Universal Segmentator

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Home page and paper at [1].

1 Aim

The developers are aware of a problem that deep learning models are not able to generalize to unseen segmentation tasks involving new anatomies. They are aware that developing new models will require resourcse and expertise to train their models. Specifically, they criticise the approach of transfer learning in the mdeical domain because of the differences in data size, features and task specifications between domains, and importantly still requires substaintial retrianing.

Therefore, UniSeg is a model that can solve unseen medical segmentation tasks without additional training. It uses a Cross-Block mechanism (Section 3). See the architectural approach at Figure 1.

2 Method

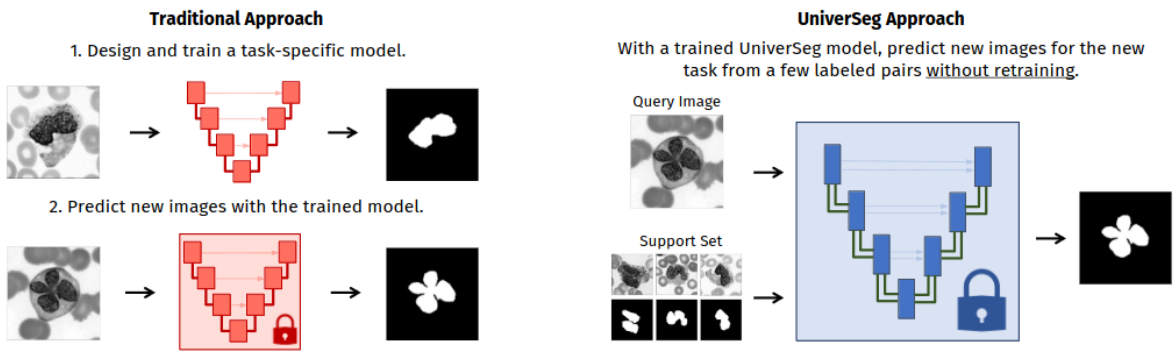

Figure 2: **Workflow for inference on a new task, from an unseen dataset.** Given a new task, traditional models **(left)** are trained before making predictions. UniverSeg **(right)** employs a *single* trained model which can make predictions for images (queries) from the new task with a few labeled examples as input (support set), without additional fine-tuning.

(a) Comparison between traditional architectures and proposed architecture for UniverSeg

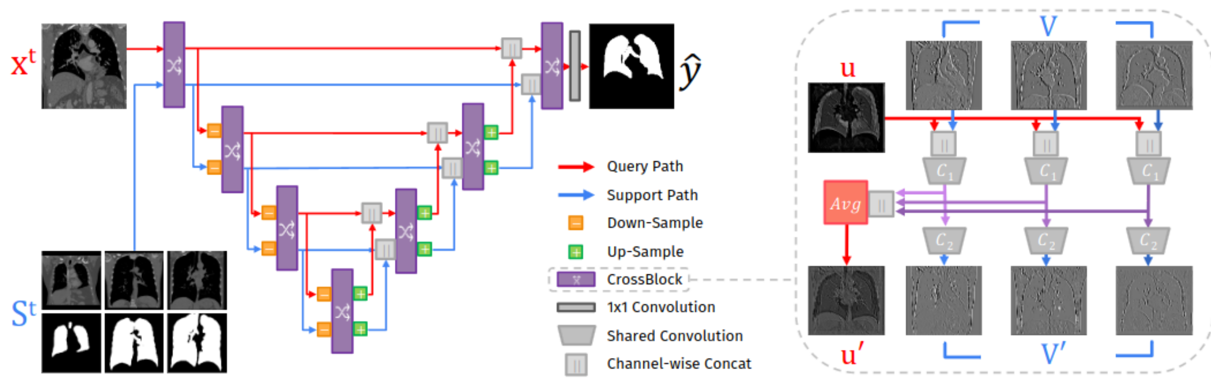

Figure 3: A UniverSeg network **(left)** takes as input a query image and a support set of image and label-maps (pairwise concatenated in the channel dimension) and employs multi-scale CrossBlock features. A CrossBlock **(right)** takes as input representations of the query u and support set $V = \{v_i\}$, and interacts u with each support entry v_i to produce u' and V'.

(b) Zoomed in view of the UniverSeg architecture

Figure 1: Taken from [1]

3 Cross Block

References

[1] Victor Ion Butoi et al. “UniverSeg: Universal Medical Image Segmentation”. In: (2023). URL: https://arxiv.org/pdf/2304.06131.pdf.