

University of Utah Report

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Biomedical Image Segmentation and Domain Adaptation

- Analysed Domain Shift in biomedical image segmentation models as a critical insight into Model Explainability. (*for both binary and multiclass semantic segmentation instances*)
- Fine-tuned U-Net, DeepLabV3 model on Dataset like GlaS from MICCAI (2015), CRAG, CPM15 to observe domain dependency of models on the dataset, created a pipeline to improve Image masks mIOU and Dice Score.
- The results achieved for metrics like mIOU Loss, Pixel Accuracy, Jaccard Loss, and Dice Score met the standards of prior field experiments, like 0.96 for CRAG and 0.89 for GLAS (mIOU). (Pathological Modality)

Details

- The hypothesis revolves around the fact that the models like U-Net get biased when trained on a specific dataset like CRAG. Then it loses its accuracy when tested on a similar dataset like GLAS. Also true for other combinations of binary and multi-class segmentation datasets.
- These differences were also found in the activation and filter layers of the model for the datasets. This model analysis would help determine the real reason behind the domain shift loss and explain the nature of the model, like U-Net and DeepLabV3.
- We trained and fine-tuned the U-Net, DeepLabV3 model on GlaS Dataset MICCAI 2015, CRAG, CPM15, CPM17 to observe domain dependency of models on the dataset, created a pipeline to improve Image masks mIOU and Dice Score.
- The work with a custom U-Net model with different adjustments from DeepLabV3 and working with activation layers and filters to figure out the problem of explaining the working of the model in the field of Domain Shift was a novel idea.
- The results generated concerning mIOU Loss and Dice Score were up to the standards of previous experiments conducted in this field, like 0.96 mIOU for CRAG. (*Pathological Modality*)

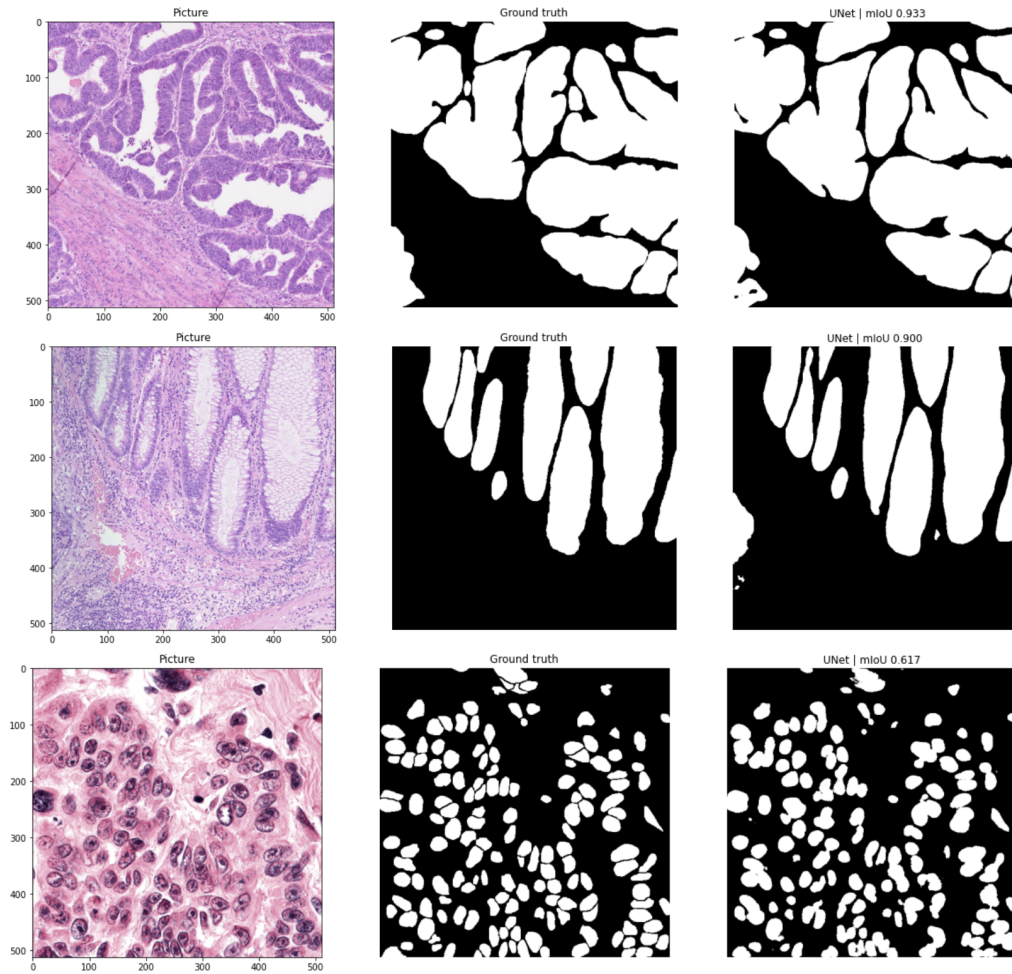


Figure 5: Example Results of segmentation on pathological datasets