



Grey + Sloan Memorial Hospital

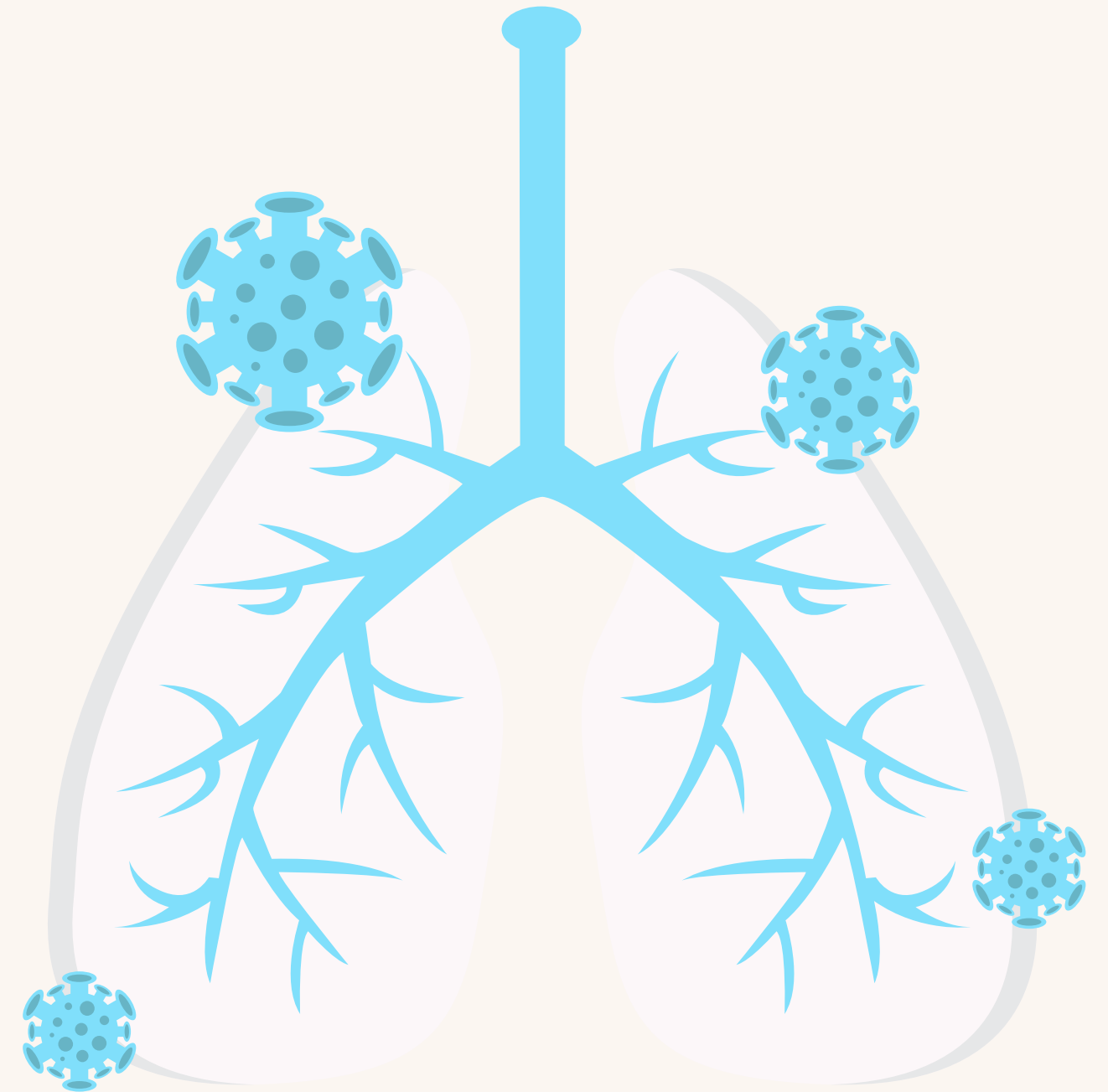
# Pneumonia detection

Using X-Ray images



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# Summary



Grey + Sloane Memorial Hospital, realised that early detection of pneumonia could potentially save lives and reduce death, especially in children. Due to the variability in chest X-rays, they hired a team of data analysts to solve the problem of wrong detection through the use of models that can detect pneumonia in different use cases.



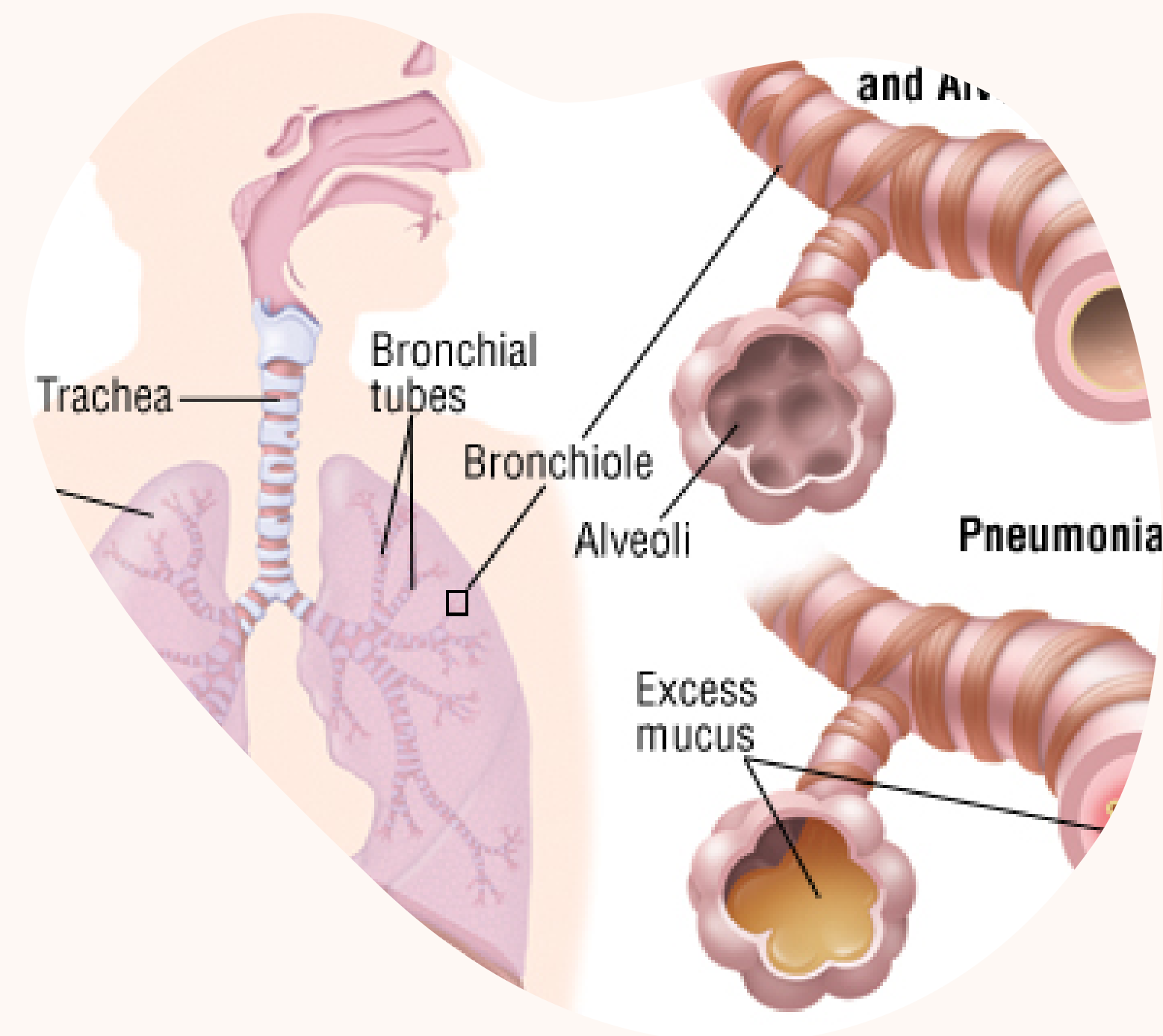
# Business Understanding

# Introduction

Pneumonia is a respiratory disease that causes inflammation in one or both lungs, resulting in symptoms such as cough, fever, and difficulty breathing.

In acute respiratory diseases, human lungs are made up of small sacs called alveoli, which are normally in the air in healthy individuals. However, in pneumonia, these alveoli get filled with fluid or "pus."

One of the major steps in phenomena detection and treatment is obtaining the chest X-ray (CXR).



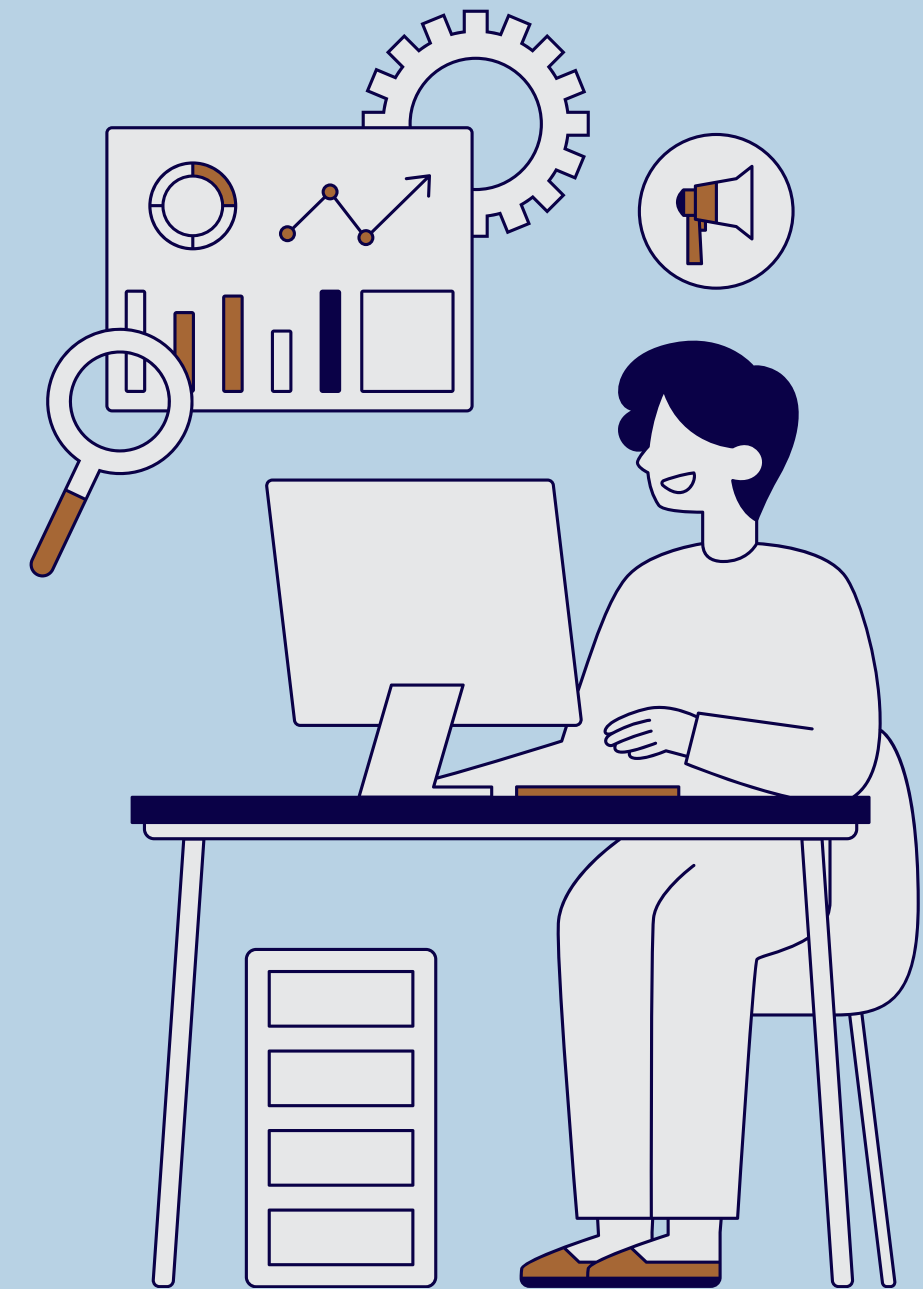
# 15%

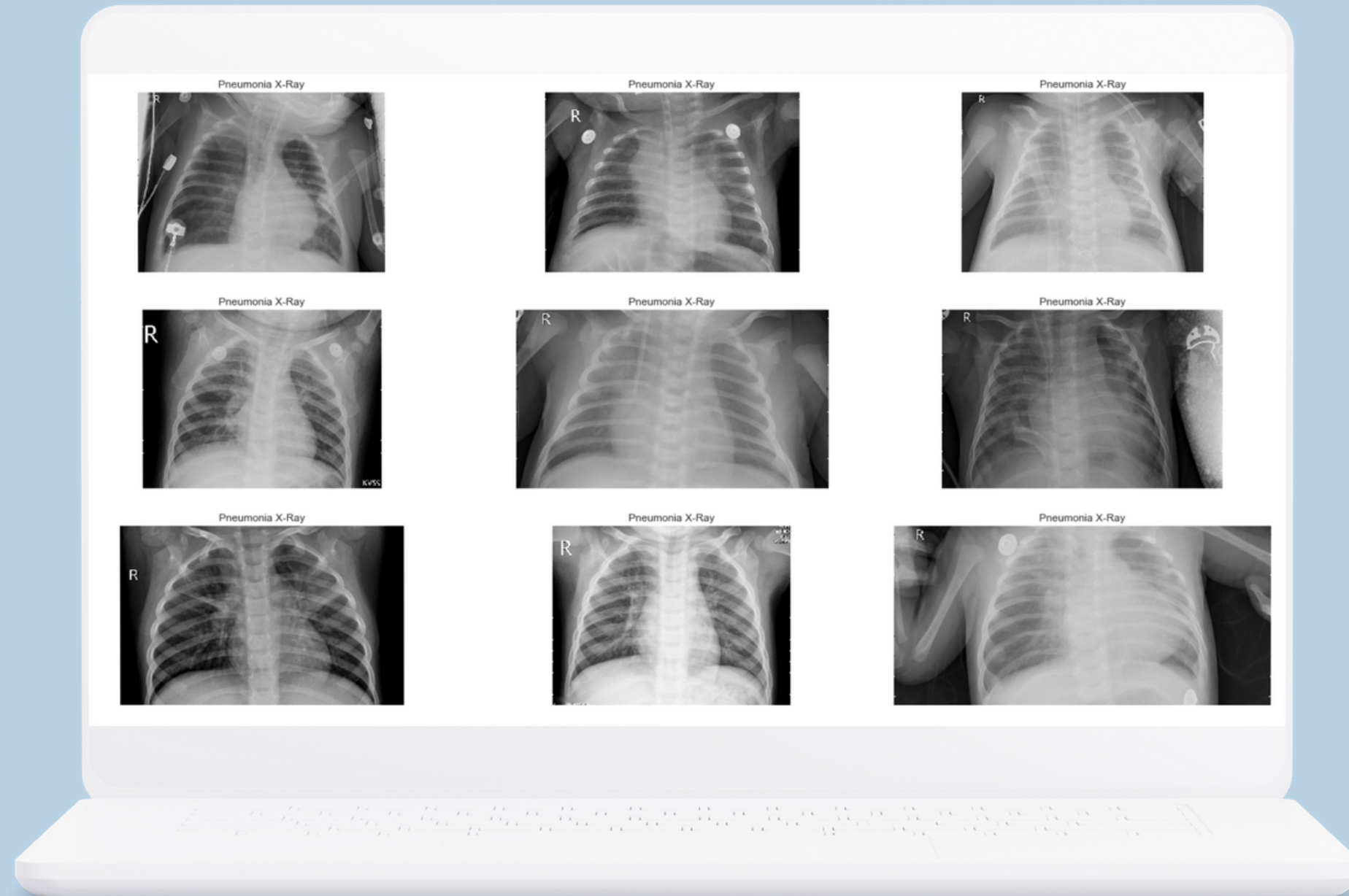
Early detection of pneumonia is essential for effective treatment and improved patient outcomes. It accounts for more than 15% of deaths in children under the age of five years. Therefore, early diagnosis and management can play a pivotal role in preventing the disease from becoming fatal.

# There is a significant variability on the way chest X-ray images are acquired

This variability can make it challenging to develop robust algorithms that can accurately identify pneumonia in all types of images. Hence, there is a need to develop robust, data-driven algorithms that are trained on large, high-quality datasets and validated using a range of imaging techniques and expert radiological analysis.

# Data Understanding





## Data overview:

- 5856 images in JPEG form
- Normal lungs 1341
- Pneumonia 3875



# The analysis of the quality scores of the images:

01.

Blur score- 77.91

02.

Contrast Score - 256

03.

Noise Score - 4093.45



The data was collected from NIH  
Chest X-ray Images data set



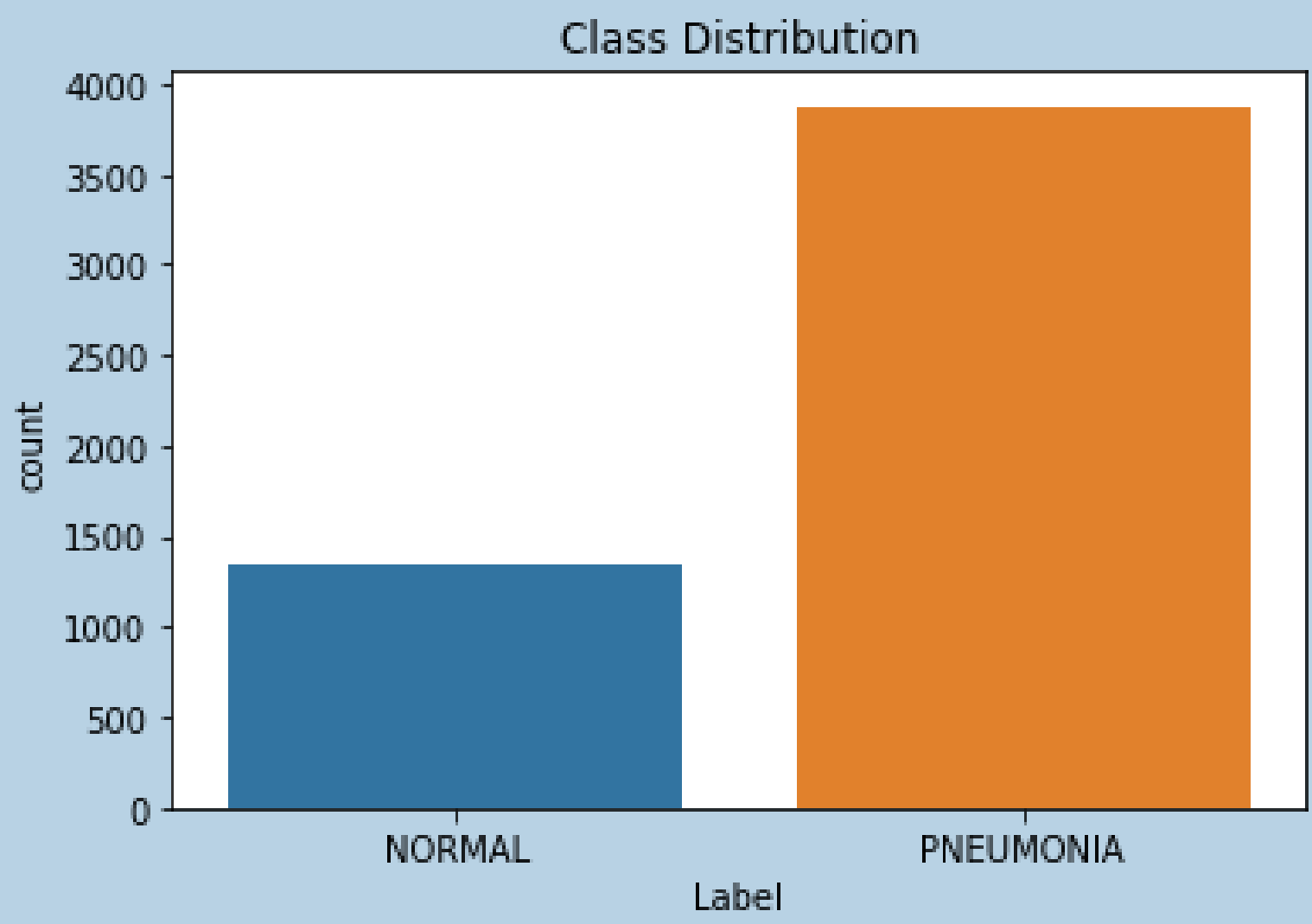
Data cleaning, ensuring  
consistency in size and resolution

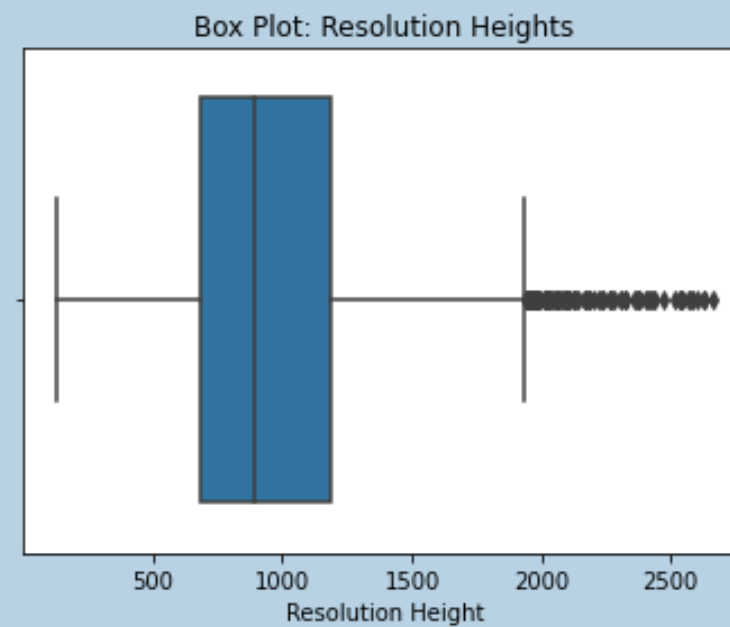
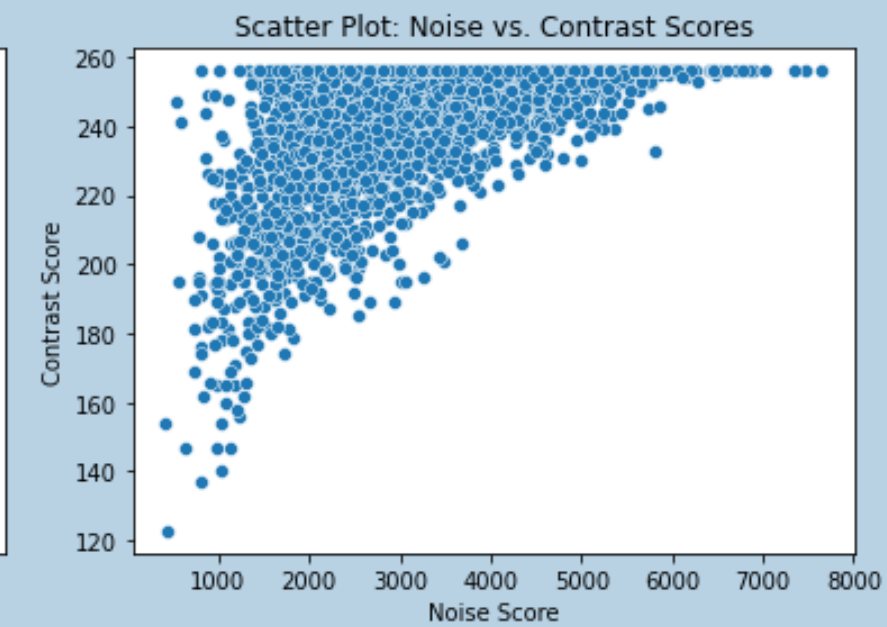
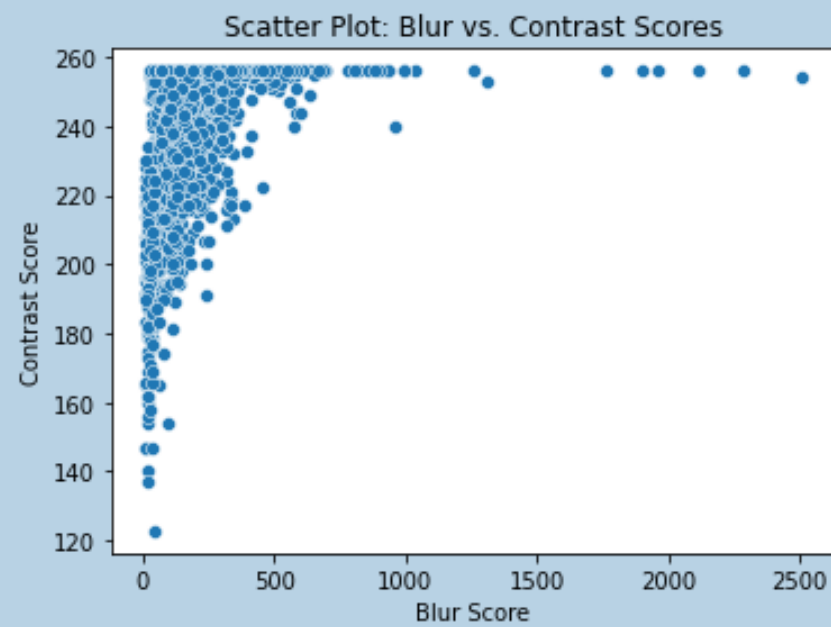
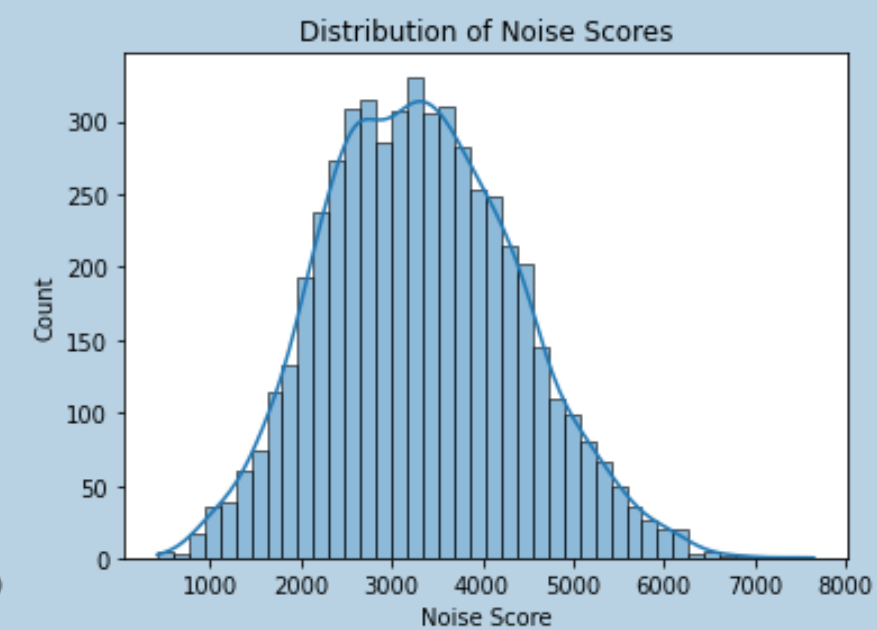
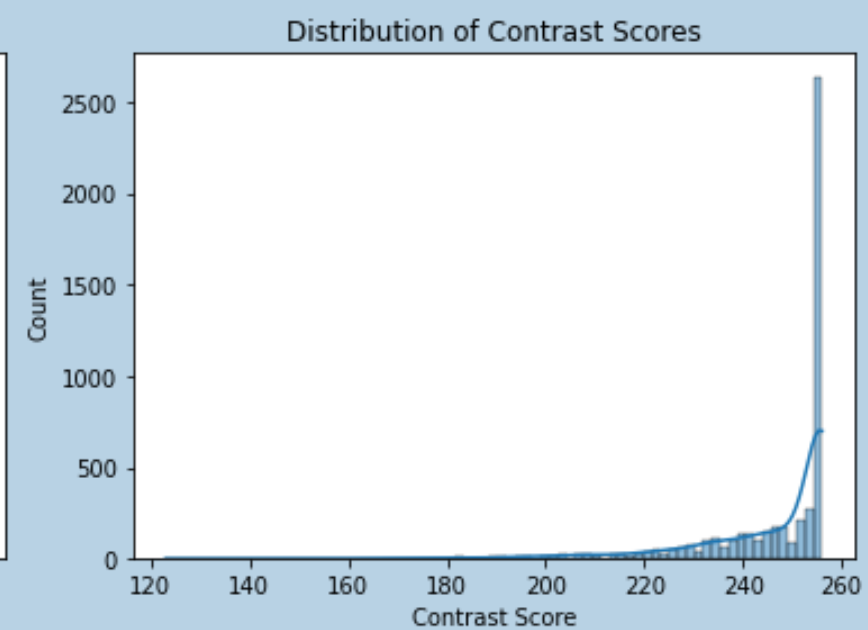
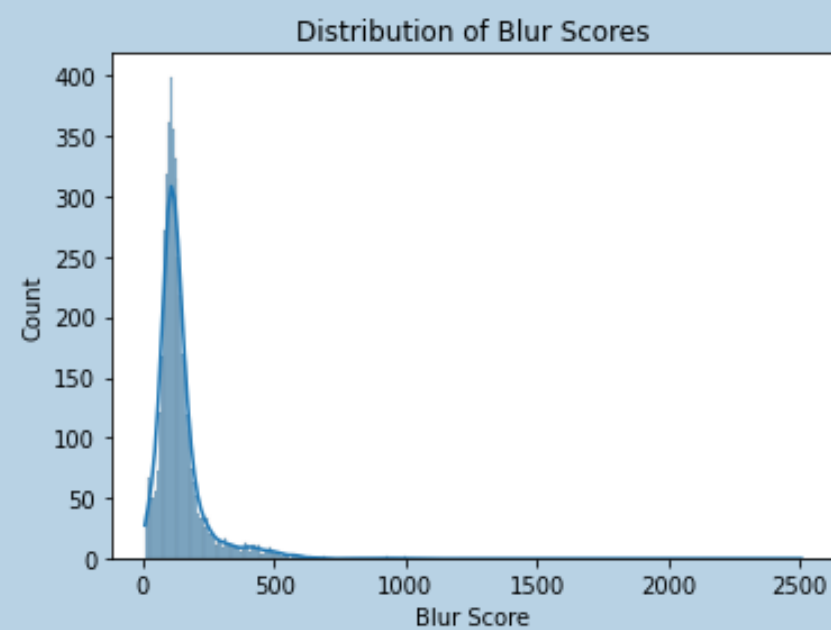


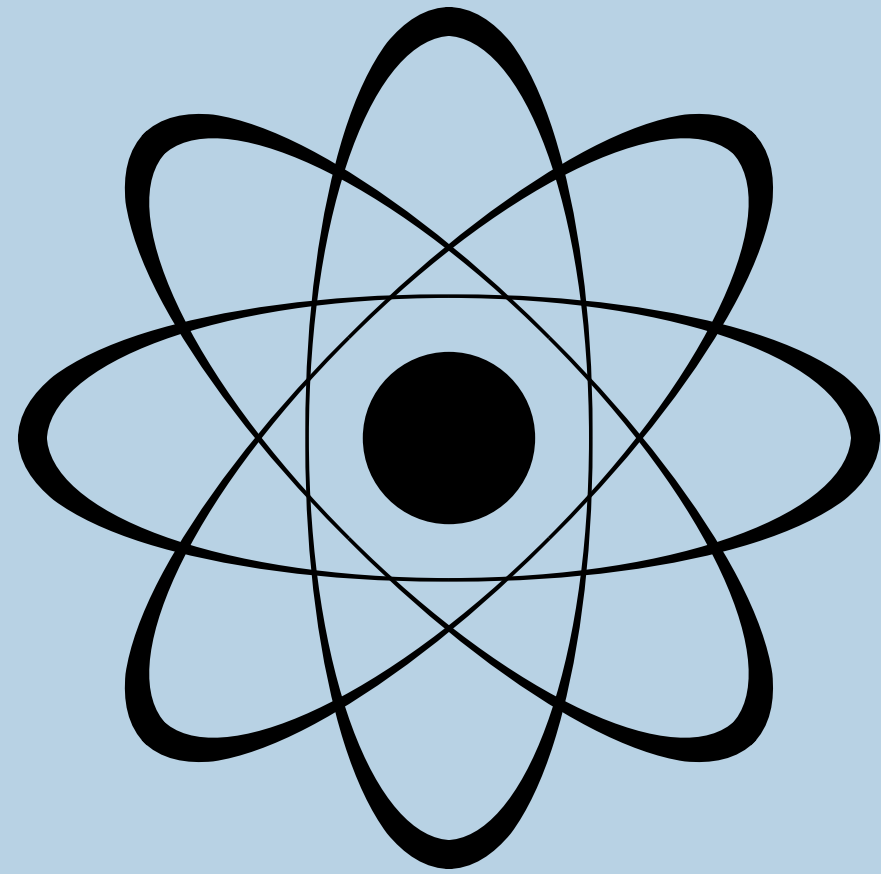
data preparation

# Exploratory Data Analysis



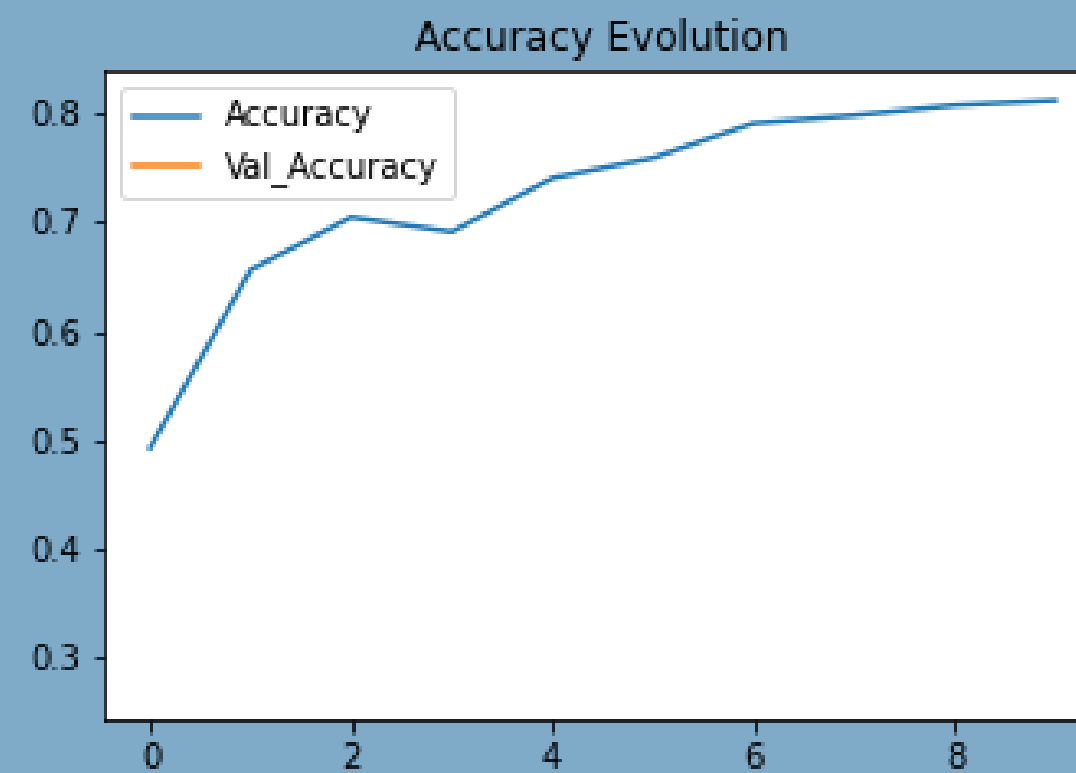
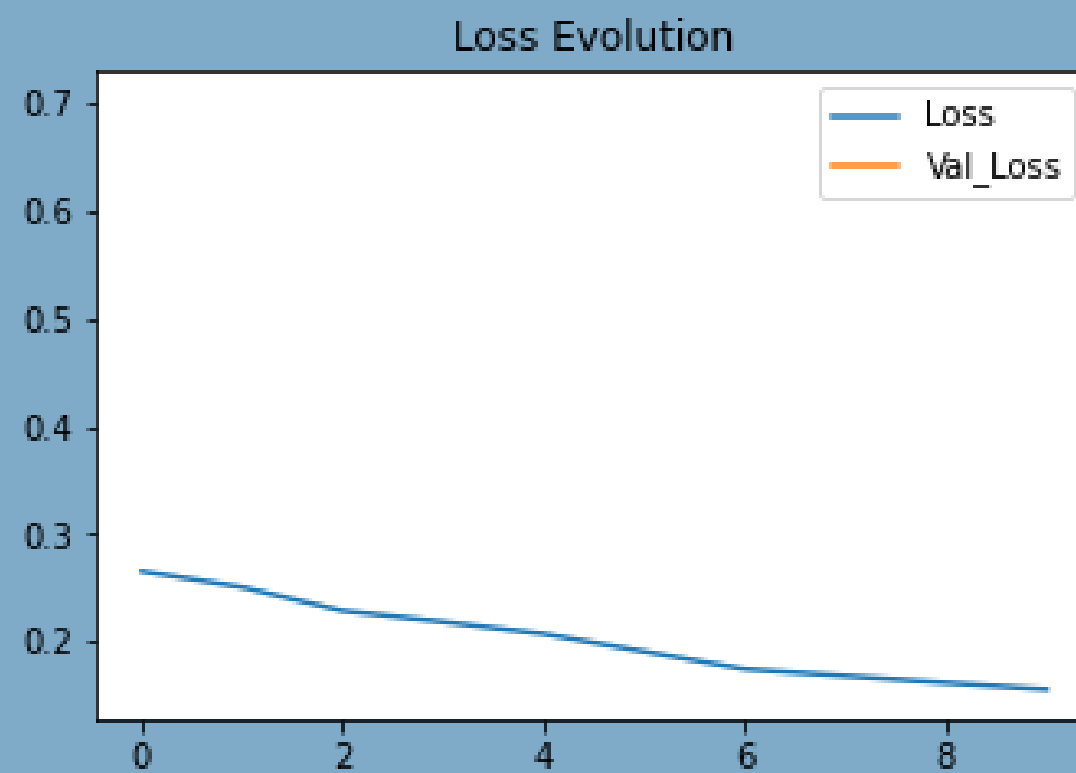






Modelling

# Convolution Neural Network



Total params: 27,841 Trainable params: 27,841 Non-trainable params: 0

Classification Report:

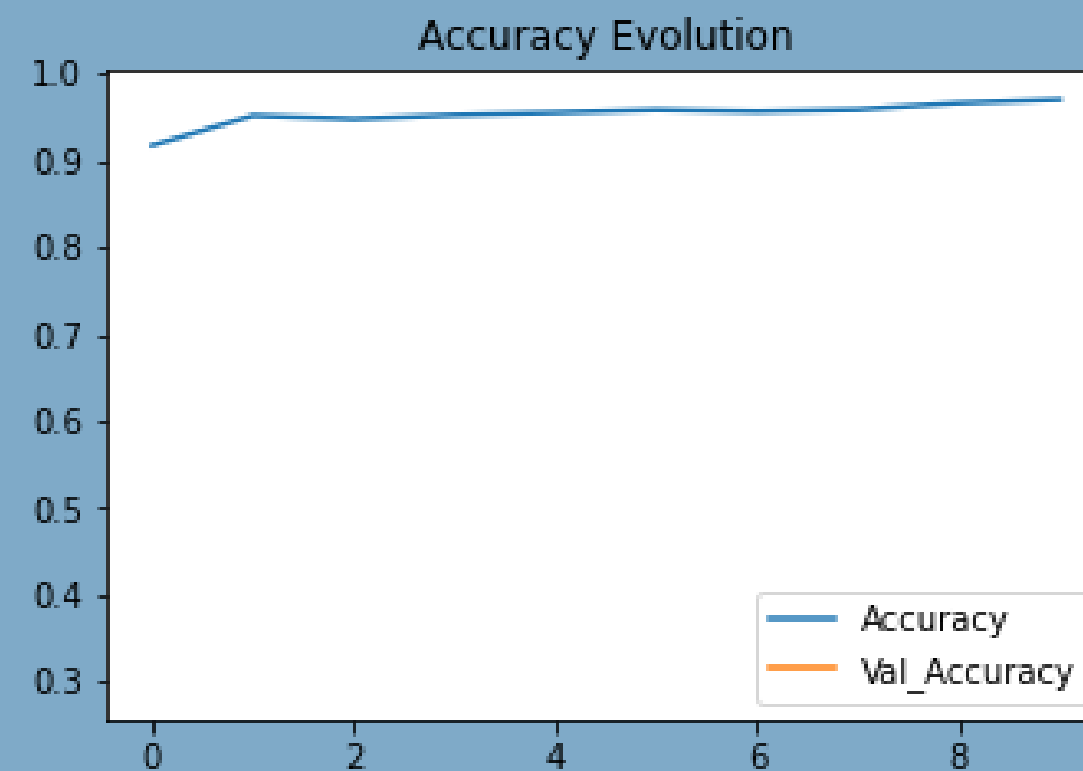
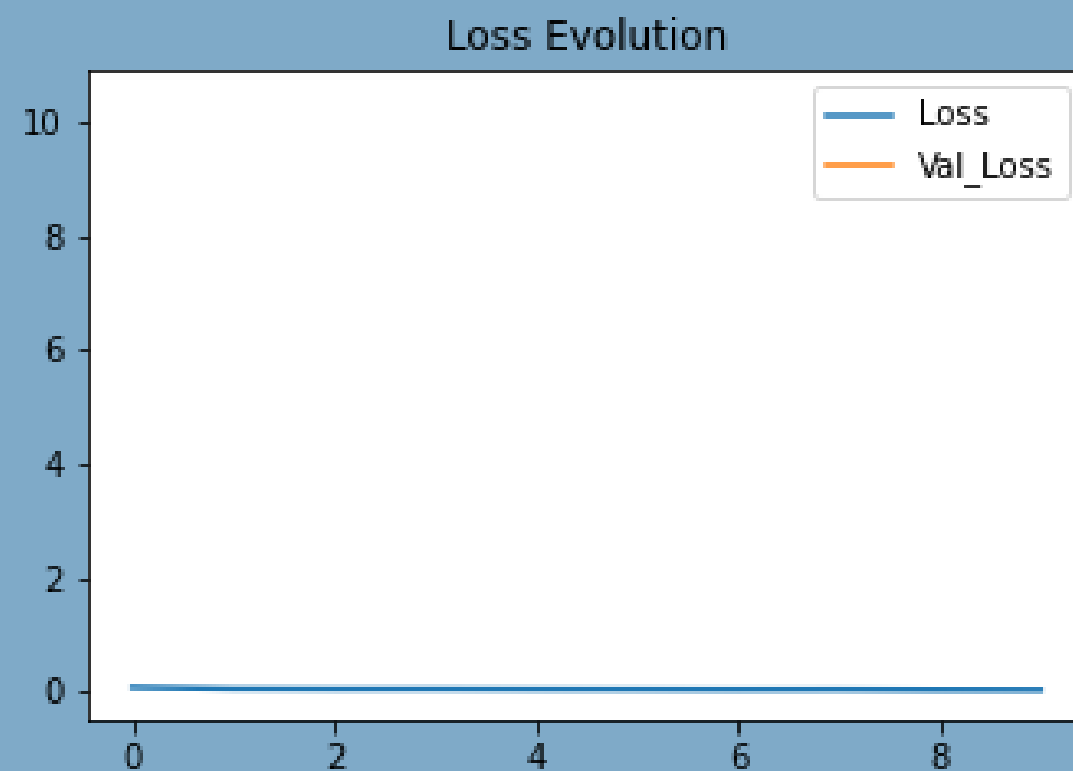
	precision	recall	f1-score	support
0	0.35	0.26	0.30	234
1	0.62	0.71	0.66	390
accuracy			0.54	624
macro avg	0.48	0.49	0.48	624
weighted avg	0.52	0.54	0.53	624

DataFrame Classification Report:

	0	1	accuracy	macro avg	weighted avg
precision	0.353741	0.606061	0.487179	0.479901	0.511441
recall	0.444444	0.512821	0.487179	0.478632	0.487179
f1-score	0.393939	0.555556	0.487179	0.474747	0.494949
support	234.000000	390.000000	0.487179	624.000000	624.000000



# DenseNet Evaluation



Total params: 11,233,602 Trainable params: 11,149,442 Non-trainable params: 84,160

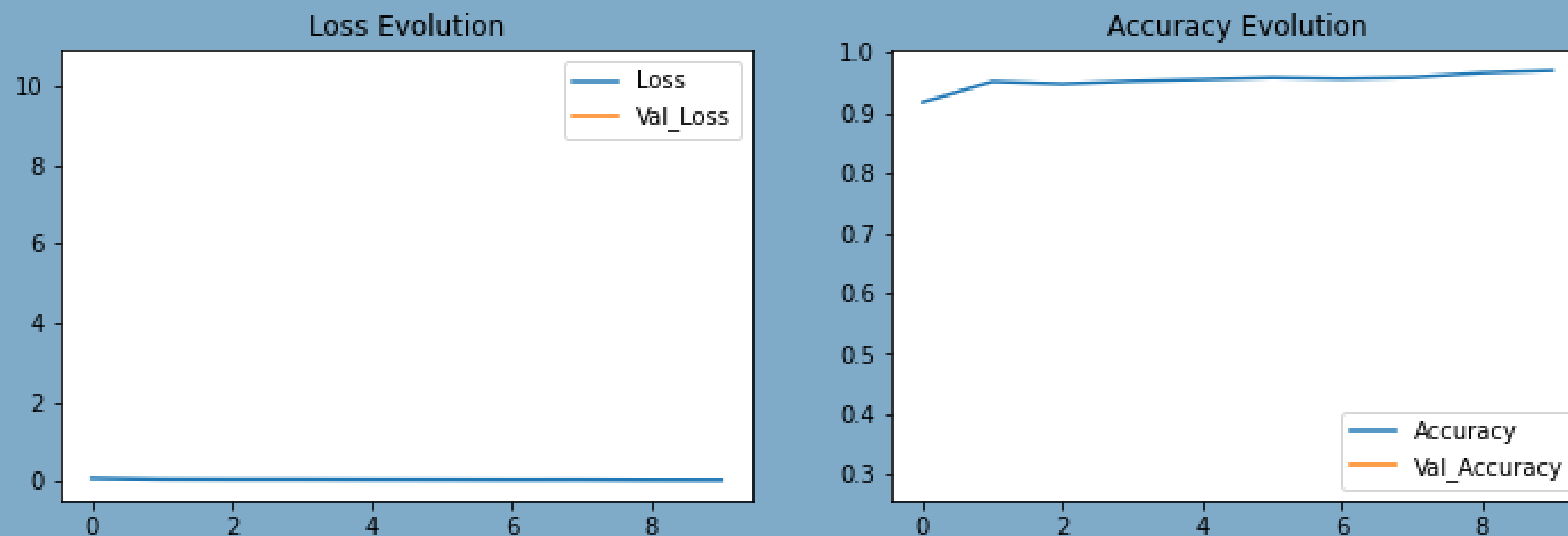
Classification Report:

	precision	recall	f1-score	support
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DataFrame Classification Report:

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recall	0.444444	0.512821	0.487179	0.478632	0.487179
f1-score	0.393939	0.555556	0.487179	0.474747	0.494949
support	234.000000	390.000000	0.487179	624.000000	624.000000

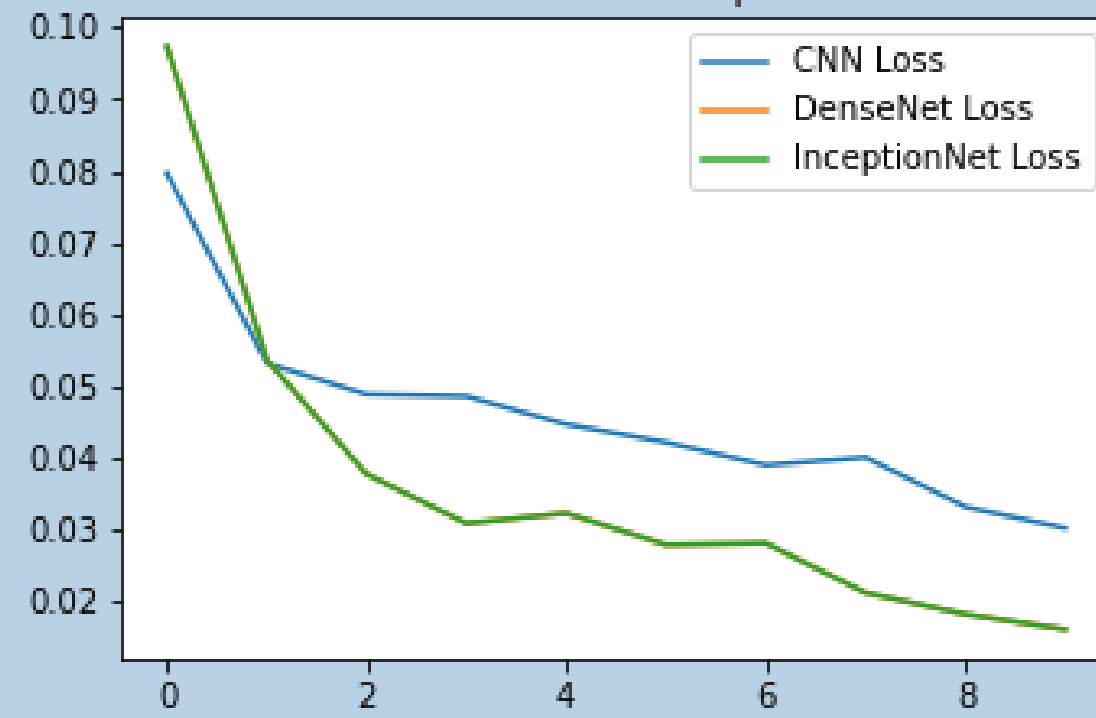
# InceptionNet Evaluation



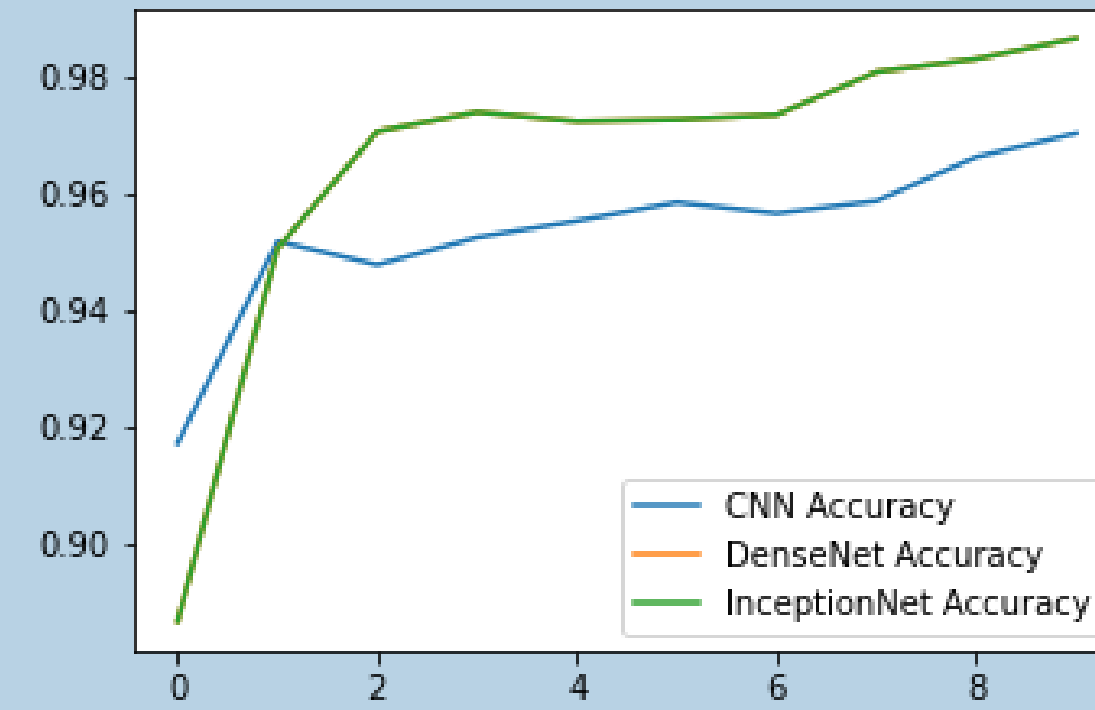
Found 4173 images belonging to 2 classes. Weight for class 0: 0.74 Weight for class 1: 0.26

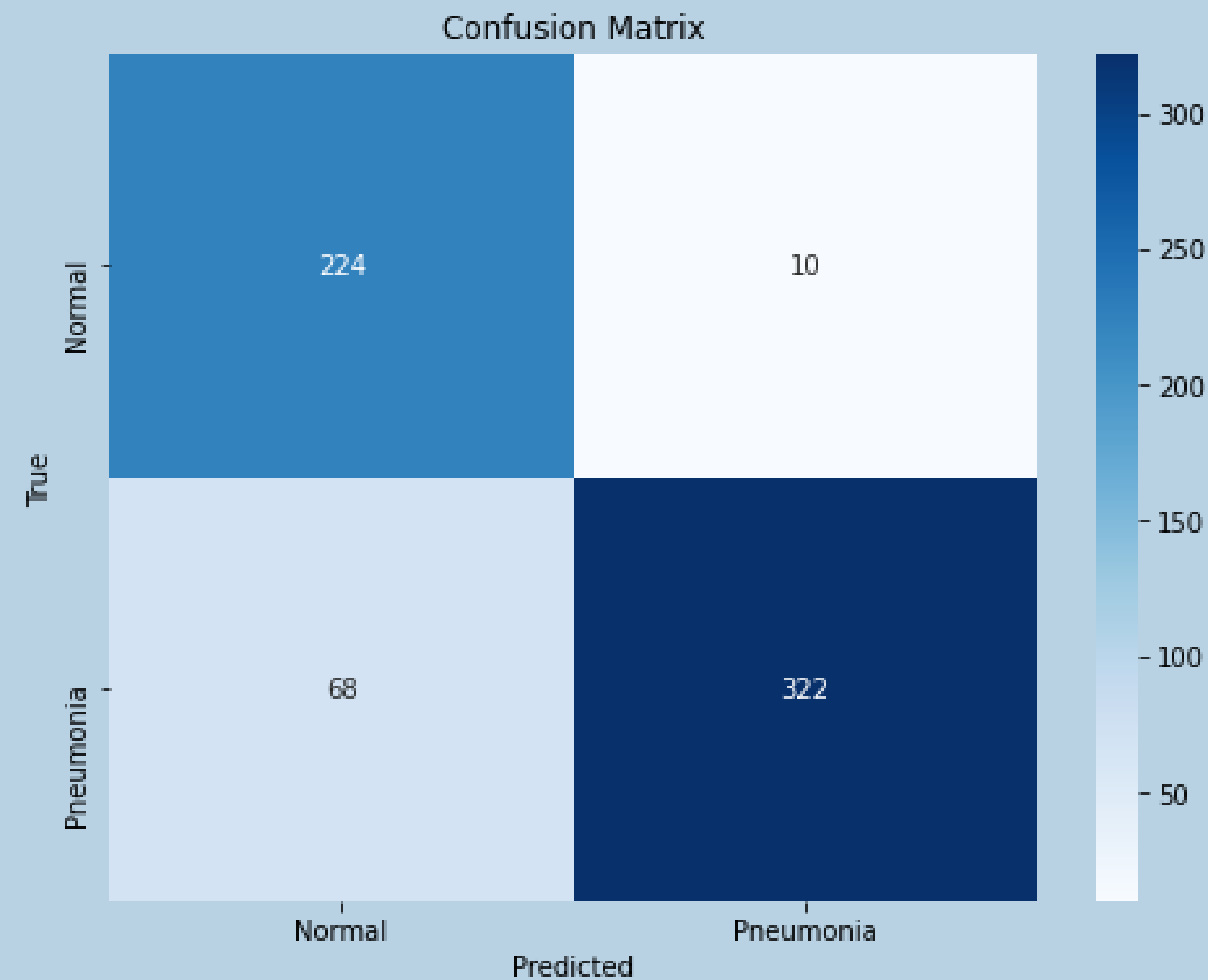
Total params: 22,328,609 Trainable params: 22,293,665 Non-trainable params: 34,944

Loss Evolution Comparison



Accuracy Evolution Comparison





# Findings

The Classification accuracy of the proposed model achieved an average accuracy of 87.5 per cent in unseen chest X-ray images

. The proposed DenseNet Model was found most suitable to detect Pneumonia infection from Chest X-ray images.

# Recommendations

We would advice the hospitals to create a standard when it comes to X-rays images to assist in more accurate predictions

The performance of the proposed Deep CNN model can be improved with more layers and parameters.



Larana, Inc.

# Thank you very much!

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