ISLES 2015 - A public evaluation benchmark for ischemic stroke lesion segmentation from multispectral MRI.

Ischemic stroke is the most common cerebrovascular disease, and its diagnosis, treatment, and study relies on non-invasive imaging. Algorithms for stroke lesion segmentation from magnetic resonance imaging (MRI) volumes are intensely researched, but the reported results are largely incomparable due to different datasets and evaluation schemes. We approached this urgent problem of comparability with the Ischemic Stroke Lesion Segmentation (ISLES) challenge organized in conjunction with the MICCAI 2015 conference. In this paper we propose a common evaluation framework, describe the publicly available datasets, and...
present the results of the two sub-challenges: Sub-Acute Stroke Lesion Segmentation (SISS) and Stroke Perfusion Estimation (SPES). A total of 16 research groups participated with a wide range of state-of-the-art automatic segmentation algorithms. A thorough analysis of the obtained data enables a critical evaluation of the current state-of-the-art, recommendations for further developments, and the identification of remaining challenges. The segmentation of acute perfusion lesions addressed in SPES was found to be feasible. However, algorithms applied to sub-acute lesion segmentation in SISS still lack accuracy. Overall, no algorithmic characteristic of any method was found to perform superior to the others. Instead, the characteristics of stroke lesion appearances, their evolution, and the observed challenges should be studied in detail. The annotated ISLES image datasets continue to be publicly available through an online evaluation system to serve as an ongoing benchmarking resource (www.isles-challenge.org).

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