

Riley Harwood

Revised Final Project Proposal

EN.605.81 – Dr. Jesus Caban

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## **Goal Statement**

This project seeks to detect objects within X-ray images and classify abnormalities.

## **Problem Statement**

Previously, this project sought to build an object detector using synthetic aperture radar (SAR) images as input and returns locations and annotated images as output. A survey of the literature and available datasets revealed that there would be large challenges in fulfilling this goal in the scope of this semester. An entire semester could be dedicated just to creating a dataset. Most SAR and ISAR data is not publicly available.

To achieve the underlying objectives of the original goal statement, this project will pivot to instead using X-Ray images as input.

Object detection and classification is a highly studied topic in the image processing field. Most research and applications are done using optical images. There is some existing research in this area using radar imagery. It's possible, though, that some of the techniques used to detect optical images have not yet been applied to X-Ray images.

This project topic appeals to me personally because I have been interested in machine learning based object detection for a long time. I am also getting ready to transition to a new job that focuses on processing radar images. This project should allow me to develop my skills in image processing while I learn about a topic that interests me and simultaneously prepare for a new job.

Building an accurate classifier for X-rays could greatly benefit the medical community. While X-rays are more cost effective than other medical images, diagnosis may be more difficult. With the help of image processing, patients can get reliable and cheap healthcare.

## **Project Plan**

The main artifacts that will lead to a trained algorithm will be research, a dataset, and an evaluator. The research portion will be to learn more about medical imagery and object recognition techniques. I have some experience with each topic but additional survey of scholarly articles will be important to understand the successes and struggles of previous scientists.

A strong candidate for the dataset is “NIH Chest X-rays”. This dataset is available to the public on Kaggle.com. The dataset will be pre-processed to increase accuracy. All images will be processed via histogram equalization, gaussian blurring, and adaptive thresholding. Then edge detection and contour finding will lead to a mask. Masked images will be handed to the image classifier.

This project will utilize several python libraries to achieve its goal. The Keras API will be used to create and train a convolutional neural network. The scikit-learn API will also be used to support the machine learning elements of the project.

The final step will be to actually train an algorithm. As part of training and refining, it will be important to evaluate the results from the object detector. The pandas, matplotlib, and numpy APIs will support handling the results for data visualization.

### Timeline

Module	Date	Project Task
Module 10	7/16-7/22	Research – Part 1
Module 11	7/23-7/29	Research – Part 2
Module 12	7/30-8/5	Dataset selection and initial algorithm writing. Revised Proposal due Bibliography due
Module 13	8/6-8/12	Algorithm complete, result visualizer created.
Module 14	8/13-8/19	Debugging and reporting. Final Project due on last day of module