Deep Generative Models to Enhance Segmentation of 2-dimensional Echocardiography Images

William Hewitt

May 21, 2020

1 Background

Two-dimensional echocardiography plays a critical role in the clinical routine as a low-cost, non-radiating and non-invasive method of assessing cardiac structure and function. The analysis of echocardiography generally involves the extraction of clinical measures, generally by manual or only semi-automated techniques.

An example of one such clinical measure is left ventricular ejection fraction (LVEF), a ratio between the volume of the heart at End Systole (ES) and End Diastole (ED). Heart volume measurements rely on the accurate segmentation of the left ventricular myocardium, from the left ventricular cavity, at both ES and ED. In the present typical clinical routine, these segmentations are made manually by clinicians leading to poor accuracy and a lack of reproducibility of measurements between readers.

Convolutional Neural Networks (CNNs) have played an increasingly important role in the field of medical image processing, their ability to extract complex features from very noisy data has

In this project, we first establish a baseline for the segmentation of the LV using a encoder-decoder convolutional neural network.

We then demonstrate that a Conditional Generative Adversarial Network (C-GAN) can be used to generate photorealistic ultrasound images, from a ground truth segmentation map.

Then the C-GAN based augmentation approach is compared to image-processing dataset augmentations, to establish if a significant effect on performance can be found.

2 Literature Review

3 Methods

4 Results and Discussion

5 Conclusion

6 Ethics