

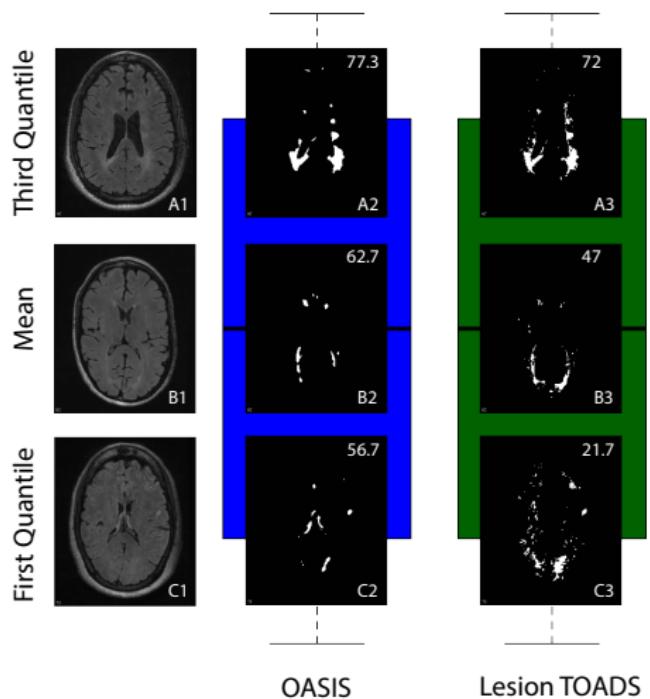
Using Adobe Illustrator for Research

Elizabeth M. Sweeney

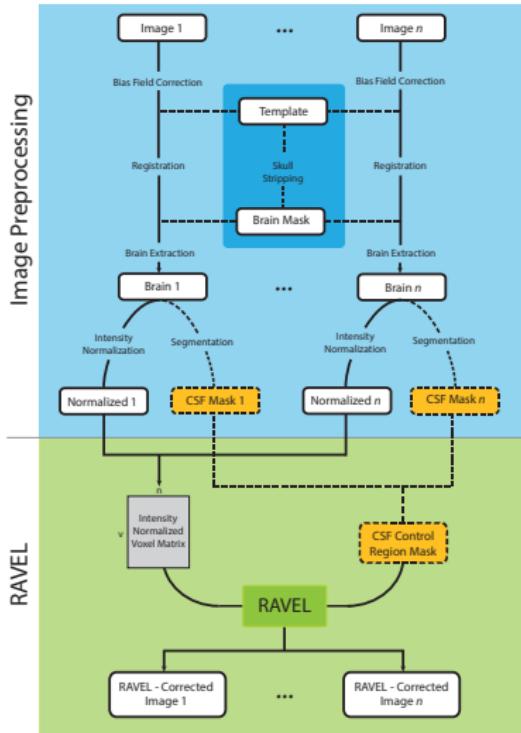
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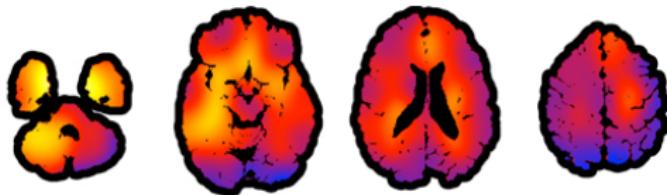
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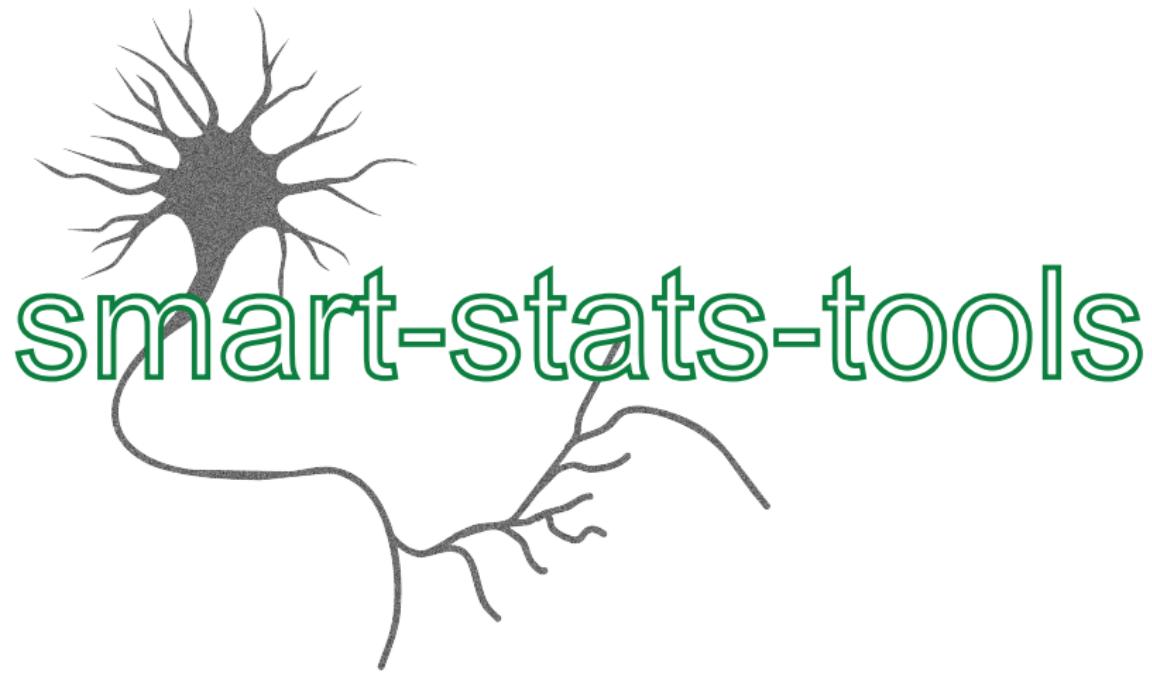
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Flow Charts









OASIS and SuBLIME Software for MS Lesion Segmentation

smart-stats-tools.org

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STATISTICAL
METHODS FOR
TRANSLATIONAL
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DISCOVERY



The smart-stats-tools website houses software for the analysis of structural magnetic resonance imaging (MRI) developed by members of the SMART group. Currently the website is home to the SuBLIME and OASIS software. SuBLIME is an automated method for segmenting incident lesion voxels between baseline and follow-up MRI studies. OASIS is an automated method for segmenting lesion voxels from a single MRI study.



SuBLIME is an automated method for segmenting incident and enlarging multiple sclerosis (MS) lesion voxels between baseline and follow-up MRI studies. Users of the software upload pre-processed T1-weighted, T2-weighted, proton density (PD) and fluid attenuated inversion recovery (FLAIR) volumes from a baseline and follow-up study, as well as a brain mask and normal appearing white matter (NAWM) mask to the SuBLIME web interface. In 3 seconds, the SuBLIME software produces a probability map of incident and enlarging lesion voxels for the user to download. The SuBLIME software is to our knowledge the only fully-automated software for segmentation of incident and enlarging MS lesions.

Validation

We have 110 MRI studies from 10 subjects acquired on a 1.5T GE scanner, with manual lesion segmentations. We assess the performance of the model by assigning 5 subjects to a training set and 5 subjects to a validation set.

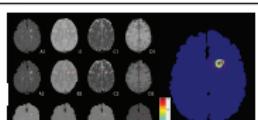


Figure 1: Baseline MRI study (row 1); Follow-up MRI study (row 2); Subtraction volumes (row 3); Fluid attenuated inversion recovery (FLAIR) volume (row 4); Proton density (PD) volume (A2); T2-weighted volume (C2); T1-weighted volume (B2); Nucleus Probability Map (E).

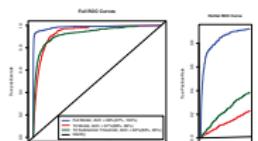


Figure 2: Receiver operating characteristic (ROC) and partial ROC (pROC) curves for the voxel level detection of incident and enlarging lesions for different thresholds of the probability maps produced from the SuBLIME model, as well as two nested models.



OASIS is an automated method for segmenting lesion voxels from a single MRI study. Users of the software upload pre-processed T1-weighted, T2-weighted, PD, and FLAIR volumes as well as a brain mask. The OASIS software produces a probability map of lesion presence.

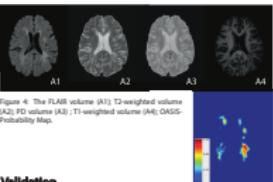


Figure 4: The FLAIR volume (A1); T2-weighted volume (A2); PD volume (A3); T1-weighted volume (A4); OASIS-Probability Map.

Validation

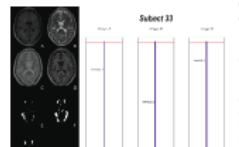
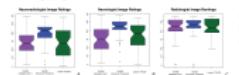


Figure 5: The set up for the expert evaluation (above) and bought the scores from the three rates for the different lesion segmentation methods (below).



References

- [1] Sweeney, E., Austin, H., Gherman, A., Reich, D.S., Calabrese, P.A., Pham, D.L., 2010. An image processing approach for the segmentation of brain images with multiple sclerosis lesions. *Neuroimage* 50 (2), 1124–1133.
- [2] Sweeney, E.M., Austin, H., Sweeney, E.J., Gherman, A., Reich, D.S., Calabrese, P.A., Pham, D.L., and Crainiceanu, C.M., 2011. Geodesic automated functional framework for segmentation with applications to multiple sclerosis lesion segmentation in MRI. *Neuroimage* 50 (2), 1124–1133.

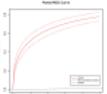


Figure 6: ROC curve for the voxel level detection of lesions for different thresholds of the probability maps produced from the OASIS model.

Some John Muschelli Originals

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Illustrator is part of Adobe Creative Suite. There are two options available for getting Creative Suite:

- Adobe Creative Cloud
- Adobe Creative Suite Software

<http://www.adobe.com/creativecloud.html>

The screenshot shows the Adobe Creative Cloud website with a dark background. At the top, there's a navigation bar with links for Overview, What's New, Learn & Support, Free Trial, Buy now, and More products >. Below the navigation, there are three main product offerings:

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- Illustrator CC**: Single App. Vector graphic design and illustration. Priced at US\$19.99/mo. A "Buy now" button is available, along with a link to See all plans >.
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