

IMAGE PROCESSING: LUNG X-RAYS, HEALTHY OR NOT?

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June 09, 2020

A dark blue diagonal gradient bar that starts from the bottom left and extends towards the top right, covering the lower half of the slide.

Agenda

01 | Introduction

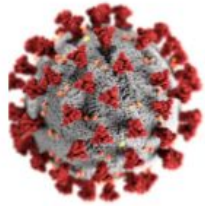
02 | Problem Statement

03 | Data Collection/Cleaning

04 | Image Processing Model

05 | Takeaways

Introduction: COVID-19



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- Illness caused by virus that can spread from person to person
 - Symptoms range from mild or no symptoms to severe



Infection transferred through:

- Contact with infected person
- Air droplets (e.g. from infected person coughing)
- Touching surfaces w/virus



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- Currently no vaccine
 - Clean and disinfect hands and surfaces
 - Best to stay at home

06/08/2020

John Hopkins: Map of Covid-19 Cases

JOHNS HOPKINS
UNIVERSITY & MEDICINE

CORONAVIRUS
RESOURCE CENTER

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[World Map](#)

[U.S. Map](#)

[Critical Trends](#)


COVID-19 Dashboard by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins ...



Total Confirmed

7,113,366

Confirmed Cases by
Country/Region/Sovereignty

1,960,642 US

707,412 Brazil

476,043 Russia

288,834 United Kingdom

265,928 India

Admin0



188
countries/regions

Lancet Inf Dis Article: [Here](#). Mobile Version: [Here](#).

Lead by: [IHU CSSE](#). Technical Support: [Esri Living Atlas team](#) and [IHU API](#). Financial

Global Deaths

406,413

110,990 deaths
US

40,680 deaths
United Kingdom

37,134 deaths
Brazil

Global Dea...

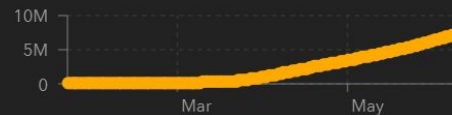
US State Level

Deaths, Recovered

30,417
deaths, **67,687**
recovered
New York US

12,214
deaths, **27,941**
recovered

US Deaths...



Confirmed

Logarithmic

Daily Cases

Last updated at 10/06/2020

6/8/2020, 7:33:02 PM

Problem Statement

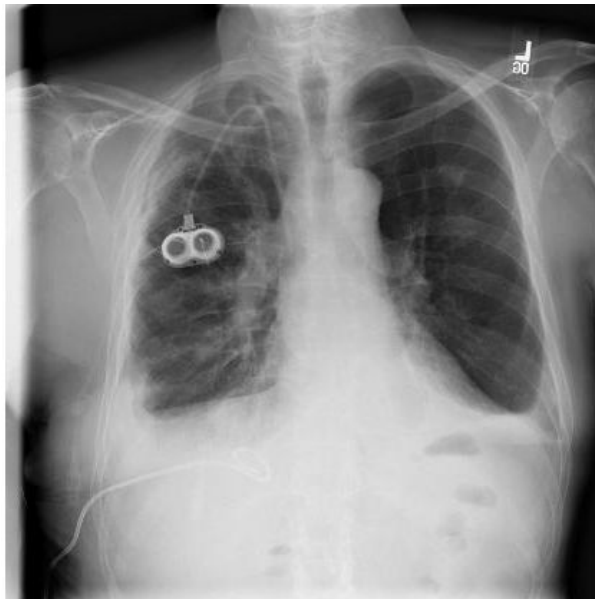
Can lung X- rays be used to identify Covid-19?

Data Collection: Roboflow

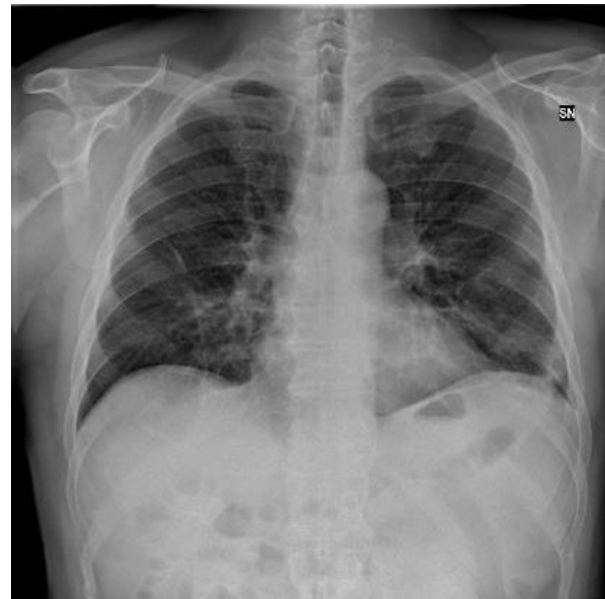
HEALTHY



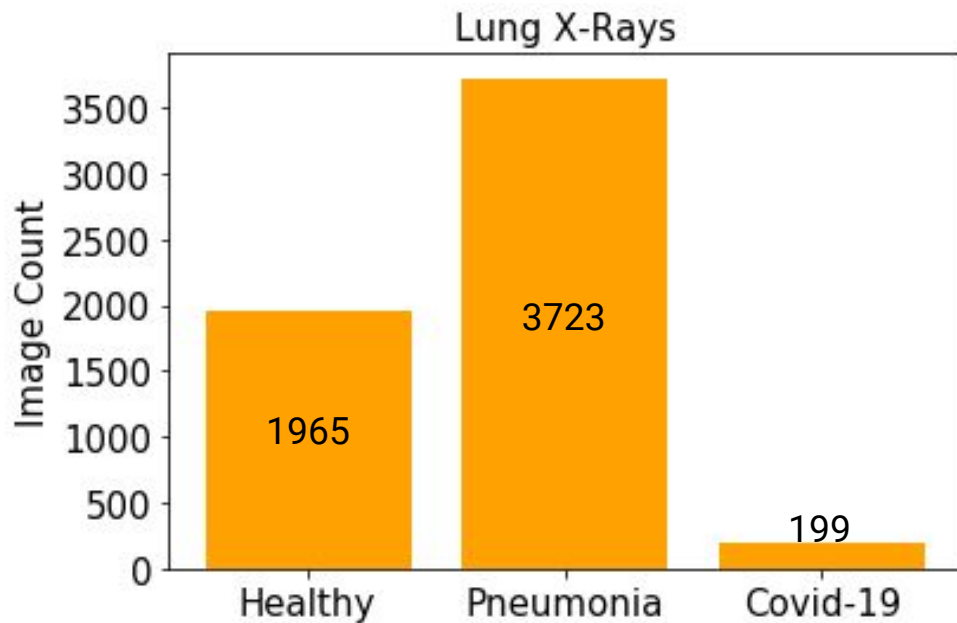
PNEUMONIA



COVID-19



5887 Images



5887 Images, mostly X-rays of people laying down, did not remove any images, even if different

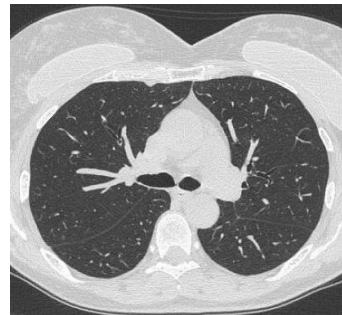
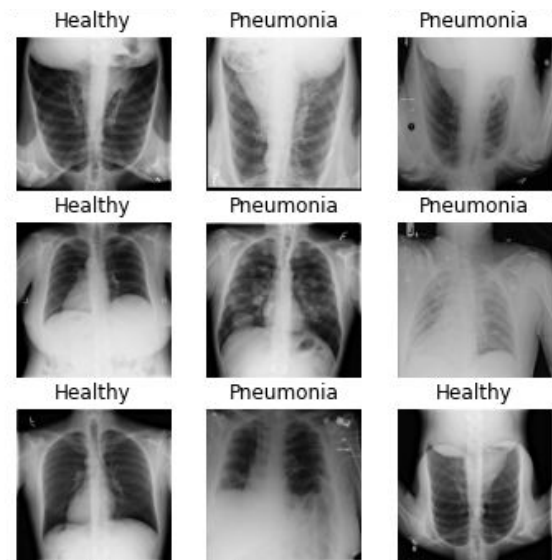


Image Processing Model

- Leveraged TensorFlow and Keras libraries
- MobileNetV2: Convolutional Neural Network
- Train/Validation/Test: 80/10/10
- Augmented data by adding horizontal flip and vertical flip



Compiling and Results

Image Size: 160x160, 224x224

Batches: 32, 64

Epoch: 10, 15

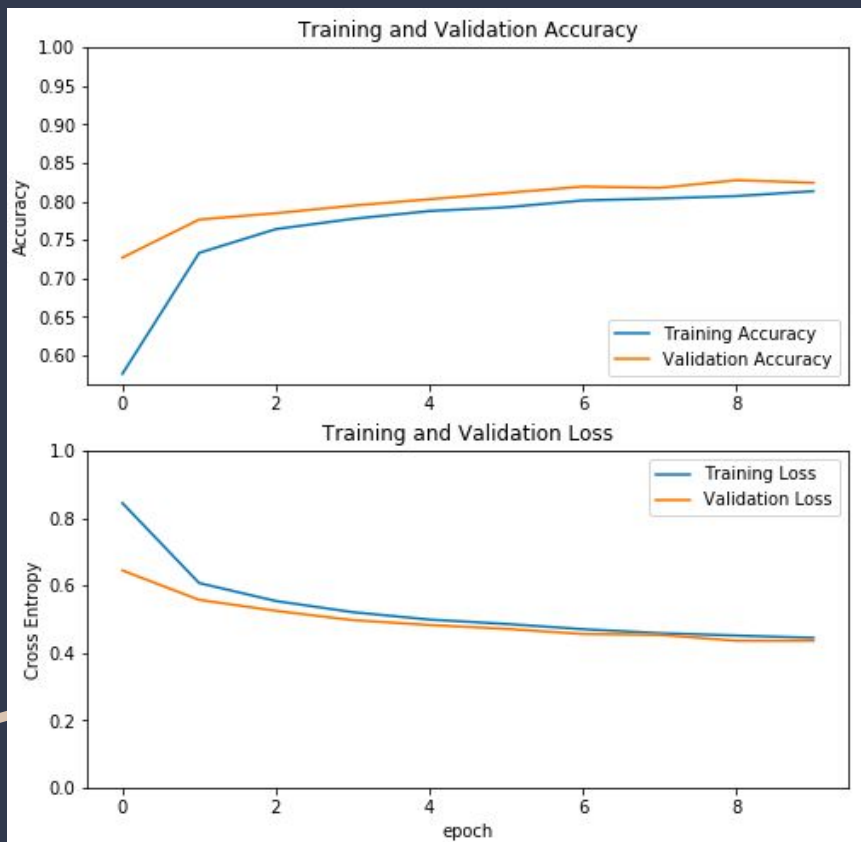
Optimizer = Adam

Loss = Categorical Crossentropy

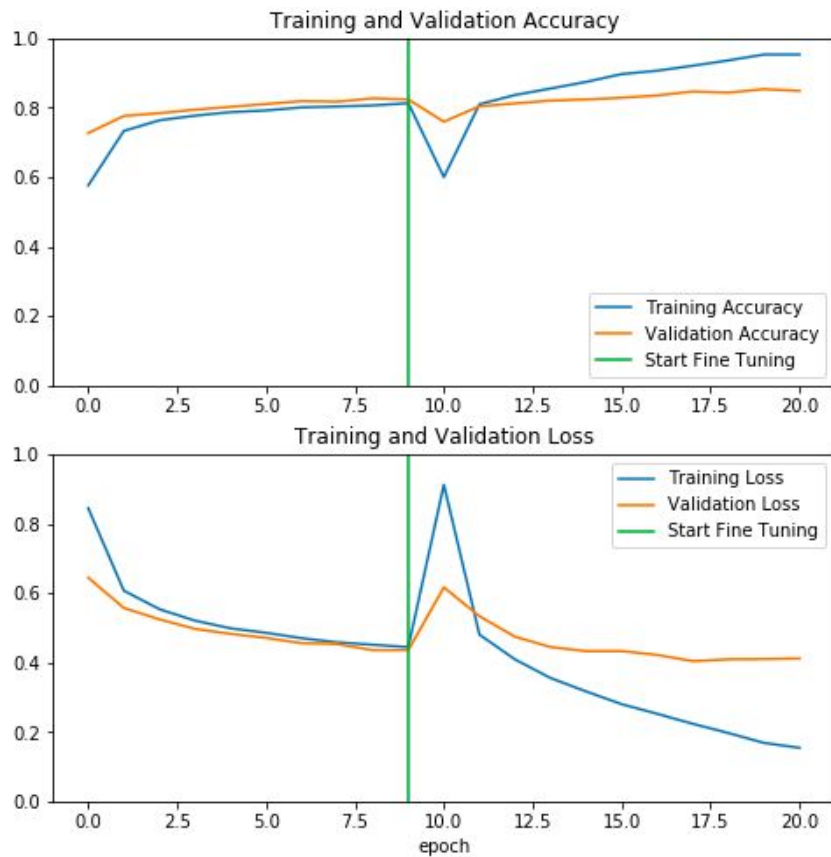
Metrics = Accuracy

	precision	recall	f1-score	support
covid	0.70	0.84	0.76	19
healthy	0.81	0.23	0.36	187
pneumonia	0.72	0.96	0.82	381
accuracy			0.73	587
macro avg	0.74	0.68	0.65	587
weighted avg	0.75	0.73	0.67	587

Freezing Training Layer



Unfreezing up Top Layers



Takeaways

- Model needs improvement to be a screening tool for Covid-19
- Important to not forget that there are people with mild or no symptoms
- Opportunities to improve:
 - Pre-trained model on medical images
 - Train on more layers/images
 - Experiment more with different parameters

THANK
YOU!