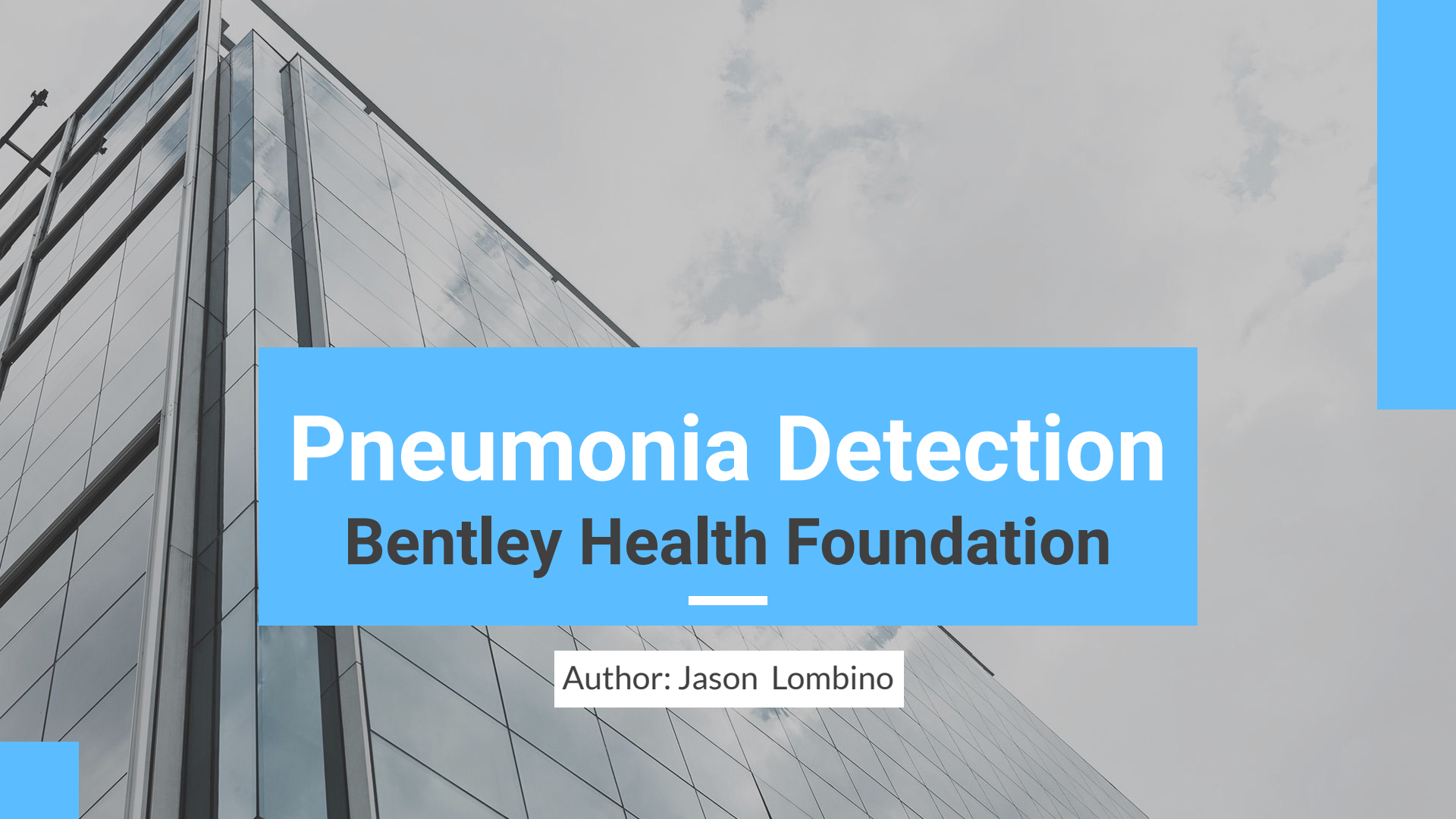


Pneumonia Detection

Bentley Health Foundation

Author: Jason Lombino

Somewhere in the world, a child dies of pneumonia every

39 seconds

Source: UNICEF Data

Currently...

Rural and developing areas are the most heavily impacted by pneumonia.

Source: UNICEF Data

Our Mission

Detect signs of pneumonia in chest x-rays using software.

Process

01

Data Exploration

Preliminary exploratory analysis of the data.

02

Iterative Modeling

Make basic models & improve upon the best performers.

03

Validation

Verify model performance and draw insights from the model.

01

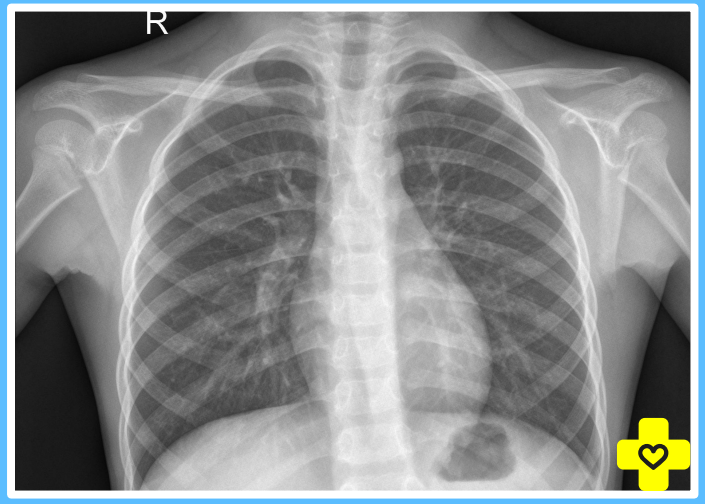
Data

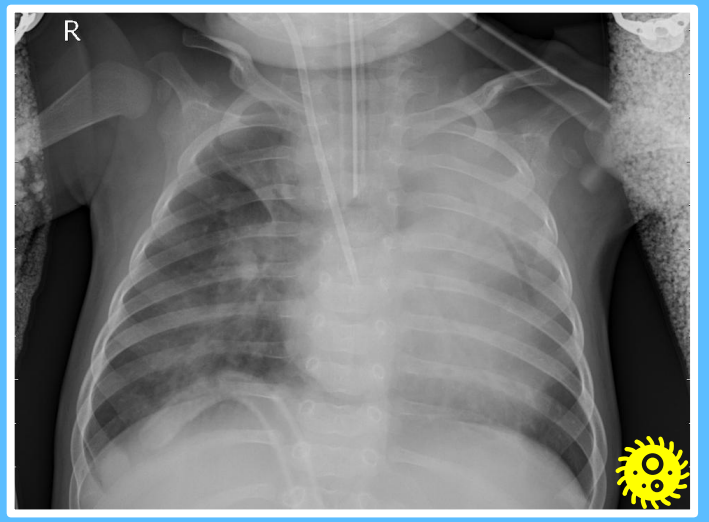
Image: Arseny Togulev on UNSPLASH

Chest X-ray Data

- 5600 Sick & healthy chest x-rays
- Sick x-rays are over-represented
- Sick includes viral & bacterial pneumonia

Link: Kaggle Dataset





Training Image Prep.

- ± 45° Rotation
- ± 30% Zoom
- Horizontal Flip

02

Modeling

Image: Louis Reed on UNSPLASH

Convolutional Neural Network

- Standard for image data
- Automatically detect important features
- Pre-trained networks available as starting point

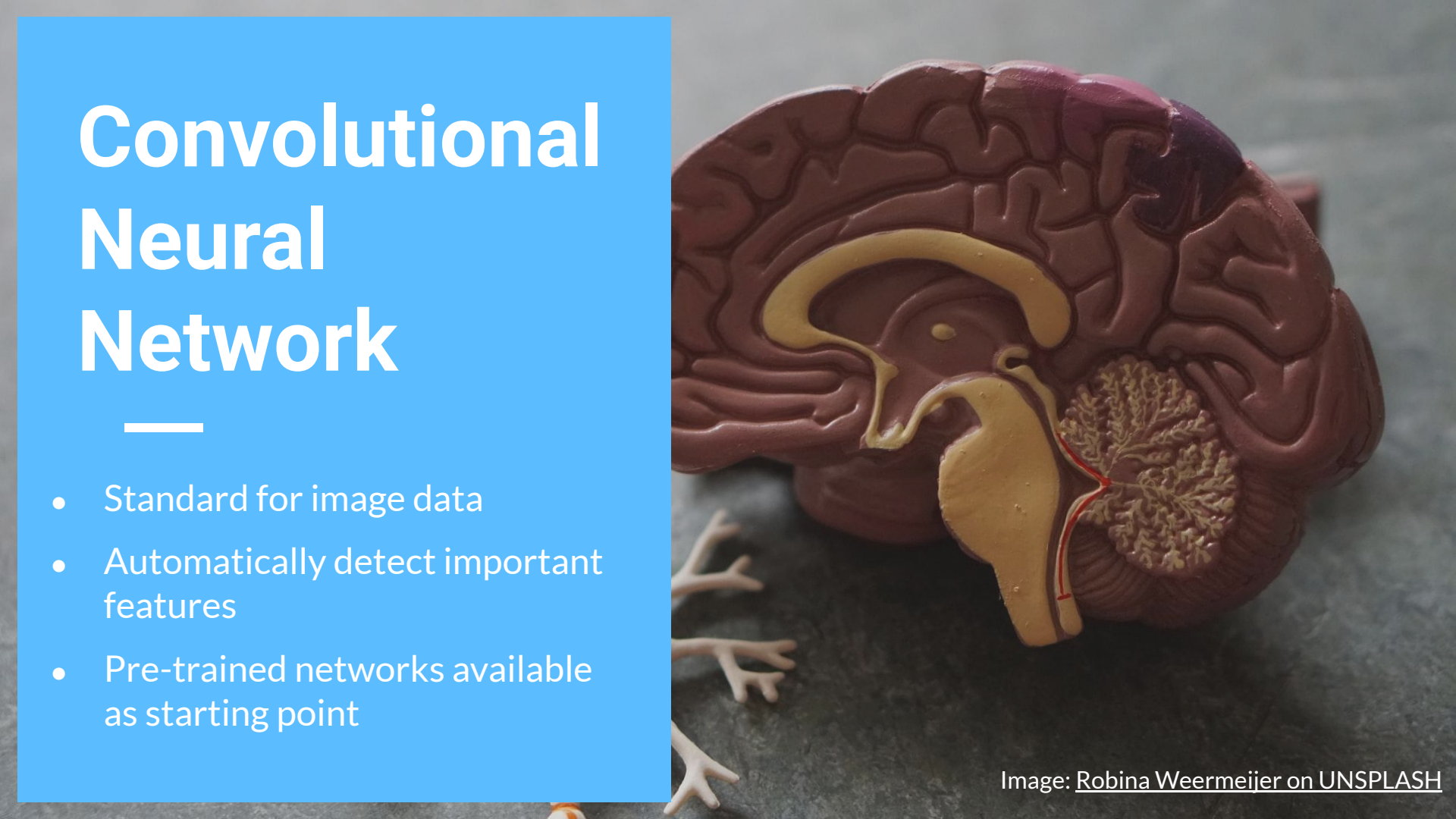


Image: Robina Weermeijer on UNSPLASH

Iterative Modeling

- Learning rate
- Network size
- Activation function
- Dropout
- Filter stride
- Pre-trained networks

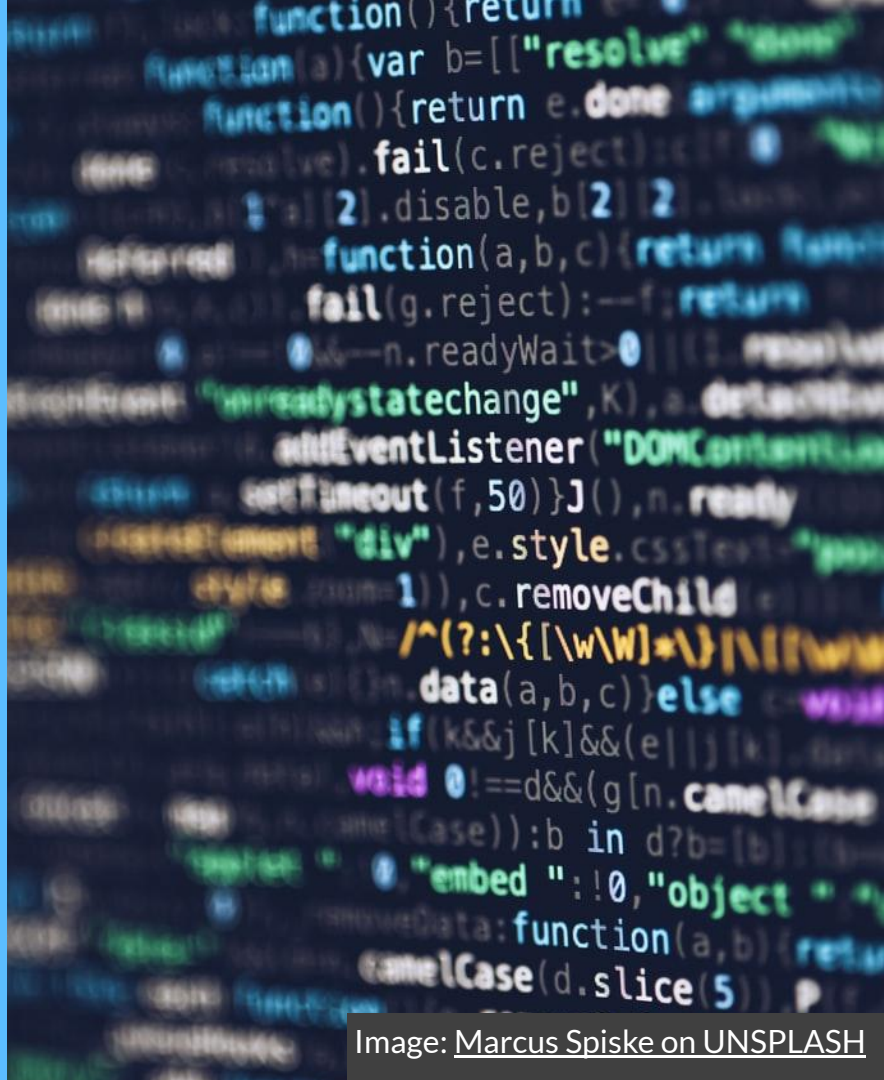
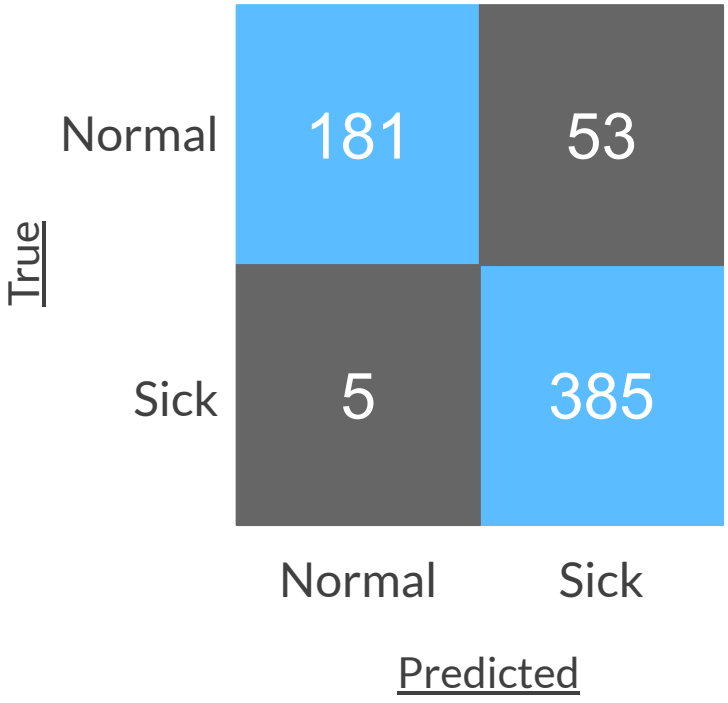


Image: Marcus Spiske on UNSPLASH

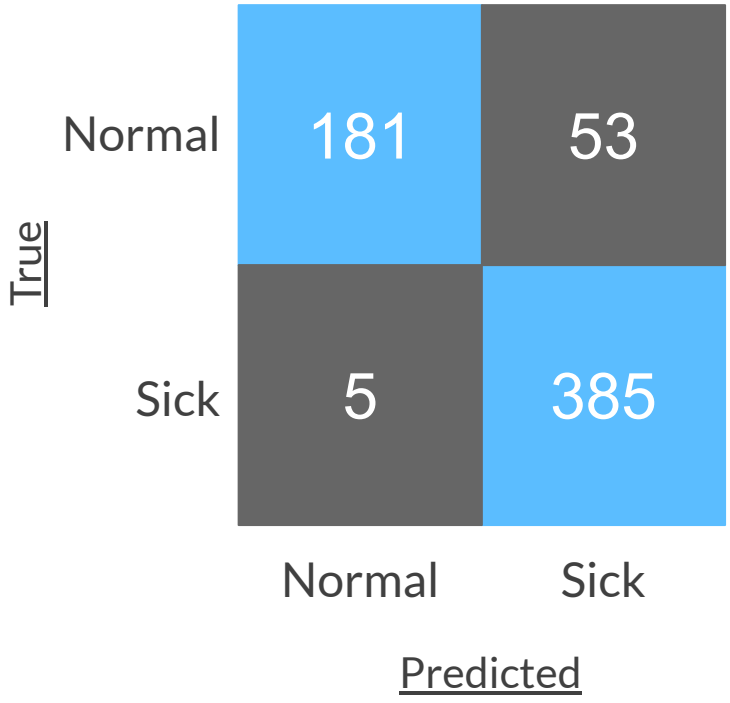
Model Results



Accuracy - 90.7%

How many model predictions were correct?

Model Results



Precision - 88%

Of the patients predicted to be sick, how many really were?

Recall - 99%

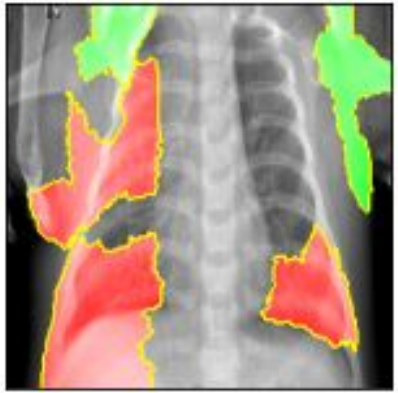
Of all sick patients, how many did the model identify?

03

Validation

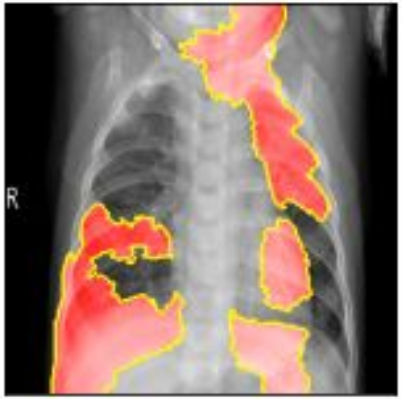
Image: Julia Zyablova on UNSPLASH

Correctly Predicted As Sick



Incorrectly Predicted As Sick

Correctly Predicted As Normal



Incorrectly Predicted As Normal

Weaknesses

Data Availability

More data yields better performance.

Interpretability

“Black box” style model.

Class Imbalance

Models perform better when data is balanced.

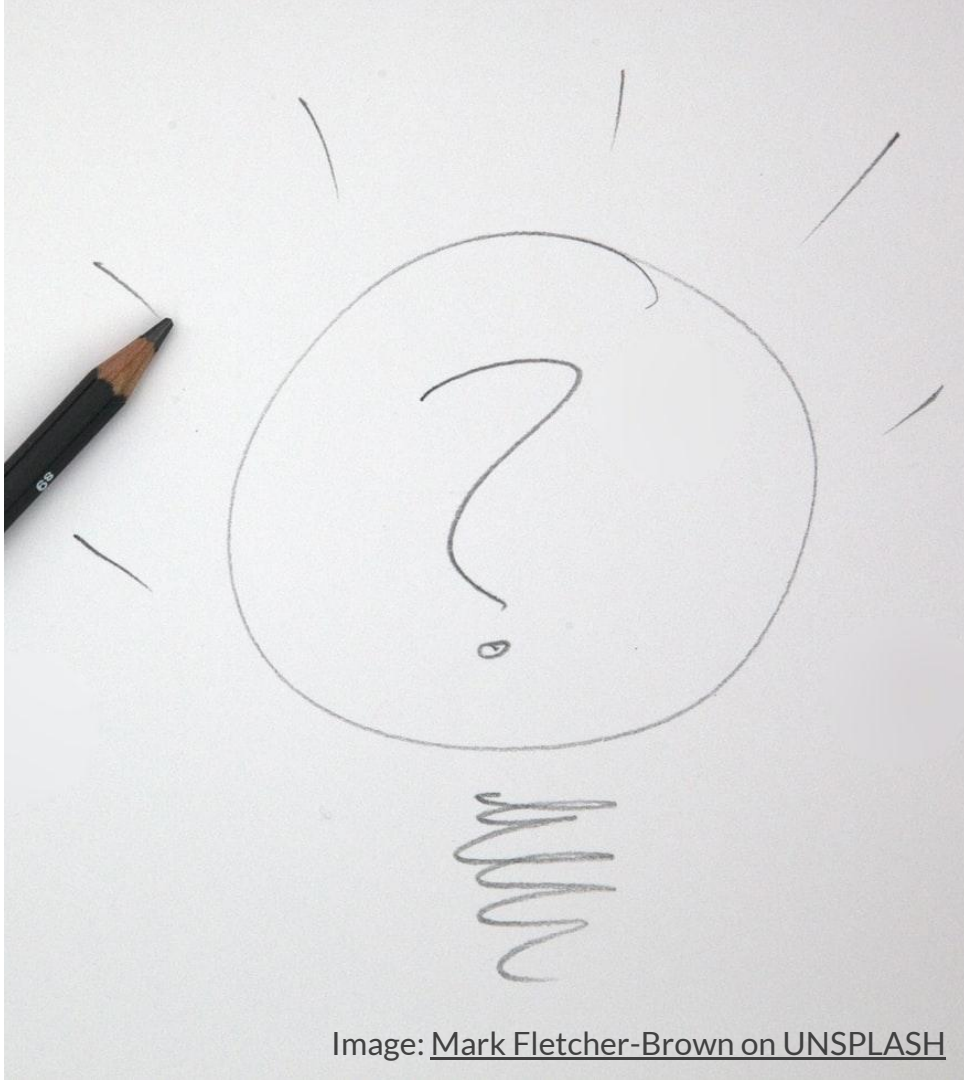


Image: Mark Fletcher-Brown on UNSPLASH

Future Research

Types of Pneumonia

Viral and Bacterial Pneumonia appear differently & require different treatments.

Various Diseases

Can a similar model be applied to similar diseases?

Older Age Groups

Can a similar model detect signs of pneumonia in older patients?

Thanks

Do you have any questions?

Project Github Repo.