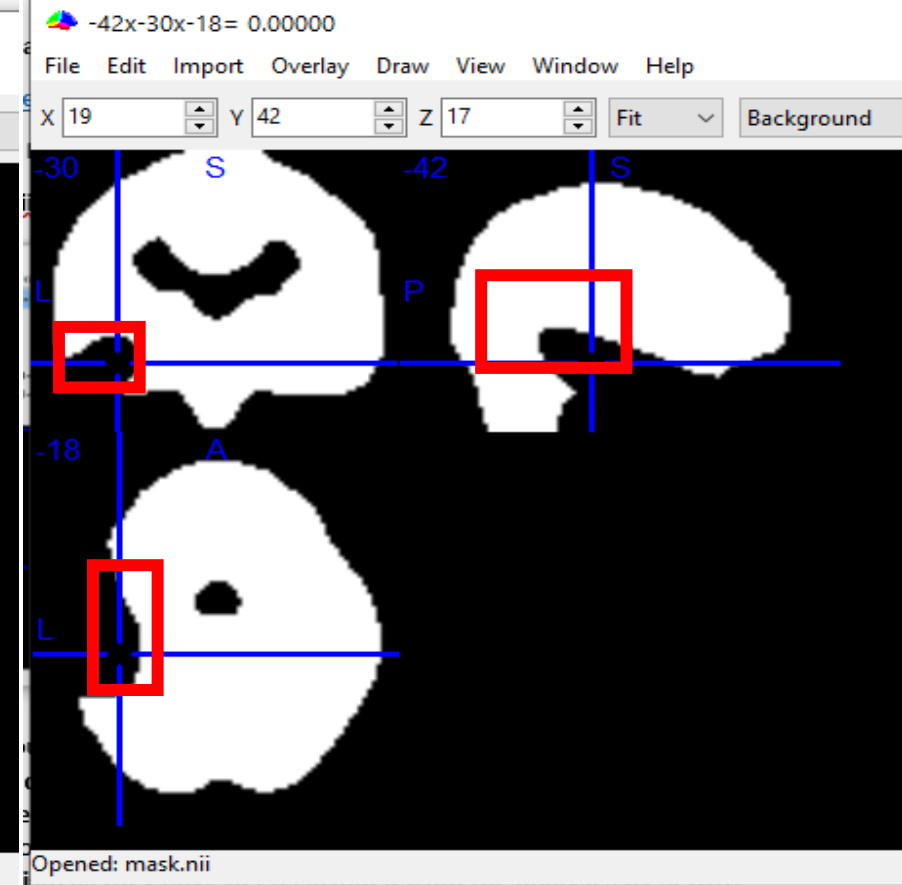
Quality check: mask



- Set up
- Run
- Quality check
- Interpretation



Open MASK.nii file



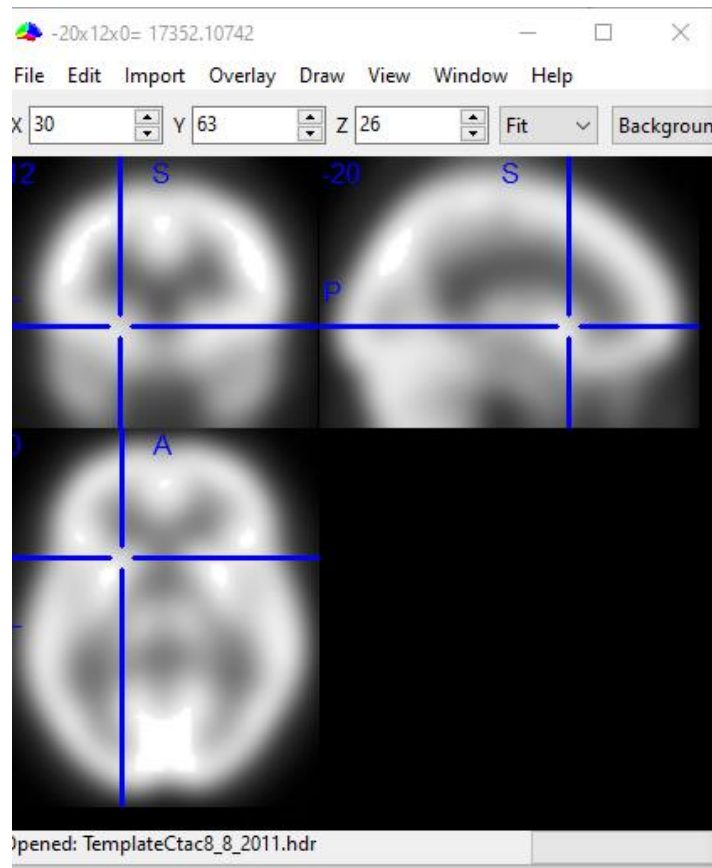
Look for unexpected black holes

The pipeline – tutorial

Quality check: normalization



- Set up
- Run
- Quality check
- Interpretation

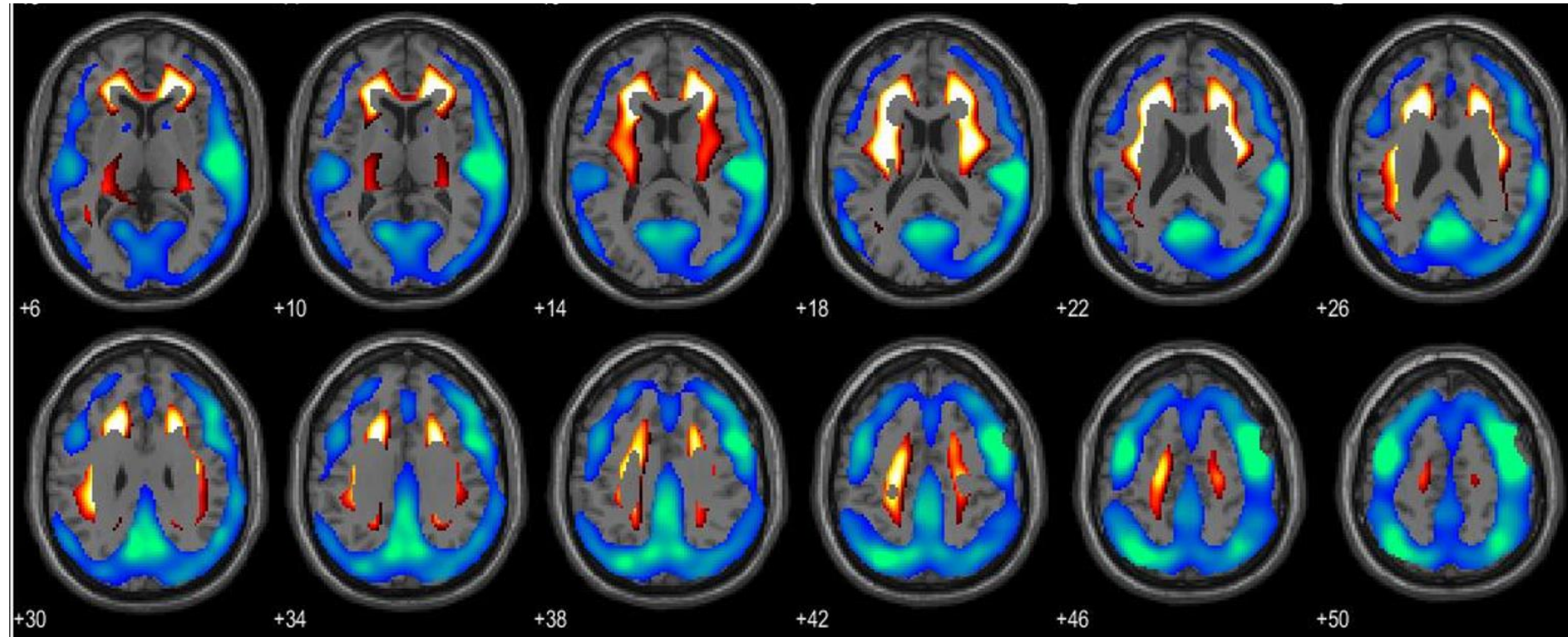


Open sw____.nii file and TemplateCtac8_8_2011.nii files and look for spatial incongruences!

The pipeline – tutorial

Quality check: white matter

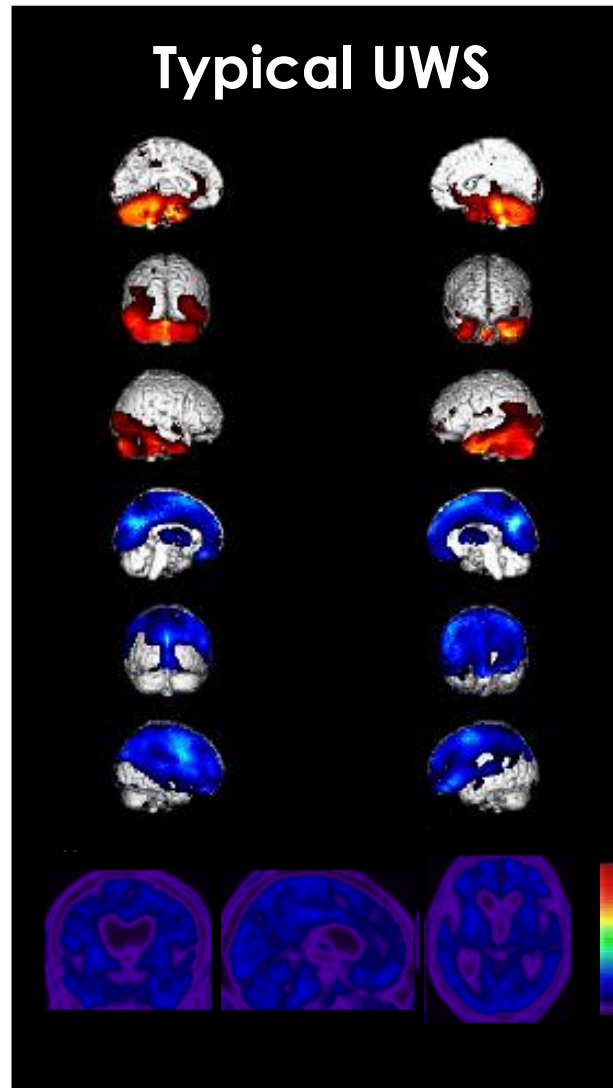
- Set up
- Run
- **Quality check**
- Interpretation



Visualize results in axial view and verify location relatively preserved metabolism (white matter?)

The pipeline – tutorial

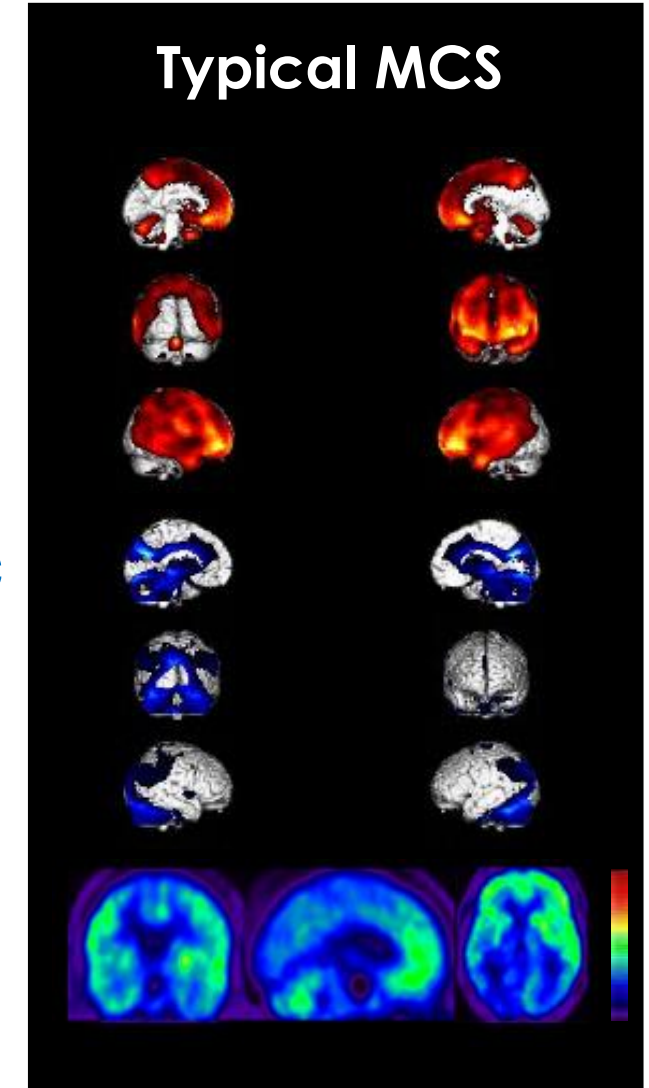
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Preserved
brain areas

Hypometabolic
brain regions

SUV





Clinical Report

Global SUV:

Allows to provide an estimate of the average glucose metabolism within the brain gray matter.



Report average global SUV decrease

When the global SUV of the patient is compared to that of the healthy controls, we get an *absolute* estimate of how much, within the patient's brain, glucose metabolism is decreased (on average).



Copy-paste patient SUV image

SPM maps of relative hypometabolism and relatively preserved brain regions:

Allow to provide an estimate of the regions that present *relative* decrease and *relative* preservation of glucose metabolism within the brain, compared to healthy controls.



Copy-paste patient SPM maps

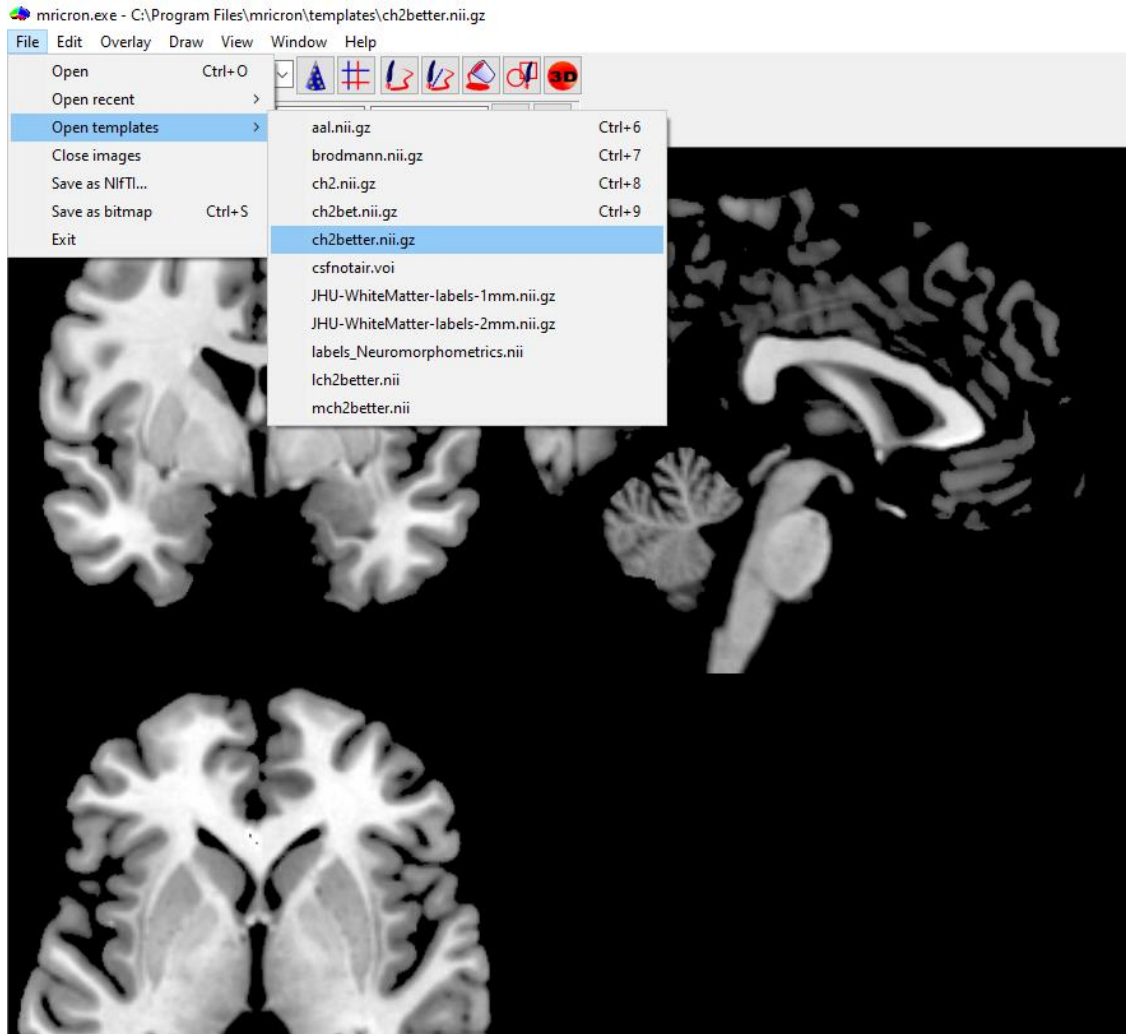
These maps allow to answer to the questions:



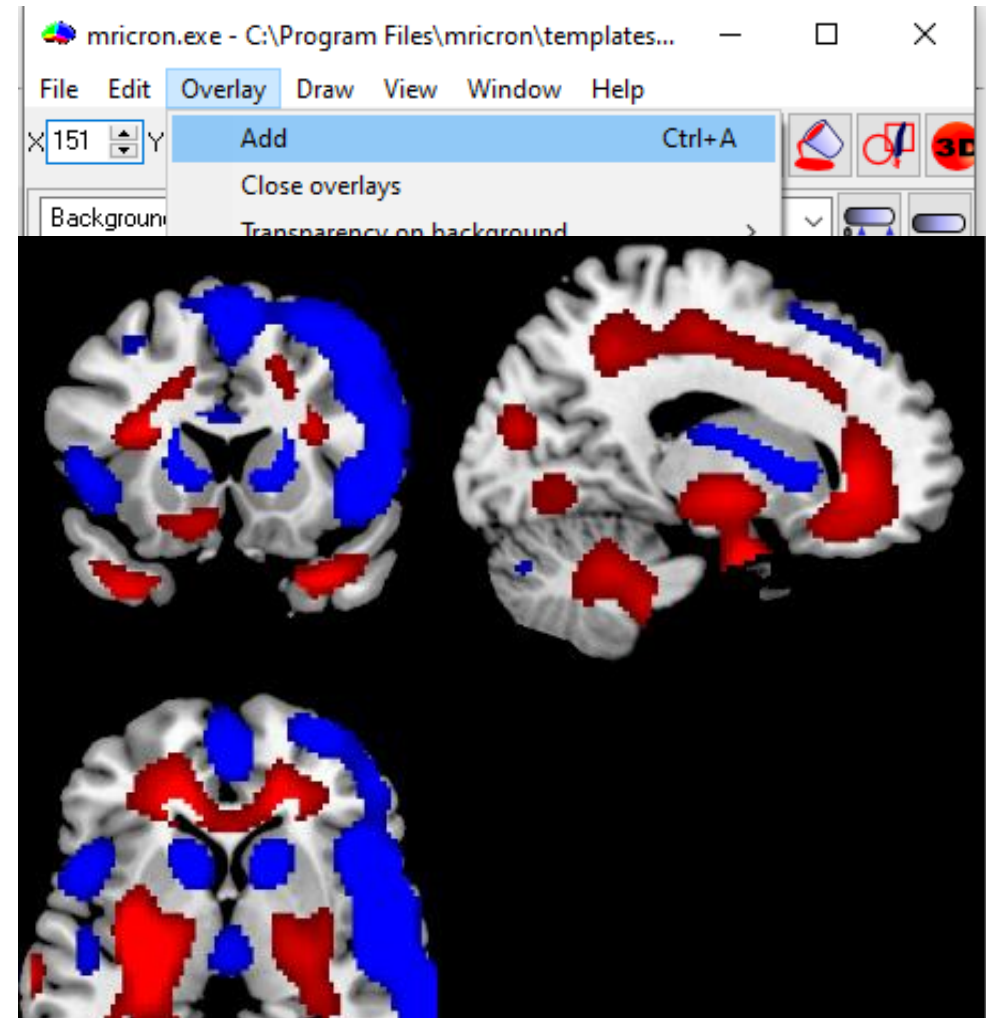
Describe the anatomical localization of relative hypometabolism and preserved brain regions

- What are the most impaired regions within this patient's brain?
- What are the most preserved regions within the patient's brain?

Anatomical localization MRIcron

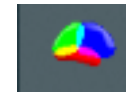


Open high resolution anatomical template ch2better

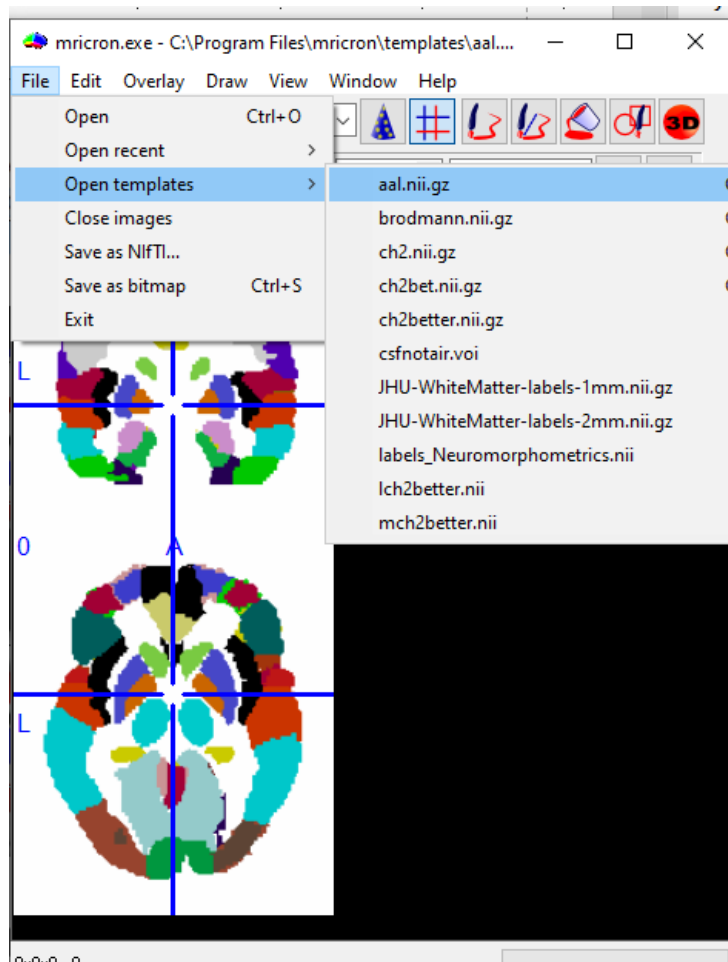


Overlay spmT_0002_Pres.nii and spmT_0001_Hypo.nii maps

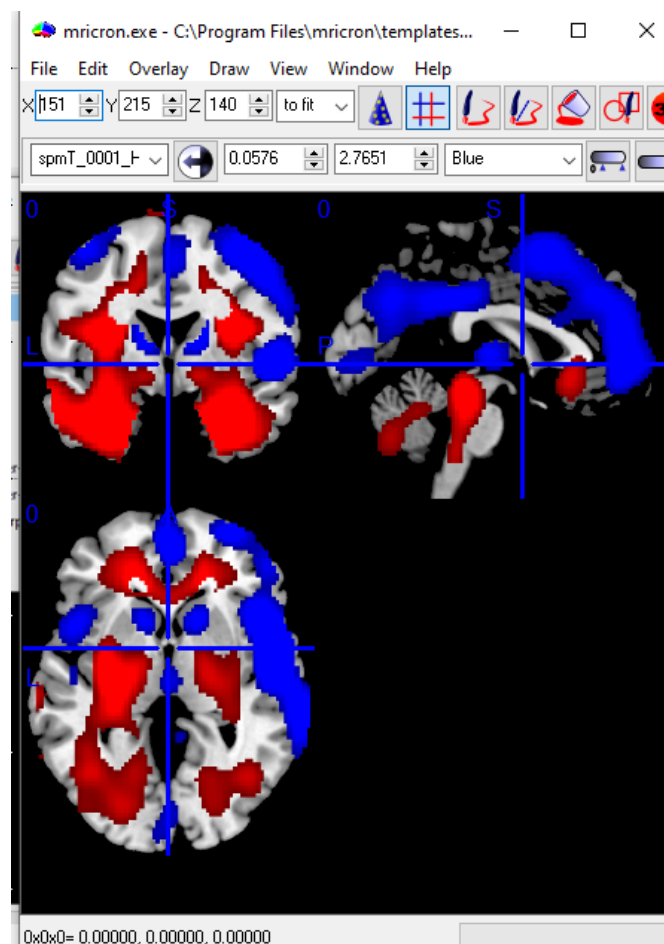
Anatomical localization



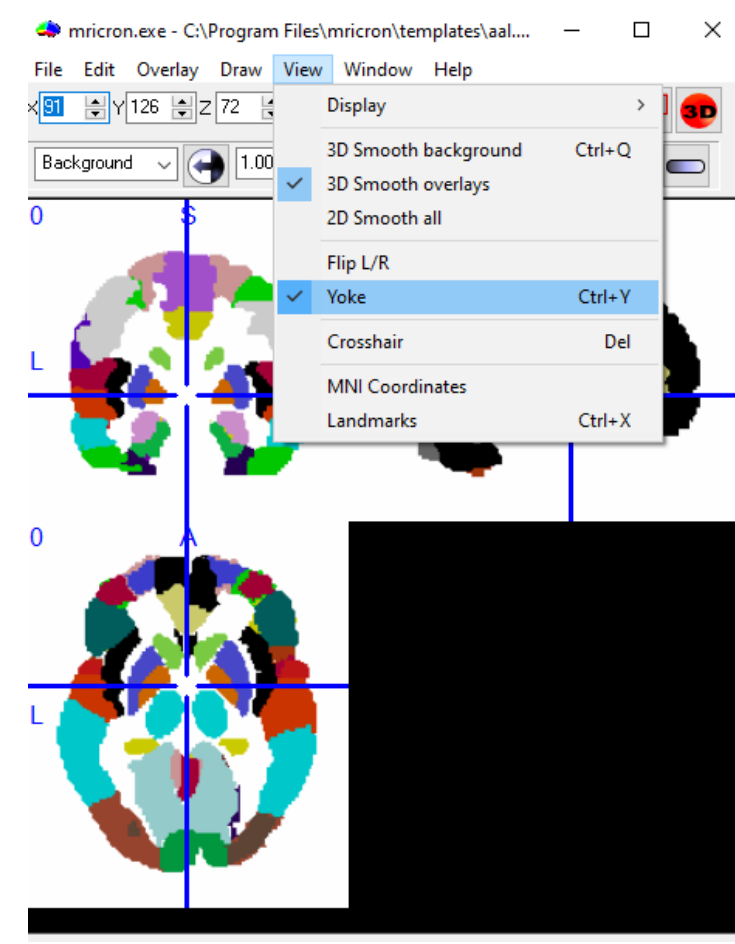
MRIcron

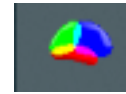


Open new MRIcron window and open the Automated Anatomical Labelling Atlas (AAL)

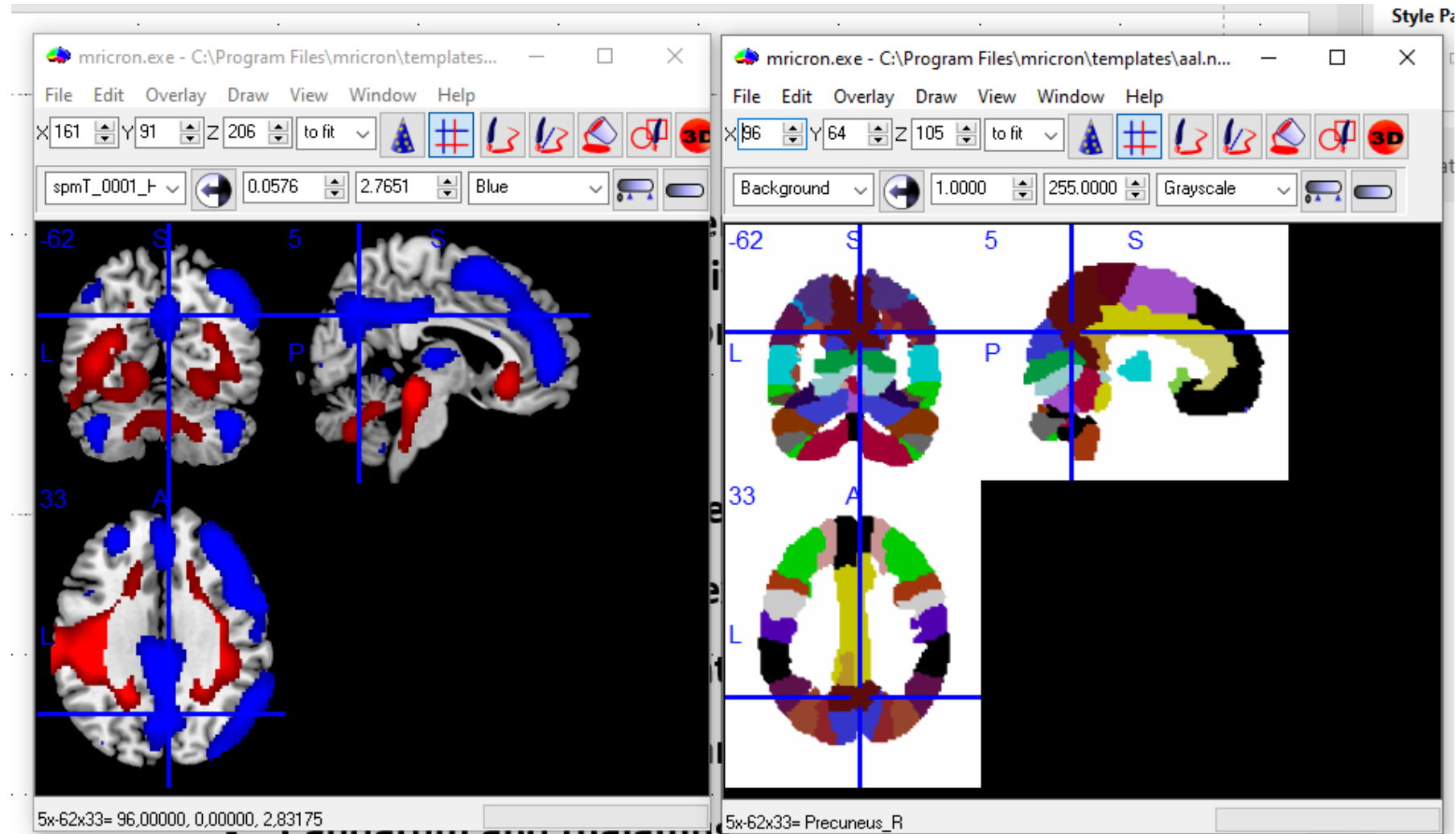


(first time you do this, you have to yoke both windows!)





Navigate around the clusters of relative hypometabolism and relatively preserved brain regions – you can see the corresponding label in the AAL window





Anatomical localization - maximum surveillance on:

- Internal awareness and external awareness networks (medial and lateral fronto-parietal regions)
- Language areas
- Sensorimotor cortices
- Basal ganglia and thalamus
- Brainstem

