

# Pneumonia Detection by Deep Learning

X-RAY IMAGE CLASSIFICATION

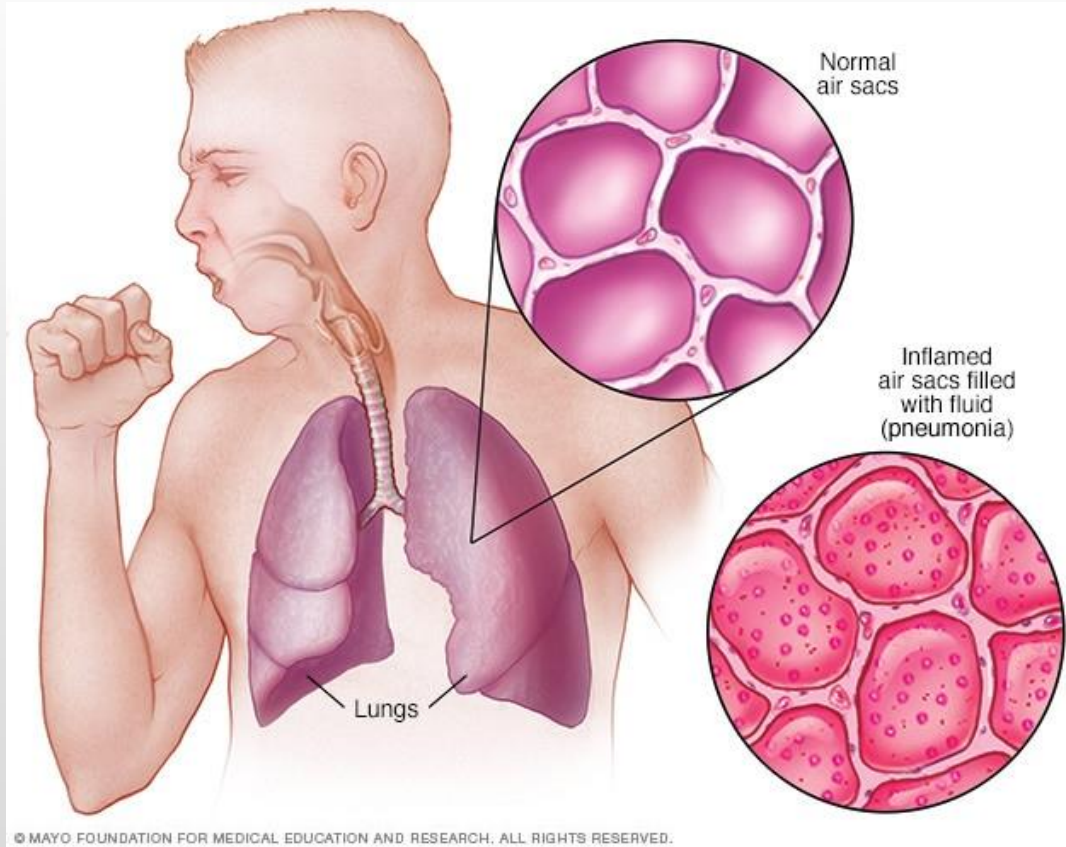




# BUSINESS PROBLEM

- 1) Increase number of patients.
- 2) Human medical mistakes can misdiagnose patients and can lead to life-or-death situation.
- 3) Build machine learning algorithm to identify pneumonia X-ray images and diagnose disease. Fast, reliable results which could save lives.

# WHAT IS PNEUMONIA?



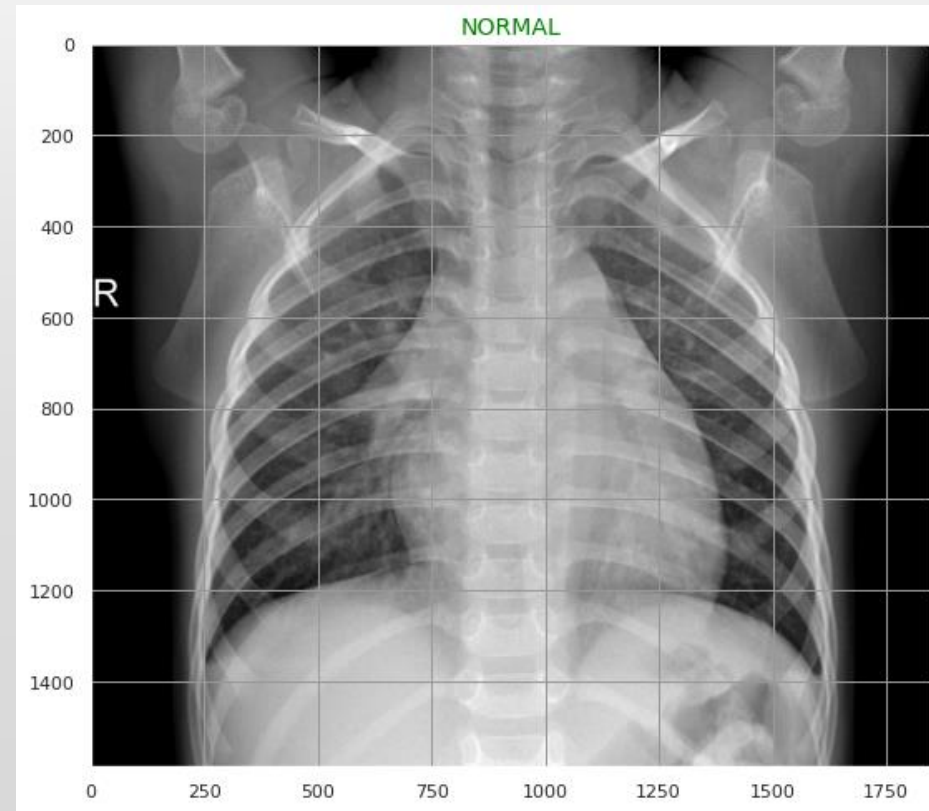
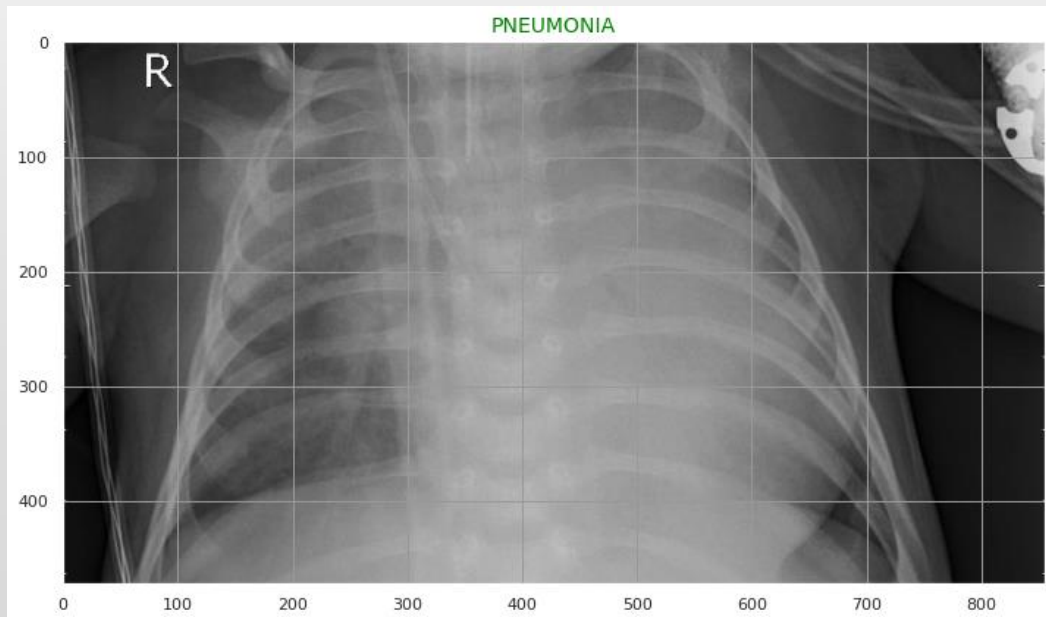
## PNEUMONIA

- Infection that inflames air sacs on one or both lungs which may fill with fluid.
- Viruses, bacteria, and fungi can all cause pneumonia.
- Common signs of pneumonia can include cough, fever, and trouble breathing.



# DATA SOURCE

- Data of 5853 images of X-ray images.
- selected from kids of one to five years old from Guangzhou Women and Children's Medical Center, Guangzhou, China.



# DATA TYPE

Data images from kaggle was already split into train, validation and test data.

## Train Data (60%)

- 3543 validated images filenames belonging to 2 classes.

## Validation Data (19.8%)

- 1162 validated images filenames belonging to 2 classes.

## Test Data (19.6%)

- 1148 validated images filenames belonging to 2 classes.

Data	Pneumonia	Normal
Train	2614	929
Validation	832	330
Test	827	321

# DATA TYPE



- There are 929 normal x-ray images and 2614 pneumonia x-ray images in train set.
- There are 330 normal x-ray images and 832 pneumonia x-ray images in val set.
- There are 321 normal x-ray images and 827 pneumonia x-ray images in test set.



**Convolutional Neural Network**



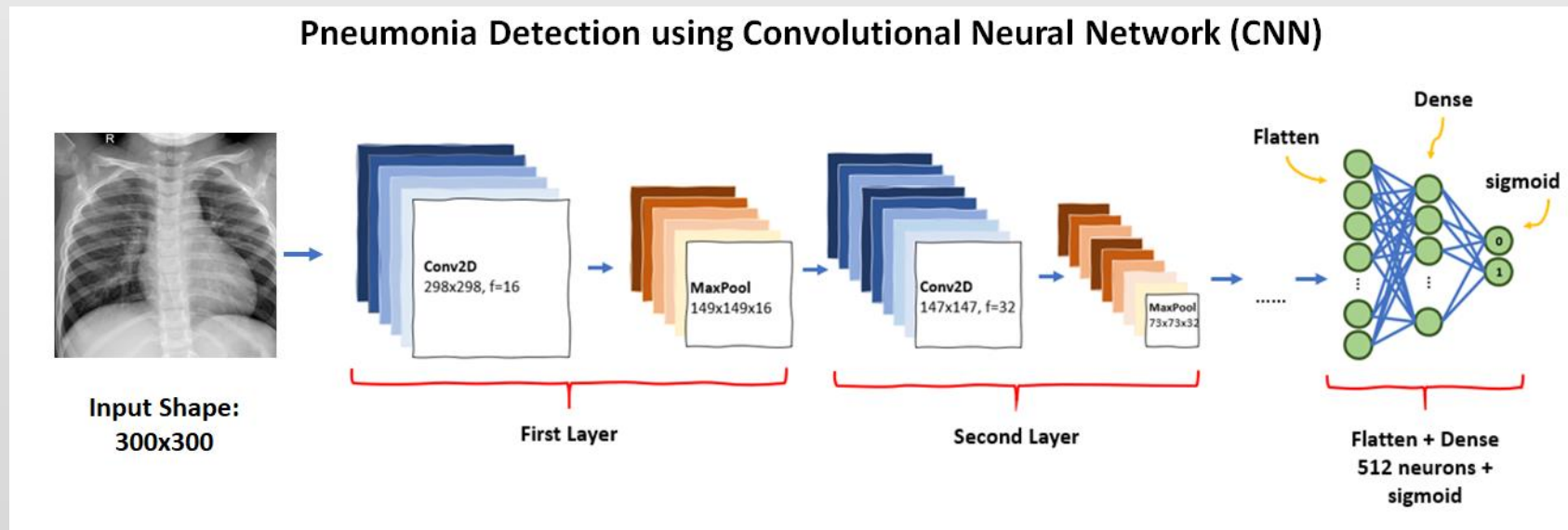
# METHODOLOGY

Convolutional Neural Network



# METHODOLOGY

- Used Convolutional Machine Learning models (CNN)
- Optimization on different parameters (number of filters, neurons, layers).
- Improving model by adding class weight, padding, regularizes, batch normalization, dropout...etc.

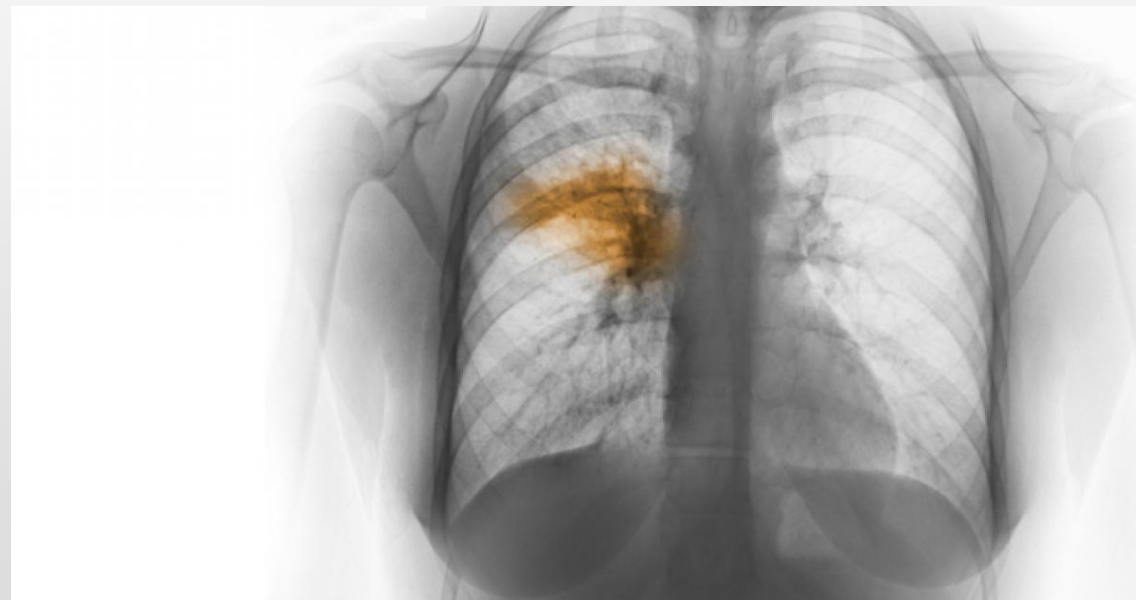




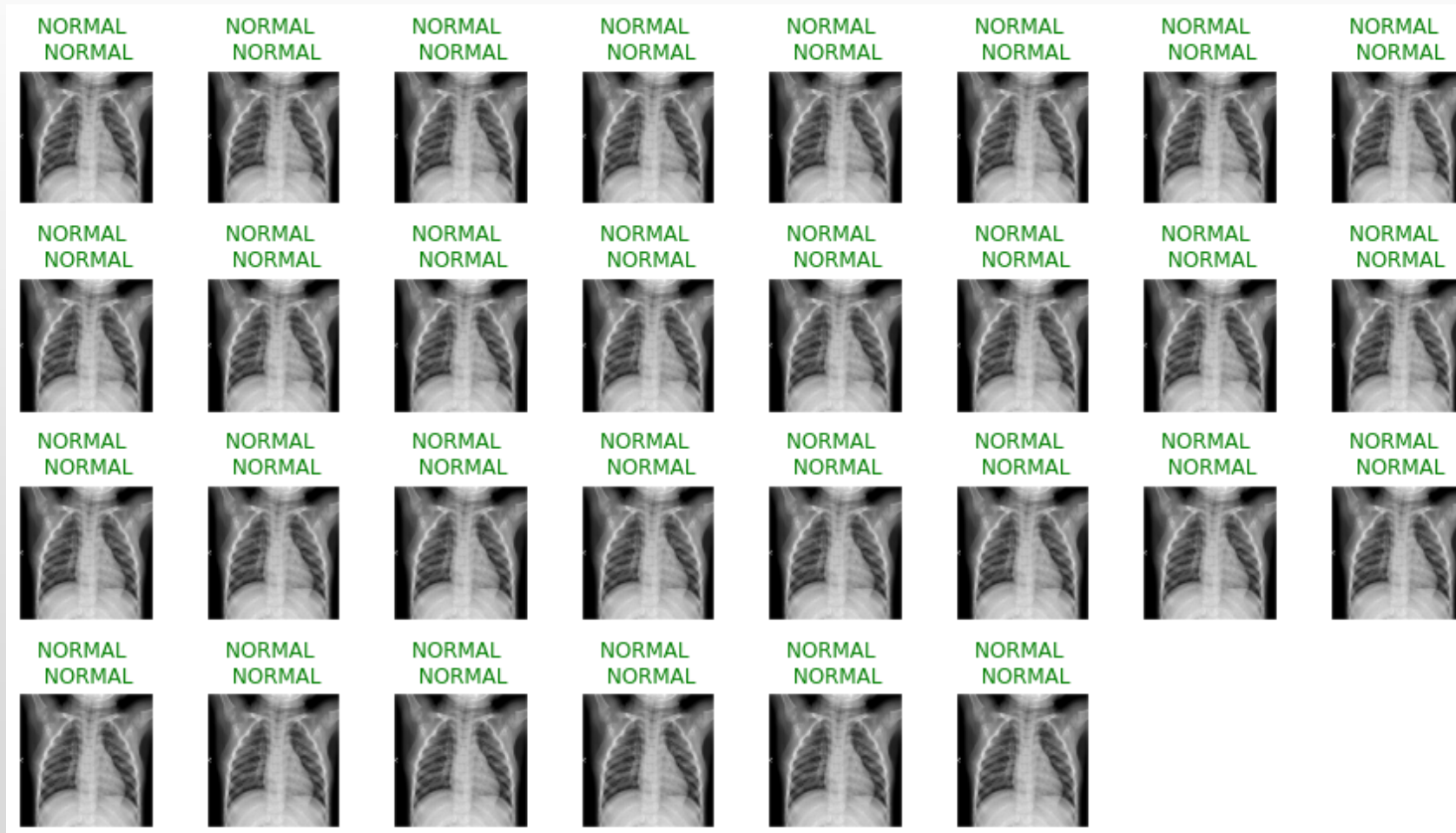
**RESULTS**

# Results

- Training on 3543 and testing on 1148 images.
- Our best CNN models:
  - Accuracy: 89-92%
  - Recall: 94-99%
  - Precision: 95%
  - False negative: 7%

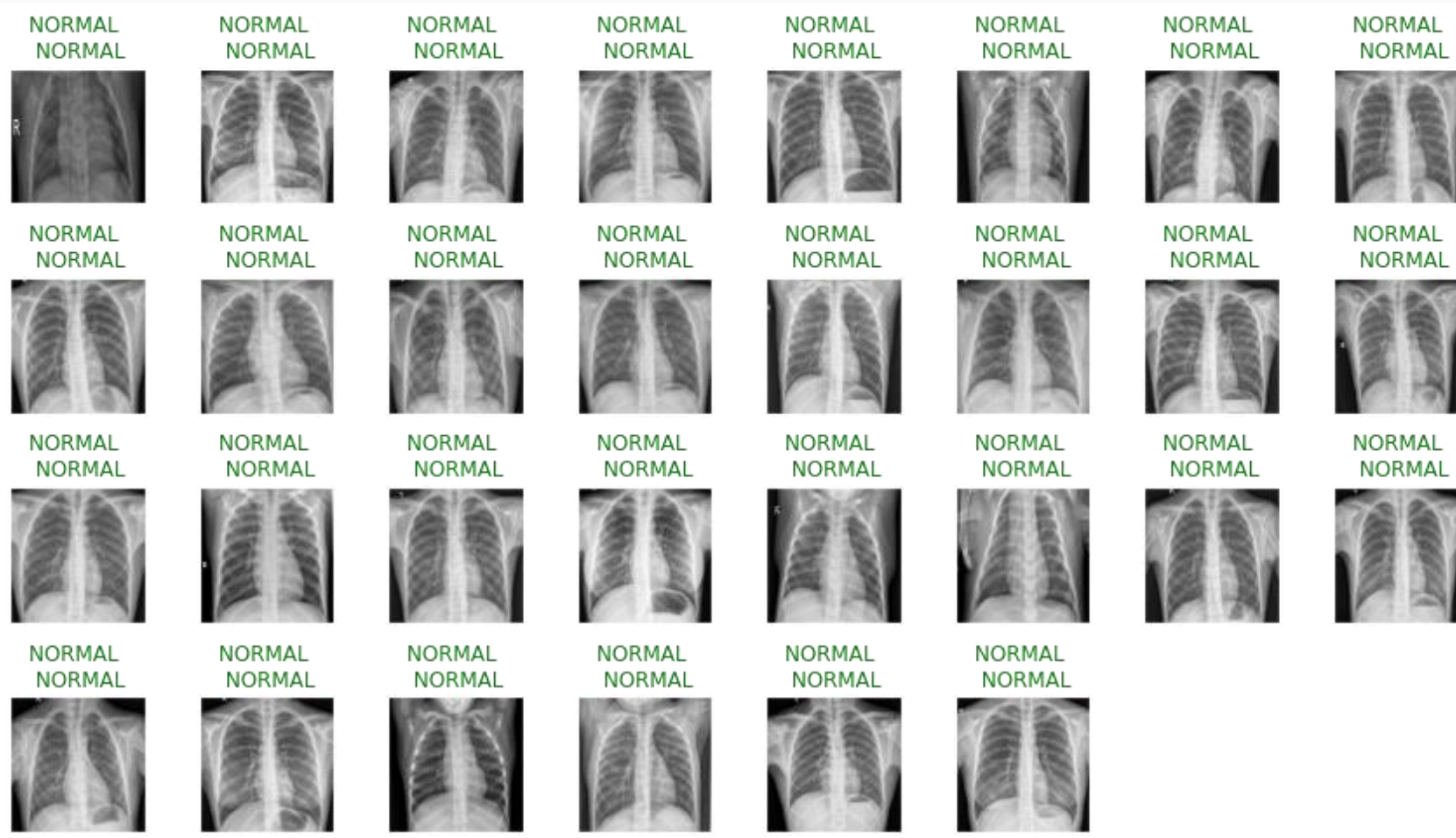


# RESULTS: Validation data





# RESULTS: Test data





clear re statement

## Automated CNN model for pneumonia detection

# CONCLUSION

Deep CNN based approach for the automatic detection of Pneumonia vs Normal X-ray images.



Best modes having test accuracy of 89%-92% and a recall of 94%-99%.





# RECOMMENDATION 1

- ✓ Computer based AI technology for early detection of pneumonia with X-ray or MRI machines.
- ✓ Development of ML models for the diagnosed illness after the scan is done.
- ✓ Accurate diagnoses of disease and efficient treatment.
- ✓ Cure patients and save lives.





## RECOMMENDATION 2

- ✓ Development of portable X-ray devices with ML models for early detection of disease at home.
- ✓ Decrease work load on health care workers.



# FUTURE WORK

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- 1) More quality & quantity data for validation.
- 2) Build Multi CNN model for detection normal, viral and bacterial pneumonia.
- 3) Optimize CNN using different parameters abd CVGridsearch.
- 4) Use transfer deep learning and pretranind models:

FastAI, pytorch, Chexnet.



A group of four people are seated around a table in a meeting. On the right, a man with a beard and a blue shirt is gesturing with both hands raised, palms facing forward. He appears to be speaking or explaining something. The other three people (a woman with glasses on the left, a man in a plaid shirt next to her, and a person with curly hair in the center) are looking towards him. The background shows a large window with a grid pattern, looking out onto a city building.

# QUESTIONS???

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## Discoveries

***STARTED FROM  
CURIOUS QUESTIONS***

A close-up photograph of a hand holding a black pen, writing on a white sheet of paper with a grid pattern. The paper is held by a wooden clipboard. The background is a dark green surface. The text 'THANK YOU' is overlaid in large, white, bold, sans-serif capital letters. The image is framed by a red and dark red header and a dark green footer.

**THANK YOU**