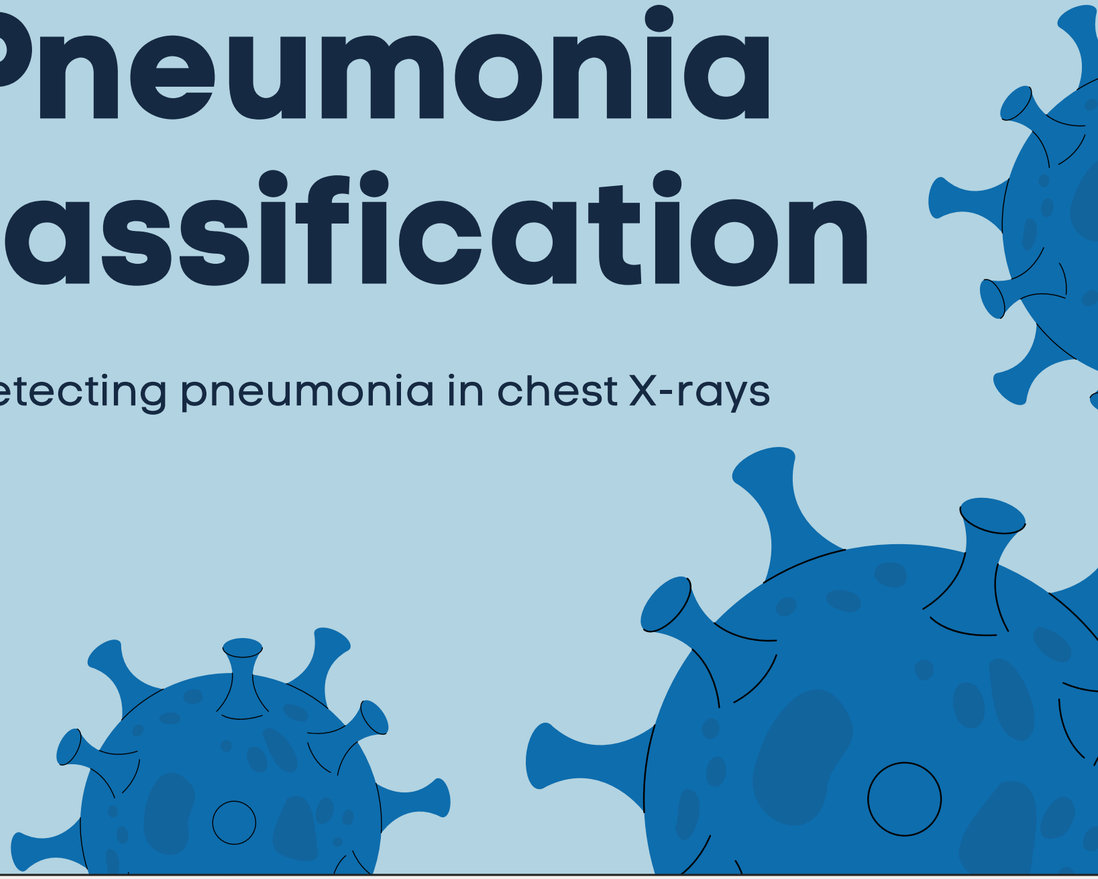
Pneumonia Classification

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

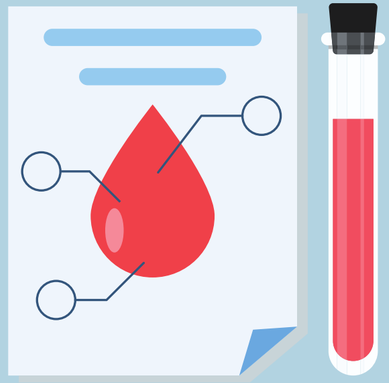
RECOMMENDERS CONSULTING FIRM

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.

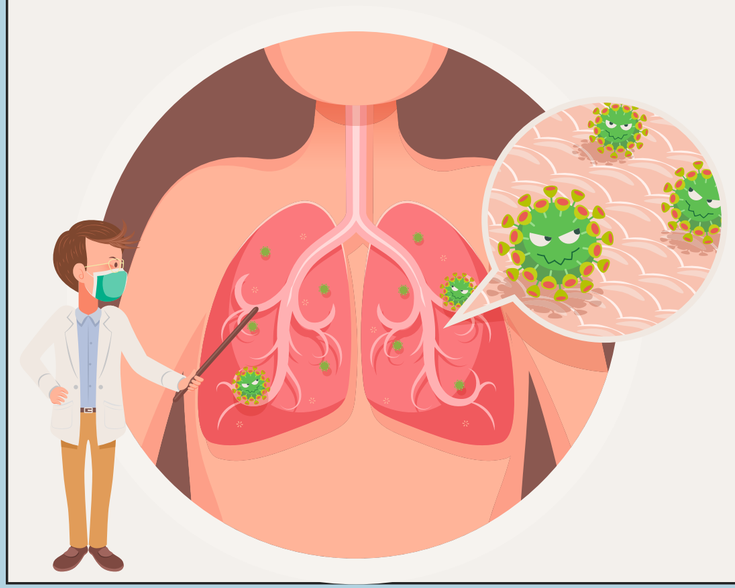
UNICEF and the WHO have made a joint effort in tackling this issue. The increasing unmet demand for trained health experts to meet population medical needs has lead them to explore technology that could help reduce the burden on the already stressed medical system. They look into your group for data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

Pneumonia



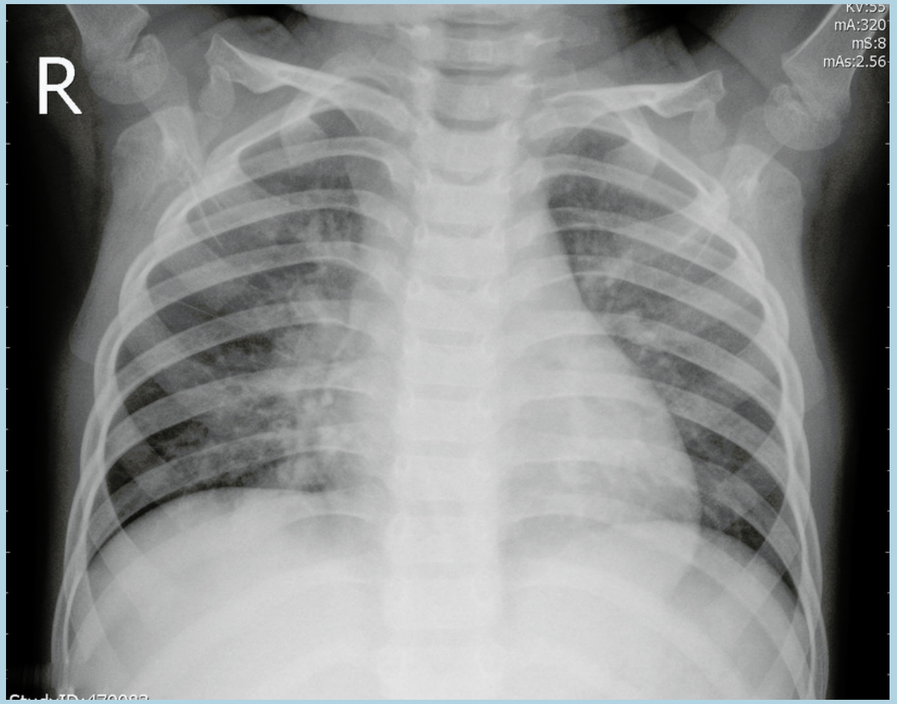
'ICD 10-M Diagnosis Code J15. 9

" 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

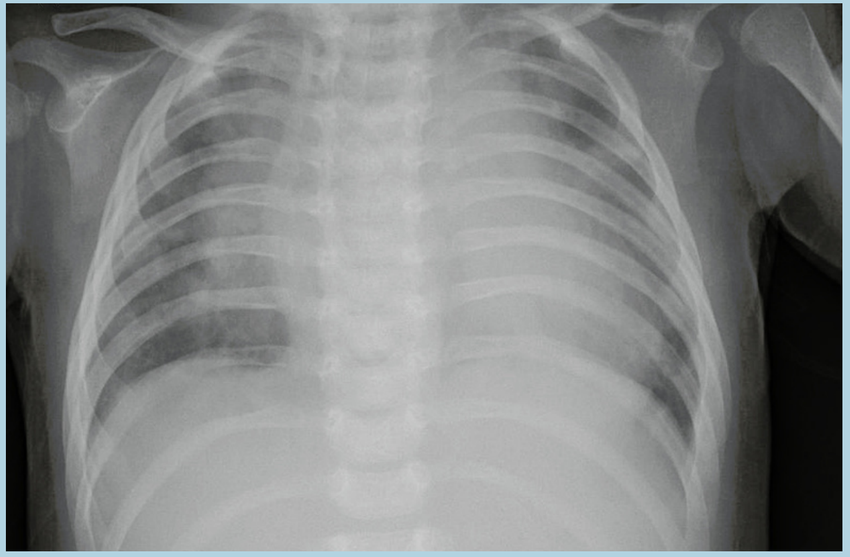


Diagnosed by

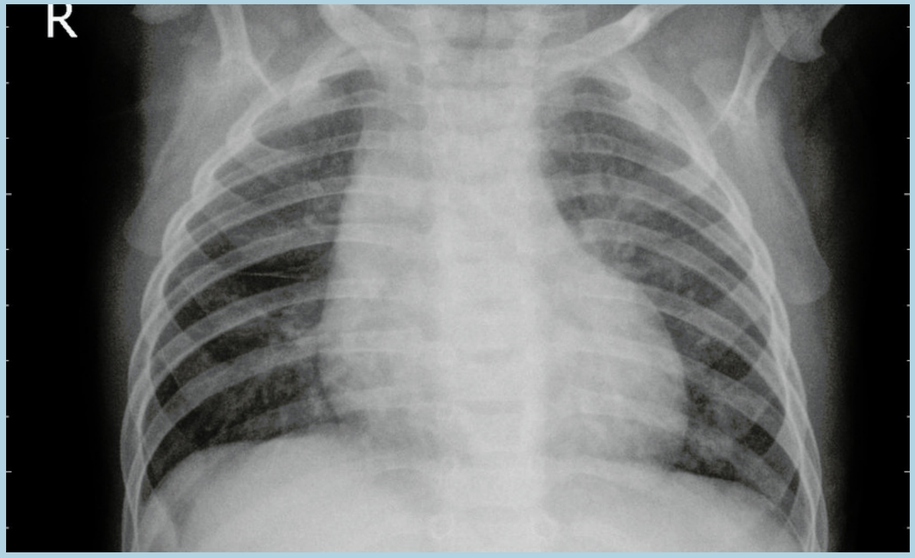
- Symptoms
- Physical exam
- Chest X-Ray
- Blood-Test



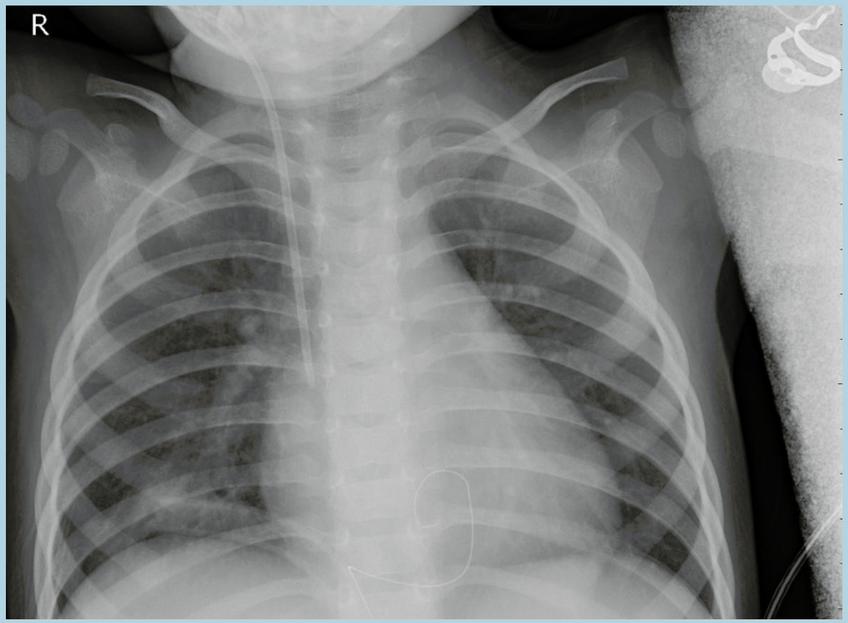
A



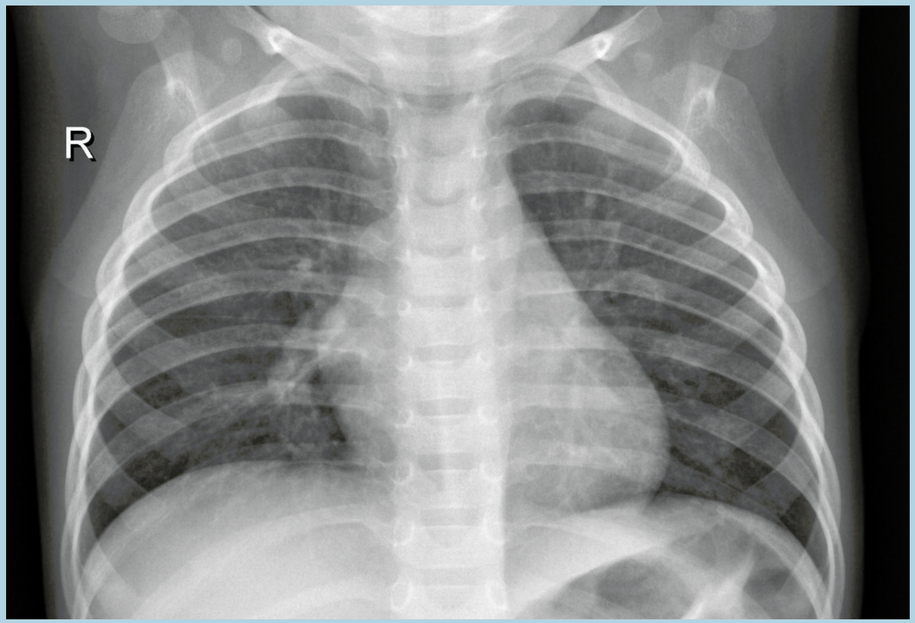
B



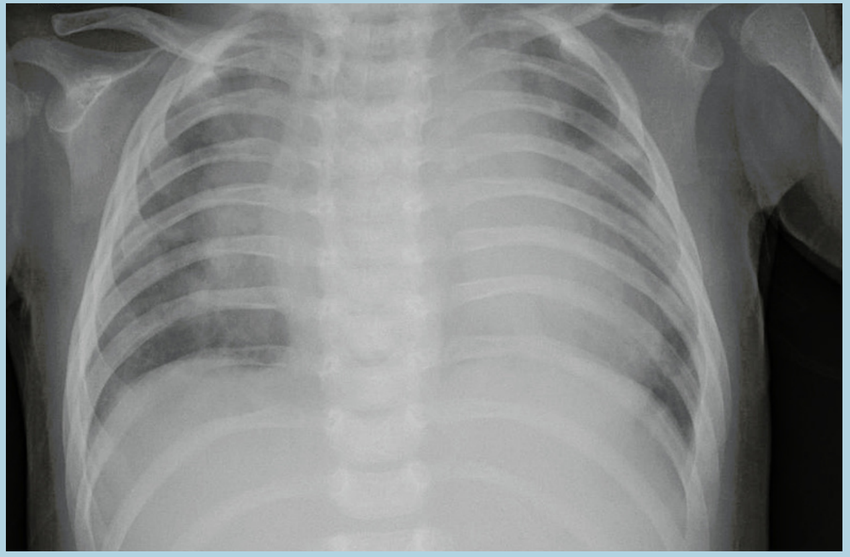
C



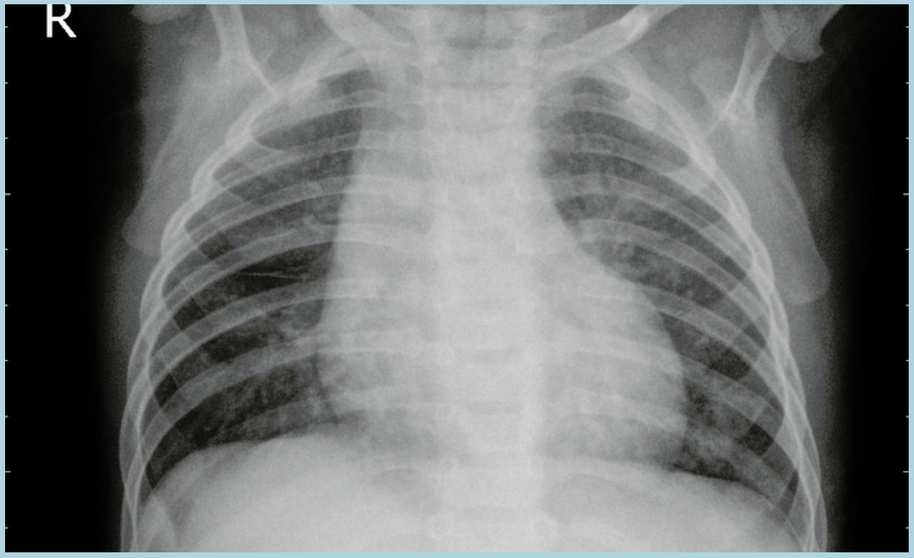
D



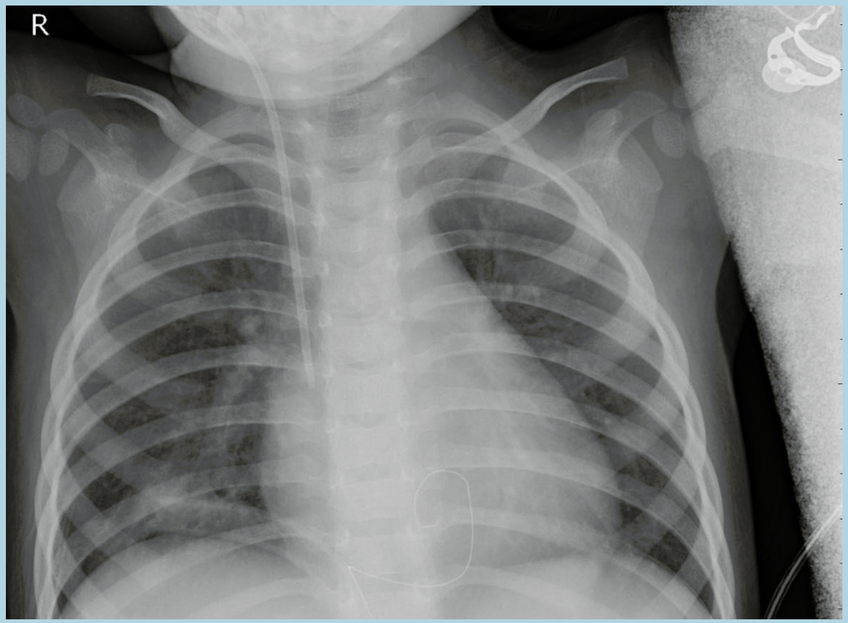
A



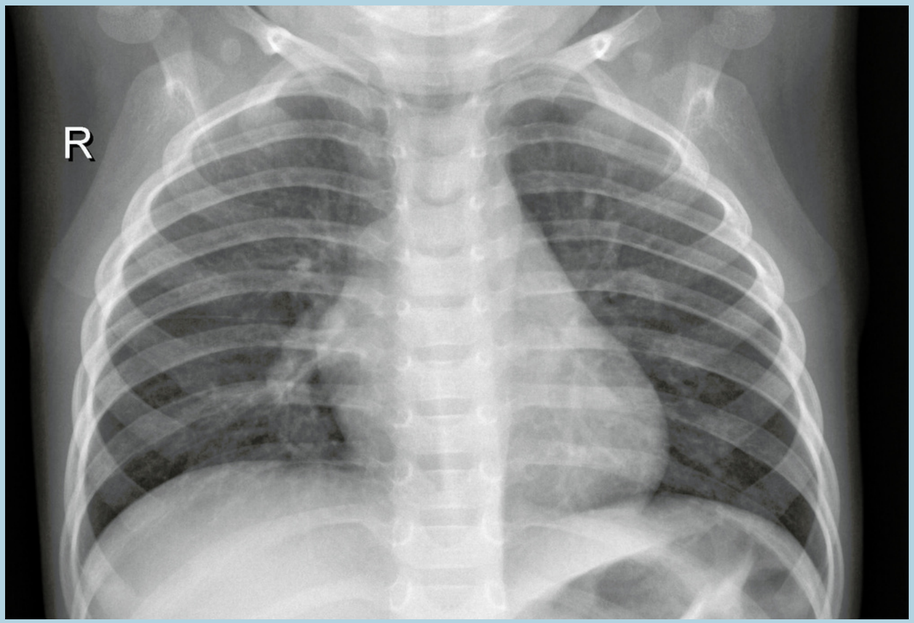
B



C



D



DATA AND METHODS

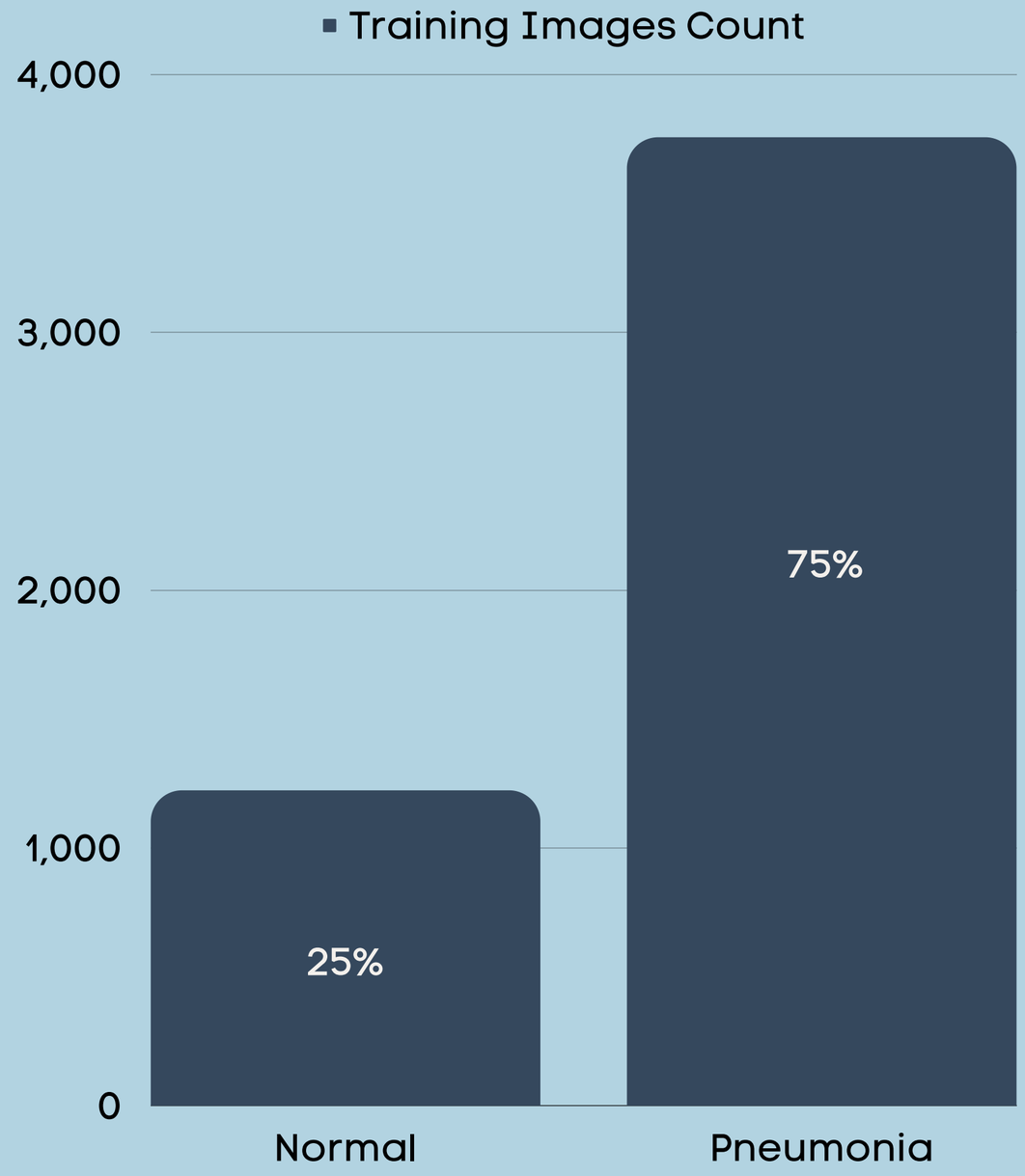
5856

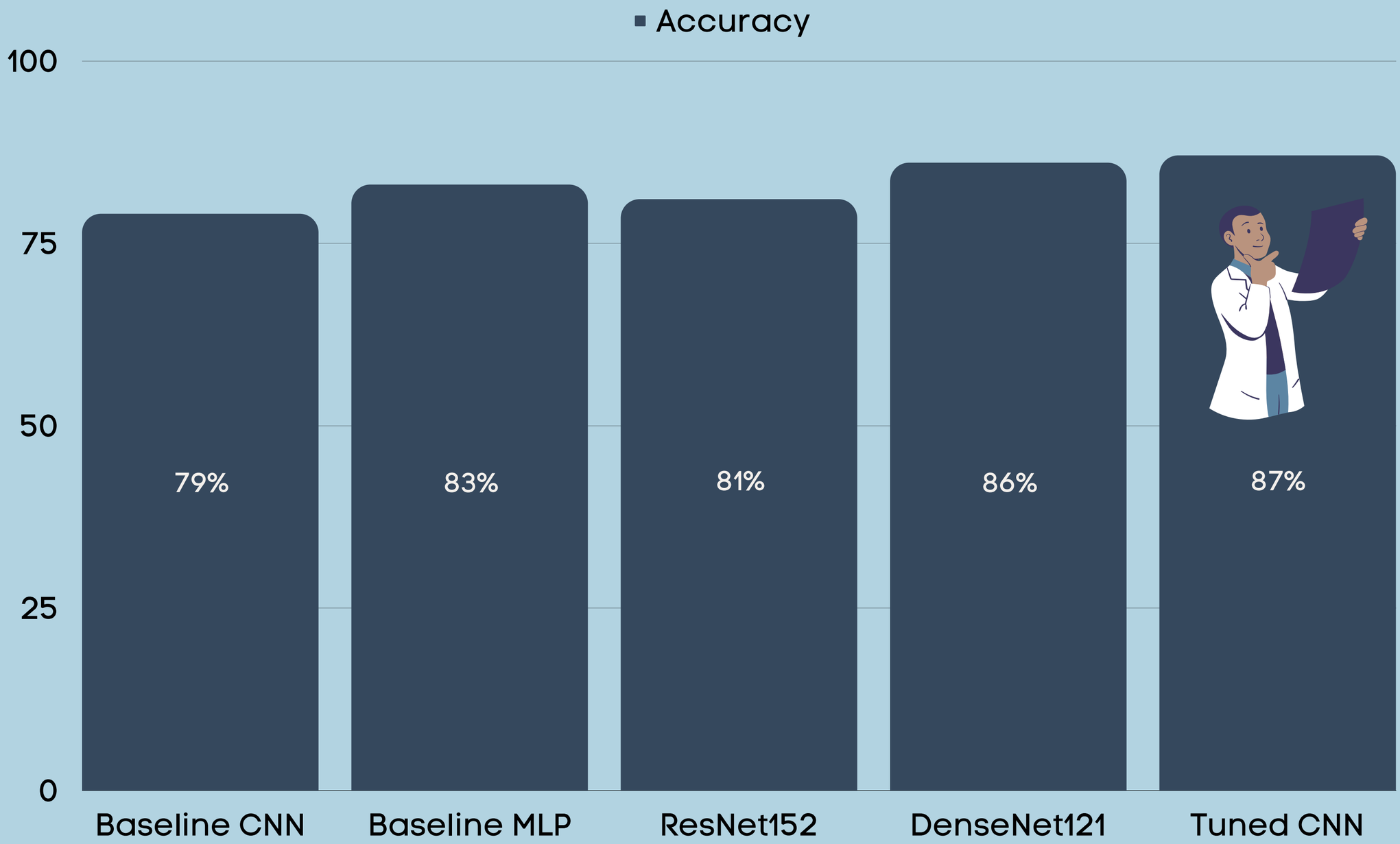
Total X-ray Images

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.





RECOMMENDERS CONSULTING FIRM

Best Model Architecture

Convolution

Pooling

Input Layer

Convolution

Pooling

Convolution

Pooling

Convolution

Pooling

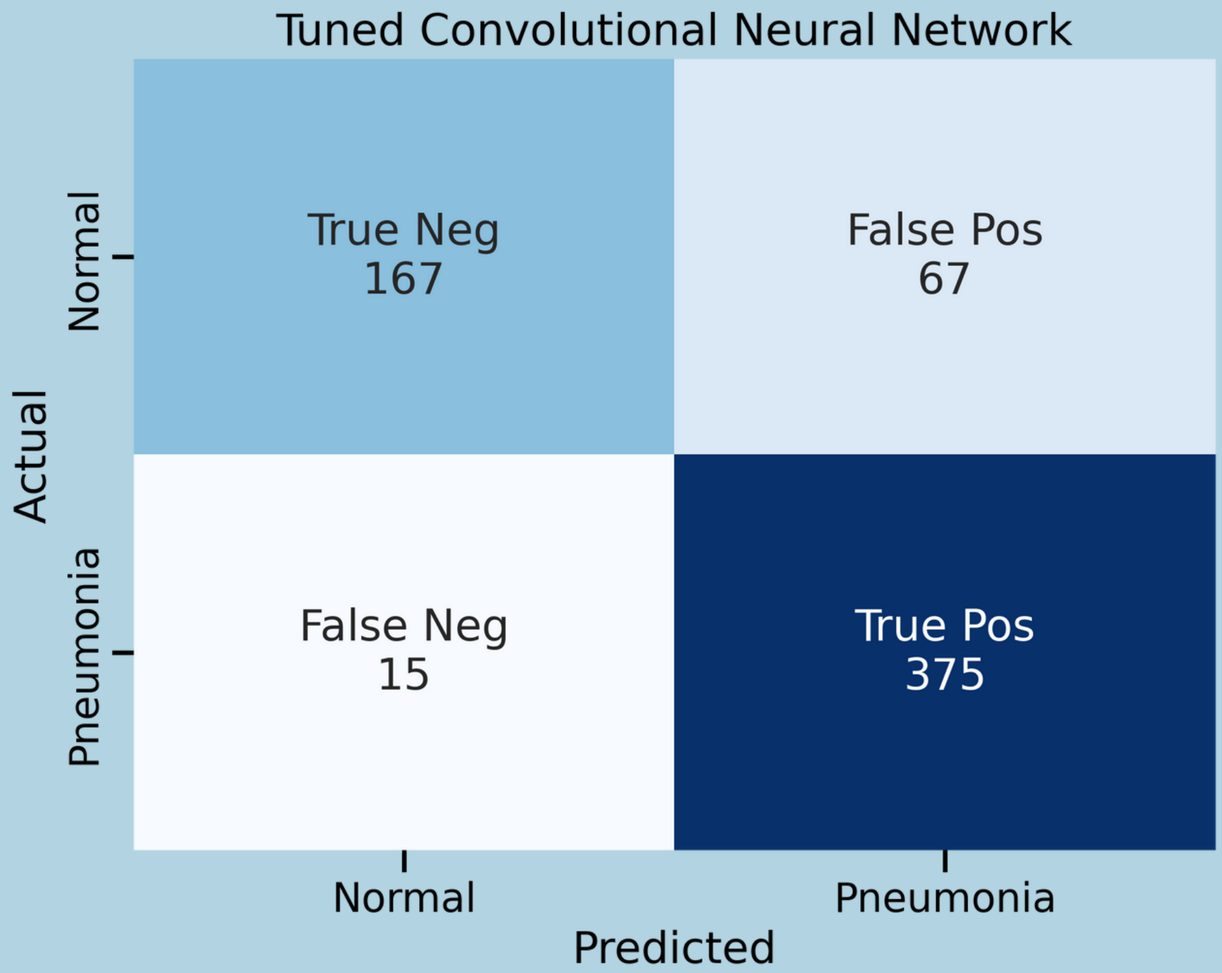
Dense Layer

Output Layer

Dense Layer

RECOMMENDERS CONSULTING FIRM

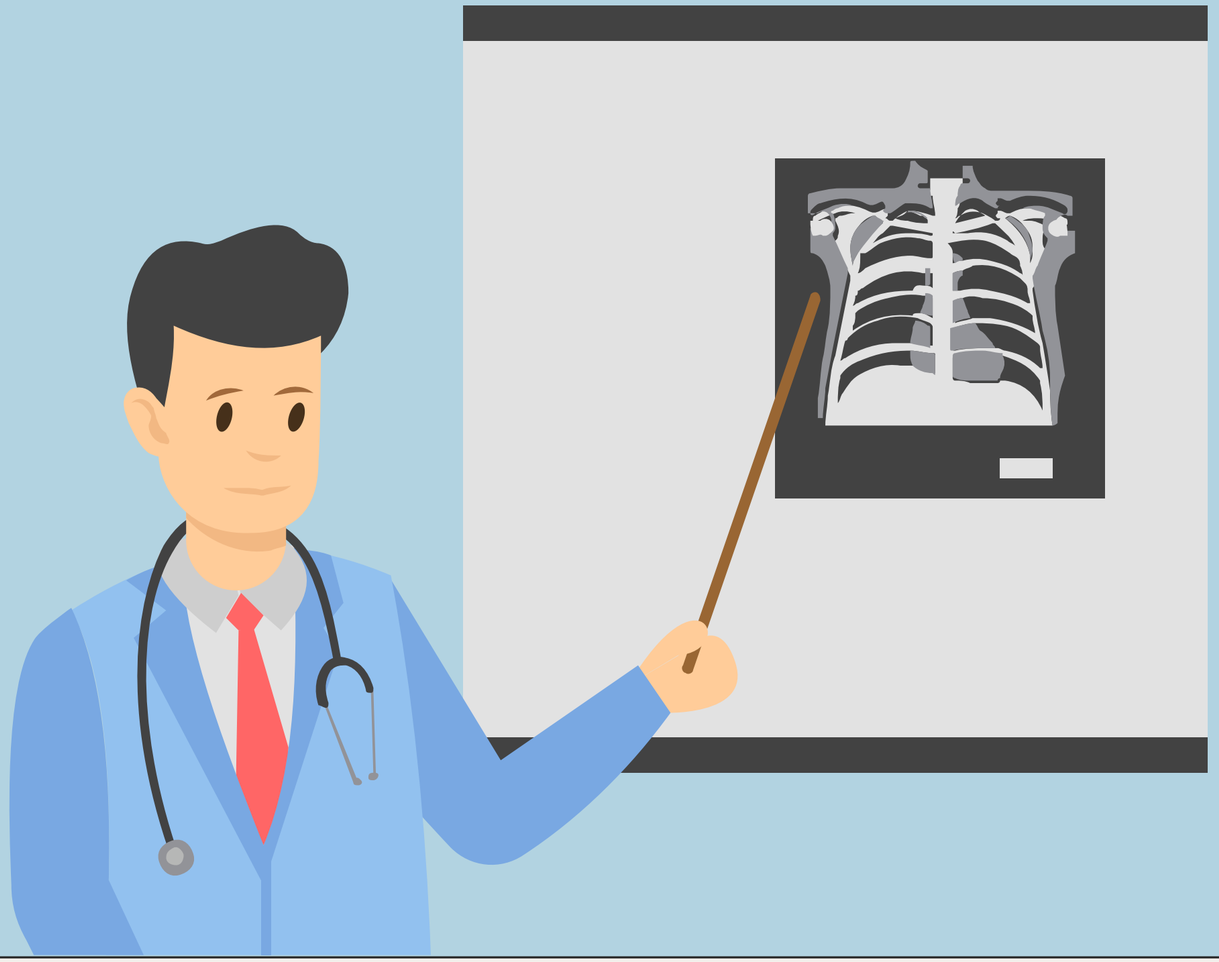
Best Model's Scores



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.

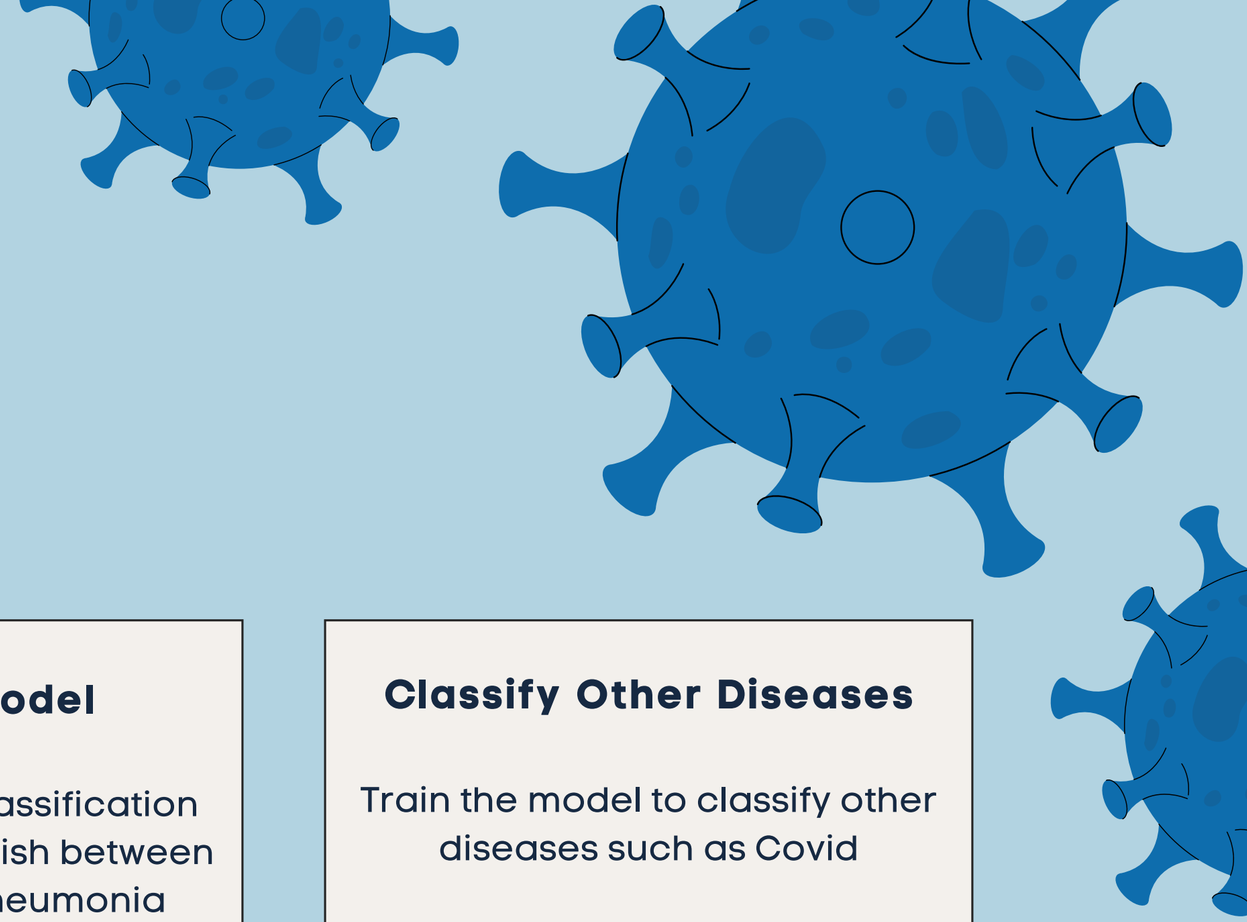
Assistance

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?

Hoang Nguyen

Lead Recommender

linkedin.com/in/hoang-nguyen-0ba498207/

Anthony Warren

Part Time Lead pharmacist,
Full Time Board Game Recommender

linkedin.com/in/anthonywarren11037/

Matthew Arling Samson

Lead Trivia Explicator
Cat Recommender

linkedin.com/in/matthew-samson-0a1b86165/

Madoria Thomas

Co-Founder
The Sims Recommender

linkedin.com/in/madoria-thomas/

RECOMMENDERS CONSULTING FIRM