Half-UNet: A Simplified U-Net Architecture for Medical Image Segmentation

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Description of Problem:

Medical image segmentation plays a vital role in computer-aided diagnosis procedures. The main goal of segmenting this data is to identify areas of the anatomy required for a particular study or medical diagnosis. U-Net is widely used in medical image segmentation. Many variants of UNet have been proposed, which attempt to improve the network performance while keeping the U-shaped structure unchanged. However, this U-shaped structure is not necessarily optimal. In this project, we attempt to analyze the segmentation ability of the existing UNet architecture and finally a more efficient architecture, Half-UNet, is proposed.

What have been done:

So far we went through the paper Half-UNet: A Streamlined U-Net Architecture for Medical Image Segmentation. From the paper, the proposed architecture is essentially an encoder-decoder network based on the U-Net structure, in which both the encoder and decoder are simplified. The re-designed architecture takes advantage of the unification of channel numbers, full-scale feature fusion, and Ghost modules. It has been observed that Half-UNet has similar segmentation accuracy compared to U-Net and its variants, however it achieves better performance in parameters and floats operations. According to this, we decided to build both the U-Net and half U-net models, making a comparison between them to find out which one is better for medical image segmentation.

Preliminary plan:

In the original paper 3 datasets were used for training and testing, we are planning to do the same. However, gathering images or finding datasets that correspond to our project can be a little bit hard, since the images with high

resolutions can be quite large and storing, transferring and processing such a large dataset can require significant computing and storage resources. Besides that, medical images contain sensitive patient information which makes it even harder to gain access to high-quality images.

References

- Publication
- Data: Mammography Dataset
- Data: Lung Nodule Dataset
- Data: Left Ventricular MRI Dataset