Medical Imaging and Machine Learning

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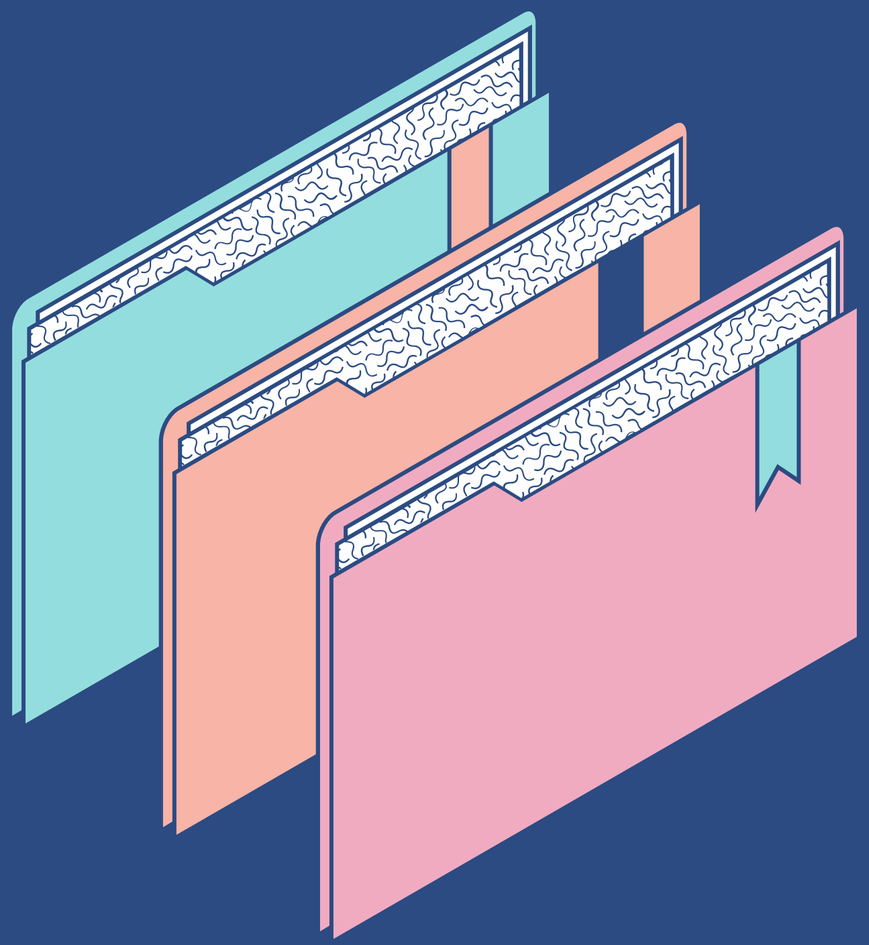
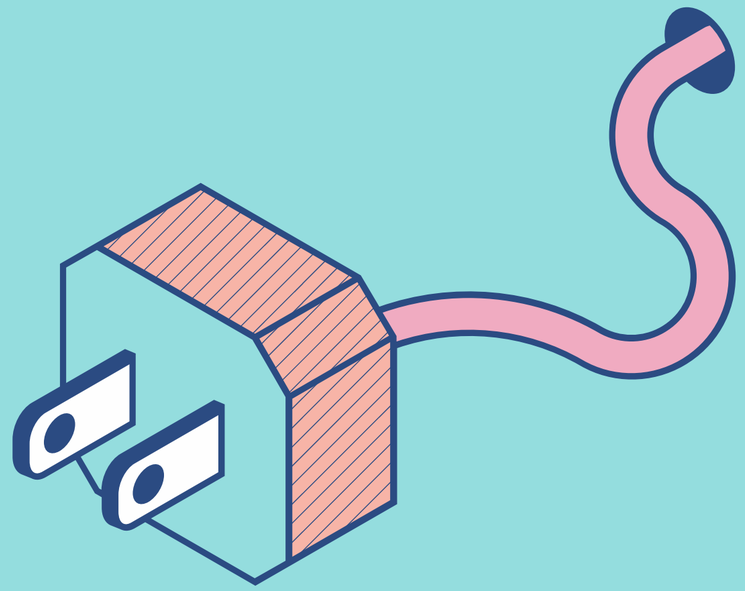


CONTENT

Artificial Intelligence in Biomedical Imaging

Medical imaging provides a number of features derived from different types of analysis, including artificial intelligence. These features are most often used for a variety of analyses including classification, evolutionary calculations, image segmentation. Medical diagnostics can be aided by proper image processing, feature selection, and artificial intelligence methods.

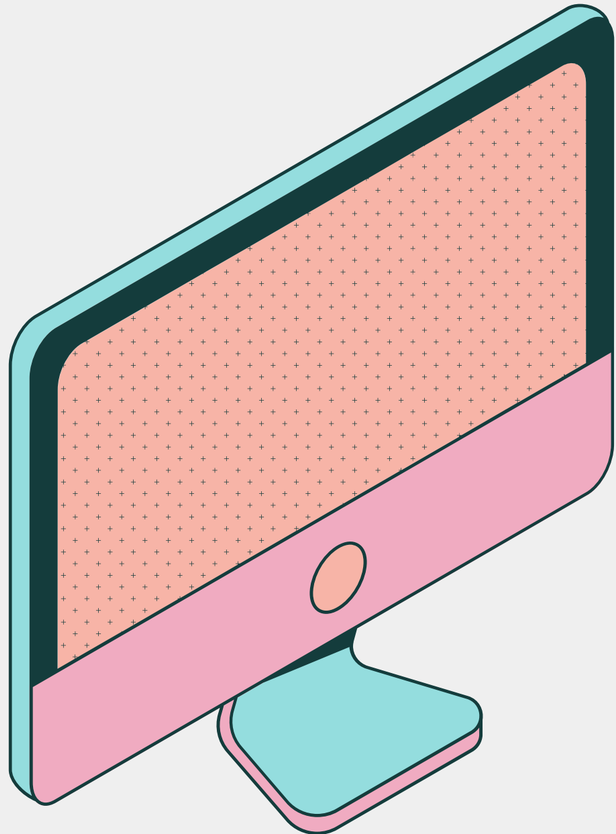


Lung Segmentation of X-Ray Images

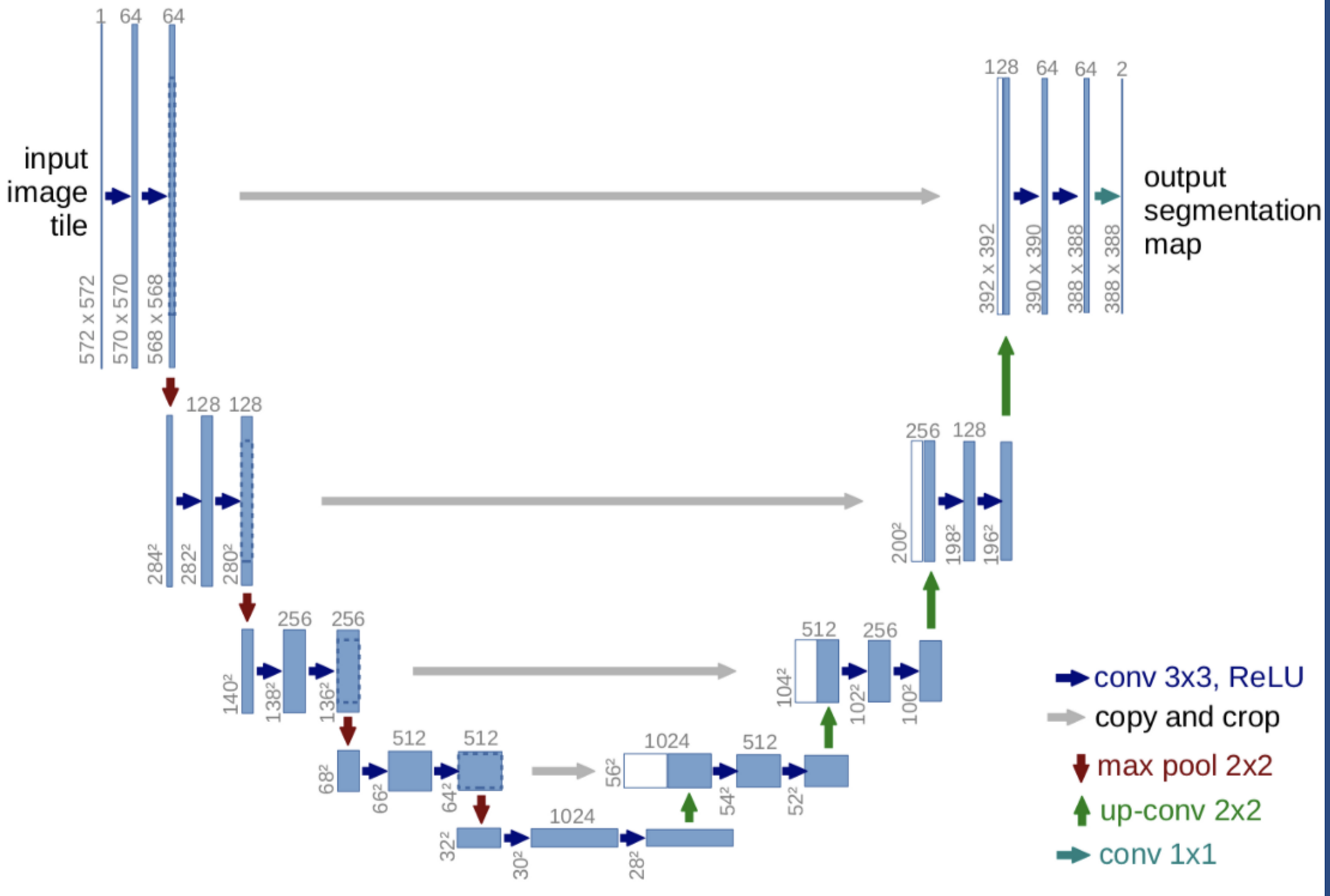
Pixel Wise Image Segmentation of Chest X-Ray Images for Pulmonary Defect Detection.

Tech Stack:

1. Python Programming Language
2. TensorFlow Library
3. UNET Model

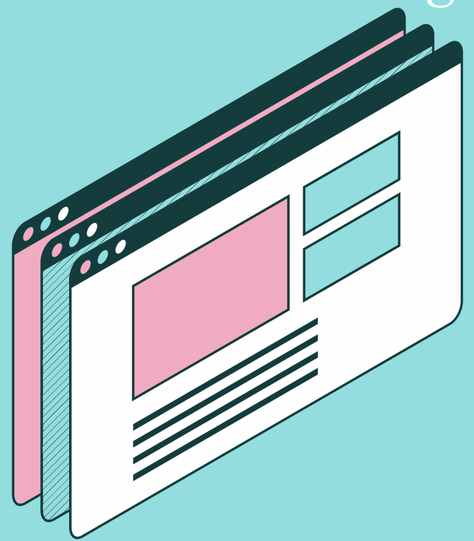


UNET Architecture



Approach for Lung Segmentation

1. Data Extraction and Data Pre-Processing
2. Train/Validation/Test Split
3. Defining Convolution Blocks and CNN Layers
4. Training the model and saving the best seen model during the training
5. Evaluation and Prediction on Test Data-Set



Dice Coefficient

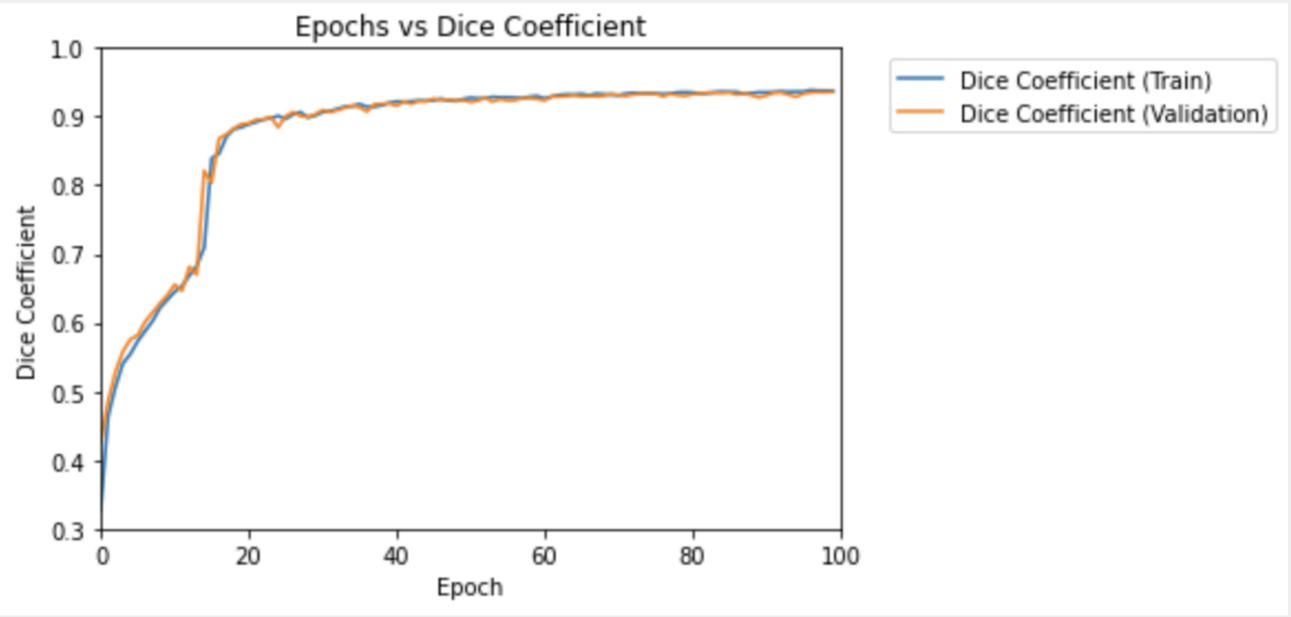
$$DSC = \frac{2TP}{2TP + FP + FN}$$

TP = True Positive

FP = False Positive

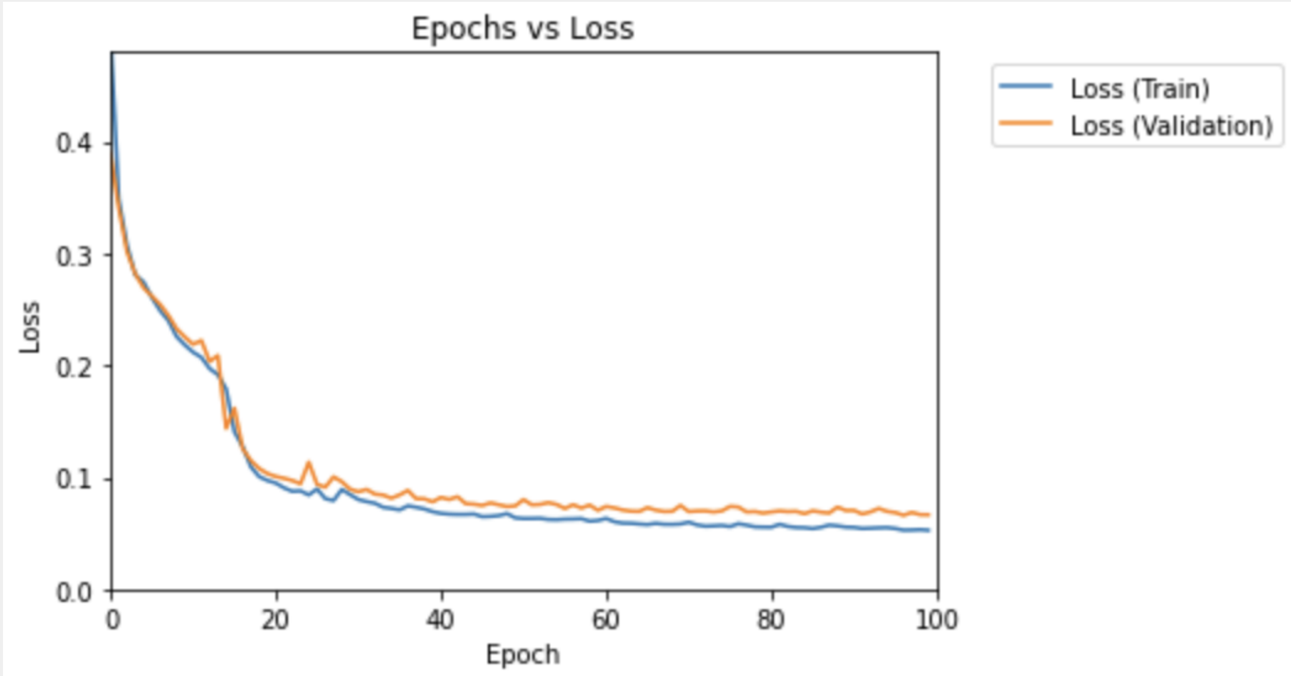
FN = False Negative

Results after Training the UNET model



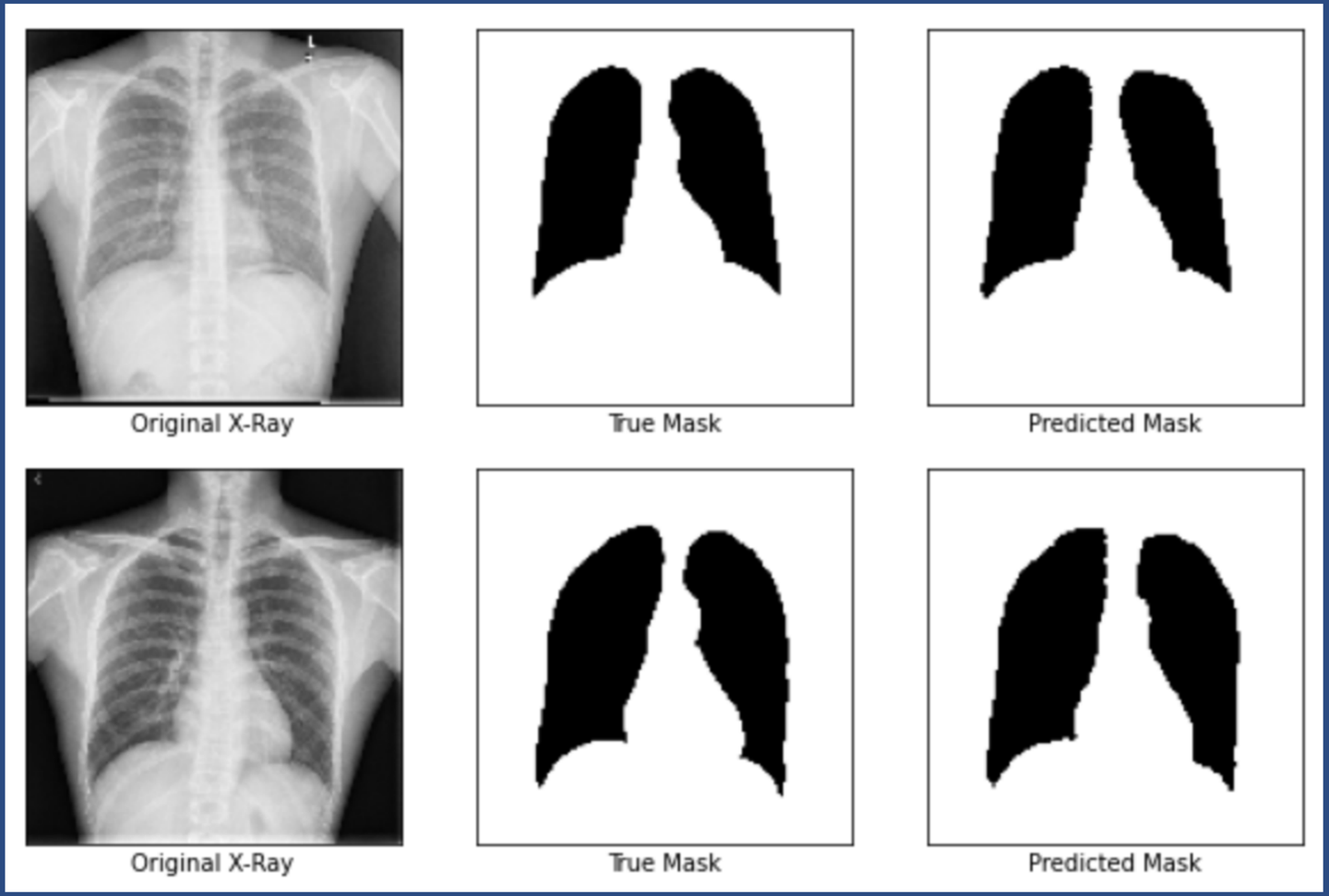
Epochs VS Dice Coefficient

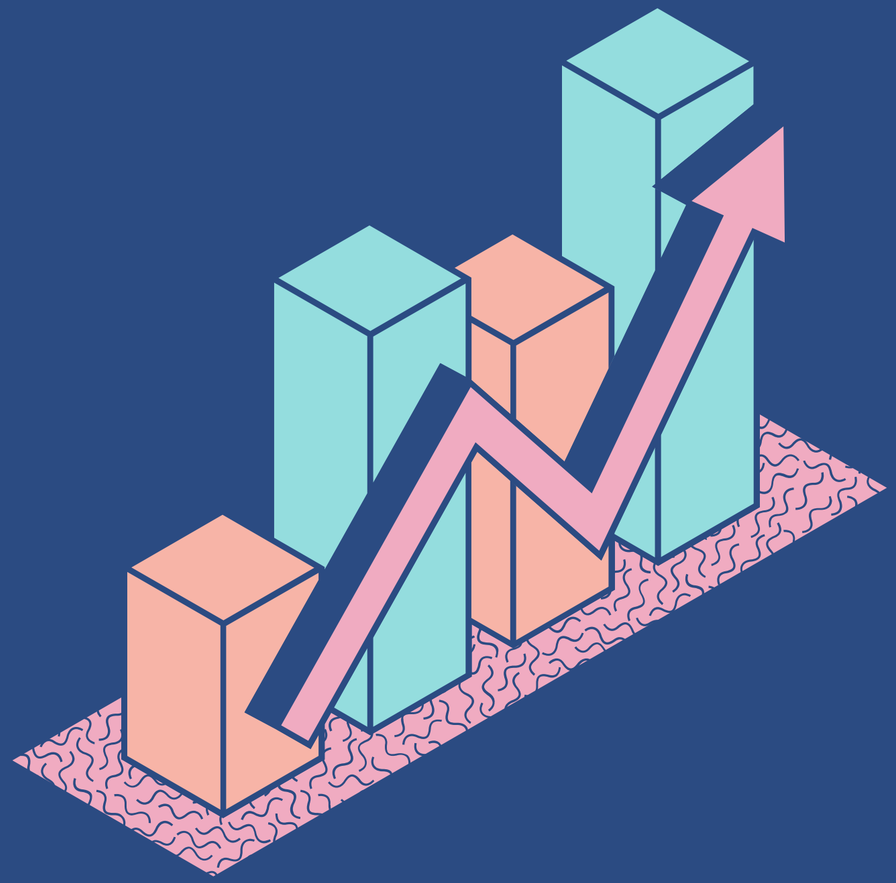
Epochs VS Loss



Evaluation and Prediction on Test Data

Dice Coefficient of model on Test Data-Set = 94.05 %



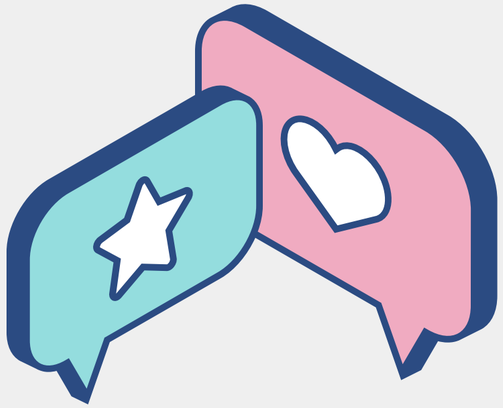


Edge Detection on X-Ray Images

Edges Detection of Chest X-Ray Images using Canny Edge Detection Method

Tech Stack:

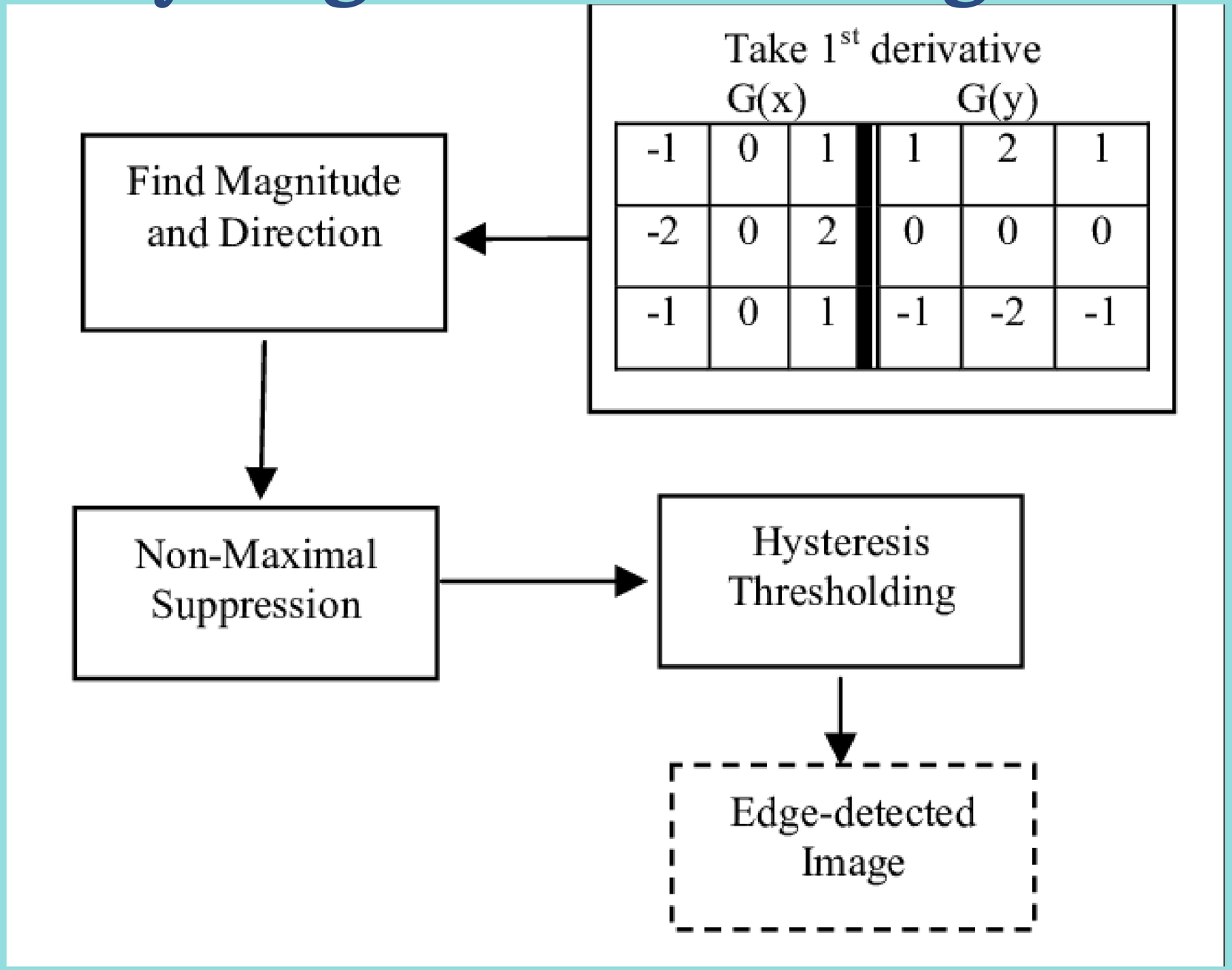
1. Python Programming Language
2. OpenCV Library



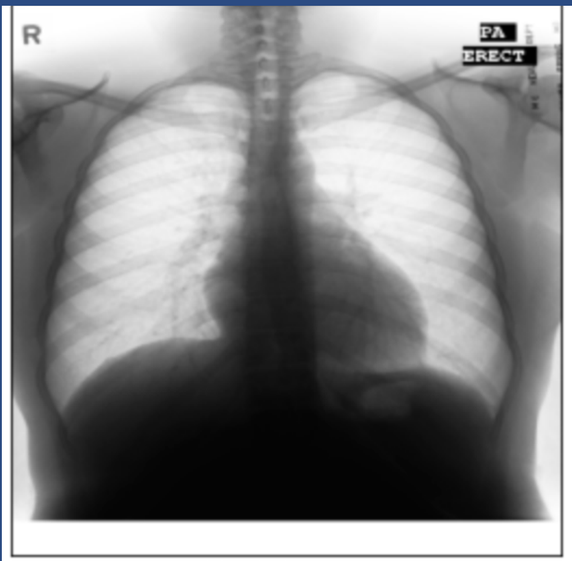
Approach for Edge Detection

1. Finding Optimal Threshold values using Track-bar
2. Finding Optimal Kernel Size using Track-Bar
3. Data Extraction and Resizing the Image to 512x512
4. Gaussian Blur
5. Canny Edge Detection

Canny Edge Detection Algorithm



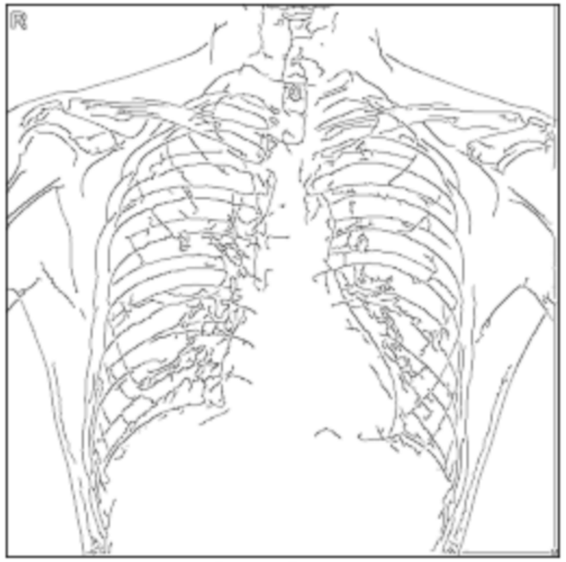
Results after Edge Detection



Original Image

Canny Edges

Original Image



Canny Edges

What I have learned?

- How to Build an End-to-End Convolution Neural Network
- How to Calculate Dice Coefficient
- Difference Between Mean IoU and Dice Coefficient.
- How to Detect Edges using Canny Edge Detection
- Different Edge Detection Techniques like Laplacian, Sobel, Canny and their differences.
- How to use TensorFlow and OpenCV Library

Link to GitHub Repository:
https://github.com/tipsijadav610/Medical_Imaging_and_Machine_Learning-SRI

Link to Dataset:
https://www.kaggle.com/nikhilpandey360/chest-xray-masks-and-labels

THANK YOU !!