Gated Two-Stage Convolutional Neural Network for Ischemic Stroke Lesion Segmentation

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Abstract. We propose a novel framework with a gated two-stage Convolutional Neural Network (CNN) for ischemic stroke lesion segmentation. Specifically, there are two CNNs in our framework. The first CNN produces a probability of being normal tissue, *i.e.*, normal, or being ischemic stroke lesion, *i.e.*, lesion. Based on our observation that as for the misclassified voxels in images, the ratio between probabilities of normal and lesion was low. That is, when the probabilities of normal and lesion are close to each other, it can be a good indicator of low confidence to make a decision. In this regard, we devise a gate function that computes the probability ratio between normal and lesion. When the ratio is lower than a threshold, the gate function turns on the second CNN to operate. It is noteworthy that in our second CNN, we also utilize the probabilities obtained from the first CNN as context information. In our experiments, we could validate the effectiveness of the proposed two-stage CNN architecture.
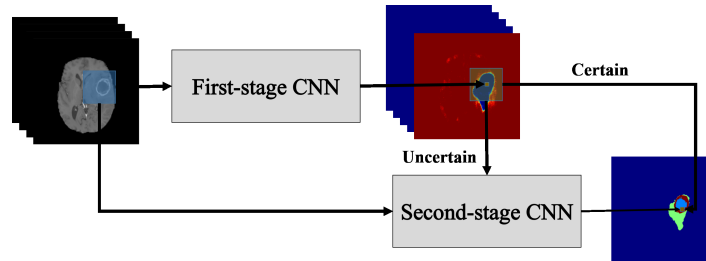
Fig. 1. A schematic diagram of the proposed two-stage CNNs.

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