

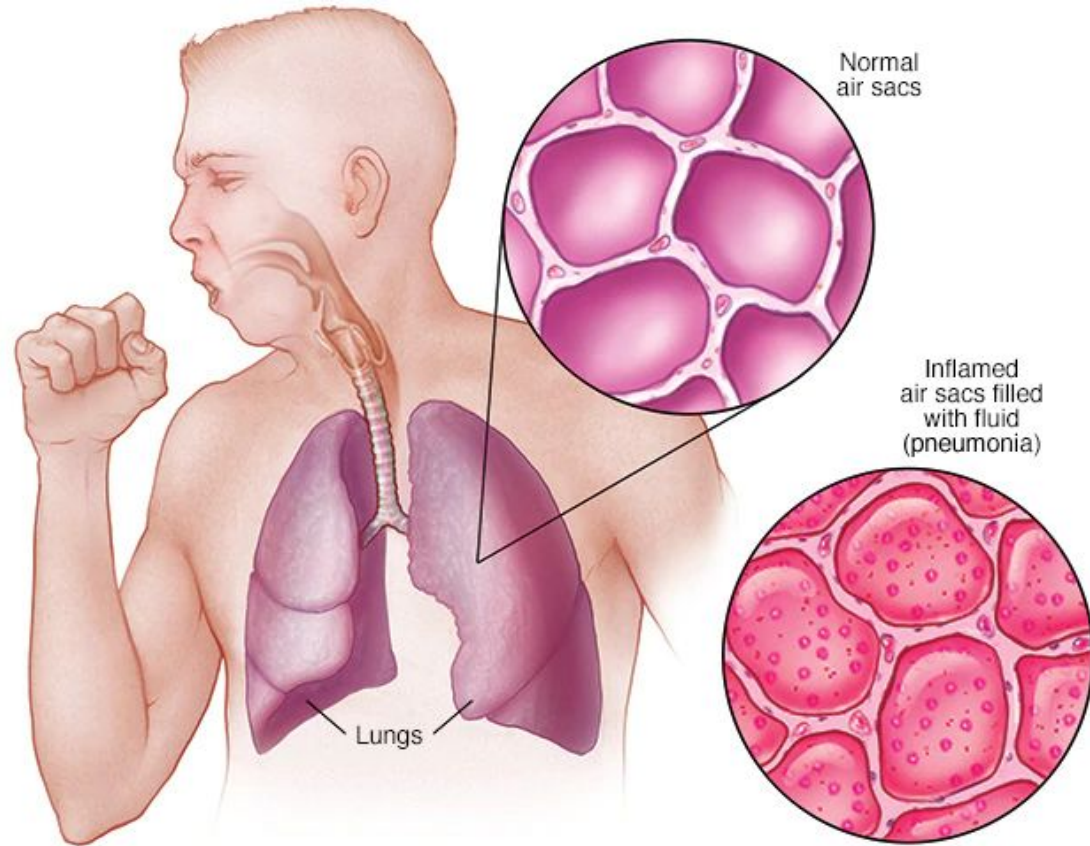


Pneumonia Diagnosis

Kiran, Zenchang, Ethan, Neel, Nidhya, and Ayesha

What is pneumonia?

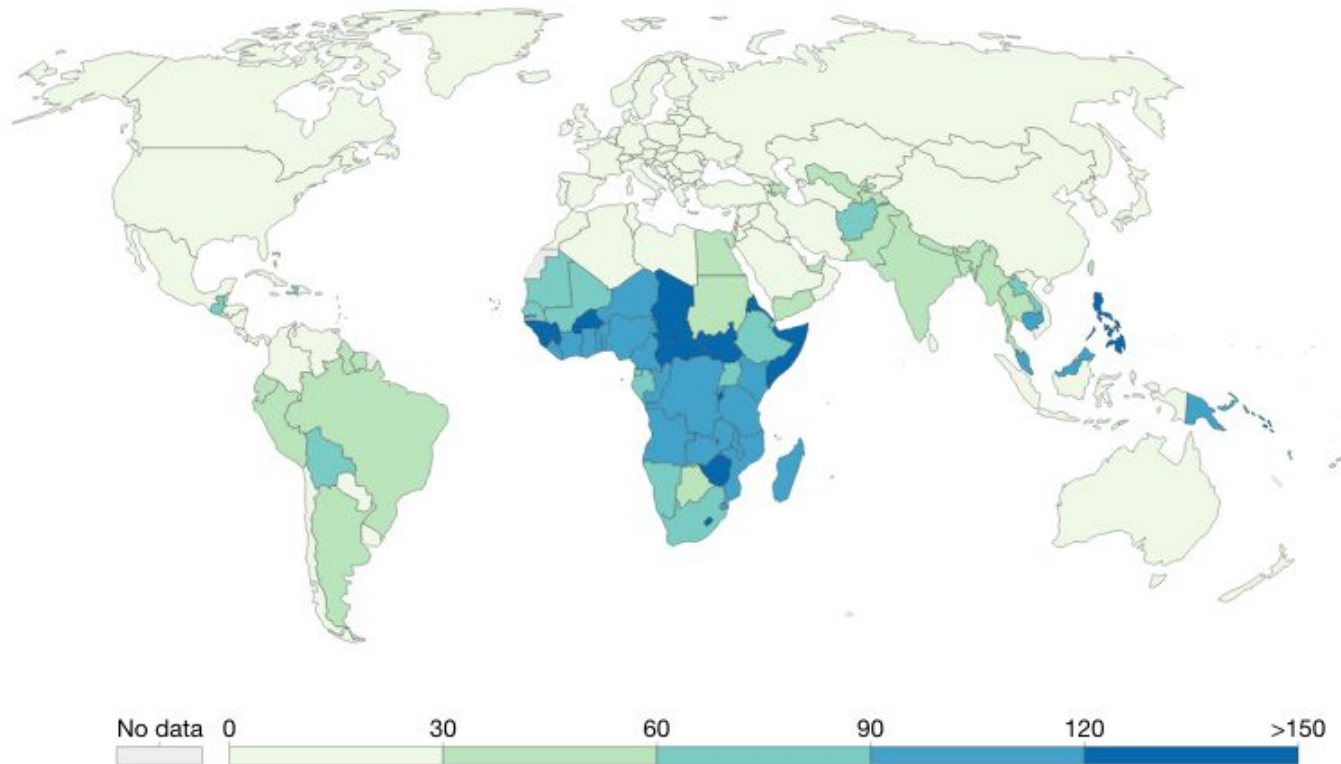
- It is a lung infection
- 2.5 million annual deaths
- Treated with antibiotics
- Various causes



Death rate from pneumonia, 2017

The annual number of deaths from pneumonia per 100,000 people.

Our World
in Data



Source: Global Burden of Disease Study, IHME (2018)

Note: To allow comparisons between countries and over time this metric is age-standardized. Deaths from 'clinical pneumonia', which refers to a diagnosis based on disease symptoms such as coughing and difficulty breathing and may include other lower respiratory diseases.

OurWorldInData.org/pneumonia • CC BY

<https://ourworldindata.org/pneumonia>

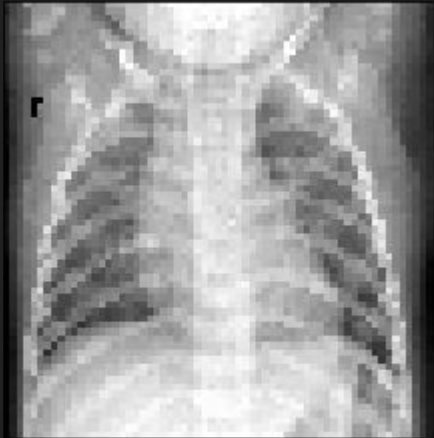
Objective

- To use AI for imaging and prediction
- Faster diagnosis
- Easy/more accessible diagnosis
- Eliminate human error

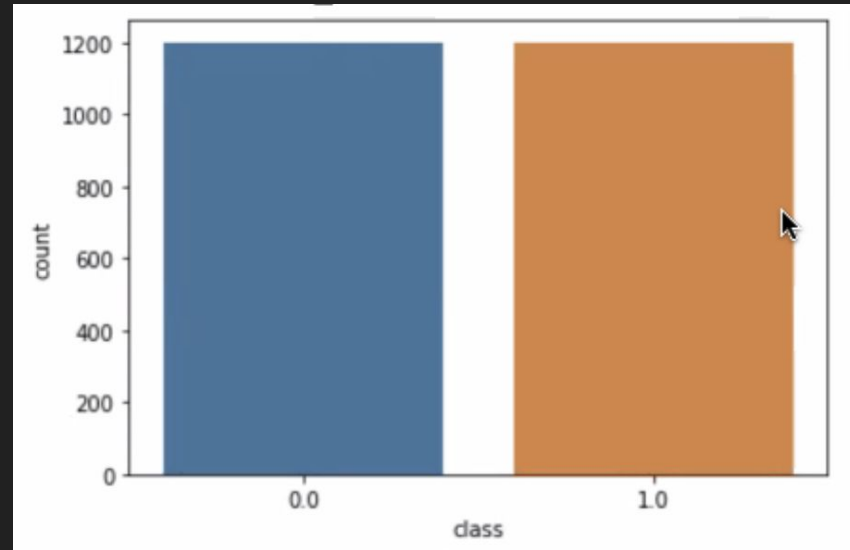


Data

Healthy



Unhealthy



Dataset Augmentation

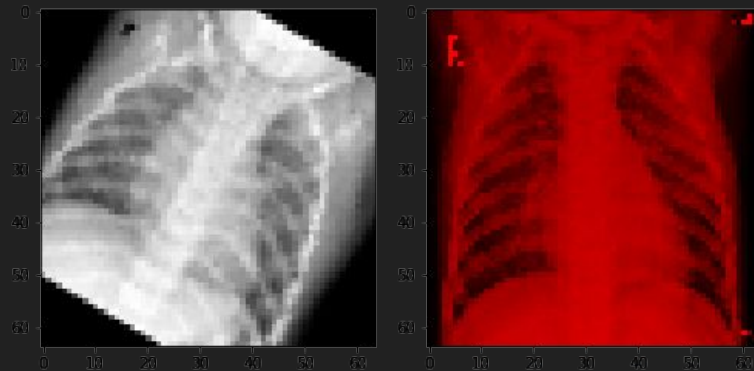
What is Dataset Augmentation?

- Manipulate images in our datasets and train to get a higher accuracy model.

How / Why:

- Scans might be accidentally manipulated in real world applications.

Example on CNN:



Rotating Image

Changing Image RGB

Original Average Accuracy	Average Accuracy After Augmentation
Accuracy is 50 %	Accuracy is 76 %

Methods & Evaluation

- Multiple types of models
- Same input, same classification goal

MODEL	ACCURACY
KNN	70.5
Logistic Regression	67.75
Decision Trees	65.75

Parameter Sweeping - KNN

- Sample parameter: $k = 5$
- Tried $k = 1$ through 9

```
KNN Accuracy when k is 1: 0.74  
KNN Accuracy when k is 2: 0.7875  
KNN Accuracy when k is 3: 0.7275  
KNN Accuracy when k is 4: 0.77  
KNN Accuracy when k is 5: 0.7025  
KNN Accuracy when k is 6: 0.7475  
KNN Accuracy when k is 7: 0.6925  
KNN Accuracy when k is 8: 0.7125  
KNN Accuracy when k is 9: 0.69
```

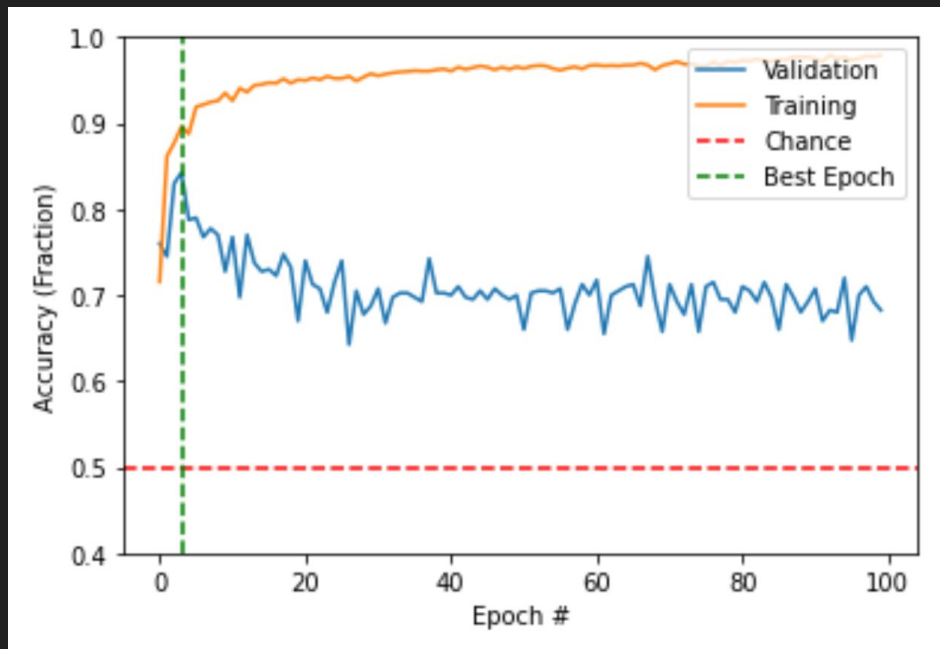
Parameter Sweeping - Decision Tree

- Sample parameter: depth = 2
- Tried depth = 1 through 9

```
Decision Tree Accuracy with depth of 1: 0.6975  
Decision Tree Accuracy with depth of 2: 0.6575  
Decision Tree Accuracy with depth of 3: 0.6825  
Decision Tree Accuracy with depth of 4: 0.7175  
Decision Tree Accuracy with depth of 5: 0.695  
Decision Tree Accuracy with depth of 6: 0.6775  
Decision Tree Accuracy with depth of 7: 0.6675  
Decision Tree Accuracy with depth of 8: 0.68  
Decision Tree Accuracy with depth of 9: 0.665
```

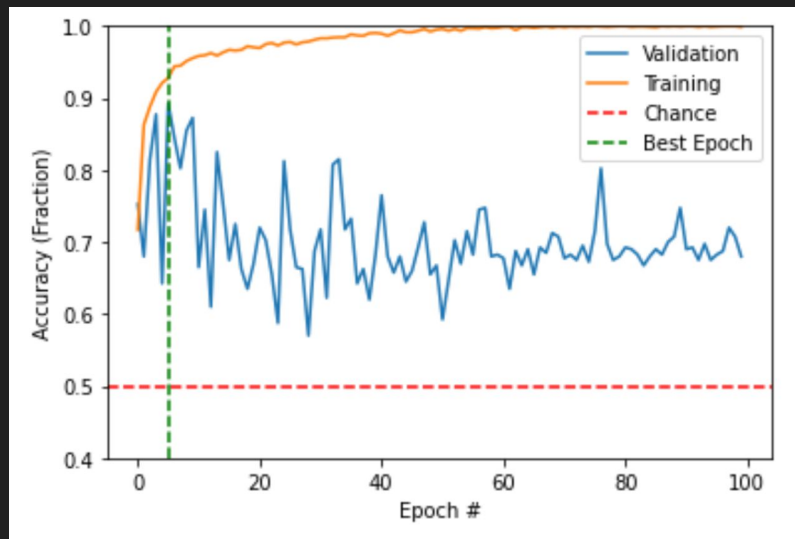

CNN Classifier

- Meant to detect complex features
- Overfitted!



Dense Classifier

- Neural network where all neurons are connected
- Also overfit...



Transfer Learning

- Using the experts
- Have been trained for a long time on other subjects - ImageNet
- Expected to pick up fairly easily



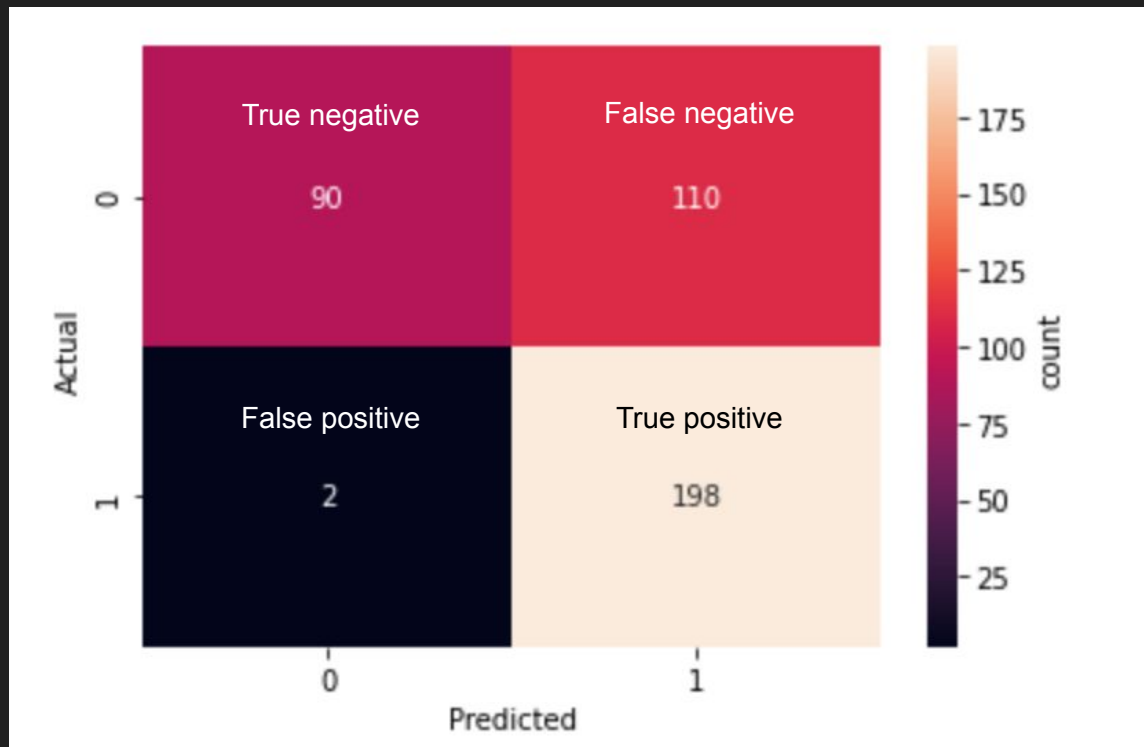
The Experts

- VGG16
- VGG19
- ResNet50
- DenseNet121
- Which one did the best?



Evaluation

- Accuracy: 86.75
- Confusion Matrix
- VGG16



Real World Applications

- Ingrained into x-ray machine
- Website for uploading pictures
- Pros:
 - Could be used in hospitals and be more efficient
 - Reduces time for doctors, increase time for other tasks
 - More time for treatment planning
- Cons:
 - Has to be very accurate in order for that to happen
 - Needs to work for a multitude of diseases and other purposes in order to be used for professional hospital use

Questions?

Sources

<https://www.who.int/news-room/fact-sheets/detail/pneumonia>