PNUEMONIA DETECTION USING CNN

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***Abstract*—**Pneumonia is an infectious disease caused by bacterial contamination in the alveoli of the lungs. When the lung tissue becomes infected, pus accumulates, leading to severe complications. To diagnose pneumonia, medical professionals use chest X-rays, ultrasounds, or lung biopsies. However, misdiagnosis and erroneous treatments can lead to life-threatening consequences. Advancements in deep learning have significantly improved diagnostic accuracy in medical imaging. This study explores an efficient approach using Convolutional Neural Networks (CNNs) to predict and detect pneumonia from chest X-ray images. A dataset of 20,000 X-ray images, each with a resolution of 224×224 pixels, was used for training the model with a batch size of 32. The trained CNN model achieved an accuracy of 95% during performance evaluation. The results demonstrate that the proposed deep learning model can effectively classify bacterial and viral pneumonia, including COVID-19, solely based on chest X-ray images. This study highlights the potential of AI-assisted diagnostics in improving early detection and treatment planning for pneumonia.

Keyword : **X-ray Image Analysis,Deep Learning,CNN Algorithm,Medical Imaging,Disease Detection**

INTRODUCTION

Pneumonia is a severe lung infection that affects millions of people around the world, especially young children and large adults. Despite the progress of therapy, pneumonia is a major health problem, leading to significant number of deaths each year. Early identification is important for effective treatment, but the diagnosis of pneumonia depending on the X -ray of the breast can also be challenging for experienced doctors. Symptoms are often similar to other lung conditions and traditional clinical methods make time and sometimes inconsistent to take time.

Artificial Intelligence (AI) and Deep Learning, especially the firm Nervous Network (CNN) has revealed new opportunities in medical imaging and the disease detection. CNN's breast x -rays can analyze with remarkable accuracy, reduce human error and accelerate the clinical process. By detection of pneumonia automatically, CNN provides a reliable and cost -effective solution, which helps doctors to make more accurate decisions.

The study checks the use of CNN to detect pneumonia, which receives impressive accuracy of AUC of 96.07% and 0.9911. With this approach, we aim to increase the health care system by offering a powerful tool for early and effective diagnosis, patients eventually improve results.

PURPOSE OF THE PROJECT

The primary purpose of the project detect pneumonia using CNN quickly and accurately using X-ray images. It reduces human error and supports doctors in making faster decisions. This leads to early treatment and better chances of recovery.

1) Pneumonia is a bacterial disease which people overlook at early stages.

2) Timely detection of this disease can help us to fast-track the process of recovery.

3) Extraction of Chest X-rays to identify any early symptoms of pneumonia.

4) A system that classifies the type of pneumonia (Viral or Bacterial).

5) To acquire the level of precision over manual human intervention.

This CNN-based pneumonia detection system enhances accuracy, speeds up diagnosis, and supports healthcare professionals in providing timely and effective treatment.

PROBLEM STATEMENT

1. Pneumonia is a serious health issue, especially for young children and the elderly.
2. Traditional chest X-ray diagnosis is time-consuming and prone to human error.
3. Pneumonia symptoms often resemble other lung diseases, making diagnosis difficult.
4. There is a need for an automated and efficient pneumonia detection system.
5. CNNs can analyze chest X-ray images with high accuracy and minimal errors.
6. A CNN-based system can assist doctors in faster and more precise diagnoses.
7. Early detection through CNN can lead to timely treatment and better patient outcomes.

EXISTING SYSTEM

1.IN 2018, THE RADIOLOGICAL SOCIETY OF NORTH AMERICA (RSNA) RELEASED A DATASET FOR DETECTING AND LOCALIZING PNEUMONIA IN CHEST X-RAYS.

2..THE DET NET NETWORK UTILIZES THE FIRST FOUR PHASES OF RESNET50 AS ITS BACKBONE FOR FEATURE EXTRACTION.

3.TO IMPROVE IMAGE ANALYSIS, THE SYSTEM INTEGRATES FPN AND DET NET, ENHANCING THE NETWORK'S ABILITY TO EXTRACT CRITICAL FEATURES.

DISADVANTAGE OF EXISTING SYSTEM

1. Slow processing.
2. Result of the system is inaccurate.
3. Less efficiency.
4. Too long to predict the pneumonia.

SYSTEM ARCHITECTURE

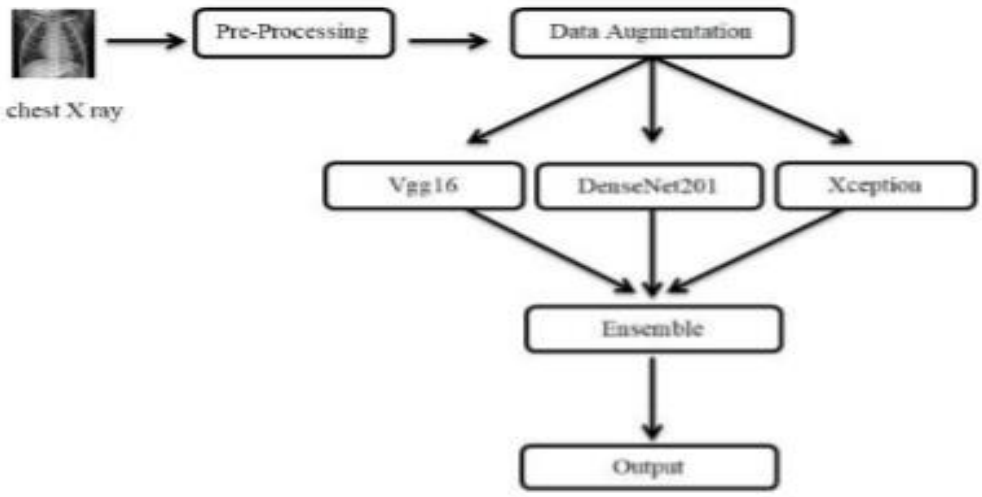

Figure 1

PROPOSED SYSTEM

1. The ResNet50 algorithm enhances pneumonia detection by using deep residual learning, improving feature extraction and classification accuracy.
2. The dataset consists of 5,856 chest X-ray images, including 1,583 normal cases and 4,273 pneumonia cases for classification.
3. Proper data preprocessing, such as resizing and cropping, ensures clean and optimized images for model training.
4. The CNN algorithm is then applied to analyze and detect pneumonia efficiently.

ADVANTAGES

1. Uses CNN algorithms to detect pneumonia from X-ray images.
2. Provides accurate predictions for pneumonia diagnosis.
3. Uses past data to improve future predictions and ensure reliability.
4. Applies CNN for final analysis and results.

SYSTEM OVERVIEW:

1. Data Gathering :

The dataset used in this project contains 5,863 chest X-ray images from Kaggle, originally created by Dr. Paul Mooney in 2017 to classify viral and bacterial pneumonia, specifically in pediatric patients.

The images are divided into three folders—train, test, and validation—with separate sections for normal and pneumonia cases. Chest X-rays mainly show shades of black, white, and gray. Lungs appear dark since X-rays pass through them easily, while the heart appears lighter. Bones are bright white as X-rays cannot pass through them, making their edges clearly visible.

2.Data Preprocessing :

1. Rescale – The pixel values of images (0–255) are scaled down by 1/255 to make them suitable for model training.
2. Shear Range – Applies random shearing transformations to images.
3. Zoom Range – Randomly zooms into images when horizontal asymmetry isn't assumed.
4. Horizontal Flip – Randomly flips half of the images horizontally to improve model robustness.

Rescale	1./255
Zoom Range	0.2
Shear Range	0.2
Horizontal_Flip	True

Table 1

3.Training and Testing the data

1. The dataset is split into **Training data**, **Validation data**, and **Testing data** for model development.
2. The model learns from **training data**, fine-tunes using **validation data**, and is tested on **test data** to measure accuracy.
3. **Test data** is only used for final evaluation, not during training.

Data Types

- **Training Set** – Helps the model learn patterns.
- **Validation Set** – Adjusts model settings for better accuracy.
- **Test Set** – Evaluates how well the model performs on new data.

4. Model Evaluation

Model evaluation helps determine the best-performing model and how well it will work in the future. To improve accuracy, we can adjust hyperparameters and analyze the confusion matrix to increase correct predictions

LITERATURE SURVEY

1.EL. Khalid, Asnaoui [1] explored different machine learning models for pneumonia classification, focusing on single and ensemble approaches. Ensemble learning combines multiple models to improve accuracy, making it a widely used technique in predictive analytics. By training each model separately and then integrating their outputs, the study found that an ensemble of three models performed significantly better than individual models in diagnosing pneumonia.

2.T. Rahman, E.H. Muhammad [2] worked on detecting bacterial and viral pneumonia using digital X-ray images. They applied transfer learning with four pre-trained deep learning models—AlexNet, ResNet18, DenseNet201, and SqueezeNet—to enhance classification performance. Their research highlights how AI-driven methods can assist radiologists in making faster and more precise pneumonia diagnoses.

3.P. Pratik, Hemprasad Patil [3] emphasized the role of early pneumonia detection in reducing fatalities. Chest X-rays are a primary tool for identifying symptoms, but manual feature selection can be time-consuming and prone to human error. In this study, a CNN-based model was developed to automatically extract important features, streamlining the diagnosis process and improving accuracy

RESULTS

Our model uses CNN to detect pneumonia from radiographs of the chest. It first provides the shape of images and removes important classification features. The model is trained on a large dataset and is evaluated using accuracy and cross-satyapan methods such as 5 times and ten times tests. The deep learning model achieved 98.46% accuracy, while the decision tree performed the worst of 85.64%. Statistical studies confirmed the biggest difference between the model, with the average F-points above 90%. The best performing approach with -98.95% accuracy with the best -performing approach with accuracy is very effective in detecting pneumonia.

CONCLUSIONS

A CNN-based model to diagnose pneumonia using x-rays of the breast. The model consists of six layers, which includes relay activation, dropout and maximum bases to increase the extraction function. This proved 92.07% accuracy and 91.41% accuracy compared to the current CNN model, its efficiency. Various entrance forms and disadvantages were held to evaluate the performance.

Future research classification will focus on improving accuracy, especially the difference between viral and bacterial pneumonia. Overall, CNN-based diagnosis Through X-rays is a promising approach to effectively detecting pneumonia.

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