Lesion-behaviour mapping analyses require the demarcation of the brain lesion on each (usually transverse) slice of the individual stroke patient's brain image. To date, this is generally thought to be most precise when done manually, which is, however, both time-consuming and potentially observer-dependent. Fully automated lesion demarcation methods have been developed to address these issues, but these are often not practicable in acute stroke research where for each patient only a single image modality is available and the available image modality differs over patients. In the current study, we evaluated a semi-automated lesion demarcation approach, the so-called Clusterize algorithm, in acute stroke patients scanned in a range of common image modalities. Our results suggest that, compared to the standard of manual lesion demarcation, the semi-automated Clusterize algorithm is capable of significantly speeding up lesion demarcation in the most commonly used image modalities, without loss of either lesion demarcation precision or lesion demarcation reproducibility. For the three investigated acute datasets (CT, DWI, T2FLAIR), containing a total of 44 patient images obtained in a regular clinical setting at patient admission, the reduction in processing time was on average 17.8 min per patient and this advantage increased with increasing lesion volume (up to 60 min per patient for the largest lesion volumes in our datasets).
Additionally, our results suggest that performance of the Clusterize algorithm in a chronic dataset with 11 T1 images was comparable to its performance in the acute datasets. We thus advocate the use of the Clusterize algorithm, integrated into a simple, freely available SPM toolbox, for the precise, reliable and fast preparation of imaging data for lesion-behaviour mapping analyses.