

Pneumonia Detection by Deep Learning

X-RAY IMAGE CLASSIFICATION

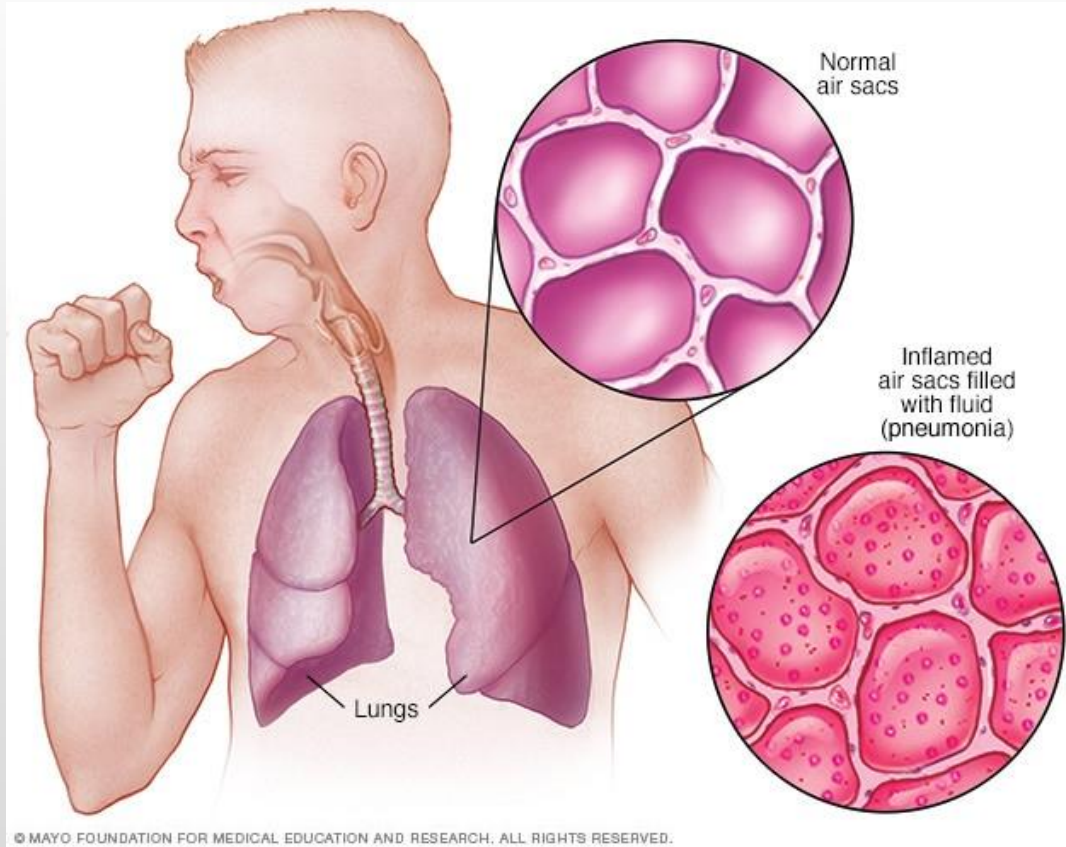




BUSINESS PROBLEM

- 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?

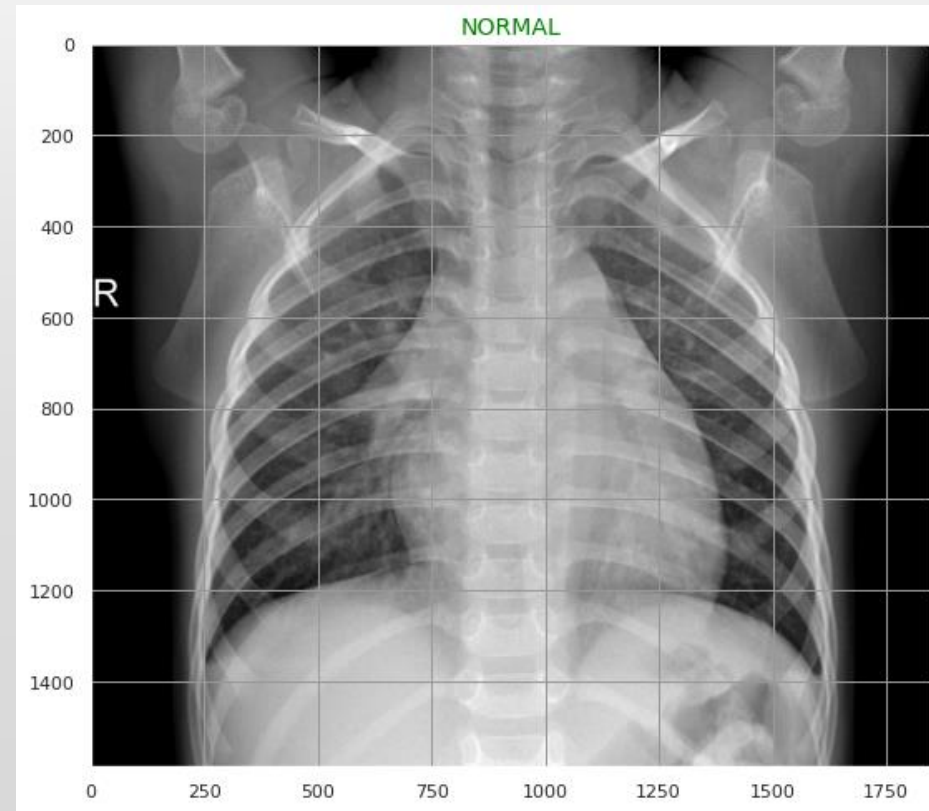
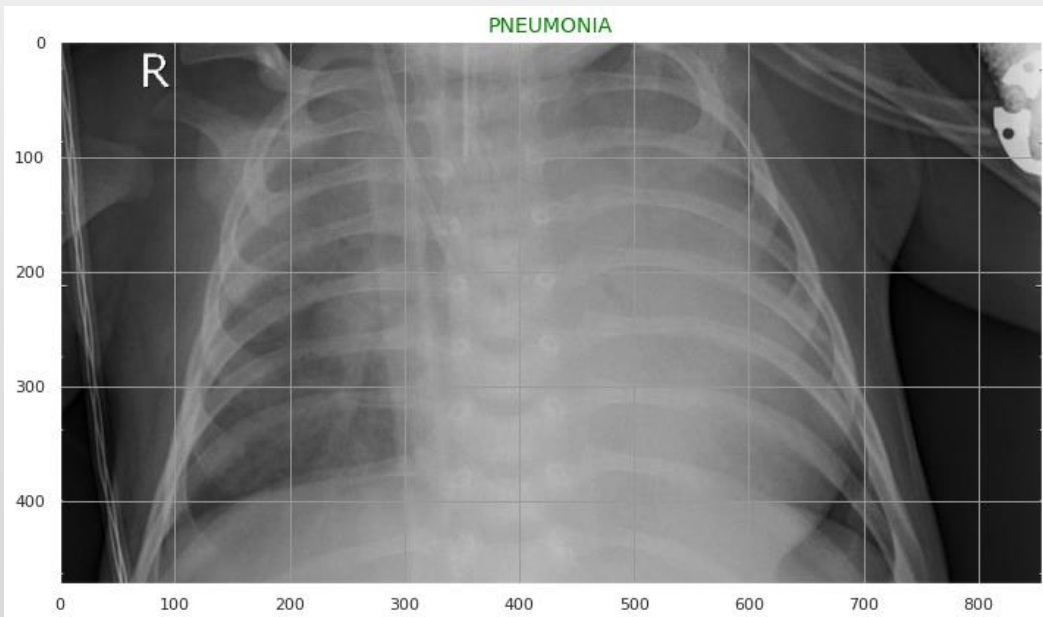


PNEUMONIA

- 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

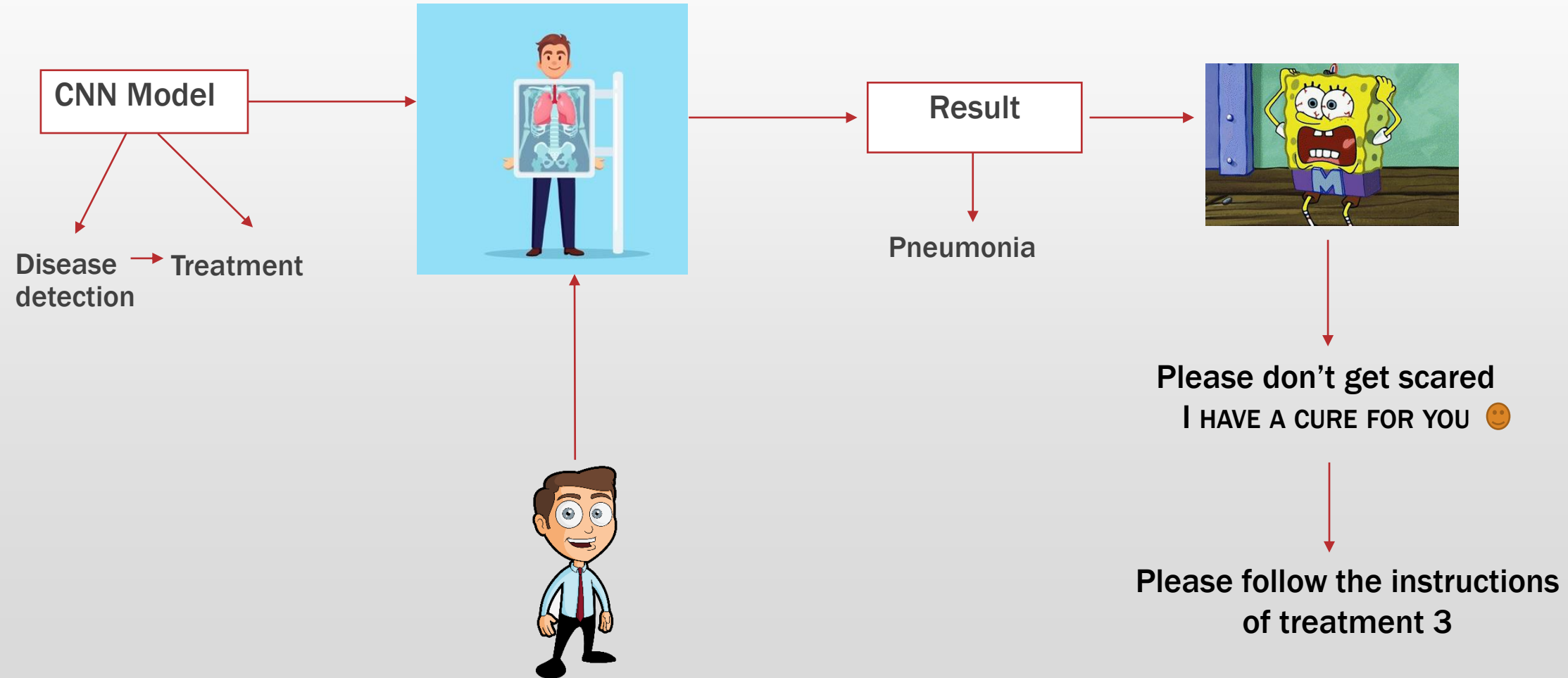


- There are 929 normal x-ray images and 2614 pneumonia x-ray images in train set.
- There are 330 normal x-ray images and 832 pneumonia x-ray images in val set.
- There are 321 normal x-ray images and 827 pneumonia x-ray images in test set.



Convolutional Neural Network

SOLUTION



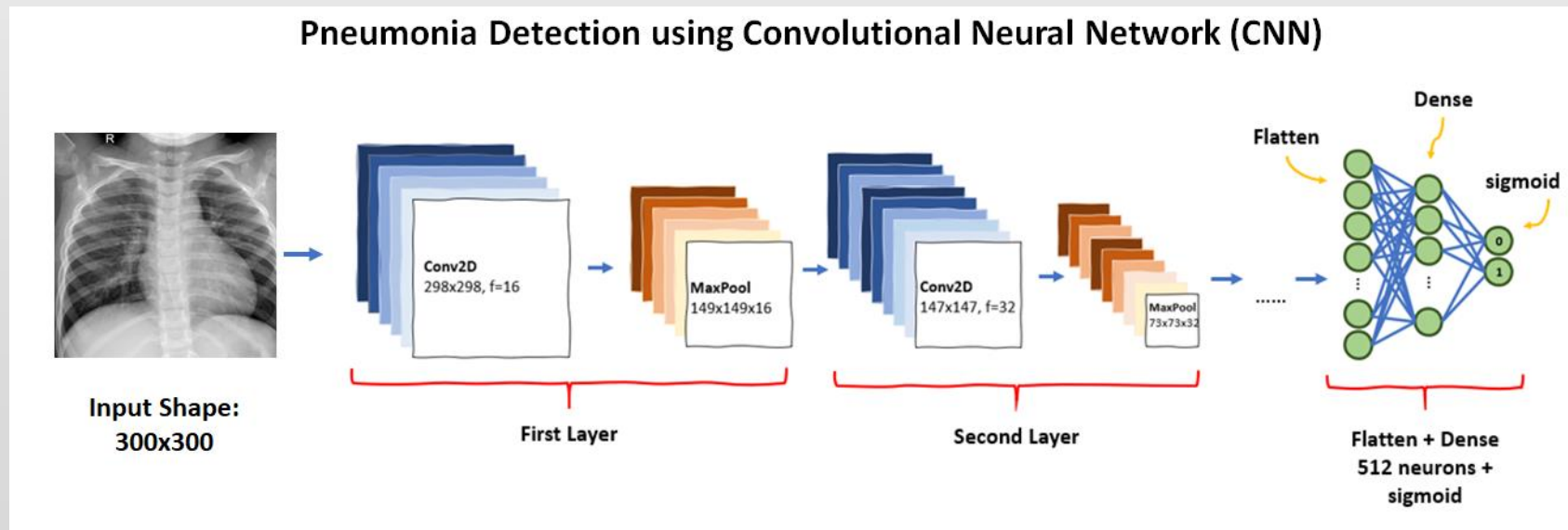


METHODOLOGY

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.

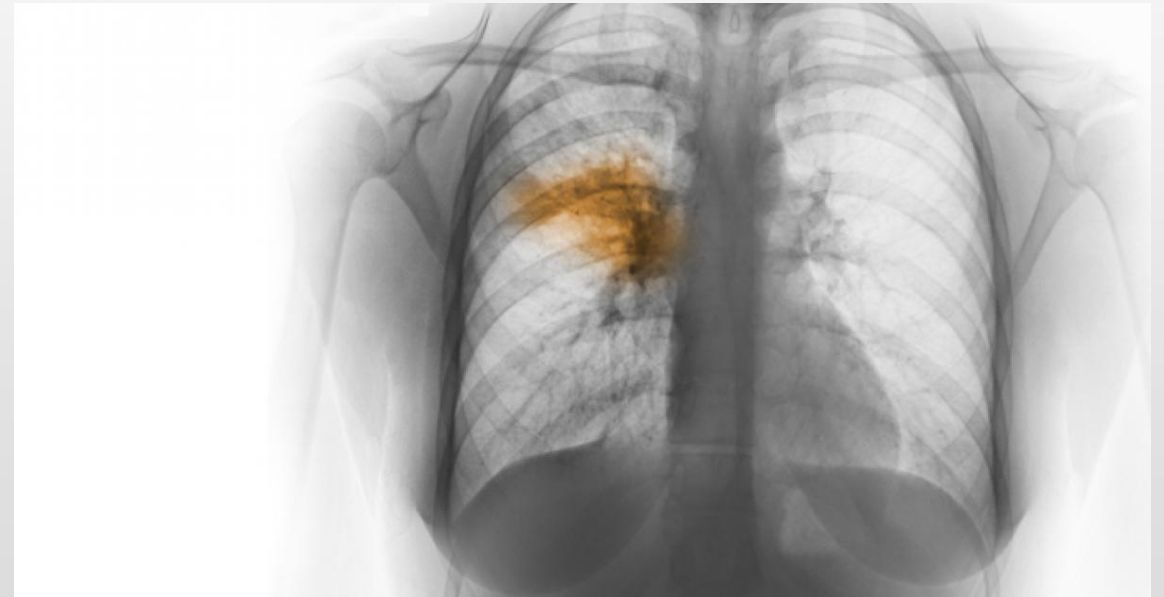




RESULTS

Results

- Training on 3543, validation on 1162 images, and testing on 1148 images.
- Our best CNN model:
- Validation data:
 - Accuracy: 94%
 - Recall: 100%
 - Precision: 96%
 - False negative: 0%
- Test data:
 - Accuracy: 89%
 - Recall: 94%
 - Precision: 91%
 - False negative: 6%



RESULTS: Validation data

PNEUMONIA
PNEUMONIA



NORMAL
NORMAL



PNEUMONIA
PNEUMONIA



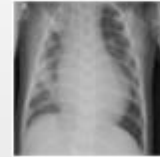
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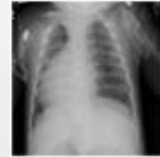
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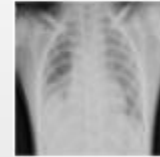
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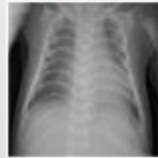
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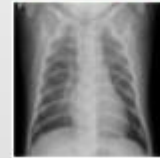
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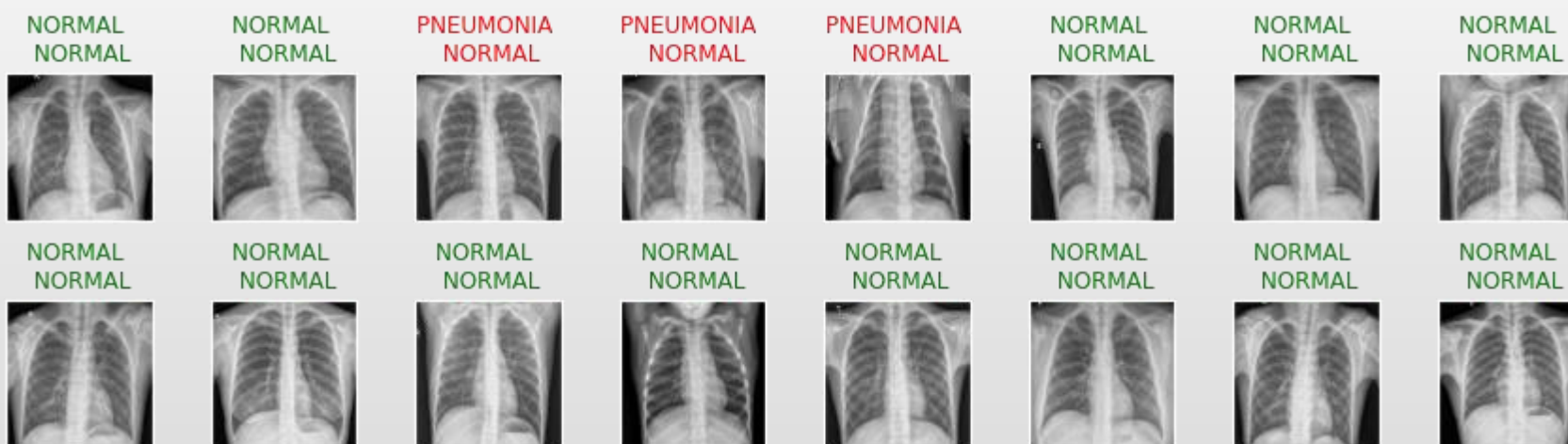
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PNEUMONIA



NORMAL
NORMAL



RESULTS: Test data





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Automated CNN model for pneumonia detection

CONCLUSION

Deep CNN based approach for the automatic detection and accurate diagnosis of Pneumonia.



Best models having test accuracy of 89%-92% and a recall of 94%-100%.

False negative is as low as 6%.

CNN model can save lives and prevent the spread of diseases.





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

- 1) More quality & quantity data for validation.
- 2) Add more outputs to CNN model (label different types)
- 3) Build Multi CNN model for detection normal, viral and bacterial pneumonia.
- 4) Optimize CNN using different parameters and CVGridsearch.
- 5) Use transfer deep learning and pretrained models.

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 is looking towards the other three people. The other three people, a woman with glasses and a man in a plaid shirt on the left, and a person with curly hair in the center, are looking at him. The background is a large window with a grid pattern. The text 'QUESTIONS???' is overlaid in white, and 'Discoveries' is overlaid in red. A black box with red text is also present.

QUESTIONS???

Discoveries

***STARTS 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 top of the image has a red and dark red gradient bar.

THANK YOU