Visual Scan Recognition

How AI can read images for pneumonia

By Arash Peimani

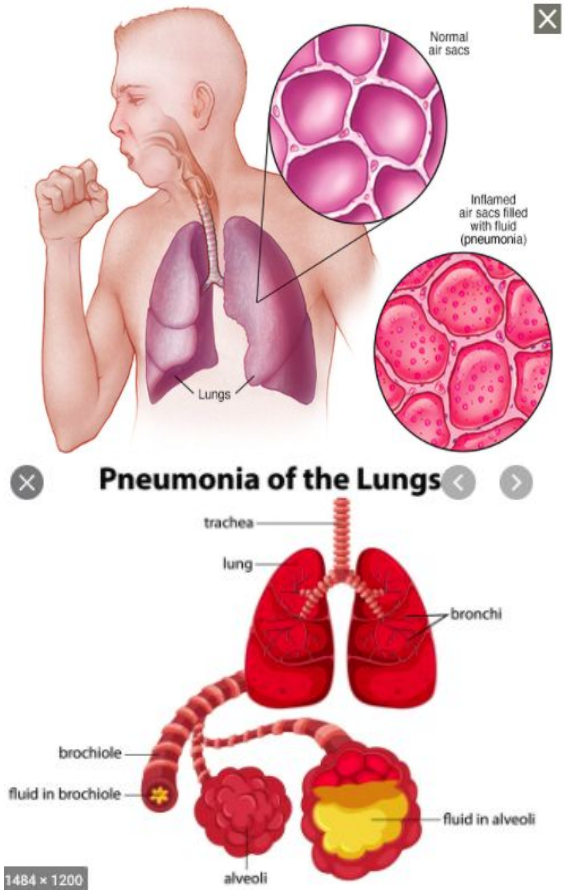
The problem

Pneumonia

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

Causes Include:

- Flu Viruses
- Cold Viruses
- RSV Viruses (age 1 or younger
- Bacteria (streptococcus pneumoniae and mycoplasma pneumoniae)



Tests

- Blood Tests - bacterial infections
- Chest X-ray - to see the spread in the lungs
- Pulse Oximetry - level of oxygen in your blood
- Sputum Test - check the fluids in lungs for cause of infection

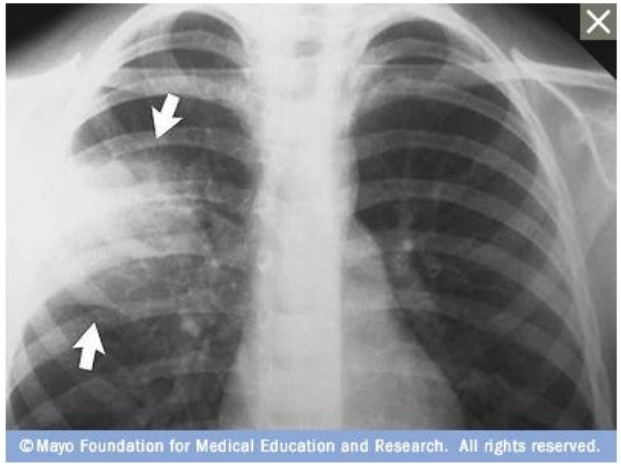
Imaging to Diagnose

Imaging is a very common non-invasive test.

Imaging shows inflammation which shows up as white areas in the lung.

Hospitalization If:

- Older than 65
- Confusion
- Rapid Breathing
- Heart rate below 50
- Heart rate above 100



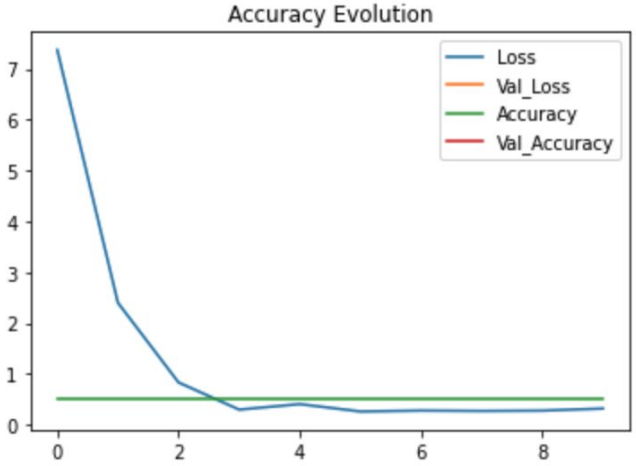
Chest X-ray showing pneumonia

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

Data Set



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

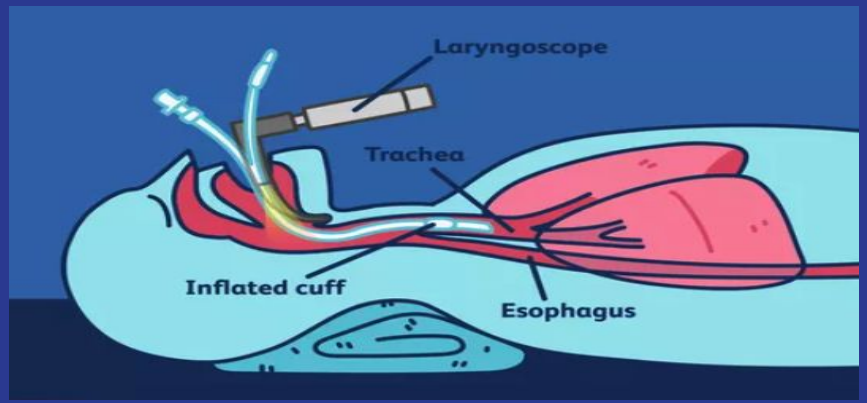
All Had an Accuracy of:
0.50

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 can be a big help to healthcare providers including radiologists.
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