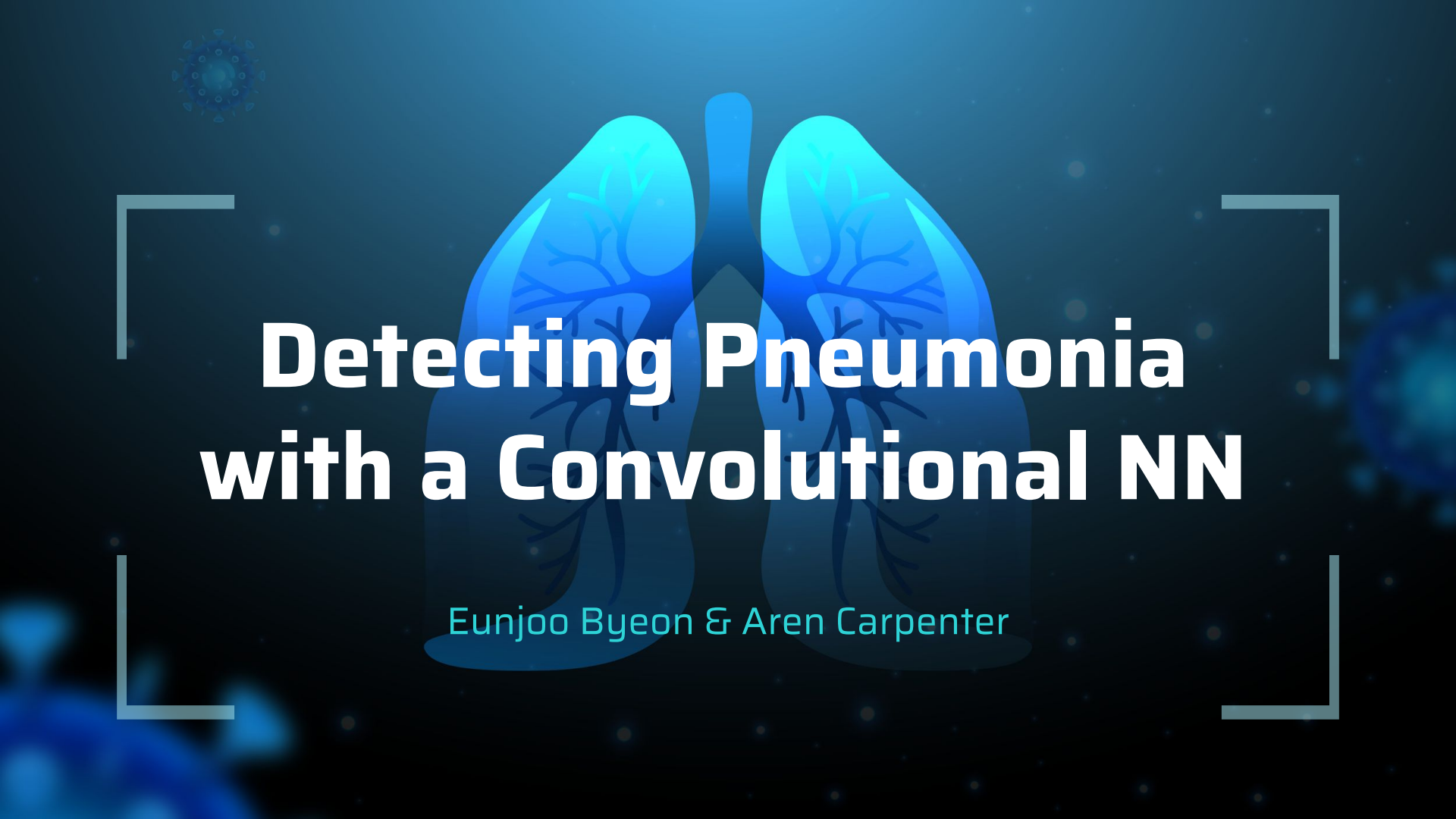


Detecting Pneumonia with a Convolutional NN

Eunjoo Byeon & Aren Carpenter

Pneumonia

01

Causes

Bacterial or viral infection

02

Fatality

8th leading cause of death in US

A leading cause of death worldwide for children under 5

03

Treatment

Easy to treat with antibiotics

Challenge

Lack of medical infrastructure, especially in South Asia and sub-Saharan Africa

Chest X-ray is an accessible equipment, yet requires a trained physician to diagnose pneumonia

The Data

+5000

Chest X-Rays by Kermany et al. at UCSD

3,001

Pneumonia Patients

1,042

Healthy Controls

Kermany, Daniel; Zhang, Kang; Goldbaum, Michael (2018)

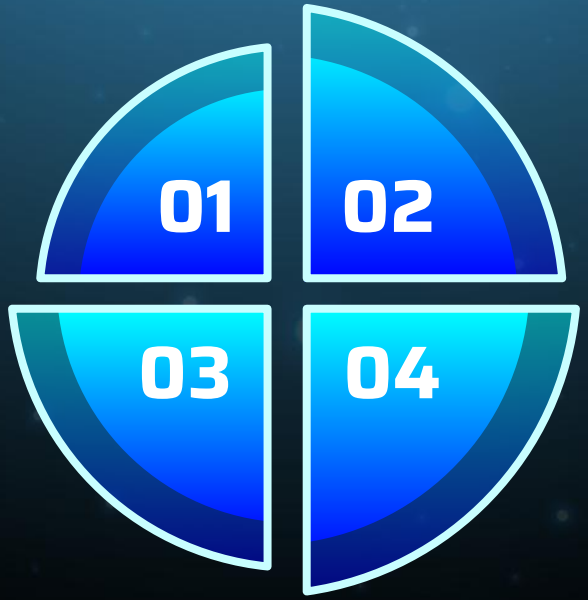
Process

Data Prep

Purging corrupted files

Modeling

Convolutional
Neural Network



Data Exploration

Evaluation & Insights

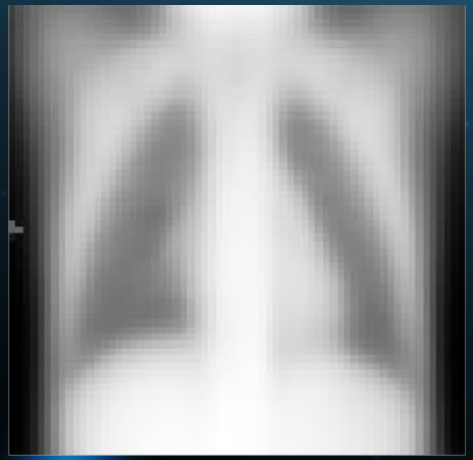
Sample X-Rays

Healthy

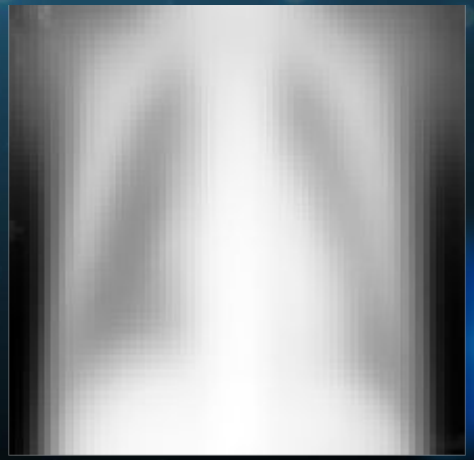
Pneumonia

Average Image

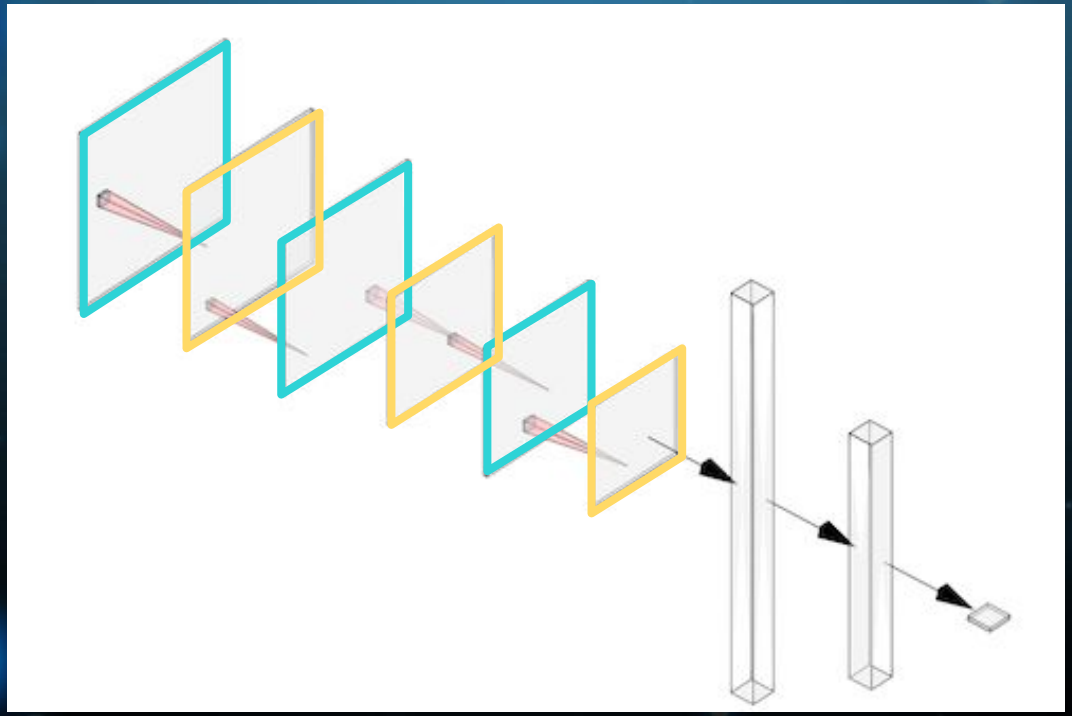
Healthy



Pneumonia



Modeling



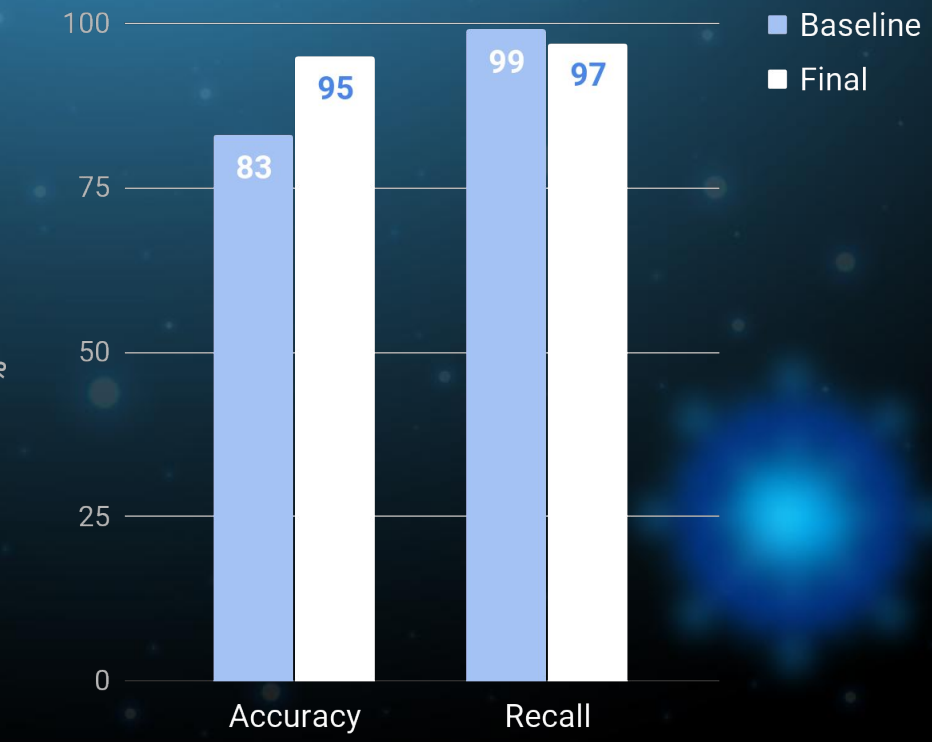
Model Evaluation

Final Model

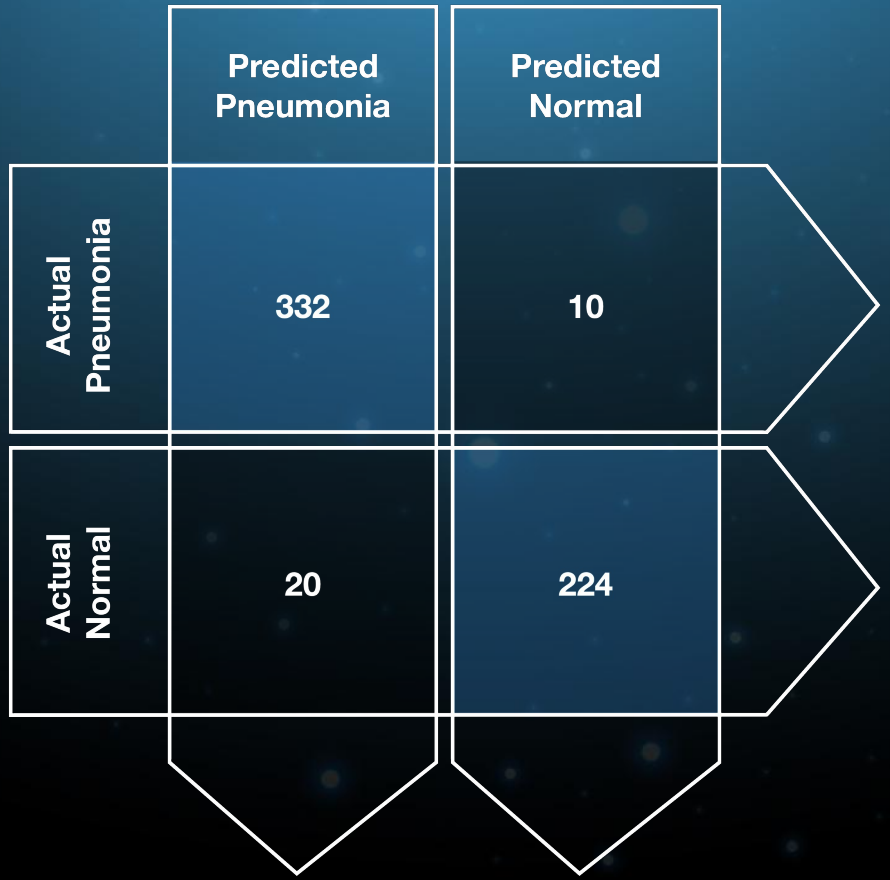
Loss reduced to 6% of baseline

95% Accuracy

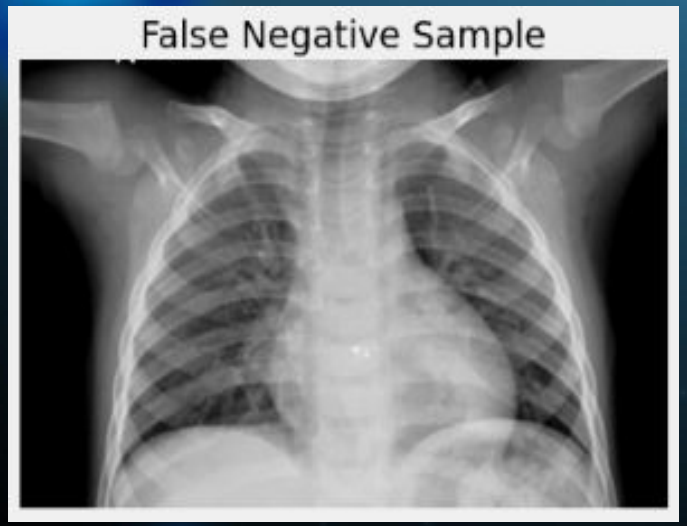
Detects 97% of Pneumonia class accurately



Model Performance



Model Performance



Key Insights

Image Classification Is a Powerful Tool

Able to achieve high accuracy and recall

Can flag potential pneumonia cases for human review

Can be Leveraged to Assist Underserved

One doctor can help more people in the same time

Can be run from a laptop, no big equipment needed

Cheaper than other Imaging Options

CT Scans are cheaper than other options

Using CNNs on CT can be just as effective

Next Steps

- Productionize model with front end for use by physicians
- Create a pipeline for introducing new images and updating model
- Create a pre-trained network on CT images (grayscale)

Thank you!

Any Questions?

References

- Hashmi, et al., Efficient Pneumonia Detection in Chest Xray Images Using Deep Transfer Learning (2020), MDPI Diagnostics 10, 417: 1-23.

- Kermany, et al., Identifying Medical Diagnoses and Treatable Diseases by Image-Based Deep Learning (2018), Cell 172: 1122-1131.