

# PNEUMONIA DETECTION USING CNN



GROUP 6



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# PNEUMONIA

- Pneumonia is a serious respiratory infection that affects the lungs. Pneumonia is an infection that inflames the air sacs in one or both lungs. The air sacs may fill with fluid or pus (purulent material), causing cough with pus, fever, and difficulty breathing. A variety of organisms, including bacteria, viruses and fungi, can cause pneumonia.
- Pneumonia can range in seriousness from mild to life-threatening. It is most serious for infants and young children, people older than age 65, and people with health problems or weakened immune systems.



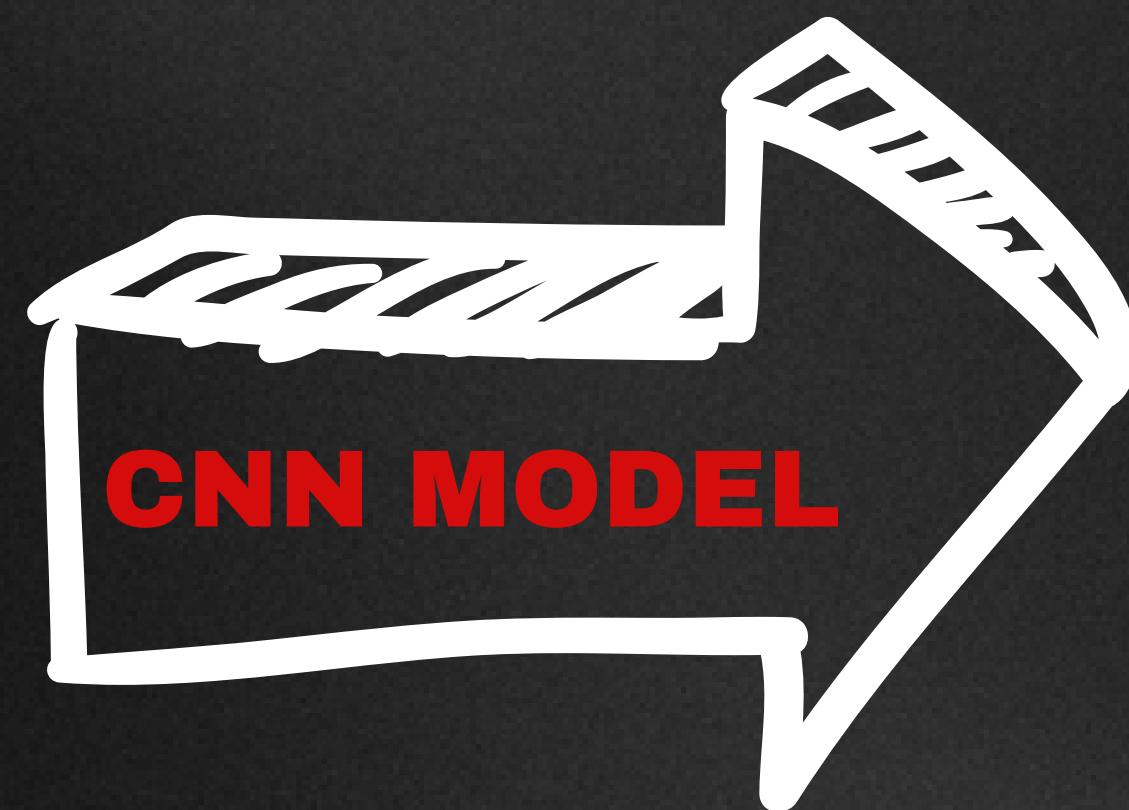
# SYMPTOMS

The signs and symptoms of pneumonia vary from mild to severe, depending on factors such as the type of germ causing the infection, and your age and overall health.

**Signs and symptoms of pneumonia may include:**

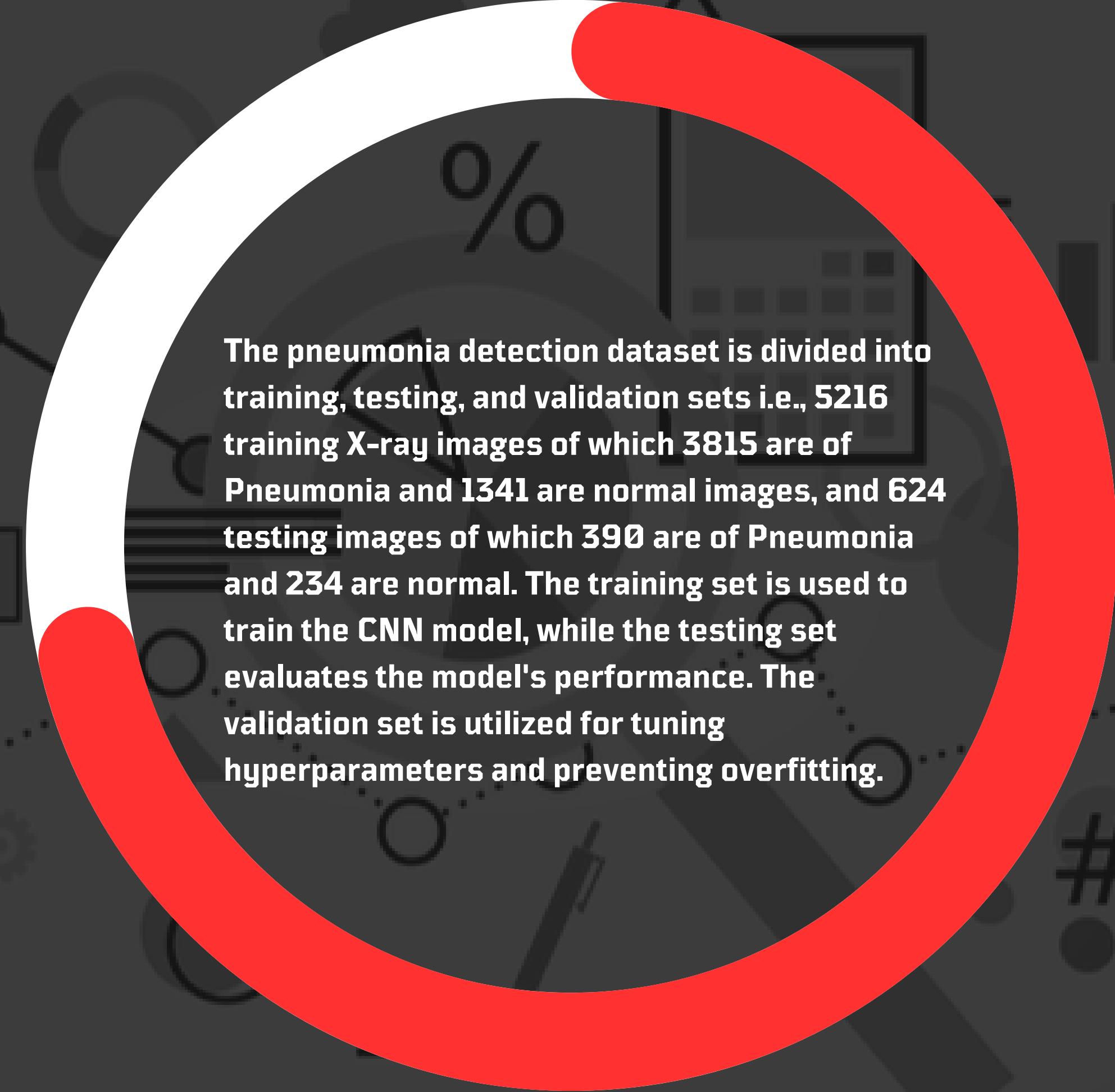
- **Chest pain when you breathe or cough**
- **Confusion or changes in mental awareness**
- **Cough, which may produce phlegm**
- **Fatigue**
- **Fever, sweating and shaking chills**
- **Lower than normal body temperature (people with weak immune systems)**
- **Nausea, vomiting or diarrhea**
- **Shortness of breath**

# WHAT DOES OUR MODEL DO?



Distinguishes between normal and pneumonia-affected person using X-ray scans

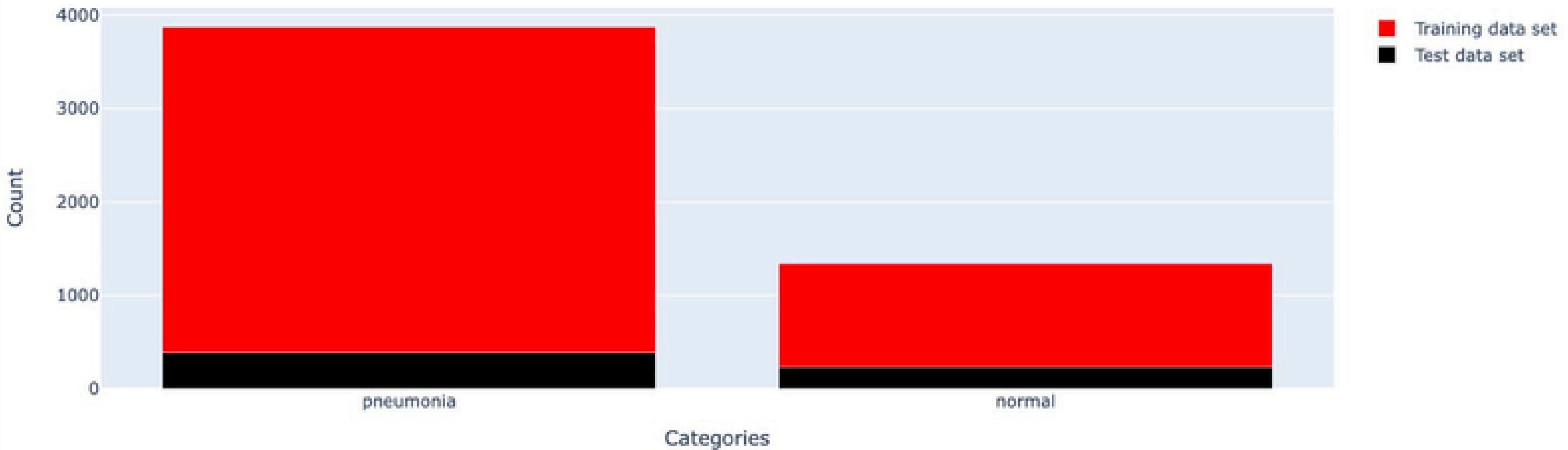
# ABOUT DATASET



The pneumonia detection dataset is divided into training, testing, and validation sets i.e., 5216 training X-ray images of which 3815 are of Pneumonia and 1341 are normal images, and 624 testing images of which 390 are of Pneumonia and 234 are normal. The training set is used to train the CNN model, while the testing set evaluates the model's performance. The validation set is utilized for tuning hyperparameters and preventing overfitting.

■ 73% PNEUMONIA SAMPLES  
■ 27% NORMAL SAMPLES

## Data Set Distribution



# DATA AUGMENTATION

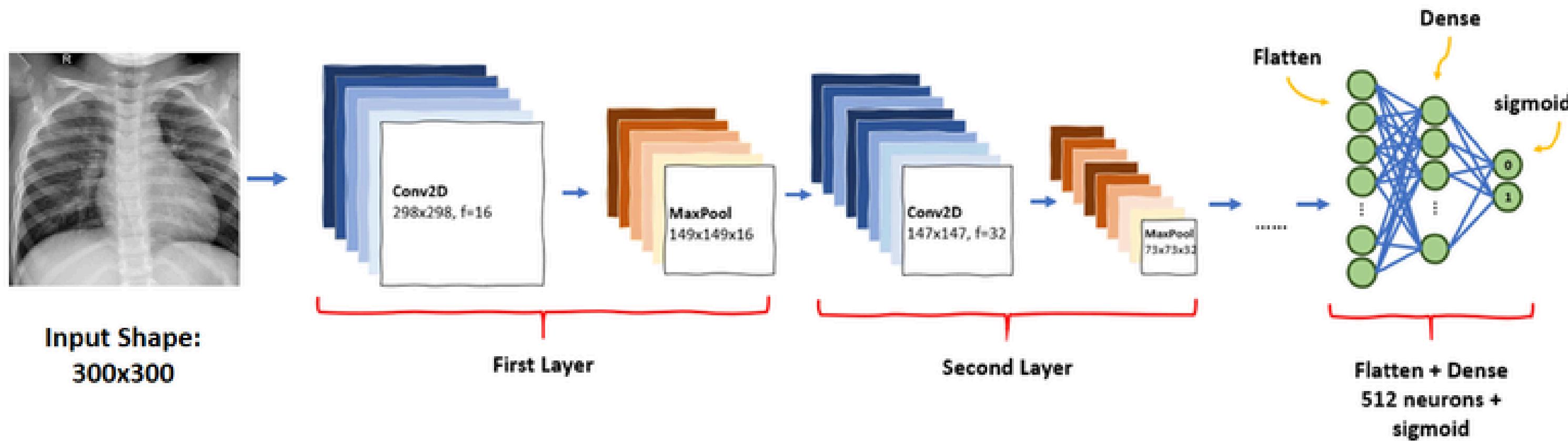


Data augmentation is a technique used to prevent overfitting in machine learning models by artificially expanding the training dataset. It involves making small changes to the existing data, like flipping images, changing colors, or rotating objects while keeping their labels the same. These modifications create variations of the original data, which helps the model generalize better and become more robust. By applying data augmentation, we can significantly increase the number of training examples, making our model more effective in handling different situations and improving its overall performance.

# **CONVOLUTIONAL NEURAL NETWORKS**

Convolutional neural networks are a type of artificial neural network useful for image recognition. Multiple layers stack up to make ConvNets. Each layer contains a number of neurons. The first layer is the input layer and the last layer is the output layer. Each neuron in the input layer receives input from the previous layer and passes it to the next neuron in the same layer. This process continues until all neurons in a given layer have received inputs from all neurons in the previous layers. The final output of this process is passed to another set of neurons in a different layer. The next layer passes it on to another set of neurons, and so on until we reach the final output.

## Pneumonia Detection using Convolutional Neural Network (CNN)



The **convolutional layer** is the first layer of a convolutional network. While convolutional layers can be followed by additional convolutional layers or pooling layers, the fully-connected layer is the final layer. With each layer, the CNN increases in its complexity, identifying greater portions of the image. Earlier layers focus on simple features, such as colors and edges. As the image data progresses through the layers of the CNN, it starts to recognize larger elements or shapes of the object until it finally identifies the intended object.

## **Activation Function - ReLU (Rectified Linear Activation):**

**Reasons for using ReLU activation:**

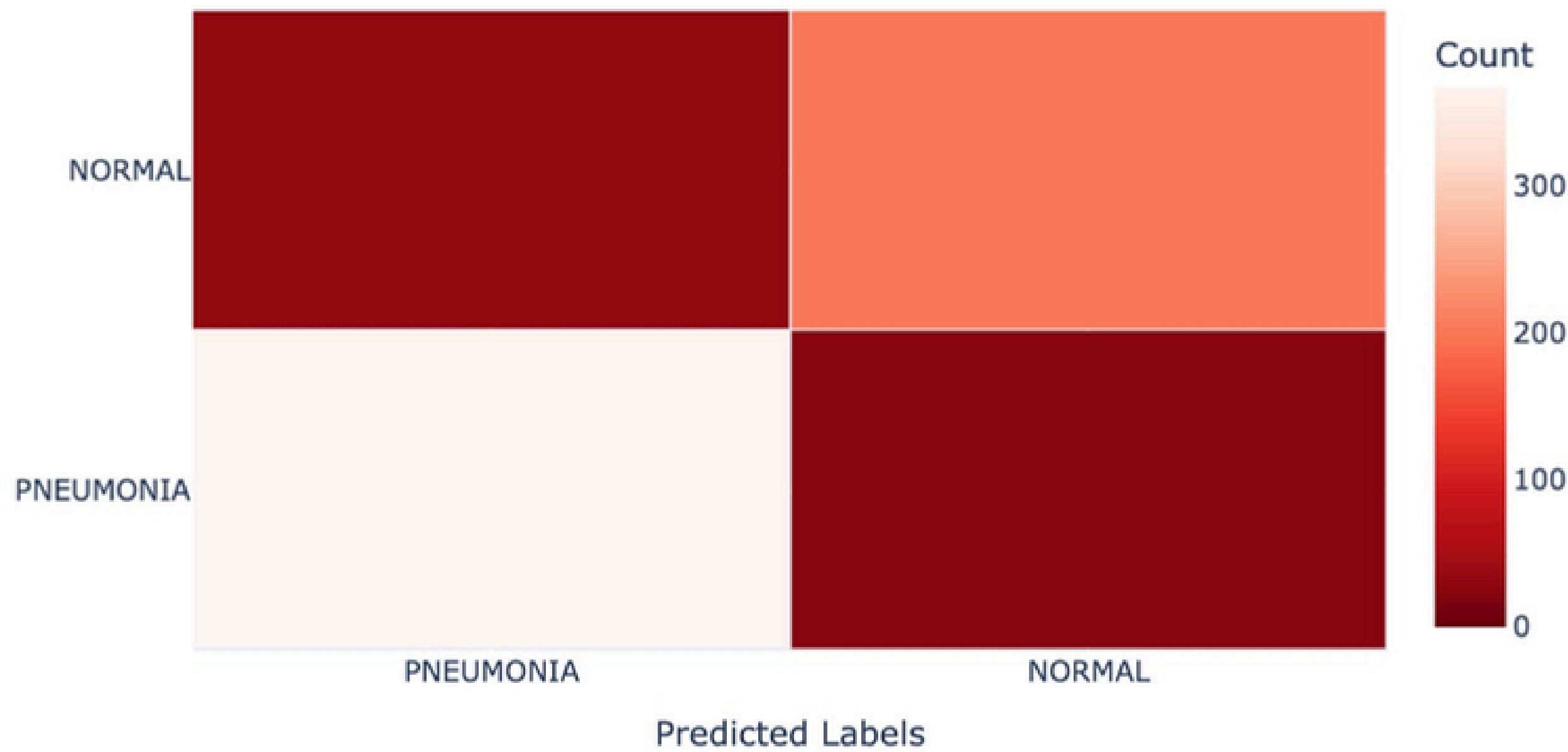
- Non-linearity:** ReLU introduces non-linearity to the model, which enables it to learn complex patterns in the data and make the model more expressive.
- Efficient computation:** Compared to other activation functions like sigmoid or tanh, ReLU is computationally efficient, as it involves simple thresholding without costly exponentials or sigmoid functions.

## **RMSprop Optimization algorithm**

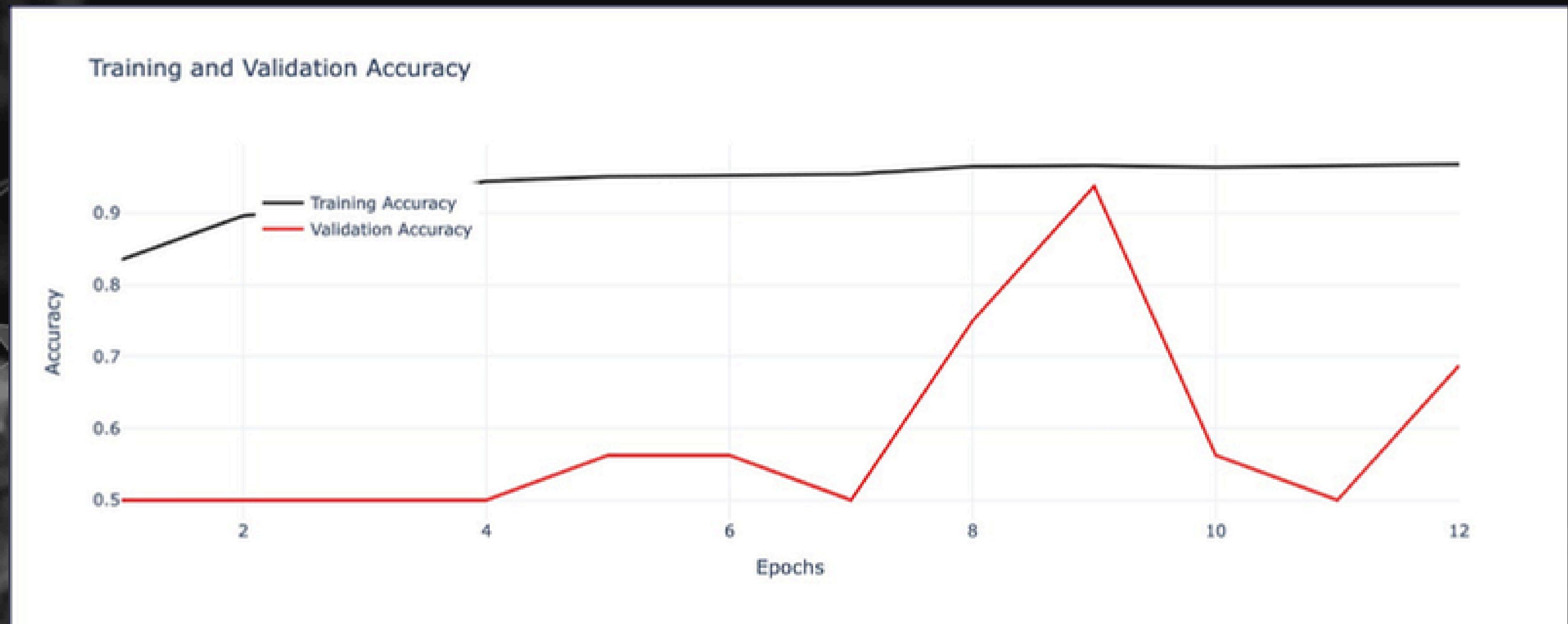
- It used in training neural networks. It adapts the learning rate for each parameter by computing a moving average of squared gradients.**
- This helps overcome issues like vanishing or exploding gradients, leading to faster and more reliable convergence. While effective, it has some limitations in non-convex optimization problems.**
- RMSprop serves as a foundational optimization method, contributing to the success of deep learning.**

# CONFUSION MATRIX

Confusion Matrix

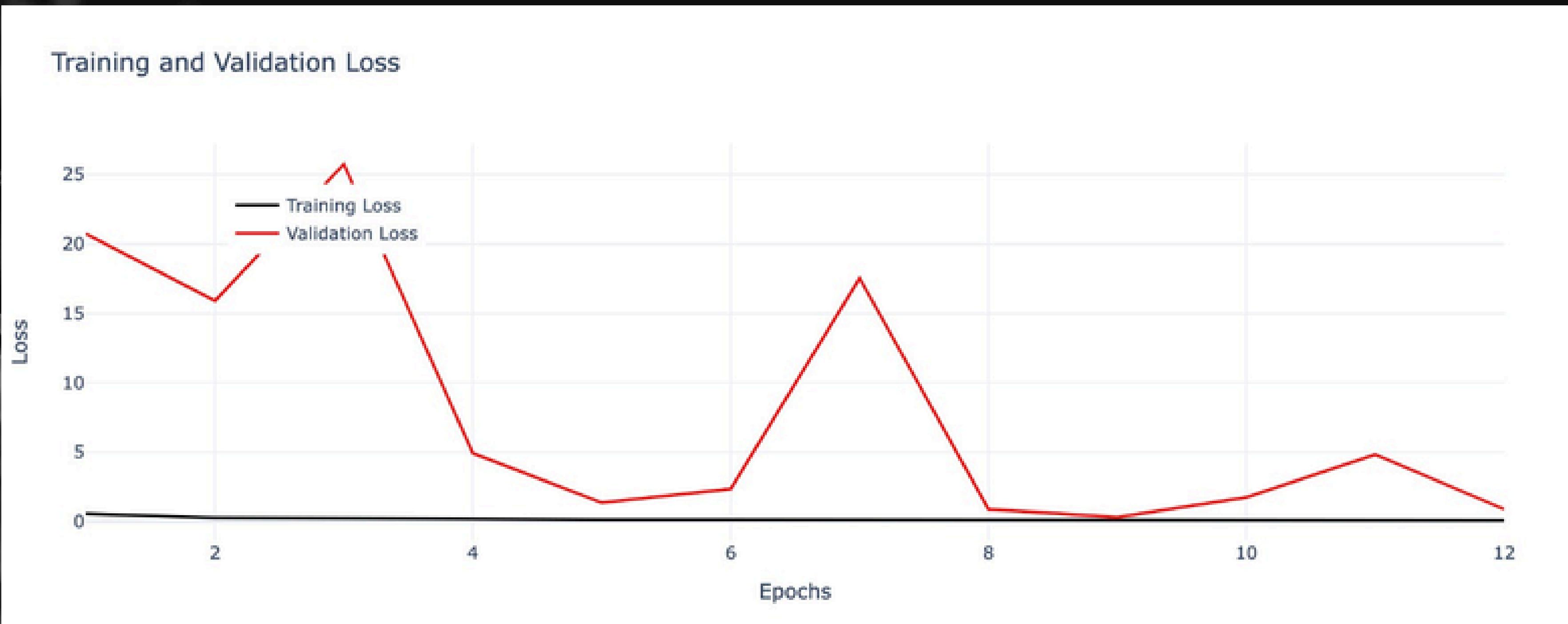


# TRAINING AND VALIDATION ACCURACY

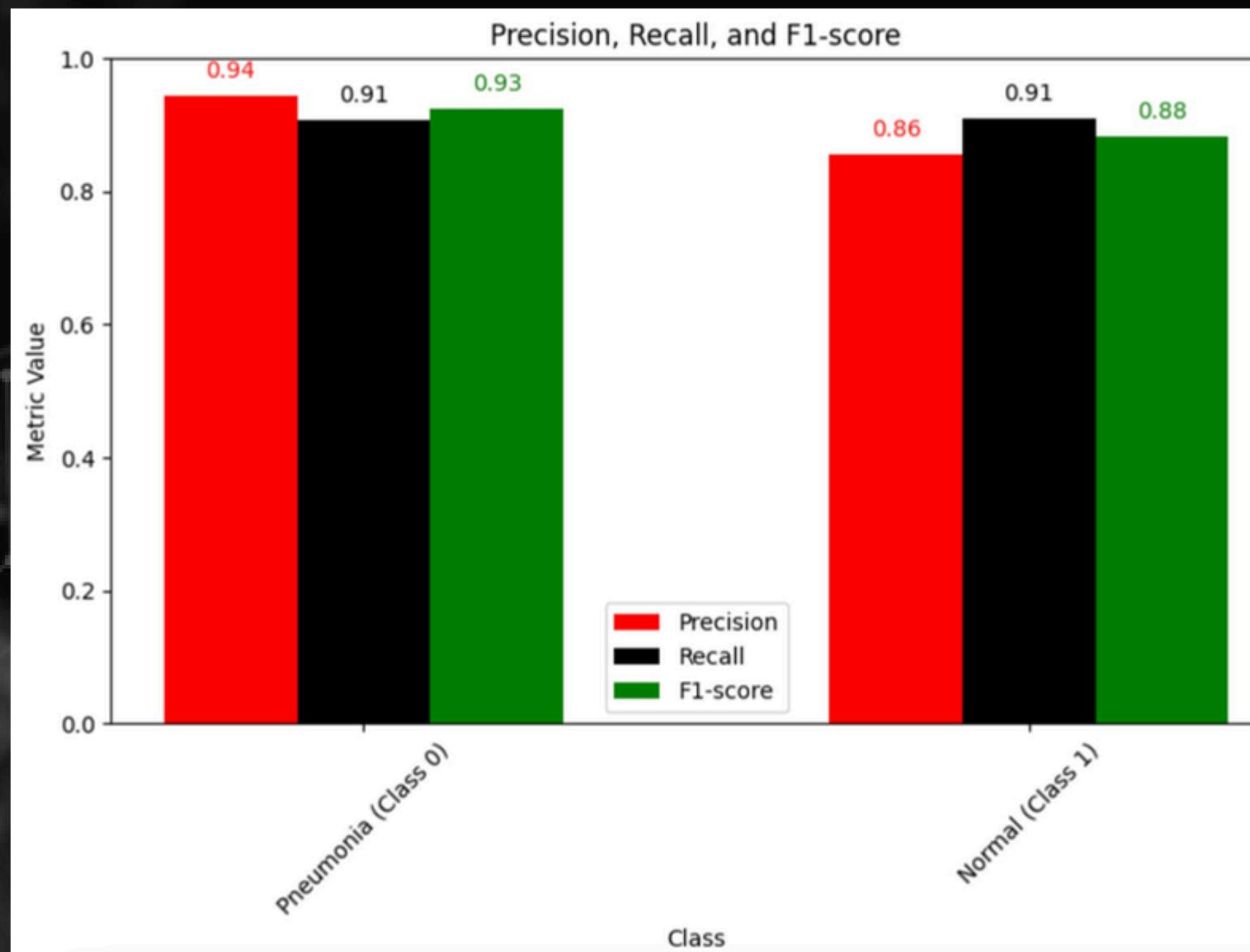


# TRAINING AND VALIDATION LOSS

Training and Validation Loss



# PRECISION RECALL AND F1-SCORE



	precision	recall	f1-score
Pneumonia (Class 0)	0.94	0.91	0.93
Normal (Class 1)	0.86	0.91	0.88
accuracy			0.91

# CONCLUSION

**Accurate Pneumonia Detection:** This CNN model has demonstrated high accuracy in detecting pneumonia, with a 91.4% success rate. This level of accuracy indicates that the model has the potential to be a valuable tool in assisting medical professionals with early diagnosis and timely intervention.

**Potential Medical Impact:** Pneumonia is a significant global health concern, and early detection is crucial for improving patient outcomes. This project's outcome in building a reliable pneumonia detection model could potentially aid healthcare providers in making more accurate and faster diagnoses, leading to better patient care and reduced mortality rates.

**Ethical Considerations:** It's essential to highlight the ethical aspects of this project. Emphasize that while AI models like this have the potential to be incredibly beneficial, they should always be seen as supportive tools for healthcare professionals rather than replacements. Ensuring responsible and ethical deployment of such technology is crucial to maintaining patient safety and trust.



**THANK YOU!**