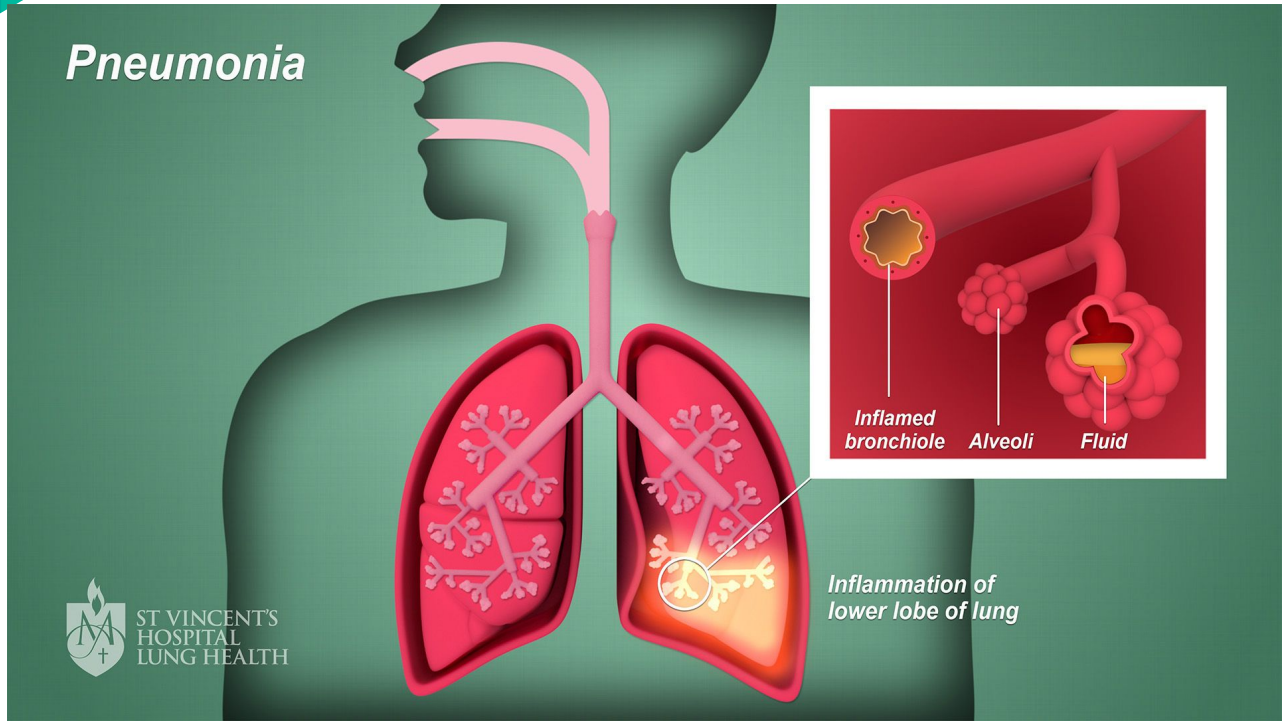
Using Computer Vision To Diagnose Pneumonia

By: Vivienne DiFrancesco

What is pneumonia?

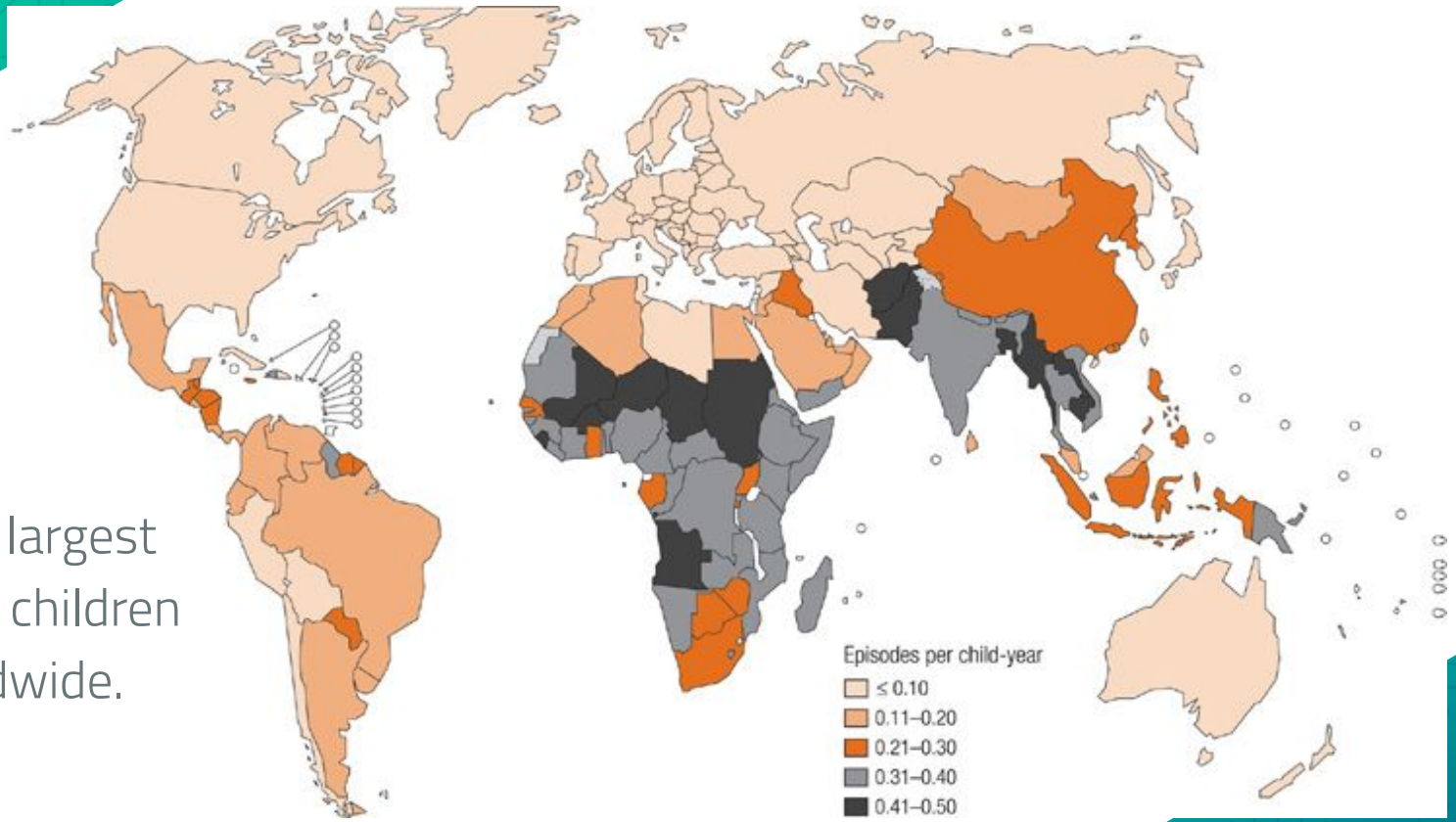
Pneumonia affects people of all ages with 50,000 deaths from pneumonia in the US each year.



Source: CDC

Childhood pneumonia

Pneumonia is the largest infectious killer of children under age 5 worldwide.



Source: World Health Organization

About the disease

Symptoms:

- Cough
- Chest pain
- Fatigue
- Fever, chills

Treatments:

- Antibiotics
- Cough medicine
- Pain relievers
- Hospital stay

Prevention:

- Vaccines
- Good hygiene
- Keep healthy habits

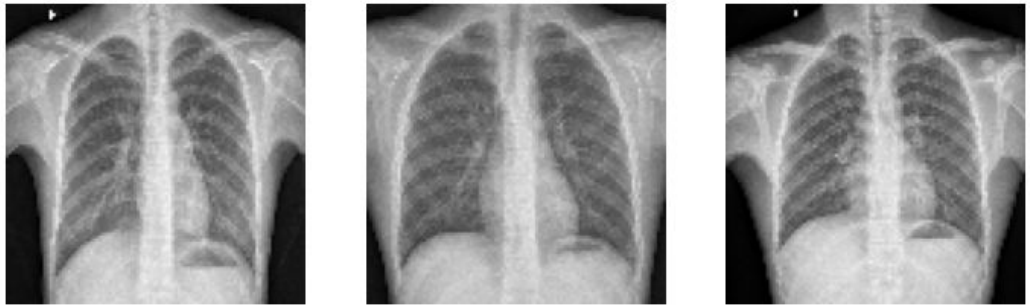
Source: Mayo Clinic

If we had technological tools that could help doctors diagnose patients more accurately and quickly, it could reduce costs, ease suffering, and save lives.

The Data

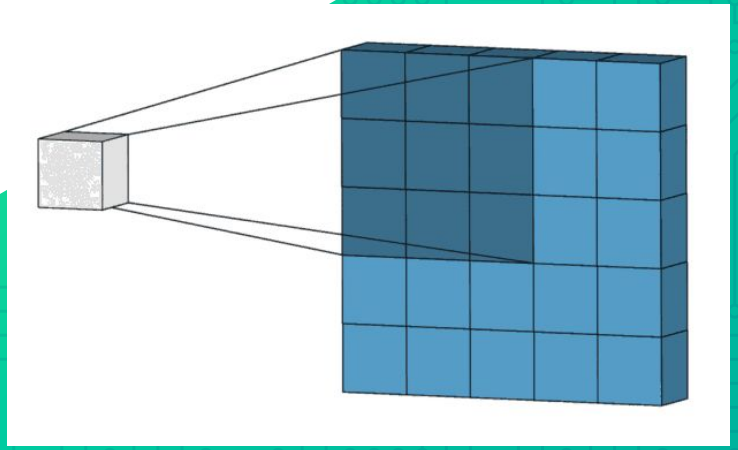
Over 5,800 X-rays of children between one and five.

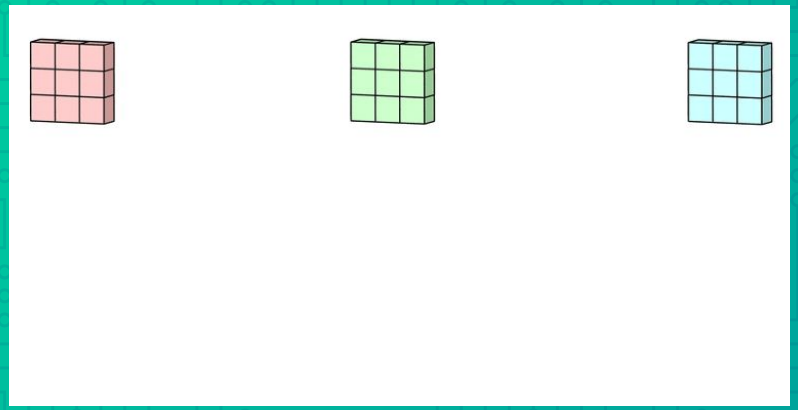
Normal X-Ray Images



Pneumonia X-Ray Images

Convolutional Neural Network (CNN)





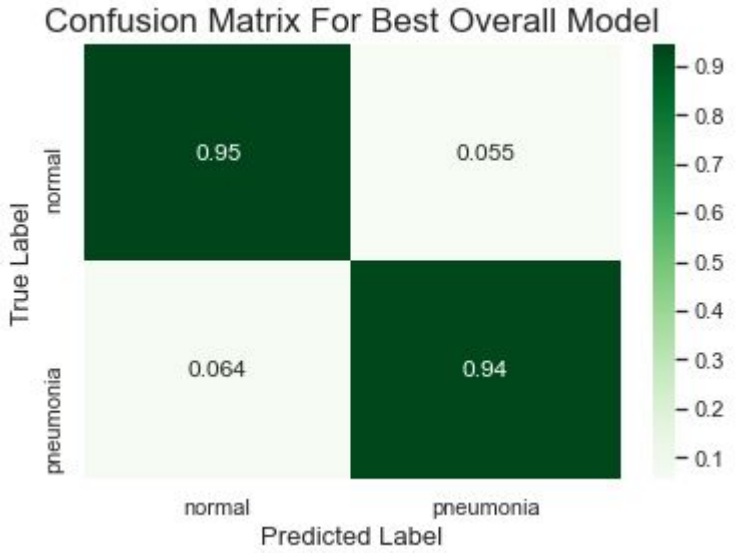
- Main principle behind the term “computer vision”
- Scans across the pixels of images to take in the details of the pictures
- Computer makes many of these scans, compiles them, scans again.

Method

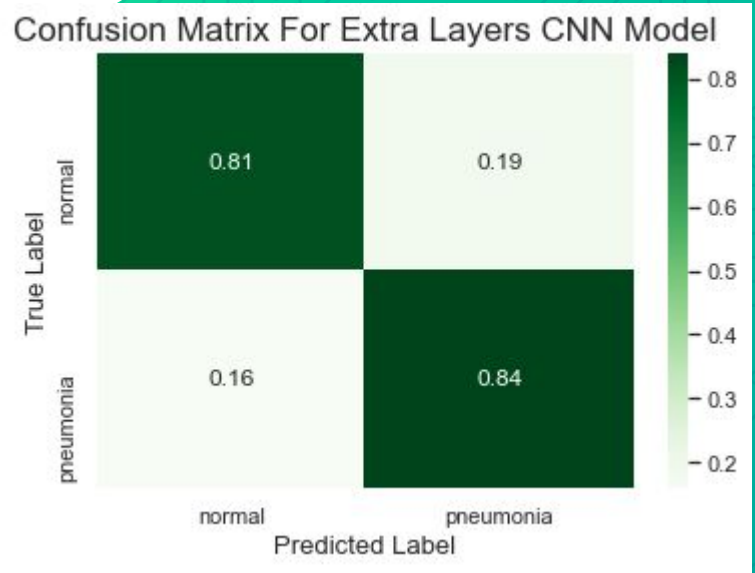
1. Build simple CNN model as a base
2. Test out different parameters and compare to the base model
3. Combine parameters that improve performance to come up with a best overall model

Best Model Results

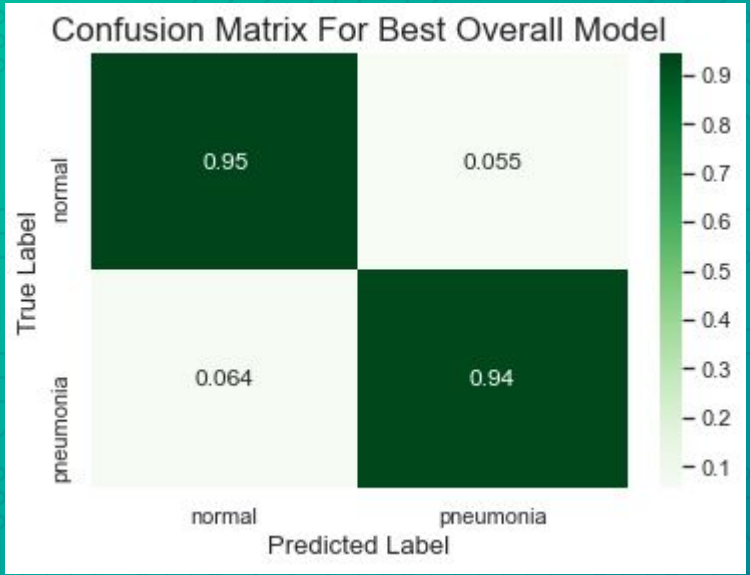
- Overall accuracy of 94%
- Low number of false positives and false negatives



Recommendation 1:
Use a simpler model



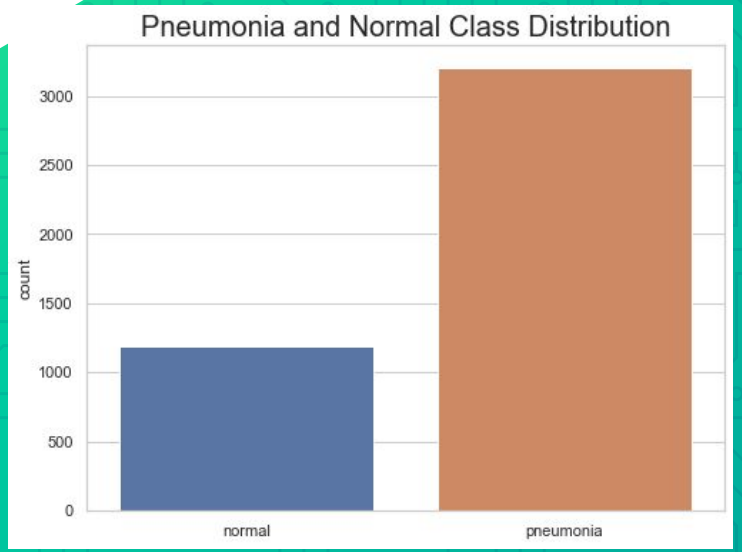
Complex

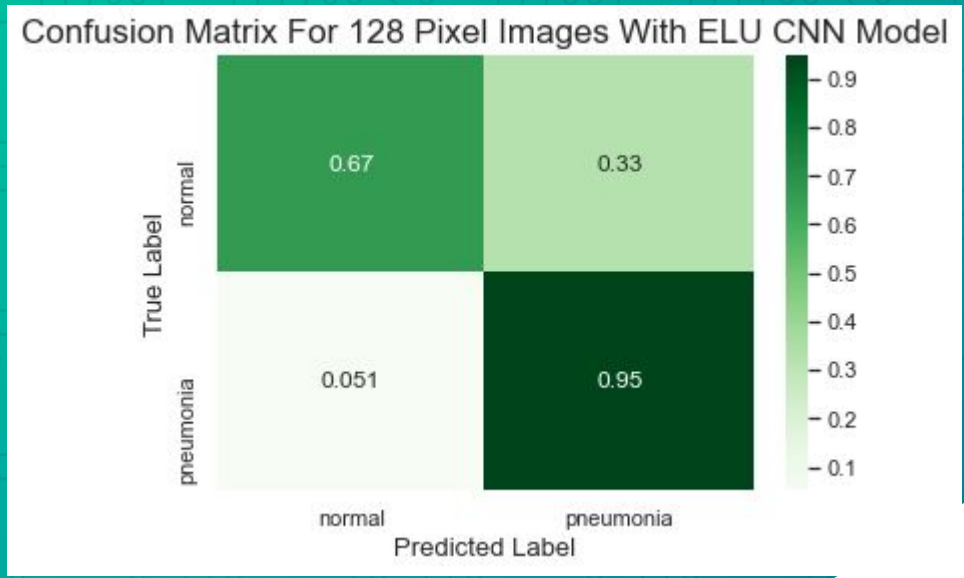


Simple

Recommendation 2:

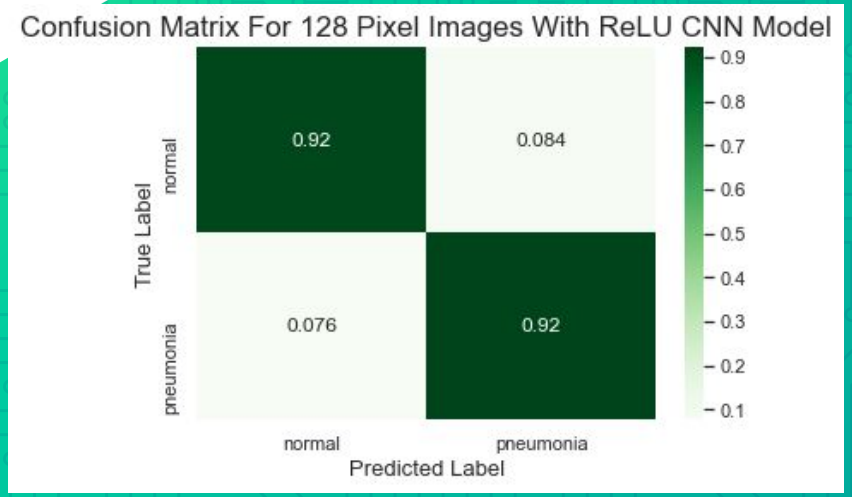
Oversample the data to correct for class imbalance



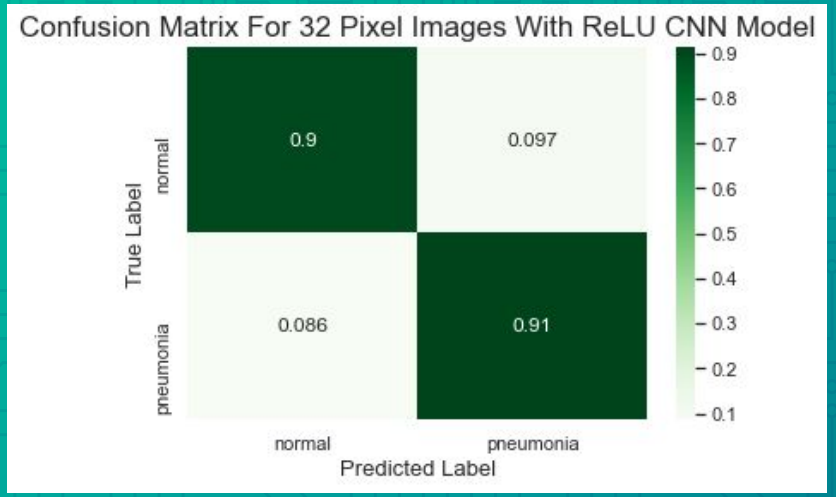


Recommendation 3:

Use image size to your advantage



128 Pixels



32 Pixels

Recommendations

- Use a simpler model
- Oversample the data to correct for class imbalance
- Use image size to your advantage based on the goals with using the model

Future Work

- Test out pretrained models for greater accuracy
- Continue testing different parameters or options
- Add more data!
  - Train the model to predict adult X-ray images?

Thank you for your time

Any questions?