

Pneumonia Detection on X-ray Images Using Deep Learning

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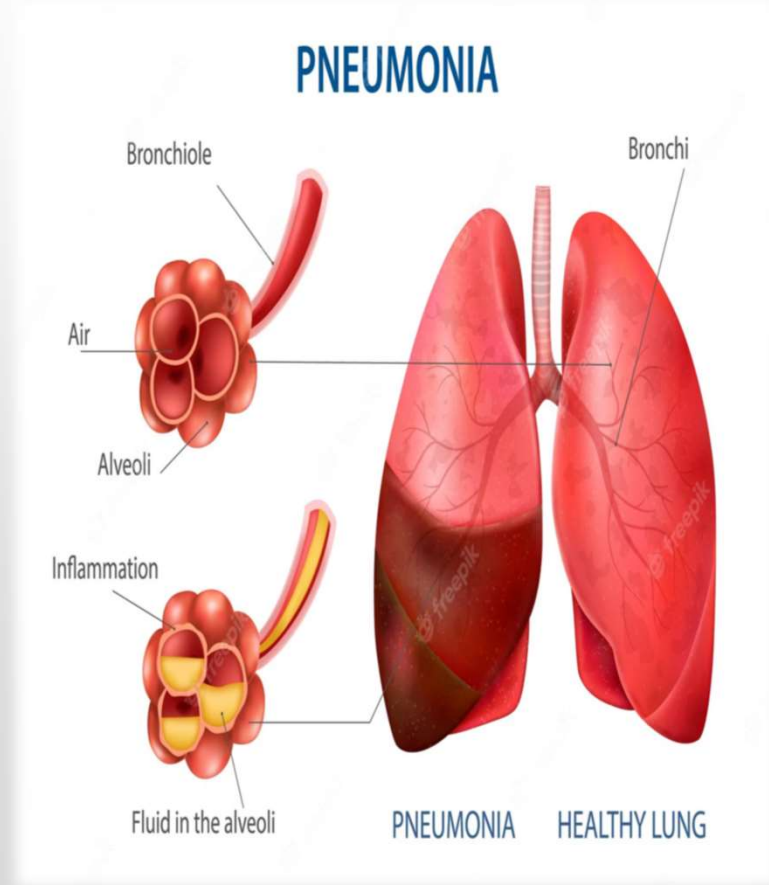
IMPORTANT FACTS ABOUT PNEUMONIA

WHAT IS PNEUMONIA?

Pneumonia is an infection that affects one or both lungs. It causes the air sacs, or alveoli, of the lungs to fill up with fluid or pus. Bacteria, viruses, or fungi may cause pneumonia.

WHAT ARE **RED** FLAGS FOR PNEUMONIA?

Fever, sweating and shaking chills. Lower than normal body temperature (in adults older than age 65 and people with weak immune systems). Nausea, vomiting or diarrhea. Shortness of breath.

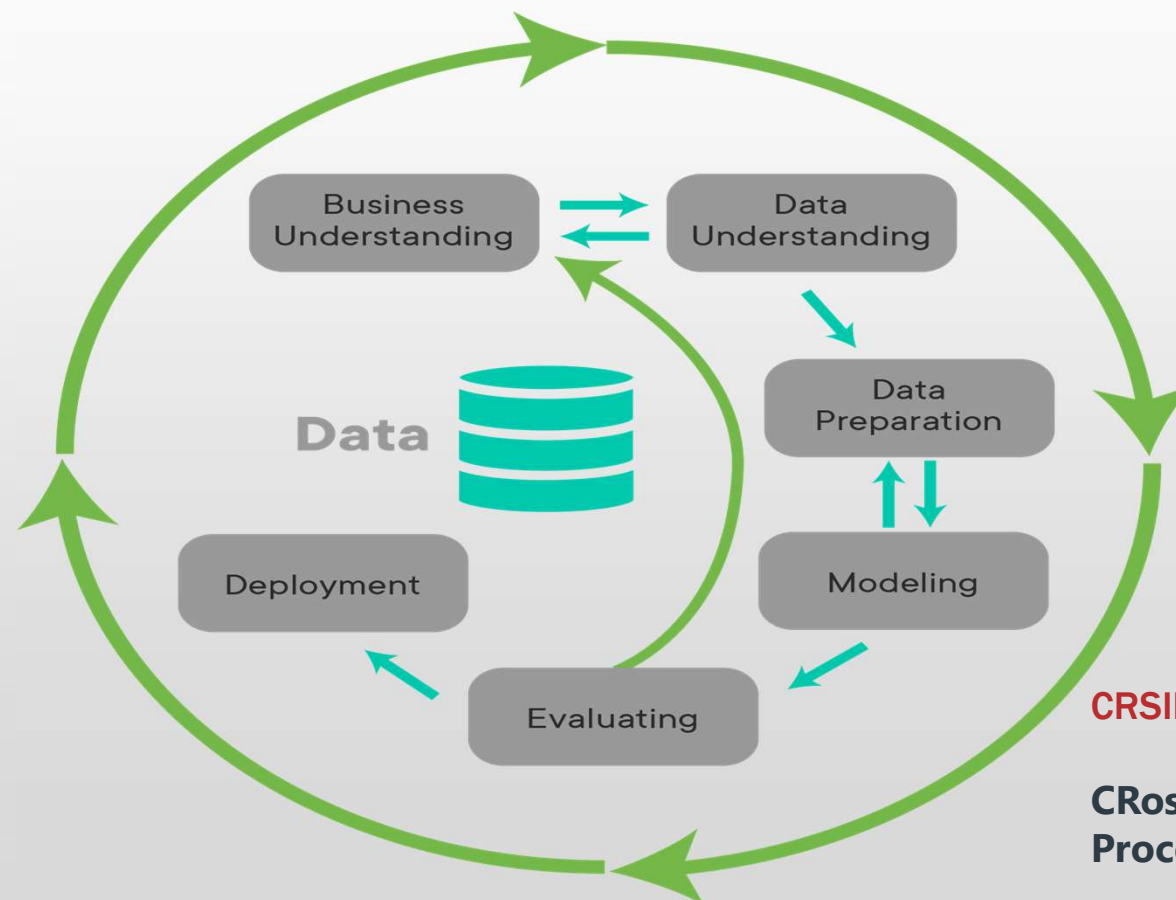


PROJECT OVERVIEW

- Pneumonia is a leading cause of death worldwide, and early detection is crucial for effective treatment.
- Manual interpretation of chest X-ray images by radiologists is time-consuming and prone to human error, leading to delayed diagnosis and treatment.
- Application of **Machine Learning**, **Deep Learning**, **Artificial Intelligence** has increased tremendously in the field of medicine over the past few years.
- **Modern Day Applications:** X-ray Images Analysis, ECGs (Electrocardiogram) and other technologies to diagnose diseases or ailments in patients.



DATA SCIENCE PROCESS/FRAMEWORK



CRISP-DM

**Cross-Industry Standard
Process for Data Mining**

BUSINESS UNDERSTANDING



Our Goal

To develop a deep learning model to automate the process of pneumonia detection from chest X-ray images, enabling faster and more accurate diagnosis.

CHEST X-RAY IMAGES

Normal



Clear Lungs Without Any
Abnormal Opacification in
the Image

Bacterial Pneumonia



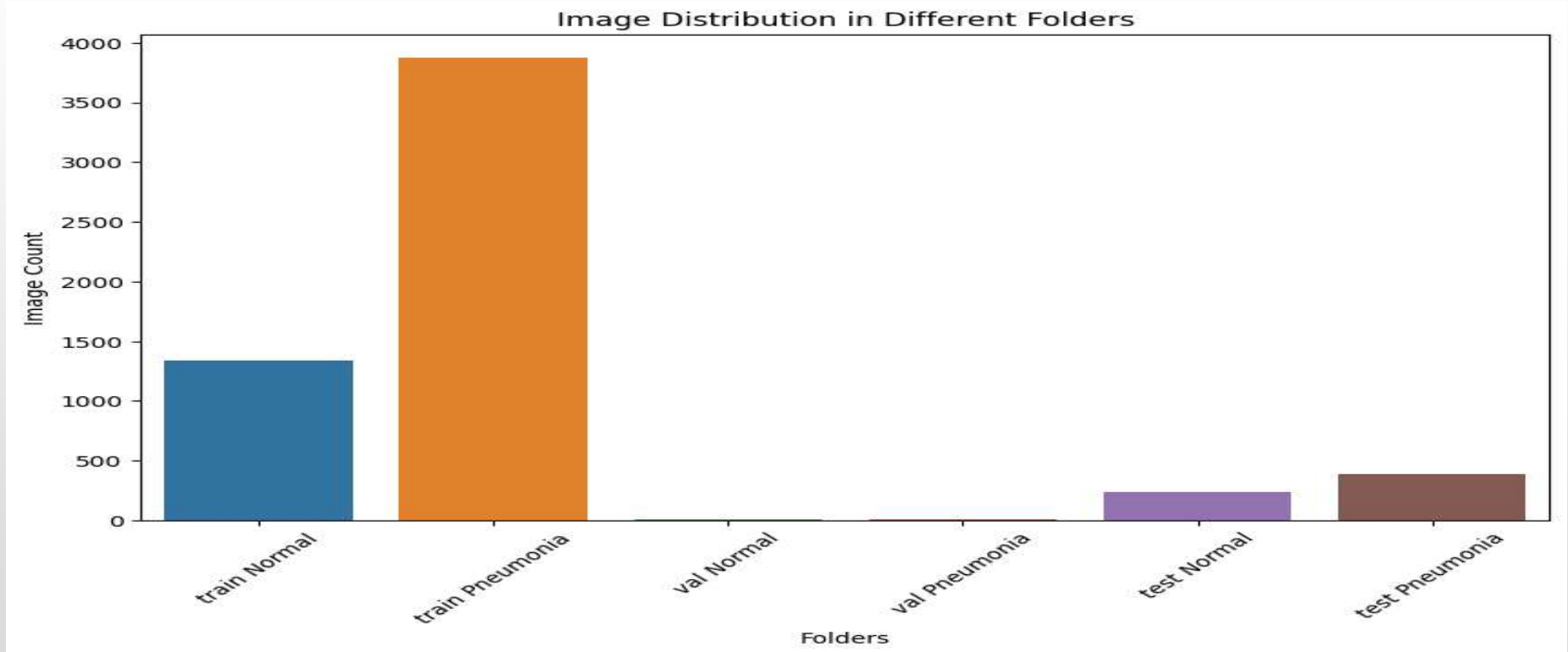
Focal lobar Consolidation
in the right upper lobe
(Depicted by White Arrow)

Viral Pneumonia



More Diffuse
'Interstitial' pattern in
both lungs

LABELS DISTRIBUTION IN TRAIN, TEST & VALIDATION FOLDERS



Training images are class imbalanced with more images labelled 'Pneumonia' than 'Normal'. Few Examples in Validation folder

PIXEL INTENSITY DISTRIBUTION (BEFORE & AFTER STANDARDIZATION)

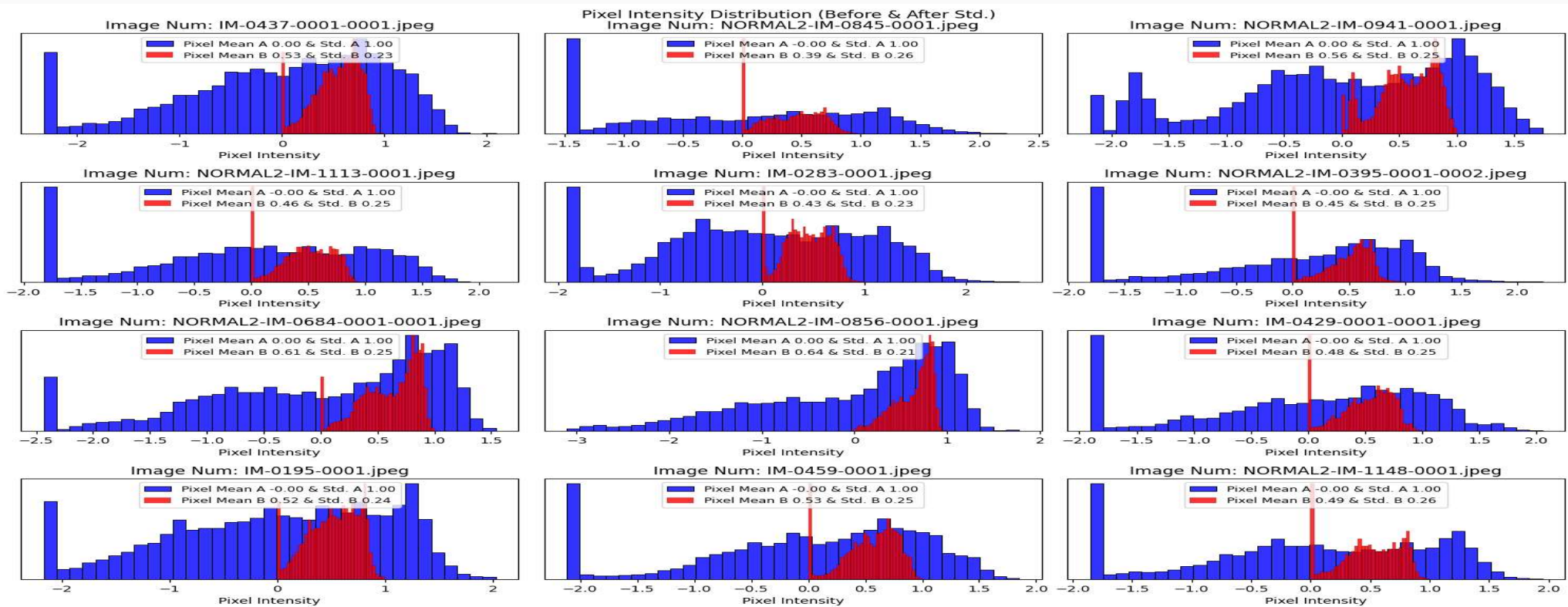
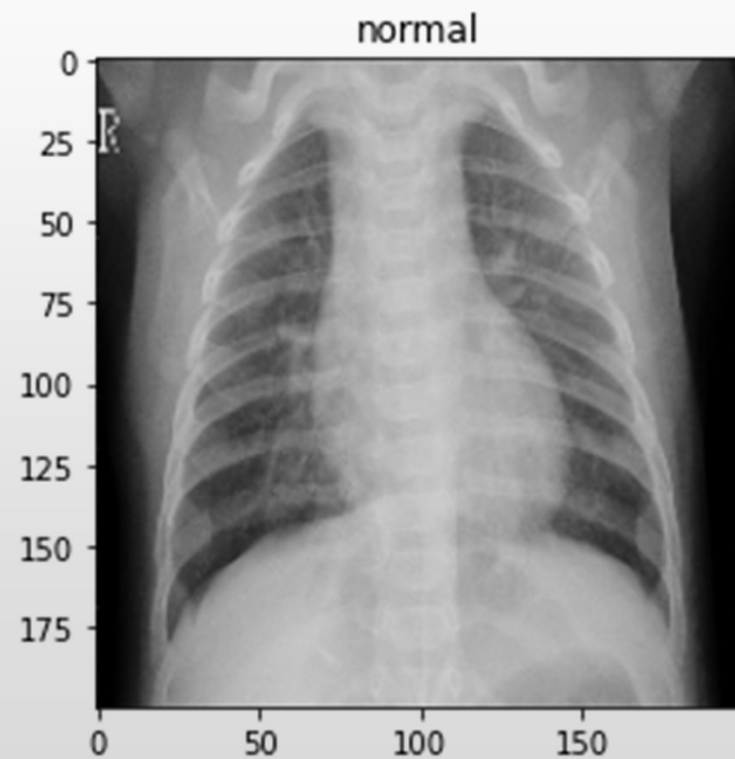
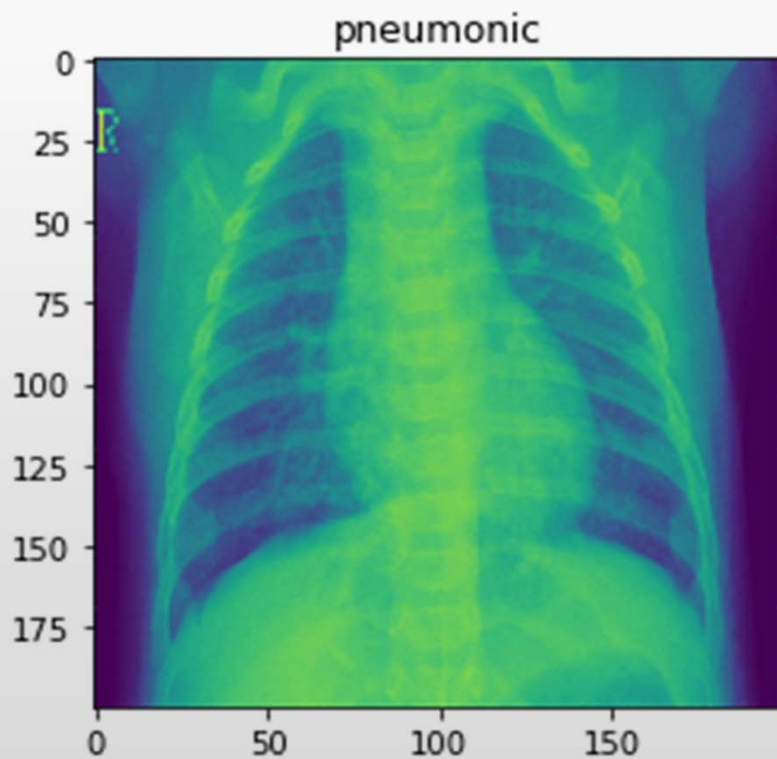


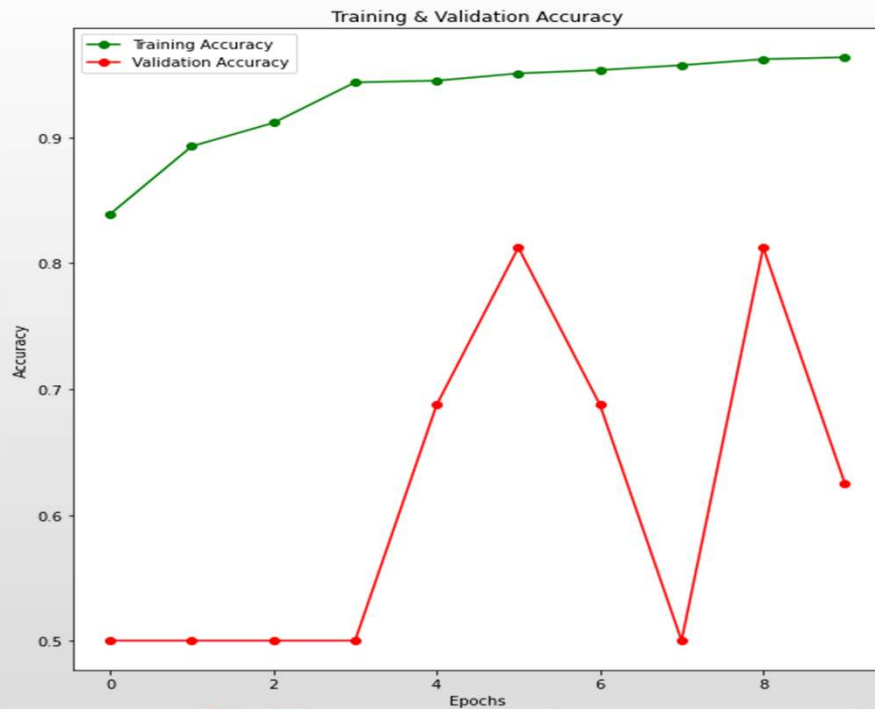
Image Data adjusted to a new mean of zero (0) & standard deviation of one (1)

EFFECTS OF ILLUMINATION

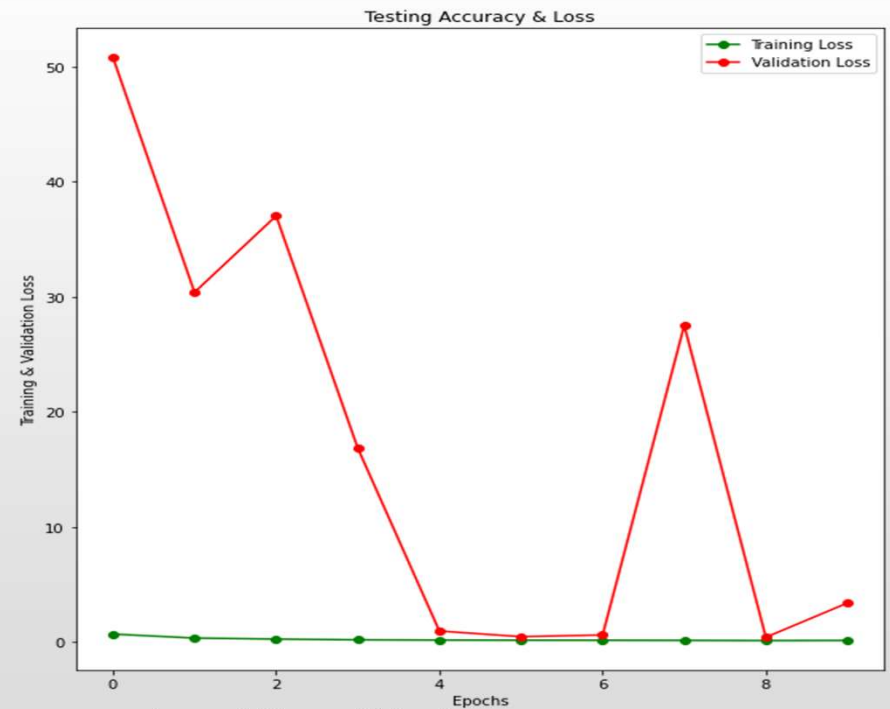


Grayscale Normalization Done to Reduce the Effects
of illuminations.

MODEL LOSS & ACCURACY PLOTS



Training accuracy increases as we increase epochs while validation accuracy irregular due to data variations.



Training loss remains relatively low & constant which is a good story

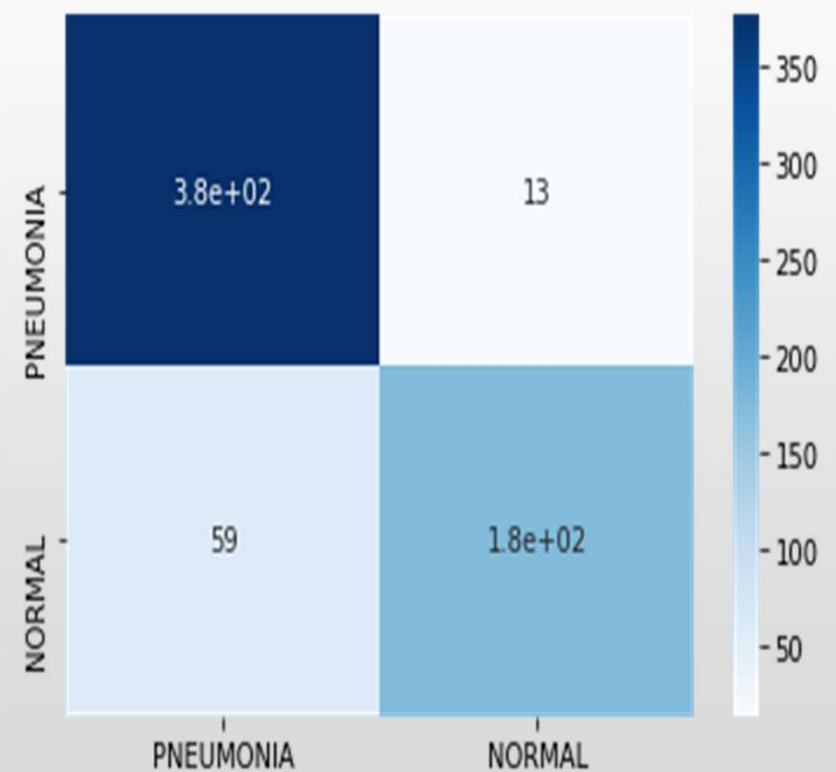
PREFERRED MODEL

CNN WITH 4 HIDDEN LAYERS

Overall Accuracy: 88%

Recall for Pneumonia: 97%

Precision for Pneumonia: 86%



RECOMENDATION



This model can be used in Healthcare sector in the radiological department to assist predict chest Xray images easily and accurately.

Similar model likewise can be improved on and deployed to assist with detection of any infectious lung diseases.

THANK YOU

