

NA-MIC National Alliance for Medical Image Computing http://na-mic.org

White Matter Lesion Segmentation

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NA-MIC Tutorial Contest: Summer 2010



Learning Objective

Learn how to run "White Matter Lesion Segmentation" module in Slicer 3.



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- Data Loading and Visualization (Sonia Pujol, Ph.D.)
 - http://www.na-

mic.org/Wiki/index.php/Slicer3.2:Training



- This tutorial requires Slicer3.6 (release version) and the tutorial dataset. They are available at the following locations:
- Slicer3.6 download page

http://www.slicer.org/pages/Downloads/

Tutorial dataset:

http://wiki.na-

mic.org/Wiki/index.php/File:White_Matter_Lesion_Segmenta tion_TutorialContestSummer2010.zip

Disclaimer: It is the responsibility of the user of Slicer to comply with both the terms of the license and with the applicable laws, regulations, and rules.

Material: Sample Data

Training data

Input: N training images (T1, T2, PD, FLAIR, lesion ROI)



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Material: Sample Data

• Testing data

Input: testing image (T1, T2, PD, FLAIR)





 This tutorial has tested on a Linux (64 bit) machine.



- Introduction
- Getting started
- Pipeline 1 Training & Segmentation only
- Pipeline 2 Preprocessing, Training, and Segmentation
- Conclusion



Learning based WML segmentation



$F(v) = \left\{ I(t_m) | t_m \in \Omega(v_m), m \in \{T_1, T_2, PD, FLAIR\} \right\}$

- SVM \rightarrow To train a WML segmentation classifier.
- Adaboost → To adaptively weight the training samples and improve the generalization of WML segmentation method.

Lao, Shen, *et al.,* "Computer-Assisted Segmentation of White Matter Lesions in 3D MR images Using Support Vector Machine", *Academic Radiology*, 15(3):300-313, 2008.



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- Module installation
 - Press F2 or go to View >> Application Settings >> Module Settings on the menu of Slicer3.
 - Click the "add a preset" button.
 - Select the location of the White Matter Lesion Segmentation modules (*wmlstrain* and *wmlstest*).
 - Close Slicer3 and restart.



• Execution

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Pipeline 1 (w/o Preprocessing)

 In case your images are already preprocessed...







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Click and select the location containing training images



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Click and select the location where SVM model will be saved after training





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Testing (Segmentation)



Click and specify the location containing the saved SVM models in the "Training" stage.

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• Visualization of the segmented lesion volume



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Pipeline (w/ Preprocessing)

• If your images are unprocessed...



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Training/Testing w/ Preprocessing

- In the training or testing menu, check the "Preprocessing" option.
- Intermediate files by processing steps are saved in the directory you specified in the training/testing menu.
- For other training and testing options, see page 12-24.

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Example of preprocessing – coregistration (FLAIR)

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Example of preprocessing – skull stripping

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 Example of preprocessing – bias correction and histogram matching





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- A Slicer3 module for automatic segmentation of white matter lesions has been developed.
 - Preprocessing
 - Coregistration, skull stripping, bias correction, and histogram matching
 - Training
 - Build SVM model using multi-protocol MRIs (T1, T2, PD, and FLAIR)
 - Segmentation
 - Test new subject images using the SVM model built in the training stage





National Alliance for Medical Image Computing NIH U54EB005149



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