Combining clinical information for Stroke Lesion outcome prediction using Deep Learning

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Abstract. Stroke is the second major cause of death in developed countries. An automatic prediction of Ischaemic Stroke lesion outcome from multi-modal Magnetic Resonance Imaging has the potential to guide the decision process of physicians, needed to forecast the risks and benefits of a revascularization procedure. However, the high variability of lesion shape and location, coupled with intrinsic biological processes, makes the problem an intricate task. In this paper, we propose a Deep Learning method that automatically predicts Stroke lesion outcome. Our architecture is based upon the 2D U-net [1] alongside Gated Recurrent Units, which are responsible for granting local and global context. In an end-to-end learning process, a feature space extracted from multi-modal Magnetic Resonance Imaging sequences is combined with non-imaging clinical information: the thrombolysis in cerebral infarction (TICI) scale. TICI scale categorizes the success of revascularization. This clinical domain knowledge is incorporated at two levels. At a population level through a custom learning loss function and at a patient specific level through an extra input channel. Therefore, we aim to drive the learning process to produce optimistic predictions, for patients with revascularization, and pessimistic predictions where there is no revascularization.

References

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