



International Journal of Innovative Research in Science Engineering and Technology (IJIRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)



Impact Factor: 8.699

Volume 15, Issue 4, April 2026

AI-Driven X-Ray Diagnosis System for Accurate Disease Detection and Prescription Support

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ABSTRACT: This project aims to build an intelligent system that analyzes medical X-ray images using Artificial Intelligence to assist in disease detection and provide basic prescription suggestions. The CSC mobile application uses machine learning and image processing to identify abnormalities such as pneumonia, tuberculosis, and lung opacity. Users can upload or capture X-ray images through their mobile phones, and the system processes the image using a trained deep learning model to generate results within seconds. The main goal is to make diagnosis faster, more accurate, and easily accessible, especially for people in rural or remote areas. In many small clinics, patients may have to wait a long time to get their X-rays reviewed by a radiologist, which can delay treatment. This system helps reduce such delays by providing quick preliminary analysis and supporting healthcare services through technology.

Keywords: Artificial Intelligence (AI), X-Ray Image Analysis, Convolutional Neural Network, Prescription Support, Artificial Neural Network, Medical Image, Diseases Detection, Clinical Decision Support System.

I. INTRODUCTION

The CSC app allows users to upload or capture X-ray images using their mobile phone. The AI system processes the image automatically, detects any abnormalities, and shows the diagnosis along with suggested prescription support. This system helps make the diagnostic process quicker, easier, and more affordable using modern technology. In rural areas and small clinics, access to radiologists is limited, so patients often have to wait for a long time to get their X-ray results. Such delays can be risky, especially in serious medical conditions.

Medical imaging, particularly X-ray scans, is very important in healthcare for detecting diseases like pneumonia, tuberculosis, bone fractures, and tumors at an early stage. However, interpreting X-ray images requires expert knowledge, and manual analysis can take time, may involve human error, and is not always easily available in under-resourced areas like rural hospitals.

Objectives of this work include:

The objectives of this work include developing an AI-based system to analyze X-ray images, detecting diseases such as pneumonia, tuberculosis, and lung opacity automatically, and integrating the model with a mobile application for easy upload or scanning of images. It also aims to provide quick and accurate diagnostic results along with basic prescription suggestions. In addition, the system is designed to reduce dependence on manual diagnosis by radiologists and improve access to healthcare services, especially in rural and remote areas, making the process faster, simpler, and more affordable.

II.RELATED WORK:**2.1 ENHANCED LUNG DISEASE CLASSIFICATION USING CALMNET: A HYBRID CNN-LSTM-TIME DISTRIBUTED MODEL FOR RESPIRATORY SOUND ANALYSIS**

Reshma Sreejith.,et.,al.,[1] Lung diseases like asthma, pneumonia, and COPD require early detection for proper treatment. Traditional diagnosis methods using a stethoscope depend on human judgment and may not always be accurate. This study introduces a deep learning model called CALMNet that analyzes lung sounds using CNN and LSTM techniques to capture important features. The model is trained using the ICBHI dataset with preprocessing and feature extraction methods to improve data quality. It achieves high accuracy and performs better than other models, making it a reliable and efficient approach for automatic lung disease detection.

2.2 A DOMAIN-ADAPTED VISION TRANSFORMER FOR AUTOMATED PNEUMONIA DETECTION AND EXPLANATION USING CHEST X-RAY IMAGES

Michael Fu.,et.,al.,[2] Pneumonia is a serious lung disease that is usually diagnosed using chest X-ray images, but identifying it accurately requires expert radiologists because the patterns can be very subtle. Artificial Intelligence can help automate this process using deep learning models. However, many existing models focus only on local features or use pre-trained data from general image datasets, which may not perform well for medical images. To solve this, a model called DAViT (Domain-Adapted Vision Transformer) is proposed, which combines Vision Transformers and CNNs to capture both global and local features. It is trained using chest X-ray datasets with domain adaptation techniques to improve performance. The model achieves high accuracy in detecting pneumonia and outperforms many existing methods. It also provides visual explanations using heatmaps, helping doctors understand the results better and supporting more reliable diagnosis.

2.3 IMPROVING EARLY DETECTION AND CLASSIFICATION OF LUNG DISEASES WITH INNOVATIVE MOBILENETV2 FRAMEWORK

Amirtha Tripathi.,et.,al.,[3] Lung diseases affect the normal functioning of the lungs, and if not detected early, they can lead to serious health problems. To address this, two machine learning models are proposed to help in early lung disease classification and assist doctors in diagnosis. The first model is based on a modified MobileNetV2 architecture with L2 regularization to improve performance. The second model is a custom CNN that uses ELU activation and also includes L2 regularization for better accuracy. These models are trained and tested using publicly available lung disease datasets. The results show that both models achieve high accuracy compared to existing methods like EfficientNet and ResNet. The proposed approach can support medical professionals by providing reliable predictions and acting as an additional tool during diagnosis.

2.4 DEEP LEARNING MODELS FOR ACCURATE DETECTION OF COVID-19 PNEUMONIA FROM CHEST X-RAY IMAGES

Thejaswini.,et.,al.,[4] The COVID-19 pandemic has made it important to detect pneumonia and lung infections quickly. Chest X-ray images are commonly used for diagnosis, but manual analysis takes time and requires expert knowledge. This study explores the use of Convolutional Neural Networks (CNNs) to automatically classify chest X-ray images and detect conditions such as normal, viral pneumonia, and COVID-19 pneumonia.

Different models like Neural Networks, SVM, and CNN architectures were tested. Among them, VGG-19 performed the best with high accuracy, followed by ResNet-50 with strong results. These findings show that AI-based systems can help improve early detection, reduce delays, and support doctors in making better decisions. Future work can focus on using larger datasets and more advanced models to further improve accuracy.

2.5 DEEP LEARNING FOR PNEUMONIA DETECTION IN CHEST X-RAY IMAGES: A COMPREHENSIVE SURVEY

Sameena javaid,et.al.,[5] This paper focuses on reviewing existing research related to deep learning techniques used for detecting pneumonia from chest X-ray images. It explains how chest X-rays, being widely available and cost-effective, are commonly used for pneumonia diagnosis. The study mainly analyzes research work done during the COVID-19 period (2020–2023) and evaluates different deep learning approaches. It also discusses the limitations of existing methods and compares their effectiveness in pneumonia detection.

2.6 Multi-Modal Deep Learning for Lung Cancer Detection Using Attention-Based Inception-ResNet

Mohamed Hosnyl.,et.,al.,[6] Lung cancer is a serious disease that requires early and accurate diagnosis. Traditional methods depend on manual analysis of medical images, which can be slow and prone to errors. Deep learning offers an automated way to detect patterns in medical images, but existing models have limitations such as using limited data, single image types, and less effective feature extraction. To overcome these issues, a new deep learning framework is proposed that uses multiple X-ray, CT scans, and histopathological images. It combines Inception-ResNet architecture with advanced techniques like residual learning and attention mechanisms to improve feature extraction and focus on important regions in images. The model achieves high accuracy across different datasets and performs better than traditional methods, showing strong potential for improving early lung cancer detection and medical image analysis.

2.7 PneuX-Net: An Enhanced Feature Extraction and Transformation Approach for Pneumonia Detection in X-Ray Images

Kashif munir.,et.,al.,[7] Pneumonia is a serious lung disease that causes inflammation in the lungs and affects breathing, especially in vulnerable groups like children, elderly people, and patients with weak immunity. Early and accurate detection is important to improve treatment and reduce health risks. This study proposes a model called PneuX-Net, which combines multiple machine learning techniques such as Random Forest, Gaussian Naïve Bayes, and K-Nearest Centroid to improve classification accuracy. Each method contributes differently—Random Forest captures complex patterns, Naïve Bayes handles uncertainty, and K-Nearest Centroid groups similar data points. By combining these methods, the system improves performance and reduces errors like overfitting. The model is tested using cross-validation and achieves very high accuracy, showing that it can effectively support automated pneumonia detection and assist doctors in decision-making.

2.8 AN ENHANCED DEEP LEARNING FRAMEWORK FOR PNEUMONIA DETECTION IN CHEST X-RAYS

Asma Binte Rashid.,et.,al.,[8] Pneumonia is a serious lung disease caused by infections like bacteria, viruses, or fungi, and it leads to fluid buildup in the lungs. Early detection is very important to prevent complications, and chest X-rays are commonly used for diagnosis. This study proposes an improved deep learning model that combines DenseNet-121 with an attention mechanism (CBAM) to better extract important features from X-ray images. The model is trained on a chest X-ray dataset and achieves high accuracy, improving performance compared to the base model. It also uses visualization techniques like Grad-CAM to highlight important lung areas for better understanding. Overall, the proposed approach shows strong performance in accurately detecting pneumonia with fewer computational resources.

2.9 PREDICTING PNEUMONIA WITH PRECISION: A DEEP LEARNING APPROACH

M.Nikesh.,et.,al.,[9] Pneumonia is a lung infection that causes inflammation in the air sacs, which may fill with fluid or pus, leading to symptoms like cough, fever, chest pain, and difficulty in breathing. It can be caused by bacteria, viruses, or fungi and is more dangerous for infants, elderly people, and those with weak immunity. Early diagnosis and treatment are very important to avoid serious complications. This study explores the use of Machine Learning and Deep Learning techniques to detect pneumonia. Different models such as Random Forest, VGG-16, Inception V3, and CNN-based approaches are tested using a Kaggle dataset. The goal is to compare these models and identify the most accurate and reliable method for pneumonia detection.

2.10 IMPROVING PNEUMONIA DIAGNOSIS WITH HIGH-ACCURACY CNN-BASED CHEST X-RAY IMAGE CLASSIFICATION AND INTEGRATED GRADIENT

Hasan.,et.,al.,[10] Accurate and early diagnosis of pneumonia is very important for proper patient treatment, and chest X-ray images are widely used for this purpose. This study proposes a Convolutional Neural Network (CNN) model to classify pneumonia using a dataset of 5,856 chest X-ray images. The model combines an InceptionV3-based feature extraction layer with dense layers to improve feature learning and classification performance. The model achieves high accuracy in identifying pneumonia. To make the results more understandable, Integrated Gradients (IG) is used to highlight the important regions in the X-ray images that influence the model's predictions. This improves transparency and helps build trust in the automated system. Overall, the approach shows strong potential for improving pneumonia detection and supporting clinical decision making.

III. EXISTING SYSTEM

I

In the existing system, diagnosis of lung diseases using X-ray images is mainly performed manually by radiologists. Doctors examine the X-ray images and identify abnormalities based on their experience and expertise. This process can

be time-consuming and may vary depending on the skill level of the radiologist. In many healthcare centers, especially in rural and remote areas, there is a shortage of radiologists, which leads to delays in getting reports. Patients often need to wait for several hours or even days to receive their diagnosis. Manual interpretation is also prone to human error, which may affect the accuracy of the results. Although some computer-aided systems exist, they are not widely accessible or integrated into mobile platforms for easy use. Therefore, there is a need for an automated, fast, and accurate system that can assist in preliminary diagnosis and support healthcare professionals.

3.1 Drawbacks

- X-ray diagnosis is done manually by radiologists, which takes more time.
- Patients often need to wait a long time to get their reports.
- There is a shortage of expert radiologists in rural and remote areas.
- Manual analysis may lead to human errors and less accurate results.
- The process is not fast enough for urgent or critical cases.
- Access to advanced diagnostic facilities is limited in small clinics.
- No easy mobile-based system for quick and convenient diagnosis.

IV. PROPOSED SYSTEM

The proposed system is an AI-based X-ray diagnosis platform that automatically detects diseases from X-ray images and provides basic prescription support. It uses deep learning and image processing techniques to analyze X-ray scans and identify conditions such as infections, fractures, pneumonia, and other lung-related problems. When a user uploads an X-ray image, the trained neural network model (such as a CNN) processes the image and quickly produces a diagnosis result. In addition to disease prediction, the system also suggests possible treatments or prescriptions using AI-based decision rules. This helps in providing fast, accurate, and supportive information for medical diagnosis.

4.1 Advantages:

- Automated X-ray Analysis using AI and Deep Learning
- High accuracy diagnosis with minimal human intervention
- Instant disease prediction and report generation
- Prescription recommendation module based on detected condition
- User-friendly interface for doctors and patients
- Cloud/Local model integration for fast response
- Real-time consultation support for remote areas
- Reduced workload for radiologists

V. ARCHITECTURE DIAGRAM

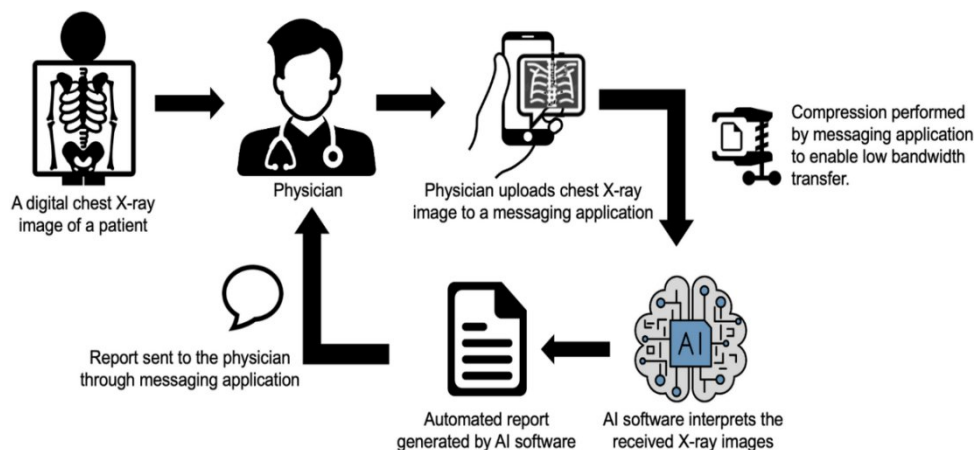


Figure:1 System Architecture diagram

VI. DATASET

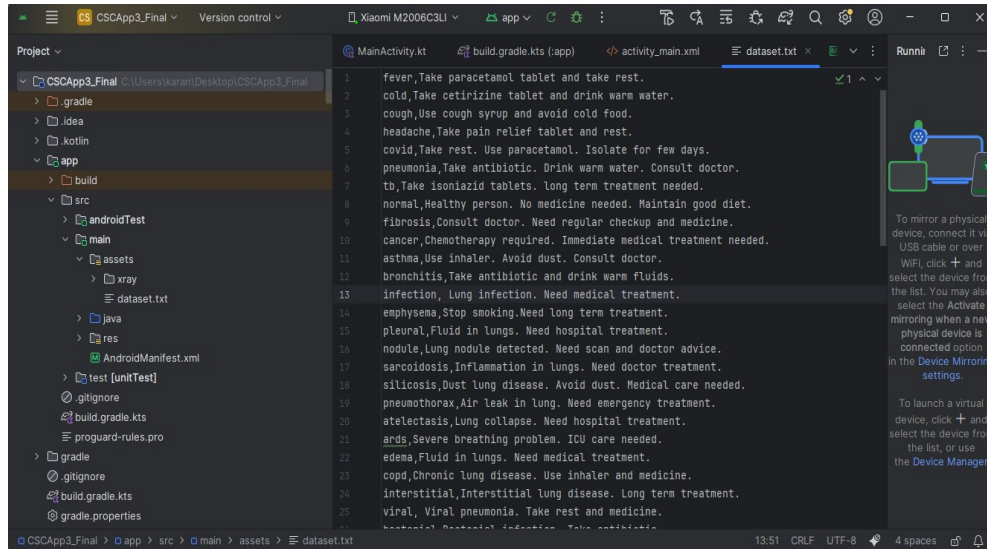


Figure:2 Dataset

VII. CONCLUSION

The project “AI-driven X-Ray Diagnosis System for Accurate Disease Detection and Prescription Support” shows how Artificial Intelligence and mobile technology can be used to assist in medical diagnosis. It successfully achieves its goals by combining machine learning, image processing, and a mobile application to improve access to healthcare services. The system helps in saving time, reducing manual errors, and supporting early detection of diseases for both doctors and patients. The application is easy to use, reliable, and provides accurate results when analyzing medical data. Overall, this project demonstrates the effectiveness of AI in healthcare by assisting doctors in decision-making and improving patient care.

VIII. FUTURE WORK

In the future, this system can be improved by training it with larger and more diverse datasets to increase accuracy and detect more diseases. Advanced deep learning techniques can be used to enhance performance and speed. The system can also be integrated with cloud storage so doctors can access data from anywhere. It can be developed into a full mobile and web application with real-time results. Additional features like multi-language support, better report generation, improved prescription suggestions, and strong security for patient data can also be added. These improvements will make the system more accurate, reliable, and useful in real-world healthcare.

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