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Deep Learning Segmentation of Acute Ischemic Stroke on Non-contrast CT

Researchers at Stanford University have established a deep learning segmentation algorithm for non-contrast CT images to aid clinicians in decision making and improve the speed of symptom to treatment in acute ischemic stroke

Supervised deep learning models are powerful tools in clinical image segmentation. While these models have promise for application to stroke imaging, there are challenges in their use in non-contrast computed tomography (CT) images. Specifically, low signal to noise ratios in non-contrast CT images restrict the development of accurate reference annotations that are essential for the supervised deep learning model training. Further, the identification of acute ischemic stroke is highly time sensitive, with clinical outcomes highly correlating with the time from symptom onset to treatment. Thus, a simple model that can directly predict a probability heat map or a binary segmentation offers a fast route for clinicians to use the information contained within non-contrast CT images in clinical decision making.

In this technology, a model trained on random expert sampling is established, harnessing interpretations from three expert neuroradiologists. The model can identify the location and volume of acutely ischemic brain tissue in non-contrast CT images and significantly correlates clinical outcomes. The model outperforms human expert performance, offering a faster route than current tools for clinicians to interpret non-contrast CT images for acute ischemic stroke.

Stage of Development Clinical data

Applications

- Automatic segmentation of acute ischemic stroke in non-contrast CT images for triaging patients for optimal treatment

Advantages

- More reliable identification, quantification, and localization of acute ischemic stroke in non-contrast CT images
- Shorter times from symptom onset to treatment, which is correlated to clinical outcome
- Reduces the need for additional imaging procedures
- Enables the use of widely available non-contrast CT for acute ischemic stroke instead of specialized imaging procedures the require particular expertise and have more limited availability

Patents

- Published Application: 20250275735

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