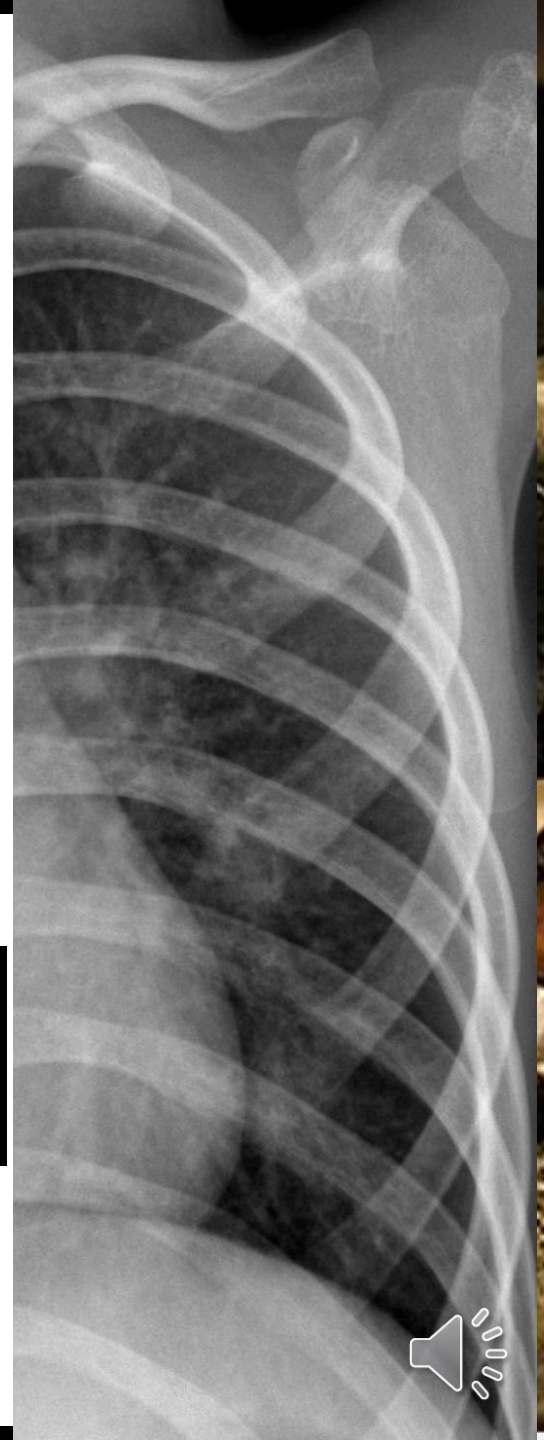


X-RAY PNEUMONIA DETECTION

*A Deep Learning
Approach*



PROBLEM STATEMENT

Covid-19

- Over a million confirmed cases and nearly one hundred thousand deaths in United States as of May 2020
- Countries with less resources are likely undercounting due to difficulty of testing

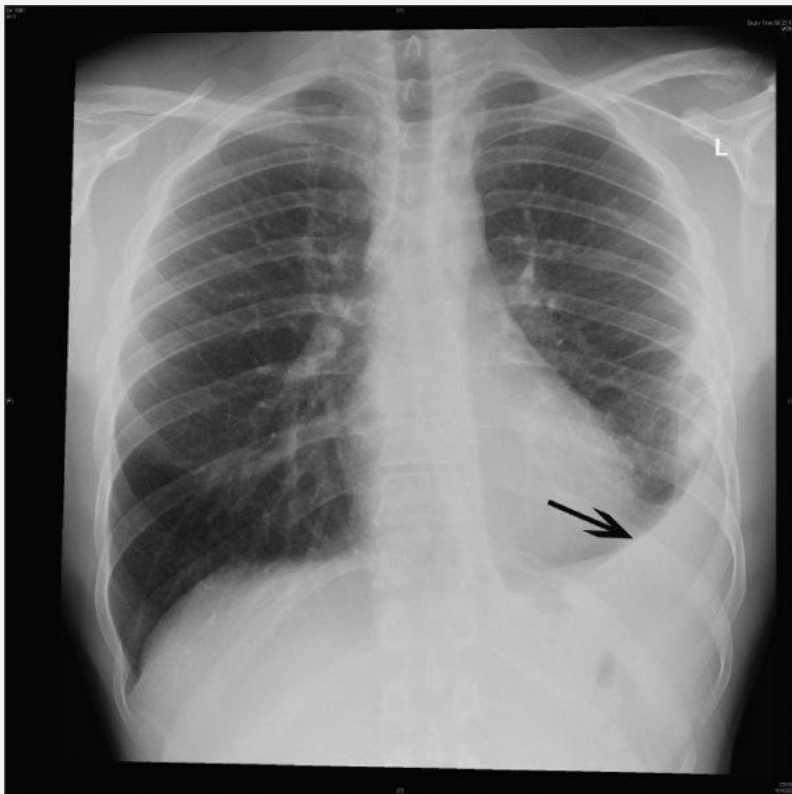
Available Testing

- US has tested over 10 million individuals for Covid-19
- Many hospitals and testing centers are still facing shortages, especially rural areas
- Confluence Health in Wenatchee, WA was unable to test patients for over a week in early May 2020

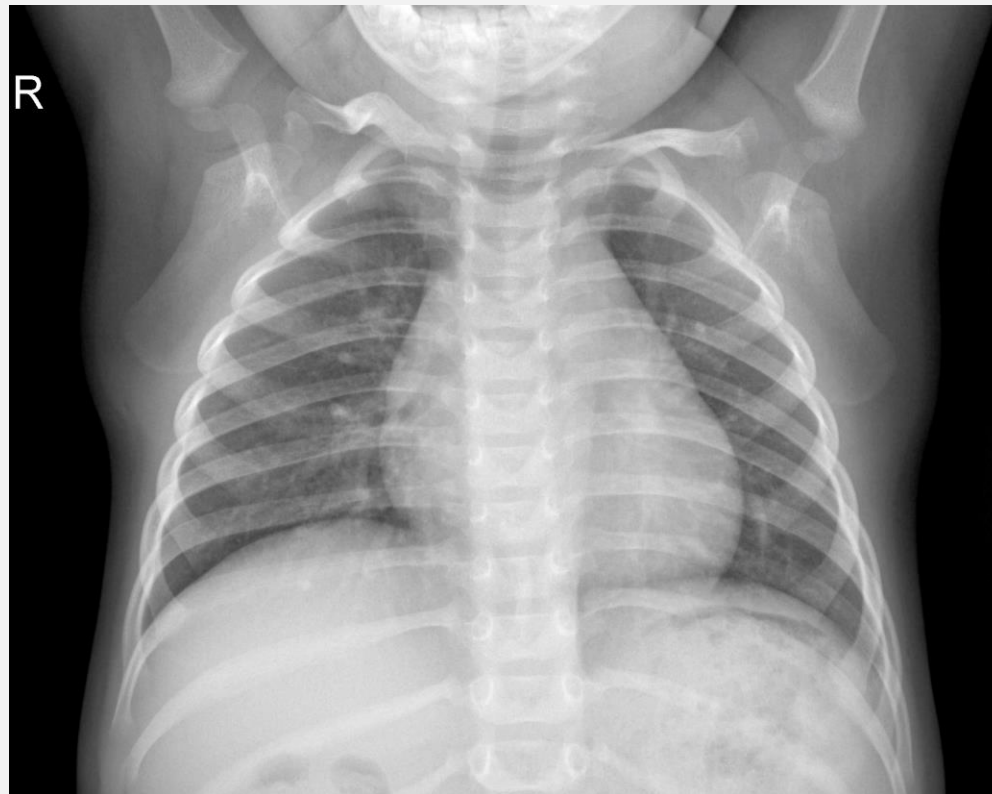
Available Data

- Radiologists may diagnose pneumonia using x-ray images
- Public Covid-19 X-Ray data is extremely limited (73 total found)
- Effective deep learning requires substantial data
- Idea was to train model on more generalize pneumonia x-ray data and apply model to Covid-19 data

X-RAY DATASET



3,875 pneumonia



1,349 normal

PROBLEM APPROACH

**Baseline Models –
VGG16 Architecture**

~73% Accuracy



**Generalization
Attempts**

~75% Accuracy



**Transfer Learning
Approach – VGG16
and Xception**

~83% Accuracy

FINAL MODEL PERFORMANCE ON TEST SET

Model	Accuracy	Precision	Recall
VGG-1	75.64%	72.12%	99.49%
VGG-3	77.88%	74.42%	98.46%
VGG-5	73.24%	70.16%	99.49%
VGG-3 (Dropout)	74.68%	71.32%	99.49%
VGG-3 (Image Data Augmentation)	71.15%	68.55%	99.49%
VGG-3 (Batch Normalization)	67.47%	65.76%	100.00%
VGG-16 (Untrained Base)	77.56%	73.95%	98.97%
VGG-16 (Trained Base)	77.56%	73.95%	98.97%
Xception (Untrained Base)	63.30%	63.05%	99.74%
Xception (Trained Base)	82.85%	78.59%	99.74%

FUTURE WORK

Train on More Data

- Obtain more data (specifically Covid-19 patients)
- Generate more x-ray images data using deep learning

Explore More Models

- Thousands of CNN models are now open source and available on the web
- Train models at scale using cloud-based GPUs

Better Prepare Images

- Each x-ray image came in a different size and aspect ratio
- Our images were “squashed” to a consistent size for training
- This likely distorted the images making training less effective
- Mechanical Turk cropping



THANK YOU

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