

The background of the slide features a dark teal color with several large, detailed images of coronavirus particles. These particles are spherical with a dark center and a lighter, textured outer layer covered in numerous small, protruding spikes or glycoproteins. They are scattered across the slide, with some appearing more prominent than others.

# Deep Learning – Chest X- Rays

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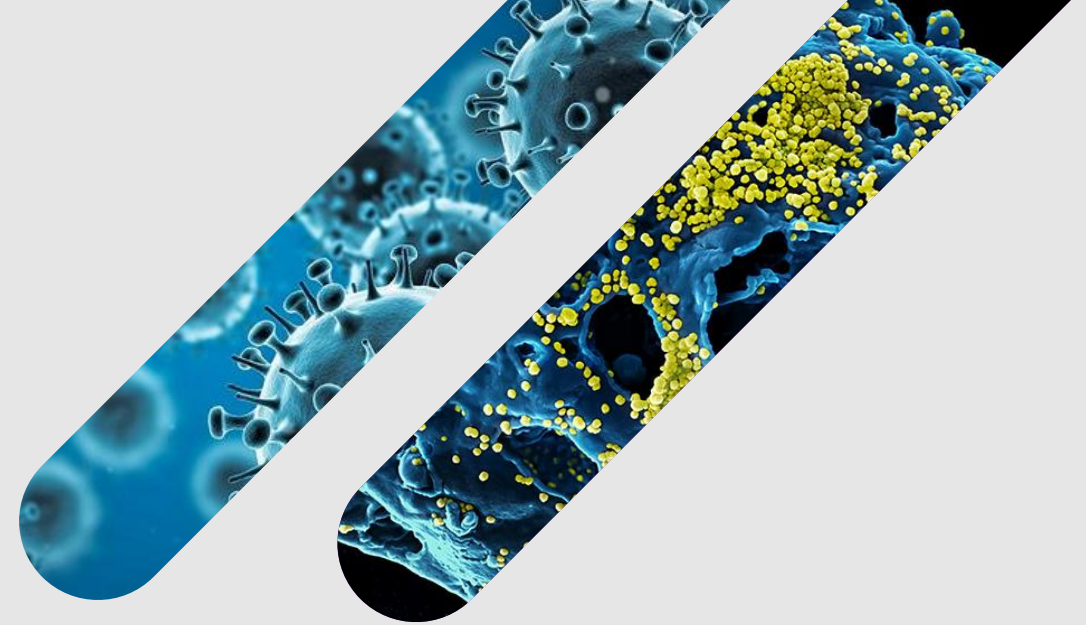
Differential Diagnosis of COVID-19, Viral Pneumonia, TB

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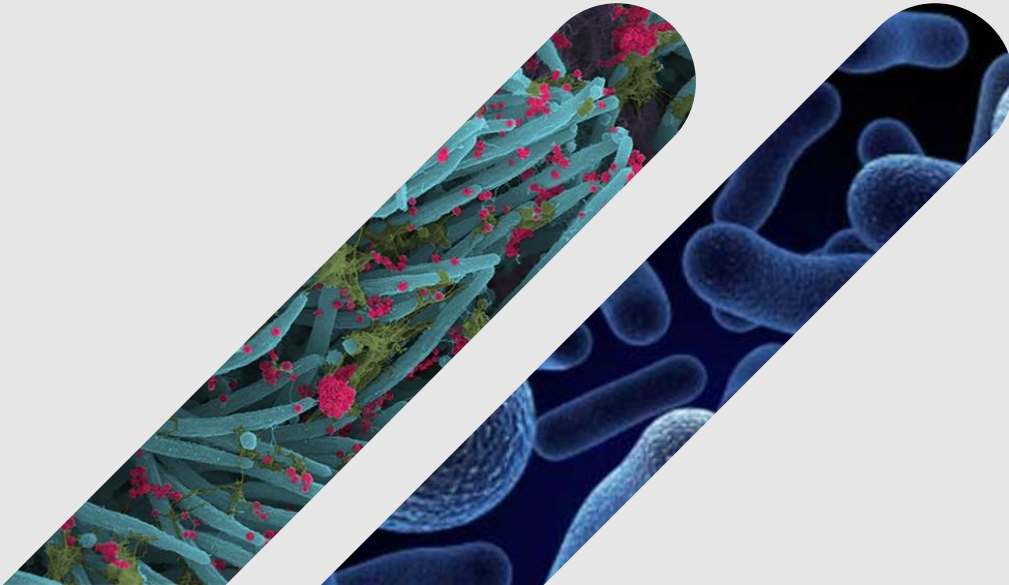
# OBJECTIVES

Analyze the importance of the differences and similarities of various diseases and viral infections like COVID, Viral Pneumonia, and Tuberculosis.



Create a model that would accurately diagnose whether a person is infected and if so, diagnoses the underlying condition

Discuss the positives and shortcomings of using an AI-based model and recommend the best use of and modifications to this model for appropriate diagnosis



# INTRODUCTION

Outbreak of COVID-19 has taken over all our lives

Difficult to detect and differentiate from other common diseases and infections

- Share common symptoms
- Example Pneumonia

Deep Learning models in the past – about 90% Accuracy in detecting pneumonia

Pneumonia often misdiagnosed as Tuberculosis

Model trained to accurately diagnose COVID, Pneumonia, TB, and Healthy

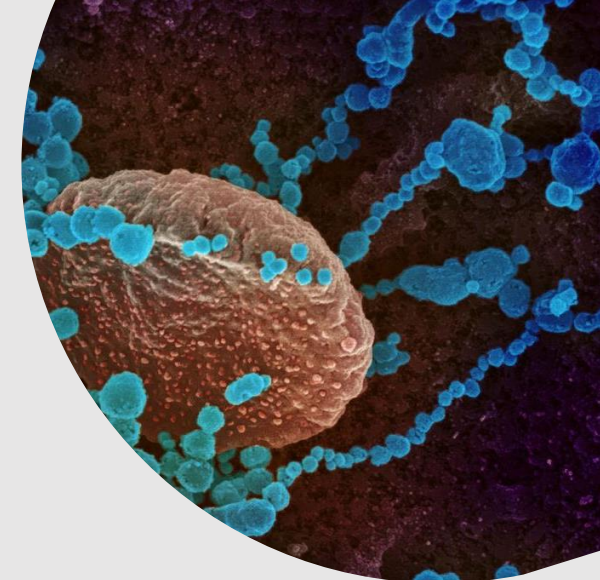
Also visualizes explanations

Important measures:

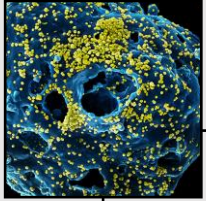
Accuracy

Precision (Important when differentiating between various diagnosis)

Recall (Important when detecting if a patient is healthy)

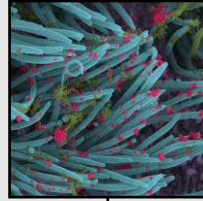


# DATA



Dataset 1

- COVID-19
- Viral Pneumonia
- Normal



Dataset 2

- Tuberculosis, China
- Normal, China

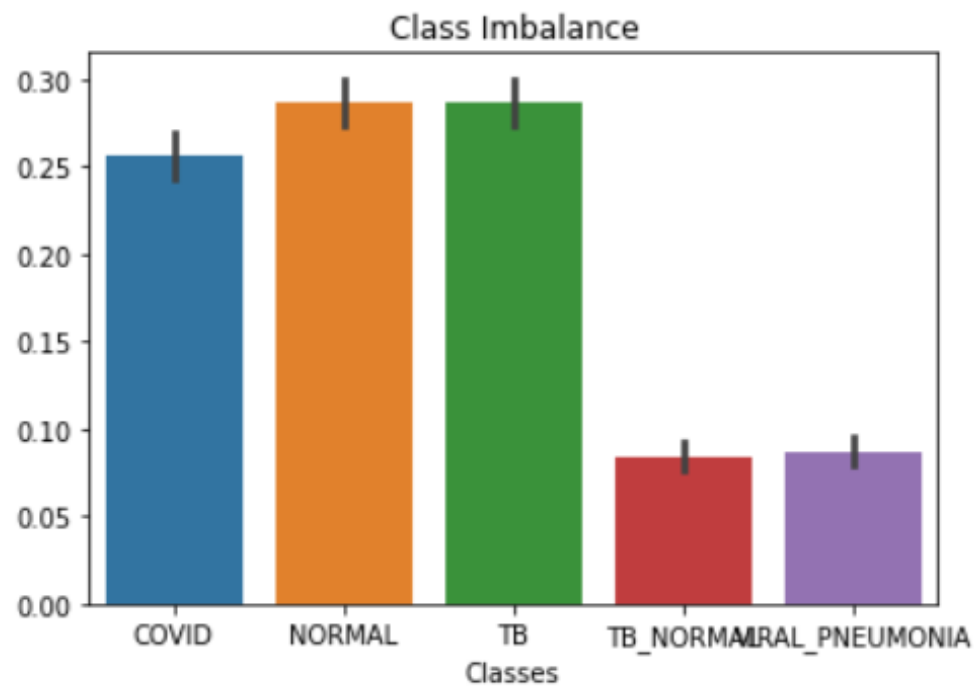


Dataset 3

- Tuberculosis, Montgomery
- Normal, Montgomery



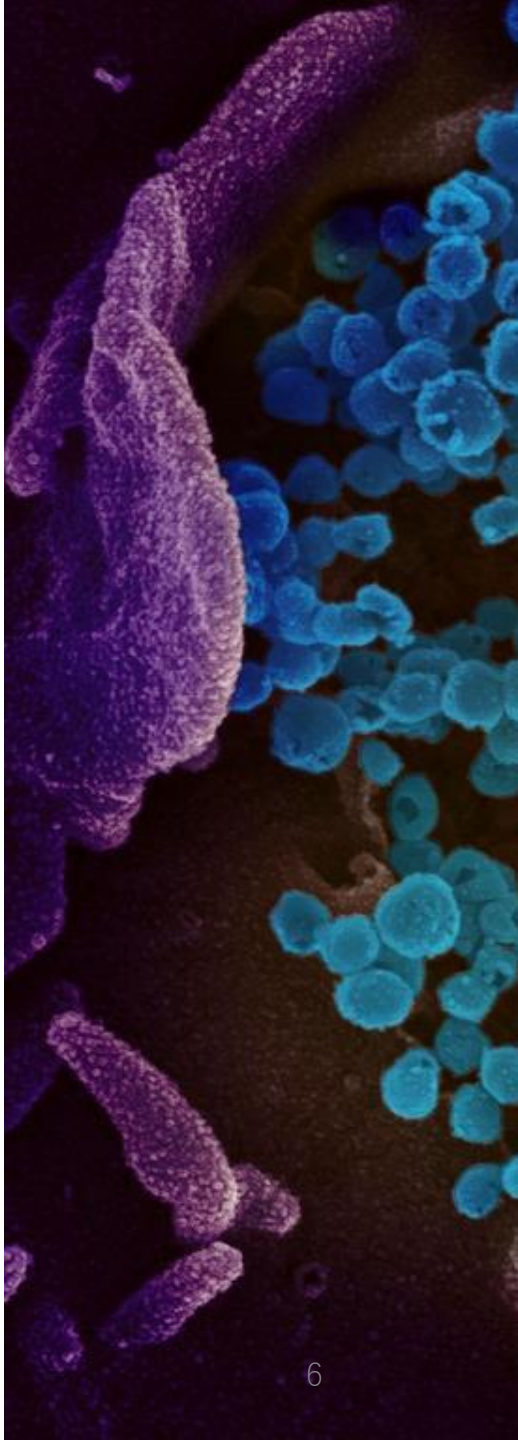
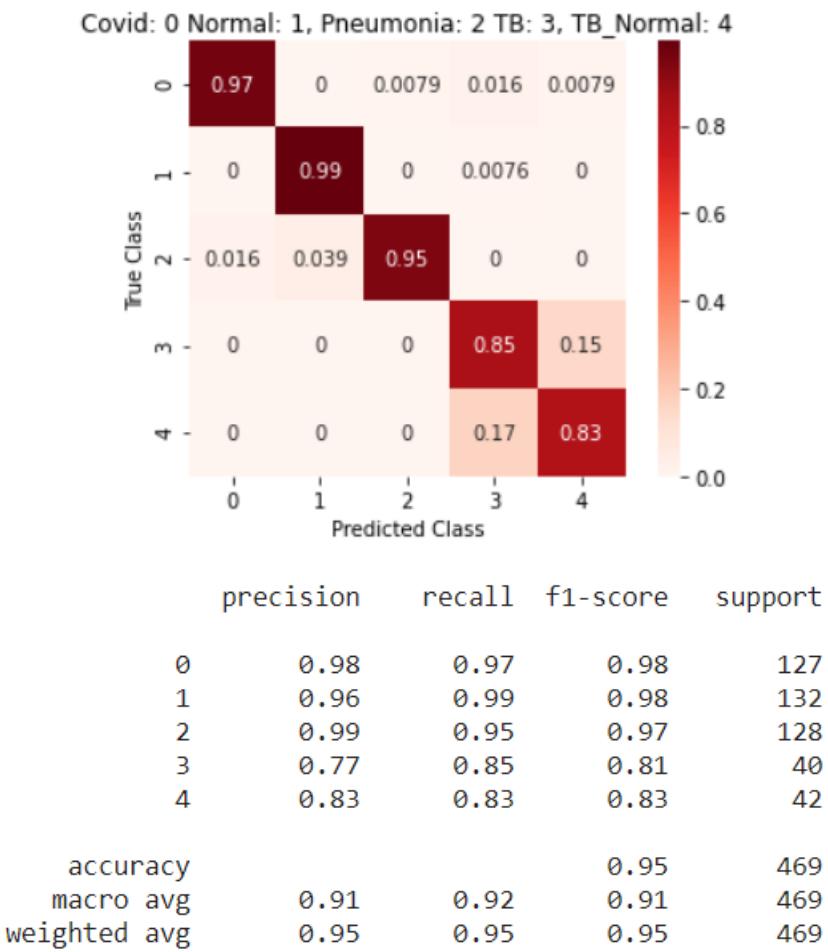
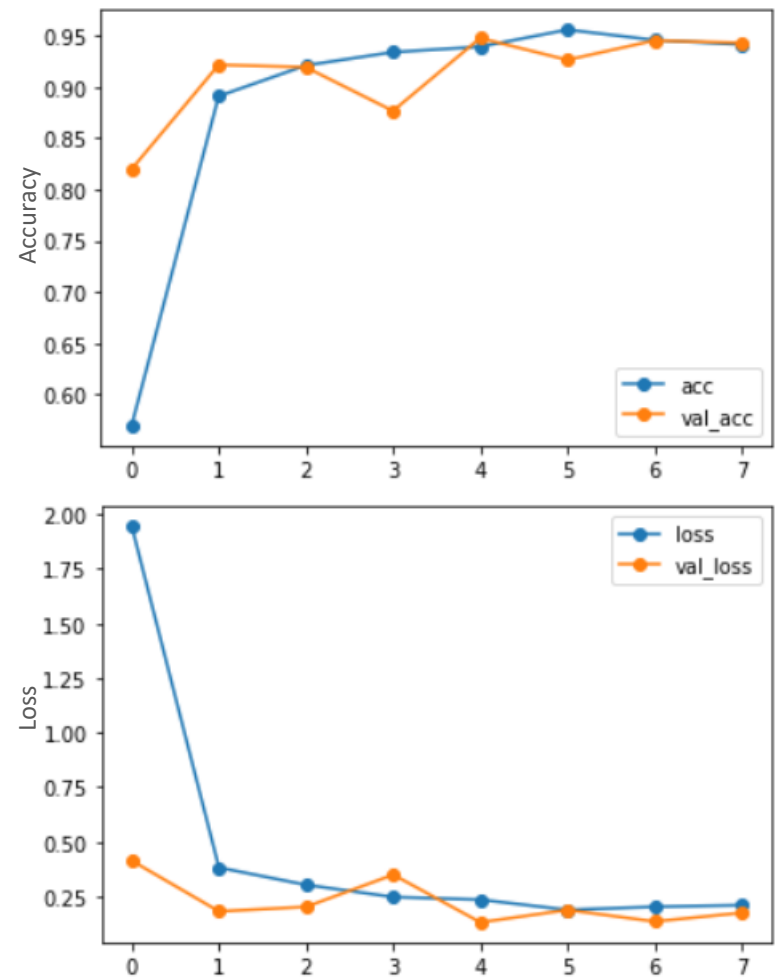
# CLASS IMBALANCE | METHODOLOGY



Class weights included in the model to incorporate the class imbalance

- Data Pre-processing
- Explore and optimize various pre-trained models to use as base model to build on.
- Finalize the best model based on performance measures (Accuracy, Precision, Recall) and model explanation

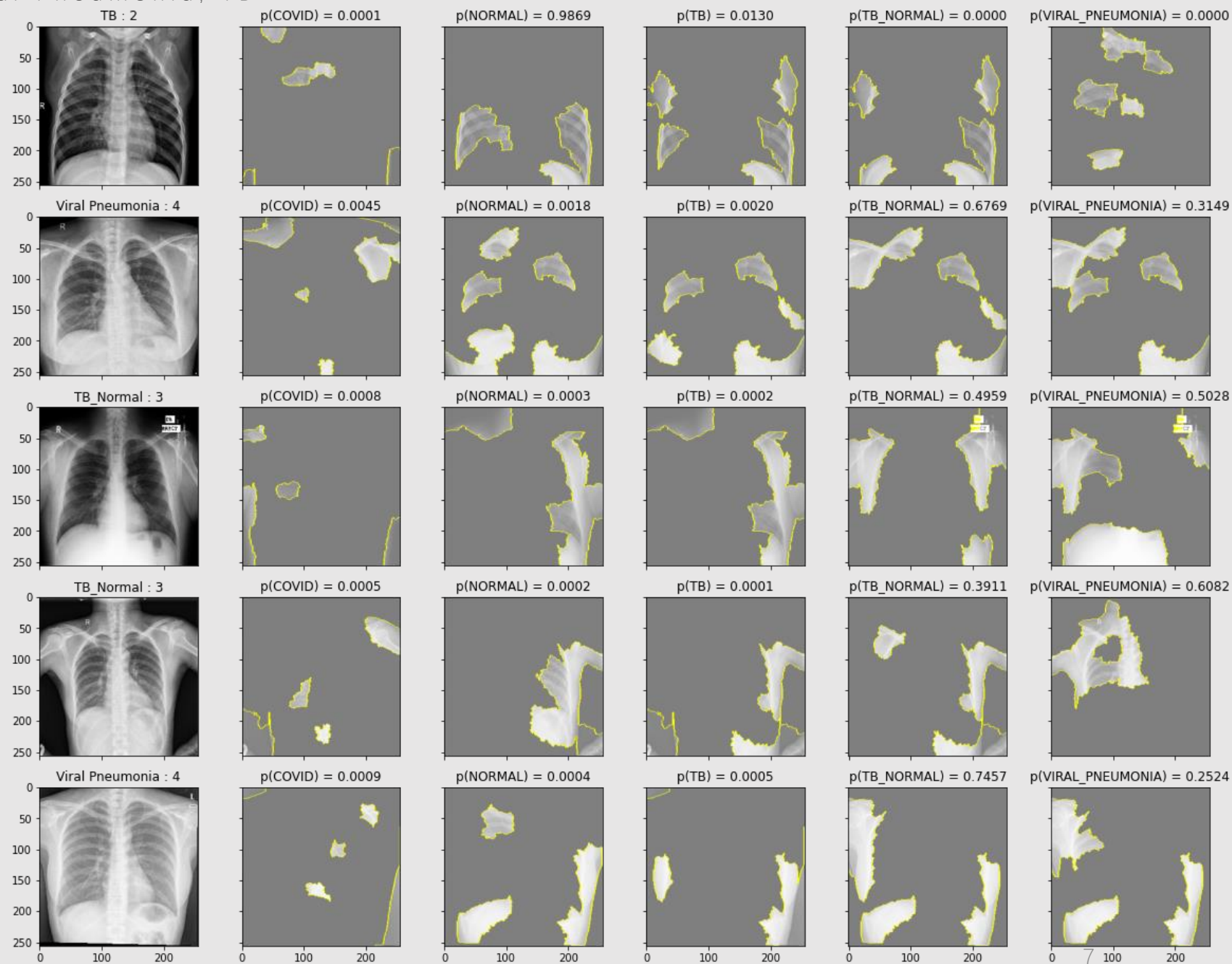
# BEST MODEL

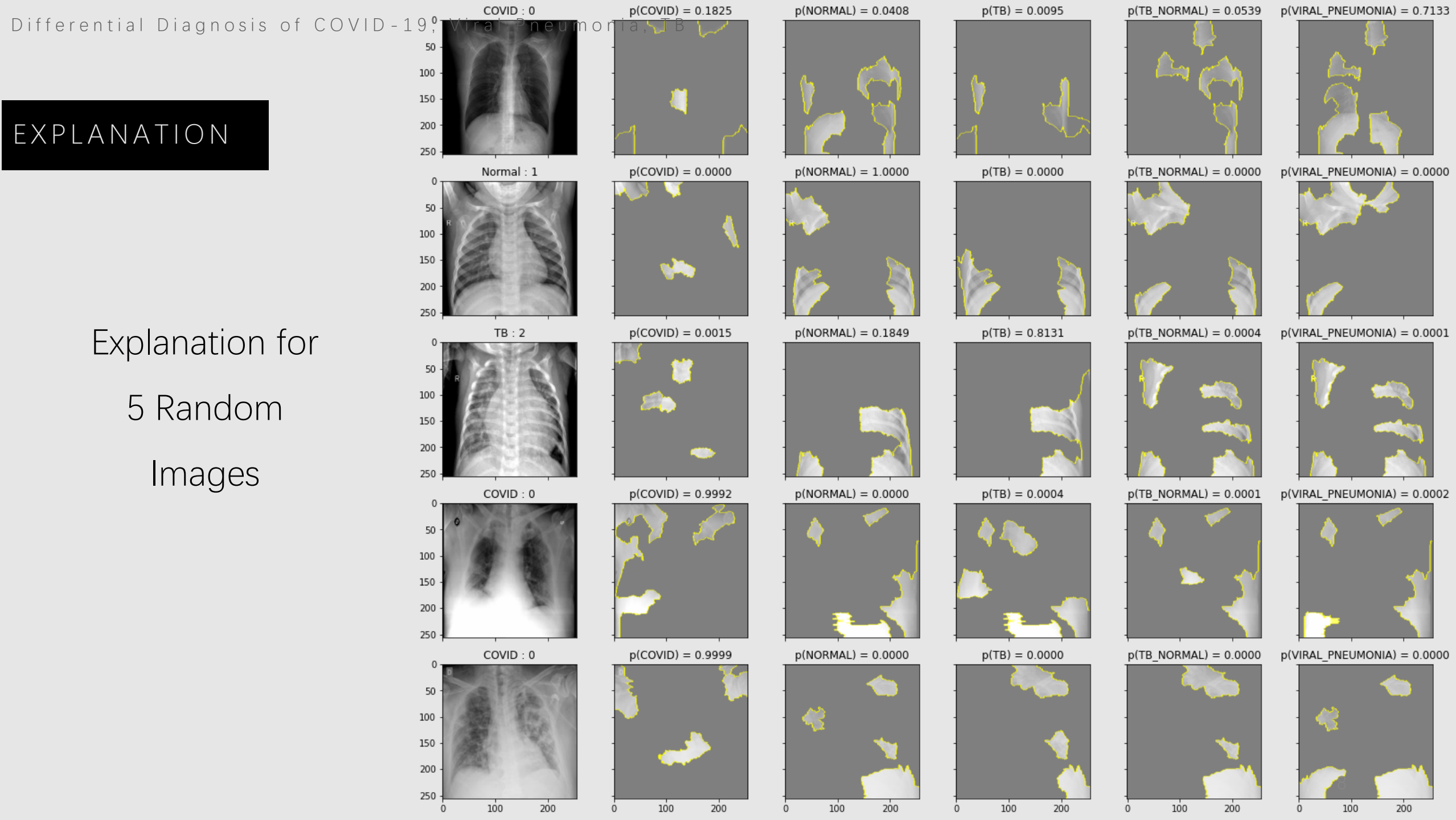


# EXPLANATION

Total Bad  
Predictions:

25/422







# RECOMMENDATIONS



Recommended to use the DenseNet121 transfer model to distinguish COVID-19 from Viral Pneumonia, and Normal: 95% ACCURACY, HIGH PRECISION and RECALL

This model should not be used to diagnose whether the patient has TB, due to low accuracy on TB chest X-rays.

The model should be used in scenarios where diagnosis is difficult looking at the symptoms, which may be common in most scenarios for COVID, Pneumonia and TB.

# FUTURE WORK

Building a Dashboard/Application that would accept any Xray, preprocess and use the model for diagnosis, and explanation

Explore other models by building by scratch, and including image augmentation, and adding masks to improve the predictability of the model

Include other symptoms in the model to aid in better diagnosis.



The background of the slide is a dark teal color with a microscopic theme. It features several large, out-of-focus virus-like particles. These particles have a dark, circular center and are surrounded by a complex, spiky outer layer that resembles a corona or a cluster of small, hook-like structures. The overall effect is a sense of depth and scientific focus.

# THANK YOU!

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QUESTIONS?