# Childhoold Pneumonia Detection

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Pneumonia is the world's leading infectious killer of children, claiming the lives of more than 800,000 children under the age of five every year, more than 2,000 every day.

These deaths are preventable

Unicef, 2019

What is Childhood Pneumonia?

- Pneumonia is an infection in the lungs

- The airsacs (alveoli) fill with fluid and pus making breathing difficult, or painful

- Most often caused by bacteria, viruses or fungi.

- Bacterial pneumonia must be treated timely with antibiotics

- This project uses neural networks to classify whether an chest x-ray of a sick child indicates pneumonia (either bacterial or viral)

Childhood Pneumonia JAMA. 2017;318(5):490. doi:10.1001/jama.2017.9428
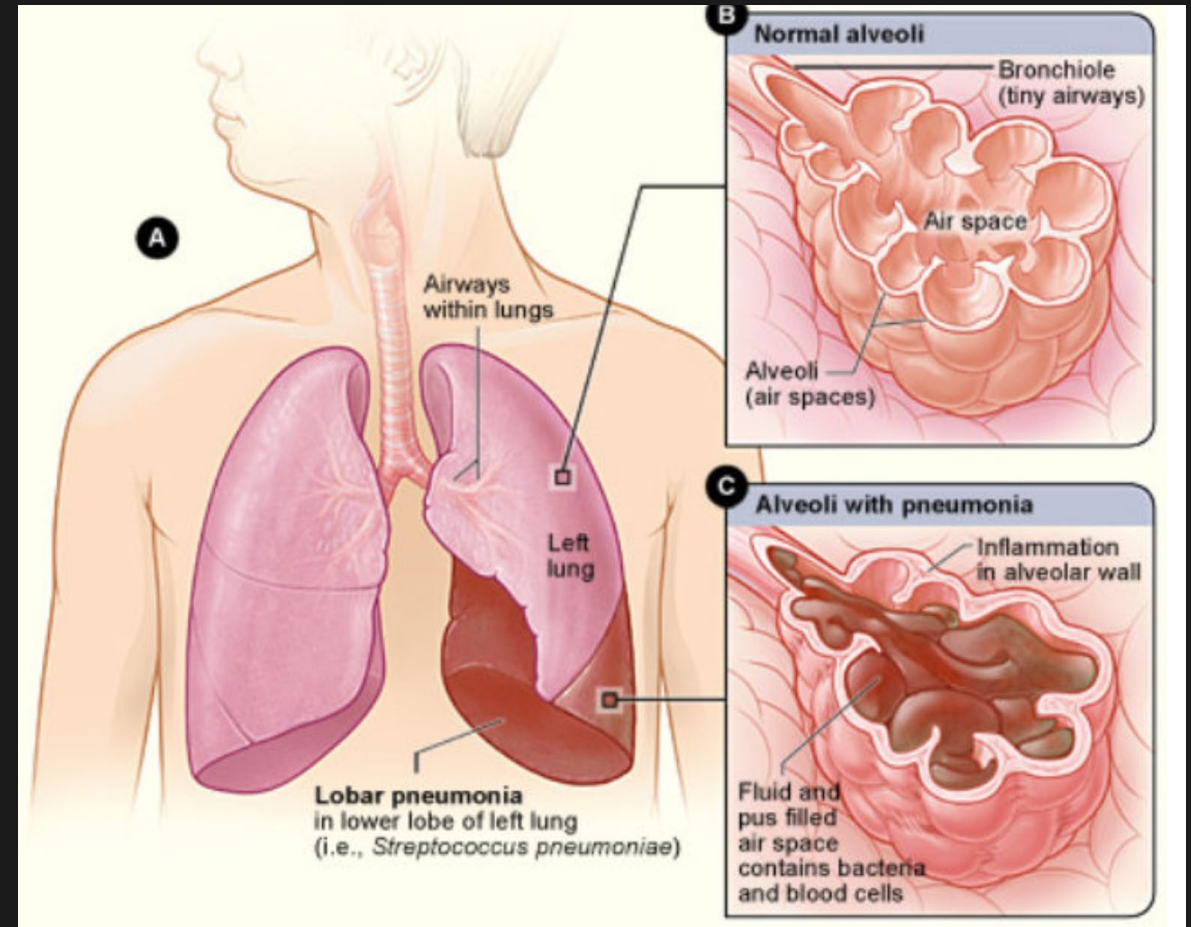
Business Objective: To Improve Treatment through Faster and More Accurate Diagnosis

- Reading chest x-rays requires significant skill.

- Comparisons to human reading of charts shows a large variation in skill

- Childhood pneumonia is most prevalent in countries with limited numbers of skilled personnel to read chest xrays accurately. Delays in diagnosis are critical.
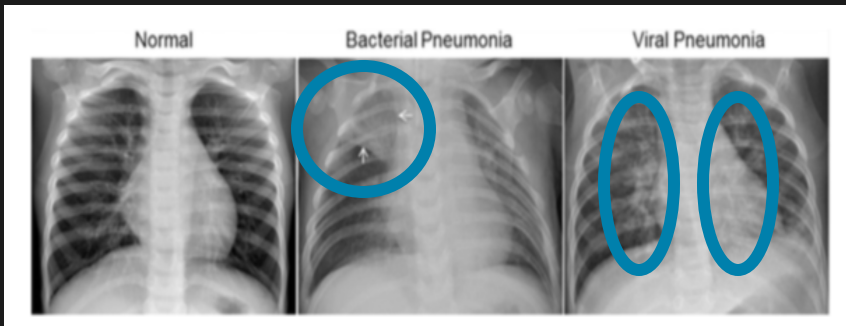
Weighted Error Comparison between human experts and model (Diabetic Retinopathy Imaging)
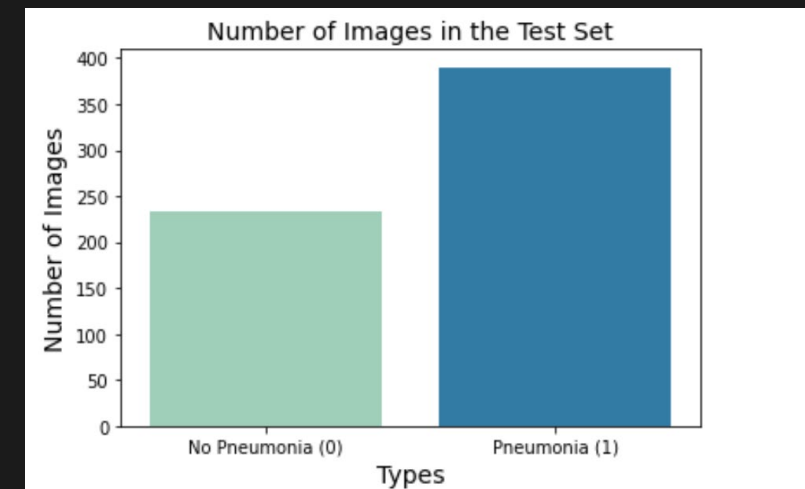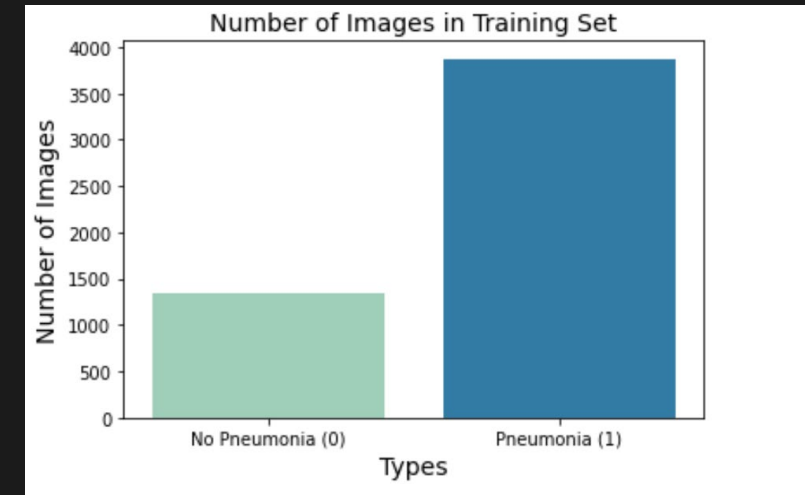
Description of the Dataset

- Chest X-ray images of children 1-5 years old

- Guangzhou Women and Children's Medical Center, Guangzhou, China

- All radiographs screened for poor imaging quality.

- The diagnoses were graded by two expert physicians. The testset was also checked by a third expert.
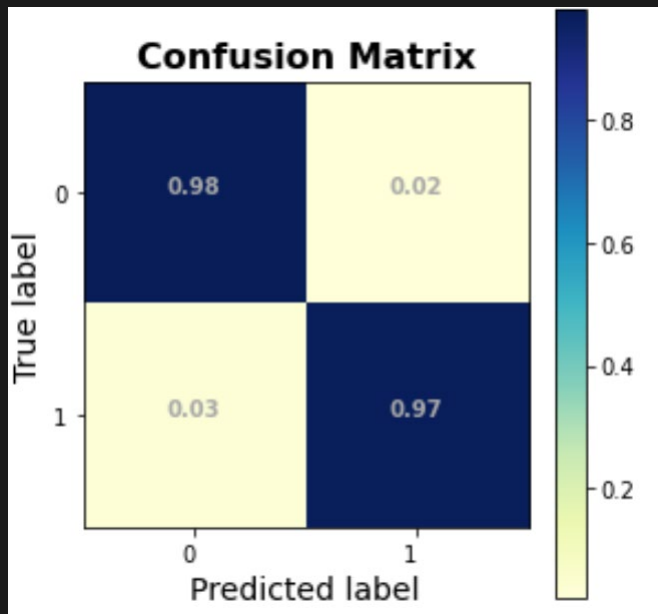

PNEUMONIA CASES

NORMAL CASES

Results – Potential for More Accurate Classification Models

Confusion Matrix

1 = has pneumonia
0 = doesn't have pneumonia

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****************************************************
    CLASSIFICATION REPORT:
****************************************************
           precision    recall   f1-score   support

        0       0.91      0.98       0.94       134
        1       0.99      0.97       0.98       388

 accuracy                            0.97       522
```

- Accuracy of 97% on limited sample data

- Conclusion: There is a high potential for a higher accuracy diagnostic models for chest-xrays of childhood pneumonia

Recommendation - 1

- Use Deep Learning Models to aid health care workers, either as a Pre-screening tool, or as 2nd opinion.

    - Freeing up valuable medical resource time, while improving diagnostic accuracy

    - Remote diagnosis is possible, improving time-to-diagnosis, especially in regions where there are few skilled technicians available to read the x-rays

Recommendations – 2 & 3

2. Try lower resolution images (32,32) or (64,64) for models. Deep learning models are surprisingly good at classification at lower resolution (than usually what humans can do).

   • This may be a good way to approximate the effect of older, lower resolution x-ray machines, which more impoverished parts of the world

3. Convolutional Neural Networks work best – choose 2-5 convolutional layers, batch sizes 32-64, with a metric of val_accuracy. Since metrics are collected after each epoch, choose smaller step size and more epochs in order to hone in on the best model more easily.
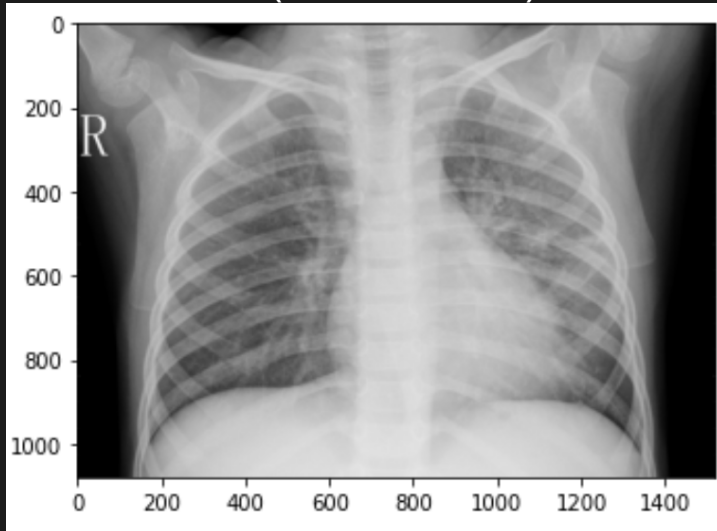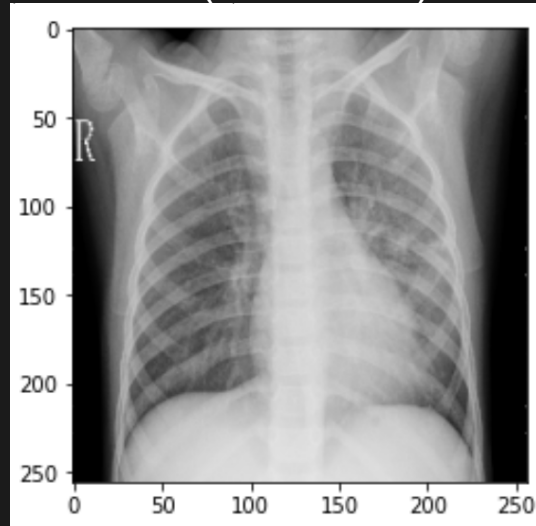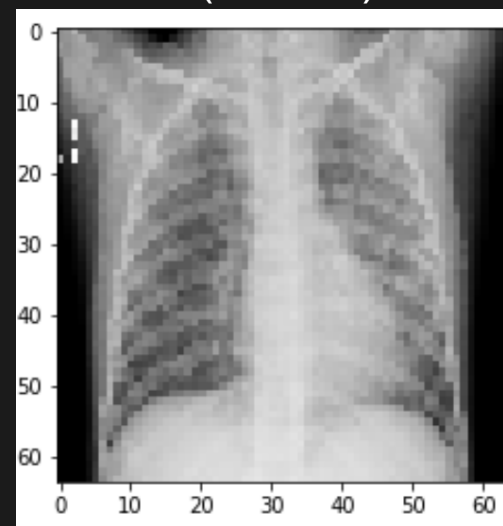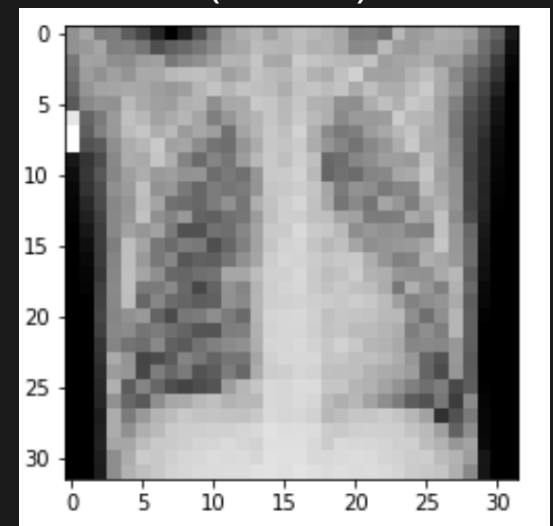

(1080, 1520)   (256 , 256)   (64 , 64)   (32 ,32)

Questions?

Thank You

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