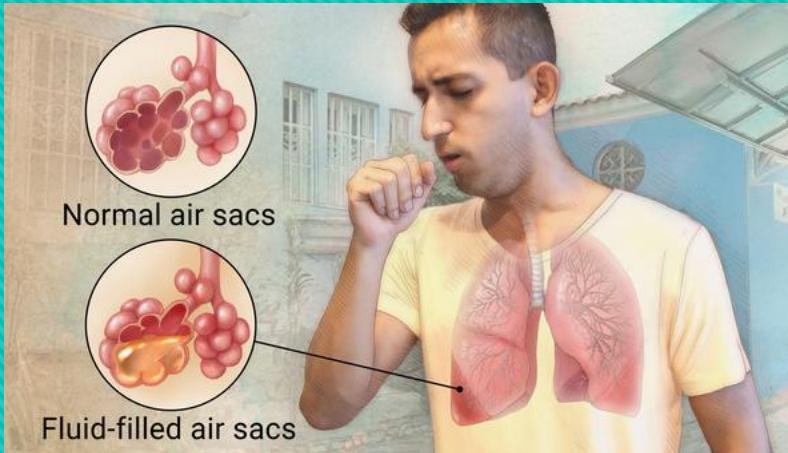


Hospital X-Ray Predictions



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 local hospital to try out for potential staffing replacement.

Model: Convolutional Neural Net, Binary Classification

Classification Values: Normal, Pneumonia

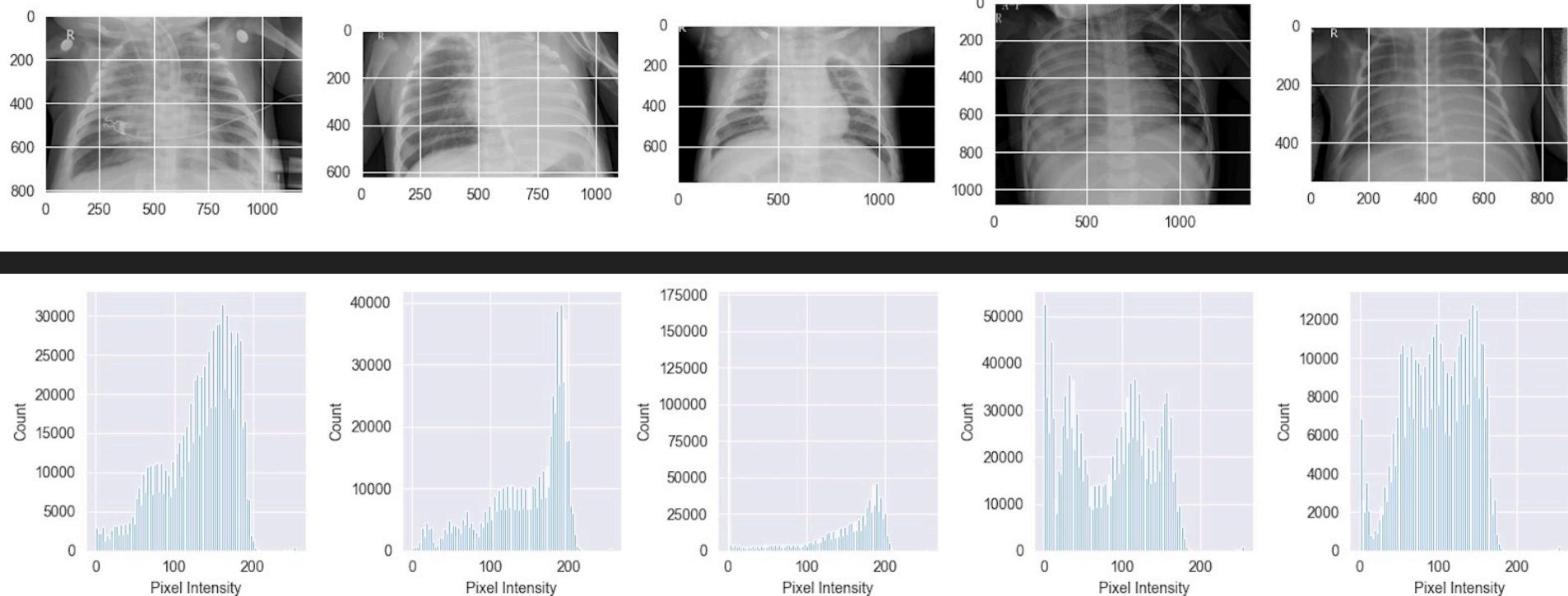
Agenda

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

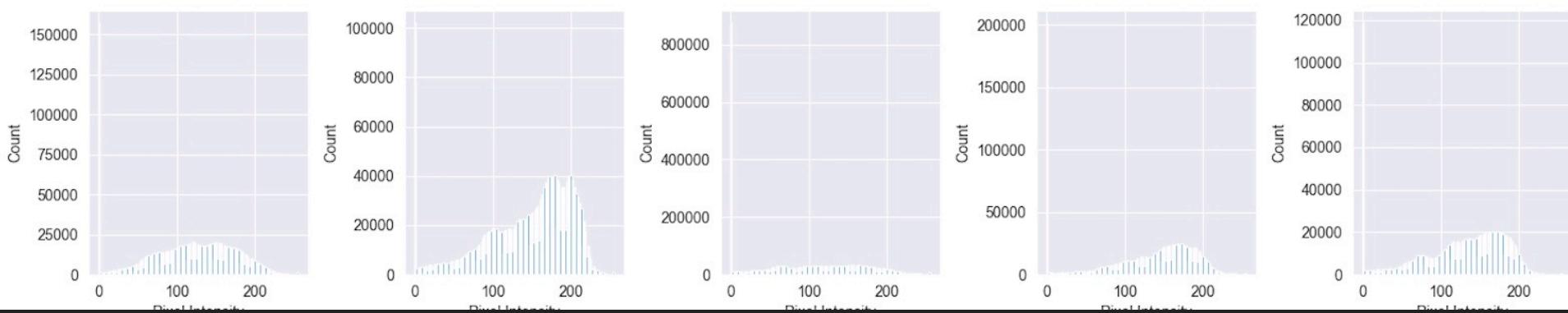
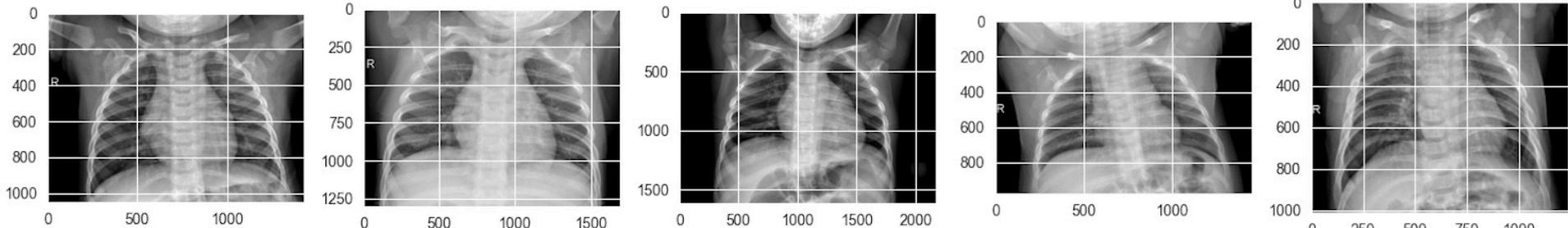
Business and Data Understanding

- **Stakeholder:** Local Hospital System
- **Use case:** Predict “Pneumonia” cases
- **Dataset:** 5856 Entries, T
- **Training Set:** 3210 (Pneu), 1115 (Norm), .35 Ratio
- **Target Variable:** Category[Pneumonia:1,Normal:0]
- **Primary Metrics:** Recall, F1-Score, Loss

Pneumonia Pixel Distribution



Normal Pixel Distribution



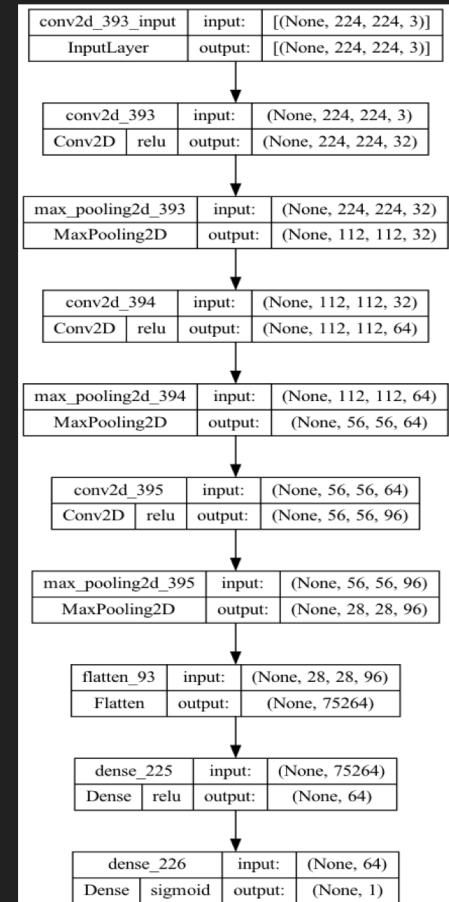
Modeling

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

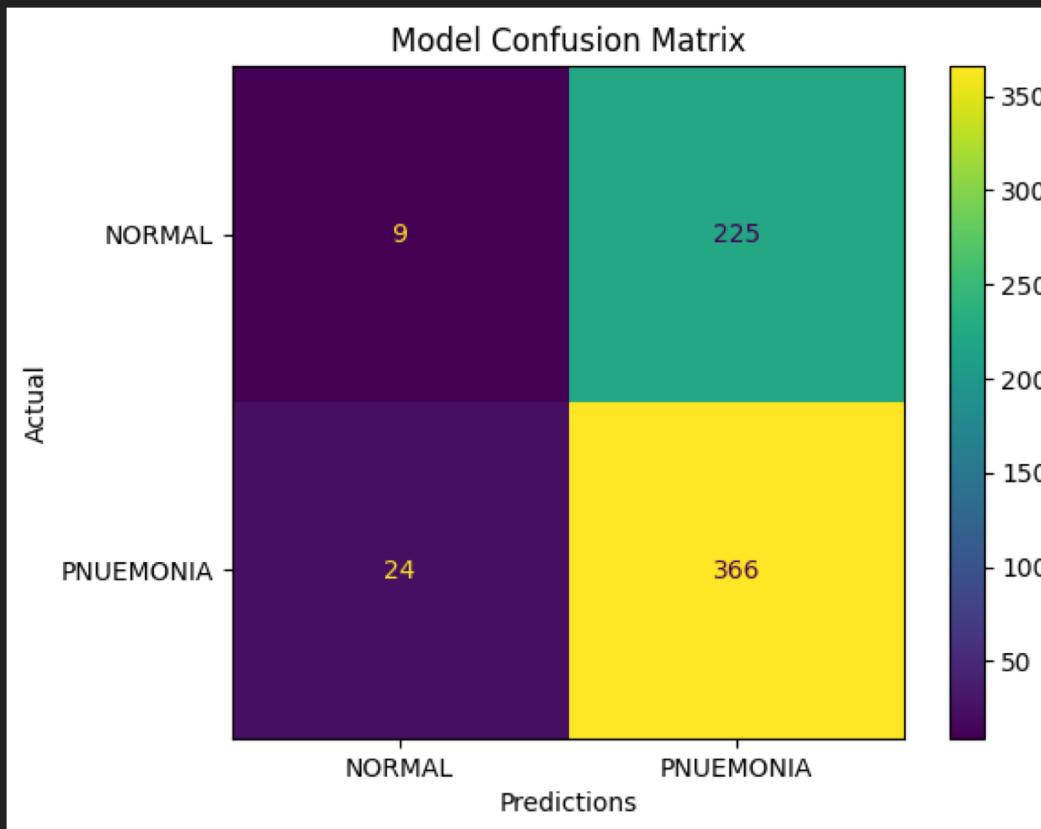
- The Final Model metrics (Normal):
 - Recall Score (Lowest False Neg) : ~.04
 - F1 Score(Harmonic Mean): ~.07
- The Final Model metrics (Pneumonia):
 - Recall Score (Lowest False Neg) : ~.94
 - F1 Score(Harmonic Mean): ~.75
 - Final Model Loss (Error Accuracy): ~.68



Final Model Architecture

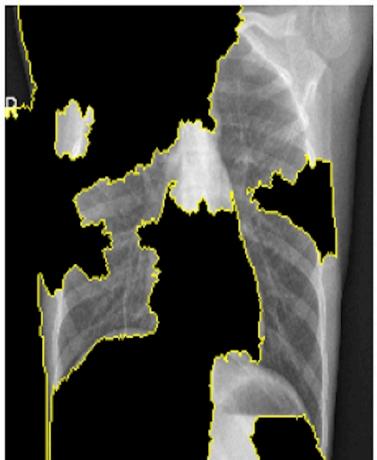
Final Model's Prediction

- Accurate “Normal” Prediction: 9
- Incorrect “Normal” Prediction: 24
- Accurate “Pneumonia” Prediction: 366
- Incorrect “Pneumonia Prediction: 225

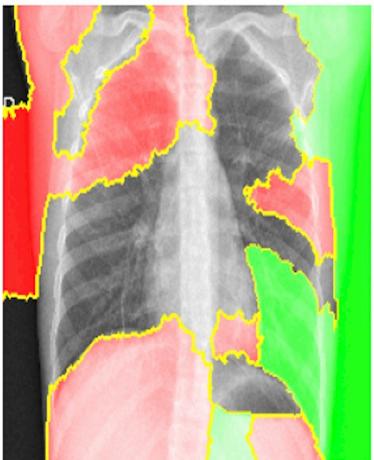


Final Model's Prediction

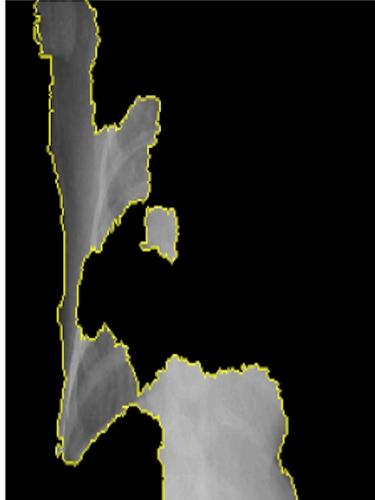
Areas Contributing to Prediction



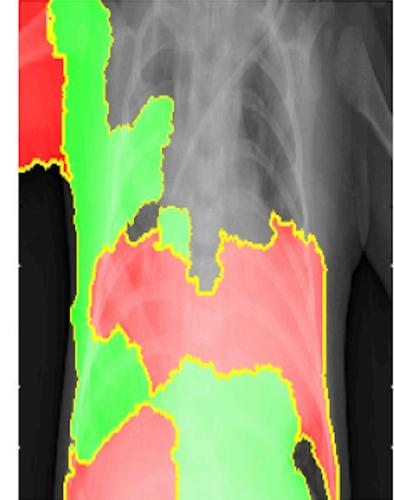
Probability Enablers (G) & Disablers (R)



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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