

# Heart MRI Superresolution

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**Abstract:** Magnetic Resonance Imaging (MRI) is a widely used tool in medicine for the diagnosis of patients. High-resolution diagnostic images take a long time to acquire, so nowadays Machine Learning tools are used to convert low-resolution images into high-resolution ones. In our project, we use a database of cardiac MRI (Bernard, et al., 2018) to find a solution to the problem described above. The dataset contains 4D images that we have converted into 3D and 2D images. Furthermore, the original data also contains segmented images of hearts, which were used to cut out the outline of the heart from the 4D images and convert them into 2D images. For this project, we used SRGAN (Ledig, et al., 2017) and WGAN (Chen, et al., 2018) models. For both models, we consider the data detailed above as high-resolution images and generate low-resolution images from these images. The WGAN (Chen, et al., 2018) model was initially trained on 2D data, however, we were unable to upgrade the model to return a non-noisy image. We then tried with 3D data, but this did not yield any results. The SRGAN (Ledig, et al., 2017) model was then trained on 2D data with different parameter settings. Then these models were further trained with our segmented images. We took SSIM (Brunet & Vrscay, 2011) as our main evaluation metric. Based on these results, the model using the Adam optimizer achieved the highest SSIM value of 0.41102 with a training rate of 0.001. Finally, this one model was retrained again and evaluated on the test set, we obtained a SSIM value of 0.38629.

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