Resource-efficient automatic segmentation of medical images

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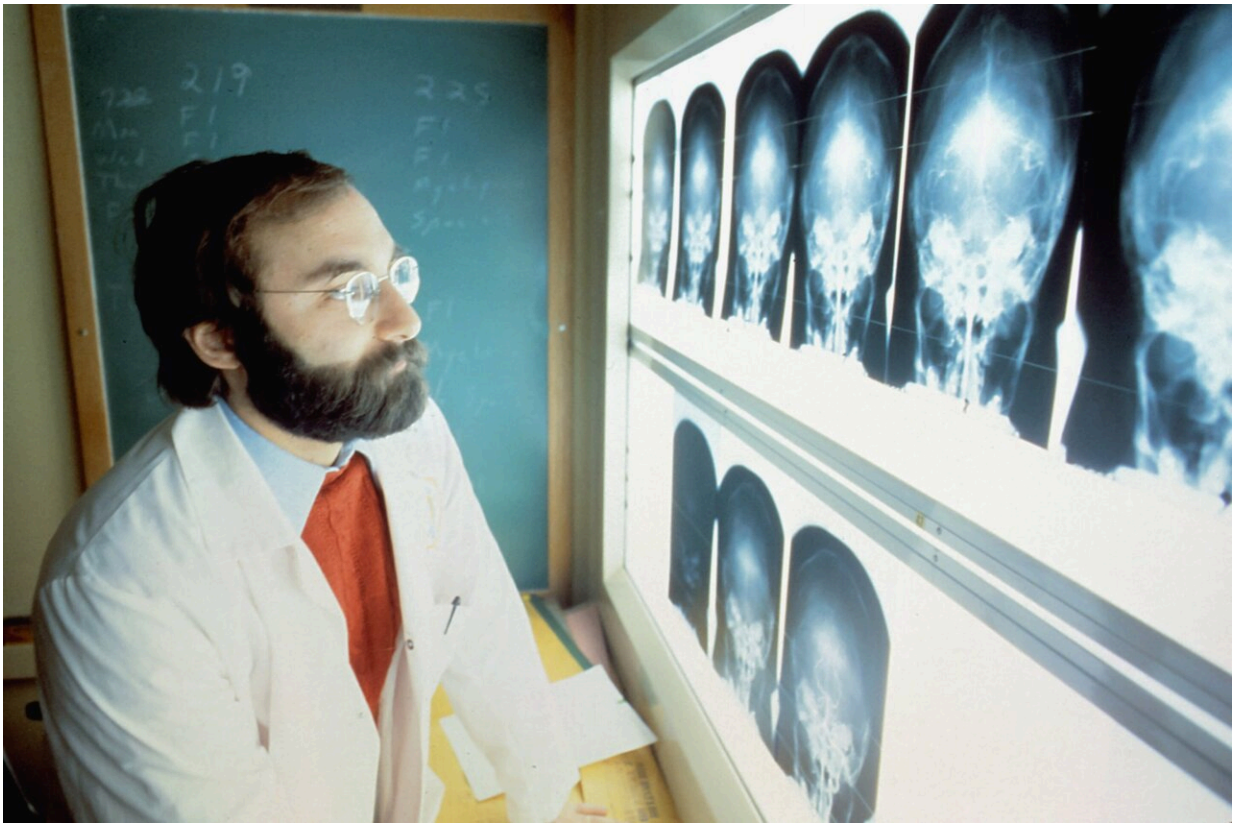

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The core benefits of convolutional neural networks (CNNs) are weight sharing and that they can automatically detect important visual features. Minh H. Vu and his group found that CNNs are very efficient in

automatically segmenting tumors, organs, and structures, which means that CNNs can save radiation oncologists much time when delineating.

First, an end-to-end cascaded deep learning network is effective and promising for quantifying uncertainty in the segmentation of medical images. Second, the proposed novel loss function, the so-called "data-adaptive loss function," demonstrated that it can address diverse issues in deep learning, including imbalanced datasets, partially labeled data, and incremental learning. Third, one of the works, designed for compressing high-dimensional activation maps, showed that it induces a regularization effect that acts on the layer weight gradients. By employing the proposed technique, the researchers reduced activation map memory usage by up to 95%.

Overall, Vu's doctoral thesis aims at the classification and segmentation of medical images. Both public and in-house datasets were used. The deep learning architectures used were generative adversarial networks (GANs) and convolutional neural networks (CNNs). The team also used numerous methods throughout the thesis: statistical tests (Friedman test followed by a Nemenyi post-hoc test) to find the methods that are significantly different from the others, hyper-parameter search, cross-validation, and ensemble, to name a few.

More information: Resource efficient automatic segmentation of medical images:
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