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 predict pneumonia in patients from a simple X-ray scan?
2. What are the most common signs in an X-ray scan that indicate possible presence of pneumonia?
3. Can our model be a better and more convenient predictor than medical tests?
4. Using our predictive model, can we decrease the number of pneumonia related fatalities?

The Data

kaggle

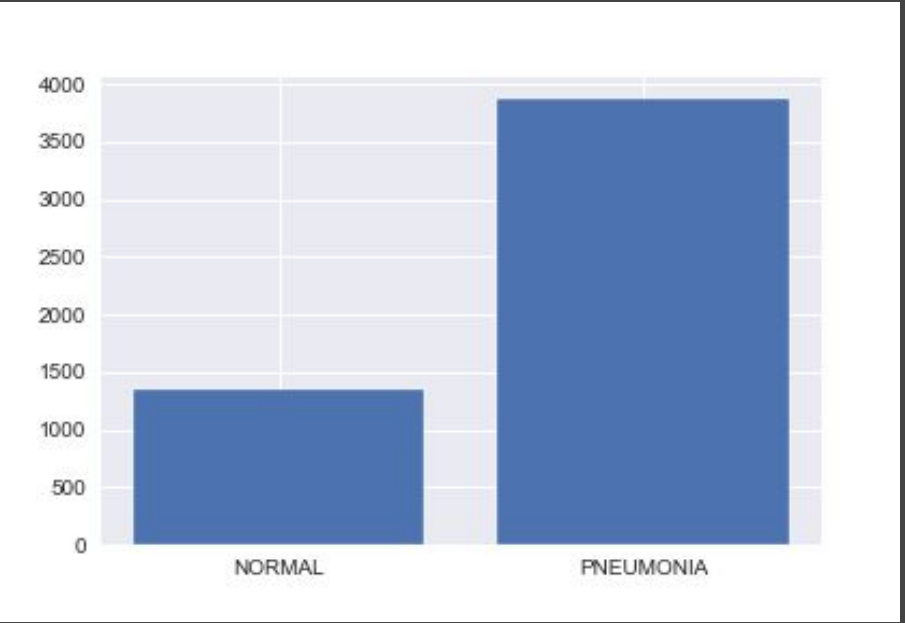
5,865 Images

jupyter

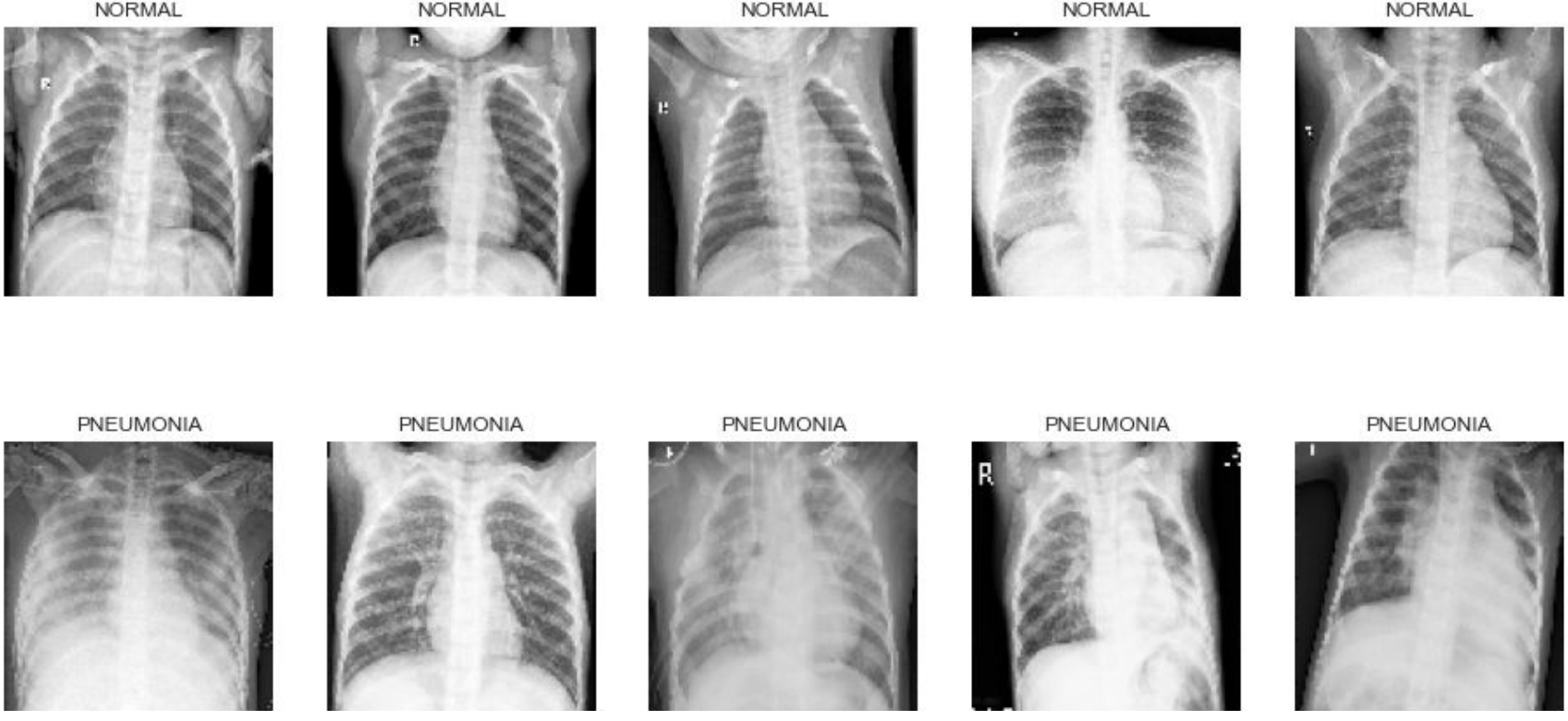
colab

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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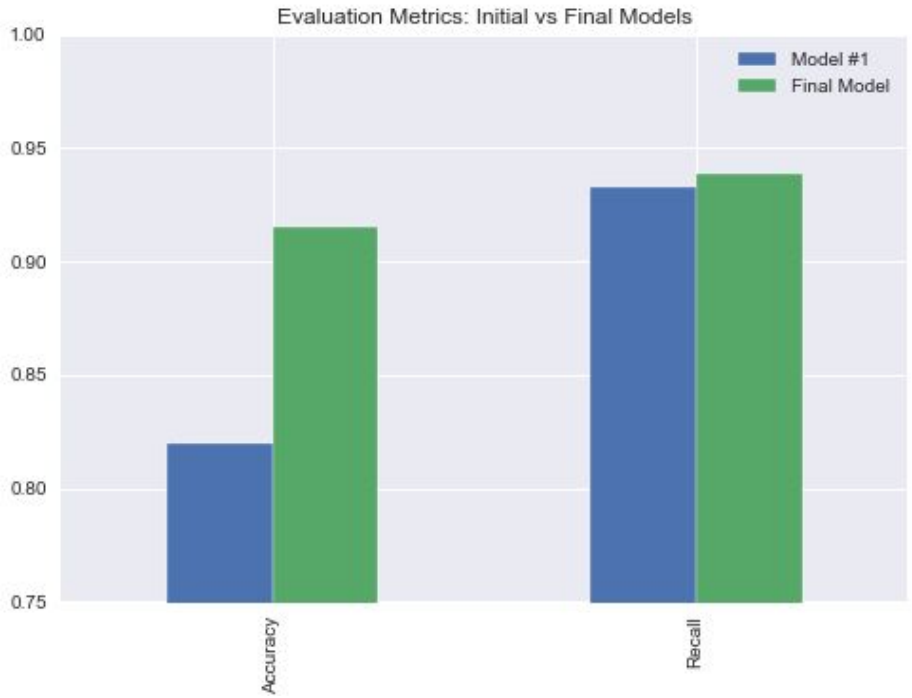
Modelling Process

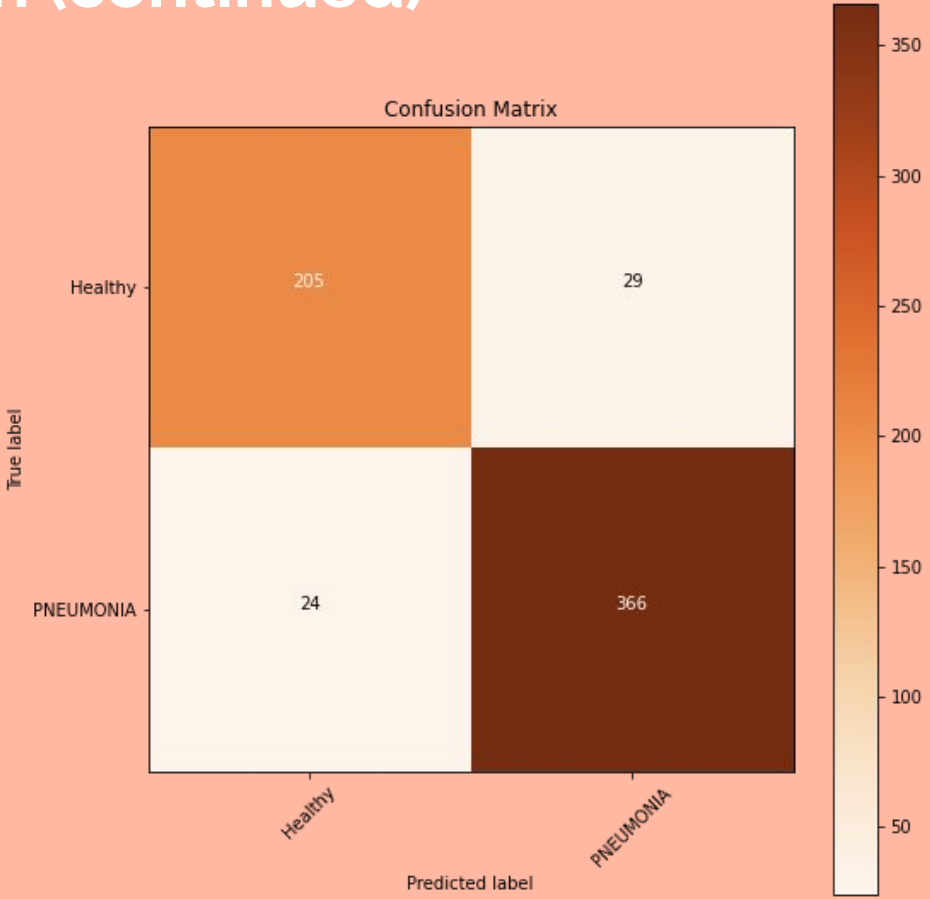
Model #	*Convolution & Max Pooling Layers*	*Dropout Layers*	*Data Augmentation*	*Optimizers*
One	1	0	No	Sgd
Four	4	2	No	Adam
Seven	4	3	Yes	Adam
Final	3	0	Yes	AdamW

Evaluation Metric

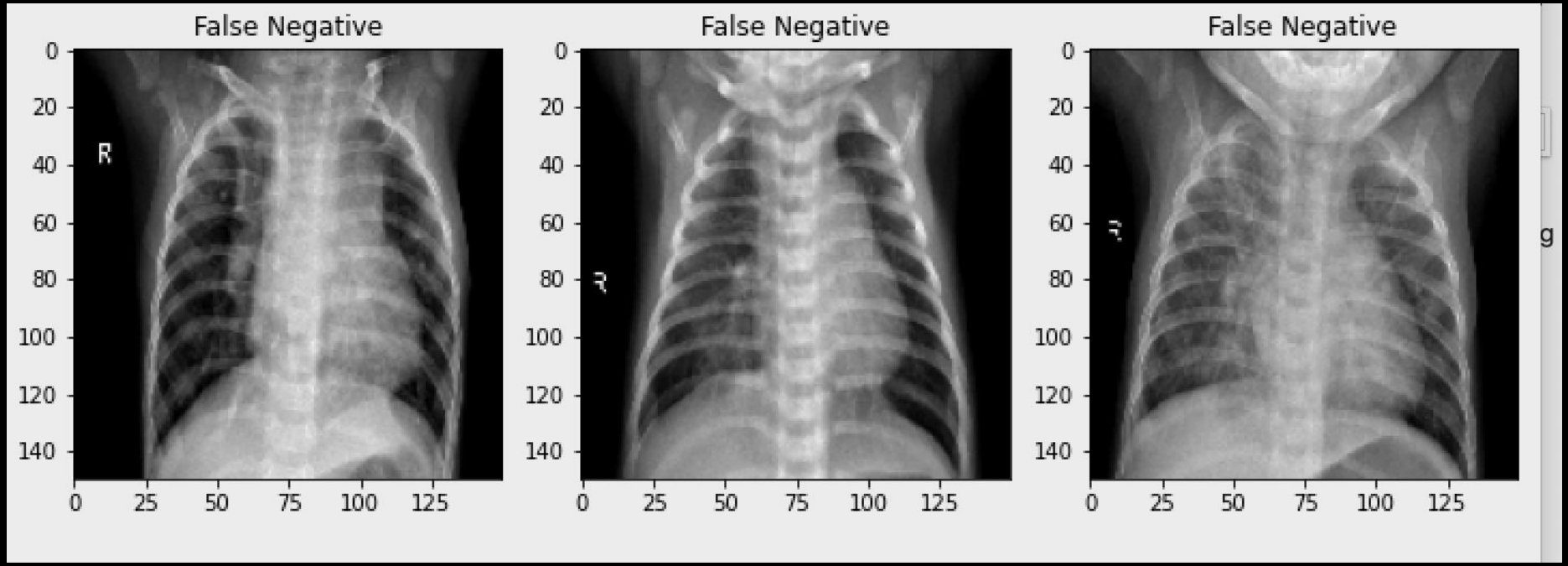
- We used **Recall** as our target evaluation metric .
- We wanted to correctly classify the maximum number of patients who end up with pneumonia .
- We also looked at **Accuracy** because we had a high imbalance towards the positive, which meant we could easily have 100% recall without having good accuracy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



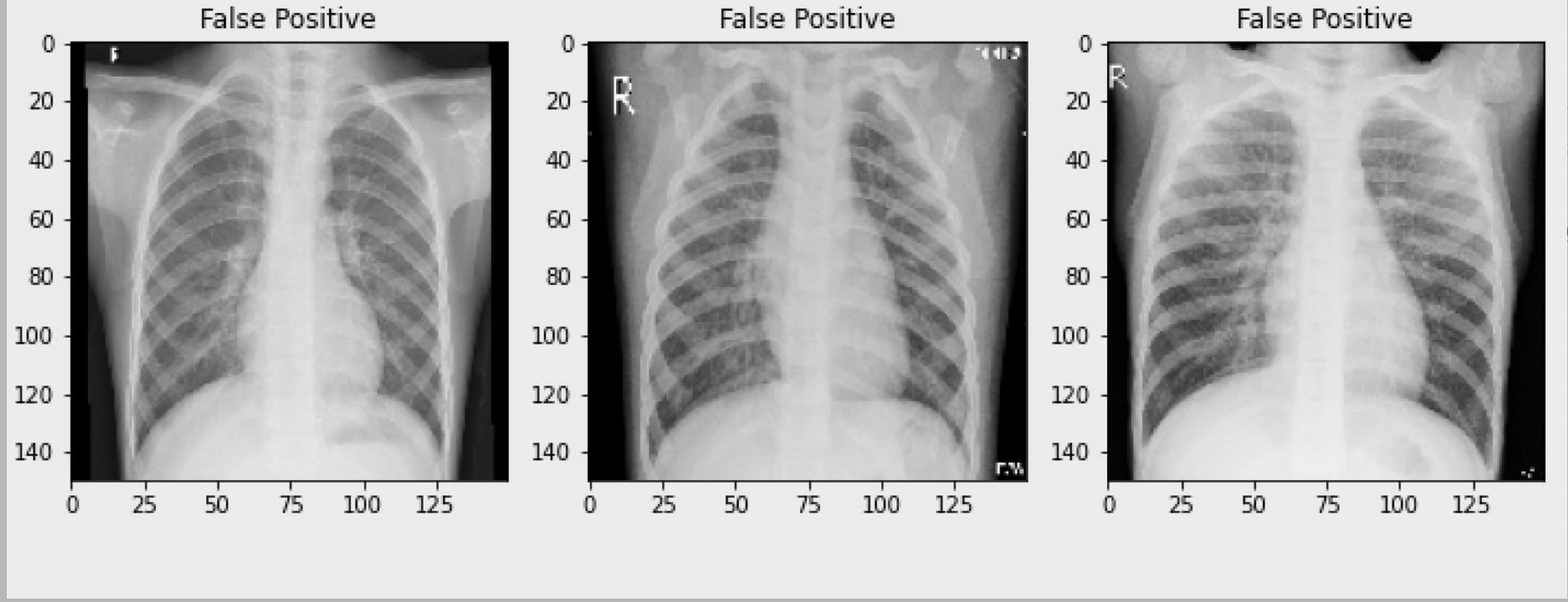
Evaluation (continued)



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.