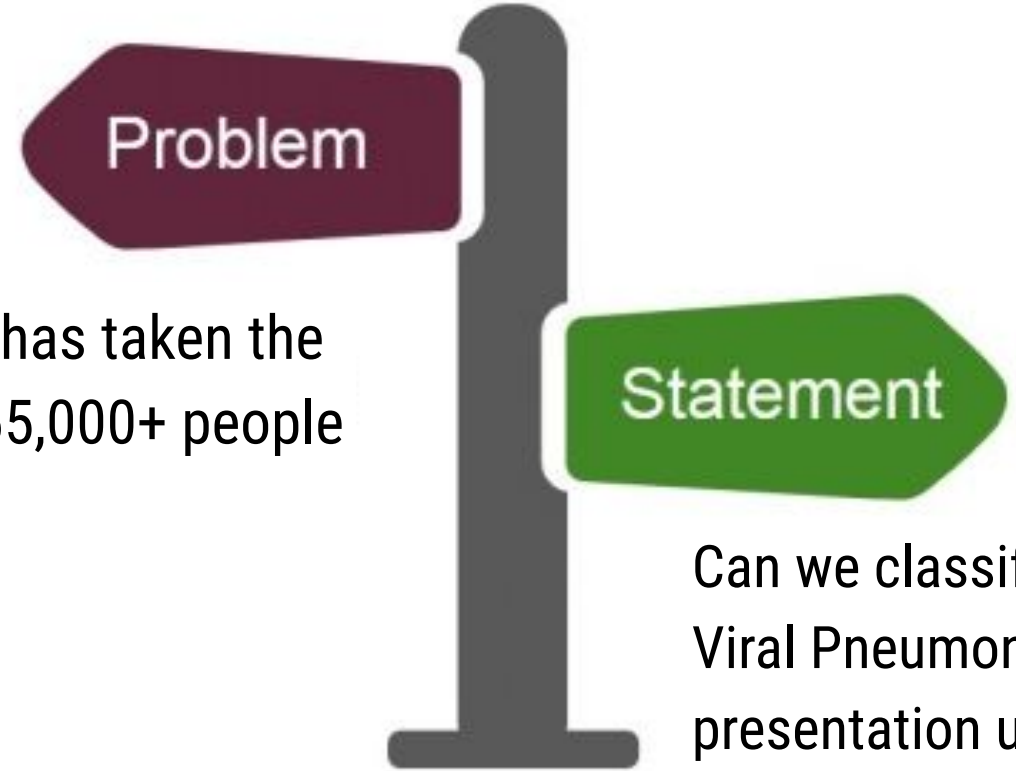
AI RADIOLOGIST

By Melissa McMillan, Mathew Katz, Michael Kenny, and Jen Boyles

Problem And Statement



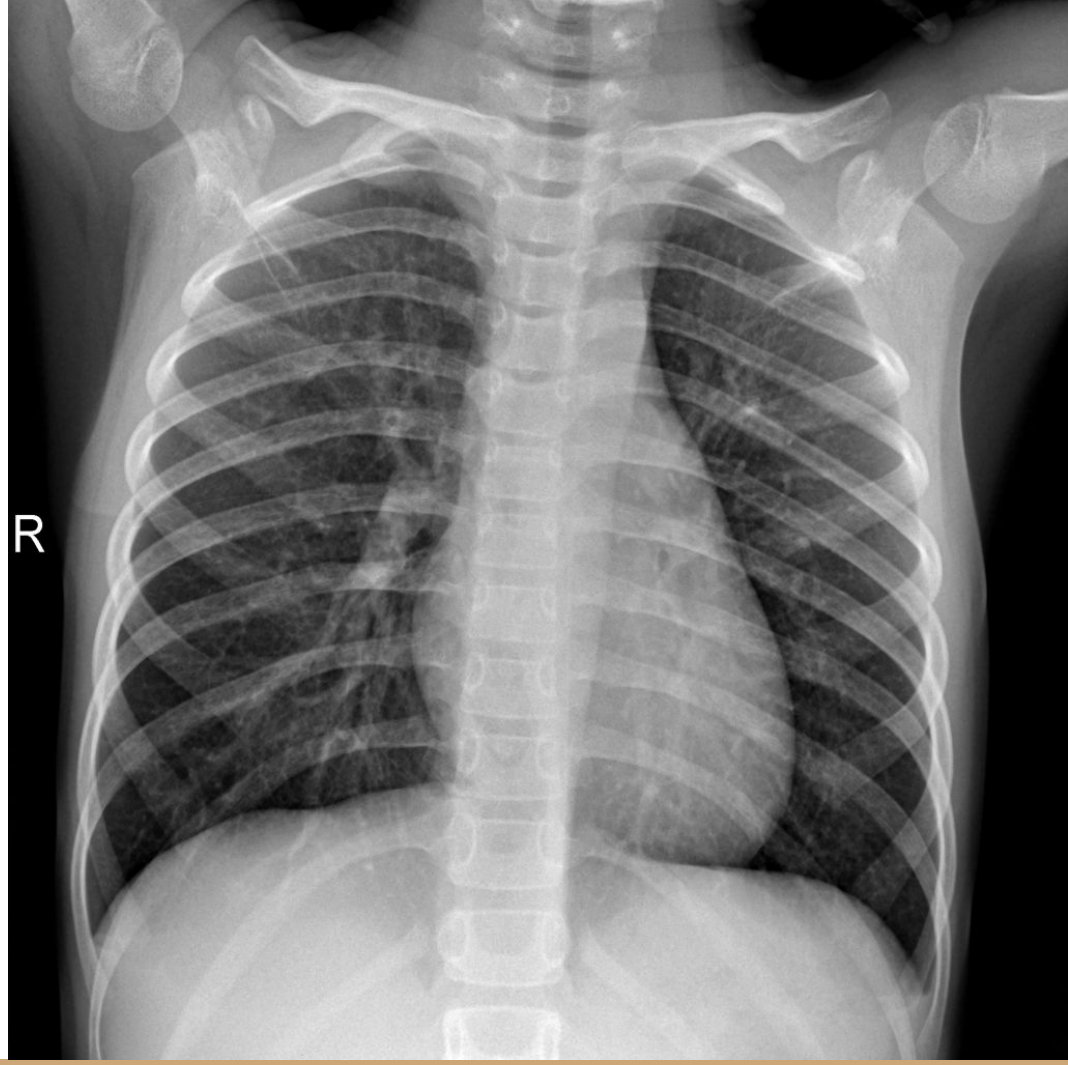
COVID-19 has taken the lives of 465,000+ people in the U.S.

Can we classify COVID-19 pneumonia, Viral Pneumonia, or Normal respiratory presentation using chest X-rays?

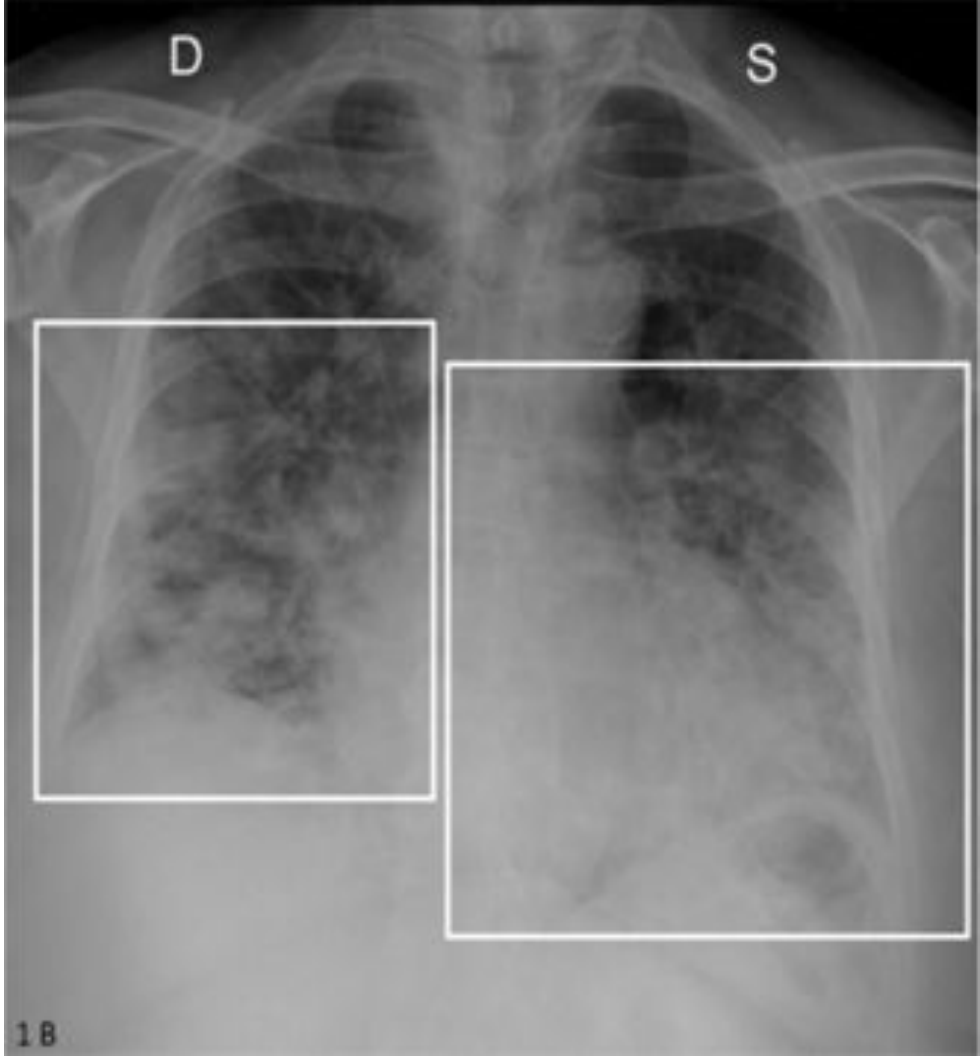
Data Acquisition & Type

- kaggle dataset[1]: The COVID-19 Radiography Database
- 3 Classes of chest X-rays: COVID, Viral Pneumonia, & Normal

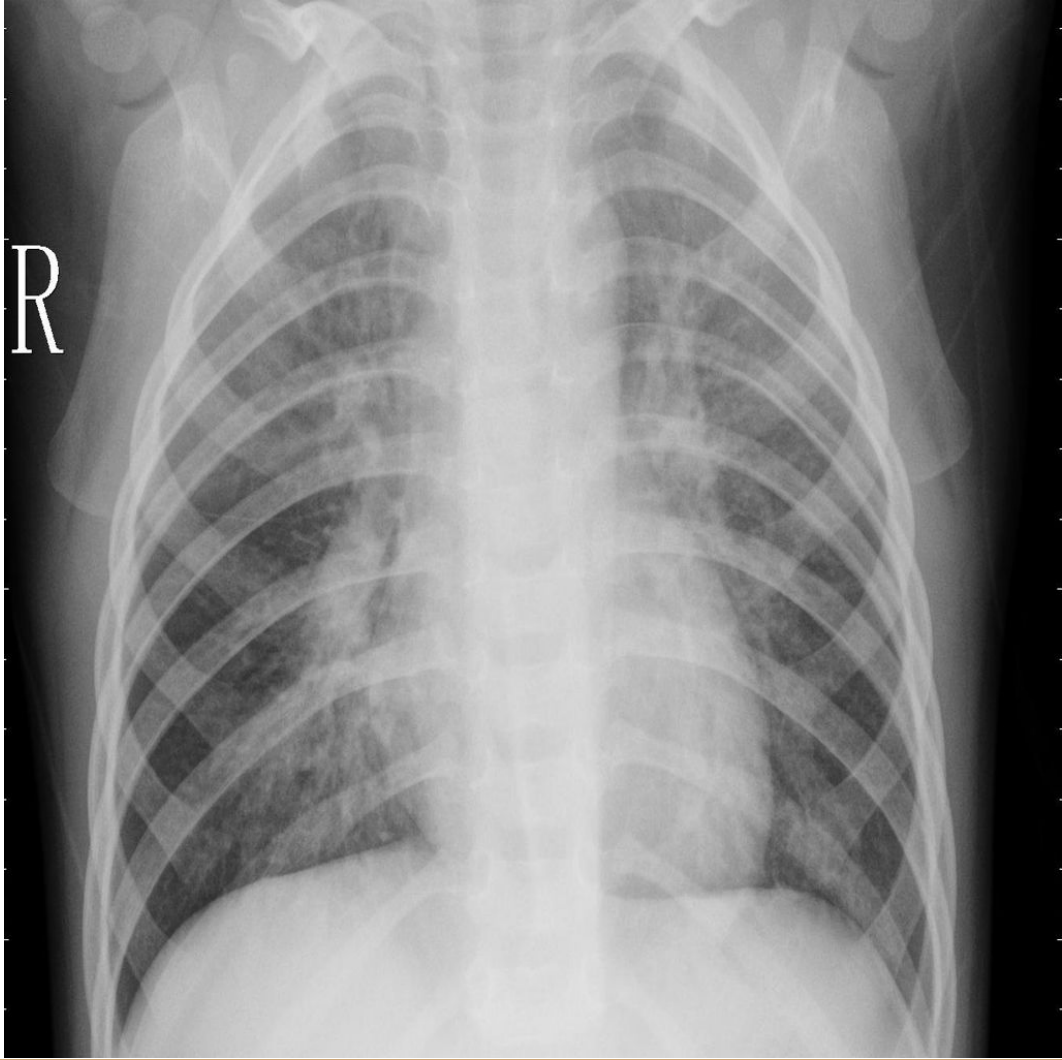
Normal Class Example



COVID-19 Class Example



Viral Pneumonia Class Example



<null> Model

- Initial comparison to deep learning classifiers
- Based on the most frequent value
- Our Null Model Accuracy: 34.6%

Evaluation Metrics

- Optimize Accuracy: want high predictive power for all diagnostic classes

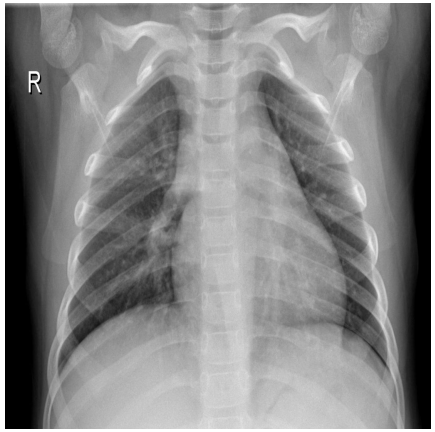
- Optimize Recall: false negatives too harmful to ignore

		Actual	
		Positive	Negative
Predicted	Positive	True Positive	False Positive
	Negative	False Negative	True Negative

Data Augmentation

- Avoid model overfitting and create more images from the training dataset.
- Class Count:
  - 1200 COVID-19 Presenting
  - 1341 Normal Presenting
  - 1345 Viral Pneumonia Presenting

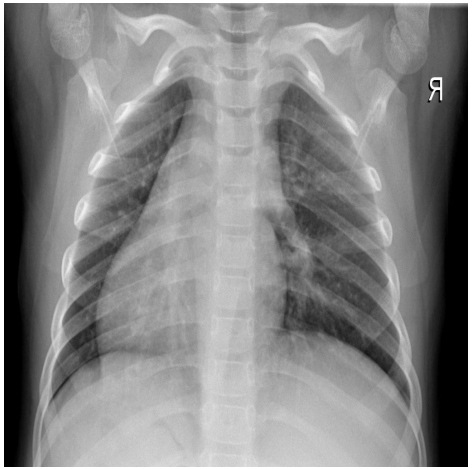
Data Augmentation



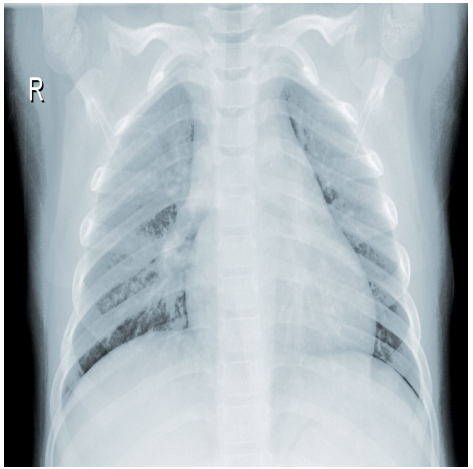
Original X-Ray

Flipped Vertically

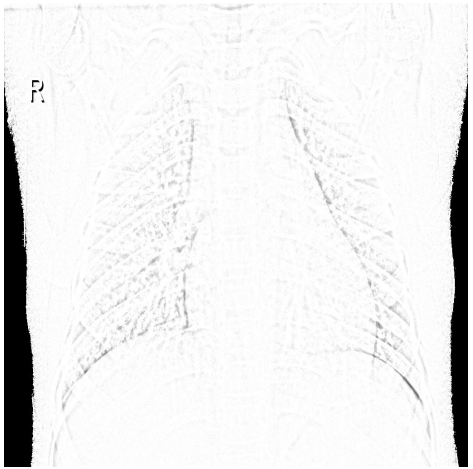
Flipped Horizontally



Brightness Scaler



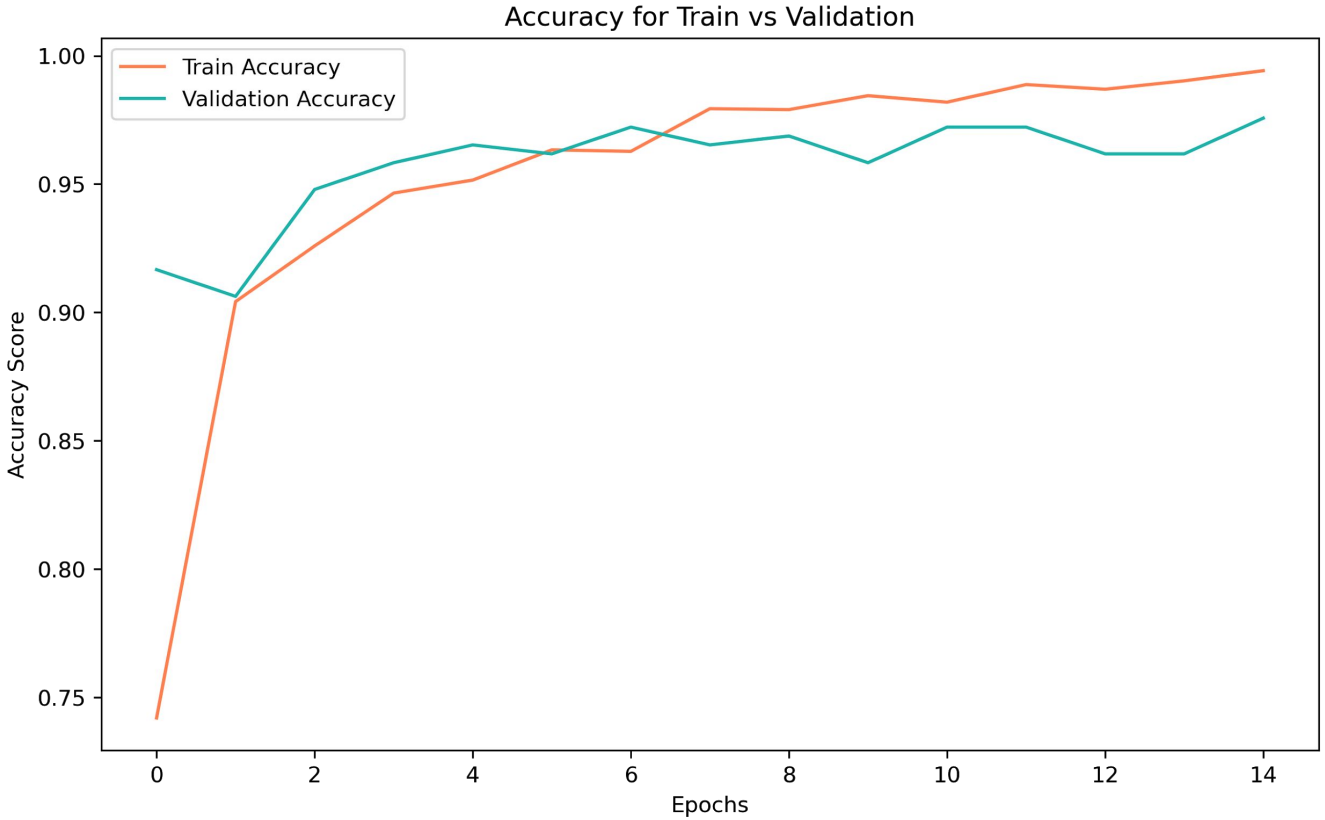
Whitening



Final Model

- CNN Model: Data Augmentation, 1 Hidden Layer of 300 Nodes
- Accuracy: 93%
- Recall: 93%

Final Model Accuracy



Final Model Recall

DEMO TIME!

Ft Michael Kenny

Conclusion & Recommendations

- Final Model: Strong predictive power

- Recommendation: the model only viable for patients with serious presentations of respiratory symptoms.

Next Steps & Improvements

- Gather more data -> improve generalizability, improve detection of presentation features

Thank you

Questions?

Citations

1. 1. M.E.H. Chowdhury, T. Rahman, A. Khandakar, R. Mazhar, M.A. Kadir, Z.B. Mahbub, K.R. Islam, M.S. Khan, A. Iqbal, N. Al-Emadi, M.B.I. Reaz, M. T. Islam, “Can AI help in screening Viral and COVID-19 pneumonia?” IEEE Access, Vol. 8, 2020, pp. 132665 - 132676.