

Thesis Portfolio

Using Deep Learning to Classify Left Ventricular Scarring in Diverse Patient Populations
(Technical Report)

The Response to Algorithmic Bias in Disease Diagnosis
(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science
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Bachelor of Science, School of Engineering

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Thesis Prospectus

My technical team focused on increasing the accuracy of automated left ventricular scar diagnosis on diverse populations using deep learning methods. Our goal was to implement deep learning methods into the preexisting workflow in the hospital to decrease the workload of physicians while maintaining a high accuracy. Although there were deep learning methods that are able to diagnose disease at a very high accuracy, they were trained and tested on a limited population. As deep learning has becoming a popular tool in the medical field, I was inspired to further research into its relation to propagating inequity in healthcare in my STS thesis. Therefore, both of my technical and STS thesis aim to increase the quality of healthcare using deep learning methods

Supported by Carina Medical, my team built our project on a segmentation deep learning model that was abundant in the false detections of scar on magnetic resonance images. We incorporated another classification deep learning model to significantly decrease the number of false positives. The segmentation model indicated the location and size of the scar, and the classification model was binary, indicating if there was a scar on an image. By running them in parallel, our team was able to increase the accuracy and significantly decrease physician workload. In order to validate our classification model, we further applied interpretability model to see if the classification model was focusing on the region of interest.

The STS thesis explores the sources of bias during the development of deep learning methods. The goal is to prevent any further inequity caused by the development of new technologies. Furthermore, A few commercially implemented deep learning-based products were examined to evaluate the current state and to provide insights into future regulations. The social development in response to new technologies is as important as technical development.