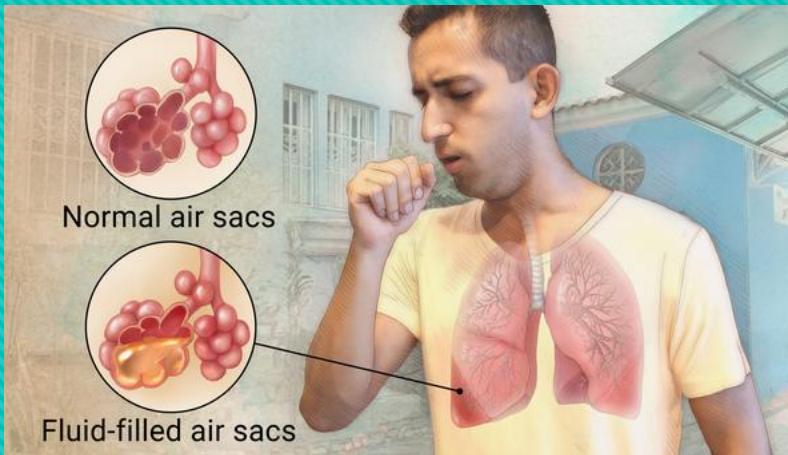


# Hospital X-Ray Predictions



# Overview

Convolutional Neural Net models will be built to best predict if patient has a "Normal or "Pneumonia" X-ray. The main stakeholder is for a Ft Washington Med Center to try out for potential staffing replacement.

**Model:** Convolutional Neural Net, Binary Classification

**Classification Values:** Normal, Pneumonia

# Agenda

- Business & Data Understanding
- Modeling
- Results
- Limitations
- Recommendations
- Next Steps

# Business and Data Understanding

## Adventist Health Care Fort Washington Medical Center

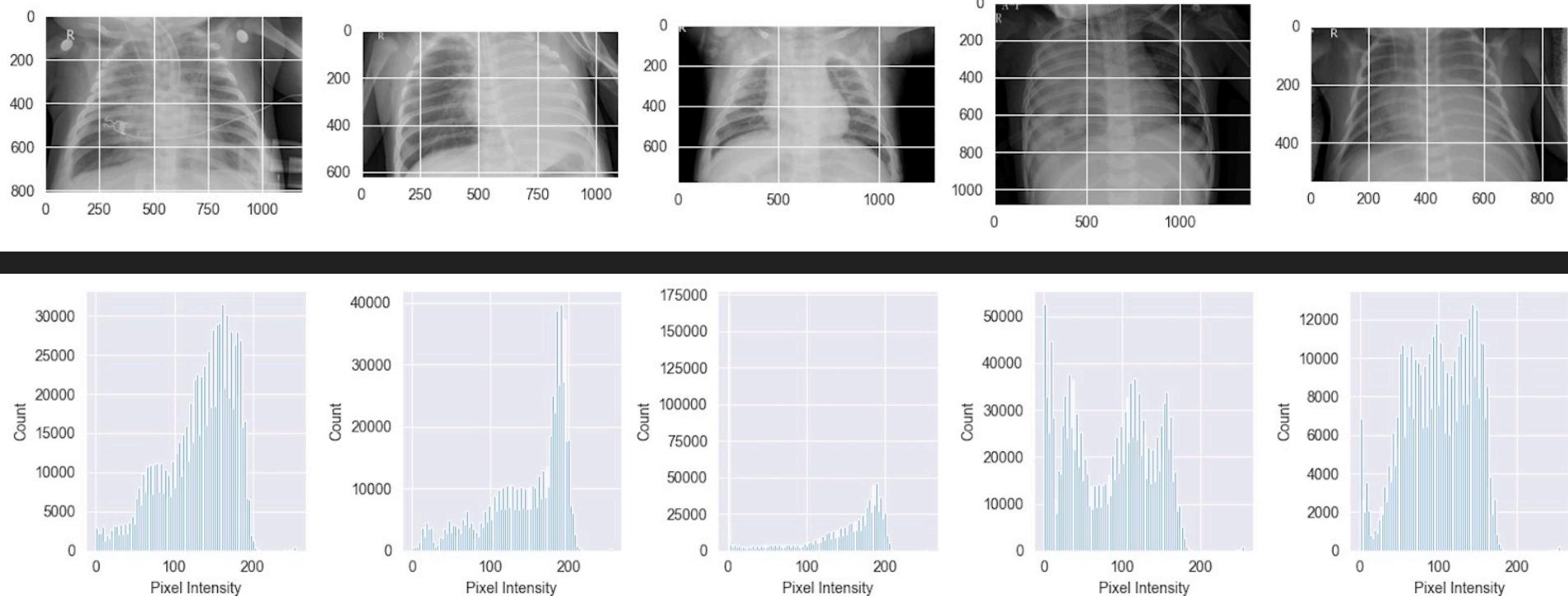
- Want to supplement knowledge with technology
- Pneumonia Detection Ratings currently great! Researching image recognition to keep ratings and not overwork staff.



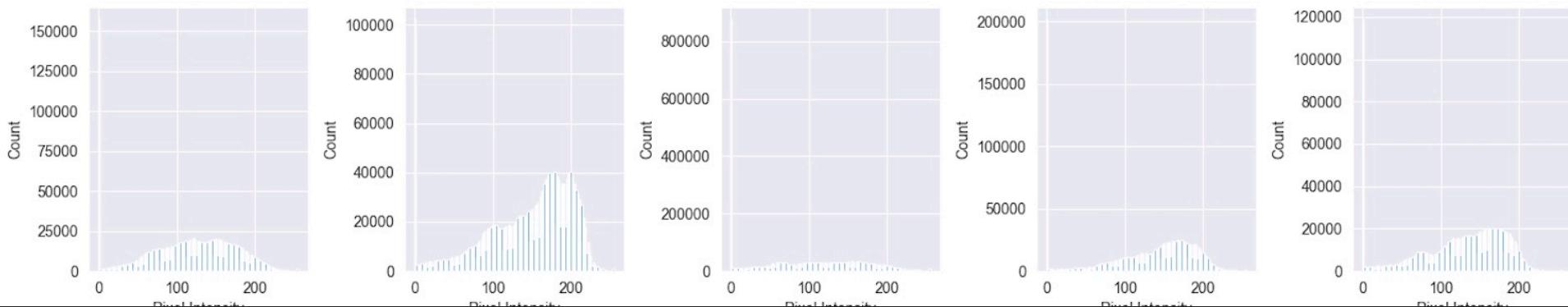
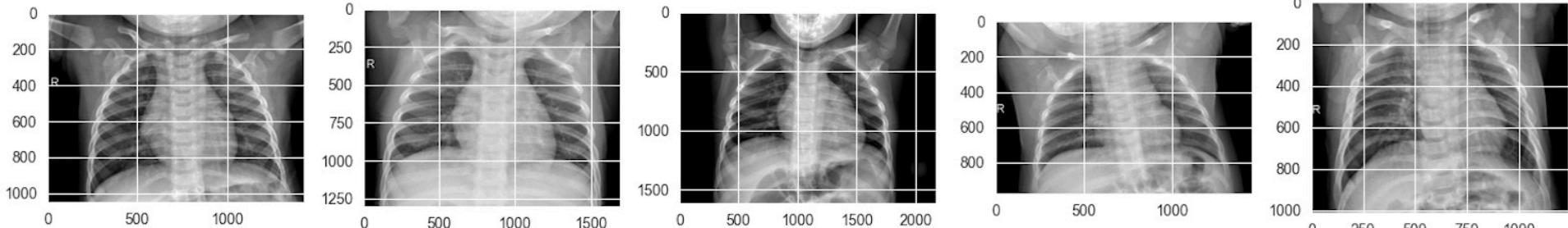
# Business and Data Understanding

- Perform image classification predictions on X-RAYS
- Minimize incorrect “Normal” diagnosis
- 5856 Normal and Pneumonia Images

# Pneumonia Pixel Distribution



# Normal Pixel Distribution



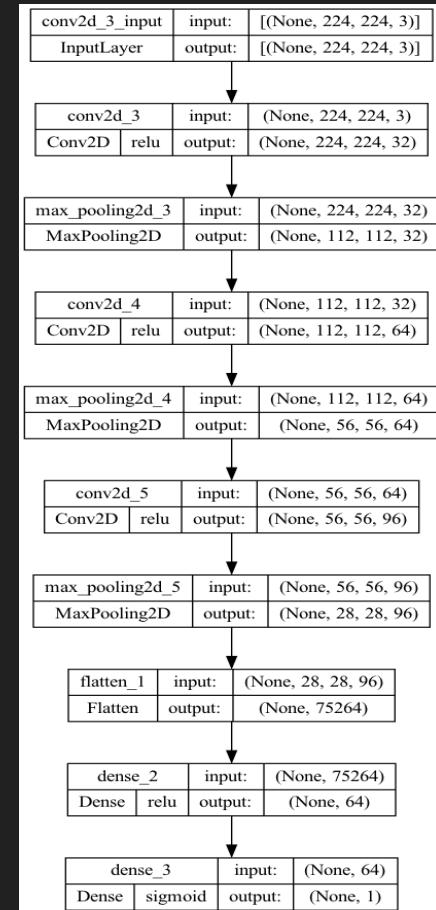
# Modeling

Iteratively produce models. As new information was learned new models, parameters and transformation techniques were applied.

- Model 1 Baseline
- Model 2-3 Baseline Modification
- Model 4-7 Hyperparameter optimization
- Model 8-10 Transfer Learning
- Final Model

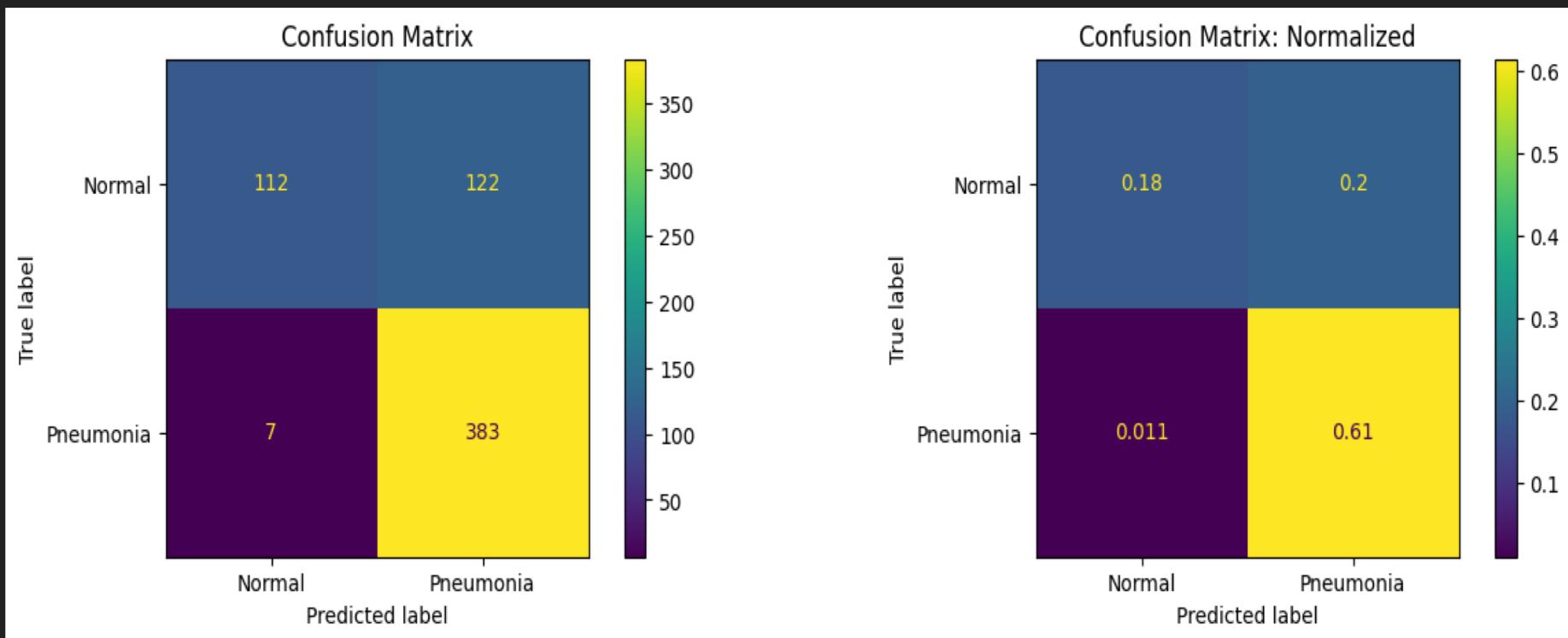
# Evaluation

Metrics	Normal Images	Pneumonia Images
Recall Score (Low FN)	48%	98%
F1-Score (Harmonic Mean)	63%	86%
Precision	94%	76%



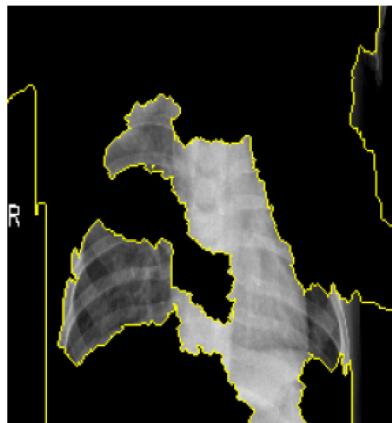
Final Model Architecture

# Final Model's Prediction

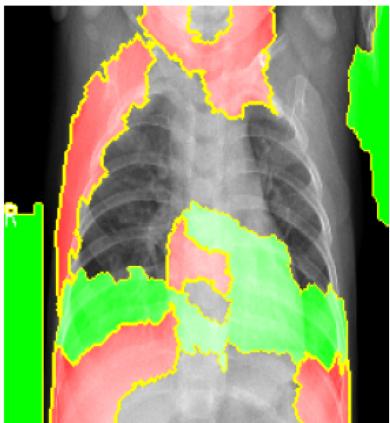


# Final Model's Prediction

Areas Contributing to Prediction



Probability Enablers (G) & Disablers (R)



Areas Contributing to Prediction



Probability Enablers (Green) & Disablers (Red)



Inaccurate Normal (FN)

Accurate Pneumonia (TP)

# Conclusion: Limitations

- Hospital:
  - Important image areas
  - Radiologist SME knowledge
- Technical:
  - Hardware and software Compatibility (Modeling on M2 GPU Laptop)
  - Hyperparameter optimization limits
  - Blackbox of Hidden Layers

# Conclusion: Recommendations

- **Usage:** The model is best as a learning tool and not an official diagnosis
- **Strategy:** Use the model as an initial reviewer of the images
- **Staffing:** The model is best used with a doctor, not standalone

# Conclusion: Next Steps

- **Iterate model improvement with with augmented data**
- **Gather more images to train**
- **Visually inspect the images that were inaccurate.**
- **Increase consultation with the data scientist/analyst to improve our domain knowledge and more specific feature criteria**

# Thank You!

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