Pneumonia Detection In Pediatric Chest X-rays

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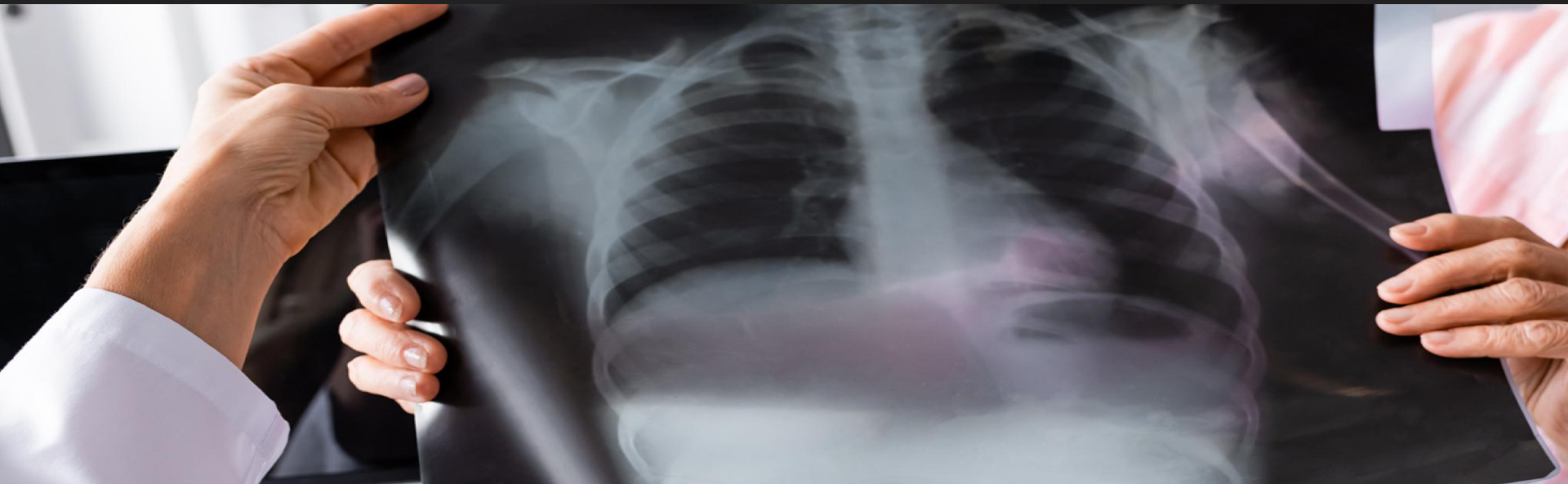


Business Problem

Create a model to detect Pneumonia in chest x-rays in order to help doctor diagnoses.

Models

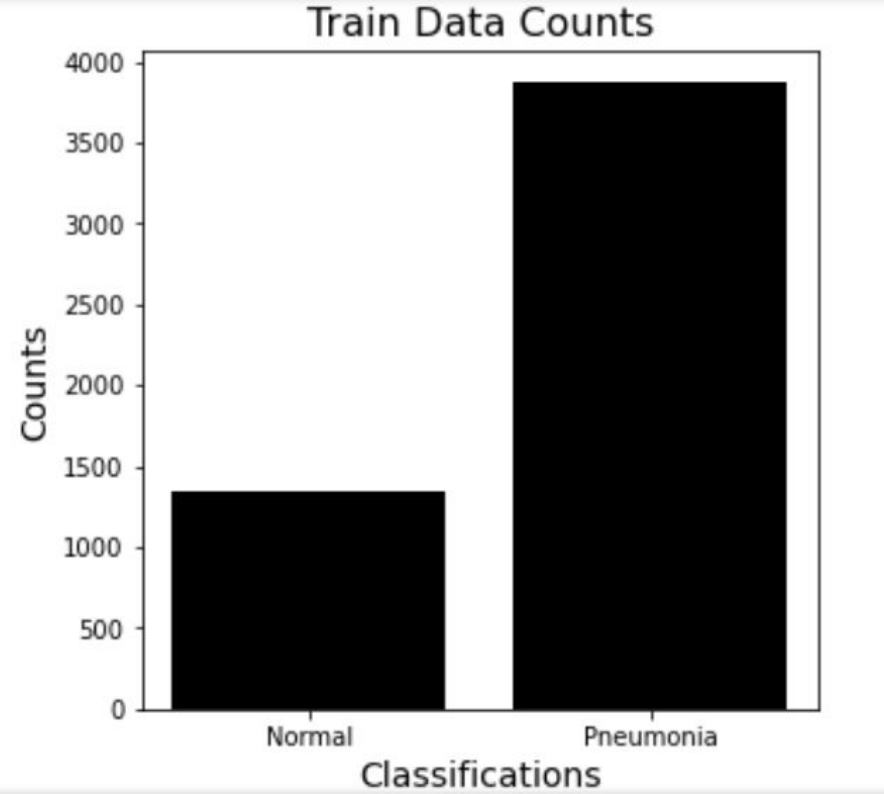
- Multi - Layer Perceptron Models (MLP)
- Convolutional Neural Network Models (CNN)

Metrics

- Accuracy & Recall
- Evaluated With Recall

Data

- 5,856 X-ray Images:
  - Train - 5,216
  - Validation - 16
  - Test - 624
  - Switch Validation and Test!
- Image Processing
  - Rescaling
  - Target Size 64 x 64
  - Reshaping
- Class Imbalance
  - Normal - 1,341
  - Pneumonia - 3,875
  - Custom Class Weight



Visualization

Pneumonia X-rays reveal areas of opacity

Normal X-rays



Pneumonia X-rays



Multi - Layer Perceptron Models (MLP)

Baseline Model

- 4 Layers

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Model	Train Acc	Val Acc	Train Recall	Val Recall
Baseline	0.9749	0.7612	0.9500	0.3846

Multi - Layer Perceptron Models (MLP)

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Second Model

- L1
- Early Stopping

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Model	Train Acc	Val Acc	Train Recall	Val Recall
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Second	0.9151	0.8157	0.9828	0.6368

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Third Model

- Dropout (0.1)

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Model	Train Acc	Val Acc	Train Recall	Val Recall
Baseline	0.9749	0.7612	0.9500	0.3846
Second	0.9151	0.8157	0.9828	0.6368
Third	0.8635	0.8381	0.9918	0.8034

Convolutional Neural Network Model (CNN)

Baseline Model

- 3 Convolutional & Max Pooling Layers

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Model	Train Acc	Val Acc	Train Recall	Val Recall
Baseline	0.9544	0.7131	0.8486	0.2479

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Model	Train Acc	Val Acc	Train Recall	Val Recall
Baseline	0.9544	0.7131	0.8486	0.2479
Second	0.9471	0.7997	0.9180	0.5299

Convolutional Neural Network Model (CNN)

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Third Model

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Convolutional Neural Network Model (CNN)

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Second Model

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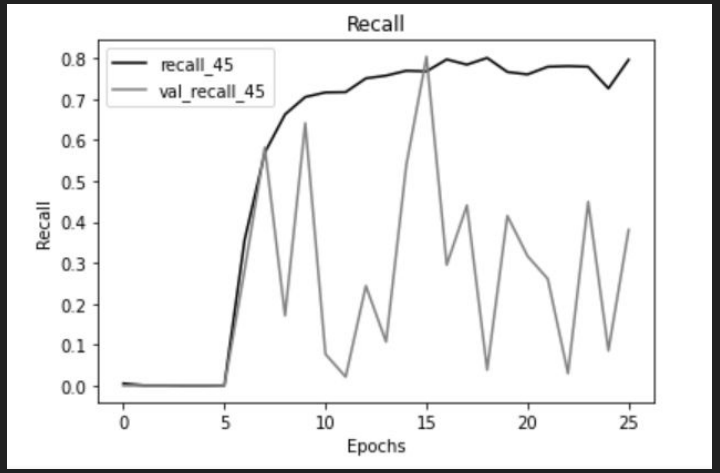
Third Model

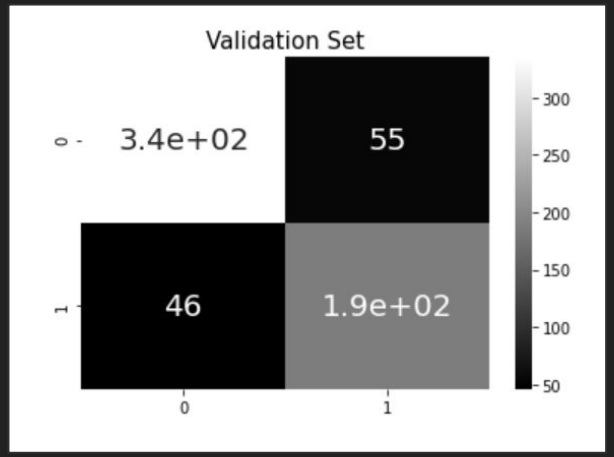
- L1

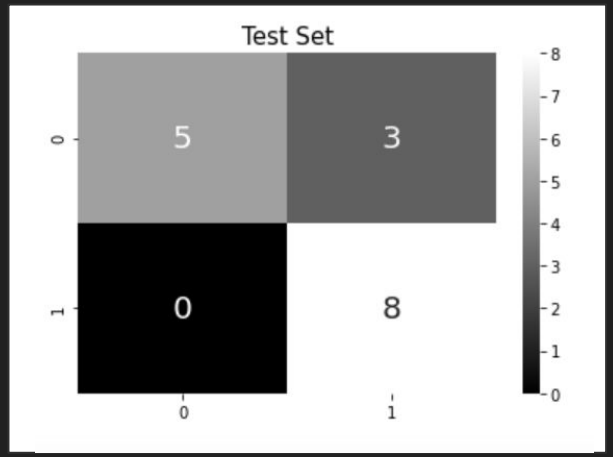
Model	Train Acc	Val Acc	Train Recall	Val Recall
Baseline	0.9544	0.7131	0.8486	0.2479
Second	0.9471	0.7997	0.9180	0.5299
Third	9417	0.7837	0.8665	0.4701

Final Model

- Third MLP Model
  - l1 = 0.0005
  - Activation = ‘relu’ & Activation = ‘sigmoid’
  - Dropout 0.1
  - Early Stopping
- Recall Results
  - Train = 0.9918
  - Validation = 0.8034
  - Test = 1







Next Steps

- Run more models to try and improve Recall score
- Try other techniques to minimize overfitting, such as batch normalization
- Implement transfer learning models