The background of the slide is a soft-focus photograph of medical supplies. On the left, a white plastic pill bottle is tipped over, with several light blue, oval-shaped tablets scattered on the surface. To the right, a silver stethoscope with a black tube is resting on a white computer keyboard. The keys for 'command' and 'option' are visible. The overall lighting is bright and clinical.

Detecting Viral vs Bacterial Pneumonia from CXR with Deep Learning

Vivian Dang

01 ABOUT THE DISEASE

Pneumonia is an infection that inflames air sacs in the lungs which may fill with fluid or pus

02 PATHOGENS

Virus, bacteria, fungus

03 COSTS

>\$13B annually
50,000 deaths annually

04 SOLUTION

Fast & accurate diagnosis of pneumonia
pathogen with AI

Our Solution:

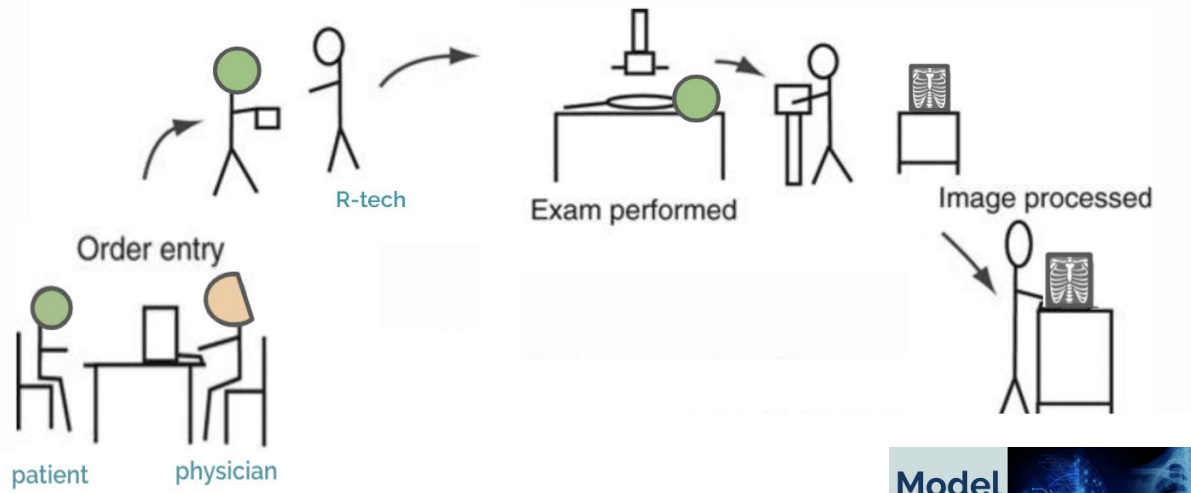
- Mendeley's Pediatric CXR Dataset
 - 2,538 Bacterial
 - 1,345 Viral
- Assumptions:
 - Pediatric patient has either viral or bacterial pneumonia (no superinfection)
 - No underlying diseases like congestive heart failure or scarring in lungs



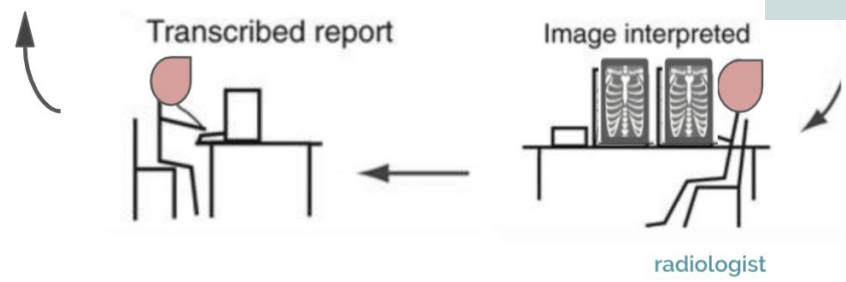


Model Demo

Accuracy = 86.7%



Patient care



Recommendations:

- Integrate model into medical software to enhance patient treatment outcomes
- Verify model's result with at least one physician to enhance diagnosis accuracy
- Report model's performance to the American Thoracic Society to allow its incorporation in future guidelines

Next Steps:

- Improve model with data augmentation
- Train data with Keras pretrained models (ex: VGG16)
- Collect data and create a multi-label classification for normal, viral, bacterial, fungal, superimposed pneumonia

Thanks!



GitHub Link: <https://github.com/viviandng>

Email: dangtvivian@gmail.com

APPENDIX

Model Design

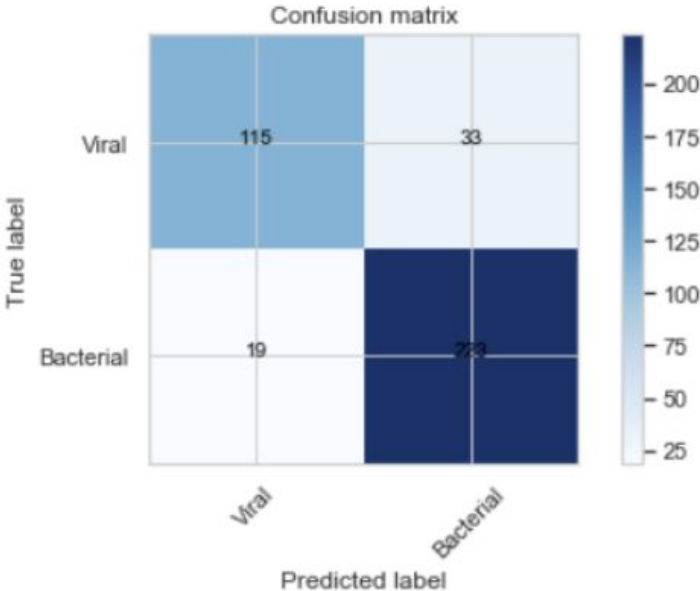
Model: "sequential_2"

Layer (type)	Output Shape	Param #
=====		
dense_5 (Dense)	(None, 20)	3010580
dense_6 (Dense)	(None, 7)	147
dense_7 (Dense)	(None, 5)	40
dense_8 (Dense)	(None, 1)	6
=====		
Total params: 3,010,773		
Trainable params: 3,010,773		
Non-trainable params: 0		

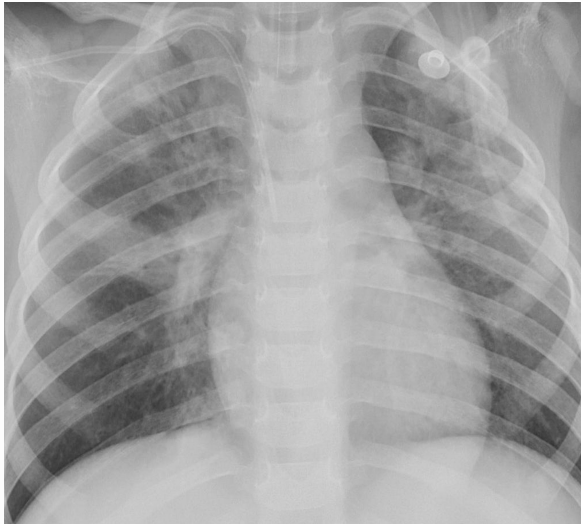
Model's Score

Accuracy	Precision	F1	Recall	Loss
0.867	0.871	0.896	0.922	0.461

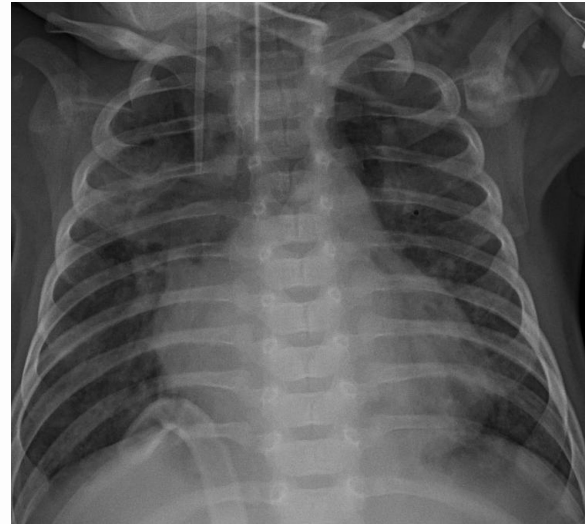
Confusion Matrix, without normalization
[[115 33]
[19 223]]



Viral CXR



Bacterial CXR



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