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Long-Range 3D Self-Attention for MRI Prostate Segmentation



Federico Pollastri, PhD Student

Università degli Studi di Modena e Reggio Emilia, Italy

The Dataset

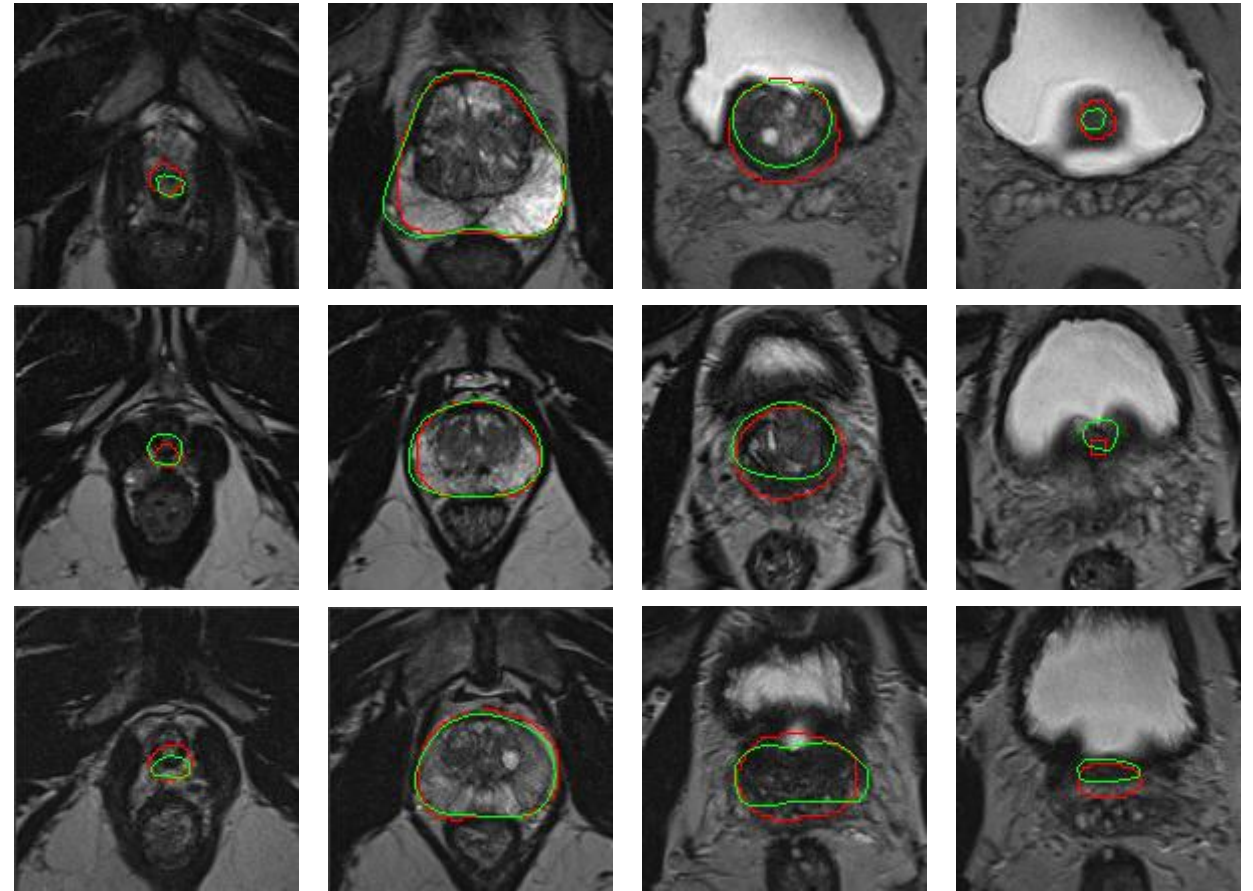
- **Task:**

The problem of prostate segmentation from Magnetic Resonance Imaging (MRI) is an intense research area, due to the increased use of MRI in the diagnosis and treatment planning of prostate cancer.

The complexity of the task and the 3D nature of the data make 2D segmentation algorithms suboptimal for the task.

- **Dataset¹:**

- 911 volumes with 60 slices
- 711 for training
- 160 for testing
- 40 for validation



The ground truth is depicted in green,
model prediction in red.

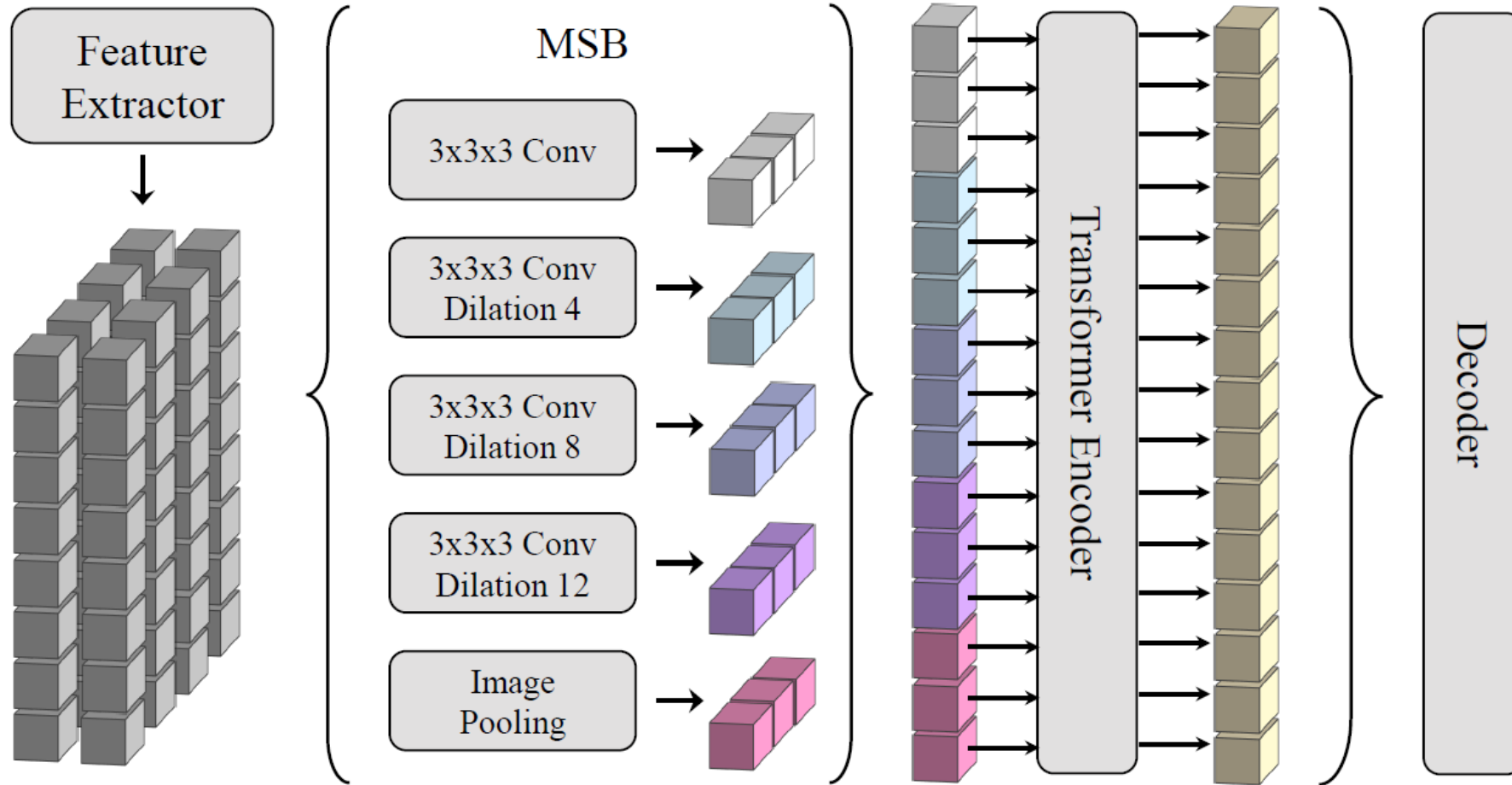
¹S. Natarajan, A. Priester, D. Margolis, J. Huang, and L. Marks, "Prostate MRI and Ultrasound With Pathology and Coordinates of Tracked Biopsy (Prostate-MRI-US-Biopsy) [Dataset]," 2020.

Experimental Results

Method	Prostate-MRI-US-Biopsy				PROMISE12				Fine-Tuned for PROMISE12			
	Volume IoU	Slice IoU	Volume DICE	Slice DICE	Volume IoU	Slice IoU	Volume DICE	Slice DICE	Volume IoU	Slice IoU	Volume DICE	Slice DICE
Ours	0.846	0.859	0.916	0.895	0.716	0.726	0.834	0.775	0.785	0.807	0.880	0.847
V-Net	0.822	0.840	0.901	0.880	0.390	0.463	0.551	0.534	0.692	0.761	0.815	0.811
Med3D	0.822	0.840	0.901	0.880	0.653	0.714	0.787	0.762	0.736	0.776	0.847	0.821
U-Net3D	0.822	0.840	0.901	0.880	0.482	0.519	0.635	0.584	0.704	0.740	0.824	0.790
DeepLabv3+	0.826	0.841	0.904	0.880	0.701	0.735	0.821	0.782	0.759	0.803	0.862	0.848
U-Net	0.776	0.810	0.871	0.855	0.699	0.779	0.820	0.822	0.763	0.814	0.865	0.857

- The proposed method outperforms every competitor for each one of the computed metrics. The PROMISE12 section display the results obtained by the networks when trained and tested using only the PROMISE12 dataset, and the last 4 columns evaluate the models when pre-trained with the Prostate-MRI-US-Biopsy and fine-tuned for the PROMISE12 dataset.

The Model



Thank you for your attention.