

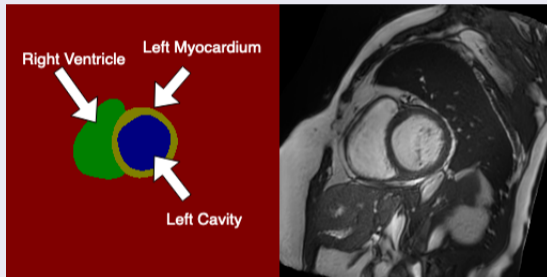
# On the effectiveness of GAN generated cardiac MRIs for segmentation



Youssef Skandarani, Nathan Painchaud, Pierre-Marc Jodoin and Alain Lalande

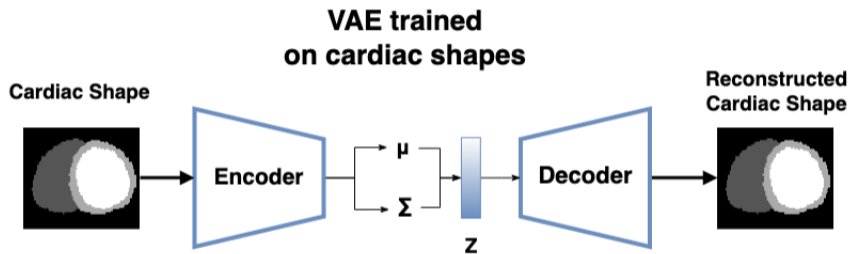


# Introduction



Can we use GANs to generate cardiac MR images as well as their anatomical map?

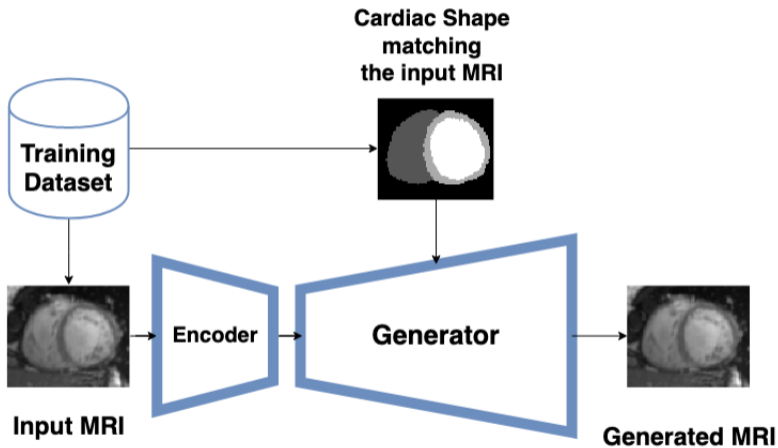
# Method: Training



We train the cVAE<sup>1</sup> to reconstruct cardiac shapes

<sup>1</sup>Painchaud et al. 2019

# Method: Training



We condition the generator of the SPADE<sup>1</sup> based GAN on anatomical maps

<sup>1</sup>Park et al. 2019

# Method: Training

We train the SPADÉ<sup>1</sup> based GAN on MRIs and their segmentation maps

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<sup>1</sup>Park et al. 2019

# Method: Training

We train the VAE on cardiac shapes in parallel with the SPADE<sup>1</sup> based GAN on MRIs

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<sup>1</sup>Park et al. 2019

# Method: Dataset Generation

To generate a large number of annotated MRIs, we leverage the decoder of the cardiac shapes VAE and the generator of the SPADE based GAN

# Experimental results

Testing	Dataset	
ACDC	ACDC	0.854
	Gen. ACDC*	0.888

Testing	Dataset	
Sunnybrook	Sunnybrook	0.798
	Gen. Sunny*	0.816

Dice scores of segmentation using ENet on ACDC and Sunnybrook datasets

<sup>1</sup>Paszke et al. 2016

\* The generated datasets contain 100k images

ACDC: <https://acdc.creatis.insa-lyon.fr/description/>

Sunnybrook: <http://www.cardiacatlas.org/studies/sunnybrook-cardiac-data/>



# Experimental results

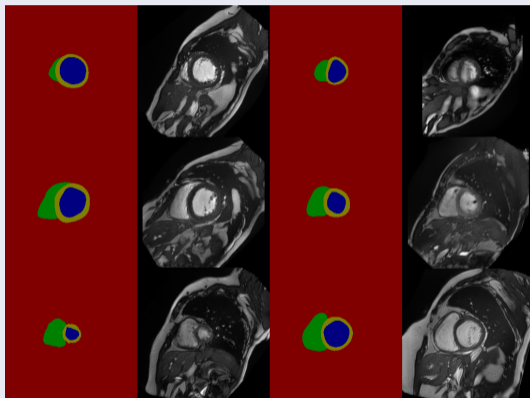
Dataset	Original	Fine-Tuning on ACDC	Dataset	Original	Fine-Tuning on Sunnybrook
ACDC	0.854		Sunnybrook	0.798	
Gen. ACDC	0.888	0.908	Gen. Sunny	0.816	0.874

Dice scores of segmentation using ENet on ACDC and Sunnybrook datasets\*

<sup>1</sup>Paszke et al. 2016

\* For more results, please refer to the paper

# Experimental results



Cardiac shapes and their corresponding MRI, all generated by our method

# Summary and remarks

## Take home message

- Conditional GANs can effectively generate cardiac MRIs as well as their associated groundtruth
- GANs are good for data augmentation

## Future work

- Conditional GANs for class imbalanced datasets
- Investigate GANs on other modalities