# Chest Related Disease Prediction using Deep learning

PRADNYA KOTHAWADE[1], SAKSHI PAWAR[2], NIKITA YADAV[3], SANIKA PAWAR[4], AKANKSHA GAYKAR[5]

[1, 2, 3, 4, 5]*Genba Sopanrao Moze College of Engineering, Pune*

*Abstract— This This project presents the development of a web-based platform that utilizes Flask for managing user interactions and TensorFlow for machine learning model execution. By integrating TensorFlow models within a Flask framework, the system allows users to perform tasks such as predictions or classifications through a simple web interface. The backend handles routing, input processing, and model predictions, while utility functions ensure smooth data processing and model loading. The project aims to combine the capabilities of machine learning and web development to offer an efficient and scalable solution. Key technologies such as Flask, TensorFlow, NumPy, and h5py are used to build a flexible system that can be adapted for various practical applications, such as image recognition, data analysis, or prediction tasks. The system's modular design makes it easy to update, scale, or integrate with additional features in the future.*

*Index Terms— Image Processing, Convolutional Neural Networks Algorithm, Languages and Compilers, Classification, Verification.*

## I. INTRODUCTION

Chest-related diseases, including pneumonia, lung cancer, and chronic obstructive pulmonary disease (COPD), pose significant challenges to public health globally. Early and accurate diagnosis is crucial for effective treatment and improved patient outcomes. Traditional diagnostic methods, such as X-rays and CT scans, often require skilled radiologists for interpretation, leading to potential delays and misdiagnoses. Convolutional Neural Networks (CNNs) have emerged as a powerful tool in medical imaging analysis, leveraging their ability to automatically extract features from images. By training on large datasets, CNNs canlearn to recognize patterns associated with various chest diseases, significantly enhancing diagnostic accuracy and speed. This approach not only assists healthcare professionals in making informed decisions but also has the potential to democratize healthcare by providing accessible diagnostic tools, particularly in underserved regions. In this context, implementing CNN algorithms for chest disease prediction represents a promising frontier in the integration of artificial intelligence into medical diagnostics, ultimately aiming to improve patient care and health outcomes.

## II. AIM AND OBJECTIVES

Aim - To Predict Chest Related Disease Using Deep Learning.
Objective -
- Detect and classify multiple chest diseases from X-ray images.
- Handle multi-label classification for identifying multiple diseases in one scan.
- Improve access to diagnostics in under-resourced areas.
- Ensure explainable AI for trust and usability in medical settings.
- Provide fast, accurate, and reliable diagnostic support.

## III. SCOPE OF PROJECT

The scope of chest-related disease prediction using deep learning is vast and transformative, encompassing enhanced diagnostic accuracy through automated analysis of medical images, enabling early detection of conditions like lung cancer and pneumonia. This technology streamlines workflows by providing preliminary assessments, reducing the workload on radiologists, and improving accessibility to advanced diagnostics, particularly in underserved areas. By integrating with electronic health records and leveraging large datasets, deep learning can personalize treatment plans and adapt to emerging diseases. Furthermore, its application in telemedicine enhances remote consultations, making healthcare more efficient and accessible, ultimately leading to better patient outcomes and innovative advancements in medical research.
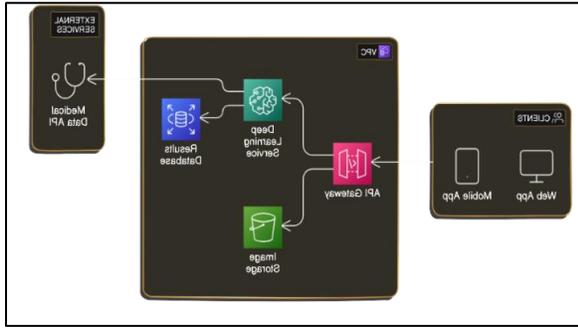
system architecture

## IV. LITERATURE SURVEY

Detecting Multi Thoracic Diseases in Chest X-Ray Images [1]Yurt et al. proposed a novel CNN architecture designed to identify multiple thoracic diseases, such as pneumonia and tuberculosis, from chest X-rays. This architecture incorporates advanced deep learning techniques that significantly enhance diagnostic accuracy, yielding high precision, recall, and F1 scores. The study demonstrated that a single model could effectively identify multiple diseases concurrently, which simplifies diagnostic workflows and reduces the need for multiple models. By capturing and analyzing intricate patterns in X-ray images, this model provides an efficient, scalable solution for detecting various chest diseases in one go.

Exploiting Uncertainty: A Transformer-Based Multi-Disease Detection Framework [2]:Smith et al. introduced a transformer-based model specifically tailored for detecting lung diseases. A key innovation in this study was the use of uncertain labels, allowing the model to handle noisy or incomplete data—a common issue in real-world clinical settings. By addressing uncertainty in training data, the model became more robust and reliable, even in the presence of mislabeling or ambiguous diagnoses. The transformer architecture enhanced the model's generalization capabilities, leading to improved performance in diagnosing diseases such as pneumonia, tuberculosis, and other lung conditions, making it particularly useful for clinical environments. Multi Disease Diagnosis Model for Chest X-ray Images with ResNet [3]:Kumar et al. utilized ResNet in combination with Faster R-CNN to create a model capable of diagnosing multiple lung diseases from chest X-rays, including conditions like lung cancer and pneumonia. The integration of ResNet allowed for deep feature extraction, while Faster R-CNN enabled precise abnormality localization, significantly boosting classification accuracy. This model, validated on public chest X-ray datasets, outperformed many state-of-the-art models, showcasing high precision and recall scores. The study underscored the potential of combining CNN architectures for enhanced multi-disease detection in thoracic imaging.

Classification and Predictions of Lung Diseases from Chest X-rays Using MobileNet V2 [4]:Souid et al. applied transfer learning with MobileNet V2, a lightweight CNN architecture, to classify lung diseases from chest X-ray images. The model was trained on the NIH Chest-X-ray-14 dataset and achieved over 90% accuracy along with an AUC score of 0.811. MobileNet V2's efficient architecture made it suitable for deployment on devices with limited computational resources, such as mobile devices, enabling more accessible diagnostics in resource-constrained settings. Transfer learning allowed the model to achieve high accuracy without the need for extensive additional training, demonstrating its effectiveness as a portable, efficient solution for lung disease detection.

## V. SYSTEM DESIGN

The system developed utilizes a Flask backend to interact with TensorFlow models for chest disease prediction. It allows users to upload chest X-ray images, which are then processed by the backend, and the trained CNN model predicts diseases such as pneumonia and lung cancer. The model is based on the Convolutional Neural Networks (CNN) architecture and employs multiple layers for feature extraction and classification. The modular design allows scalability and future enhancements, including real-time predictions. Diagrams such as the System Architecture and DFDs are included to illustrate the design.

## VI. METHODOLOGY

The methodology for chest-related disease prediction using deep learning involves several key steps: 1. Data Collection: Chest X-ray images were collected and preprocessed to ensure consistency. 2. Model

Selection: A CNN model was selected due to its effectiveness in image classification tasks. 3. Model Training: The dataset was split into training and validation sets, and the CNN model was trained to classify diseases such as pneumonia. 4. Evaluation: The model's performance was evaluated using accuracy, precision, and recall metrics. Visualization techniques like Grad-CAM were employed to interpret the model's predictions.

## VII. RESULTS

The CNN model achieved high accuracy in detecting chest diseases from X-ray images, with an accuracy rate of over 90%. The model's predictions were further validated using confusion matrices and F1 scores. Grad-CAM visualization showed that the model correctly identified disease regions in the images, indicating its reliability in clinical settings.

## ACKNOWLEDGEMENT

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