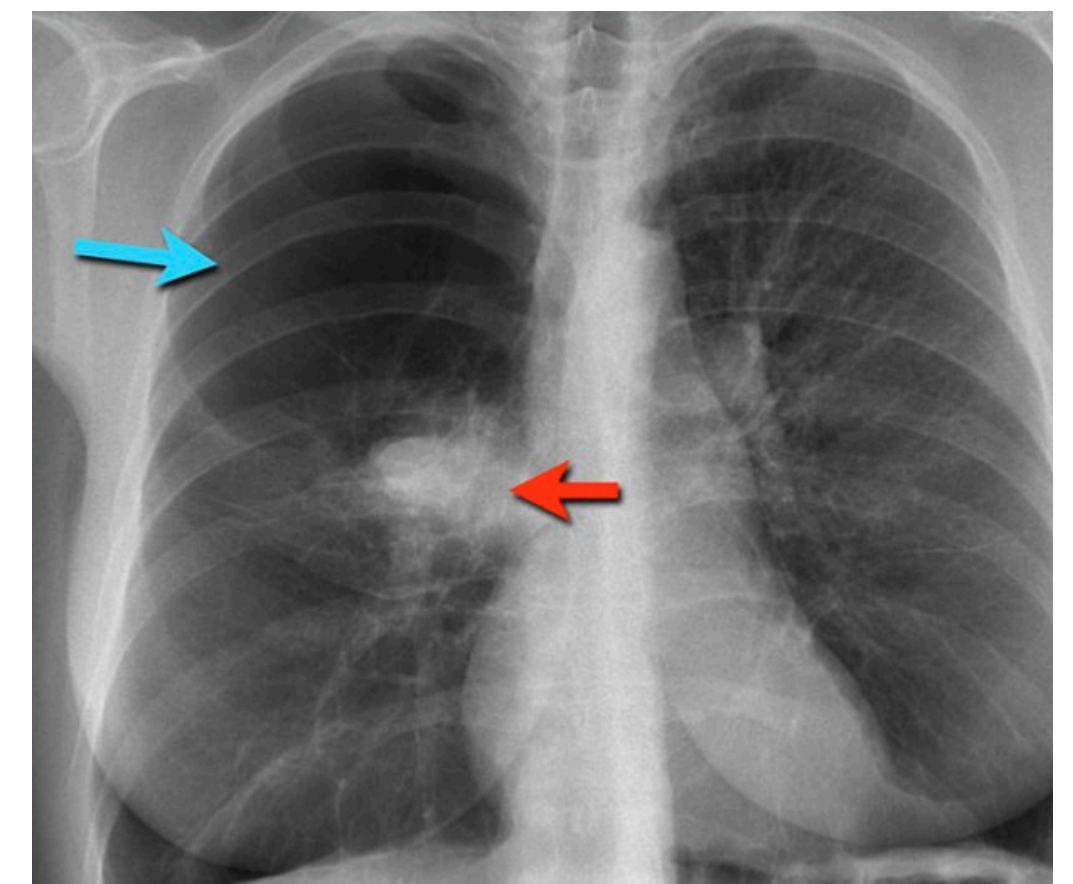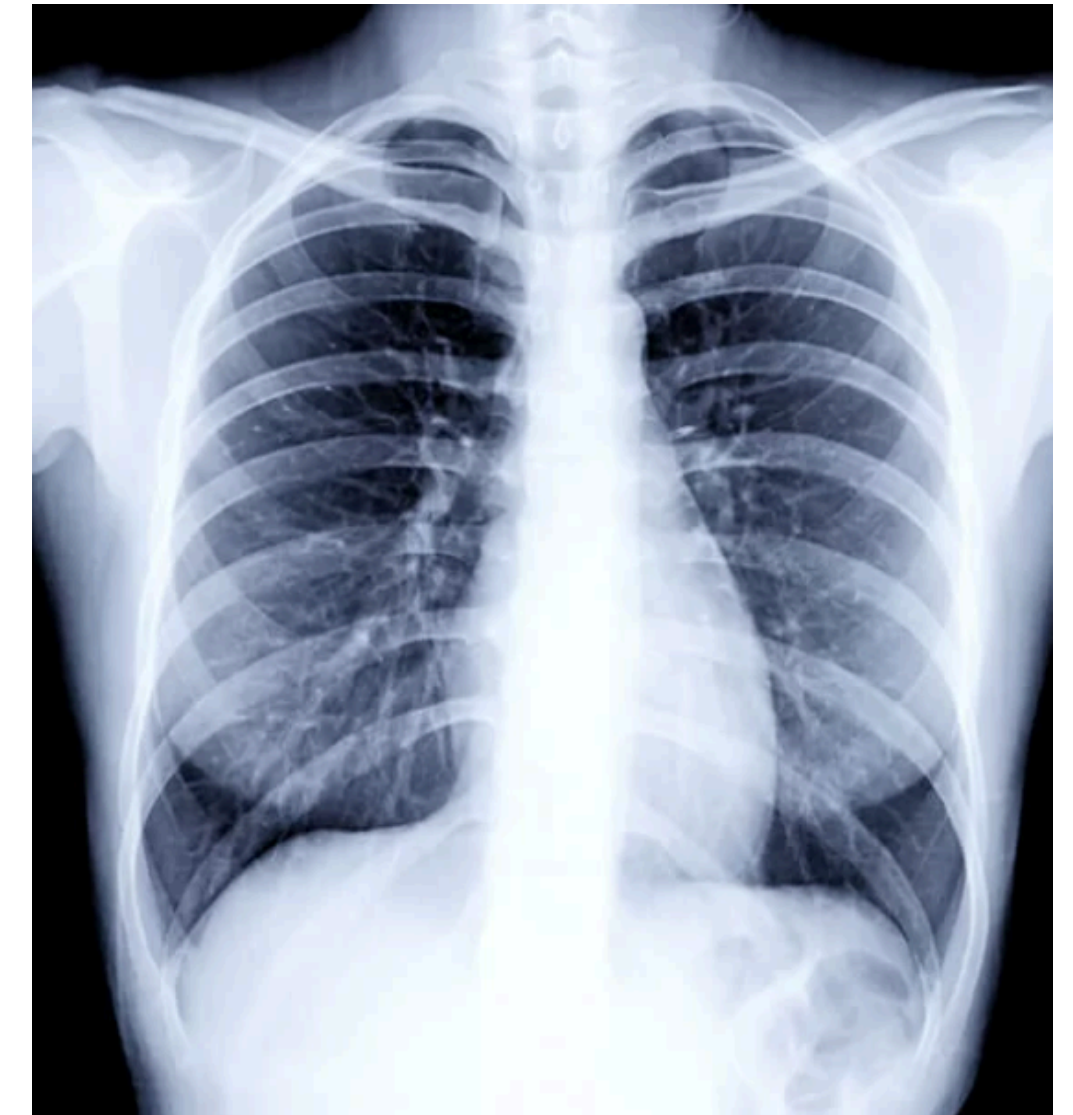# DIGITAL IMAGE PROCESSING

MEDICAL IMAGE ANALYSIS

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INTRODUCTION

- Pneumonia is a significant health problem worldwide, often diagnosed through chest X-rays.

- Developing an automated system to detect pneumonia can aid in early diagnosis and treatment, reducing the burden on healthcare professionals.

DATASET

- CHEST X-RAYS PNEUMONIA" DATASET FROM KAGGLE.

- INCLUDES 5,863 IMAGES CATEGORIZED INTO NORMAL AND PNEUMONIA CASES
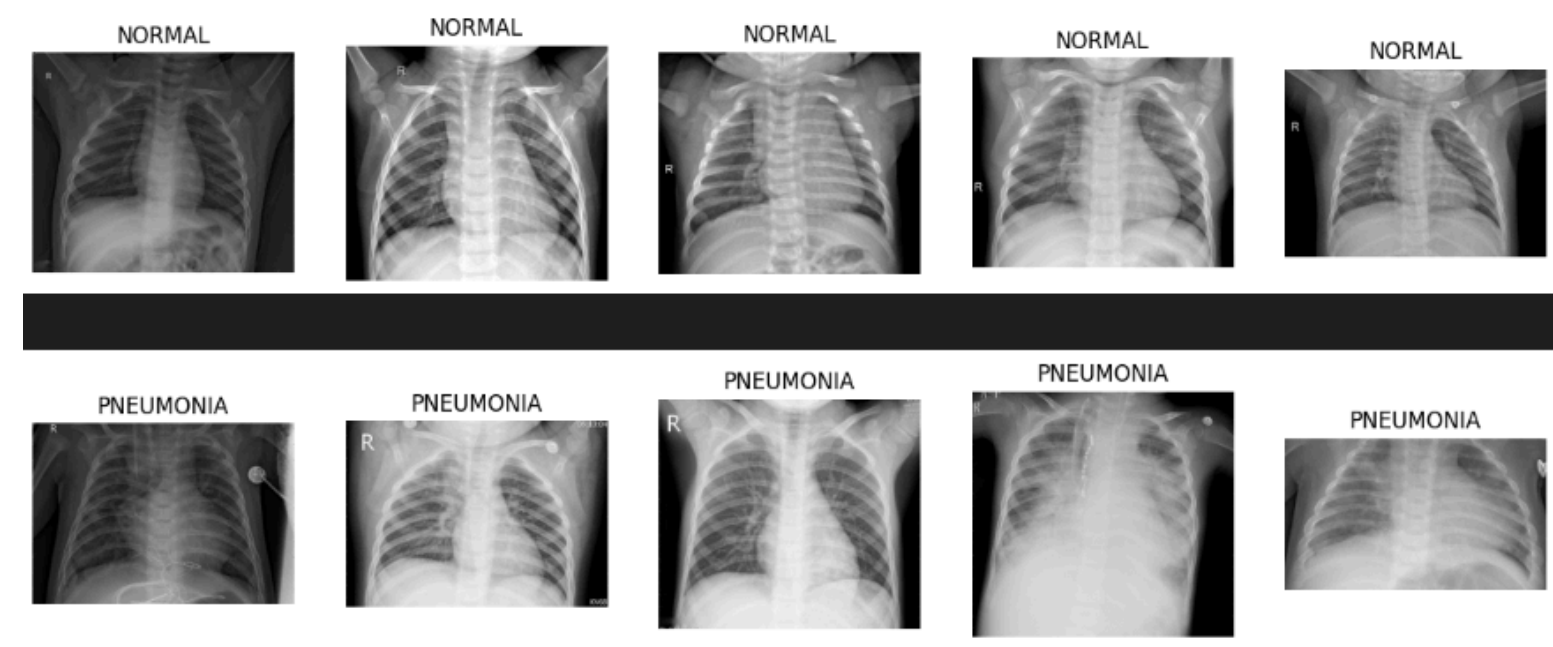
PROBLEM GAP

OUR CONTRIBUTION

- High rates of false positives and negatives in existing models

- Existing Methods doesn't rely on Digital Image processing a lot.

- Use of advanced pre-processing techniques to improv image quality and model performance.

WORK FLOW

original image → pre-processing → CNN → result

NORMAL

PNEUMONIA
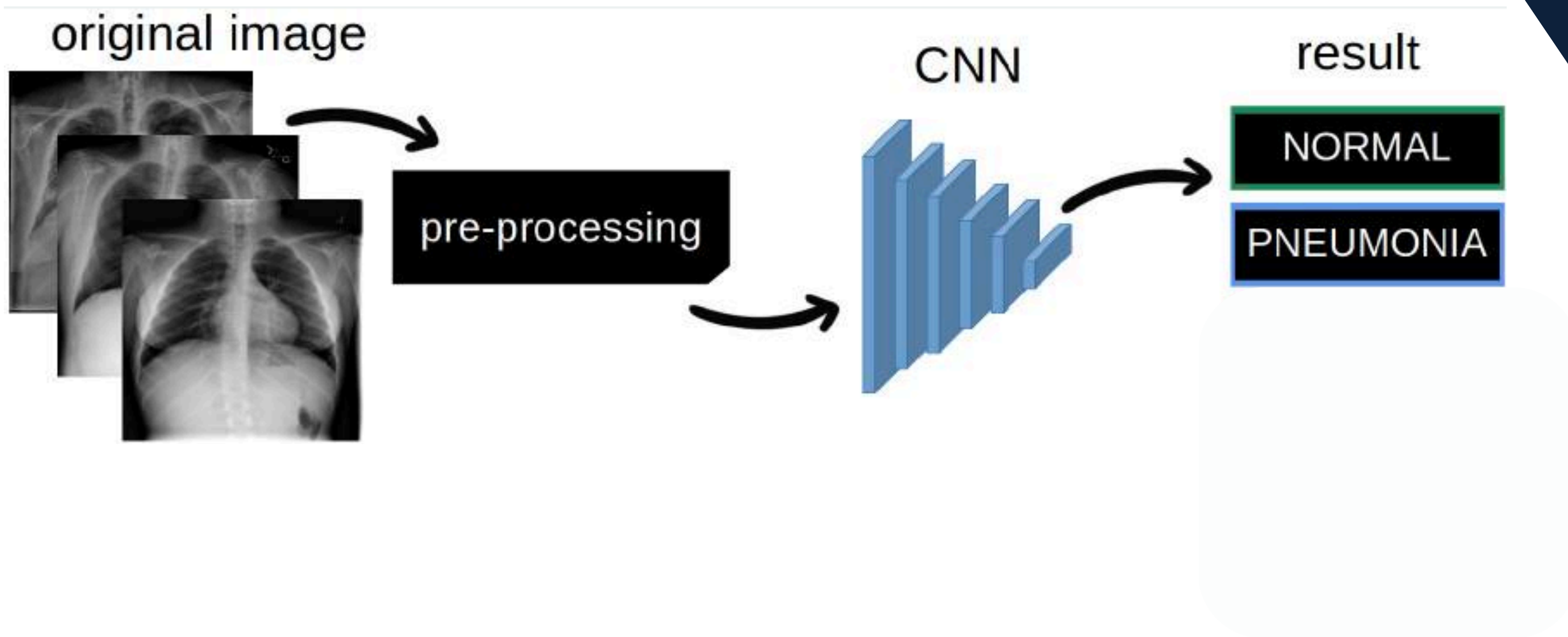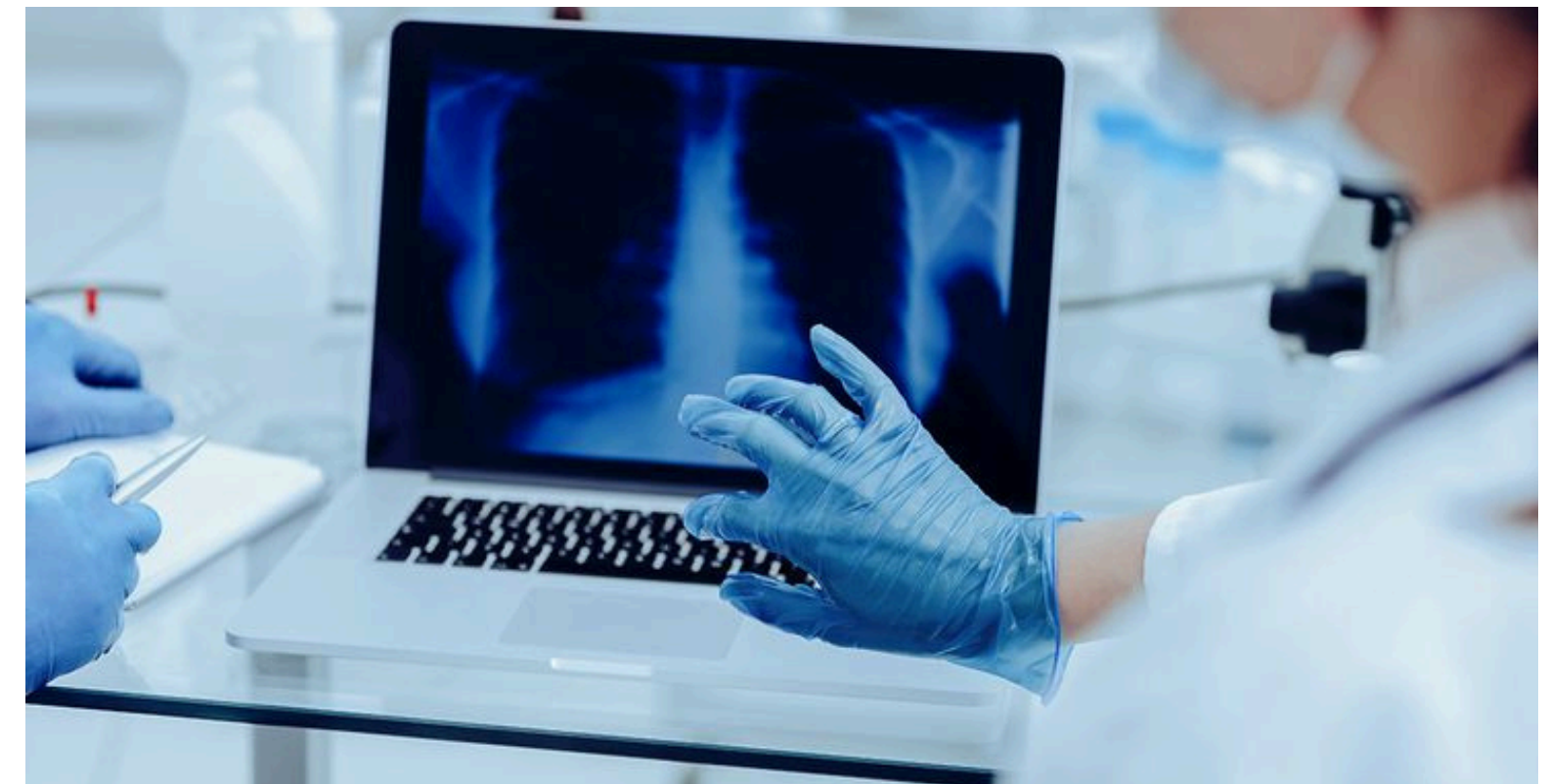
IMAGE PRE-PROCESSING

- Histogram Equalization

- Noise Reduction(Gaussian Filter)

- Sharpening using Laplacian Filter

- Resize

- Normalization

HISTOGRAM EQUALIZATION

- Computes the histogram of pixel intensities.

- Distributes the intensities more uniformly across the histogram.

- Improves visibility of features in both dark and bright regions.

Histogram Equalization

NOISE REDUCTION

- Applies a Gaussian filter, which is a type of low-pass filter.

- Convolves the image with a Gaussian kernel.

- The degree of smoothing is controlled by the standard deviation (sigma) of the Gaussian function.


Noise Reduction
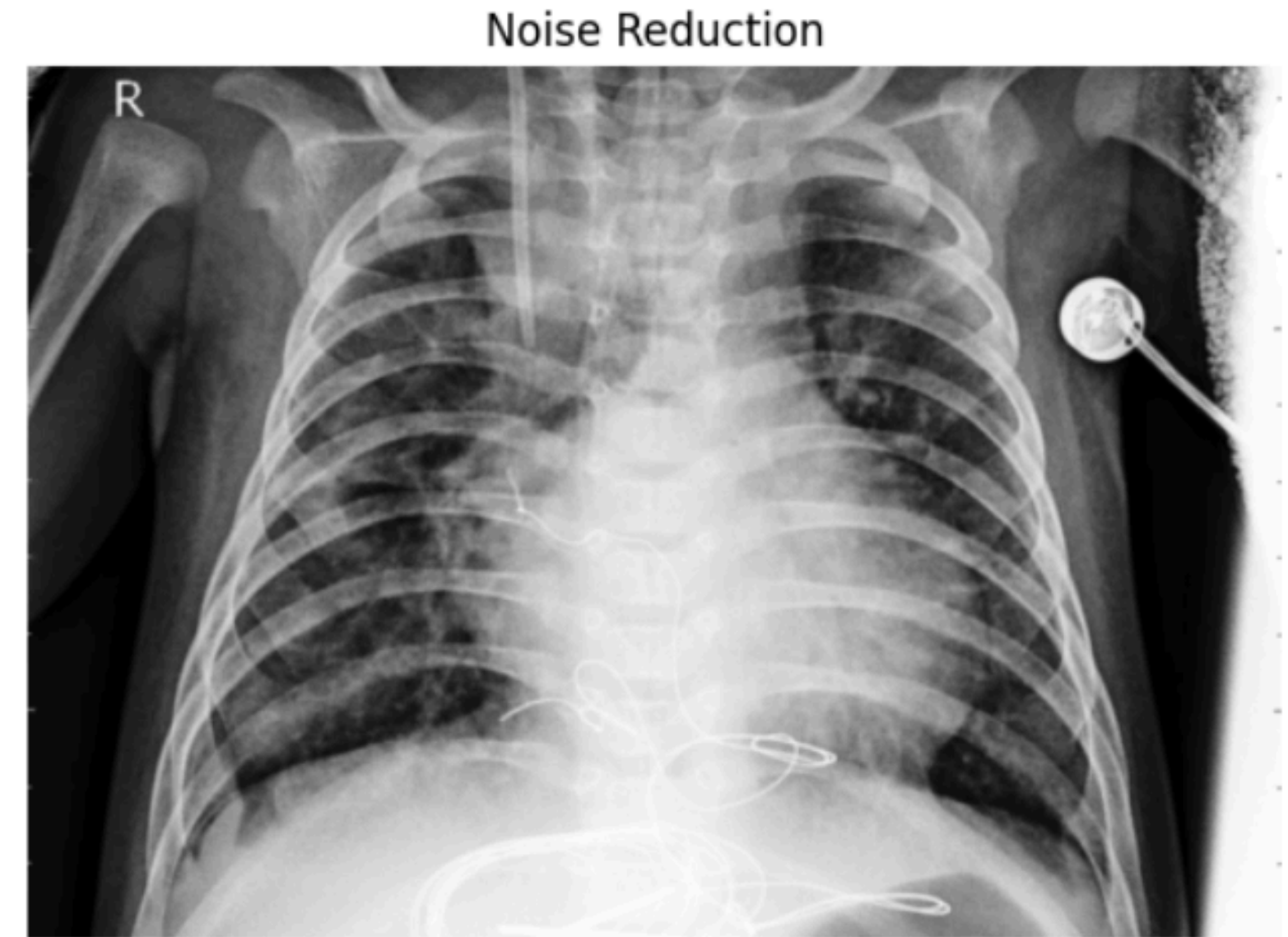
SHARPENNG

- Applies a Laplacian filter to highlight regions of rapid intensity change (edges).

- Can be combined with the original image to create a sharpened effect.

- Helps to enhance important features such as the edges of lung structures.


Sharpened Edges
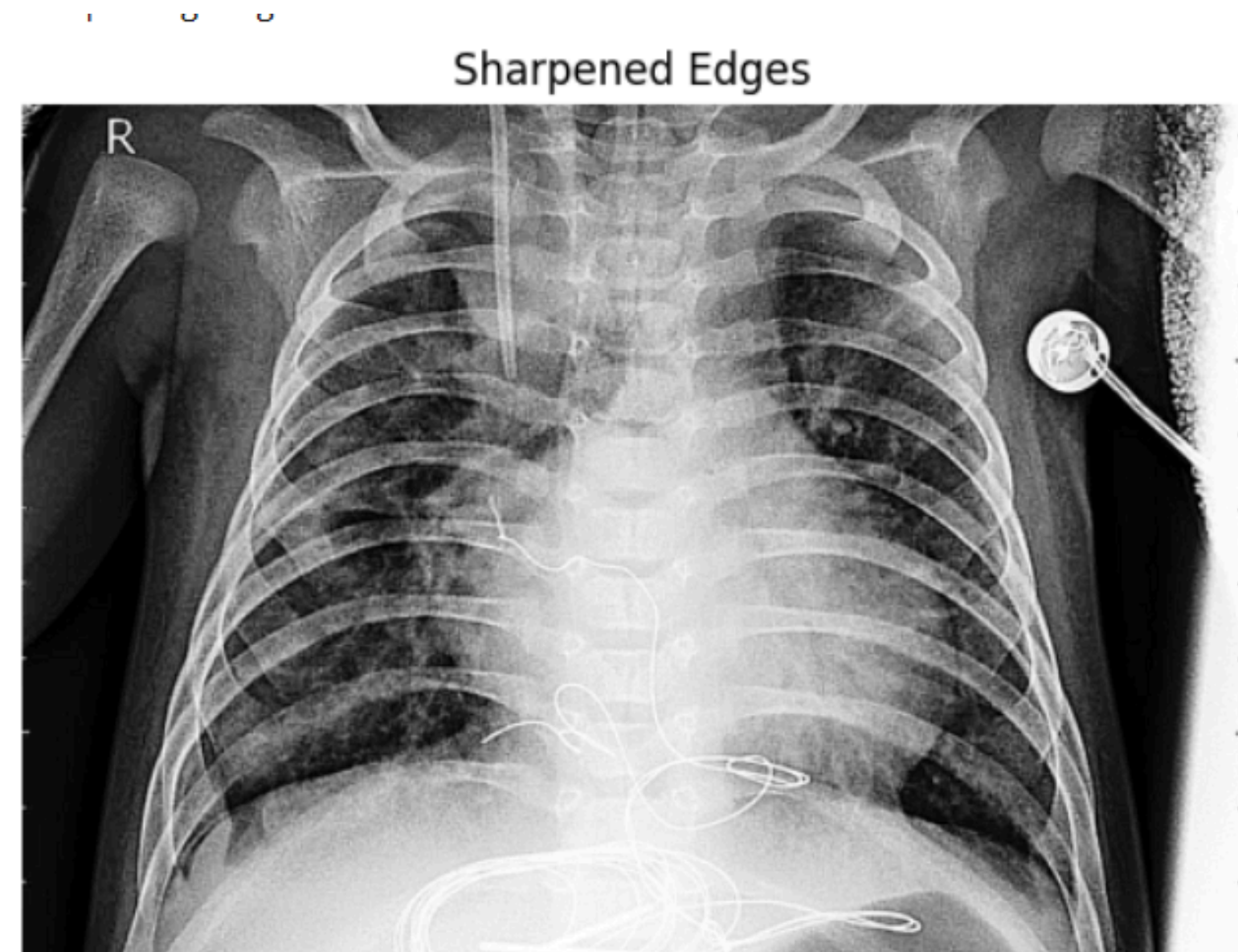
RESIZNG

- Scales all images to a predefined size (e.g., 224x224 pixels).

- Ensures consistency in input data, reducing computational complexity.

- Maintains the aspect ratio to avoid distortion (if applicable).
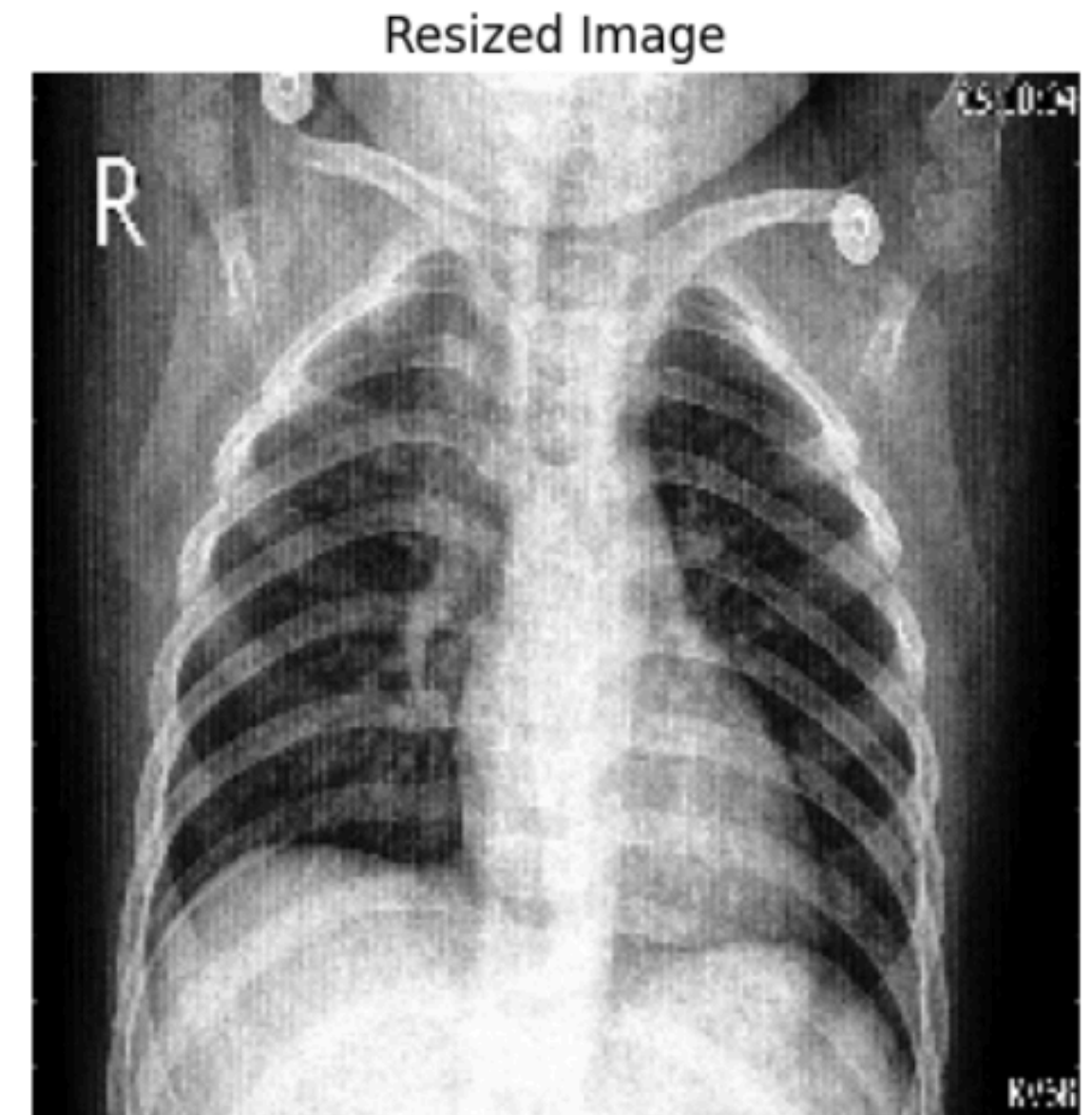

Resized Image

NORMALIZATION

- Divides pixel values by the maximum possible value

- Sometimes subtracts the mean and divides by the standard deviation of pixel values.

- Helps in speeding up the convergence of the CNN during training.


Normalized Image
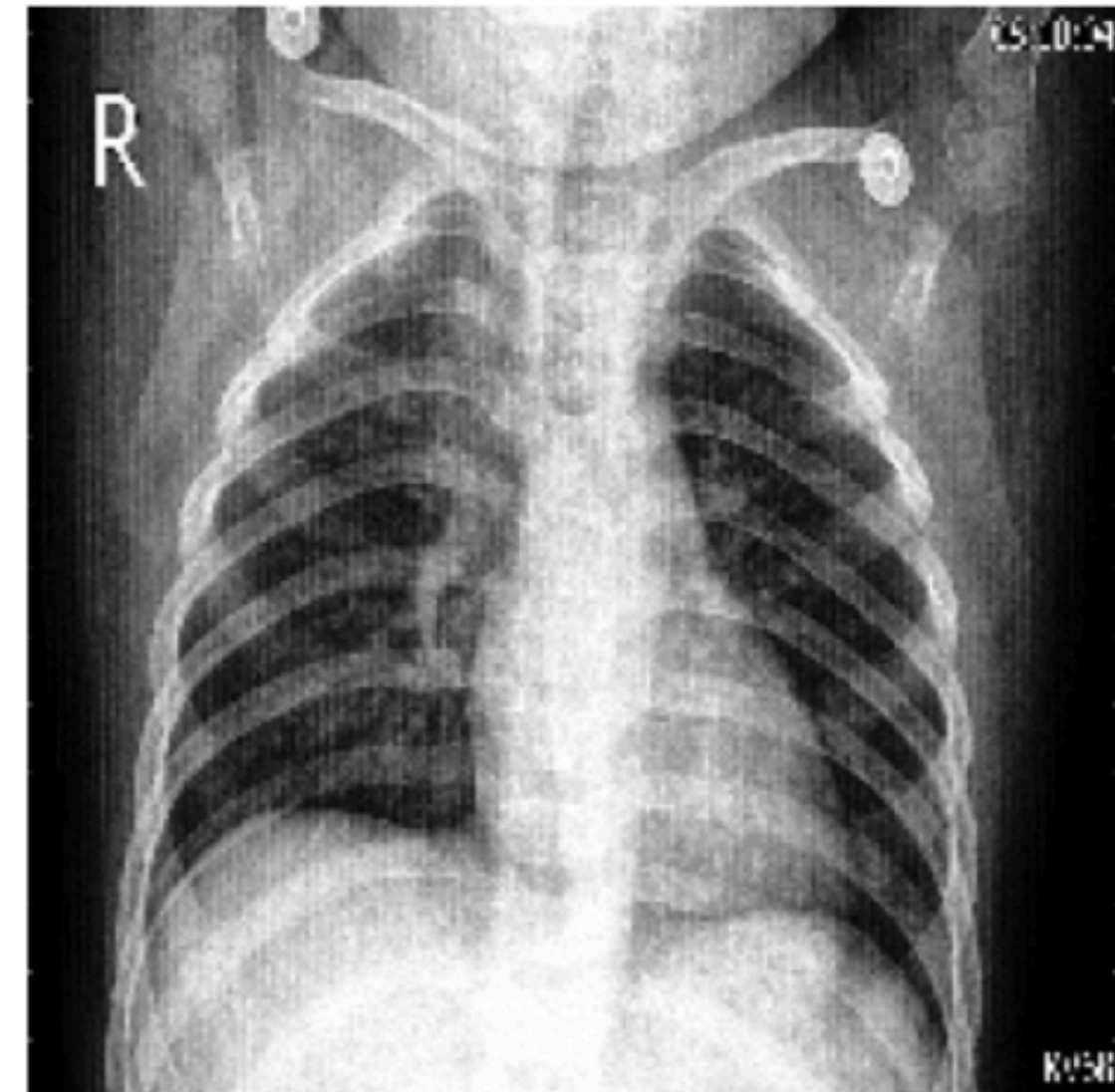
CNN

- Input Layer: Accepts resized, normalized chest X-ray images.

- Convolutional Layers:

- Multiple layers to extract features from images.

- Use of filters/kernels to detect edges, textures, and patterns.

- Relu activation functions to introduce non-linearity.

- Pooling Layers:

- Typically max-pooling to reduce the spatial dimensions and computational load.

- Helps in making the model invariant to small translations.

- Fully Connected Layers:

- Flatten the output from convolutional layers.

- One or more dense layers to interpret the features and make final classifications.

- Output Layer:

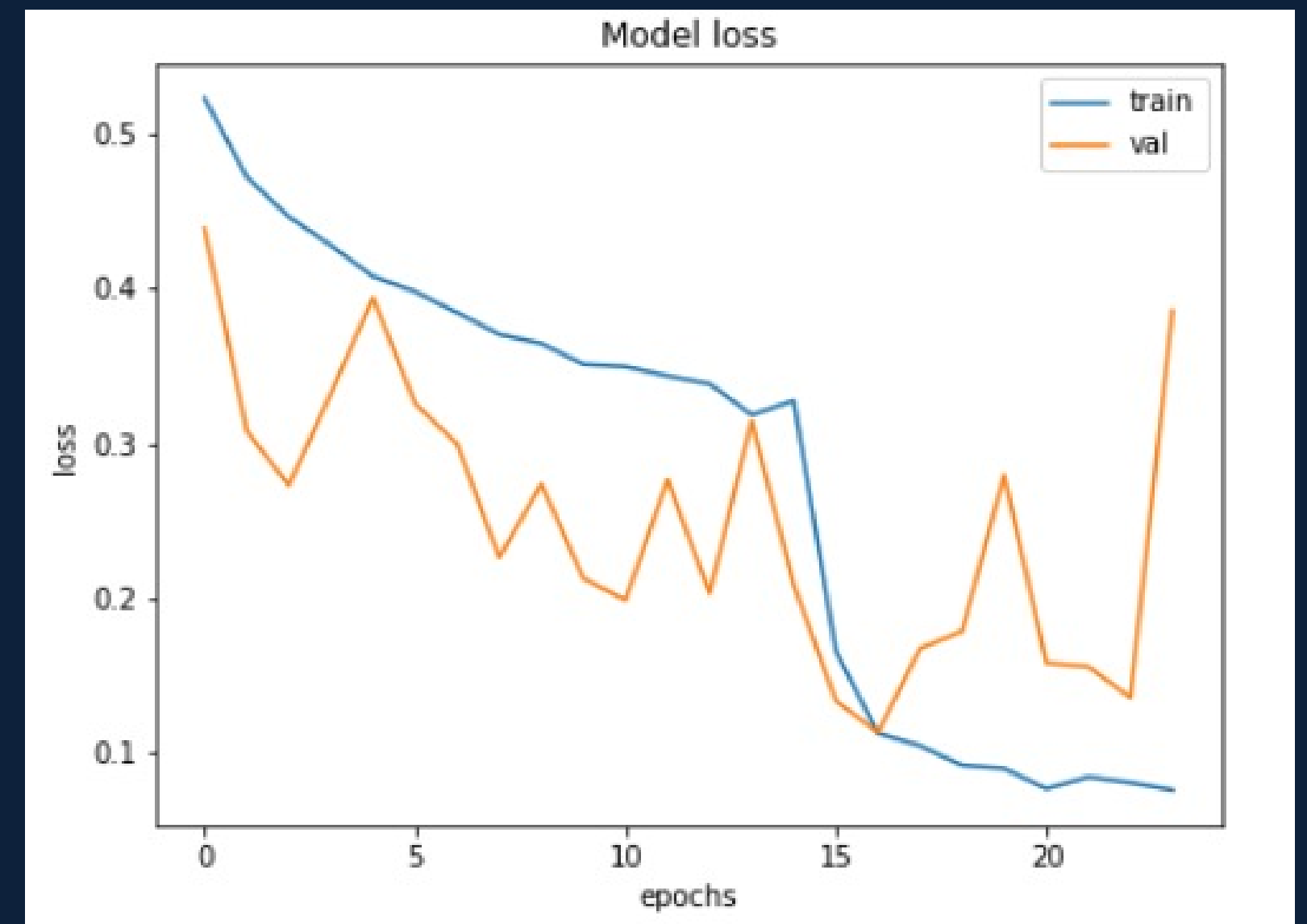- Softmax activation function for multi-class classification (e.g., normal vs. pneumonia).
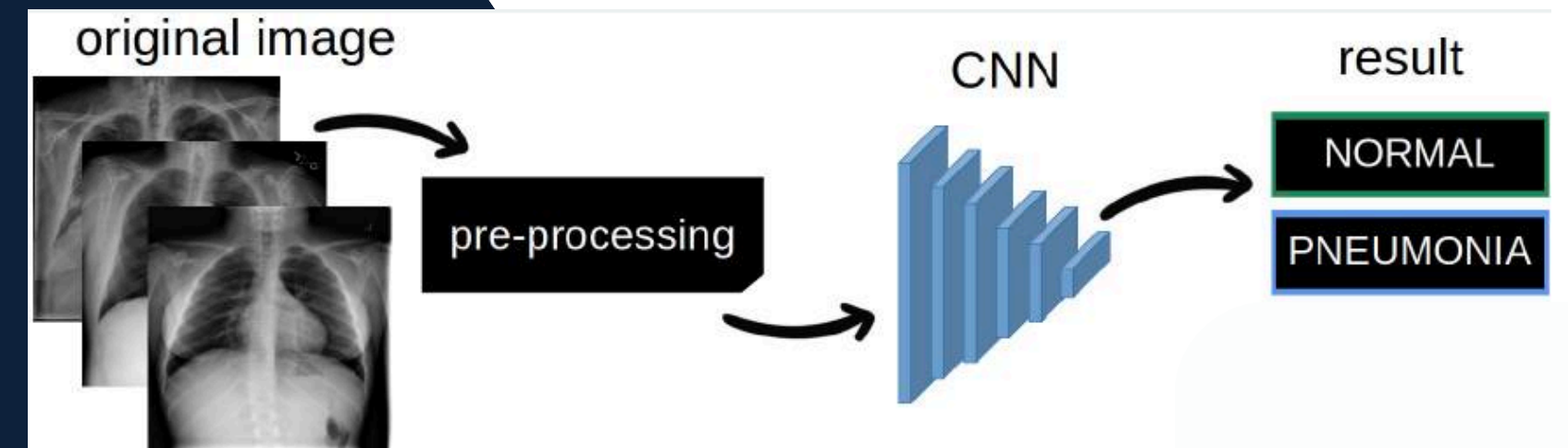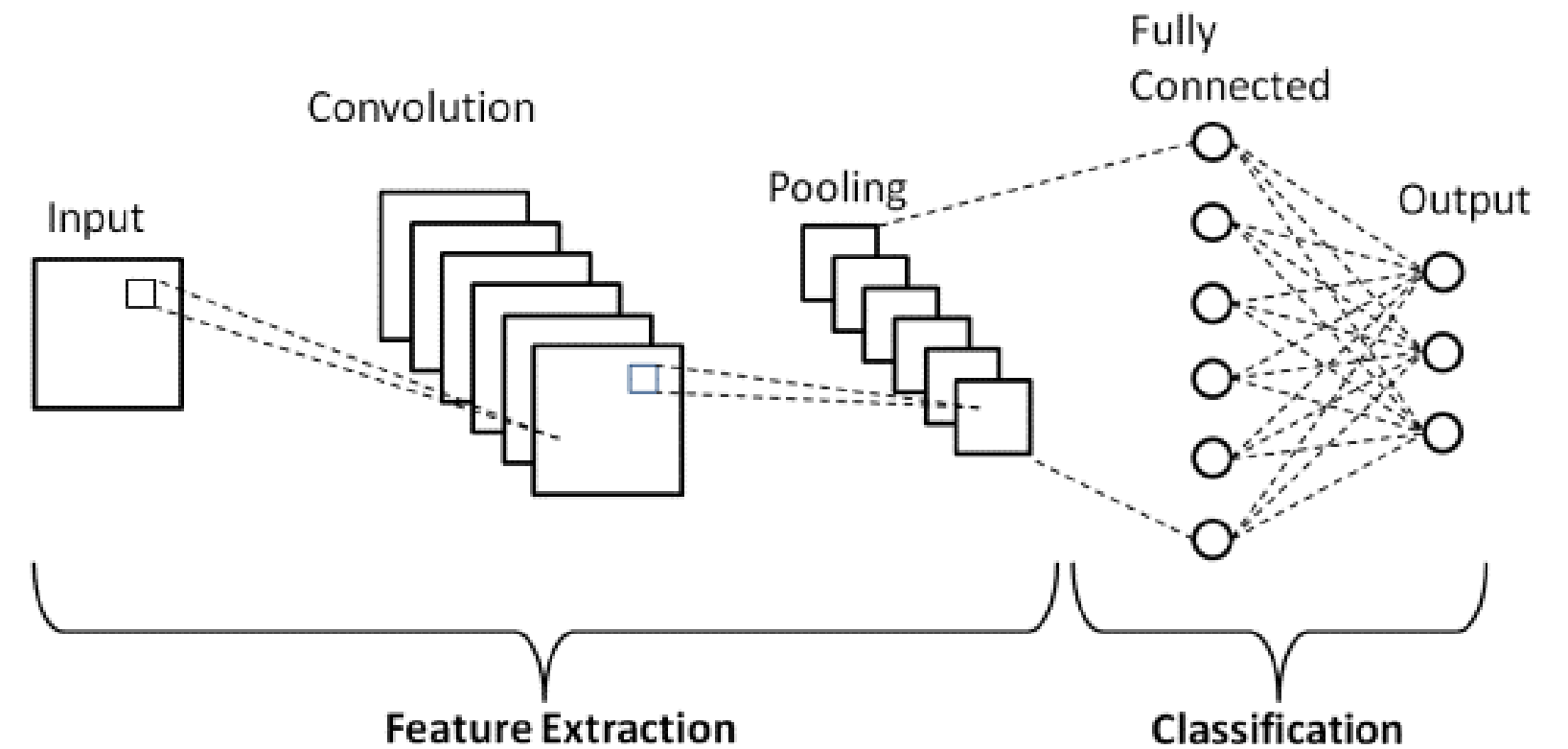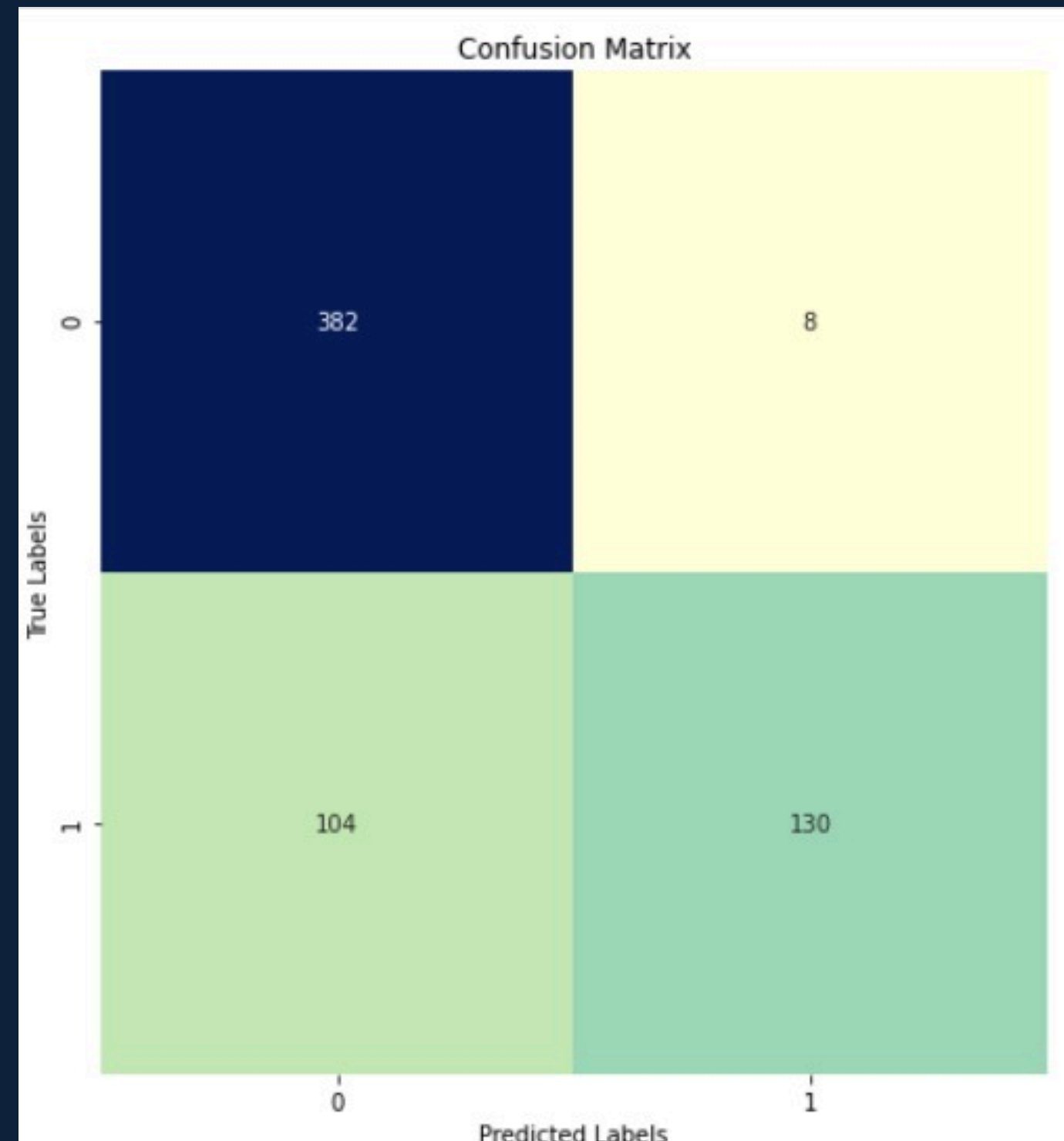
RESULTS

MODEL ACCURACY
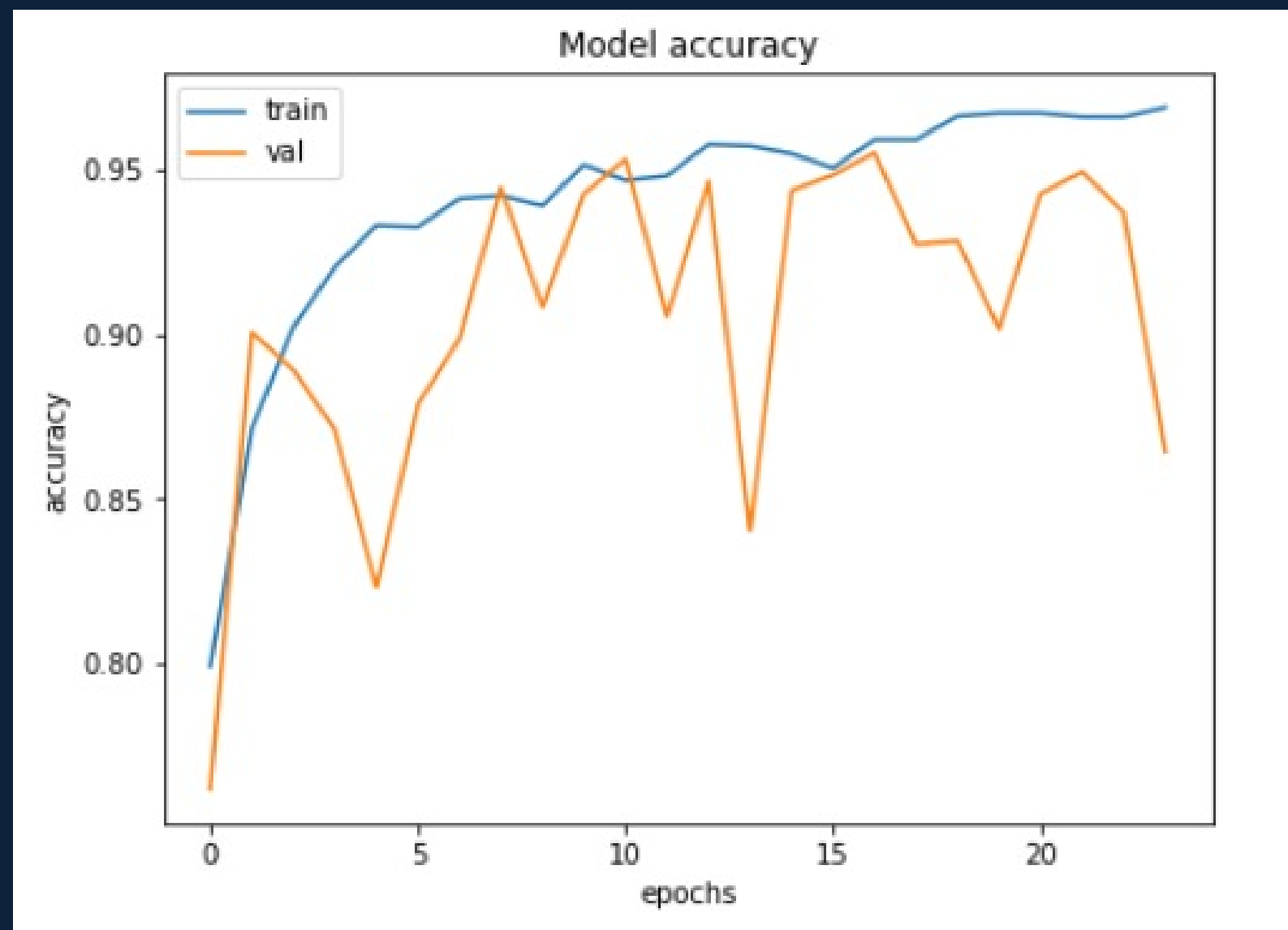
MODEL LOSS GRAPH

RESULTS

CONFUSION MATRIX

THANK YOU