Domain Adaptation of Echocardiography Segmentation Via Reinforcement Learning

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Supplementary Materials

1 Anatomical Metrics

Table S1: Anatomical validity rules for segmentations composed of left ventricle (LV), myocardium (MYO) and background (BG) classes. Inspired by [1].

Metric	Description
Presence of LV	There are pixels of class LV.
Presence of MYO	There are pixels of class MYO.
LV holes	No holes are present in the LV.
MYO holes	No holes are present in the MYO.
LV disconnectivity	There is only one LV region.
MYO disconnectivity	There is only one MYO region.
Holes between LV, MYO	There are no holes between regions of LV and MYO.
LV & BG frontier ratio	Border length between LV and BG is within thresholds.
MYO thickness	Ratio between minimal and maximal thickness of the MYO is below threshold.
LV width / MYO thickness ratio	Relative width of LV and thickness of MYO walls is between thresholds.

2 Ablation Study

Table S2: Ablation study covering the creation of the reward dataset ($\mathcal{D}_r$): image transforms (brightness, contrast), weight perturbations (Gaussian noise) and anatomical correction with VAE.

Image Transforms	Weight perturbations	Anatomical correction	Dice (%) ↑	HD (mm) ↓	Anatomical Validity (%)↑
✓			92.2	6.1	98.6
	✓		91.5	6.8	90.0
		✓	92.1	6.3	94.8
✓	✓		93.0	5.8	98.2
	✓	✓	92.7	6.0	98.4
✓		✓	92.1	6.0	**98.9**
✓	✓	✓	**93.3**	**5.3**	**98.9**

3 Uncertainty Results

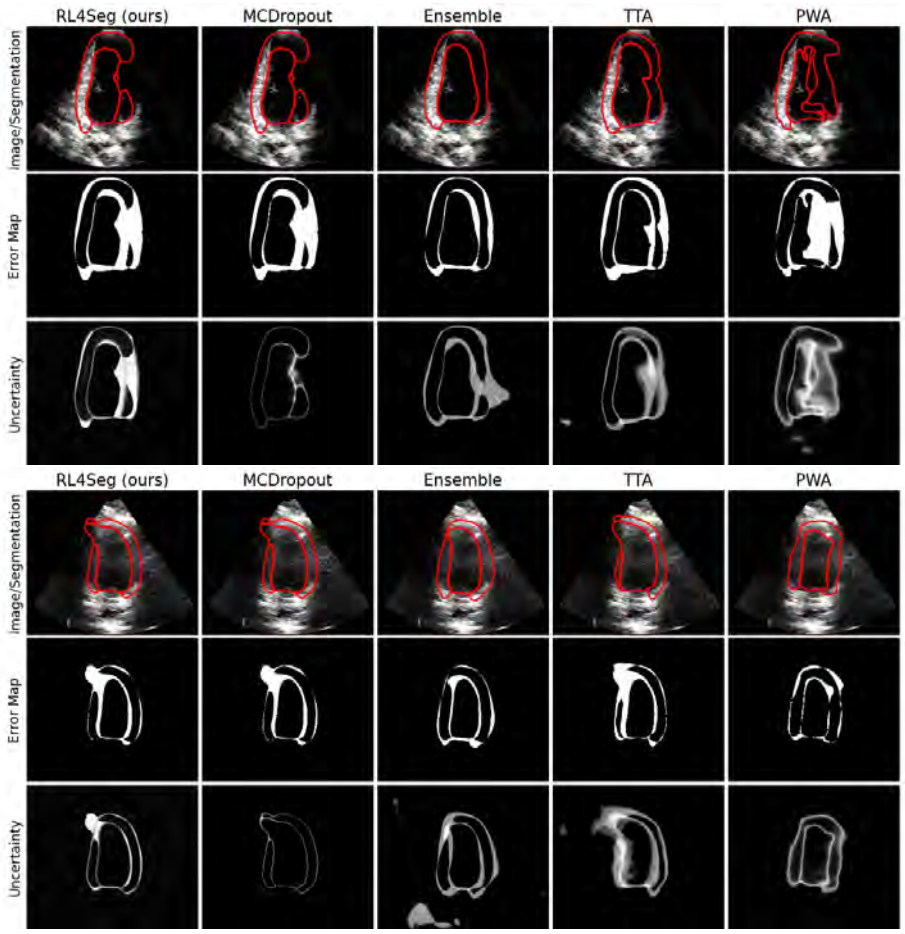

Fig. S1: Additional uncertainty results for SOTA methods and RL4Seg on different subjects of the target domain. Segmentations with errors (contour presented on image) from baseline models.

References

1. Painchaud, N., Skandarani, Y., Judge, T., Bernard, O., Lalande, A., Jodoin, P.M.: Cardiac segmentation with strong anatomical guarantees. IEEE Transactions on Medical Imaging **39**, 3703–3713 (2020)