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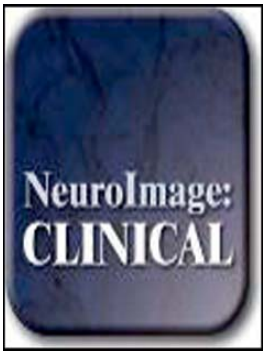

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ACCEPTED MANUSCRIPT

Brain Lesion Segmentation through Image Synthesis and Outlier Detection

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Abstract

Cerebral small vessel disease (SVD) can manifest in a number of ways. Many of these result in hyperintense regions visible on T_2-weighted magnetic resonance (MR) images. The automatic segmentation of these lesions has been the focus of many studies. However, previous methods tended to be limited to certain types of pathology, as a consequence of either restricting the search to the white matter, or by training on an individual pathology. Here we present an unsupervised abnormality detection method which is able to detect abnormally hyperintense regions on FLAIR regardless of the underlying pathology or location. The method uses a combination of image synthesis, Gaussian mixture models and one class support vector machines, and needs only be trained on healthy tissue. We evaluate our method by comparing segmentation results from 127 subjects with SVD with three established methods and report significantly superior performance across a number of metrics.

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