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| Comparing manual and automated lesion segmentation methods through a voxel-based lesion symptom mapping analysis on ischemic stroke patients with aphasia |
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| Master thesis in Experimental Biomedical Research |
| The investigation of anatomo-clinical correlation in brain-damaged patients requires the lesions to be reconstructed in order to compare them with the associated neuropsychological deficit. Nevertheless, there are numerous methods available for reconstructing the lesion, and it is unclear whether their cost-benefit ratios are equivalent. In order to shed more light on the subject, a comparative research of the efficacy of manual versus automatic brain lesion delineation was conducted. The brain lesions of 89 individuals were reconstructed manually using the MRIcron software on diffusion weighted images taken during post-stroke clinical assessment and collected retrospectively. Exploiting a public deep learning algorithm (the 3D DAGMNet), the same brain lesions were also automatically generated. The lesions produced by the two approaches were then compared in terms of their similarity, using the manual delineation as reference. The average Dice similarity index obtained is 0.75; this indicates that 75% of the automatically generated lesion pixels are superimposed on the ones that were manually made. The two techniques were then employed in a voxel-based lesion symptom mapping (VLSM) analysis to examine the neurofunctional correlations in patients who had an ischemic stroke and reported a speech production deficit. The outcomes derived from the VLSM analysis on manually created lesions appeared to be equivalent to those obtained with the automatic method. These results demonstrate that, despite the fact that the accuracy of the automatic approach for delineation is not yet perfect, it is nevertheless possible to produce analogous practical results to those acquired manually. Taking into account that the manual method is particularly expensive in terms of both time and effort, the automatic approach could therefore represent a valid alternative. |
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