



COV-ID



The Problem

Proper diagnosis of COVID-19 is essential in timely and accurate treatment to reduce mortality.

Chest X-Rays (CXR), while simple and cost-effective compared to RT-PCR testing, are prone to misinterpretations by clinical experts.

With the current rise in cases, demand for radiologic interpretation are increasing and clinical providers are overwhelmed.

The Solution

We use AI to aid differentiation between COVID-19 pneumonia, Non-COVID-19 pneumonia, and normal CXRs.

We outsource our services in providing expert interpretation by qualified radiologists .



Time Saving
Cost-reduction
Accurate interpretations
Reduces burn-out

Background

Polymerase chain reaction (PCR) tests are the most reliable and accurate form of SARS-CoV-2 testing. PCR tests typically take hours to perform. Another method for testing is a rapid antigen test. Rapid antigen is less accurate, but yields results sooner.

Our AI-based system aims to aid physicians and radiologists in detecting COVID-19 through chest x-ray, one of the first diagnostic tests performed on a patient who is presumed to be COVID-19 positive or display COVID-19 related symptoms.

COVID-19-induced pneumonia shown on chest x-rays present significantly differently than non-COVID-19 related pneumonia. This factor is key in rapid diagnosis and treatment, with the end goal being to prevent ventilation and COVID-19 related death.



Why X-rays?

- To aid physicians in diagnosing **COVID-19** vs non-COVID-19 pneumonia -> **timely diagnosis** -> **successful treatment** -> **early recovery**
- Timely diagnosis and successful treatment can **decrease ventilation rates**
- **Shortened turnaround time** with more accurate interpretation
- **Reduces physician burnout**
- Data (X-Ray imaging) to be **stored** in database for further **research purposes**

The data

Preprocessed Datasets:

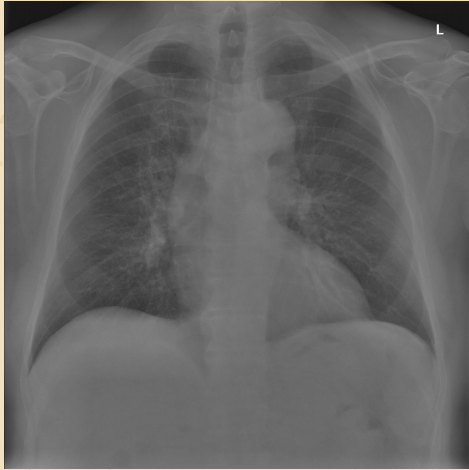
- [COVID-19 Chest X-rays dataset](#) - On Github curated by Dr. Joseph Cohen (Post doc. Fellow at the University of Montreal).
 - [Normal X-rays vs Pneumonia Chest X-ray dataset](#) - Kaggle
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Post Processed Datasets:

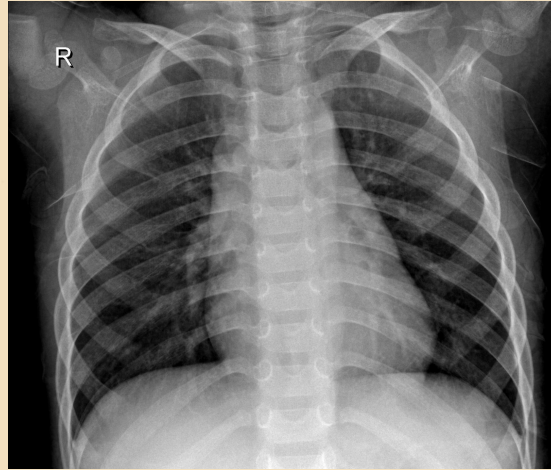
PA view (Frontal view) Chest X-rays - 196 each from the following categories:

- [COVID-19 Pneumonia](#) Chest X-rays
- [Normal](#) Chest X-rays
- [NON-COVID-19 Pneumonia](#) Chest X-rays

The data



COVID-19 Pneumonia
Chest X-ray



Normal Chest X-ray



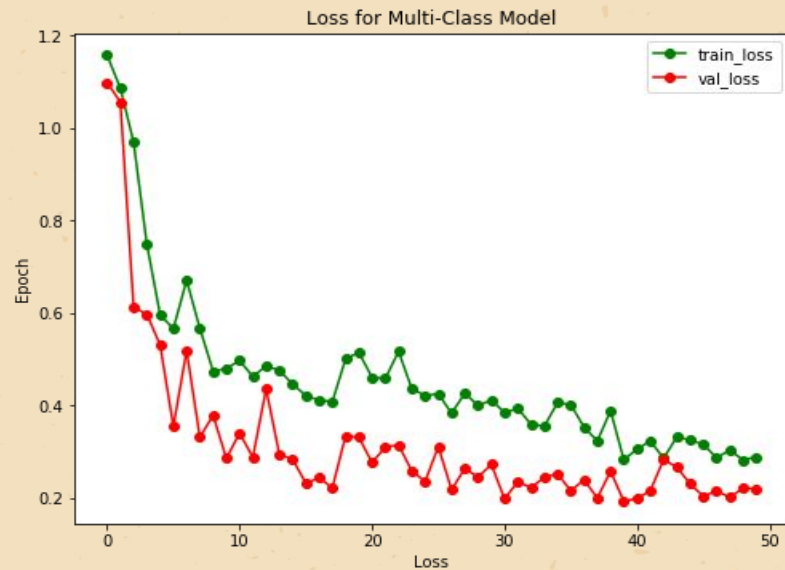
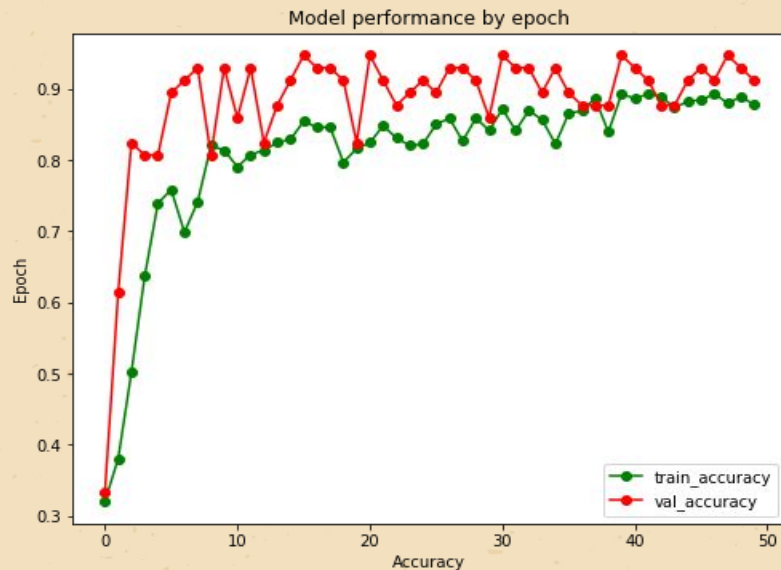
NON-COVID
Pneumonia Chest
X-ray

Model: "sequential_14"

Layer (type)	Output Shape	Param #
=====		
conv2d_75 (Conv2D)	(None, 222, 222, 32)	896
conv2d_76 (Conv2D)	(None, 220, 220, 64)	18496
max_pooling2d_65 (MaxPooling)	(None, 110, 110, 64)	0
dropout_41 (Dropout)	(None, 110, 110, 64)	0
conv2d_77 (Conv2D)	(None, 108, 108, 64)	36928
max_pooling2d_66 (MaxPooling)	(None, 54, 54, 64)	0
dropout_42 (Dropout)	(None, 54, 54, 64)	0
conv2d_78 (Conv2D)	(None, 52, 52, 128)	73856
max_pooling2d_67 (MaxPooling)	(None, 26, 26, 128)	0
dropout_43 (Dropout)	(None, 26, 26, 128)	0
conv2d_79 (Conv2D)	(None, 24, 24, 256)	295168
max_pooling2d_68 (MaxPooling)	(None, 12, 12, 256)	0
dropout_44 (Dropout)	(None, 12, 12, 256)	0
flatten_16 (Flatten)	(None, 36864)	0
dense_41 (Dense)	(None, 64)	2359360
dropout_45 (Dropout)	(None, 64)	0
dense_42 (Dense)	(None, 3)	195
=====		
Total params: 2,784,899		
Trainable params: 2,784,899		
Non-trainable params: 0		

Model: Convolutional Neural Network

Model Performance

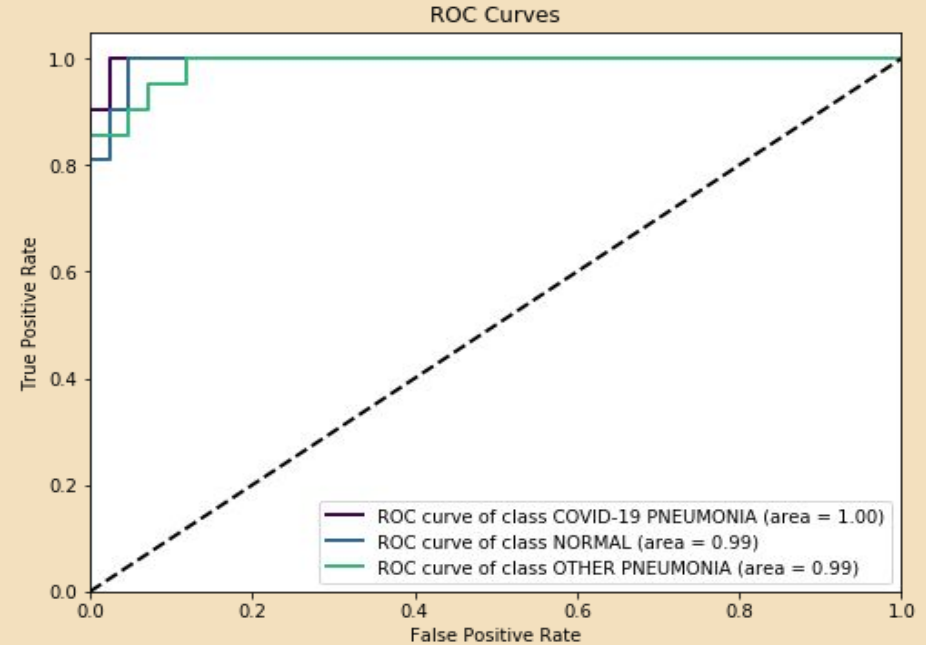
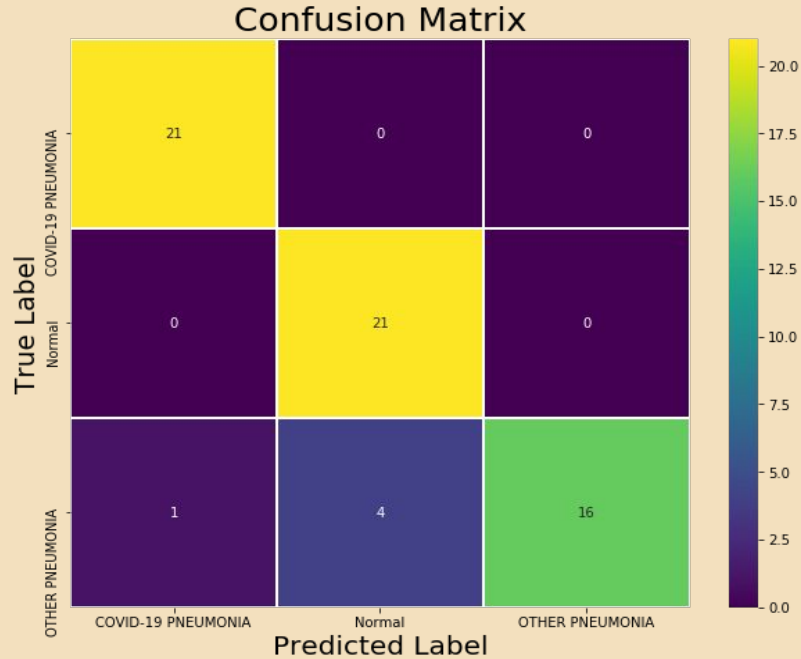


Model Evaluation

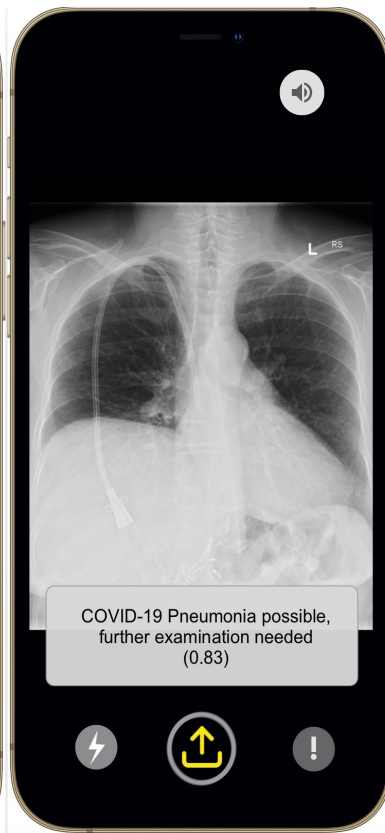
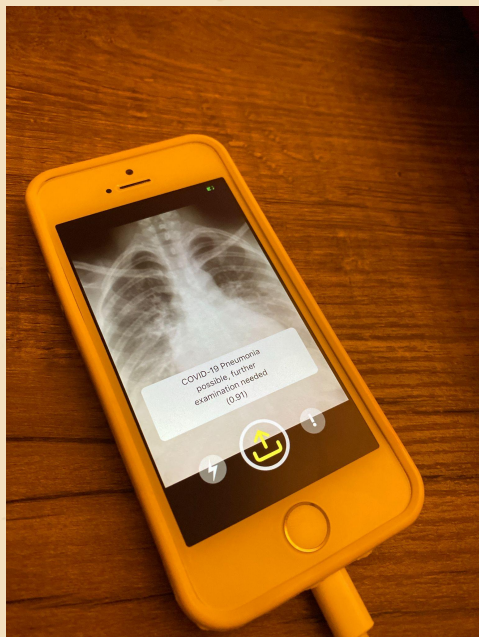
	precision	recall	f1-score	support
COVID-19_Xray	0.95	1.00	0.98	21
Normal_Xray	0.84	1.00	0.91	21
PNEUMONIA_Xray	1.00	0.76	0.86	21
accuracy			0.92	63
macro avg	0.93	0.92	0.92	63
weighted avg	0.93	0.92	0.92	63

Dataset	Accuracy
Training set	93.16%
Testing set	92.06%

Model Evaluation











The App



User Experience

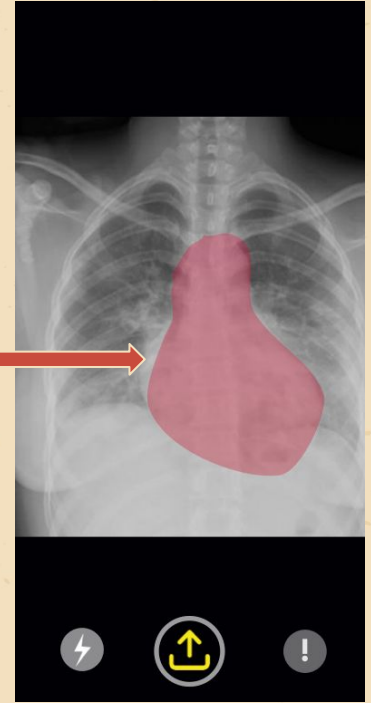


Competitive Landscape

Company	Main Purpose	Teleradiology Service	AI	Pricing
cov-ID	AI-backed detection with outsourcing services			FREE
behold.ai	AI-backed, computer-aided detection tool			Subscription
Lunit	Web-based medical image diagnostic software			Subscription
Rology	On-demand teleradiology platform serving radiologist shortage			On-demand

Future Direction

- Expand classification (multi-classification) to further specify diagnosis
- Train our model with more datasets and for longer epochs to achieve higher accuracy
- Have a more polished interface for users
- Highlight suspected COVID-19 pneumonia markers on X-Ray image (mockup on right)



Conclusion

Thank you MedHacks!