

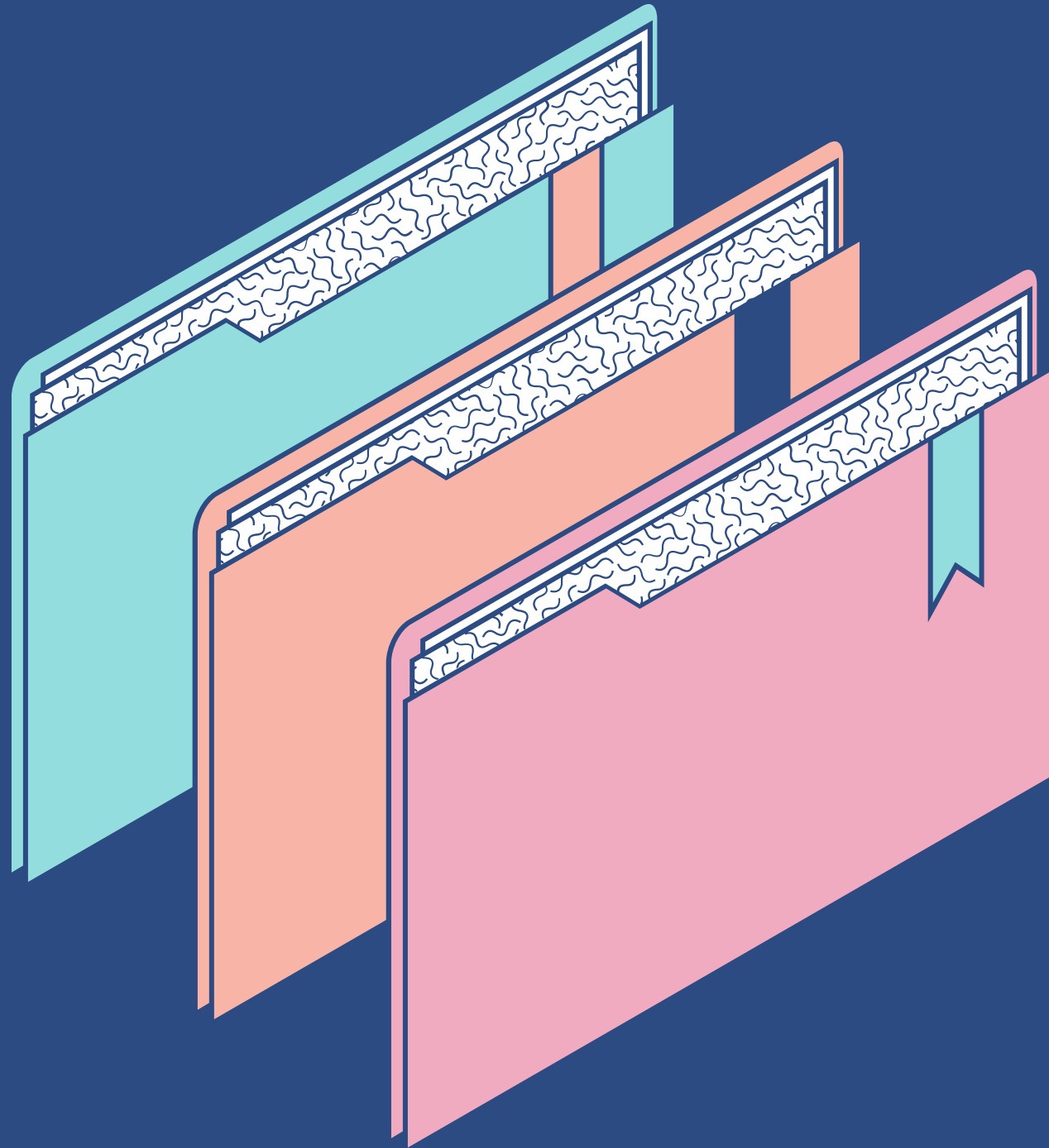
A stylized illustration of a desk setup. In the center is an open laptop with a teal screen and a dark keyboard. To the left of the laptop is a stack of three books in teal, orange, and teal. Below the books is a potted plant with long, pointed leaves in teal and orange, sitting in a pink and orange pot. To the right of the laptop is a teal pen holder with a pink base, containing three pens in orange, teal, and orange. Above the laptop is a teal folder or book with a white border and a pattern of small white crosses. The entire scene is set against a dark blue background.

# Medical Imaging and Machine Learning

Mentor: Professor Bakul Gohel

By: Tipsi Jadav  
ID: 201801091

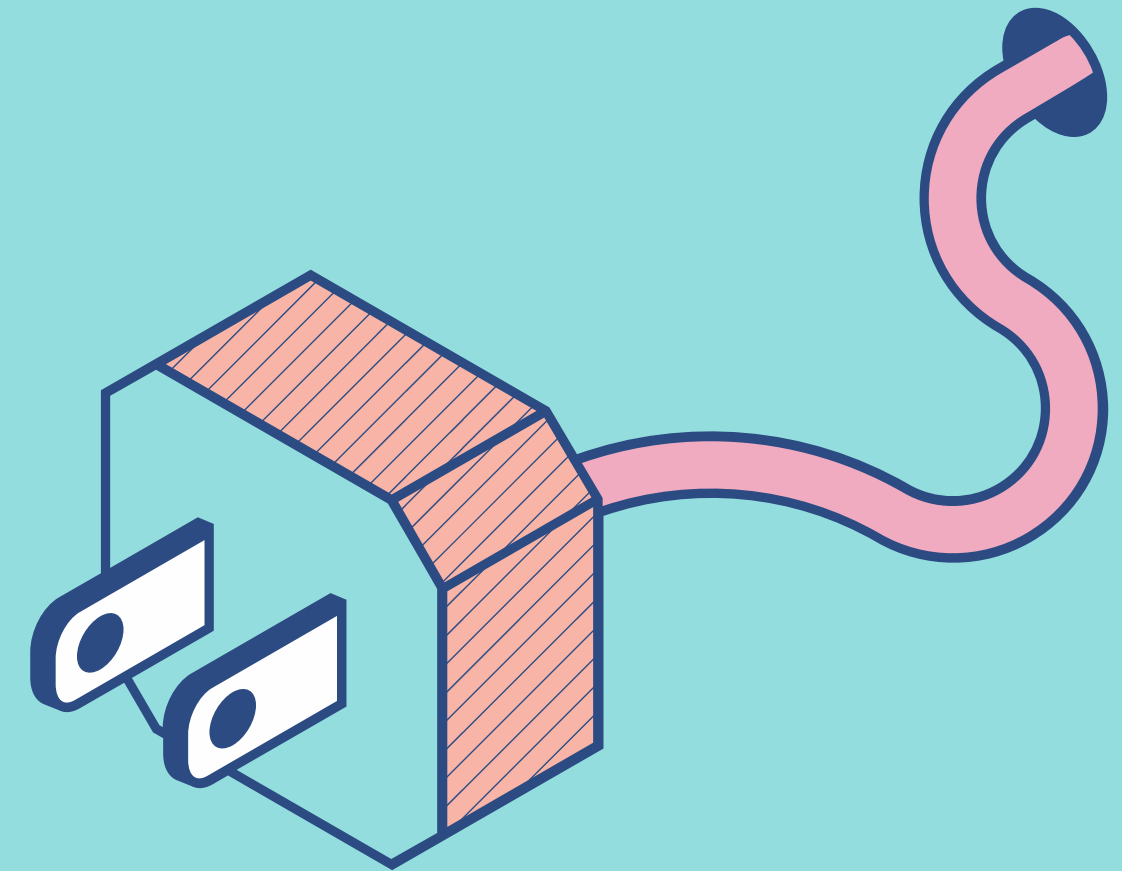
# CONTENT

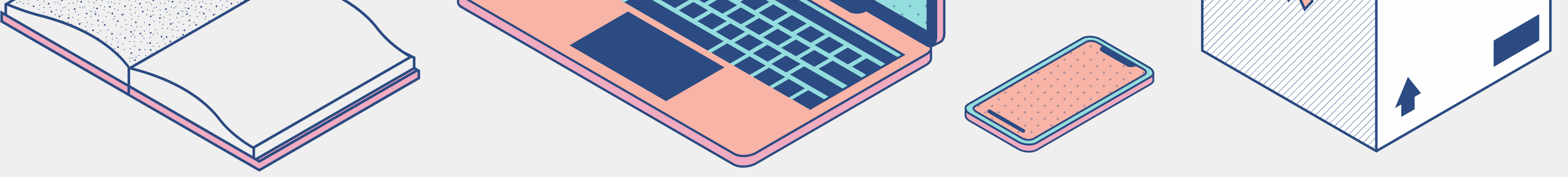


1. Artificial Intelligence in Biomedical Imaging
2. Lung Segmentation of X-Ray Images
3. UNET Architecture
4. Approach for Lung Segmentation
5. Dice Coefficient
6. Results after Training the UNET model
7. Evaluation and Prediction on Test Data
8. Edge Detection on X-Ray Images
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# 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.



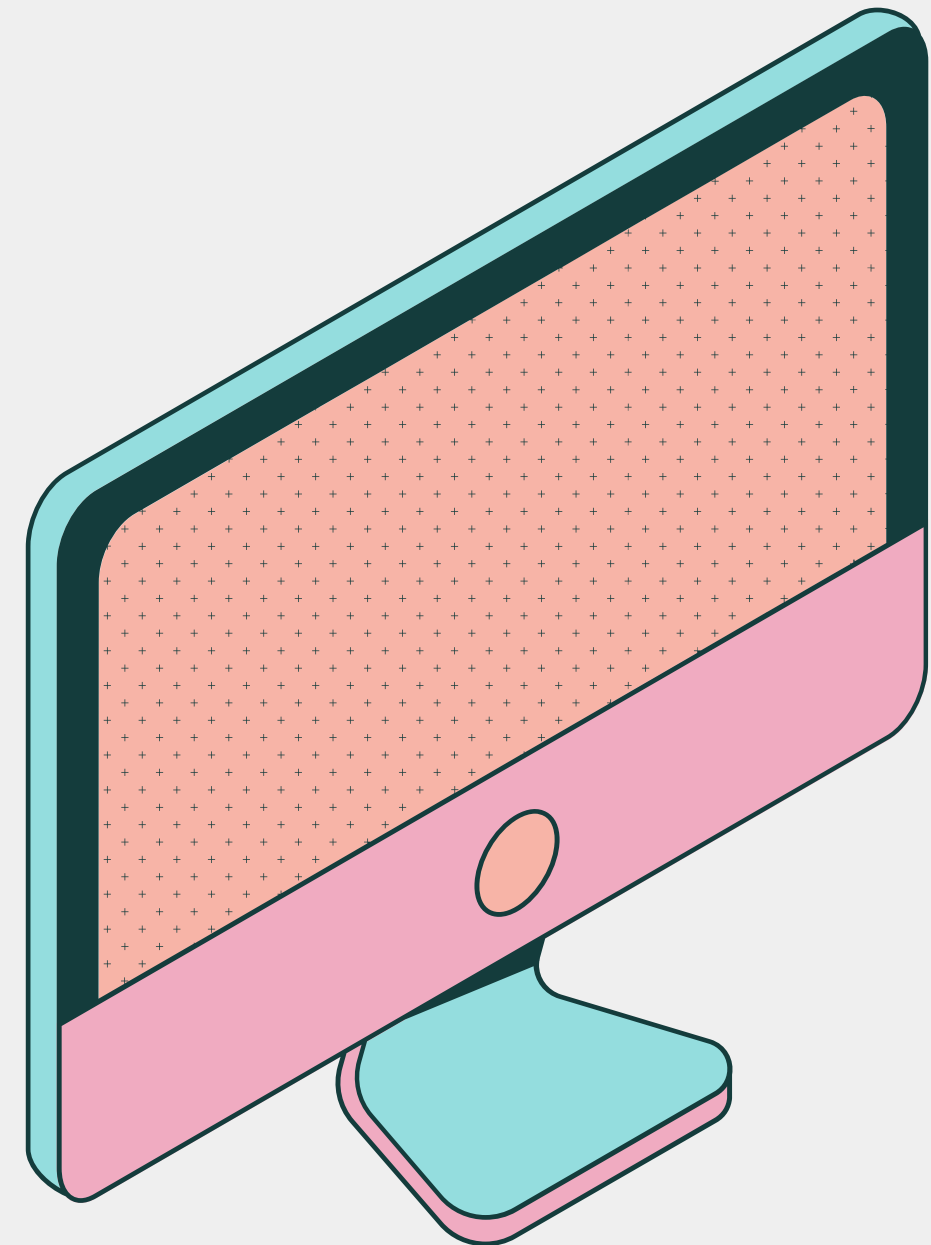


# Lung Segmentation of X-Ray Images

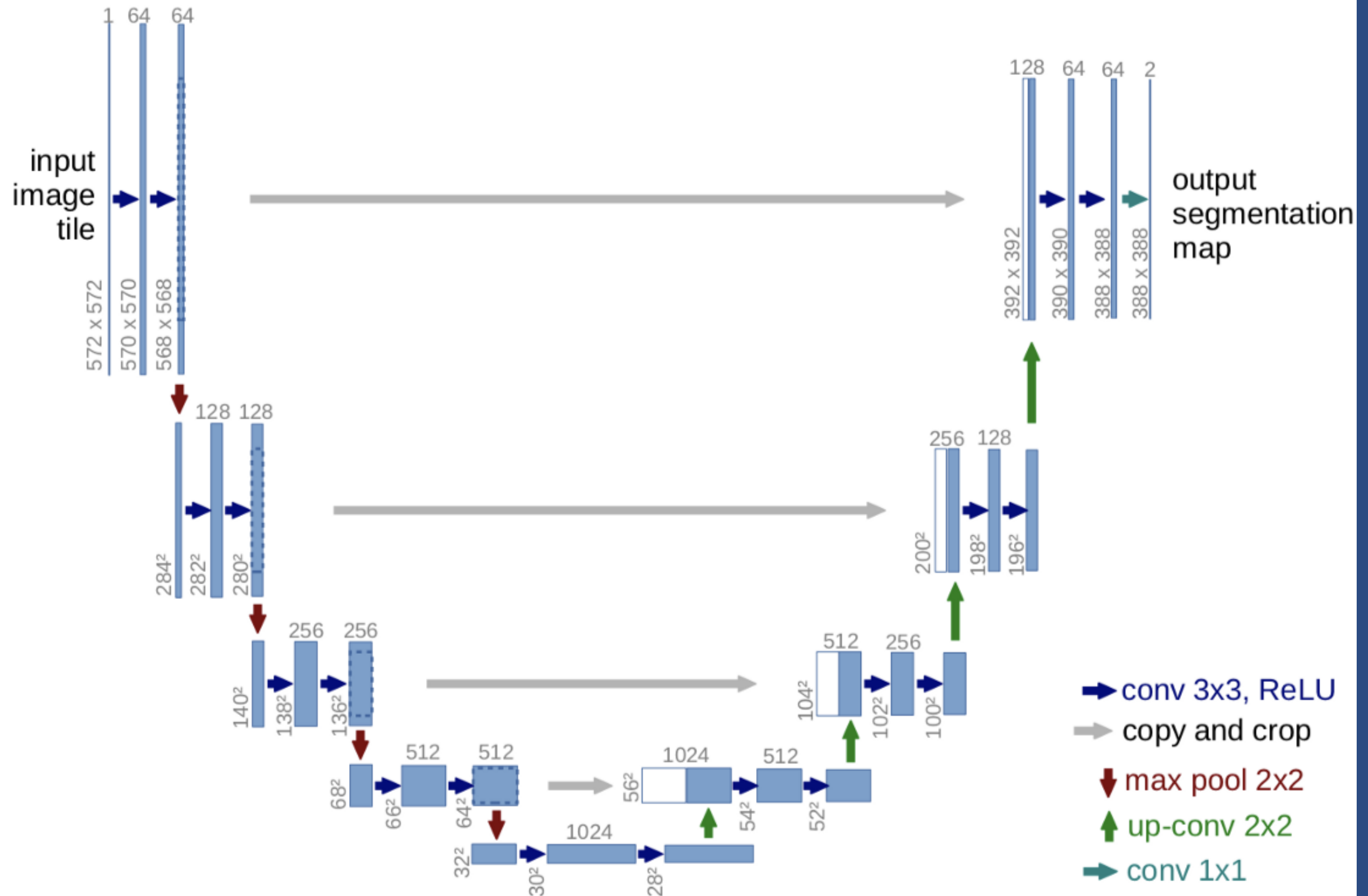
Pixel Wise Image Segmentation of Chest X-Ray Images for Pulmonary Defect Detection.

## 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/Valida  
tion/Test  
Split

**3**

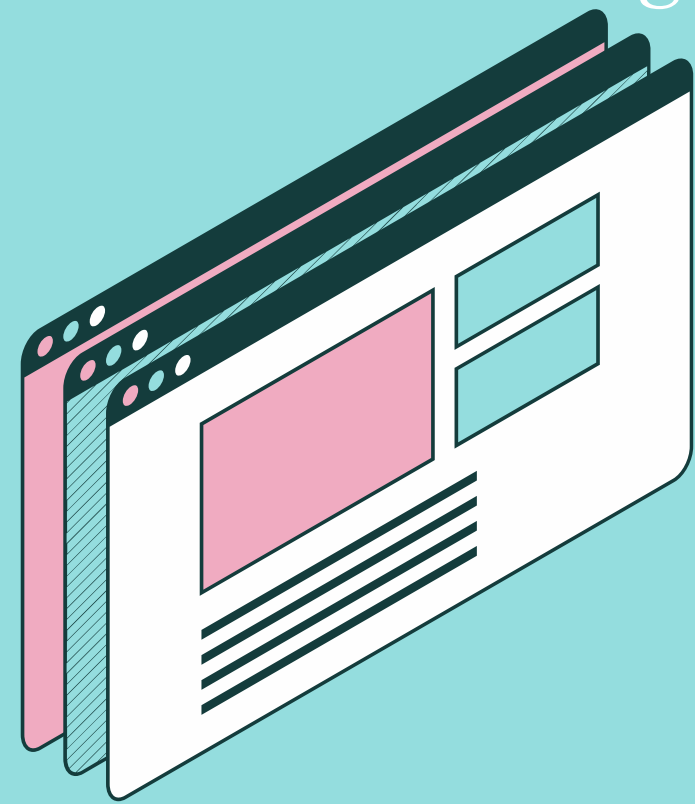
Defining  
Convolution  
Blocks and  
CNN Layers

**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

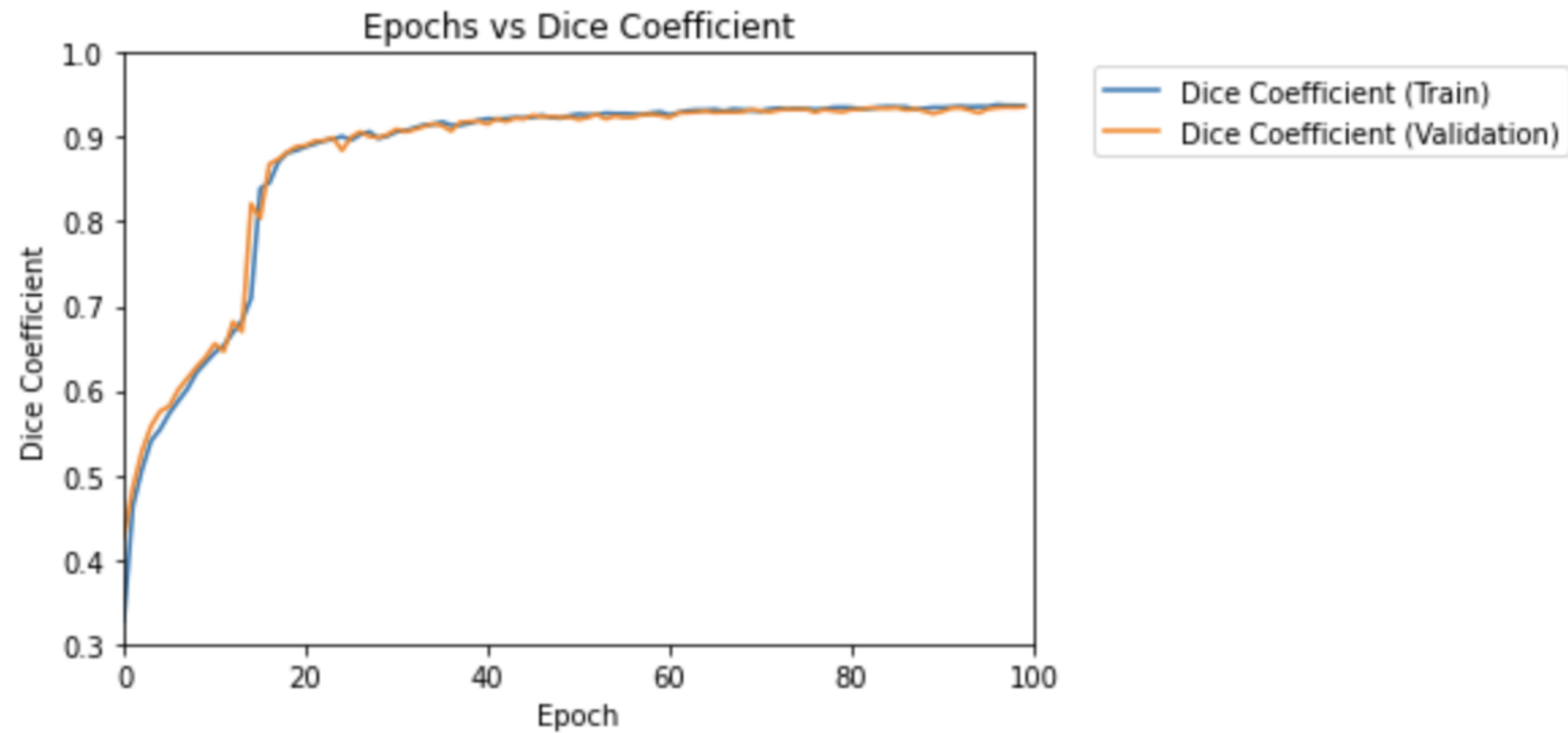
FP = False Positive

FN = False Negative



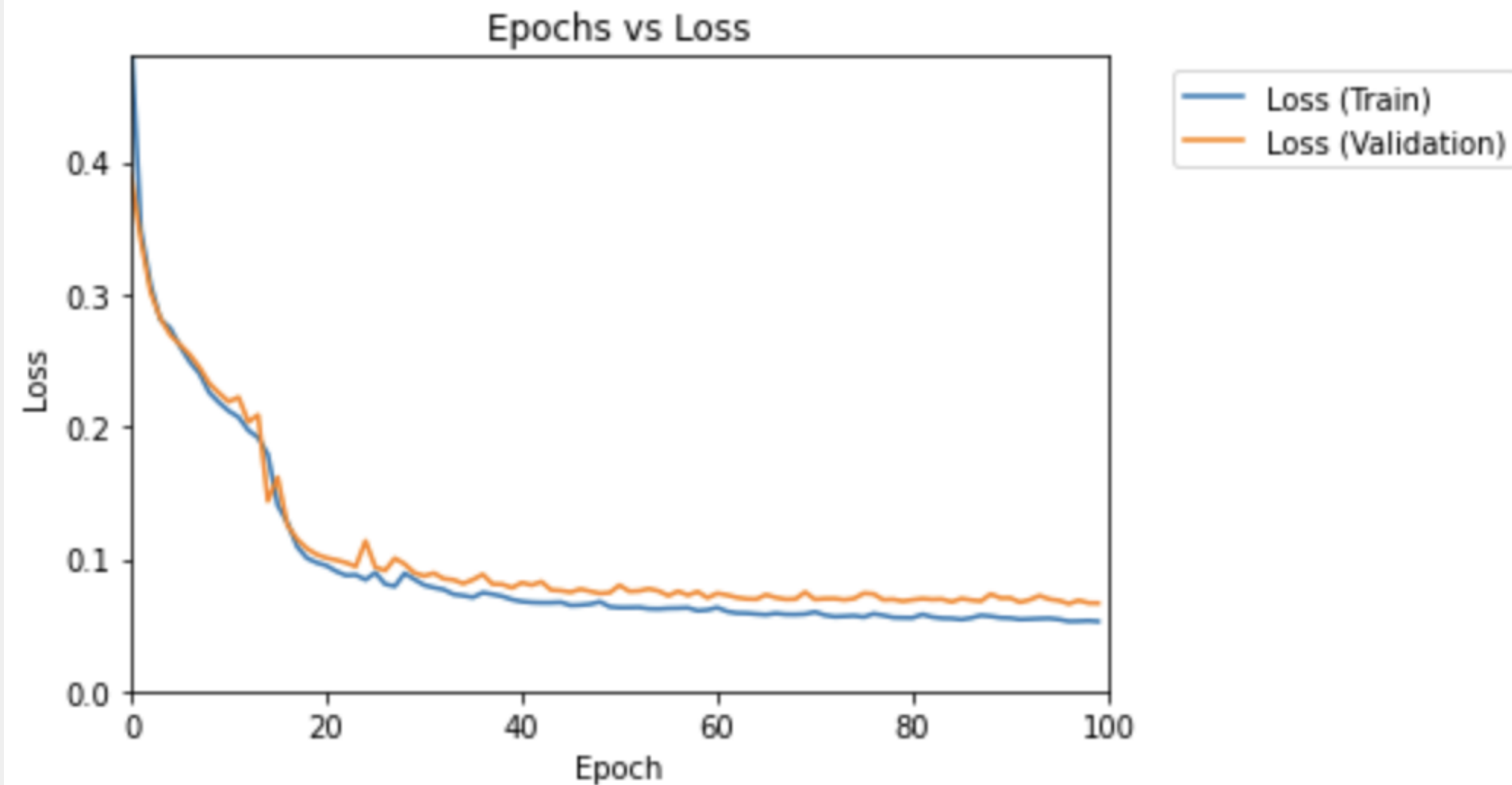


# Results after Training the UNET model



Epochs VS Dice Coefficient

Epochs VS Loss





# Evaluation and Prediction on Test Data

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



Original X-Ray



True Mask



Predicted Mask



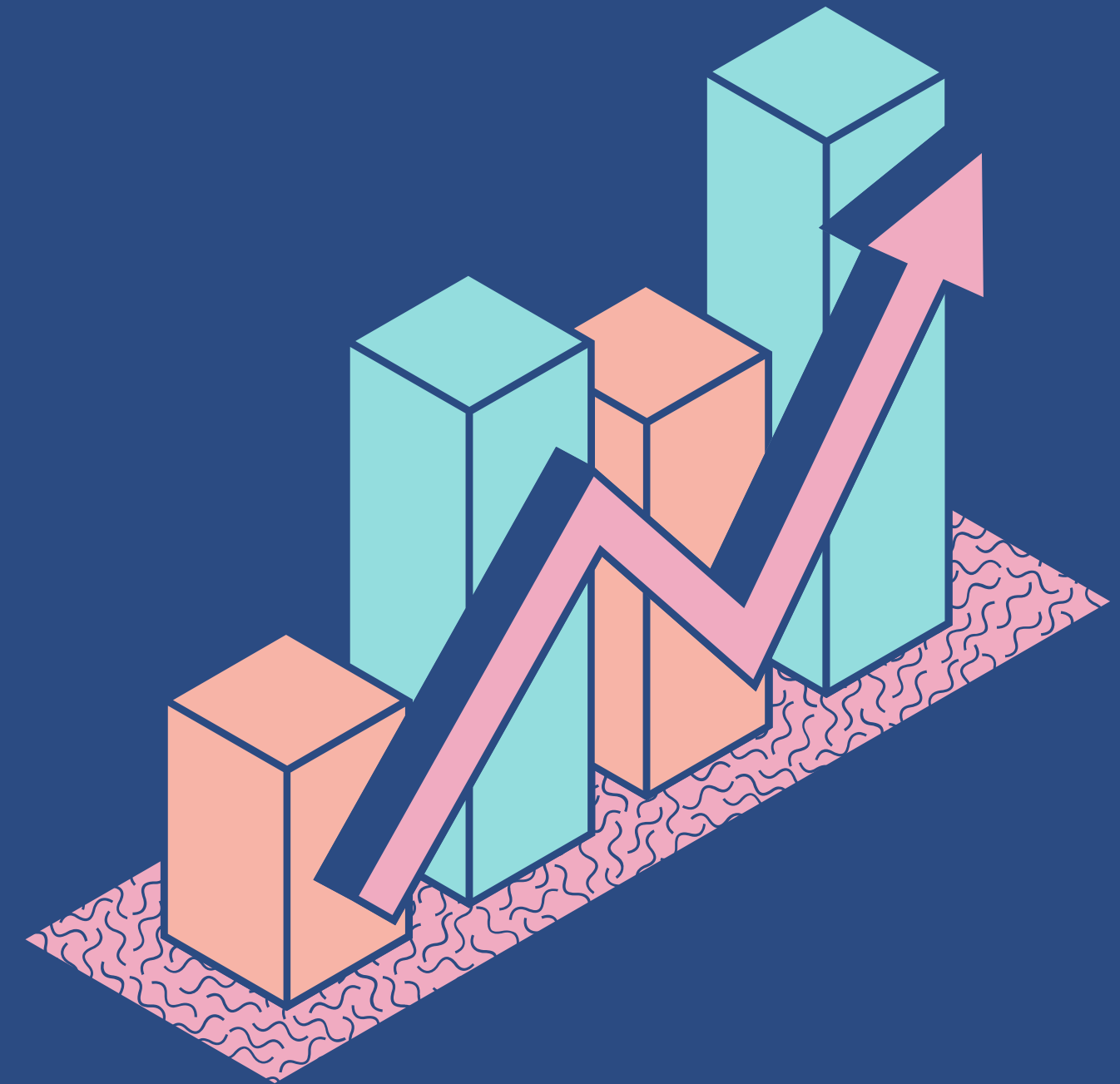
Original X-Ray



True Mask



Predicted Mask



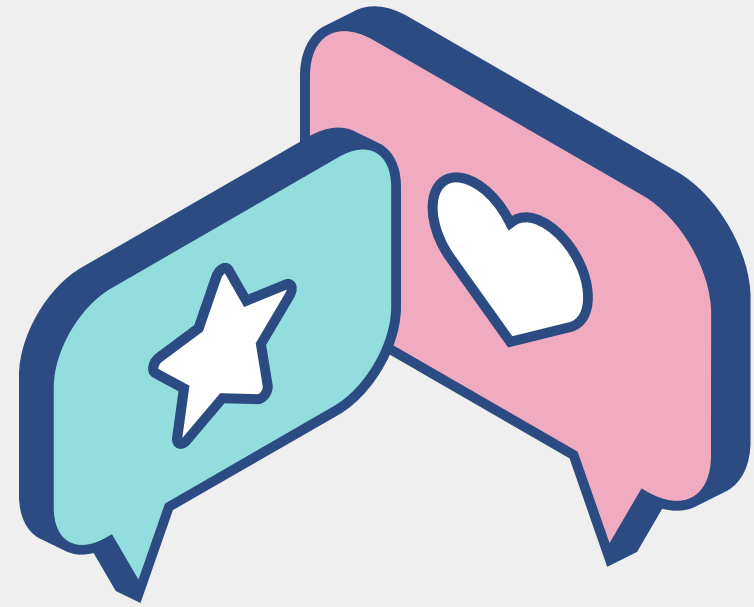
# Edge Detection on X-Ray Images

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

## Tech Stack:

1. Python Programming Language
2. OpenCV Library



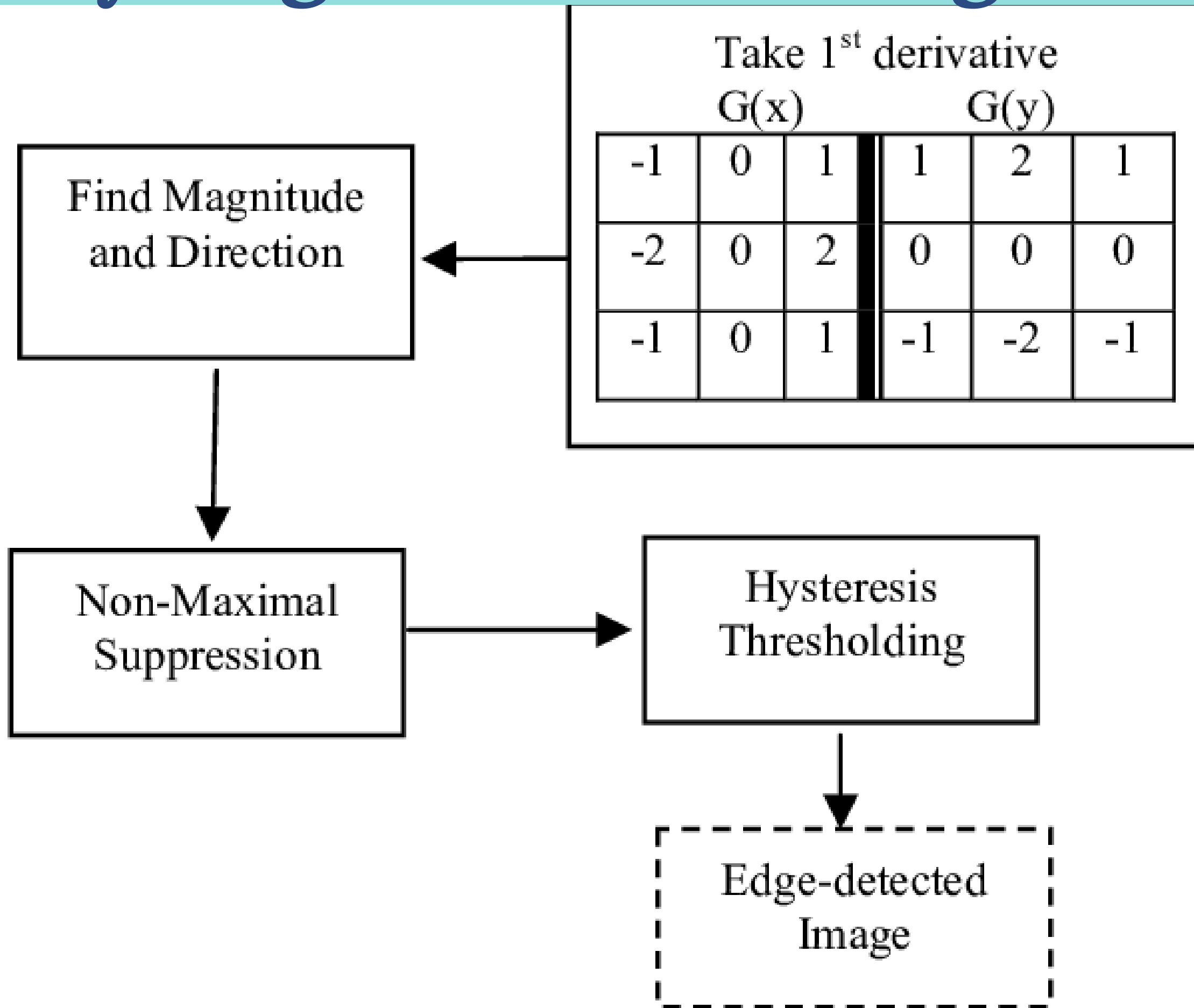


# Approach for Edge Detection

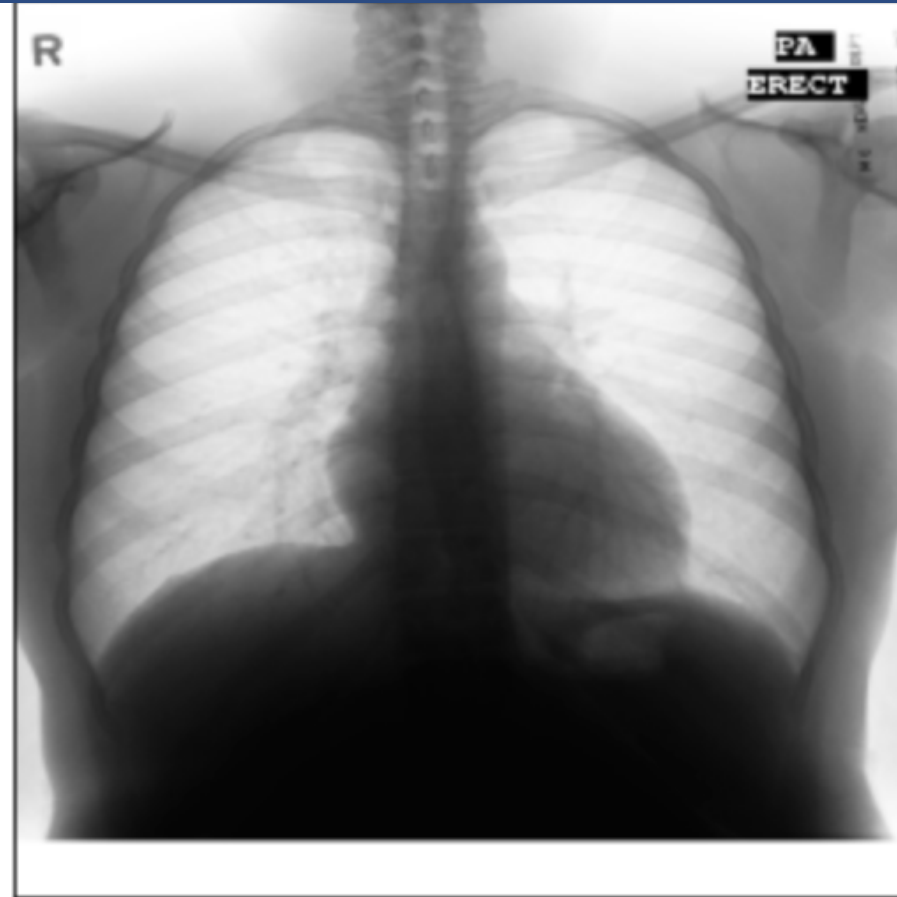
1. Finding Optimal Threshold values using Track-bar
2. Finding Optimal Kernel Size using Track-Bar
3. Data Extraction and Resizing the Image to 512x512
4. Gaussian Blur
5. Canny Edge Detection



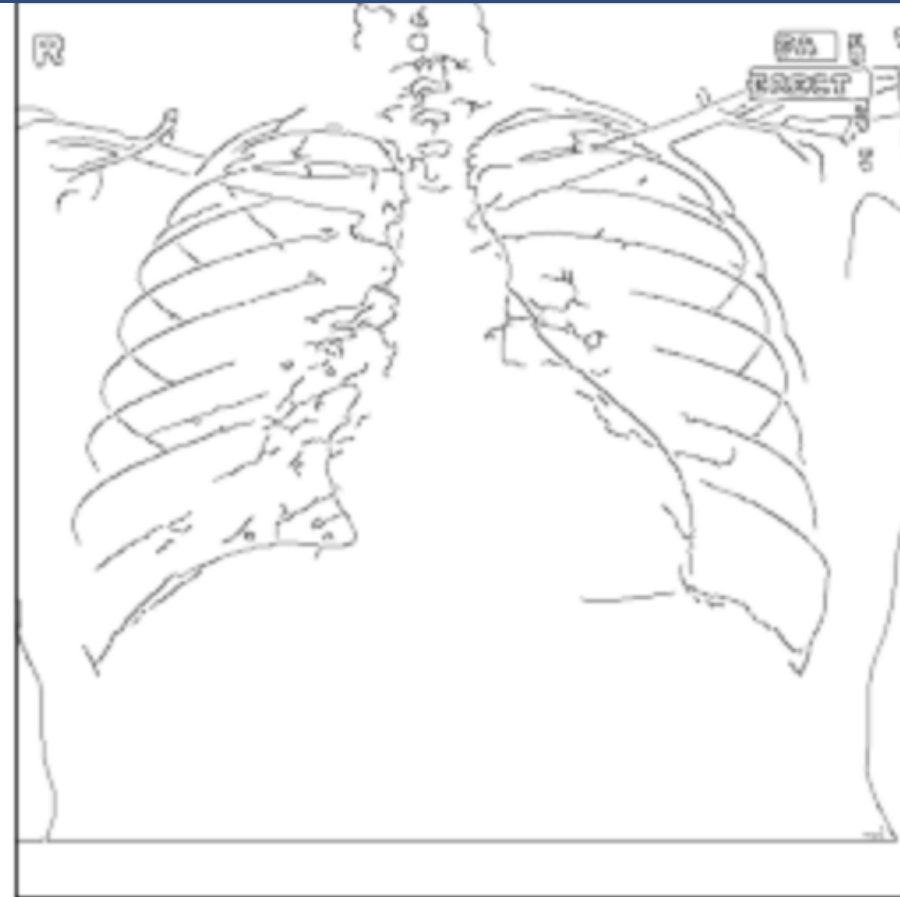
# Canny Edge Detection Algorithm



# Results after Edge Detection



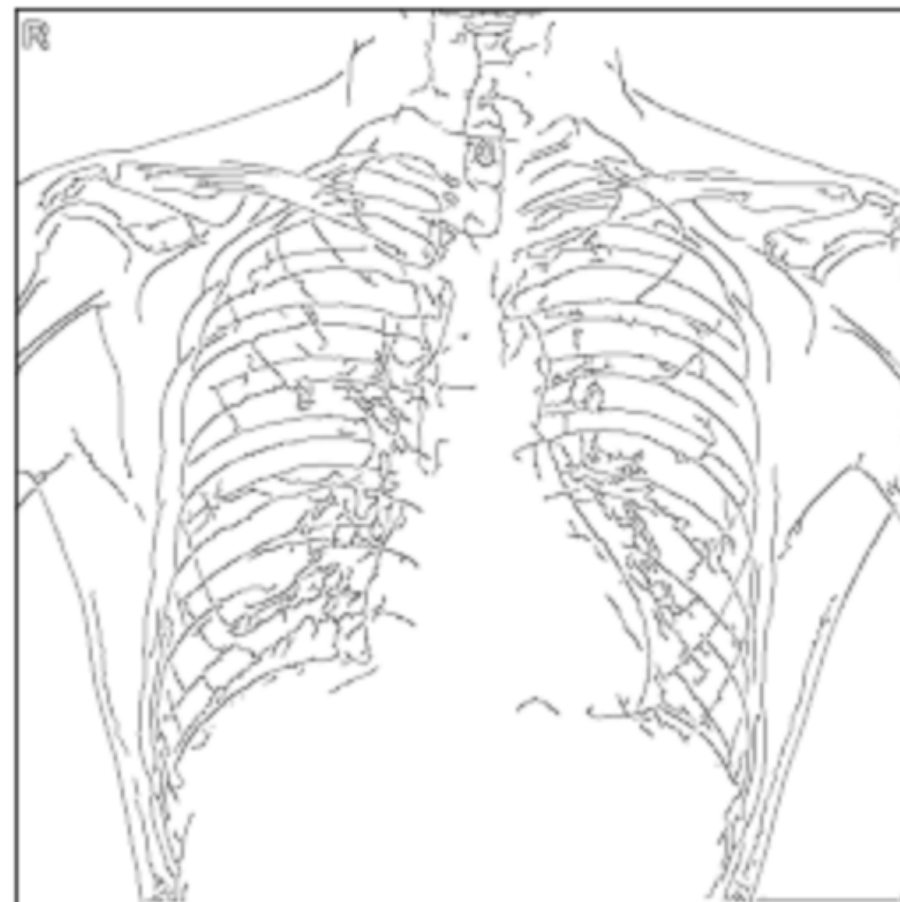
Original Image



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/tipsi2022/Medical Imaging and Machine Learning-SRI](https://github.com/tipsi2022/Medical_Imaging_and_Machine_Learning-SRI)

**Link to Dataset:**

<https://www.kaggle.com/nikhilpandey360/chest-xray-masks-and-labels>





THANK YOU !!

