ADNI Alzheimer's Disease Neuroimaging Initiative

Methods for medial temporal lobe measures from high-resolution T2 MRI

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Summary

These data represent volumetric measurements of subregions of the medial temporal lobe derived from high-resolution coronal T2 MRI obtained in ADNI. Measurements are provided for the following regions of interest: hippocampal subfields CA1, CA2, CA3, dentate gyrus and suboculum; extrahippocampal cortical regions of entorhinal, perirhinal, and parahippocampal cortex. Perirhinal cortex is divided into BA35 and BA36 segments.

Method

The measurements are generated by applying ASHS software (https://sites.google.com/site/hipposubfields/) to the hippocampal T2-weighted MRI scan (version 1.0.0). The required inputs are 1) High-resolution T2-MRI, 2) Standard T1-weighted MRI from the same scanning session.

This method uses a multiatlas label fusion technique in combination with a learning-based error correction module to produce a fully automated segmentation of hippocampal subfields along the entire length of the hippocampal formation, as well as segmentation of some MTL cortical regions. Candidate segmentations of a subject's MRI are obtained using high-dimensional mapping to multiple manually labeled atlas images. These are then fused into a consensus segmentation, taking into account the degree of similarity between the subject image and atlas images. Patterns of systematic segmentation errors introduced in this procedure are learned a priori using training data and are corrected in a further postprocessing step, to generate the final segmentation.

If you are going to use these for analysis, here are the things to keep in mind:

1. Take note of the QA columns, which describe image quality on a scale from 0 (worst) to 4 (best). These represent overall usability of the T2-weigthed images and we don't recommend using volumetric data for any image with a QA rating <= 1. Common factors contributing to low QA score are motion artifacts and slab orientation and positioning errors.
2. For extrahippocampal cortical regions ERC, PHC, BA35 and BA36, use a normalized volume which can be obtained by dividing the raw volumes by the number of slices in which the ROI appears. This is because the segmentation of these regions along the MRI slice direction is partial. See Yushkevich et al. (PMID: 25181316) for additional details.
3. CA2 and CA3 measurements are noisy due to the small size of these subfields. We recommend using CA1, or a combined CA (1+2+3) in your analysis if you can.

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Dataset Name	Date Submitted
Upenn PICSL ASHS volumes	October 16, 2018

References

Yushkevich, P.A., Pluta, J.B., Wang, H., Xie, L., Ding, S.L., Gertje, E.C., Mancuso, L., Kliot, D., Das, S.R., Wolk, D.A., 2015. Automated volumetry and regional thick- ness analysis of hippocampal subfields and medial temporal cortical structures in mild cognitive impairment. Hum. Brain Mapp. 36, 258-287.

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