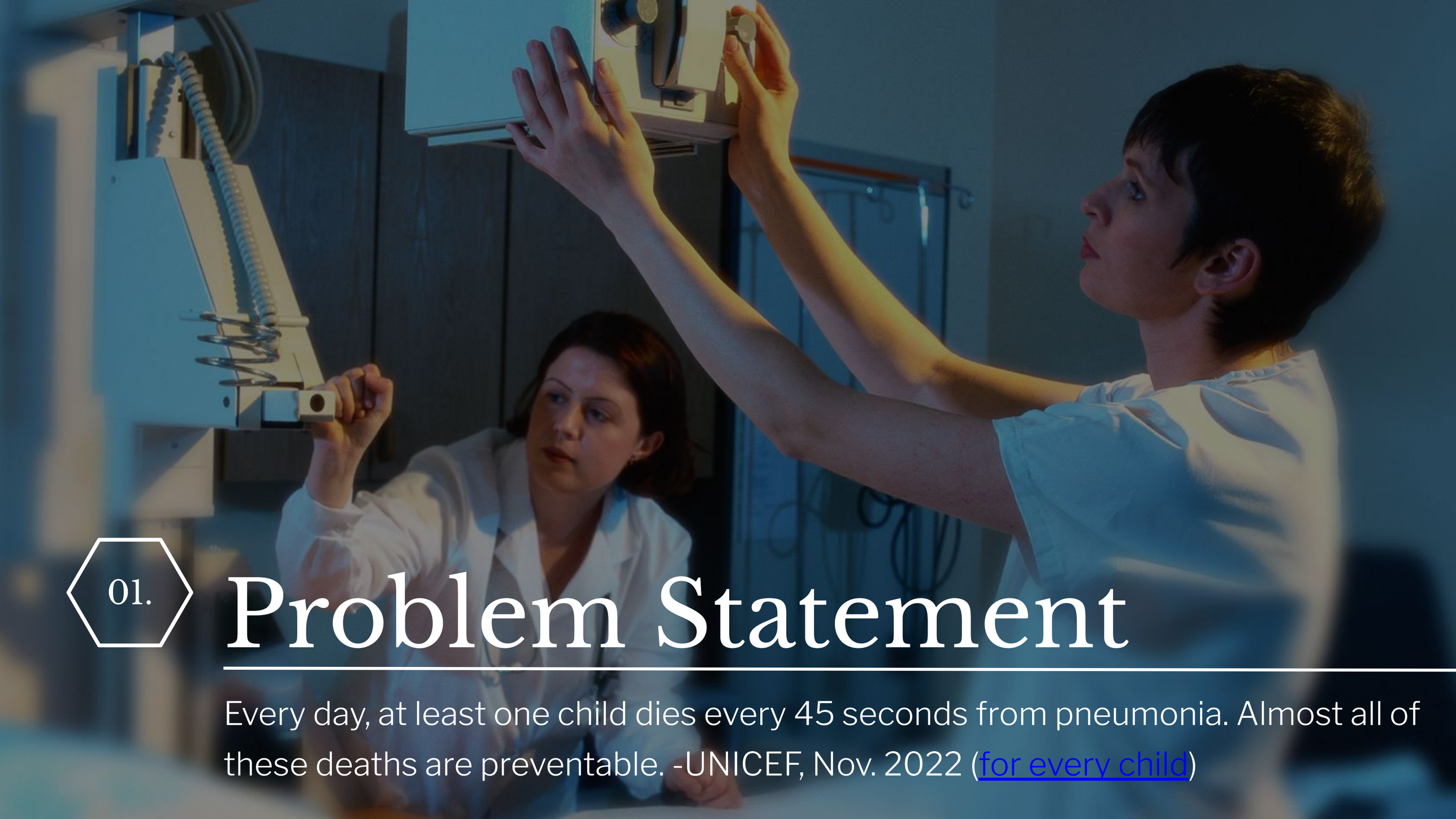
Detecting Pneumonia in X-rays with Convolutional Neural Networks(CNNs)

Presented By: Tenicka Norwood



01.

Problem Statement

Every day, at least one child dies every 45 seconds from pneumonia. Almost all of these deaths are preventable. -UNICEF, Nov. 2022 (for every child)

We want to create a solution that automatically identifies if a patient has PNEUMONIA from looking at chest X-ray images.

02.

Proposal

Employing computational methods to detect pneumonia in X-ray images can significantly reduce mortality rates among children.

03.

Our Process

Explore the Data

Identify Patterns in the data

Create a set of Models

Generate a Convolutional Neural Network that detects PNEUMONIA in chest X-rays with a balance of precision and accuracy.

Evaluate model performance

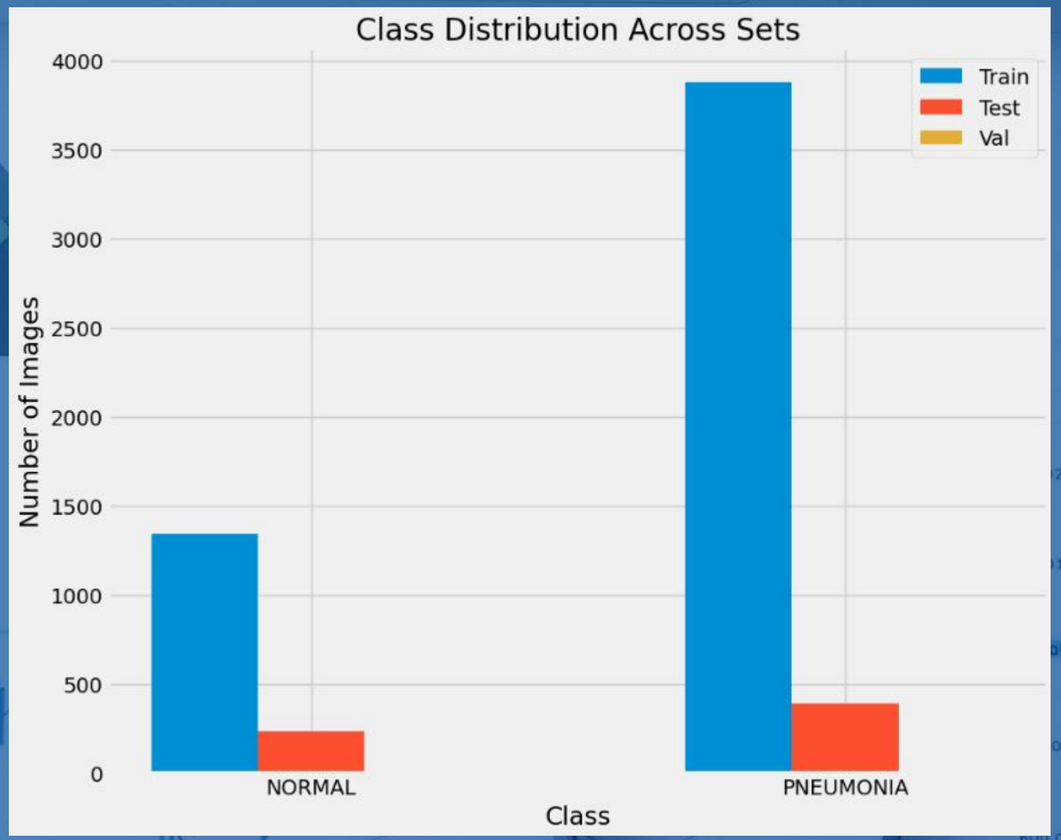
Model should correctly identify at least 90% of positive cases & predict status of 85% of chest x-rays.

Type: Chest X-ray images from pediatric patients aged one to five years

Source: Guangzhou Women and Children's Medical Center in Guangzhou, China during routine clinical care.

Quality Control:

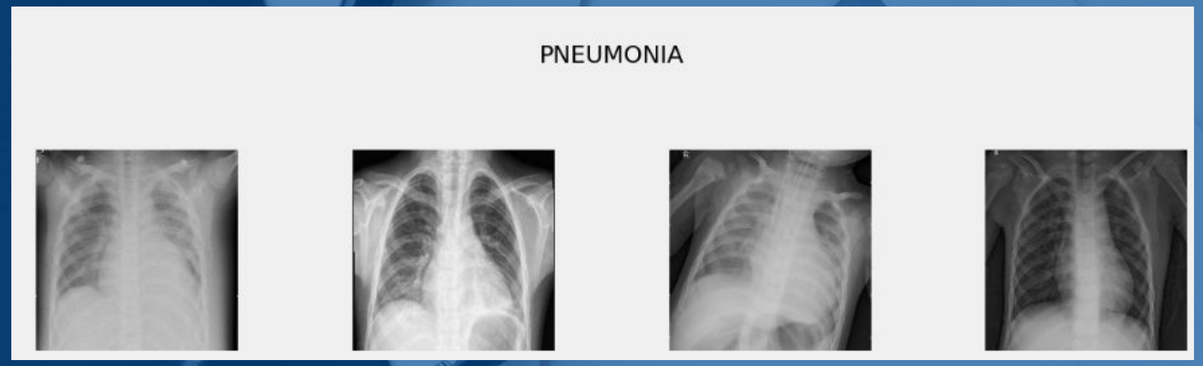
- initial screening to remove low-quality or unreadable scans.
- Two expert physicians graded the diagnoses of the images before they were used in training sets.

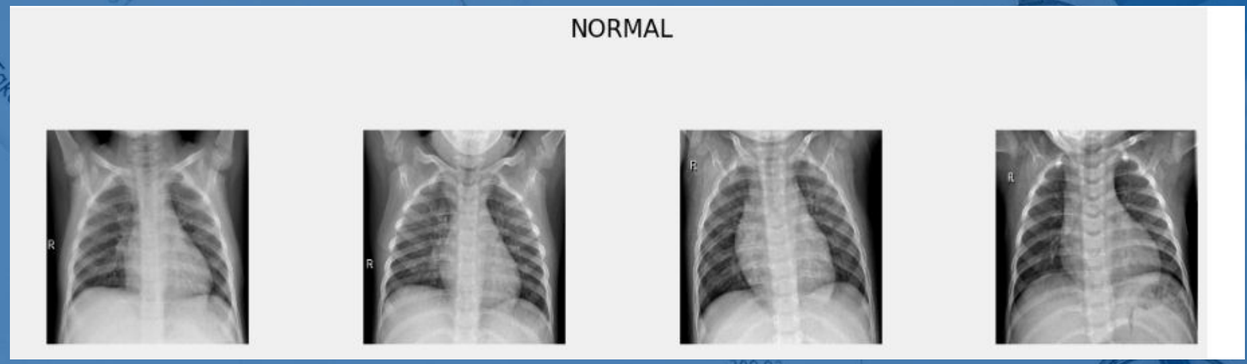


Train NORMAL: 1341 images
Train PNEUMONIA: 3875 images
Test NORMAL: 234 images
Test PNEUMONIA: 390 images
Val NORMAL: 8 images
Val PNEUMONIA: 8 images

04.

Exploring the Data





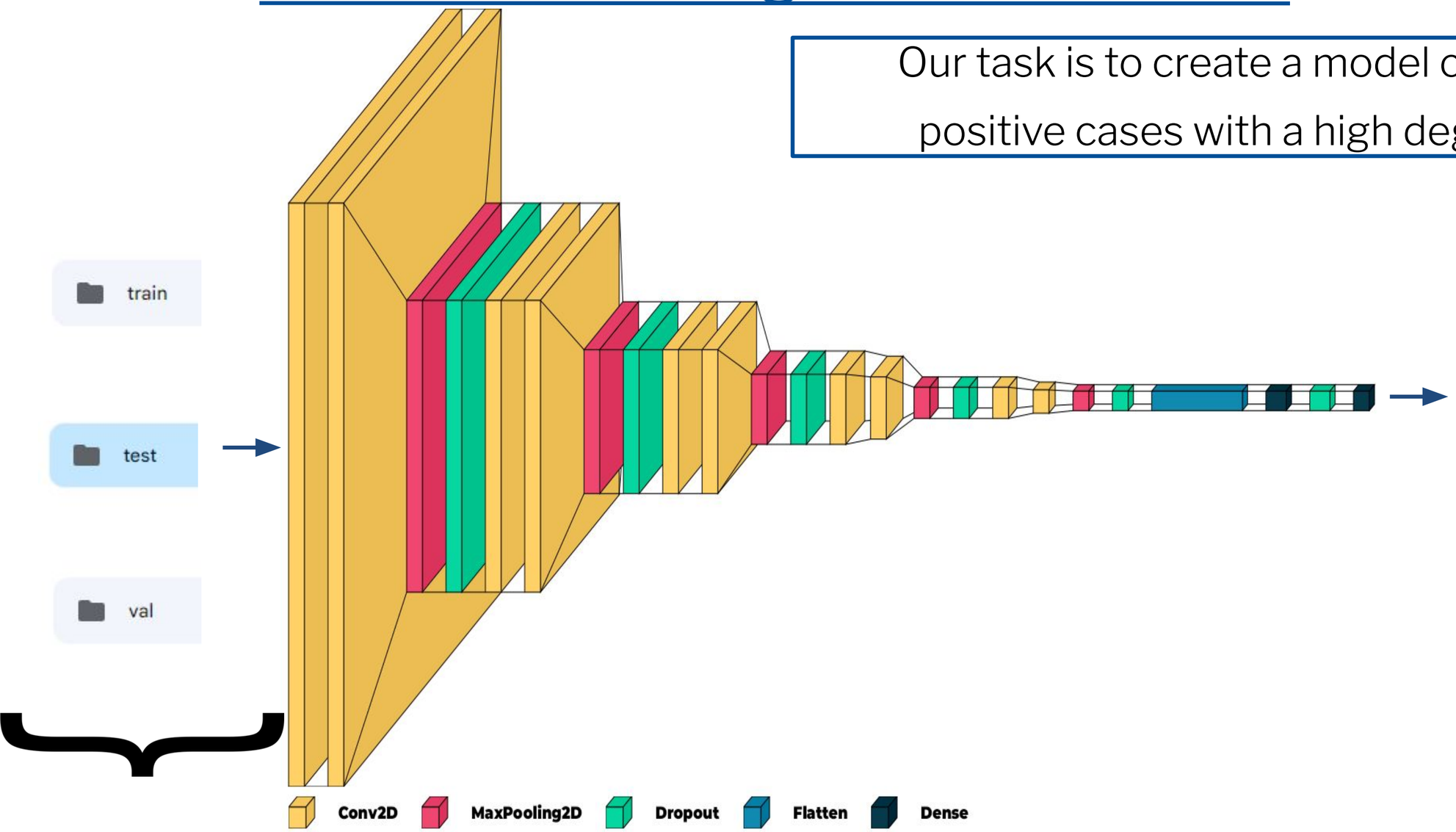
05.

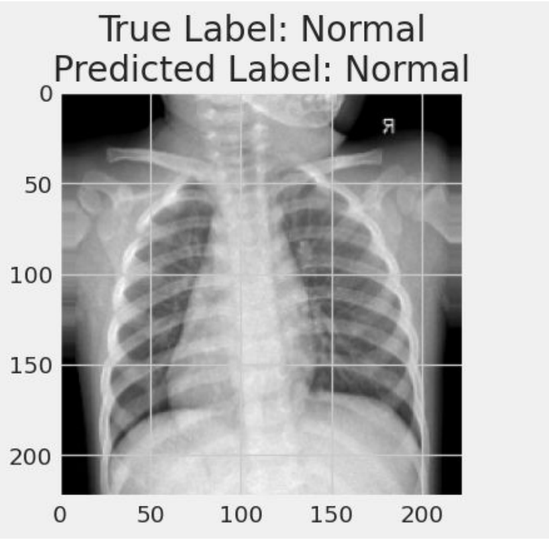
Exploring the Data

Expert validated images from this dataset could be used in training materials or quick reference materials for clinicians, radiologists and physicians.

Creating Models

Our task is to create a model correctly identifies positive cases with a high degree of accuracy.



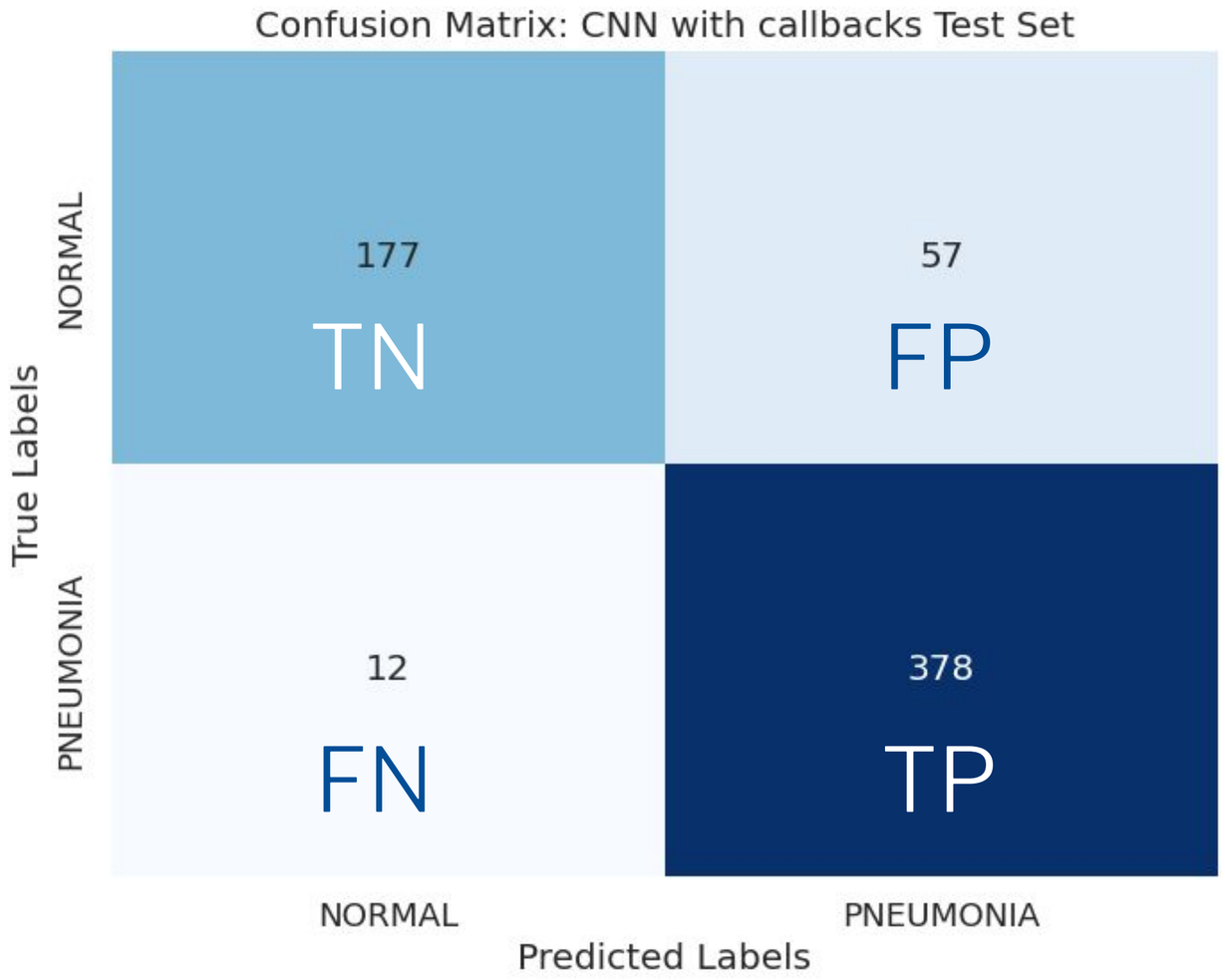


Input

Feature Learning

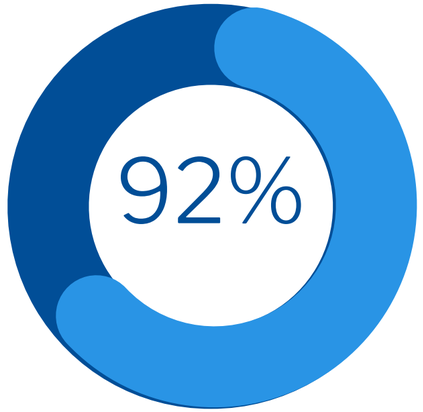
Output

Model Performance

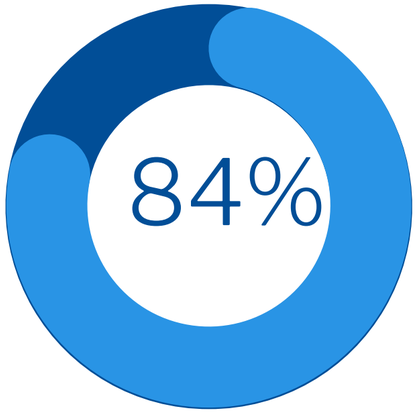


234

390



F1-Score PNEUMONIA



F1-Score NORMAL

08

Recommendations

Collect More Data

Strategic placement of x-ray scanners preloaded with best model

Perform Testing

Add models into devices at a set if hospitals and monitor performance compared to expert diagnosis.

Use Data

Train model with larger dataset enhance model accuracy and performance

Evaluate Model Performance

Review models that have been successful with other respiratory diseases and combine them with our model

09.

Future Work

Test more models

test Resnet50, vgg19 and other pretrained models

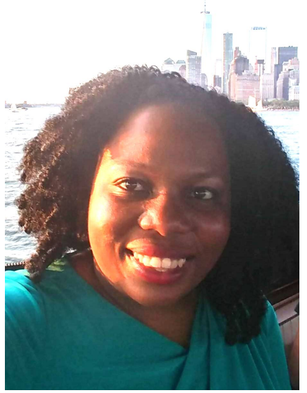
Data

Collect more validation and training data

Tertiary model

PNEUMONIA can be caused by a virus or bacteria

Thank you!



Any questions?

You can find me at:

- Repo at:
- https://github.com/dataeducator/image_classification_with_deep_learning
- tenicka.norwood@gmail.com
- www.tenickanorwood.com

Credits:

- Presentation template by SlidesCarnival
- Photographs by Unsplash and Pexels

Credits

Choi, K. W., & Stein, M. B. (2019). "An Epidemiological Update on Posttraumatic Stress Disorder in Adults: A Comprehensive Review." Depression and Anxiety, 36(9), 814-828. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6458916/

Johns Hopkins Center for Health Security. (2022). "The SPARS Pandemic, 2025-2028: A Futuristic Scenario for Public Health Risk Communicators."

Kermany, Daniel; Zhang, Kang; Goldbaum, Michael (2018), “Labeled Optical Coherence Tomography (OCT) and Chest X-Ray Images for Classification”, Mendeley Data, V2, doi: 10.17632/rscbjbr9sj.2.