WhiteRest manual

WhiteRest is a module of the Functionnectome software developed to help you explore the WhiteRest atlas and analyze the potential impact of a white matter lesion on RSNs.

For now, WhiteRest is only available through command line call, but we are planning on creating a user interface and a web app to facilitate its use.

Disclaimers

No financial conflicts.

Not licensed for medical use.

The software and its codes are licenced under the GNU General Public License.

Installation

- A Python environment is needed to use WhiteRest. For detailed instructions, check the start of our video tutorial for the Functionnectome on YouTube.
- WhiteRest is installed along the Functionnectome, so following the instruction in the Functionnectome manual will install the software.
  The following commands in a terminal with a proper Python environment will install it:
  pip install git+https://github.com/NotaCS/Functionnectome.git
  or
  python -m pip install git+https://github.com/NotaCS/Functionnectome.git

- Download and unzip the WhiteRest atlas and RSN labels information following the link: https://www.dropbox.com/s/mo4zs159rqhqopv/WhiteRest.zip?dl=0
- After the installation, to check if WhiteRest was properly installed, type "WhiteRest -h" (without the quotation marks) in the terminal and press Enter. The description and the help should be displayed.

Using WhiteRest

- Prepare the region of interest (ROI) file you wish to use (for example a white matter lesion mask). The file must be in NIfTI format (.nii or .nii.gz), in MNI space, and with $2mm^3$ isotropic voxels.
- Open a terminal. If necessary, activate the Python environment where the Functionnectome is installed (if it is not the default one).
- Type "WhiteRest" followed by the paths to paths to the files and the chosen options and press Enter.
  The minimal inputs should be (in that order):
  - The path to the ROI file you wish to explore (as a nifti file in the MNI space)
  - The path to the white matter maps of the WhiteRest atlas
  - The path to the RSN labels information from the atlas

  For example:

"WhiteRest /myhome/my_ROI.nii.gz /myhome/WhiteRestAtlas_WM.nii.gz /myhome/WhiteRest_labels.txt"

By default, WhiteRest will output a table with the Presence score for each RSN in the ROI, both in % and raw score, as well as a few other metrics. If no output file is given (with the "-o" option), the table will be printed in the terminal. Otherwise, it will be saved as a text file, which can be imported to a spreadsheet software (such as Excel) for further processing.

Additional options (the order does not matter):

-o OUT_TABLE (or --out_table OUT_TABLE)
Path to save the results (.txt).

-z Z_THRESH (or --Z_thresh Z_THRESH)
Threshold to apply to the atlas z-maps (default z>7).

-b (or –binarize)
Binarize the maps after thresholding.

-p OUT_PIE (or --out_pie OUT_PIE)
Path to save a pie-chart figure of the results (.png).

-pt THR_LOW_PIE (or --thr_low_pie THR_LOW_PIE)
Presence % under which the RSNs are grouped on the pie-chart (default <5%).

For example:
"WhiteRest /myhome/my_ROI.nii.gz /myhome/WhiteRestAtlas_WM.nii.gz /myhome/WhiteRest_labels.txt -o /myhome/table_results.txt -p /myhome/fig_results.png"
This command will save the table in the file */myhome/table_results.txt* and create a pie-chart figure saved in */myhome/fig_results.png*.

Output
The main output from WhiteRest is a table containing the presence score of each RSN whose white matter maps intersect with the ROI/lesion.
Multiple metrics are proposed for a more complete analysis of the atlas:

- The "raw" presence score *Presence (raw)*: Sum of the z-score of all the voxels from the white matter map of one RSN in the ROI
- The proportional presence *Presence (%)*: Proportion of the presence of one RSN compared to the sum of the presence of all RSN in the ROI
- The RSN presence proportion Presence/RSN (%) : The proportion of presence in the ROI of an RSN compare to the whole white matter map of the said RSN (i.e. how much of the RSN is in the ROI).
- The ROI coverage *Coverage (%)*: The volume fraction of the ROI occupied by the RSN.