Visual Scan Recognition

How AI can read images for pneumonia

By Arash Peimani
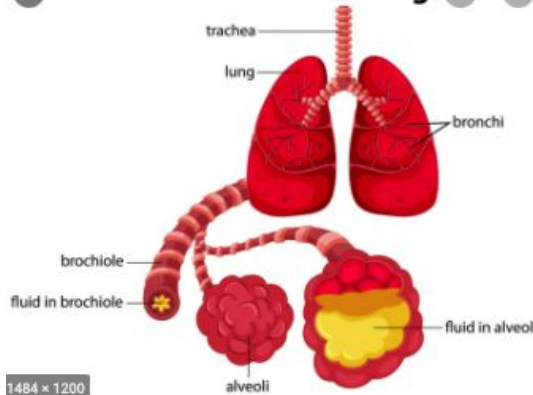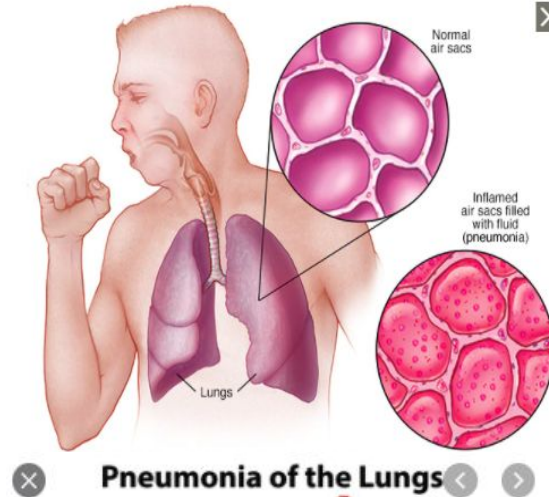
The problem

Pneumonia

Pneumonia is an infection that inflames the air sacs in one or both lungs.

Causes Include:

- Viruses
- Bacteria

Pneumonia of the Lungs

Tests

- Pulse Oximetry
- Chest X-Ray
- Blood Tests
- Sputum Test

Imaging to Diagnose

Computer Program:

- **Imaging looks for the site of inflammation in the lungs, represented by the white areas.**

- Program will look at images and distinguish between normal and infected lungs.

- The more images it looks at the more it will learn.

- We will know how accurate the results are by getting a percentage after running it.

- **This allows for classification**
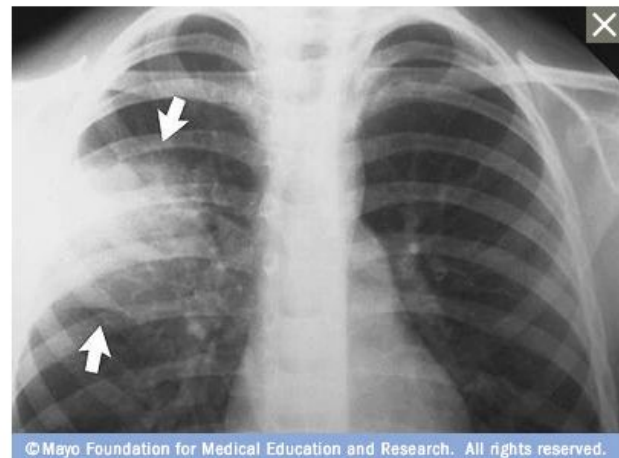
Chest X-ray showing pneumonia

This chest X-ray shows an area of lung inflammation indicating the presence of pneumonia.

Baseline Model

Train set:
================
PNEUMONIA=3883
NORMAL=1342
Test set:
================

Data Set
The more images, the better the results

PNEUMONIA=390
NORMAL=234
Validation set:
================
PNEUMONIA=8
NORMAL=8
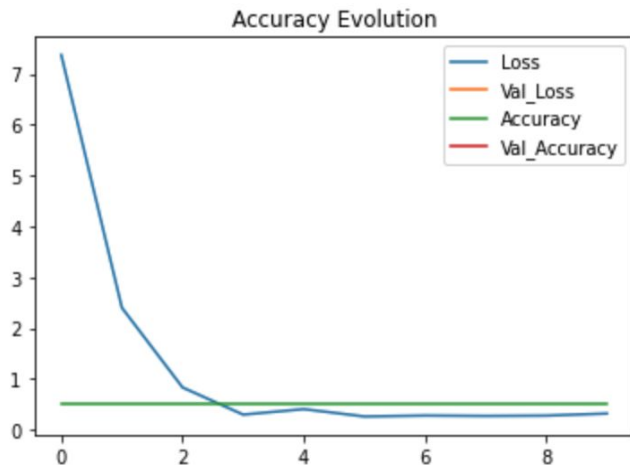

```
Model: "sequential_1"

Layer (type)              Output Shape            Param #
=================================================================
dense_2 (Dense)           (None, 20)              1350020

dense_3 (Dense)           (None, 7)               147

dense_4 (Dense)           (None, 5)               40

dense_5 (Dense)           (None, 1)               6
=================================================================
Total params: 1,350,213
Trainable params: 1,350,213
Non-trainable params: 0

```

Using various models to classify our image, the goal was to have our program read the images and classify them as 'Pneumonia' or 'Normal'.

Using Convolutional Neural Network Models

Various Optimizers Were Used to Make Our Model Recognize Images Better

All Had an Accuracy of:
0.50

Baseline Model:
Loss: 0.26
Accuracy: 0.50

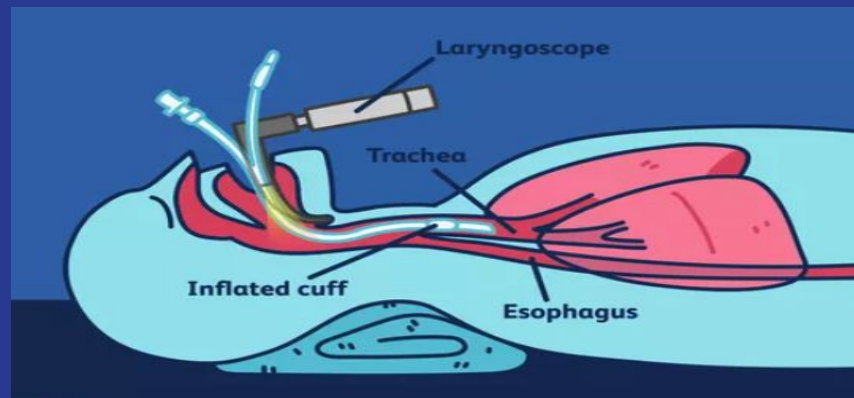|	
RMSprop	**Loss: 0.26**
Adam_01	**0.26**
SGD	**0.26**
AdaDelta	**0.26**
AdaGrad	**0.26**

Conclusion

We are able to design a Neural Network that can distinguish images. This will:

- Speed up ED waiting times
- Accuracy will improve the more it is utilized.
- Lives will be saved.

Although my results were not able to create an accuracy of over 50%; it is possible to construct a model with over 90% accuracy.

Future Work

- Develop a classifier that will distinguish between the different types of pneumonia.
- Develop a translator to label the scans.
- Create a neural network that can classify other types of images, including MRIs.

Thank You!

Appreciate the help of my instructors and the FlatIron cohort

Blog:
https://arash28.medium.com/image-recognition-of-x-rays-26552a620ec2

Resource: Mayo Clinic
https://www.mayoclinic.org/diseases-conditions/pneumonia/diagnosis-treatment/drc-20354210#dialogId39054