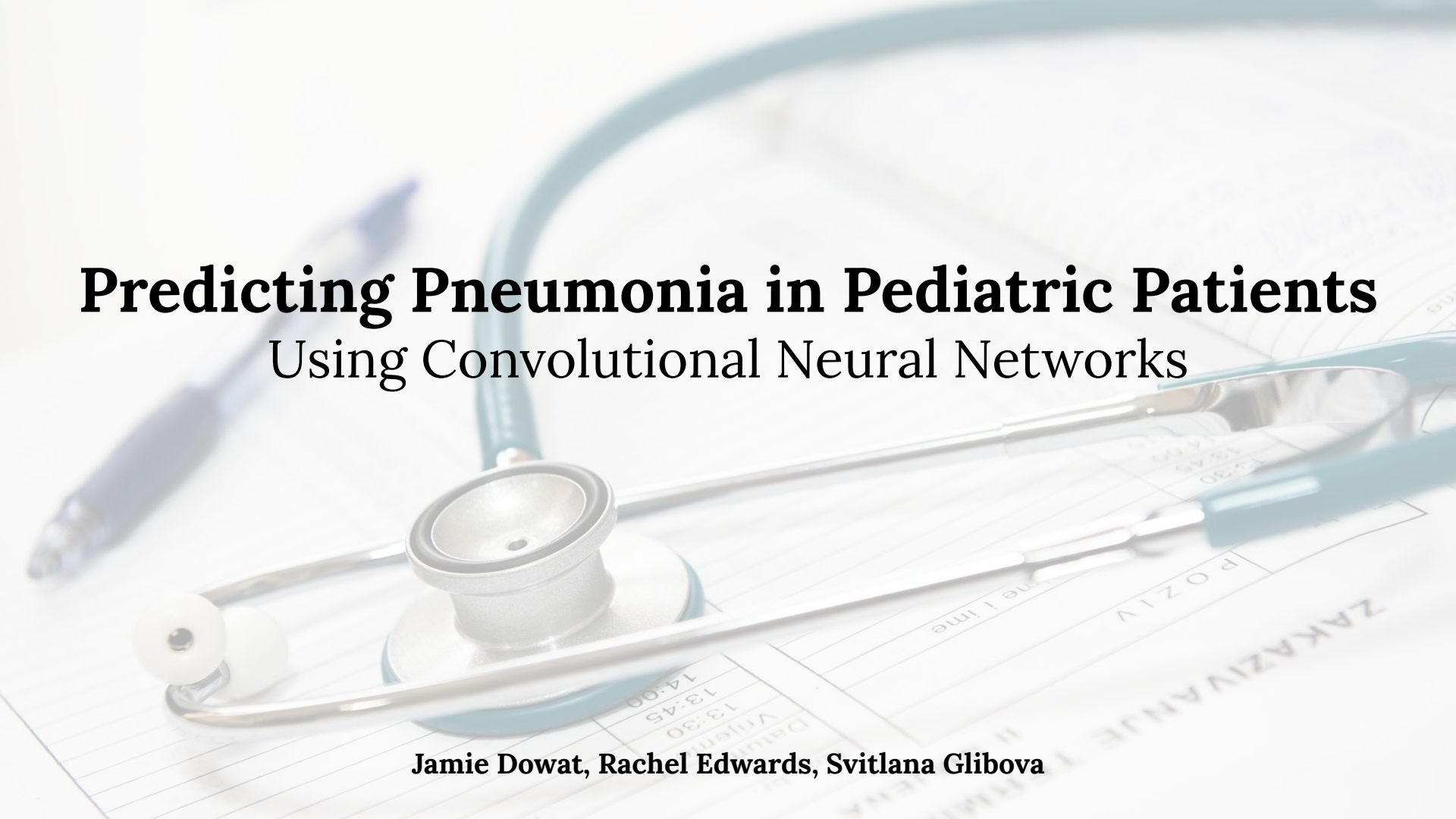
Predicting Pneumonia in Pediatric Patients

Using Convolutional Neural Networks



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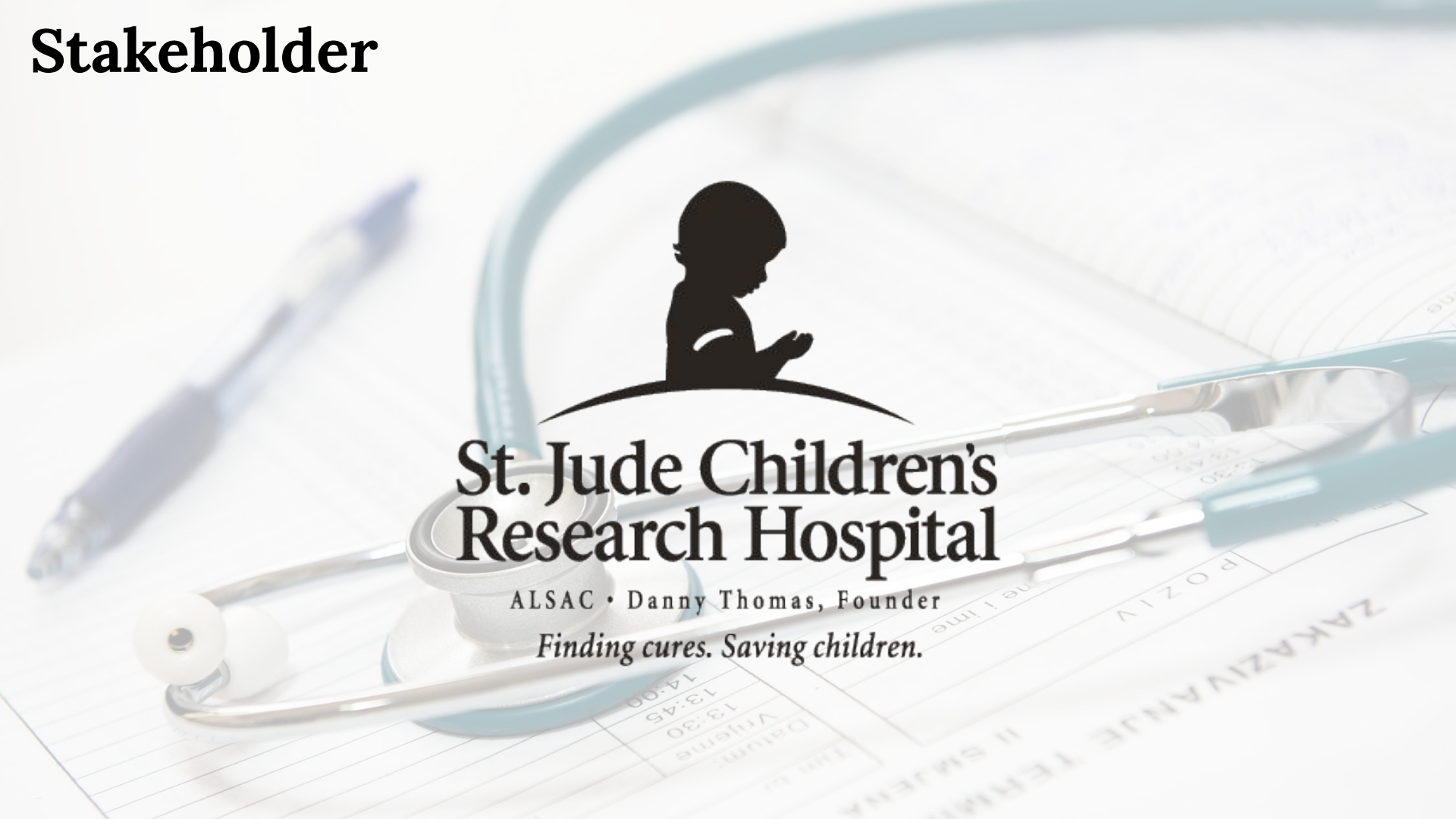
Outline

- Business Problem
- Proposal
- Data
- Modeling
- Analysis
- Next Steps

Stakeholder



Business Problem

- Globally, pneumonia is the leading cause of morbidity and mortality in children under 5
- 11% of COVID-19 cases in the United States are children
- Viral pneumonia is a symptom of COVID-19 and can go undetected

Proposed Solutions: Method

- Build a binary classification convolutional neural network to detect pneumonia from x-rays of pediatric patients

Convolutional Neural Network (CNN)

- Neural Nets(NN) aren't good at image classification

- CNNs allow us to build a deeper model to pick up image patterns

Proposed Solutions: Target

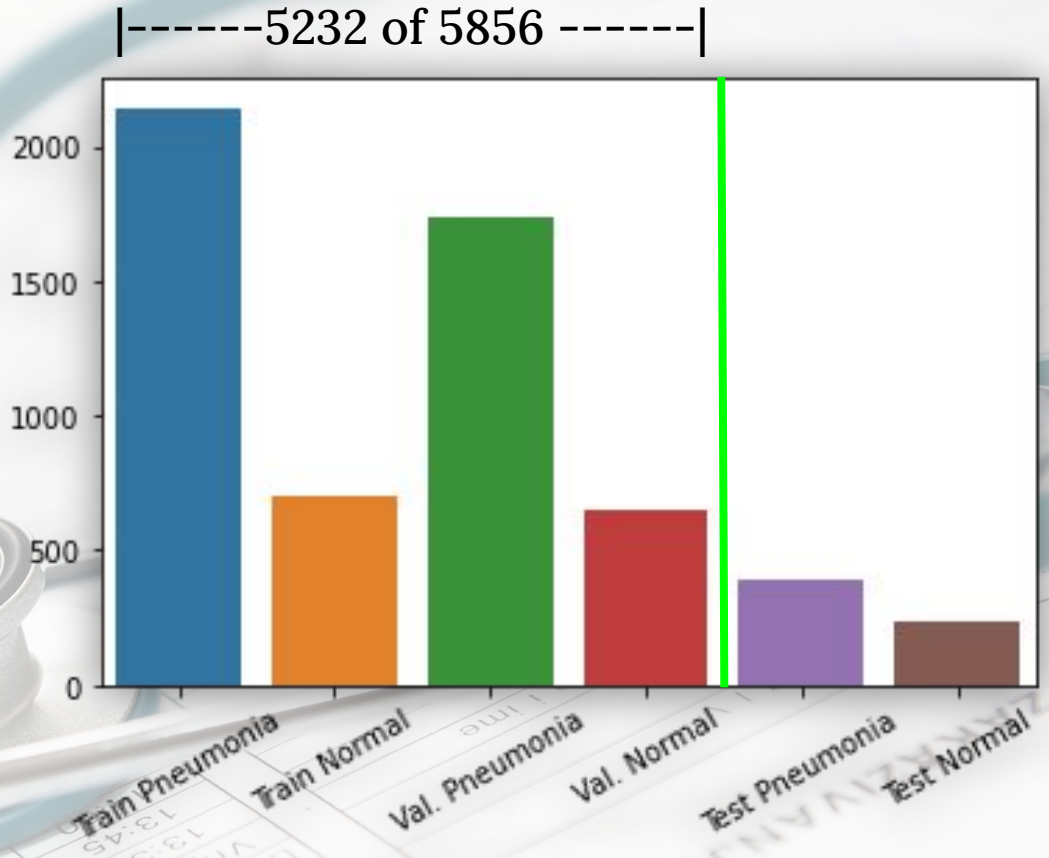
- Reduce false negatives (reduce under-diagnosing)
- A false negative is misdiagnosing a patient to be pneumonia free when they actually have pneumonia
- Getting these false negative creates a serious health risk for those who were misdiagnosed

Data

Chest X-Rays: *Patients Ages 1-5*

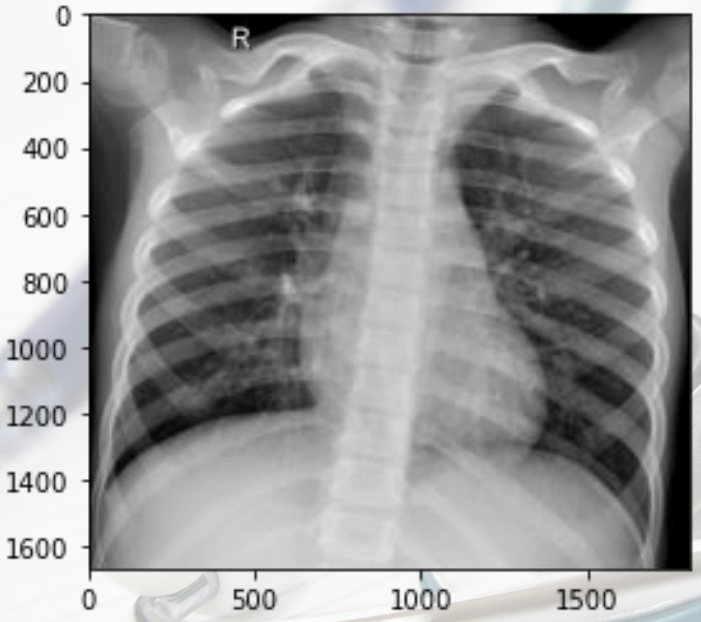
~89% of the data used for model training & validation

Training: 5,232 images
Testing: 624 images
TOTAL: 5,856

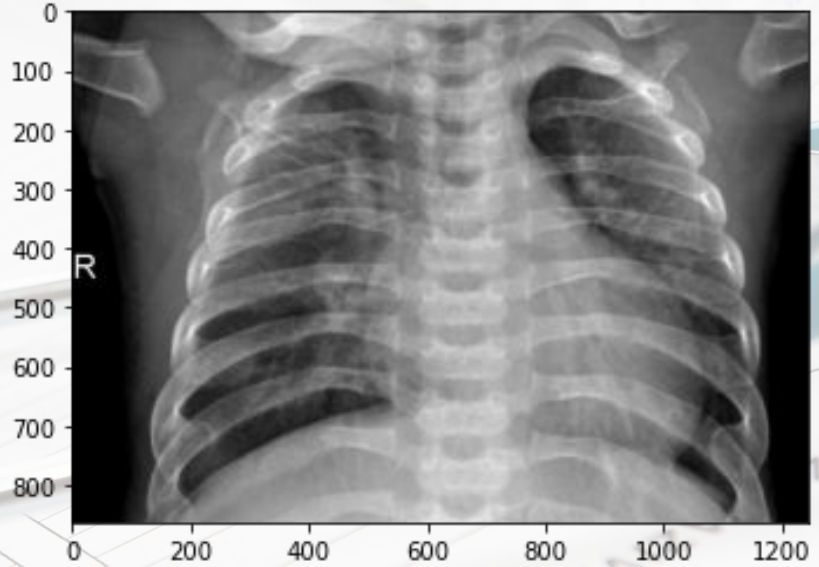


Data

Normal

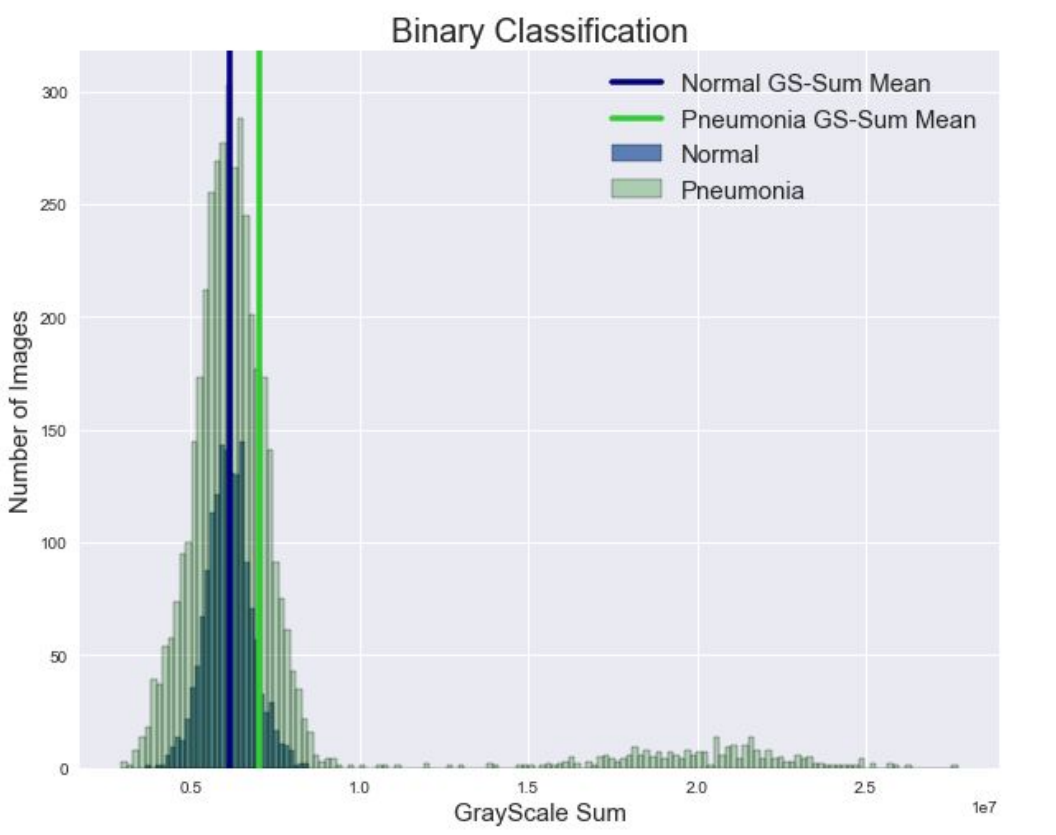


Pneumonia



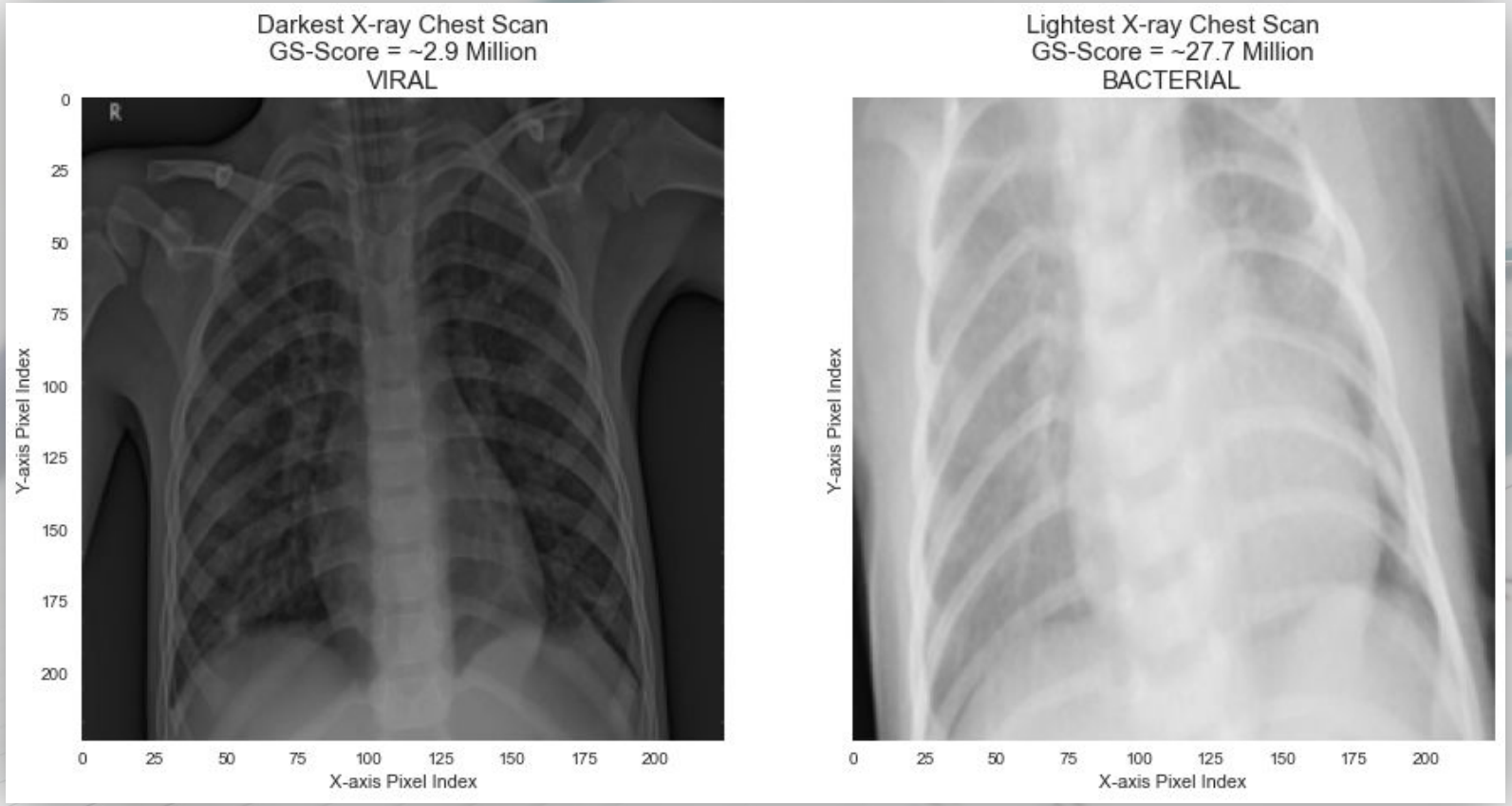
Data

Grayscale Distribution - Pneumonia vs. Normal X-Rays



Data, cont.

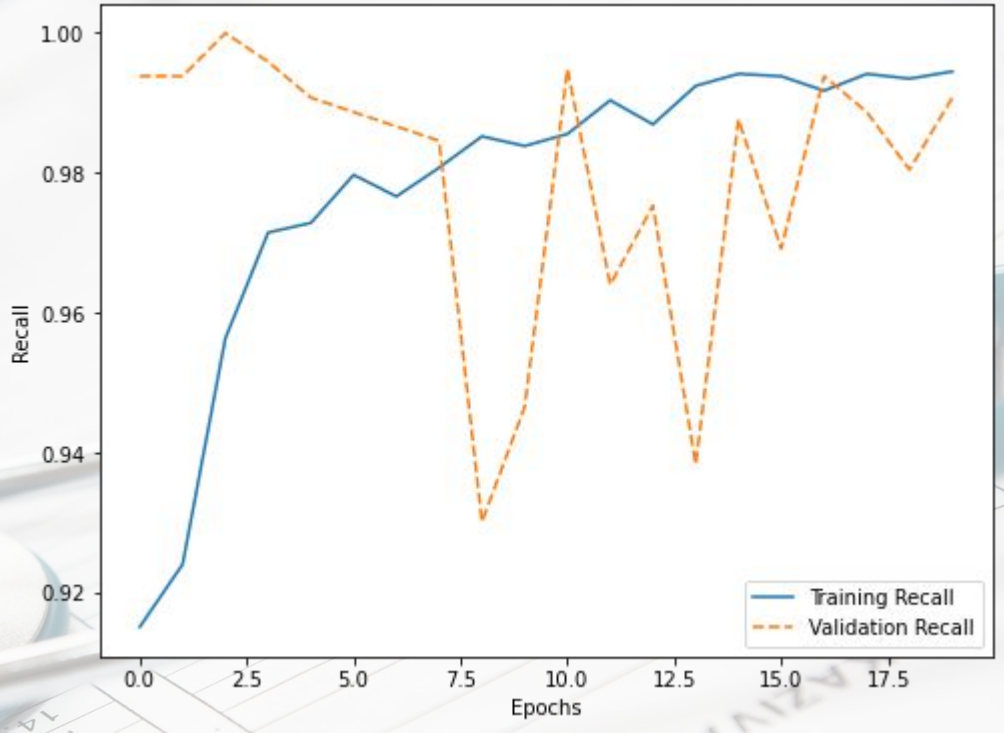
Grayscale Distribution - Dataset Extremes



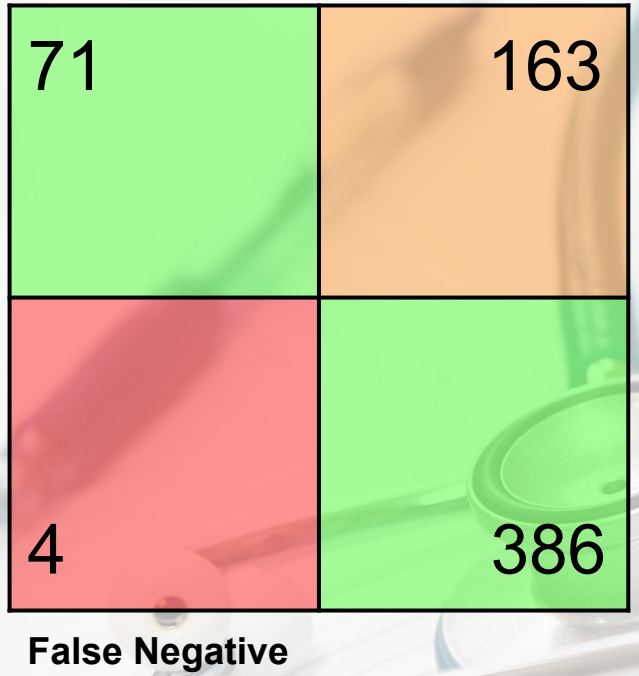
Modeling

- Marked decrease in loss through 20 epochs - high accuracy with training and validation data

- Oscillation in recall - continuing to run the model as a next step



Analysis



- 98% recall - accurately predicted pneumonia in 386 out of 390 cases
- High rate of predicting pneumonia in patients with normal lungs
- F1 score - 83%

Next Steps

- Boost the signal of the negative class - augment the ‘normal’ X-Ray image data
- Transfer Learning
- Ternary Classification

Thank you!

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