

# DIAGNOSING PNEUMONIA USING DEEP LEARNING

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# Why Pneumonia?

Pneumonia is the  
cause of **1 out of 6**  
childhood deaths,  
making it the  
leading cause of  
fatalities in children  
under 5 years

In the United States,  
The death rate of pneumonia is 10 out of every  
100,000 individuals



In Africa,  
The death rate of  
pneumonia is 100  
out of every  
100,000 individuals

# 100,000

Deaths per year due to the misdiagnosis  
of pneumonia

# Misdiagnosis

- *Wrongful diagnosis of pneumonia can be very life threatening given that it leads to an increase in severity due to lack of treatment. Especially in cases where the patient might have a more serious infection like COVID-19.*
- *Why so many misdiagnosis?*
  - *Such errors are caused by rushing patients through examinations especially now during the times of COVID - 19.*
  - *It can also be due to the health workers who often possess low education levels which causes them to lack the required knowledge for recognizing pneumonia.*



# TREATMENT



## **VIRAL**

Antiviral medications will be prescribed to the patient.



## **BACTERIAL**

Antibacterial medications will be prescribed to the patient.



## **WALKING & CHEMICAL**

Rest, antibiotics, anti-inflammatory drugs, steroids, etc.

# PNEUMONIA TIME SCALE

More deadly if younger than 5  
years of age or older than 65

People most-likely recover when  
diagnosed and treated properly

## WEEK 1

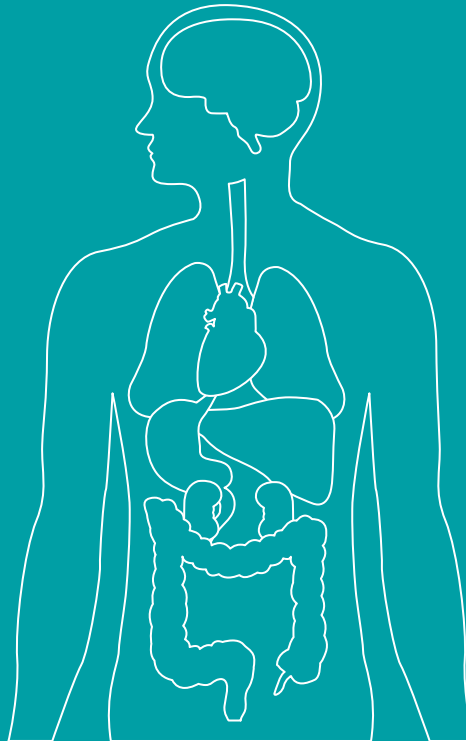
30% 

Temperature should have  
reduced.

## WEEK 6

70% 

cough and breathlessness should've  
reduced.



## WEEK 4

 50%

Mucus and chest pain should  
have reduced.

## WEEK 12

 90%

Most symptoms should have  
subsided by now.

# Using the Kaggle's Image Dataset With X-Rays of Patients who Tested Both Positive and Negative For Pneumonia



50% Chest X-Rays  
showing normal lungs



**TOTAL: 2,682**



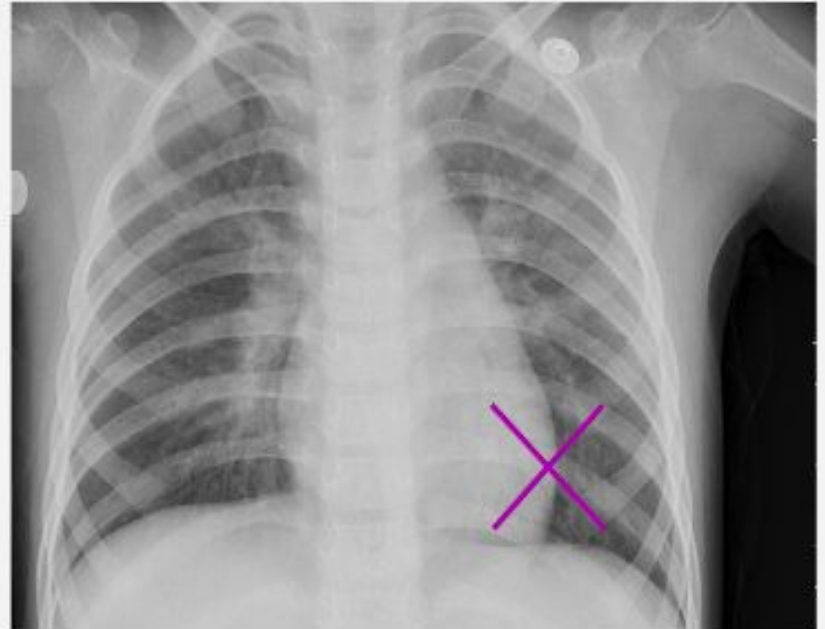
50% Chest X-Rays showing  
lungs infected with Pneumonia

# Physical Examination

NORMAL



PNEUMONIA





# Sequential Model's Results - Pneumonia

## ACCURACY

The accuracy is 90% and this is the amount of time the predicted result is actually correct.

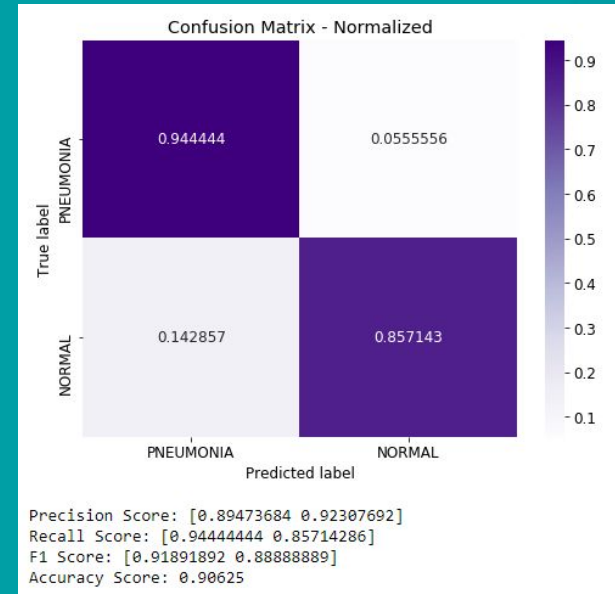
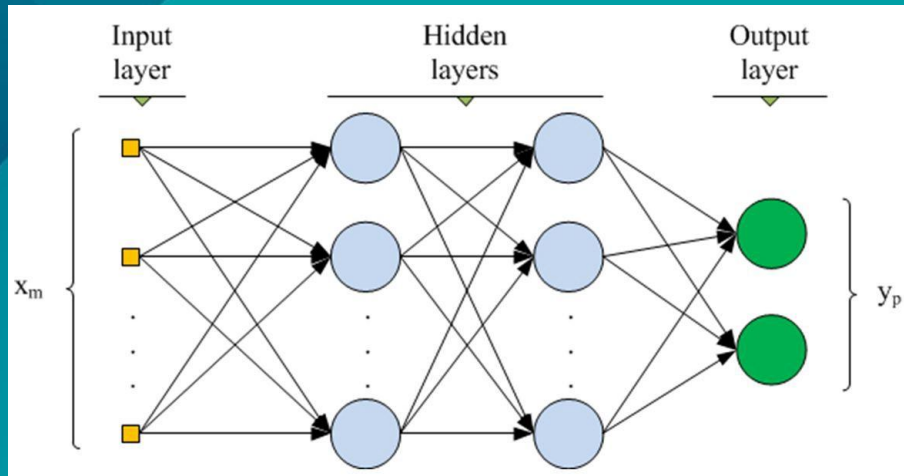
## LOG LOSS

The model loss is 0.26 out and this is the amount the model penalizes for incorrect predictions.

## RECALL

The recall score for pneumonia is 94% and this is the probability of the model diagnosing a correct positive case out of all the times it diagnosed a positive case.

## Using A Base CNN Model



# VGG-19 Model's Results - Pneumonia

## ACCURACY

The accuracy is 94% and this is the amount of time the predicted result is actually correct.

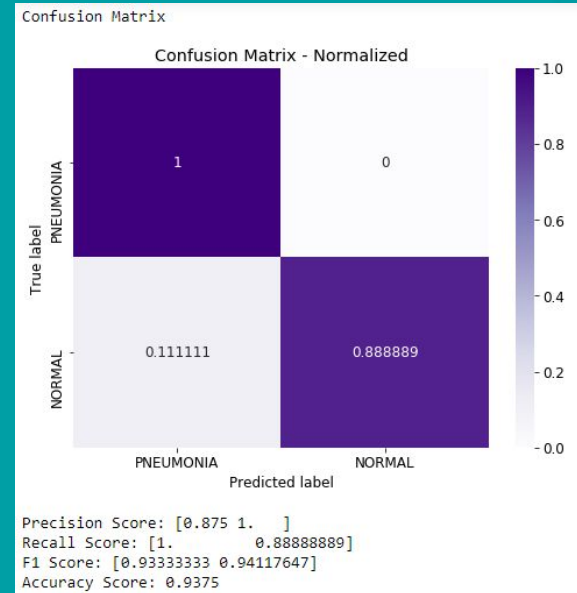
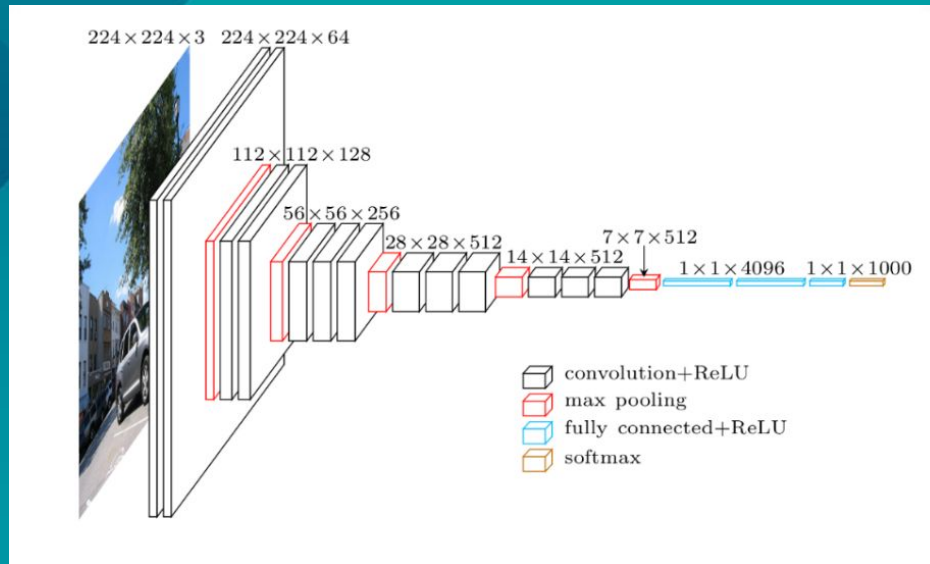
## LOG LOSS

The model loss is 0.17 out and this is the amount the model penalizes for incorrect predictions.

## RECALL

The recall score for pneumonia is 100% and this is the probability of the model diagnosing a correct positive case out of all the times it diagnosed a positive case.

Using VGG19 Transfer Learning Model



# Conclusion



The Pneumonia model has a recall score of 95%. It could be improved by trying different parameters but these scores are good enough as it is so Doctors and Radiologists are more than welcomed to integrate this models into their medical applications to help in the correct diagnosing of Pneumonia, after thorough verification.

# Recommendation



- Use the vgg-19 model since it shows its 6% better at correctly diagnosing a pneumonia case.
- Add a dropout layer before the final dense layer to dropout half of the output from the prior dense layer using 512 nodes in order to reduce overfitting when using the VGG19 model.

# Future Work

## Other Lung Diseases

Create a classifier to differentiate pneumonia x-rays from other lung infections like Tuberculosis, etc.



## Target Detection

Create a classifier to detect what section of the lungs the infection is located.

## Model Improvement

Collect more data and tune more layers to the transfer learning model to improve its performance.



THANK YOU

## References

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# Appendix - Pneumonia

- *The AUC score is 0.90 and this is the average probability that the model can diagnose each X-ray image correctly.*
- *The model loss is 0.17 out and this is the amount the model penalizes for incorrect predictions.*

