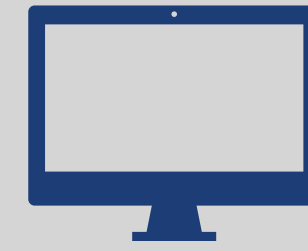




Chest X-Ray Pneumonia Detection

Luay Matalka & Maria Galdina

Contents



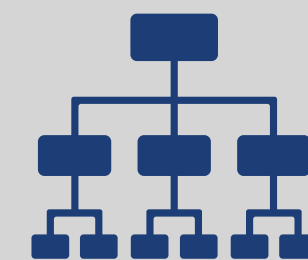
Introduction



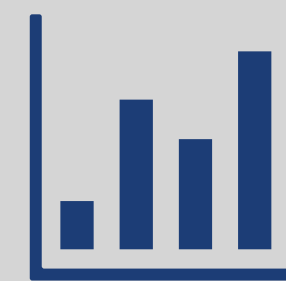
Research Goal



Data Gathering



Data Pre-Processing

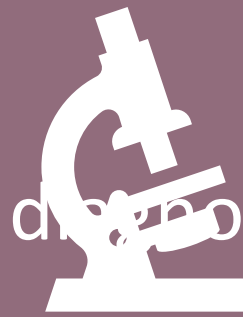


Results

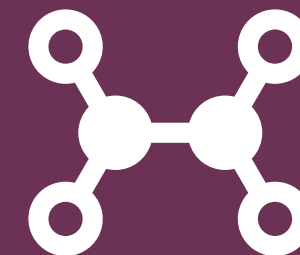
Introduction



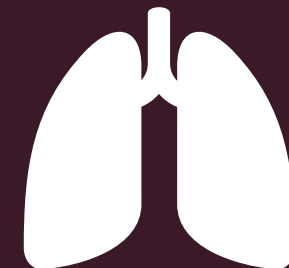
Radiology is a branch of medicine where the disease is diagnosed by examining X-ray images



To reduce human error and the time required for a diagnosis, medical centers implement computer-aided systems



Machine learning techniques have shown great results with image recognition in diagnostics



In this project we attempt to diagnose pneumonia from X-rays using deep learning

Research Question

- ✓ Can we create a deep learning model that can classify x-ray images as having pneumonia with a 100% sensitivity/recall?

Data Gathering



dataset

Data for this project is extracted from a Kaggle prepared



There are 5,856 X-Ray images in two categories
(Pneumonia/Normal = 4273/1583)



Images are in JPEG format with different sizes

Classes Distribution

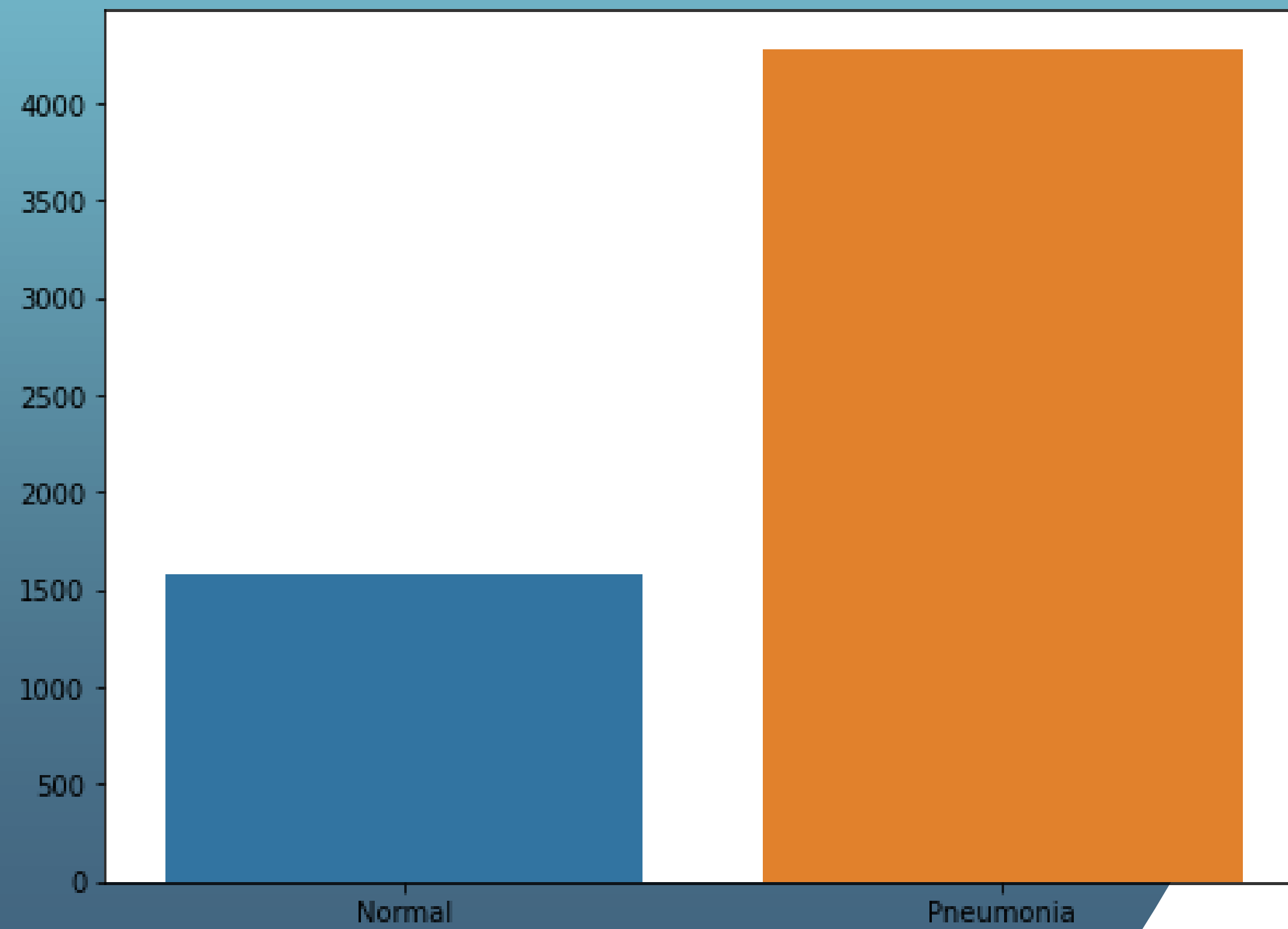
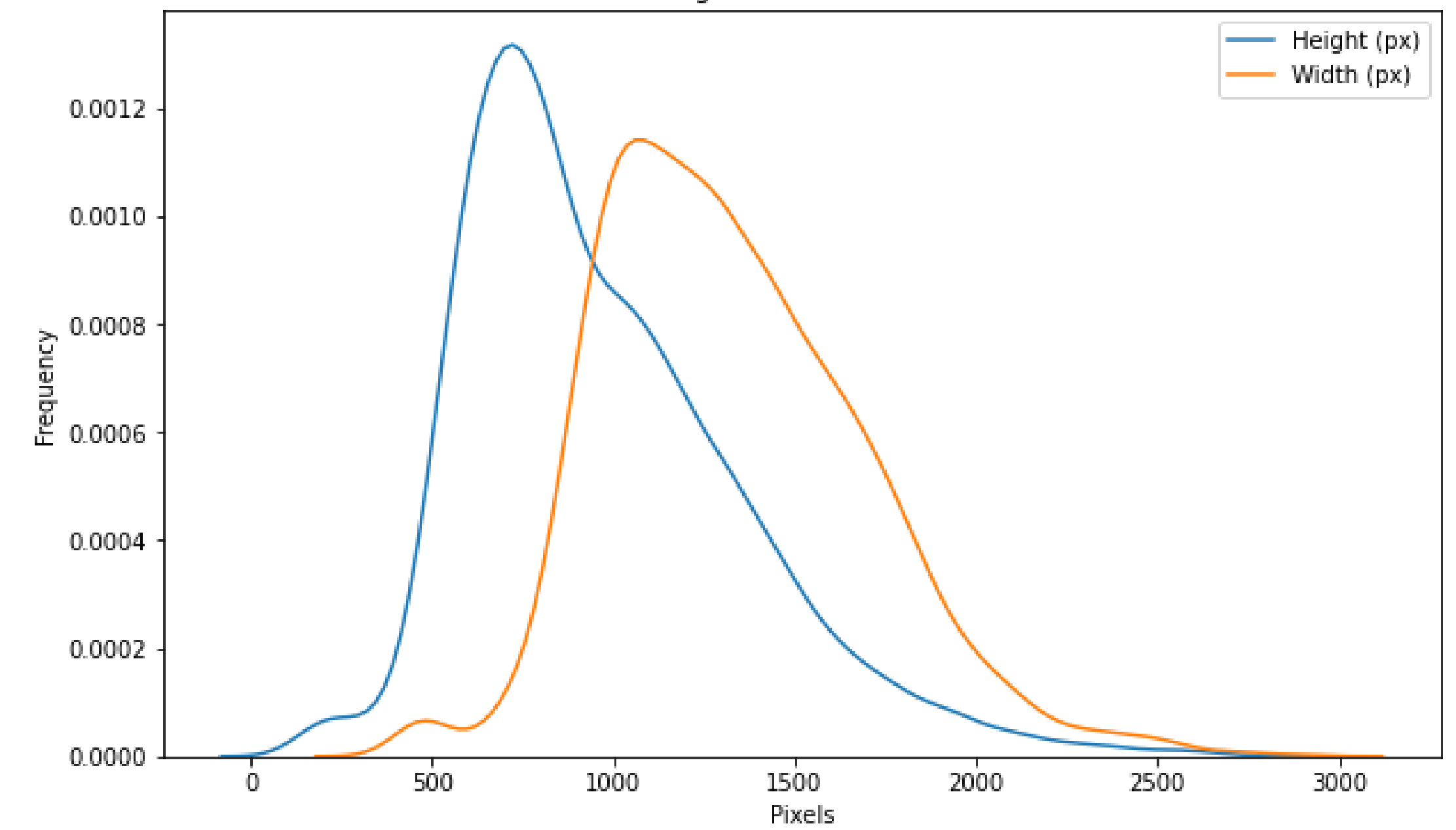
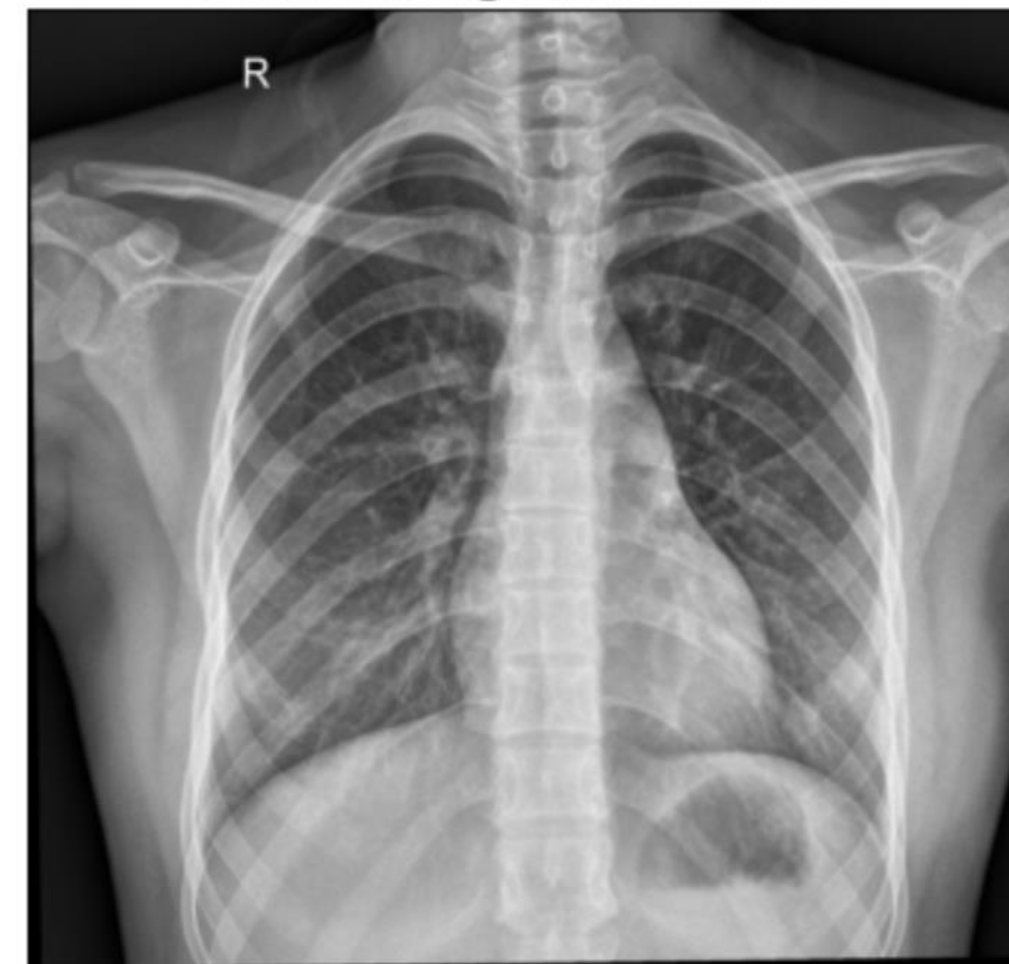


Image Size Distribution



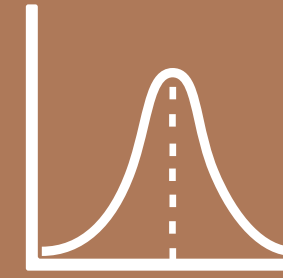
Normal Image from train set



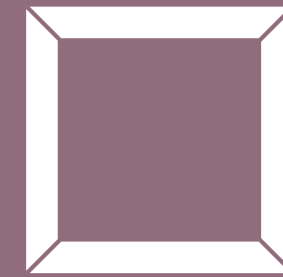
Pneumonia Image from train set



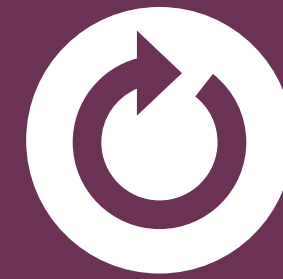
Data Preprocessing



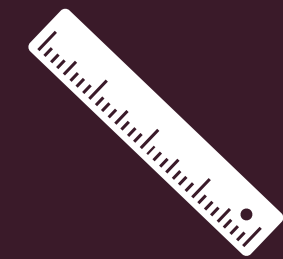
Rescaling: divided each image by 255



Resizing: all images sized to 224x224 pixels



10 degrees range for random rotations



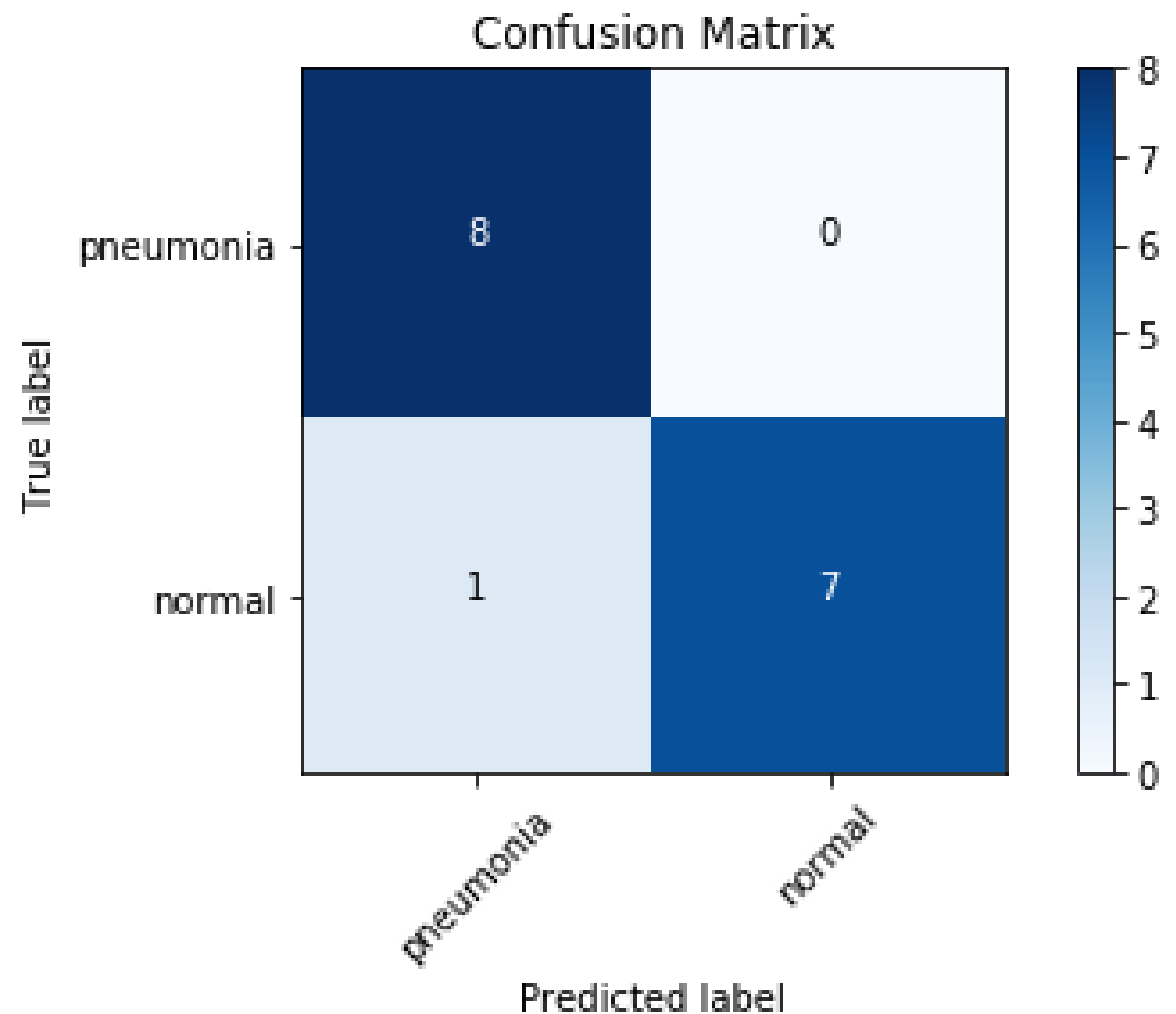
Also used: shearing transformations, zooming and horizontal flipping

Subtracted the mean RGB value from each pixel (VGG16)

Results

- 94% overall accuracy
- 100% recall/sensitivity for the pneumonia class

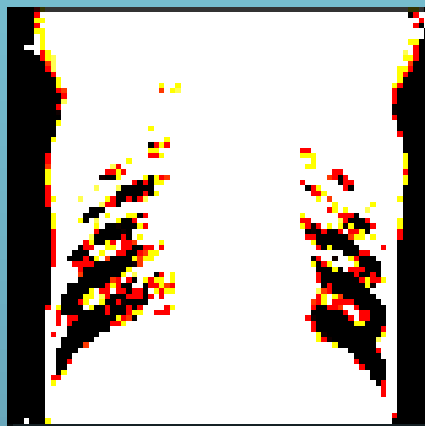
	precision	recall	f1-score
0	0.89	1.00	0.94
1	1.00	0.88	0.93
accuracy			0.94
macro avg	0.94	0.94	0.94
weighted avg	0.94	0.94	0.94



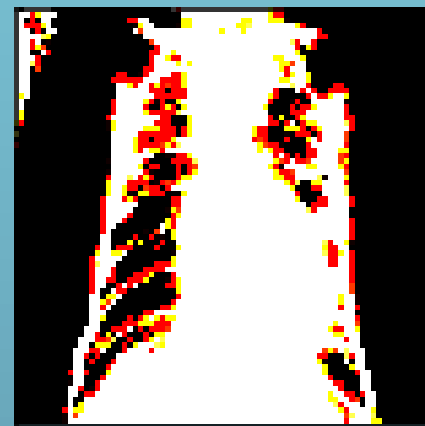
PNEUMONIA
NORMAL



PNEUMONIA
PNEUMONIA



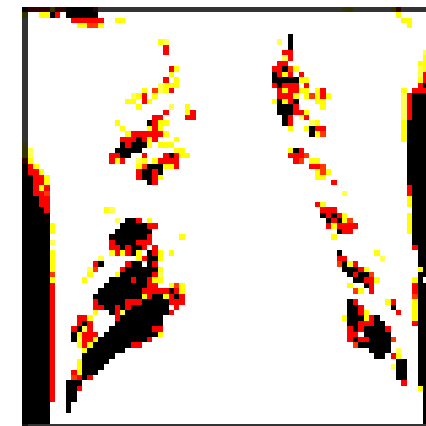
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PNEUMONIA



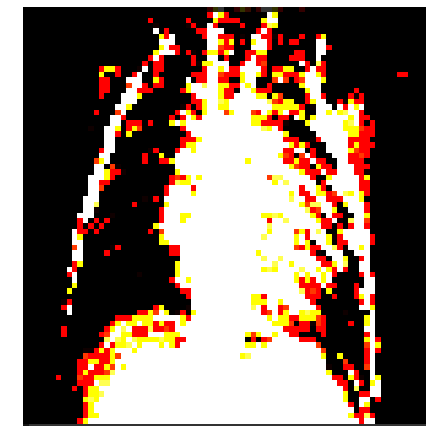
PNEUMONIA
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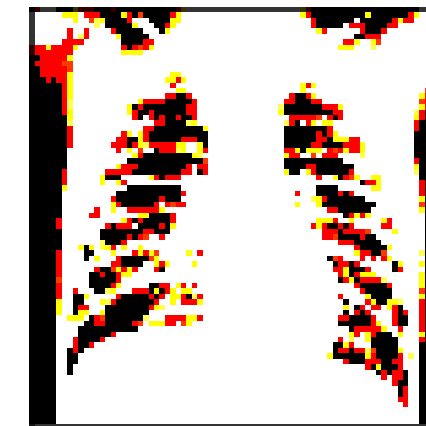
NORMAL
NORMAL



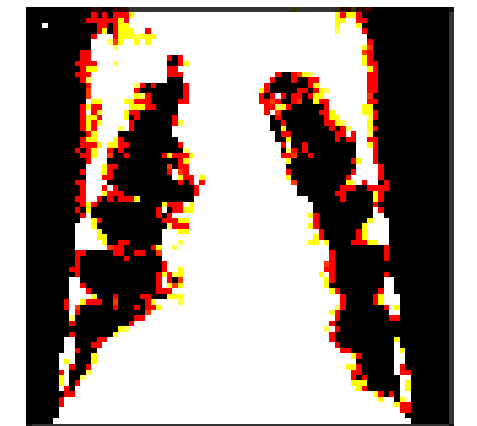
NORMAL
NORMAL



NORMAL
NORMAL



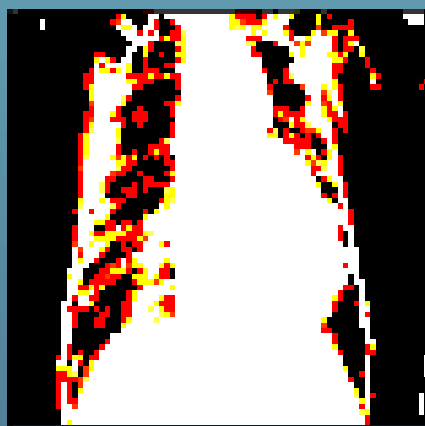
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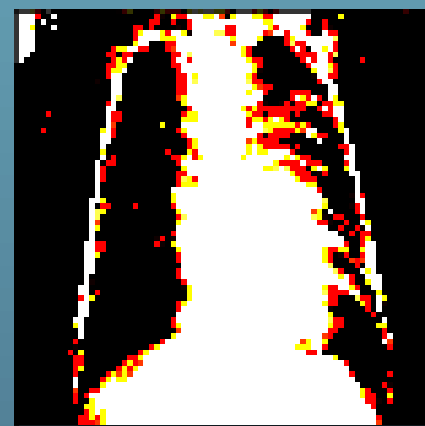
PNEUMONIA
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NORMAL
NORMAL



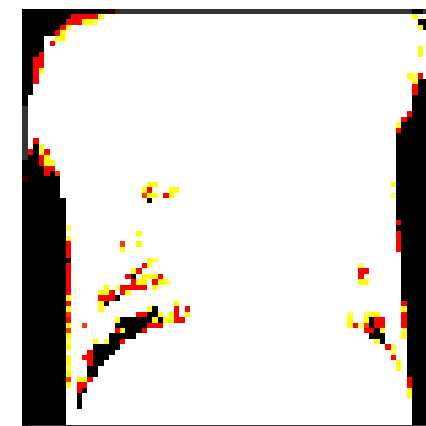
NORMAL
NORMAL



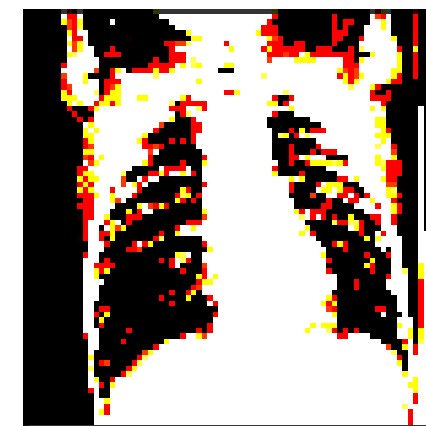
NORMAL
NORMAL



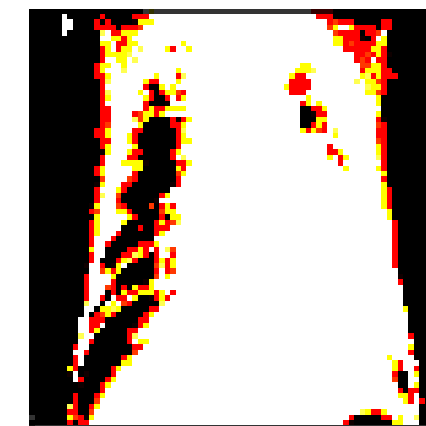
PNEUMONIA
PNEUMONIA



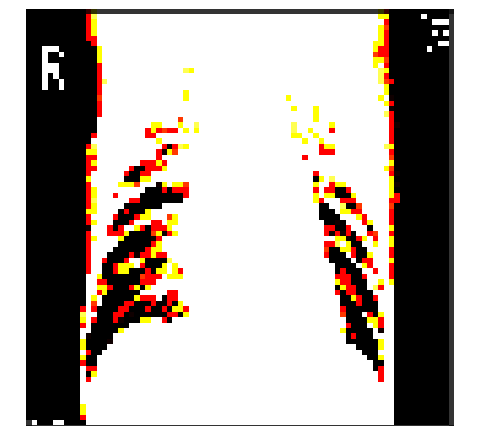
NORMAL
NORMAL



PNEUMONIA
PNEUMONIA



PNEUMONIA
PNEUMONIA



Conclusion

- ✓ With a 100% sensitivity/recall, if a patient tests negative with this CNN model, it is highly likely that they do not have pneumonia.
- ✓ Thus, this model can be used to quickly screen patients without pneumonia.
- ✓ If a patient tests positive, a doctor needs to examine the x-rays and determine if it is a false positive, although the false positive rate is low with this model.

Recommendations

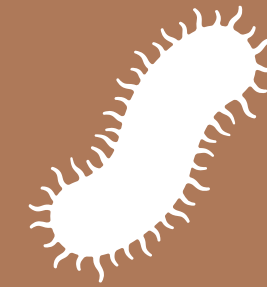


Using the model to quickly screen patients without pneumonia, especially when resources are low and/or time is limited



Integrate this model into medical apps for easy screening in different settings

Further Research



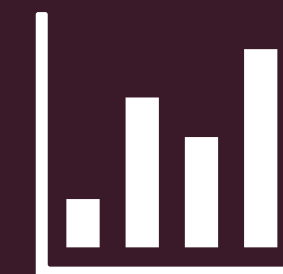
Further categorization of pneumonia X-rays into bacterial, viral, or other culprits



Identifying other respiratory illnesses using X-rays and MLT



Use GridSearch on GPU for better hyperparameter optimization



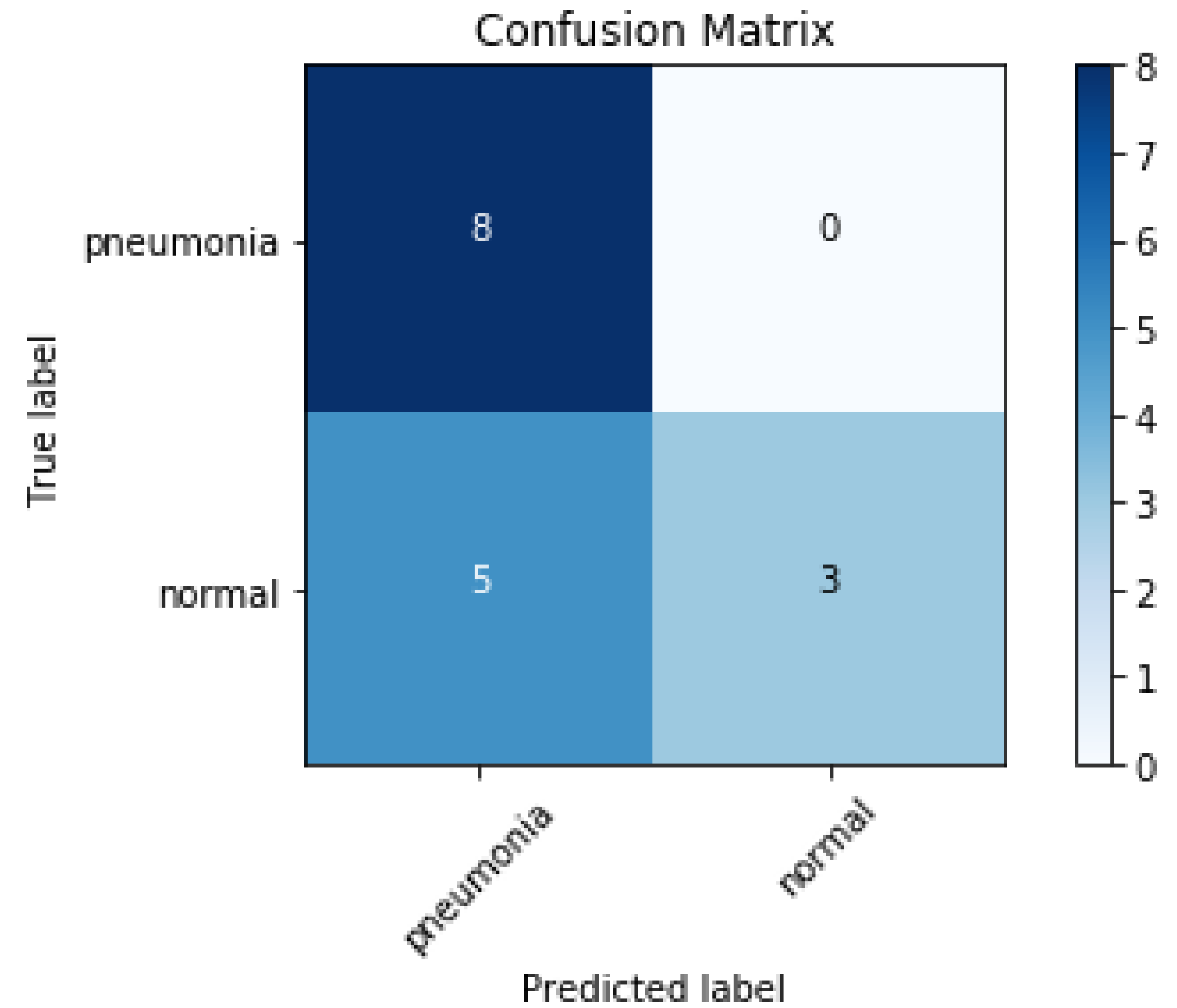
Gather more normal X-rays to improve overall accuracy and precision scores

THANK YOU!

Questions?

Appendix

	precision	recall	f1-score	s
0	0.62	1.00	0.76	
1	1.00	0.38	0.55	
accuracy			0.69	
macro avg	0.81	0.69	0.65	
weighted avg	0.81	0.69	0.65	



PNEUMONIA
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NORMAL
NORMAL



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