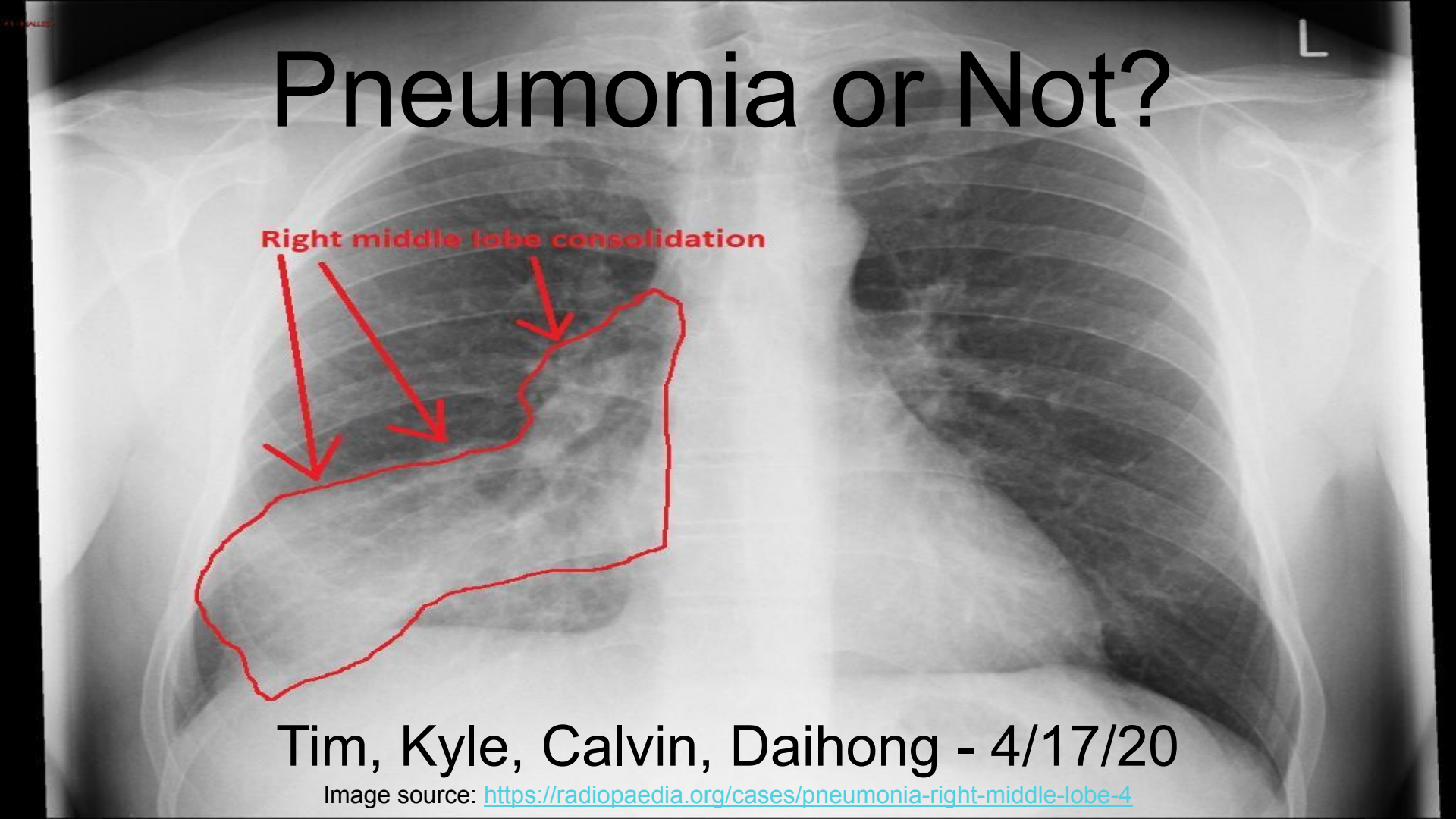
Pneumonia or Not?

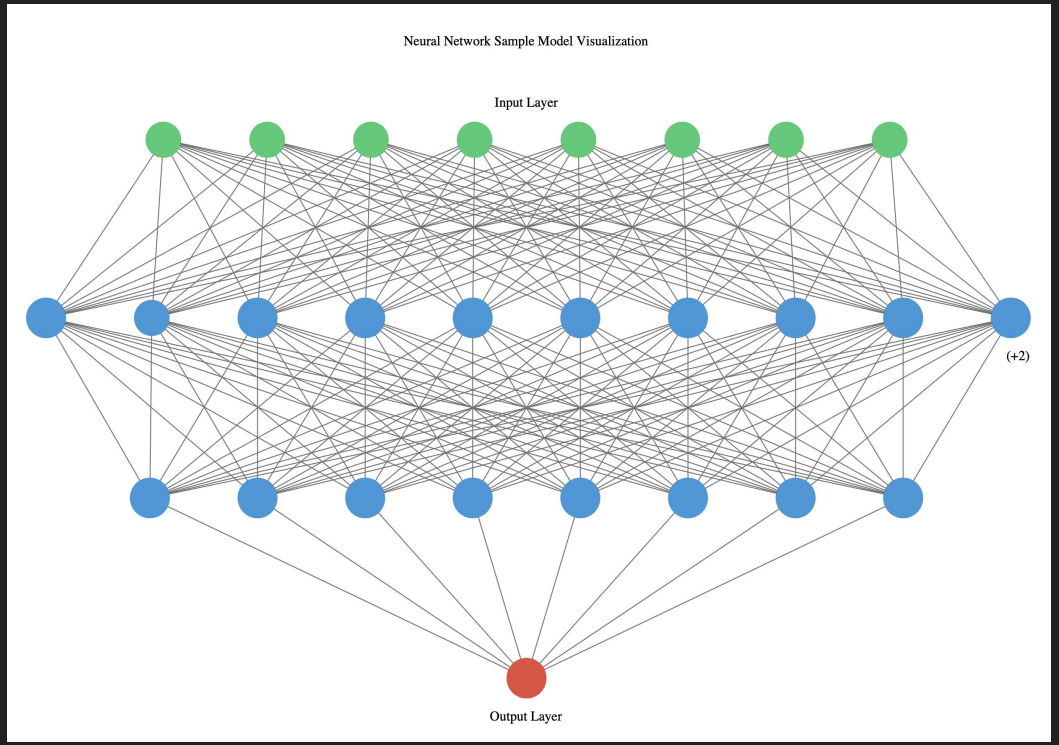


Tim, Kyle, Calvin, Daihong - 4/17/20

Image source: https://radiopaedia.org/cases/pneumonia-right-middle-lobe-4

Problem Domain

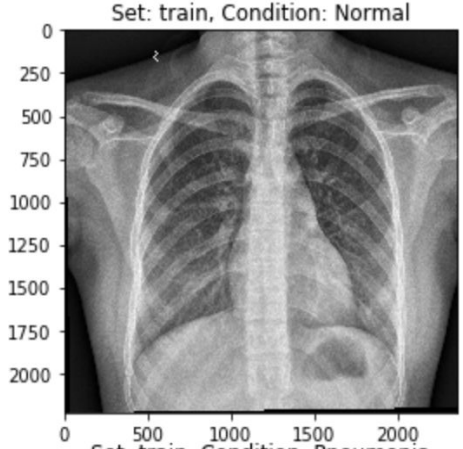
1. Accurately diagnose Pneumonia
2. Aid human expert shortcomings
    a. fatigue, subjectivity
3. Rural areas lack staff & resources
    a. Reduce healthcare system burden during pandemics
4. Computer model isn't always right
5. How to gauge and measure accuracy

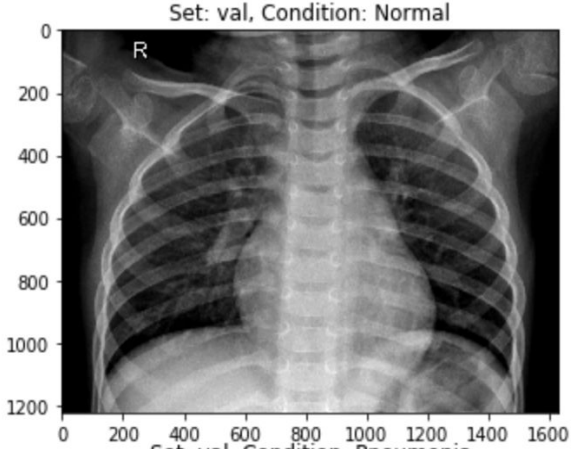


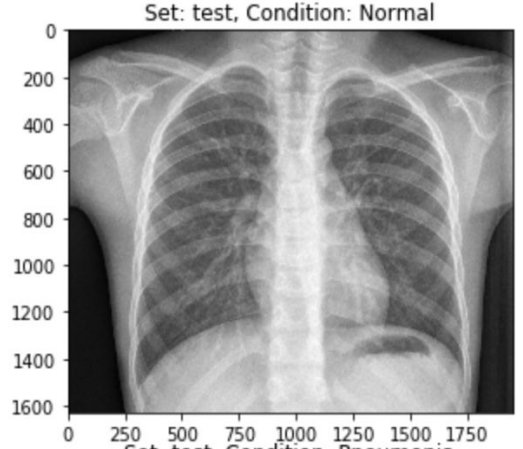
Overview of Methodology

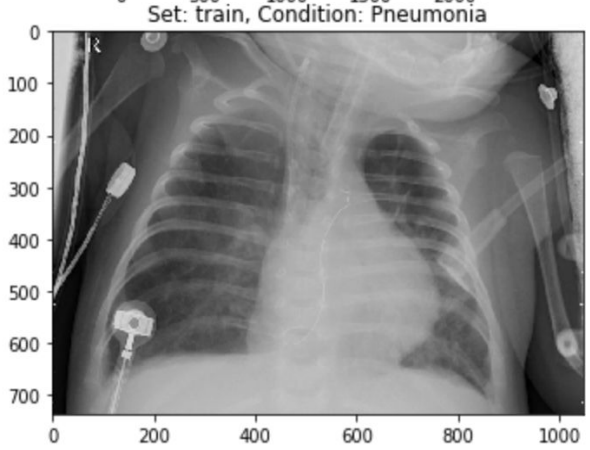
1. Check that all images are in the same format
2. Create a directory for Training, Validation and Testing images
3. Read the images from directory
4. Build and test a transferred learning algorithm
5. Build and test Convolutional Neural Networks to fit the subset of data
6. Tune hyperparameters
7. Retrain the model to fit the large dataset
8. Evaluation of the model (confusion matrix & classification report)

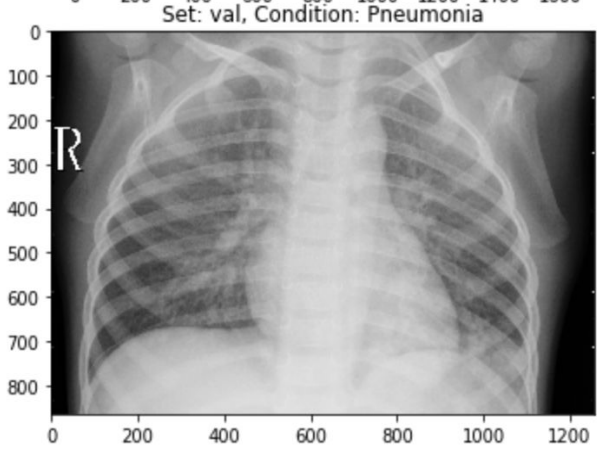
Raw Images

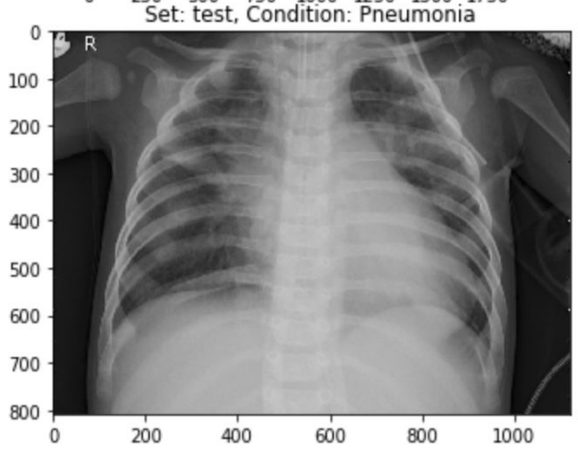

Set: train, Condition: Normal


Set: val, Condition: Normal

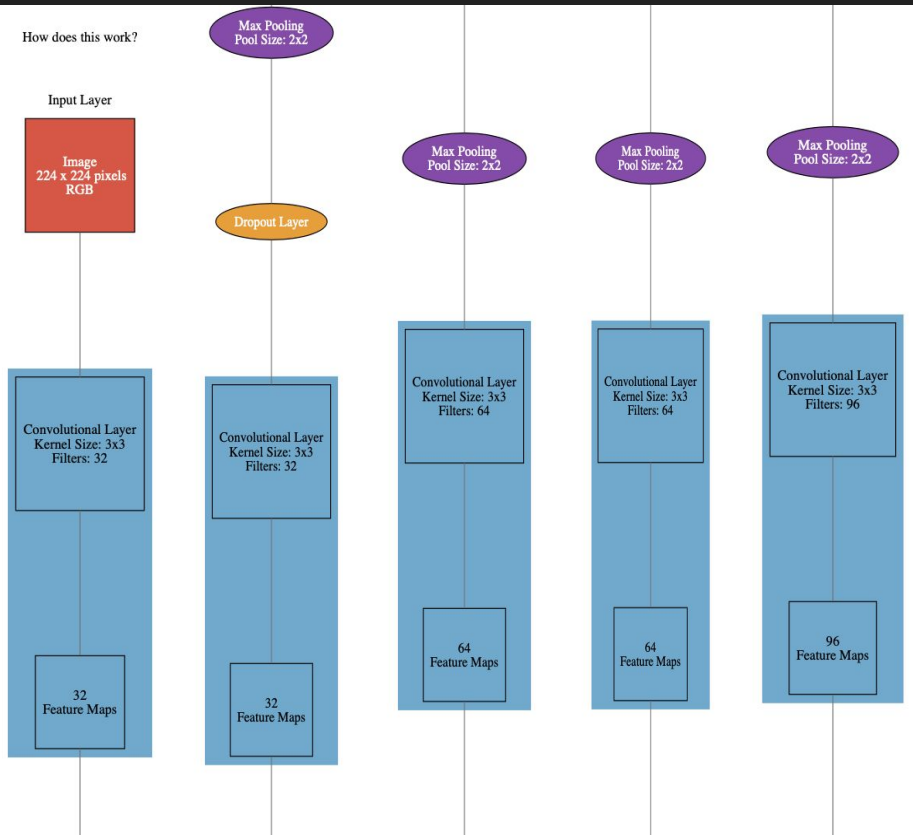

Set: test, Condition: Normal

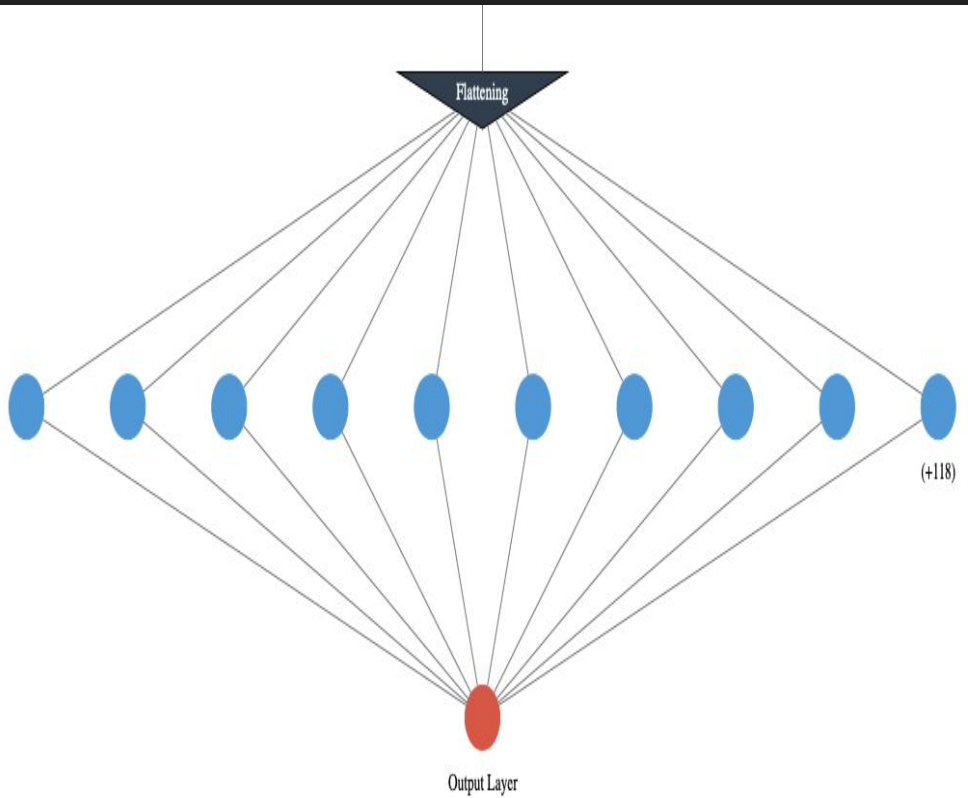

Set: train, Condition: Pneumonia


Set: val, Condition: Pneumonia

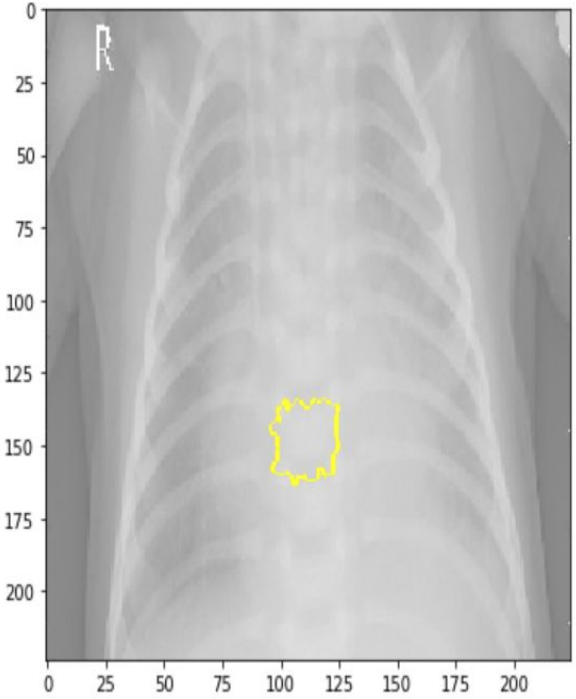

Set: test, Condition: Pneumonia

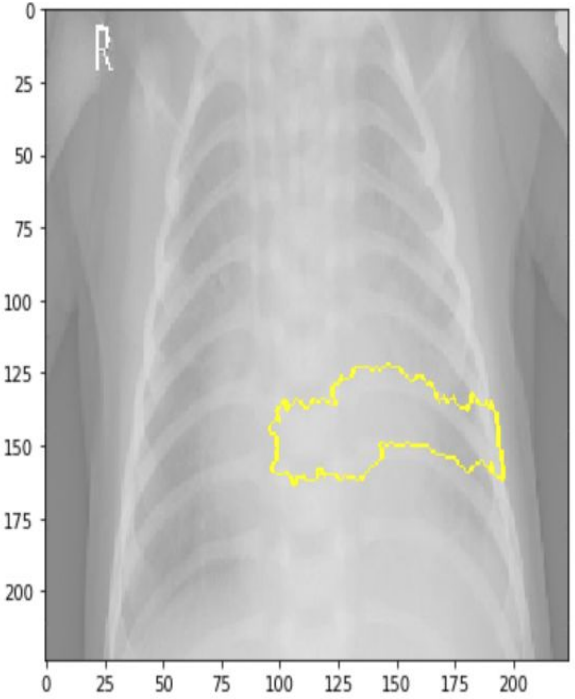
Final Model Visualized

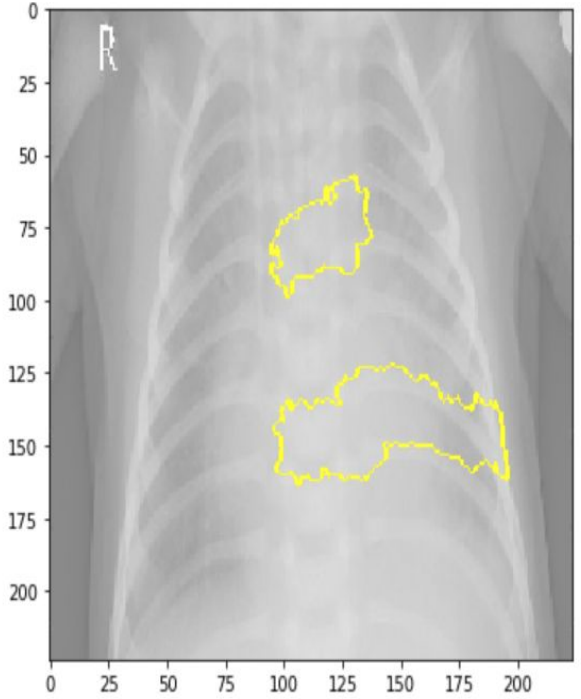




Interpreting the Model







Evaluation

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Accuracy: 0.789
F1 Score: 0.856
Recall: 0.997
Precision: 0.749
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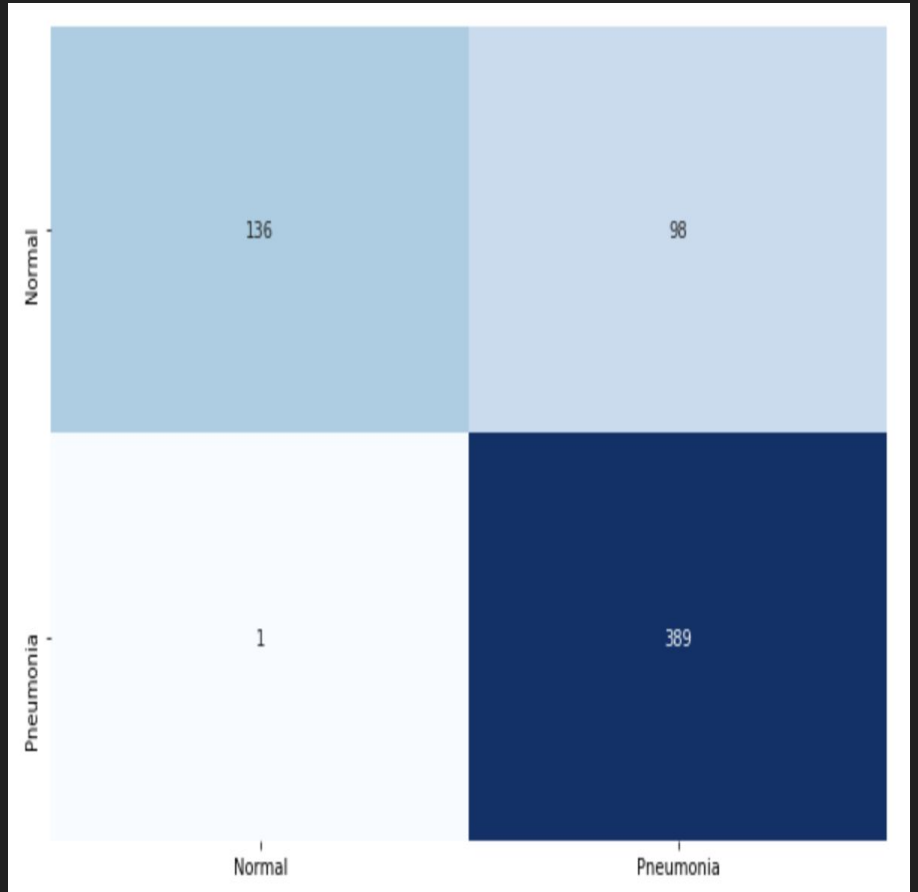

Conclusion & Recommendations

- Satisfactory accuracy:
  - Image with Pneumonia is predicted correctly 99%
  - If model predicts Pneumonia it is correct 86%
- Further research to reduce false positive rate
- Algorithm can be adapted to other medical image recognition tasks.
- Overall, executives should care as this has potential savings in operation costs as well as increased efficiency and reduced wait times.