

Medical Image Segmentation

Team Autobots

Team:

Autobots

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Project:

Medical Image Segmentation

Primary reference paper:

[1] [Chen, Jieneng, et al. "TransUNet: Transformers Make Strong Encoders for Medical Image Segmentation." *arXiv preprint arXiv:2102.04306* \(2021\).](#)

Secondary reference paper:

[2] [An Image is Worth 16x16 Words: Transformers for Image Recognition at Scale](#)

Overview

Segmentation of organs, pathology etc, from medical images is an significant in disease detection, diagnosis, prognosis, surgery and post surgery assessment. Recently segmentation has been reformulated as a pixelwise classification problem and CNN based UNet architectures evolved, which have now become the standard for segmentation tasks in computer vision.

As the fields of Computer Vision and Natural Language Processing are converging, transformers have been applied to images [2] showing remarkable performances. We aim to use transformers as a backbone for UNET architecture for medical image segmentation.

Incidentally, this has been recently published on arxiv (8th feb '21). We plan to implement their approach, and build over it for other modalities.

Objectives

To develop a transformer based UNet architecture for improving medical image segmentation while incorporating conventional computer vision (non deep learning) techniques

Method Overview

- We will be using Transformers as a backbone for a U-Net based architecture. Will begin by implementing our reference paper, & will make our modifications as the project evolves.
- The paper has used CT and MRI images which are 3D imaging modalities. We will be applying that on 2D images to begin with, and extend to videos, if time permits.
- We will experiment with wavelets as an additional input to improve the performance (non deep learning component). Also, the image preprocessing would be required.

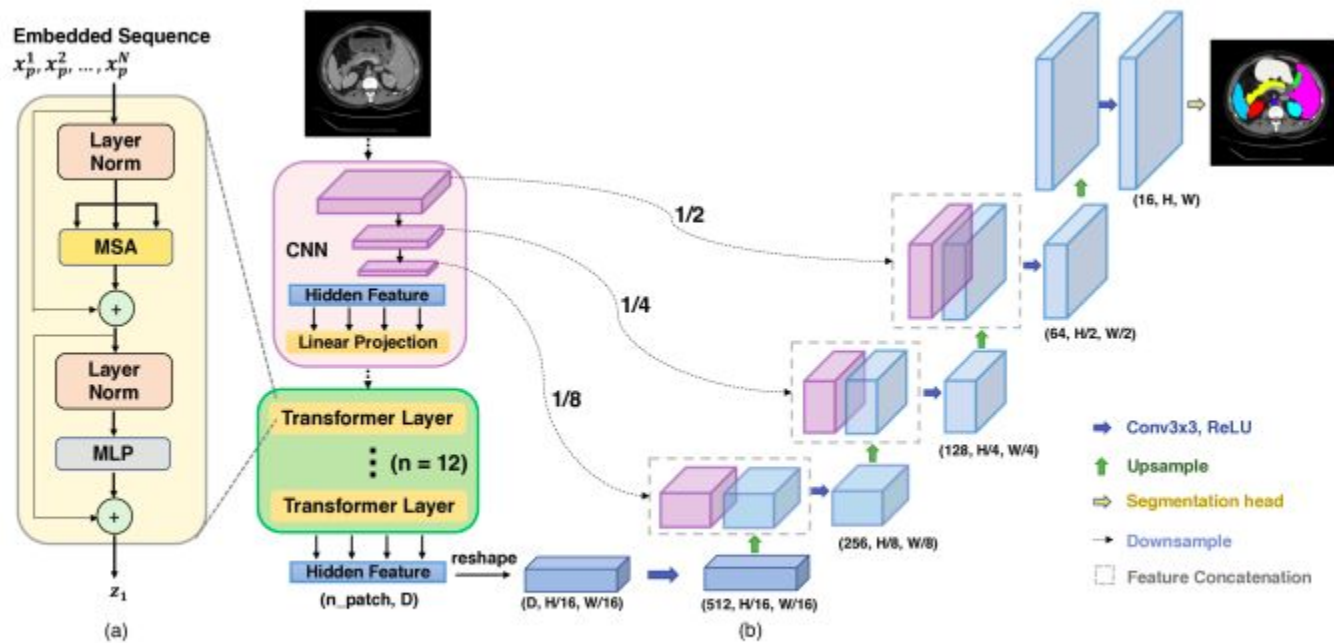


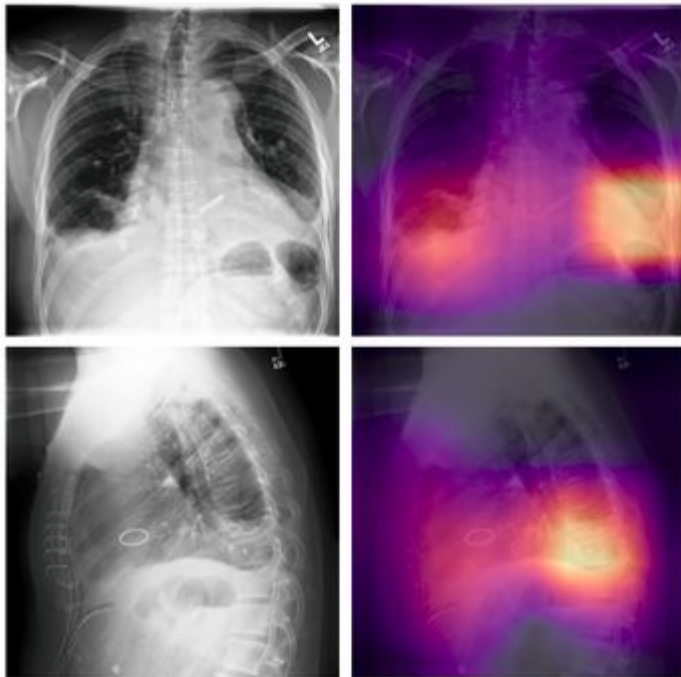
Figure 1: Overview of the framework. (a) schematic of the Transformer layer; (b) architecture of the proposed TransUNet.

TransUnet from the reference paper

Dataset 1: Xray images

Chexpert

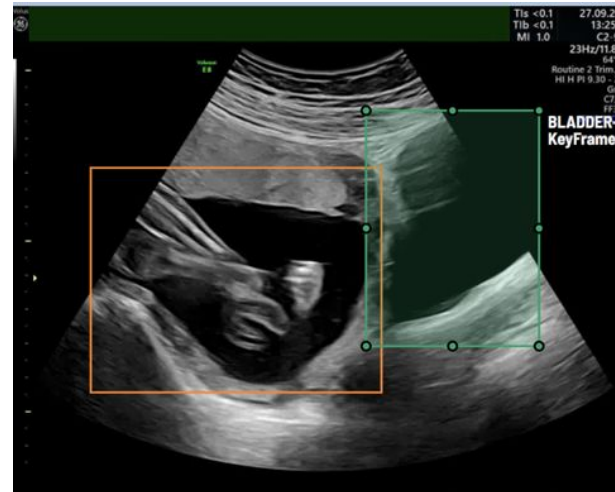
Contains X ray images annotated for 14 observations



Dataset 2: Ultrasound videos

Dataset Description:

- This dataset has been recently introduced for a challenge.at ISBI.
- It contains ultrasound videos whose frames will be used as images initially.



Deliverables

- Baseline models on Ultrasound images and xray images
- Experiments with wavelets evaluating their role on performance