

Medical Image Segmentation - Week 1

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1 Introduction

After extensive research, the following problems have been identified where Medical Image Segmentation can be performed. In case of most of these problems, manual segmentation is a difficult process and the use of ML algorithms can heavily increase the speed of diagnosis of many such diseases which if not detected early can have lasting effects and can even be fatal.

- Retinal Blood Vessel Segmentation.
- Brain Tumor Segmentation
- Lung Segmentation
- Polyp Segmentation
- Cell Nuclei Segmentation

2 Retinal Blood Vessel Segmentation

This involves the segmentation of the thin blood vessels present inside the human eye. For this retinal blood vessel segmentation, I have referred to the ICDS 2018 paper "Retina Blood Vessel Segmentation Using A U-Net Based Convolutional Neural Network". The datasets used here is the DRIVE dataset which has 20 training examples with annotated training labels, which can be augmented further and the STARE dataset. It's performance was significantly better than a skilled ophthalmologist on the DRIVE dataset, but on practical datasets the results weren't that good due to noisy images, but the authors conclude that they can be improved by using various image processing techniques.

3 Brain Tumor Segmentation

Brain Tumors can drastically reduce the life expectancy of a person, and it's early detection is very important. It can also lead to the timely diagnosis and treatment of other neurological disorders. Some tumors are easily segmented

while others are much harder to localize because they are diffused, poorly contrasted and extend tentacle like structures that make them difficult to segment.

4 Lung Segmentation

CT scanned images of the lung need to be analysed to detect and label infected tissues of patients affected by diseases like COVID-19. One of the papers which I came across uses UNet and SegNet for this purpose.

5 Polyp Segmentation

Polyps are predecessors to various cancers like Colorectal Cancers and thus they need to be discovered early. The paper I came across used ResUNet++ based on deep residual UNet, for this very purpose.

6 My Problem Statement

For this project, I have decided to choose the problem(s) **Retinal Blood Vessel Segmentation**. I have chosen this problem because I was able to read a paper doing the same in detail. I have also found datasets related to it, the most famous one being `/textbfDRIVE` Dataset on Kaggle. I also feel that this field is a bit underrepresented, because retinal diseases are quite rare, yet extremely dangerous. I also feel I know a little bit about this field, because I had formed an unhealthy obsession with eye diseases, back in lockdown, simply because I was bored and noticed weird artifacts in my vision, which led me to a conclusion that I was going blind XD.