

AUTOMATIC PERIVENTRICULAR WHITE MATTER HYPERINTENSITY SEGMENTATION, QUANTIFICATION & GRADING

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Abstract

We perform periventricular white matter hyperintensity segmentation by applying adaptive thresholding and 3D connectivity analysis to Fluid Attenuated Inversion Recovery MR images. The results were evaluated by comparing the automatic method to the manually delineated segmentations obtained from the experts. We obtained a dice score of up to 0.82 and a correlation coefficient of approximately 0.8 for the segmentation and quantification respectively.

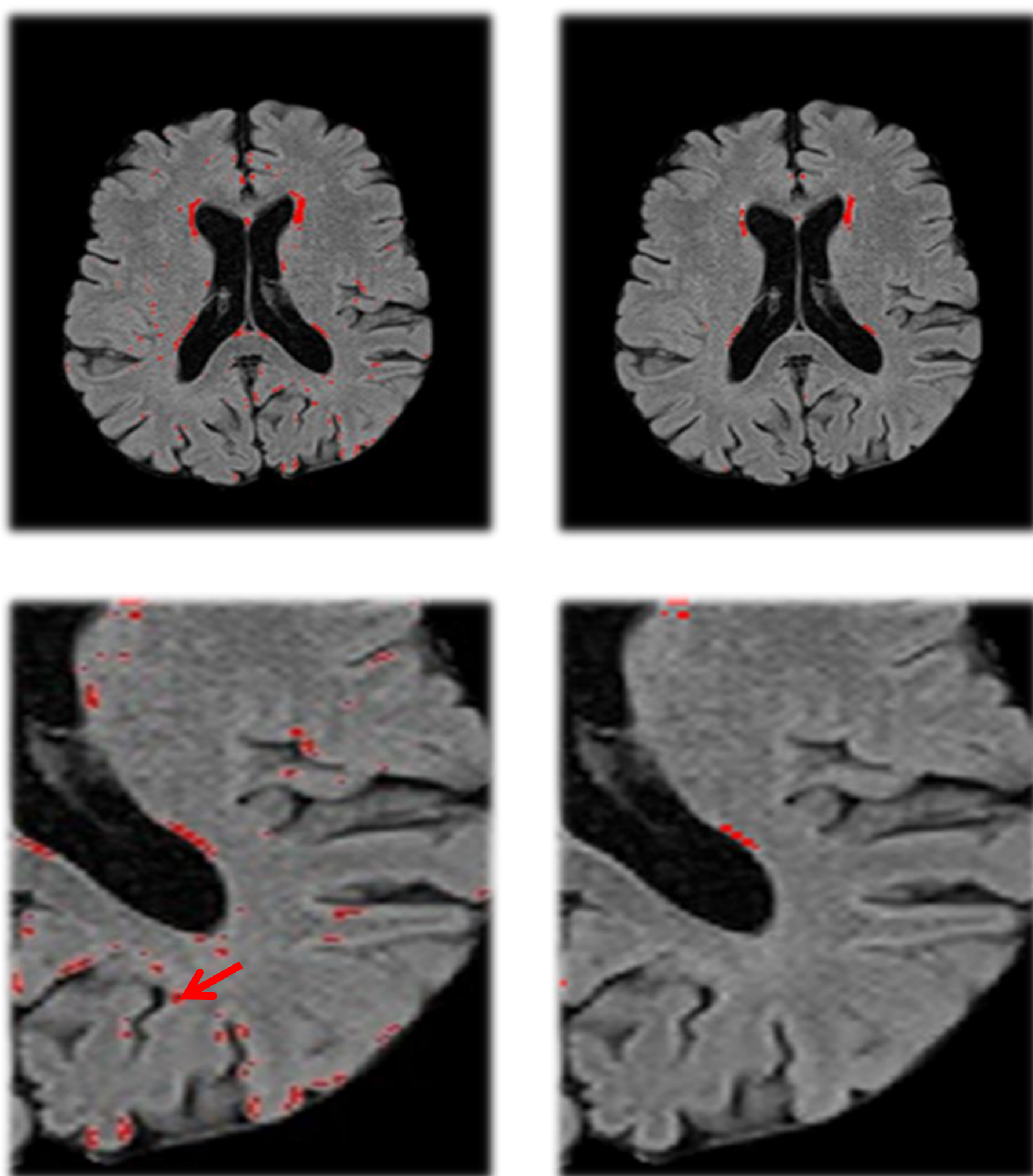
Dataset

So far, we have collected a total of 72 subjects, 33 manually delineated (training) and 39 blinded (testing). The training data PWMH grade distribution is as follows:

Grade	No. of Subjects
0	13
1	8
2	5
3	4
4	3
Total	33

WMH Segmentation

Thresholding + 3D connectivity analysis. Similar to [1]



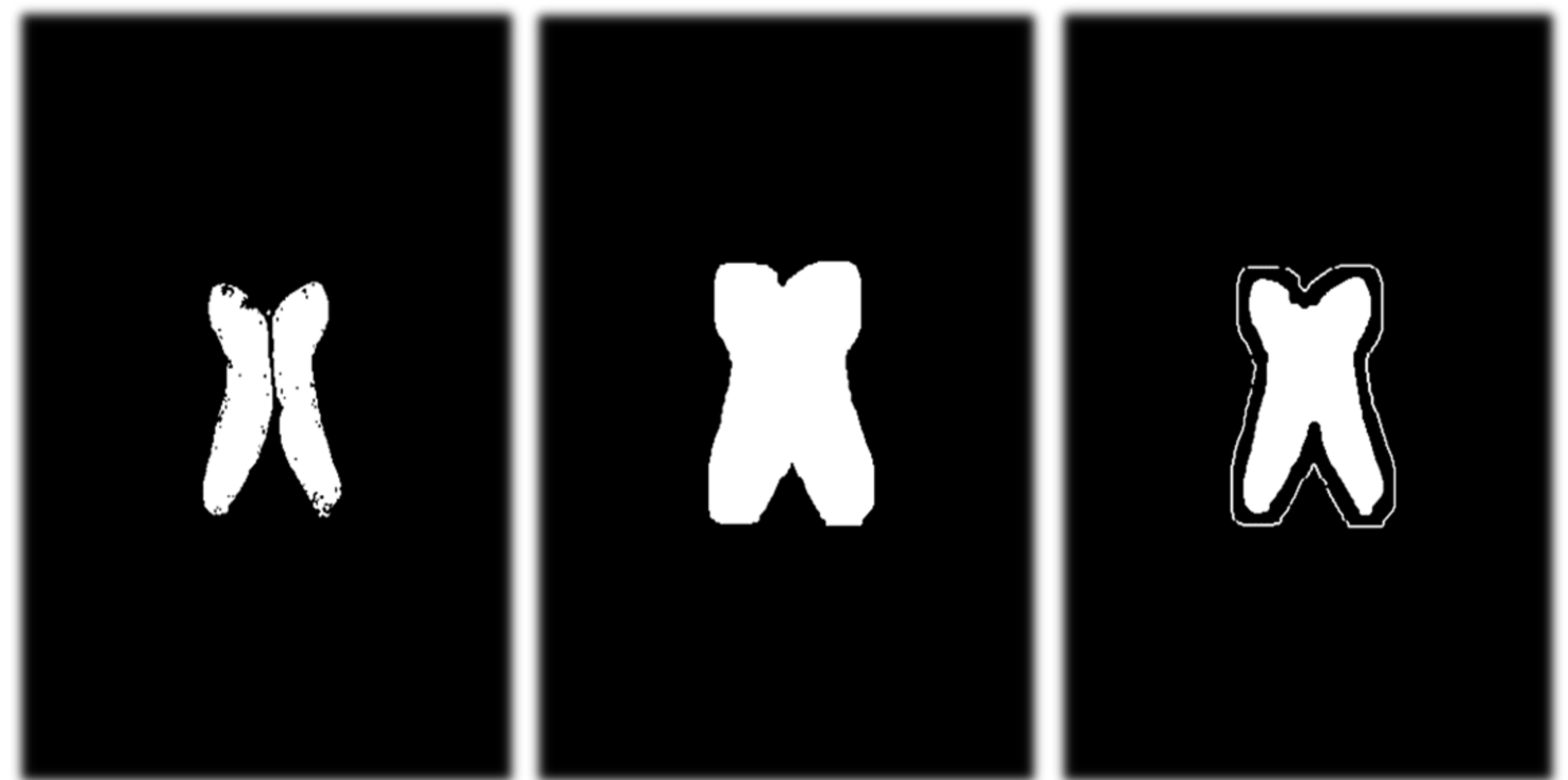
(a) Result of intensity thresholding and (b) application of the 3D connectivity rule

References

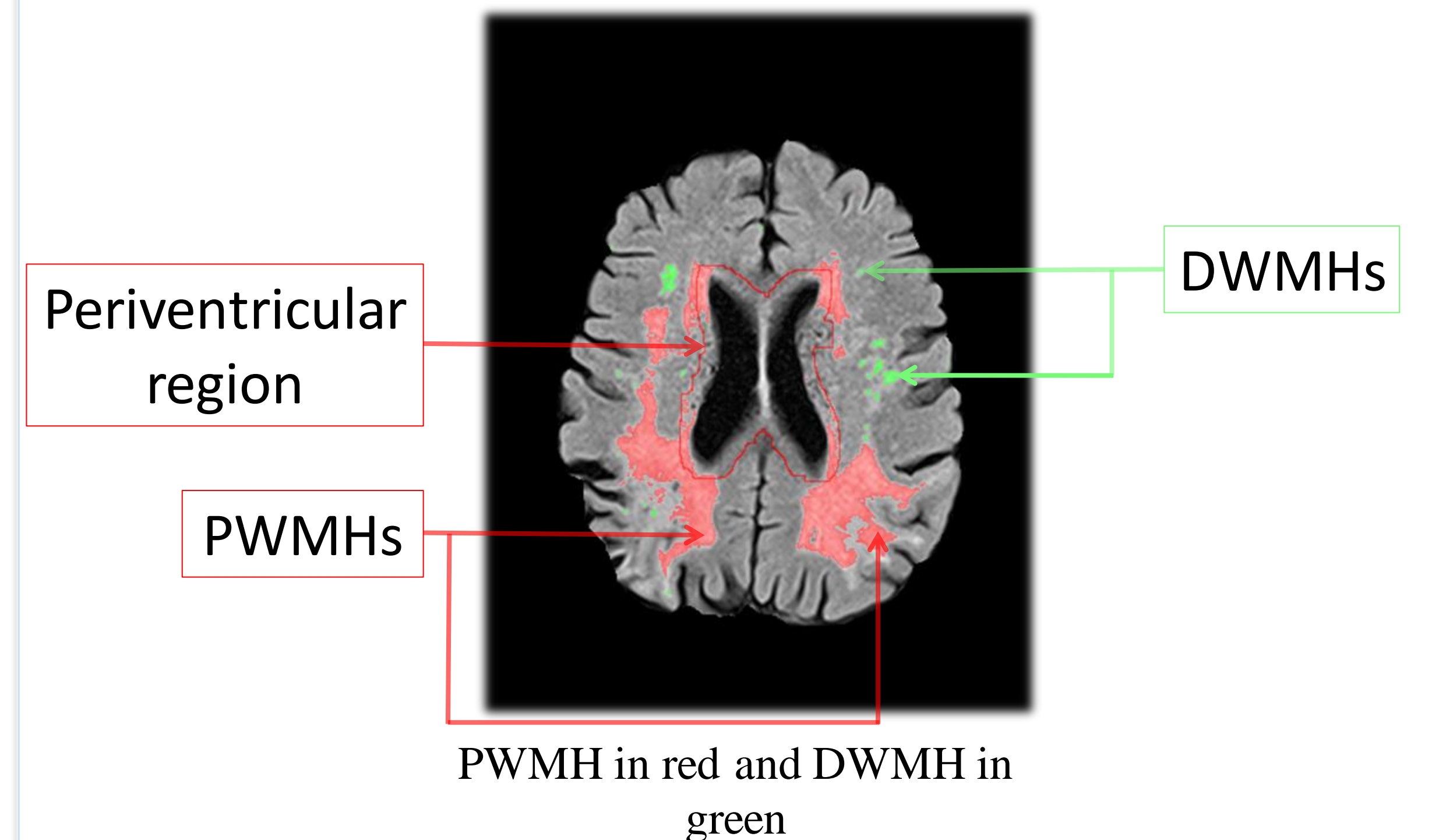
- [1] Jack Jr, C. R., et al., "FLAIR histogram segmentation for measurement of leukoaraiosis", J Magn Reson Imaging vol. 14, pp. 668-676, 2001.
- [2] M. J. Kempton, et al., "A comprehensive testing protocol for MRI neuroanatomical segmentation techniques: Evaluation of a novel lateral ventricle segmentation method", NeuroImage, vol. 58, no. 4, pp. 1051-1059, 2011

PWMH Segmentation

PWMH Detection. ALVIN [2] is used for lateral ventricle segmentation



Lateral ventricle segmentation



Results

Dice score mean (std)	Correlations	
	0.82 (0.14)	Pearson
	Kendall	0.77

Conclusion

Decent PWMH segmentation and quantification results were obtained by thresholding and applying the 3D connectivity analysis to FLAIR MRI. Further algorithm development is however required in order to get rid of false positives that appear at CSF-brain parenchyma boundaries. For that purpose and more, we shall turn our attention to machine learning since we have training data at our disposal.