Identifying Pneumonia From X-Rays

Using Convolutional Neural Networks

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Overview

- Pneumonia is a serious lung infection that disproportionately affects the young, the elderly, and the immunocompromised.

- It is the leading cause of death among children under the age of 5.

- USA has shown negligible improvements in decreasing the death rate from pneumonia over the last half century even as antibiotics have become much more prevalent.

Problems to solve

1 How accurately can we detect pneumonia in patients from a simple X-ray scan?

3 Can our model be a better and more convenient predictor than medical tests?

2 What are the most common signs in an X-ray scan that indicate possible presence of pneumonia?

4 Using our model, can we decrease the number of pneumonia related fatalities?

The Data

kaggle

5,865 Images

Jupyter

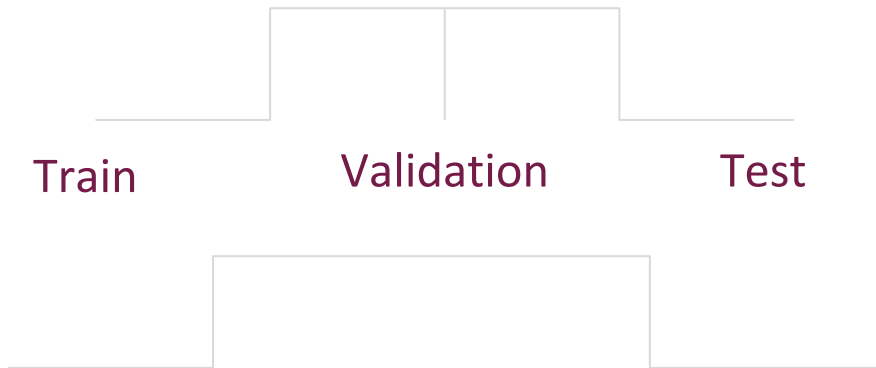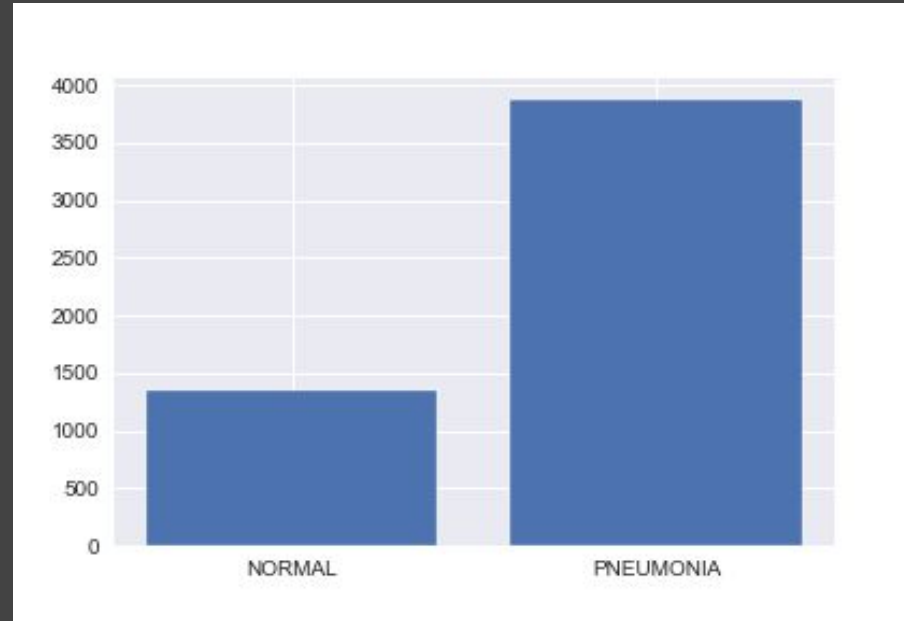colab

Train   Validation   Test

Normal   Pneumonia

Class Imbalance

- **Our data was highly imbalanced with a ratio of 1:3**
- **Contrary to a real-world scenario, our majority class was the patients with pneumonia**
- **We need to keep this in mind for our evaluation metrics.**

EDA

Modelling Process

Model #	Convolution & Max Pooling Layers	Dropout Layers	Data Augmentation	Optimizers
One	1	0	No	Sgd
Four	4	2	No	Adam
Seven	4	3	Yes	Adam
Final	3	0	Yes	AdamW

Evaluation Metric

- We used **Recall** as our target evaluation metric .
- We wanted to correctly classify the maximum number of patients who end up with pneumonia .
- We also looked at **Accuracy** because we had a high imbalance towards the positive, which meant we could easily have 100% recall without having good accuracy overall.
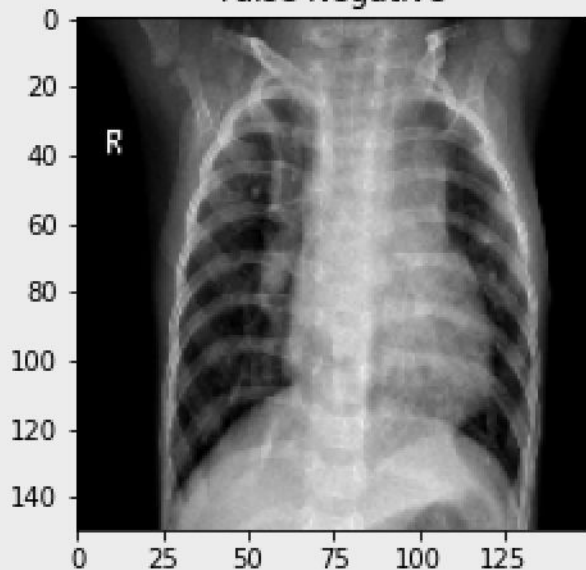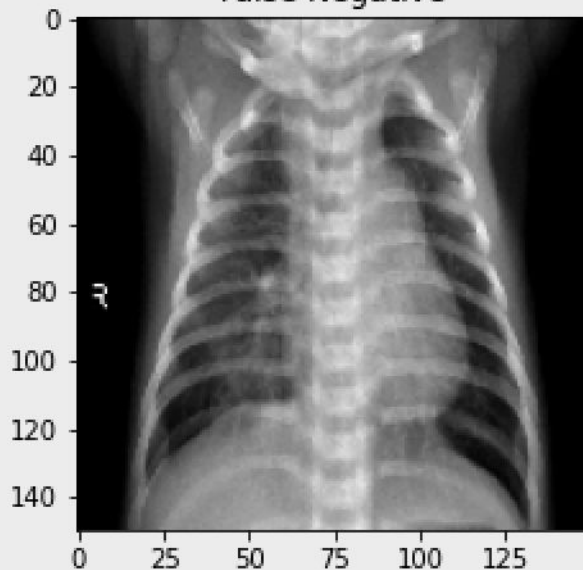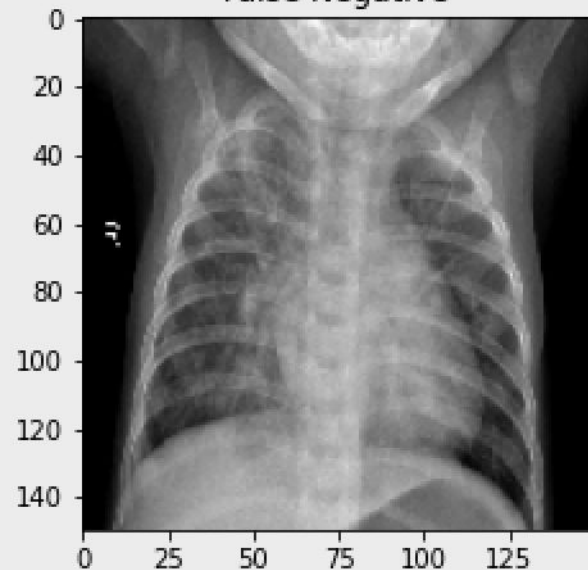

Evaluation Metrics: Initial vs Final Models
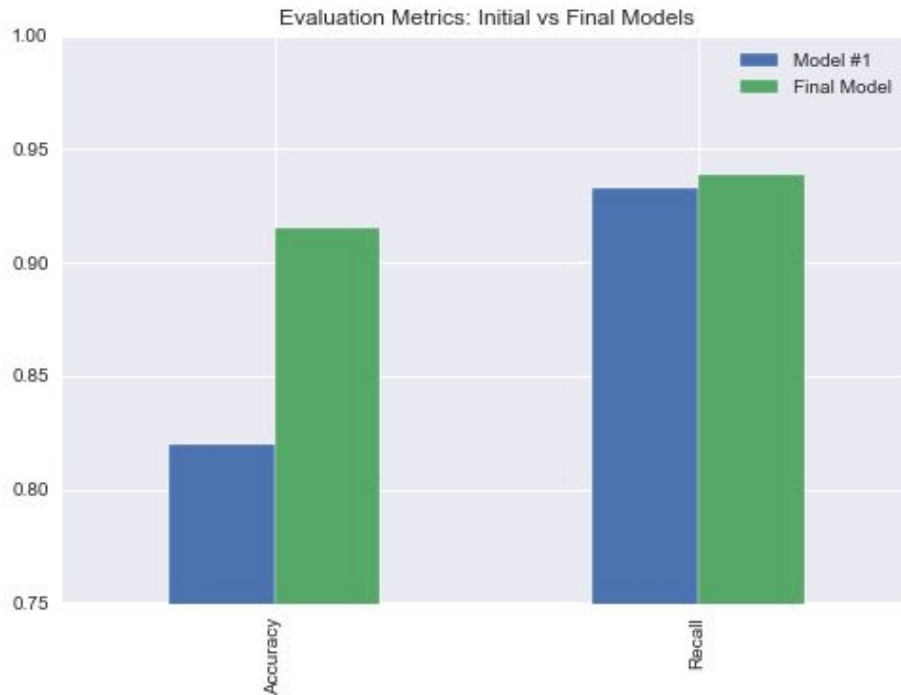
Evaluation (continued)

Analyzing Incorrect Predictions

Continued - Analyzing Incorrect Predictions
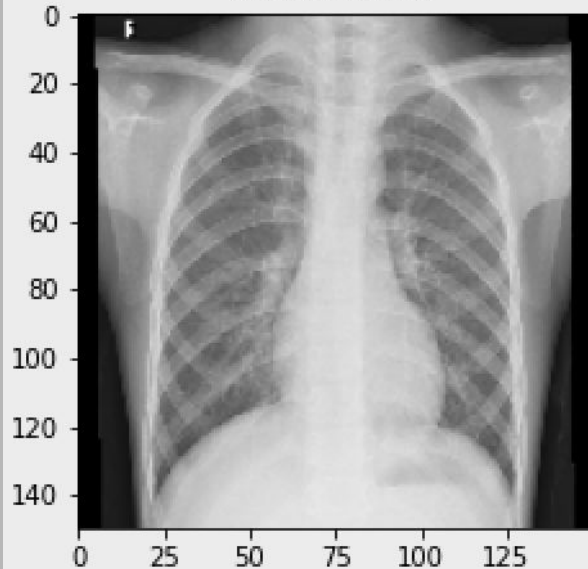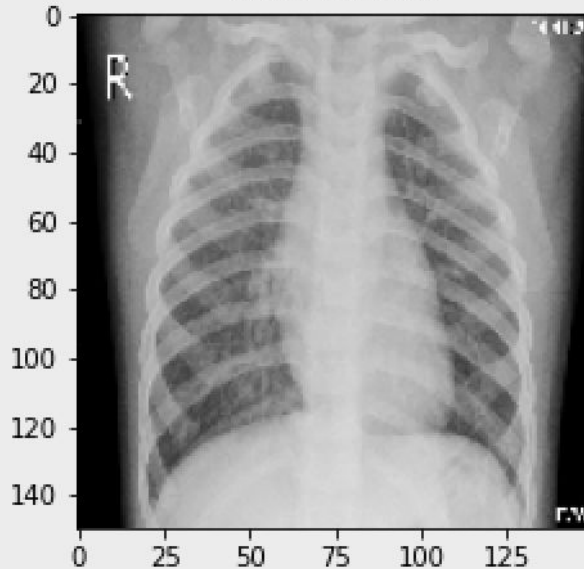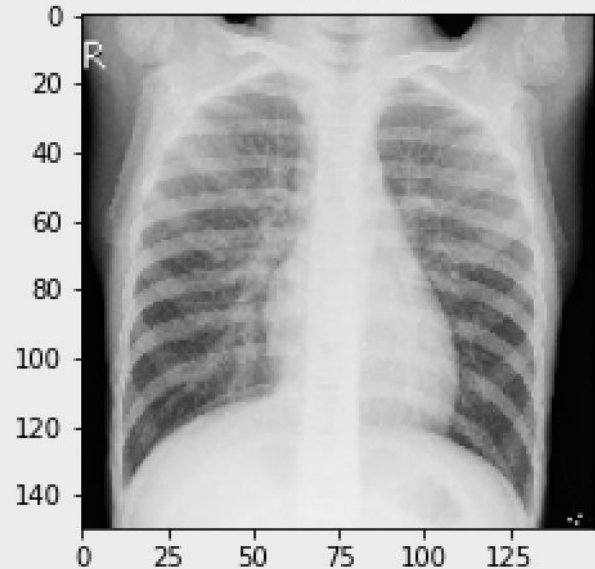
Future Work:

- In reality, X-ray scans are not ideal for detecting pneumonia. We can use CT scan images as the data next time.

- We were limited by our system in constructing the architecture of the models. Using a faster runtime, we can increase epochs, batch sizes and other parameters to get more complex models.

- We can implement transfer learning as our following measure.

- We can visualize the activation and intermediate layers of our models to see how it may be recognizing patterns.

Thank you.