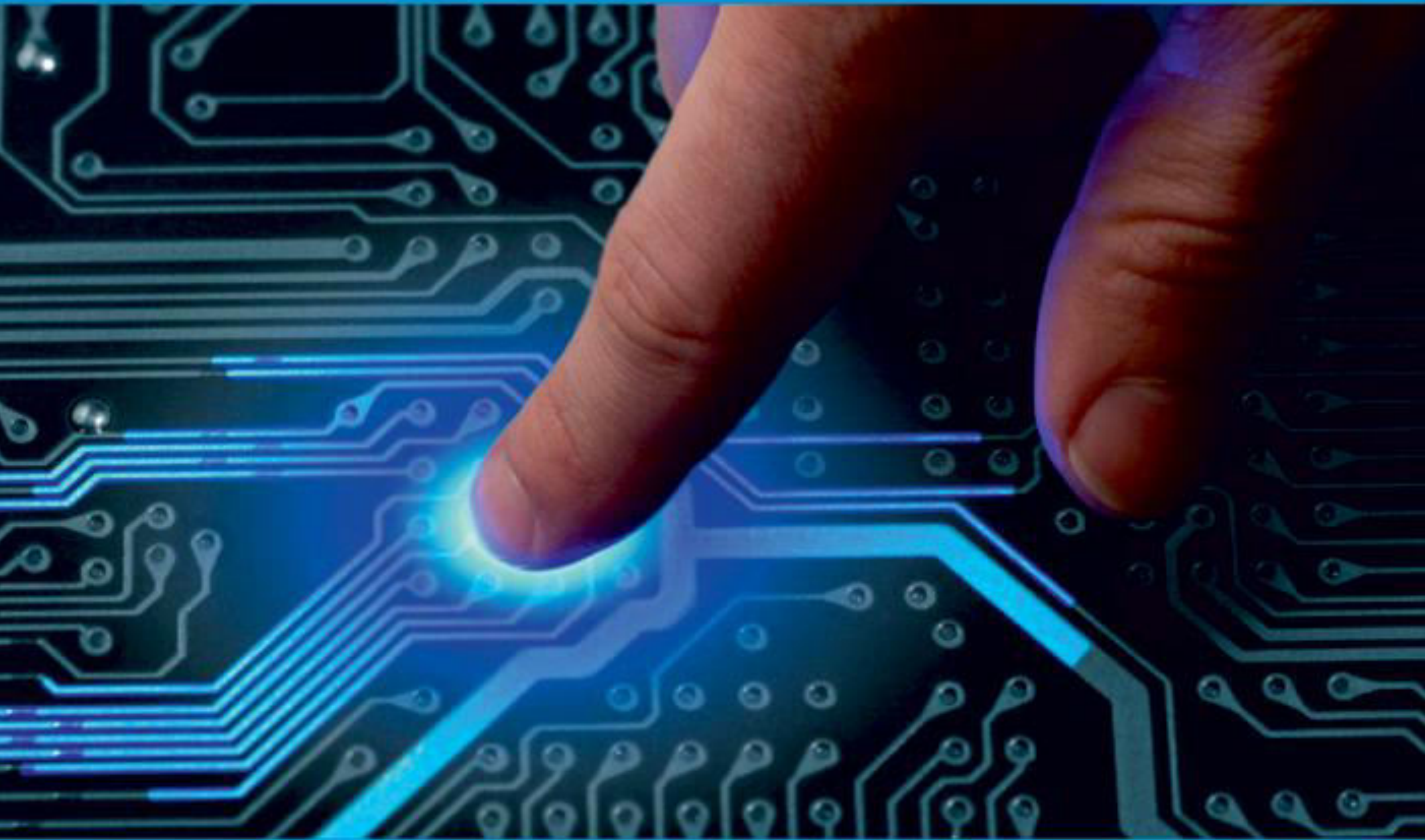
IJIRCCE

e-ISSN: 2320-9801 | p-ISSN: 2320-9798



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

Volume 12, Issue 7, July 2024

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 8.379

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 | A Monthly Peer Reviewed & Referred Journal |

|| Volume 12, Issue 7, July 2024 ||

| DOI: 10.15680/IJIRCCE.2024.1207068|

Identifying Abnormality in Chest X-Ray Using Deep Learning Model

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ABSTRACT : About 500,000 people die in the US each year as a result of the widespread use of chest X-rays for the screening of heart and lung failure (CXR). A computer-aided image categorization system is required due to the growing patient population and the ensuing physician overwork. Our recommendation is to apply a CNN model to detect abnormalities in chest X-ray images. This system aims to reduce healthcare costs, boost diagnostic performance, and enhance patient care particularly in resource constrained settings.

KEYWORDS: Convolutional Neural Network, Chest X-ray, Identifying abnormalities.

I. INTRODUCTION

Chest X-ray (CXR) analysis is pivotal for the early detection and diagnosis of pulmonary abnormalities, which is essential for effective patient care. However, the high demand for immediate interpretation and the limited availability of radiologists creates significant challenges in many healthcare settings. This study aims to overcome these obstacles by automating the identification and classification of CXR abnormalities by utilizing the capabilities of deep learning, namely Convolutional Neural Networks (CNNs). In addition to being time-consuming, manual CXR image analysis is also prone to human error, which can result in delays and errors that negatively impact patient health and interfere with the smooth running of healthcare facilities.

In order to automatically learn complicated patterns from raw image data something that traditional machine learning techniques frequently find difficult to accomplish deep learning algorithms, particularly CNNs, offer a potent answer to these issues. By exploring various CNN architectures, including well-established models like Sequential and Inception V3, this project aims to develop customized CNNs tailored for CXR analysis. These models will be trained and evaluated on comprehensive datasets, such as those from the ChestXRay14 repository, to make sure they can differentiate between normal and abnormal CXRs and identify specific pathological findings. The goal is to achieve superior performance in CXR analysis through meticulous training and fine-tuning of these advanced neural network models.

The impact of this work goes well beyond simple automation. By providing rapid and accurate insights into CXR abnormalities, this technology could revolutionize CXR analysis, particularly in resource-constrained environments where access to skilled radiologists is limited. In time-sensitive scenarios, the ability to quickly and accurately diagnose conditions based on CXR images could significantly enhance diagnostic efficiency, reduce healthcare costs, and improve patient outcomes. The integration of deep learning-based CXR analysis into routine clinical practice and telemedicine platforms could make high-quality diagnostic tools more accessible and reliable, even in remote or underserved areas.

To ensure the practical applicability of this approach, rigorous experimentation and validation are essential. The project's success hinges on demonstrating the efficacy and reliability of CNN-based CXR analysis through extensive testing and real-world deployment. This entails not just reaching high accuracy rates but also making sure the system can function reliably across a range of datasets and settings. The research intends to clear the path for these deep learning models smooth incorporation into healthcare systems by extensively testing their performance, thereby improving the standard of care given to patients. Using deep learning to its full potential will enable CXR analysis to keep up with the ever-increasing demands of contemporary healthcare.

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II. EXISTING SYSTEM

Based on previous approaches, detecting diseases from chest X-ray images has been challenging due to the intricacy of accurately identifying specific conditions among many possibilities. Accuracy has been limited by techniques like hybrids and machine learning. Therefore, this study seeks to enhance results by adopting deep learning techniques. The goal is to achieve more precise disease detection, overcoming the shortcomings of earlier methods and advancing diagnostic capabilities in medical imaging.

II.PROPOSED METHODOLOGY

A.Proposed System:

The system aims to accurately identify abnormalities in chest X-ray images by leveraging multiple Convolutional Neural Network (CNN) architectures. The system is designed to classify images into six distinct categories: Atelectasis, Pneumothorax, Cardiomegaly, Consolidation, Effusion, and Normal. The system employs various CNN architectures such as Sequential and InceptionV3 to leverage their unique strengths in feature extraction and classification. The performance of the proposed system is evaluated using accuracy as metrics. Application of the proposed system are:

- The aim of this study is to reduce time and cost inefficiencies in busy healthcare centers.
- This model is beneficial in situations where healthcare expertise varies, as it autonomously detects abnormalities in chest X-rays.
- Deep learning was utilized in this study to increase the accuracy of detecting chest X-ray abnormalities, providing superior diagnostic capabilities.

B. Methodology:

The procedures and methods employed in the study "Identifying Abnormality in Chest X-ray using Deep Learning Models," along with limitations and ethical considerations, are described in this part. It includes information on sample selection, data processing, analytic techniques, data collection strategies, and research design. To quantify and quantitatively evaluate the effectiveness of deep learning models in identifying anomalies in chest X-rays, a quantitative research methodology was selected.

The ChestXRay14 and other publicly accessible chest X-ray datasets provided the study's data, which were tagged and preprocessed to include shrinking images to 224x224 pixels and normalizing pixel values. For a trustworthy model evaluation, the sample comprised 720 randomly chosen chest X-ray pictures that were split evenly into test, validation, and training sets. For classification and feature extraction, convolutional neural networks (CNNs) such as Sequential and InceptionV3 were used. The Keras package was used to train and assess the models.

Obtaining chest X-ray pictures, preprocessing them, training CNN models, and assessing model performance on test and validation sets were some of the methods included in this research. In accordance with ethical standards for the administration of medical data, anonymised public datasets were used to resolve ethical concerns. The availability of labeled data and computer resources were limitations, indicating that larger datasets and more complex models might be explored in future studies.

Standard preprocessing, well-established datasets, and repeated training sessions were used to guarantee validity and dependability. Consistency was also maintained. Tools with strong support for data analysis and deep learning, like Python, Anaconda, TensorFlow, and Keras, were selected. The methodology's utilization of large datasets and potent neural networks to produce high anomaly detection accuracy justifies its use for medical picture analysis.

III. SYSTEM ARCHITECTURE

The structured framework used to conceptualize software parts, interactions, and properties is referred to as system architecture. It deals with a system's high-level organization, the relationships between its parts, and the limitations that govern its operation. The architecture of a deep learning-based system for
identifying anomalies in chest X-ray pictures is depicted in the diagram. The c1,c2,c3,c4,c5 and c6 belongs to Atelectasis, Pneumothorax, Cardiomegaly, Consolidation, Effusion, and Normal.

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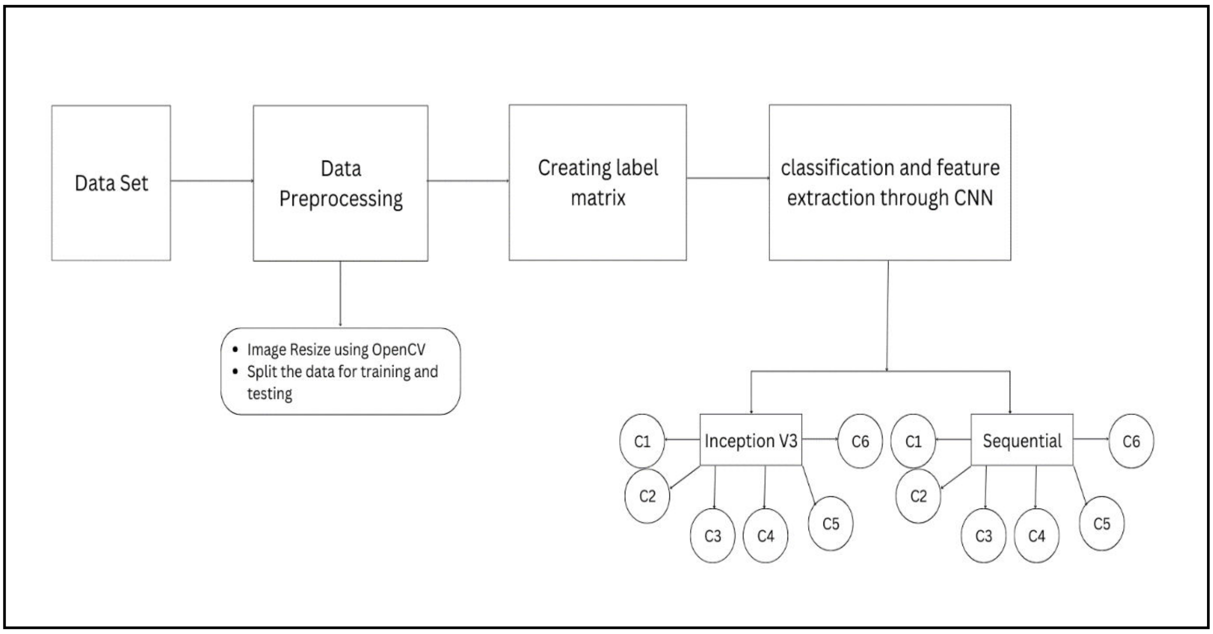

Fig 1 System Architecture

IV. RESULTS

The project's main objective is to create and assess deep learning models more especially, Convolutional Neural Networks (CNNs) in order to automate the identification and classification of abnormalities on chest X-rays (CXRs). Its goal is to mitigate the shortcomings of manual CXR analysis, which is often time-consuming and prone to human mistake. A thorough analysis of the literature identifies a number of effective strategies with accuracy rates ranging from 75% to 96%, including generative adversarial networks, transfer learning, and bespoke models. The paper highlights the need of using various datasets for successful training and validation and makes recommendations for future developments, such as expanding datasets and improving model designs.

The proposed system uses Python, Anaconda, and Jupyter Notebook to implement CNNs for real-time CXR abnormality detection. The steps involved in using the system are obtaining CXR images, preprocessing them, training the models, and real-time item detection. Each and every component of the system, including data loading, model training, and anomaly detection, has undergone extensive testing and validation, all of which have been successfully finished.

To sum up, the study demonstrates the possibility of incorporating deep learning-based systems into the healthcare industry, especially in environments with limited resources. The suggested approach offers quick and precise CXR analysis, improving diagnostic capabilities. A examination of the literature and test cases has confirmed the system's good performance, which highlights the system's potential to improve medical imaging diagnostic procedures and outcomes. Subsequent enhancements may augment the efficacy and broader applicability of the system across other medical imaging modalities.

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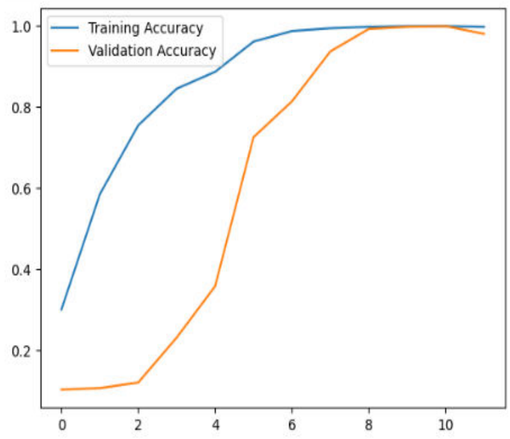

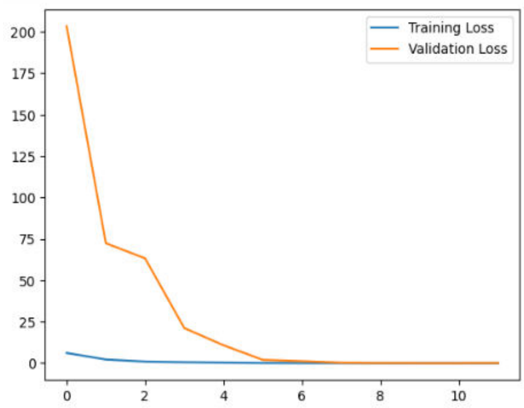

Fig 2 Model Accuracy

V. CONCLUSION

The experiment successfully identified abnormalities in chest X-ray pictures, proving the value of deep learning models for interpreting medical images. With the use of large datasets and Convolutional Neural Networks (CNNs), the study has effectively and highly accurately detected anomalies. It has become simpler to connect Python with a number of deep learning frameworks by using Anaconda and Jupyter Notebook to oversee the development and testing procedures.

The system's outputs were thoroughly examined to ensure that they met the user's requirements, demonstrating the model's dependability and usefulness in real-world situations. The project also demonstrated economic viability by significantly reducing development costs without compromising performance through the use of open-source technologies.

Overall, by reducing the time, cost, and human error associated with manual chest X-ray processing, the new system has the potential to improve patient outcomes and operational efficiency in healthcare facilities. The system satisfies clinical standards, and positive user acceptability test results demonstrate the value and utility of this deep learning-based approach to medical diagnosis.

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