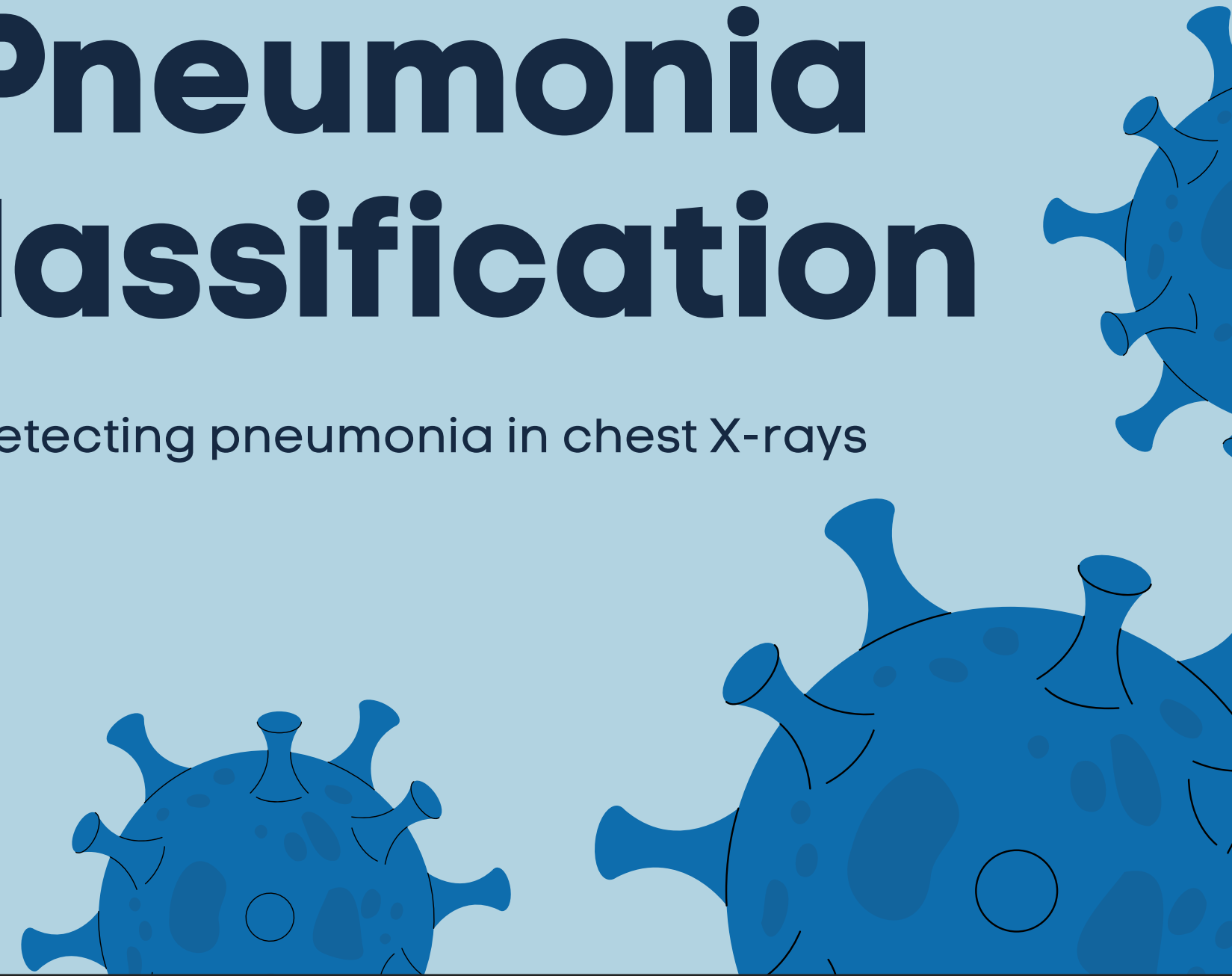
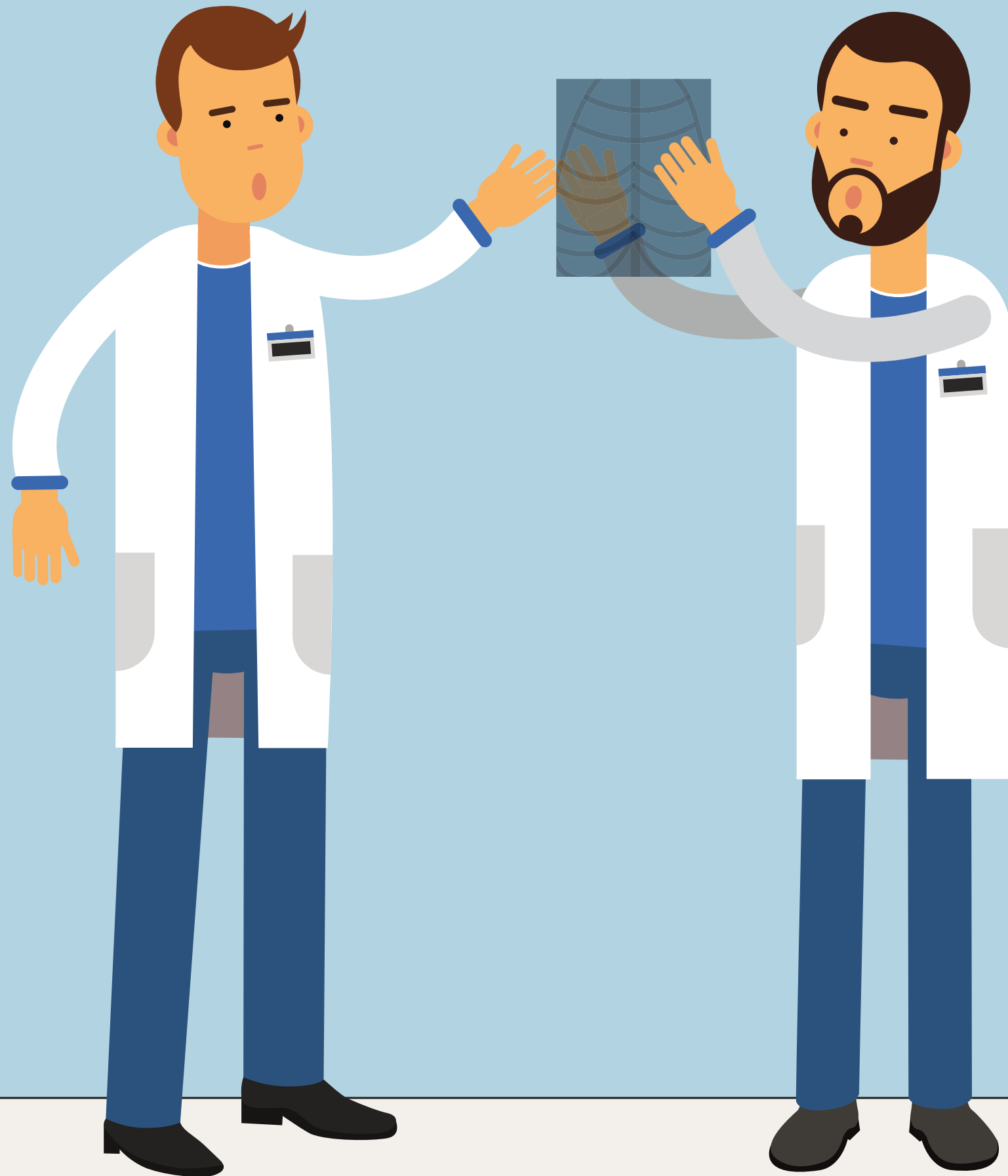


# Pneumonia Classification

Detecting pneumonia in chest X-rays



RECOMMENDERS CONSULTING FIRM

# Outline

Topics for discussion

**01** Business Problem

**02** Data and Methods

**03** Models and Results

**04** Recommendations

**05** Next Steps

**06** Thank you



# Business Problem



According to the World Health Organization and UNICEF, pneumonia kills more children than any other infectious disease, disproportionately affecting low-income countries. In 2019, pneumonia killed over 740,000 children under the age of 5 or roughly about 1,900 children a day. This accounts for 14% of all deaths of children under five years old with almost all these deaths being preventable.

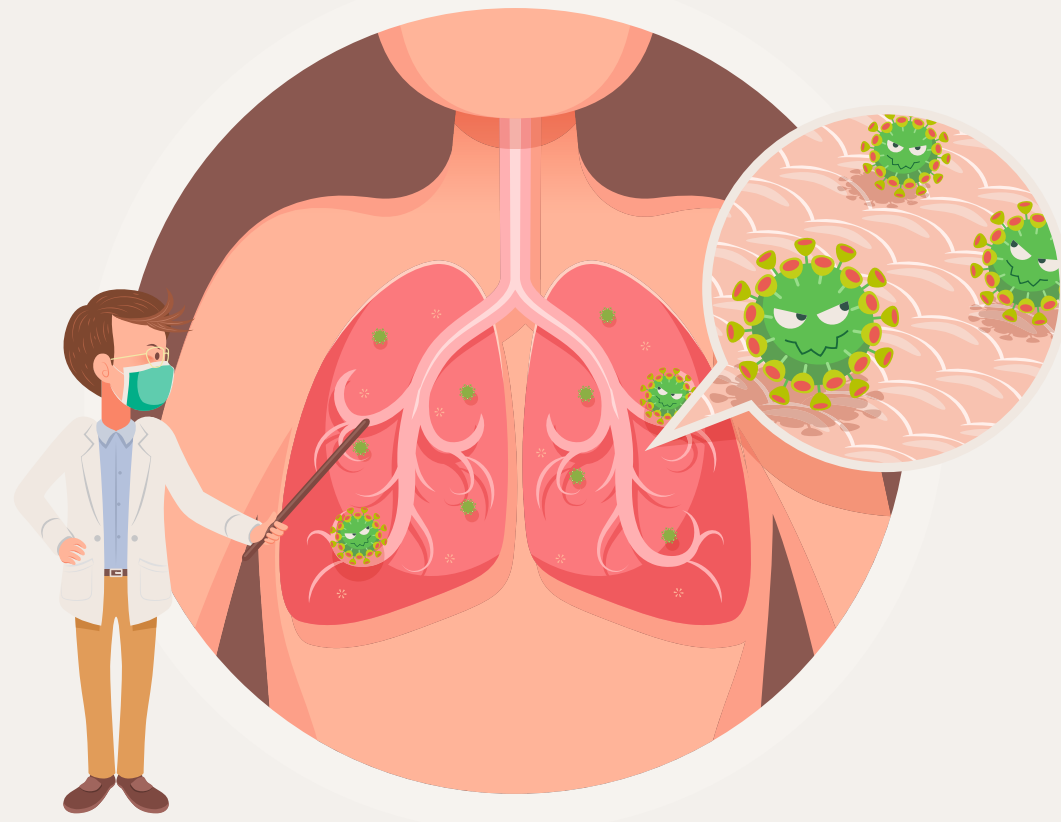
UNICEF and the WHO have made a joint effort in tackling this issue. The increasing unmet demand for trained health experts to meet population medical needs has lead them to explore technology that could help reduce the burden on the already stressed medical system. They look into your group for data science and deep learning recommendations for this problem.



# Pneumonia

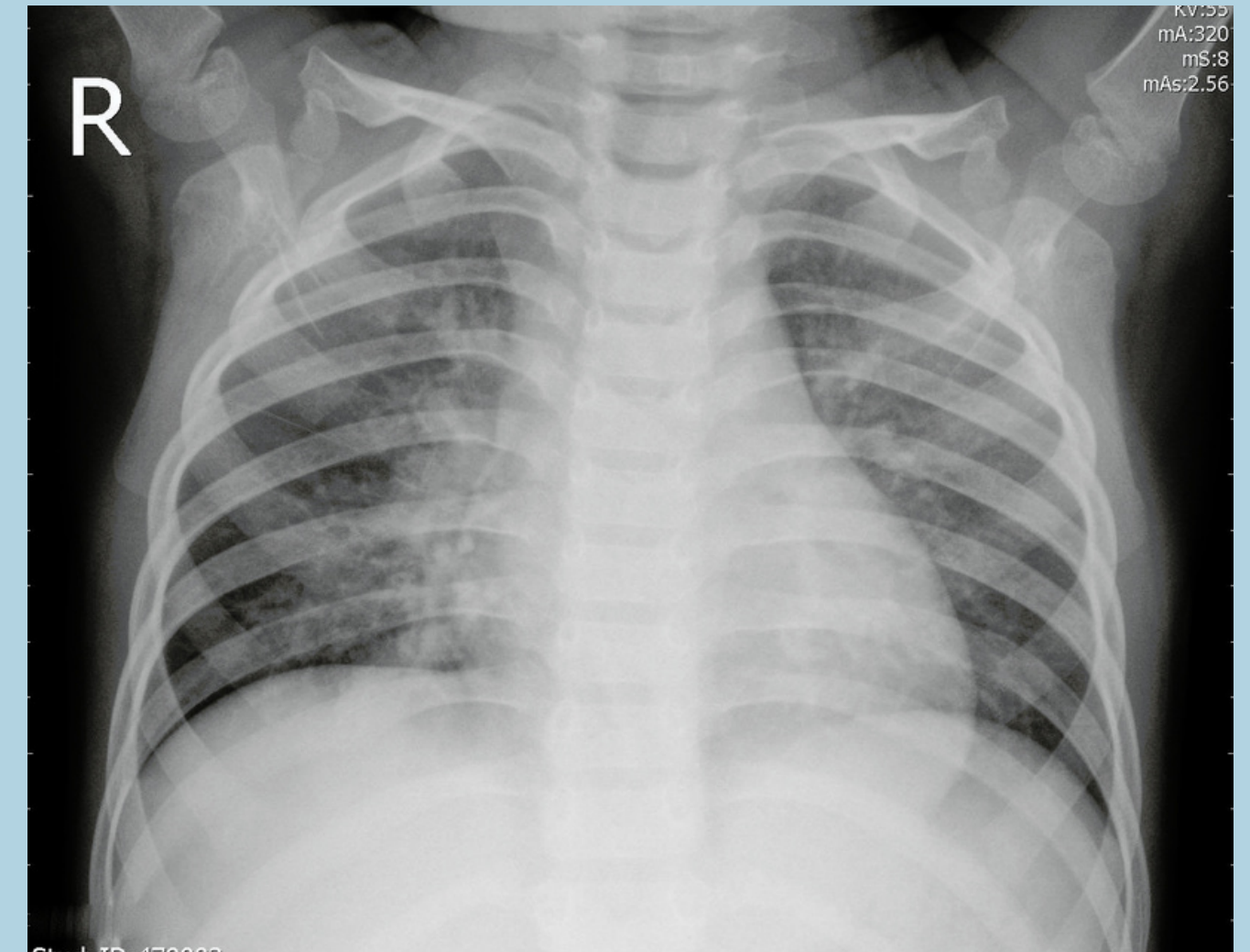
'ICD 10-M Diagnosis Code J15. 9

" Pneumonia is a form of acute respiratory infection that affects the lungs. The lungs are made up of small sacs called alveoli, which fill with air when a healthy person breathes. When an individual has pneumonia, the alveoli are filled with pus and fluid, which makes breathing painful and limits oxygen intake. " - WHO



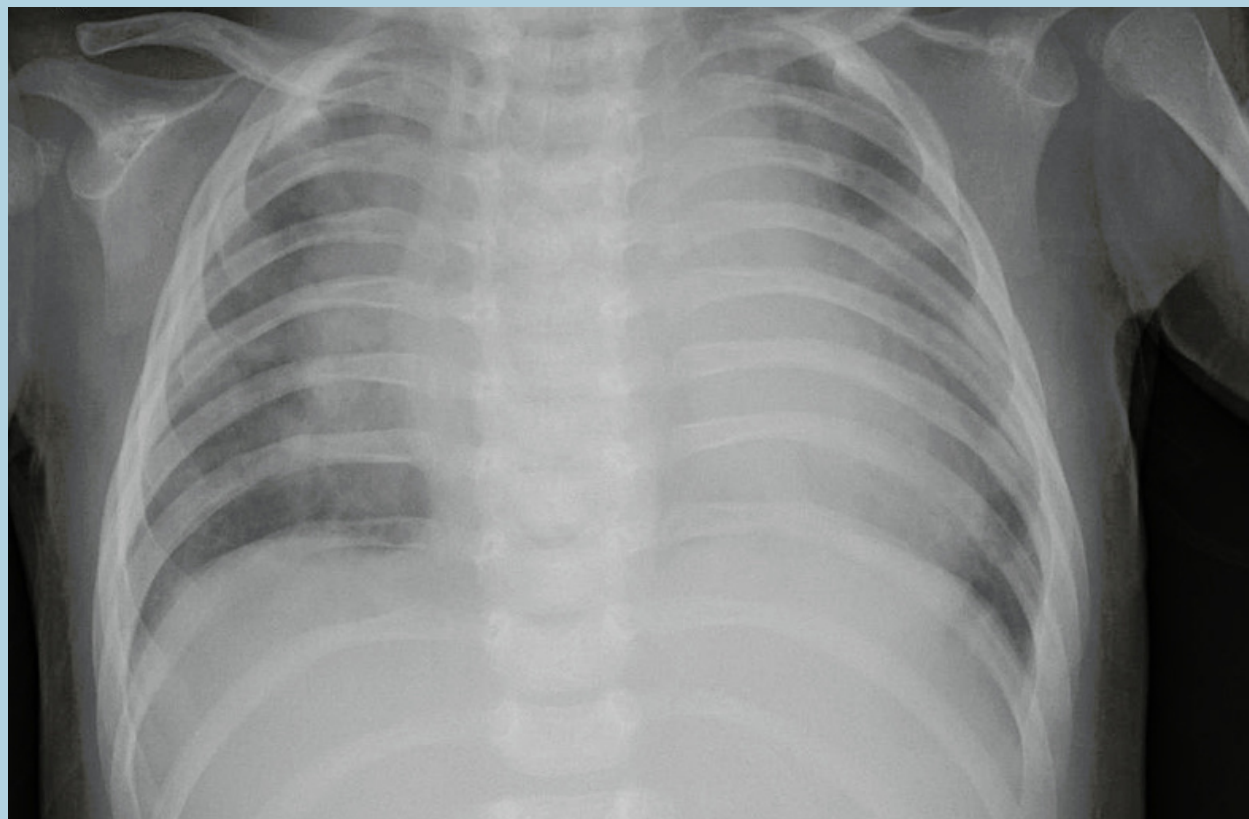
Diagnosed by

- Symptoms
- Physical exam
- Chest X-Ray
- Blood-Test

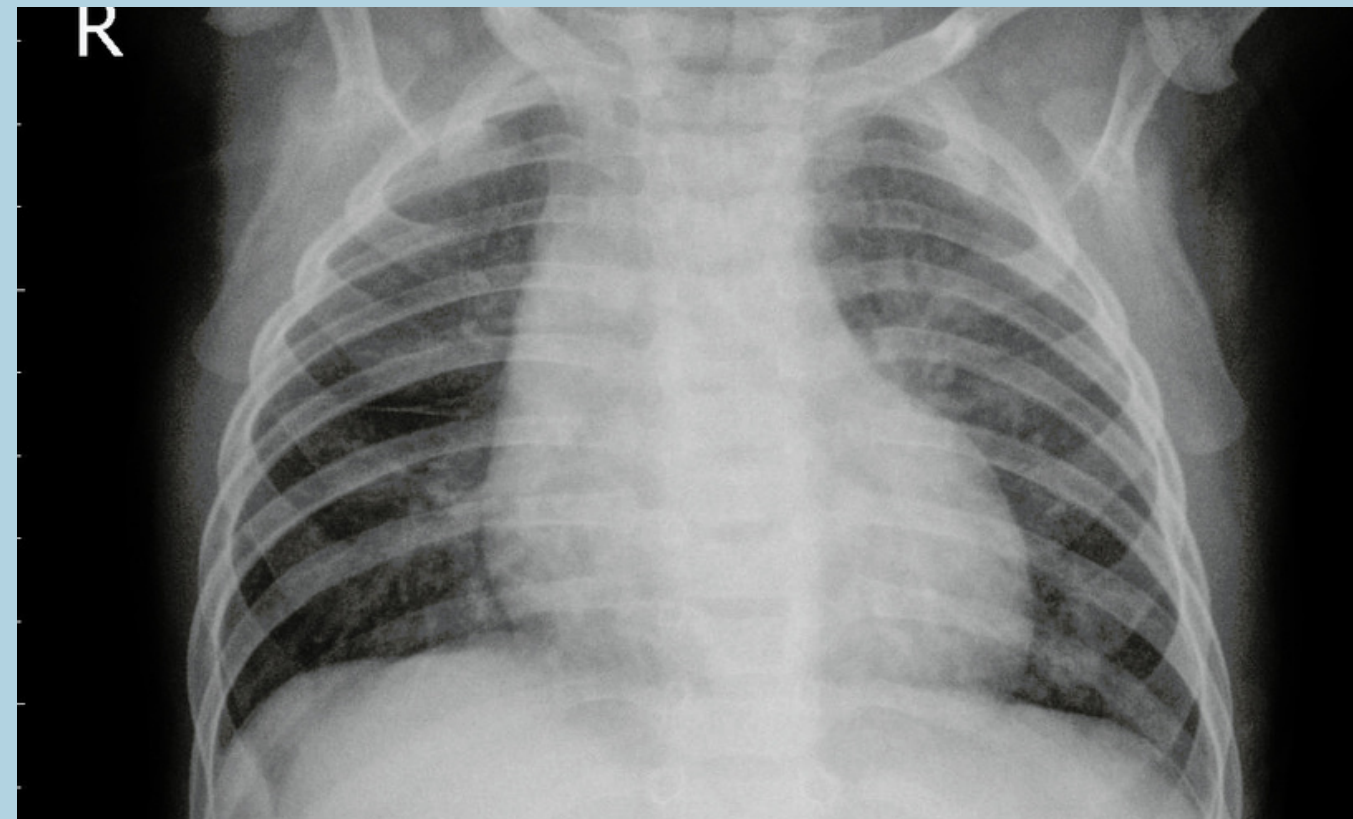




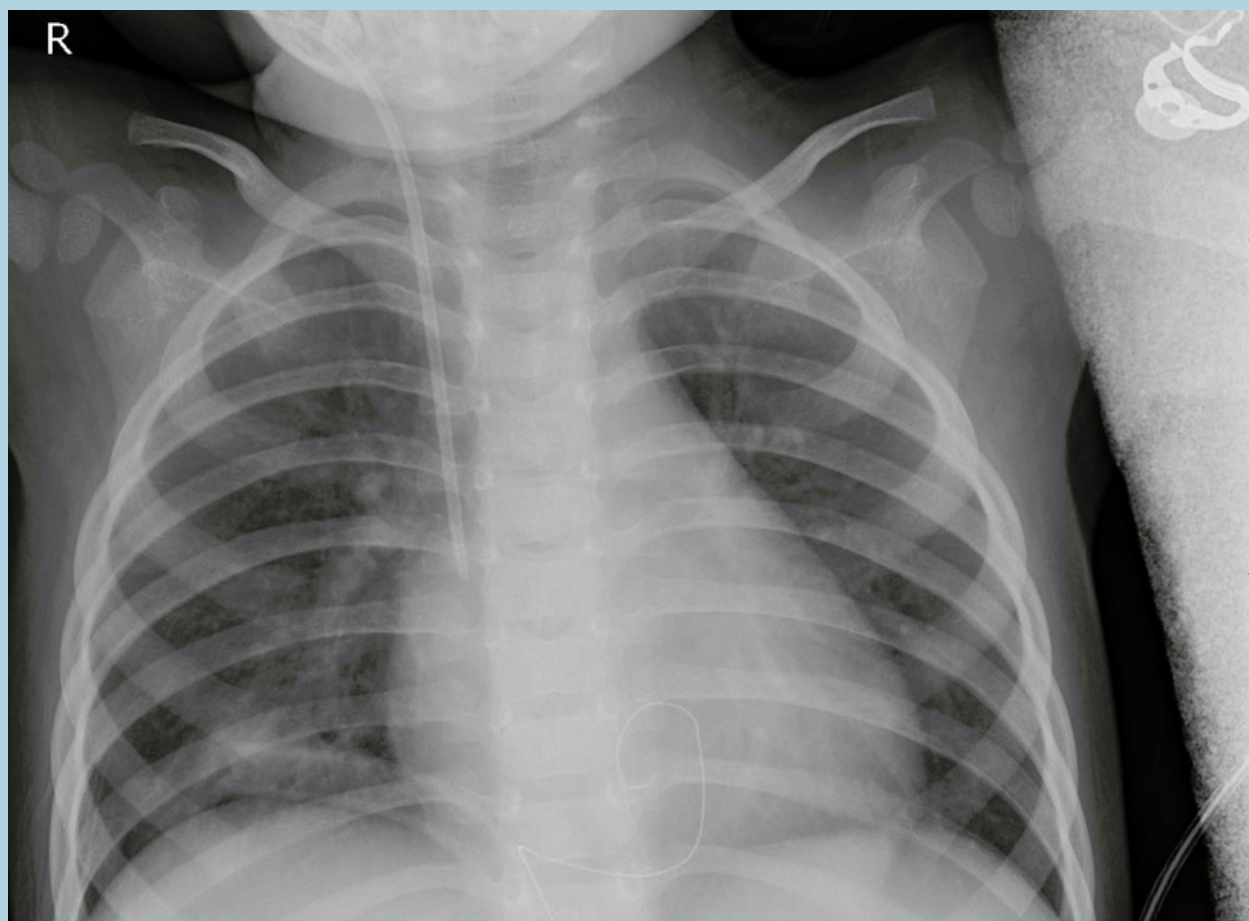
**A**



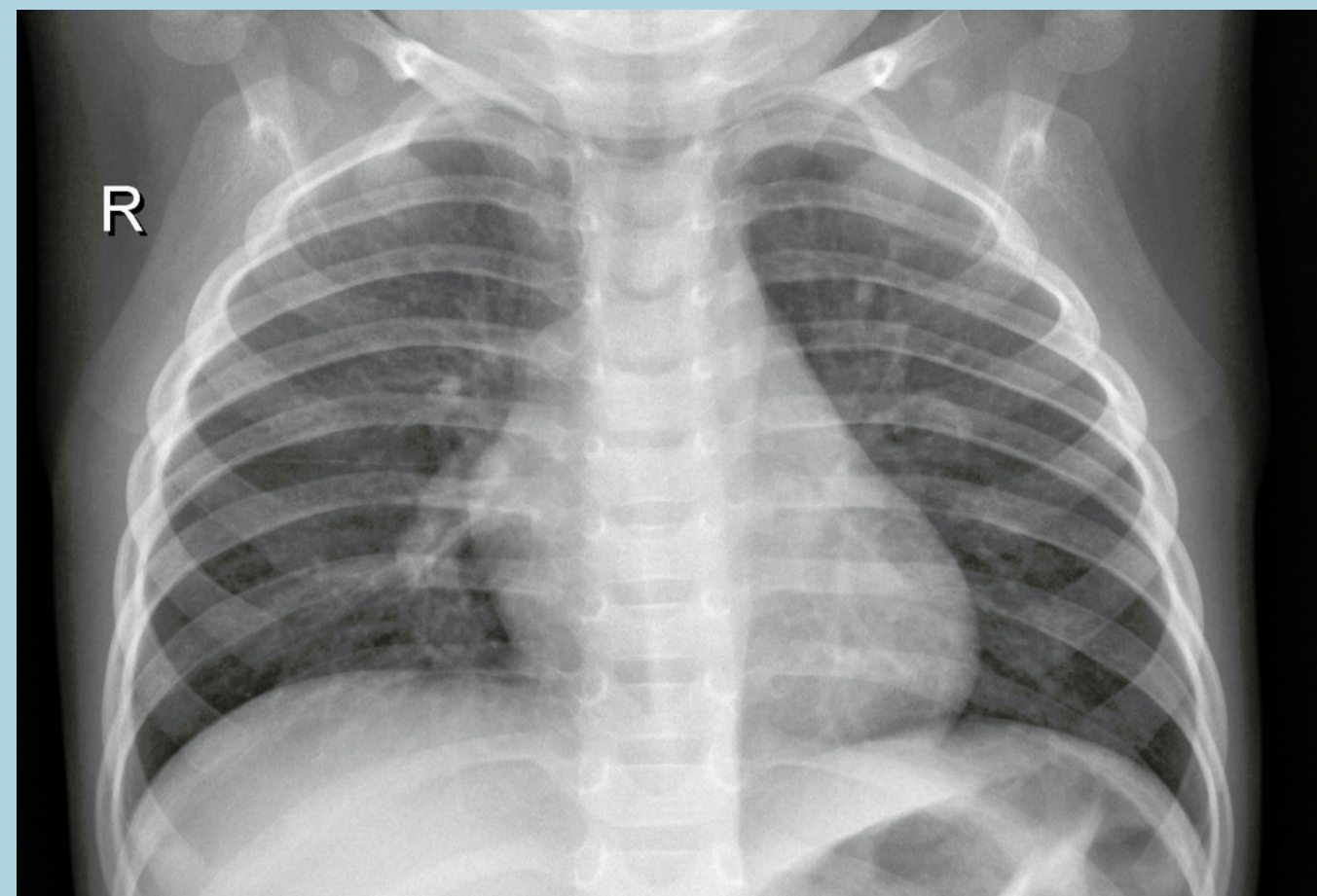
**B**



**C**

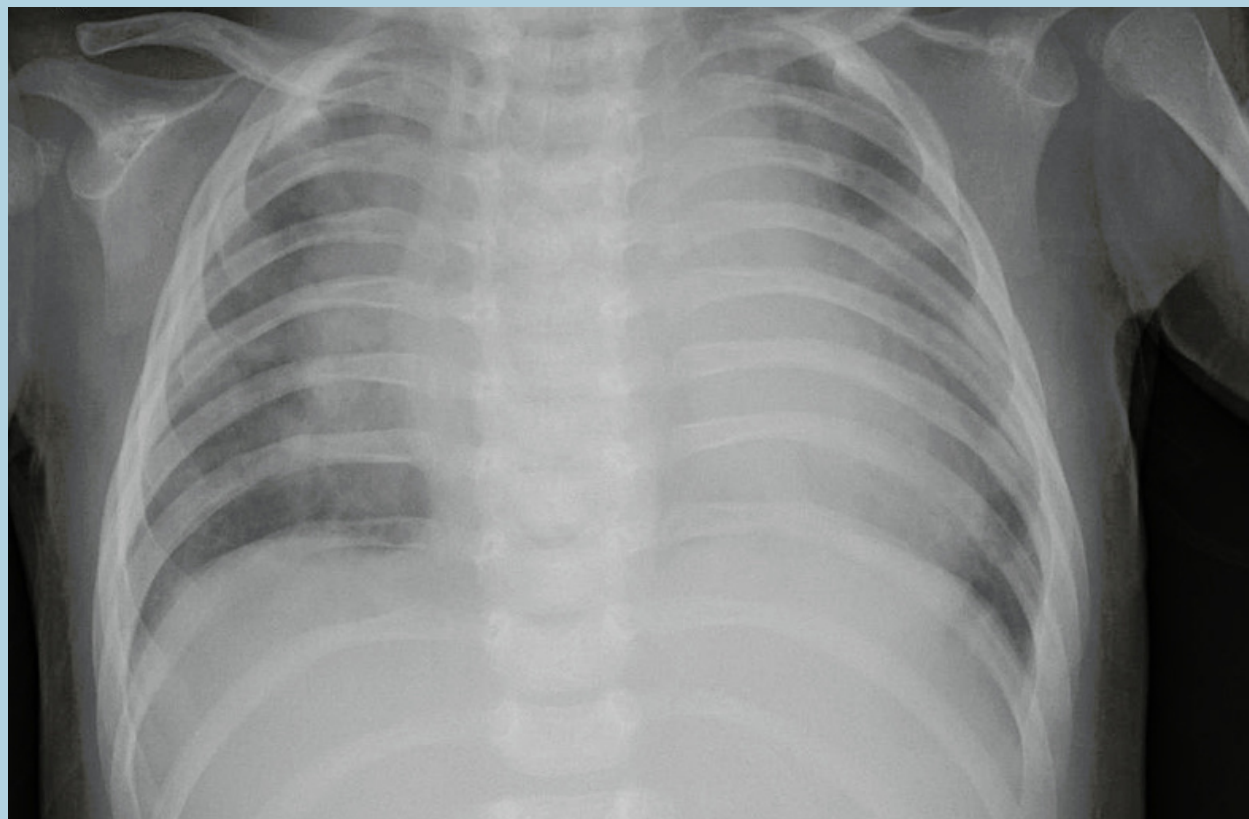


**D**

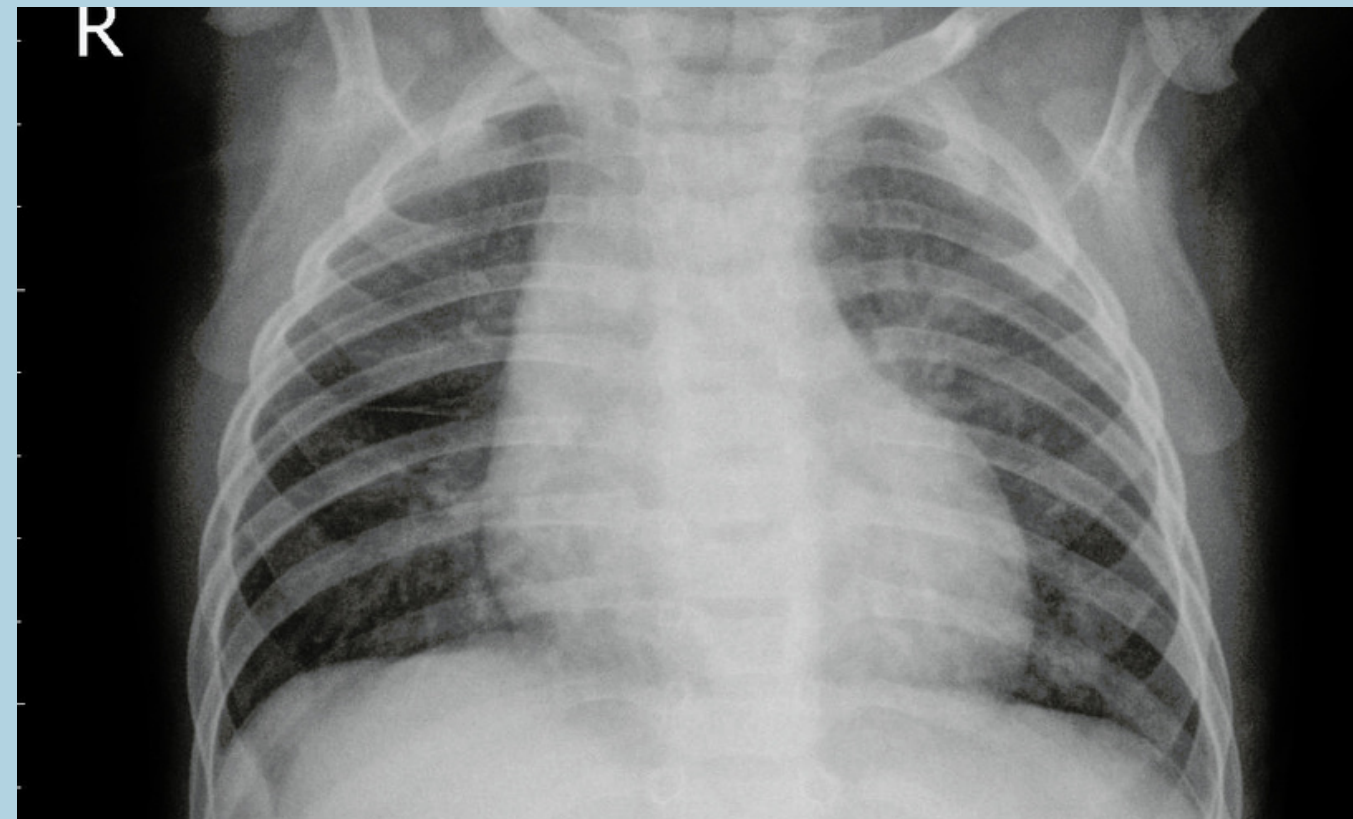




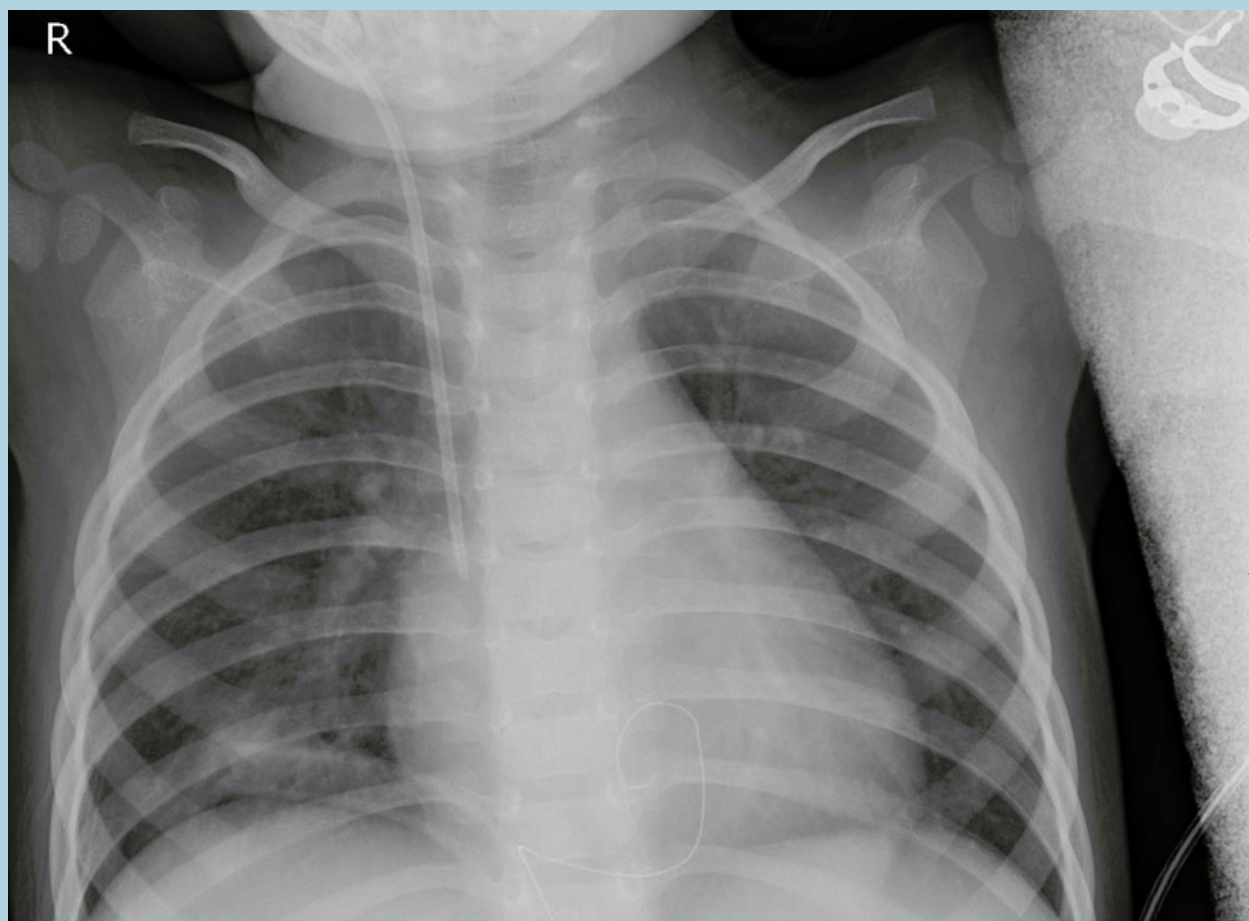
**A**



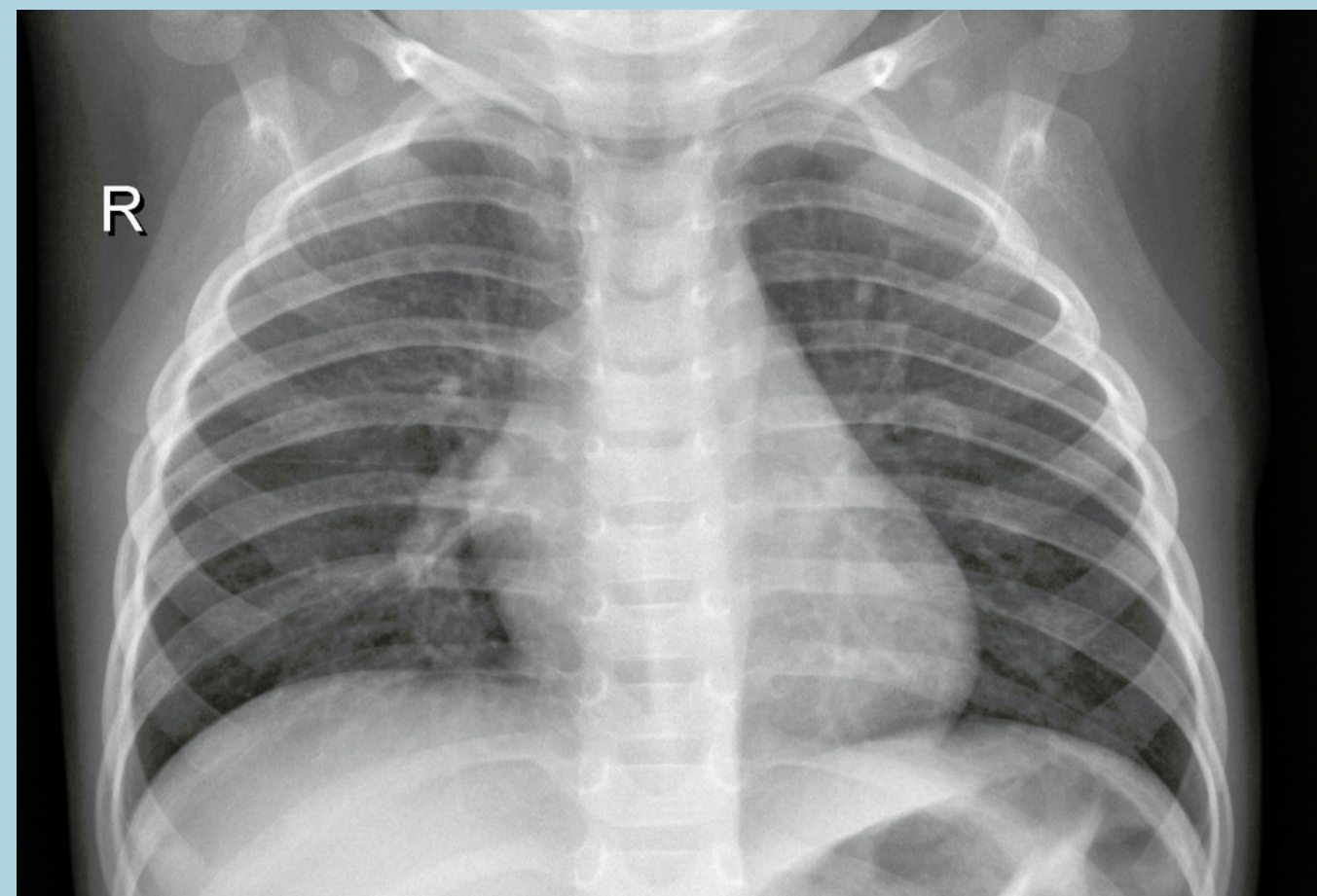
**B**



**C**



**D**



## DATA AND METHODS

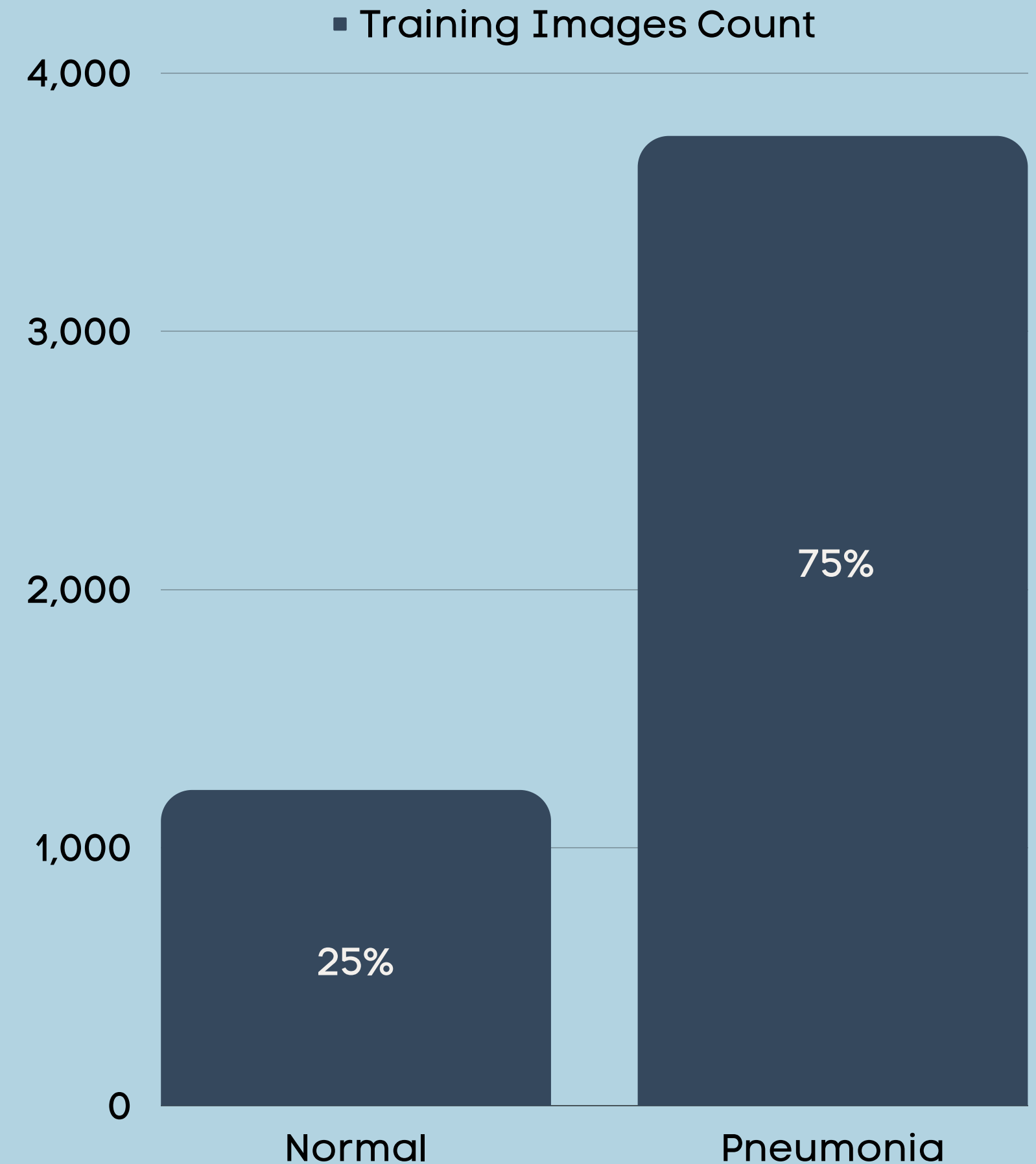
**5856**

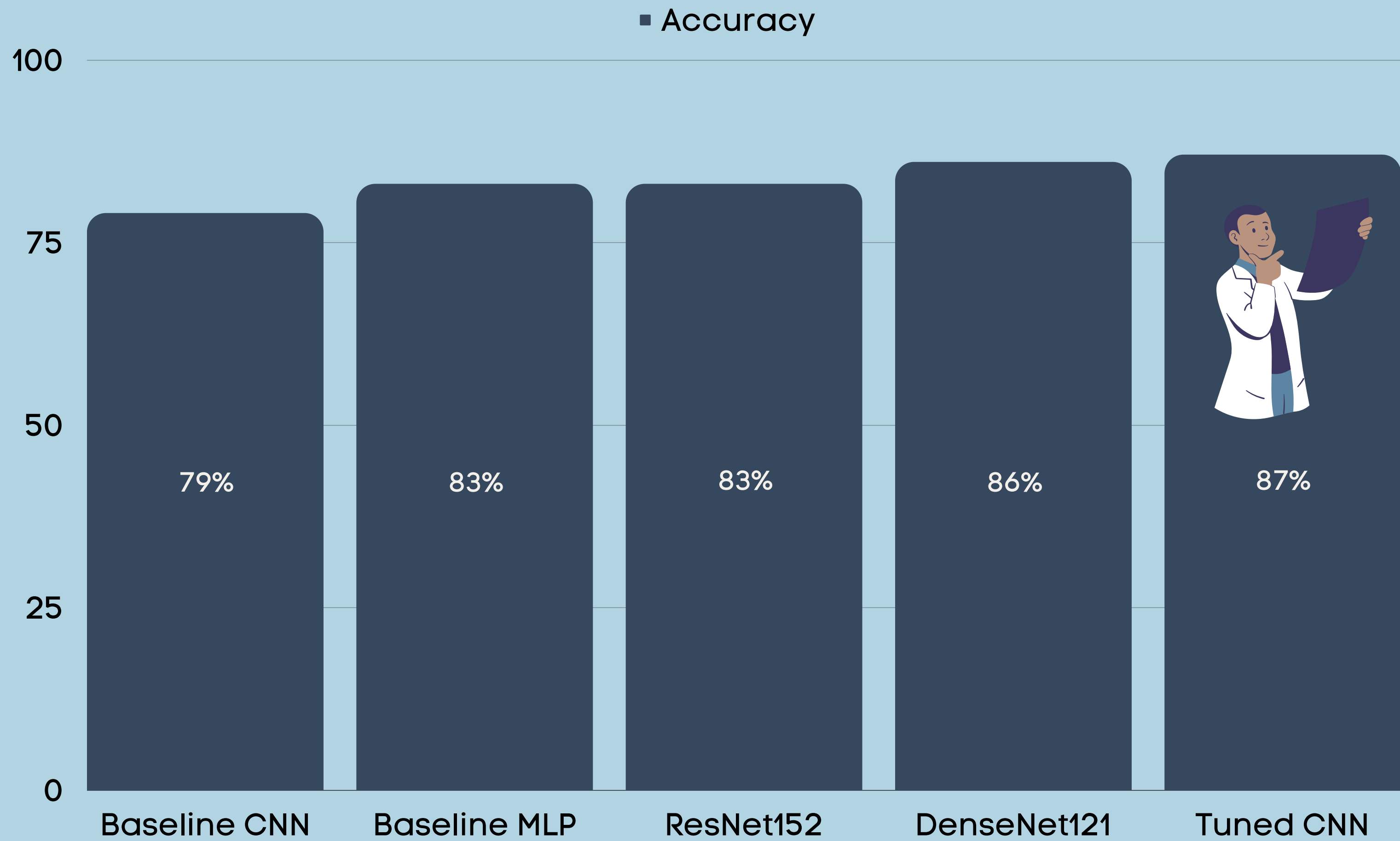
**Total X-ray Images**

Dataset contains over 5800 pediatric lung x-rays  
(source: Guangzhou Women and Children's  
Medical Center)

4976 Training Images:  
75% with pneumonia, 25% normal

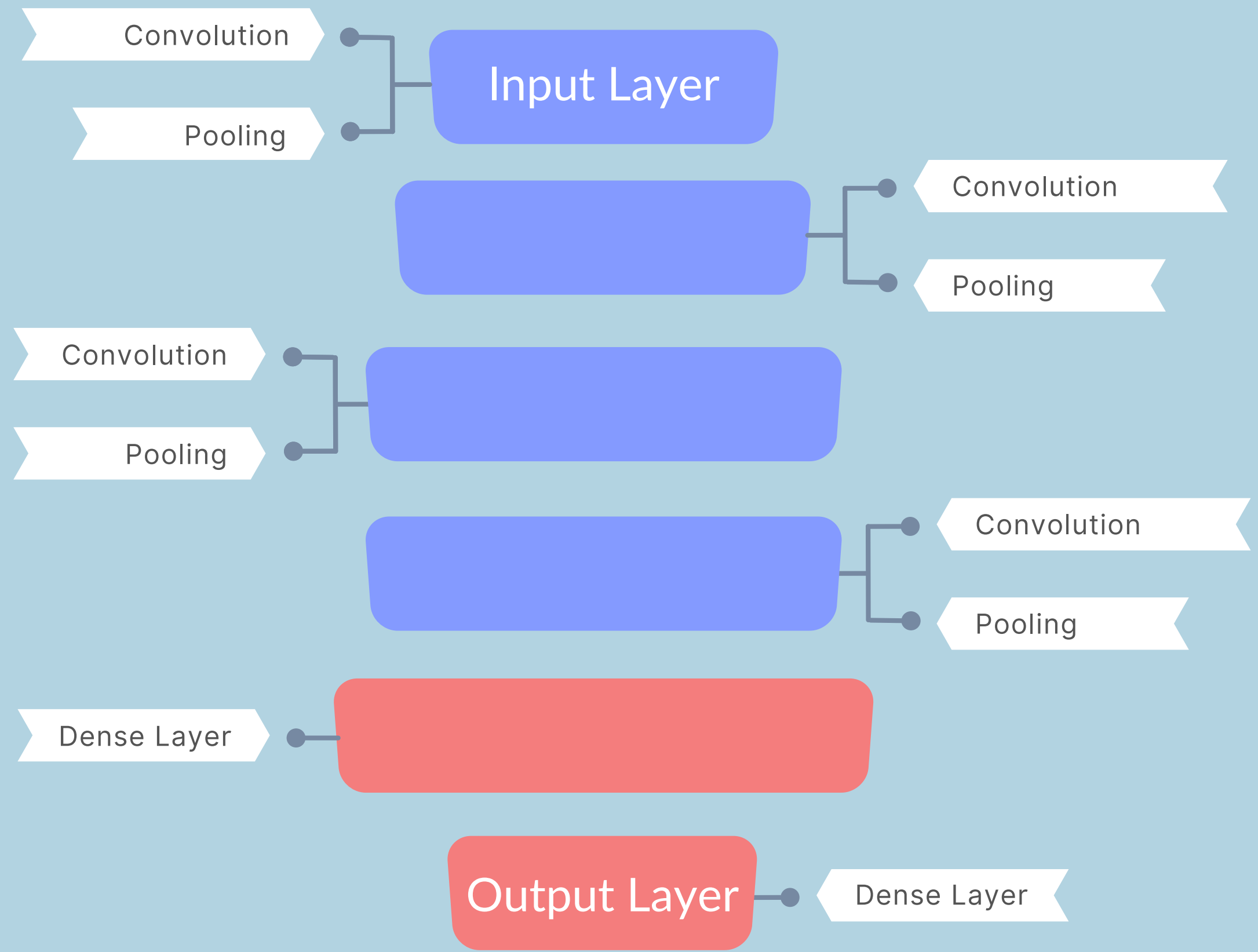
We trained convolutional neural networks for this  
binary image classification problem.



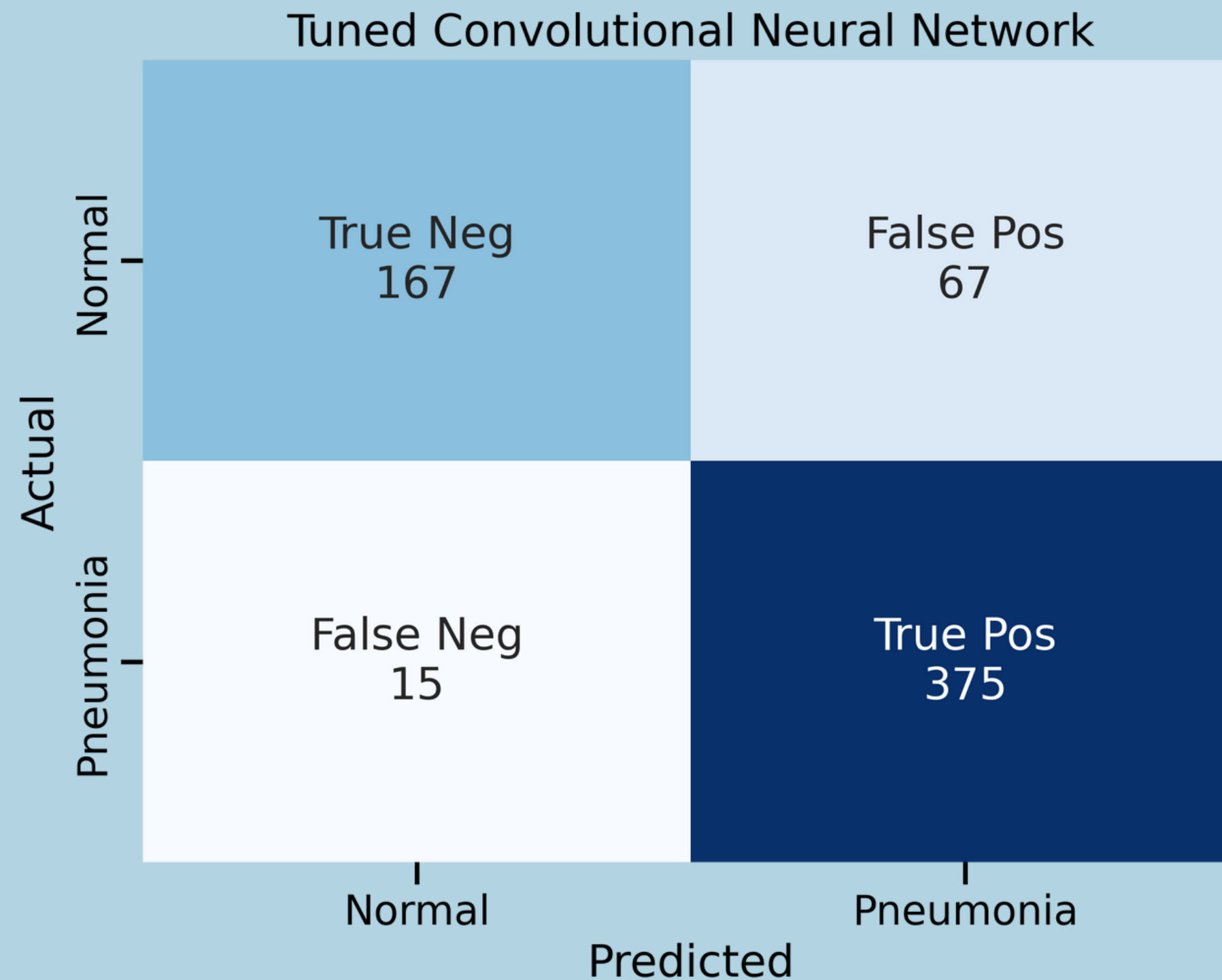




# Best Model Architecture



# Best Model's Scores



Recall: 96%

Precision: 85%

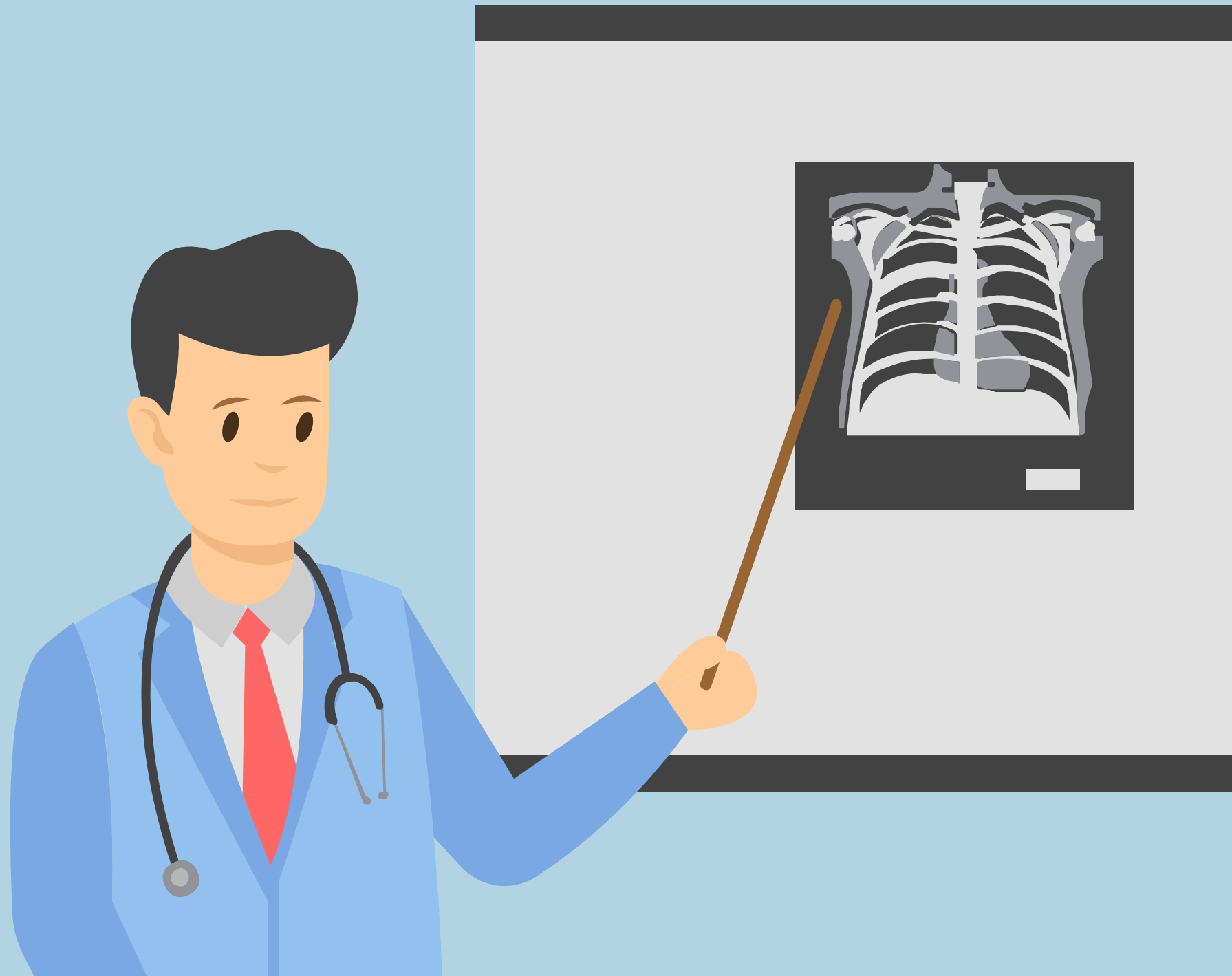
Accuracy: 87%

F1 score: 90%

AUROC: 91%

90th percentile of  
Human Radiologists  
Recall: 96%

# Recommendations



## Access

In areas where specialized professionals are not readily available, use our model for pneumonia diagnosis.

## Assistance

Our model can assist current trained experts to validate and speed up image readings.

## Antimicrobial Resistance

Giving out antibiotics to patients that don't need it can be harmful. Our model reduces the rate of false positives.



# Next Steps

## Expand The Dataset

Expand to include adult chest x-rays. Also get data from different regions, and perhaps x-rays using different equipment

## Fine Tune Model

Fine tune disease classification to be able to distinguish between viral vs bacteria pneumonia

## Classify Other Diseases

Train the model to classify other diseases such as Covid

# Thank you!

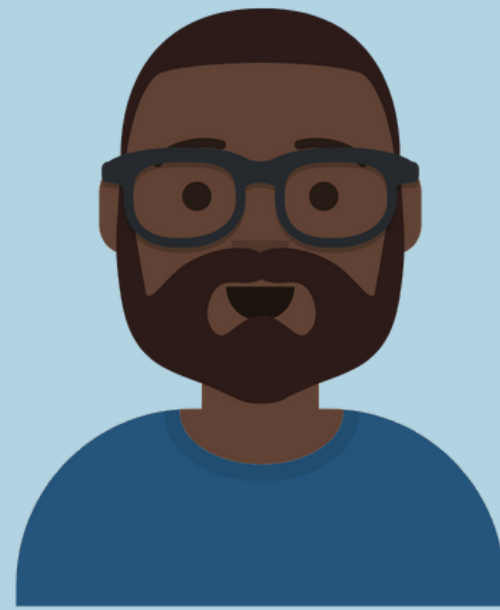
## Any questions?



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