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PNEUMONIA DIAGNOSIS USING CHEST X-RAY IMAGES AND CNN

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Abstract - *A pneumonia diagnosis system was developed using convolutional neural network (CNN) based feature extraction. InceptionV3 CNN was used to perform feature extraction from chest X-ray images. The extracted feature was used to train three classification algorithm models to predict the cases of pneumonia from the Kaggle dataset. The three models are Support Vector Machines, Neural Networks, and K-Nearest Neighbour The confusion matrix and performance evaluation were presented to represent the sensitivity, accuracy, precision, and specificity of each of the models. Results show that . The sensitivity of the Neural Network model was 84.1 percent, followed by support vector machines (83.5 percent) and the K-Nearest Neighbour Algorithm (83.5 percent) (83.3 percent). The Support vector machines model obtained the highest AUC of all the classification models, at 93.1 percent.*

Key Words: **convolutional neural network, K-Nearest Neighbour, InceptionV3 CNN, X-ray Images, Neural Networks.**

1. INTRODUCTION

Pneumonia is a common illness for the childhood community ranging from bacteria to viral pneumonia or the combination of both [1]. Pneumonia is life-threatening and one of the primary causes of excessive child mortality rates in rural settings. According to the World Health Organization (WHO), pneumonia is responsible for one-third of all infant fatalities in India [2].

The presence of an aberrant area known as lung opacity, which looks opaque due to the attenuation of the x-ray beam in comparison to the surrounding tissues is required for the diagnosis of pneumonia [3]. Traditional X-ray chest radiography, Magnetic resonance imaging (MRI) and computerised tomography (CT) scan (MRI)are all options for detecting pneumonia [4, 5]. Among these methods, X-ray chest radiography is the most economical option compared to other imaging diagnostics for pneumonia detection [6].

However, X-ray chest radiography is inferior in diagnosing pneumonia, especially for patients below five years old. This is due to the subtle differences in terms of scale, shape, intensity, and textures, which complicates the diagnosis [7]. Besides, other illness such as lung scarring, and congestive heart failure could also be misidentified as pneumonia [2]. Therefore, pneumonia diagnosis requires a skillful radiologist X-ray of the chest to detect pneumonia symptoms radiographs. The radiologist expert usually requires other information from the patient, such as the detailed medical record and phlegm condition [5]. It would be advantageous if an automated classification system can be developed to assist medical advisors or radiologists in the diagnosis of pneumonia.

Since X-ray radiographs are essentially images, CNN can be used to extract features VGG-16 and DenseNet-169, are examples of XCeption.are some of the CNN models that have been utilised for image identification of pneumonia [2, 3]. Rules-based, Bayesian network, Fuzzy C-means method, To predict, support vector machines, Nave Bayers, K-Nearest Neighbor, random forest, and other types of classifiers could be employed. The case of pneumonia.and Decision Tree [2, 8, 9]. Chapman and co-workers reported that the decision tree attained a precision of 85%, followed by rules-based (80%) and Bayesian network (72%), for the identification of pneumonia [8]. However, most of the papers focused on the feature extractions and did not evaluate the performance on different classifiers [9, 10].

1.1Related work

J. Zhou and W. Ge proposed A common, deadly, but preventable consequence of an Stroke-associated pneumonia (SAP) (AIS) is a kind of acute ischemic stroke. Identifying people who are most likely to develop SAP is crucial. as soon as possible. On the other hand, Previous clinical prediction methods have not been widely used. practise. As a result, we set out to use machine learning (ML) techniques to create a model that may predict SAP in Chinese AIS patients .Although challenging to implement, the XGBoost model, which comprises six common traits, can ISAN and PNA scores do not accurately predict SAP in Chinese AIS patients.

There is currently no equipment available for early diagnosis of pneumonia caused by using a ventilator, according to Chung-Hung Shih and Yu-Hsuan Liao (VAP). As a result, he recommends employing an offline gas detection device to track the development of pneumonia metabolites and to identify them early. The new method collects breath samples from VAP patients using a e-nose with a low-cost microarray is simple to connect to an ICU mechanical ventilation system. However, this is the standard approach of implementing apps.

According to YanqiuGe, Qinghua, WangLi, WangHonghu, and Wu ChenPeng, pneumonia is a common complication following a stroke, resulting in a longer hospital stay and death. As a result, the ability to predict post-stroke pneumonia in a timely and reliable manner would be immensely beneficial in clinical practise. Simple statistical methods like logistic regression were commonly employed to generate pneumonia risk score models in the past. Machine learning approaches that are more powerful, it is simple to predict post-stroke pneumonia. The datasets will take longer to train.

Medication is often used to treat schizophrenia, according to Chi Hsien Huang, however anti-psychotic drug use has been linked to pneumonia instances. Using machine learning, we hope to construct a machine learning-based In schizophrenic patients, a technique for predicting hospital-acquired pneumonia has been developed.Because of the great accuracy, it will take longer to implement.

Dimpy Varshni says that The fundamental purpose The goal of this research is to expand medical knowledge in locations where radiotherapists are scarce. Their investigation aides in the early Pneumonia must be detected in order to be treated. Avoid negative outcomes (including mortality) in such remote places. So far, not much effort has gone into particularly detecting Pneumonia from the dataset in question. The creation of algorithms in this field could be extremely advantageous in terms of improving healthcare services. In such remote places, her research helps with early detection of Pneumonia to avoid negative repercussions (including mortality).But the disadvantage here is all users can't access these applications only restricted area peoples can access.

Heewon K: A deep neural network can be used to train this relationship by detecting objects. As a result, using pneumonia detection with deep learning could be a very successful diagnostic method. This is done using a group of deep convolutional neural networks. research presents a method for detecting lung opacities on chest radiographs (CXR) that can be recognised as pneumonia.Furthermore, to tackle the RSNA Pneumonia Detection problem, this work deployed an ensemble model with Mask R-CNN and Kaggle challenge: RetinaNet, demonstrating that this strategy is capable of achieving high prediction accuracy. All of the individual models outperformed our voting ensemble approaches .High accuracy More time taken for training .

Shubhangi Khobragade This study uses lung segmentation, lung feature extraction, and classification to help diagnose diseases like tuberculosis, lung cancer, and pneumonia. an artificial Technique of neural networks We employed simple image processing methods including the intensity-based method and the discontinuity-based method to establish lung borders.We extract statistical and geometrical features. To detect major lung disorders, image classification utilising neural feed forward and back propagation networks was used. Easy to predict disease It will take more time to train the dataset.

Abdullah Faqih Al Mubarok says Pneumonia is a lung infection caused by bacteria. An infection in the air sacs. The presence of fluids in the air sacs, as well as inflammation of the alveoli are symptoms of pneumonia. A radiologist can determine whether or not pneumonia is present based on the x-ray picture intensity of the thorax By offering a second viewpoint, computer-aided detection (CAD) can increase radiologist diagnostic skill. One of the strategies employed is deep convolutional architecture. To create a CAD system. The goal of this study is to see how well two frequently used deep convolutional architectures. The residual network and mask-RCNN are both useful for detecting and recognising pneumonia. Furthermore, the outcomes will be compared and analysed. Easy to implement and adding to the unbalanced dataset with a more complicated network structure.

1.2.DATASET DESCRIPTION

The dataset is divided into three files (train, test, and val), with subfiles for each picture type (Pneumoniae/Normal). There are 5,863 JPEG X-ray images divided into two classes (pneumonia and normal).A retrospective sample of paediatric patients aged 1 to 5 years was chosen for chest radiography (before and after). Guangzhou Women's Pediatric Medical Center is located in the city China's Guangzhou. The patient's chest x-rays were all taken as part of his routine medical care. All chest radiographs were evaluated for quality before being used and analysed, with inferior and faded images being removed. Before being released for AI training, the diagnostic imaging was evaluated by two medical practitioners. A third evaluator examined the rating set to correct for classification flaws..

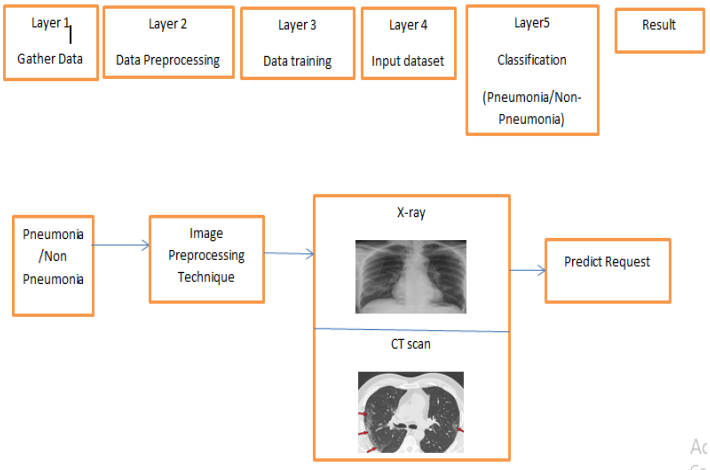
1.3.PROPOSED METHODOLOGY

The CNN, ANNs, also known as Feedback or Auto Associative A network is an artificial neural network of some form.(ANN) that creates a directed cycle by connecting units. CNNs, as a well-liked DL family, have shown promising outcomes in a number of Computer vision and machine learning applications problems. However, quantifying qualitative inputs like nation and location is a significant effort when using this approach. Because CNN has real-time data and real-time learning capacity, updating the model is possible. The proposed ANN model can be used to propose a virus epidemiological model in various regions. The suggested structure's major goal is to increase the accuracy and speed of recognising and classifying difficulties DL-based approaches were used to mitigate the virus's effects..

1.4.ADVANTAGE:

It can also anticipate the pattern of cardiovascular problems, allowing it to predict responsiveness to various treatment

approaches. ELMs are thus advised for such difficulties due to their features and many advantages. However, while AI accelerates the tactics for conquering, it should be highlighted that pneumonia, Because a complete knowledge of the benefits and drawbacks of AI-based pneumonia treatments has yet to be realised, and new approaches are needed,for such large-scale problems are needed, are required, real experiments should be conducted.



Fig(i) : System Architecture

1.5. SYSTEM REQUIREMENTS

Software Specification	Hardware Specification
Operating System: Windows XP	System : Pentium IV 2.4 GHz. Hard Disk : 40 GB.
Platform: PYTHON TECHNOLOGY Tool: Anaconda, Python 3.6	Monitor: 15-inch VGA Color. Mouse: Logitech Mouse.
Front End: Spyder Back End: python anaconda script	Ram : 512 MB Keyboard: Standard Keyboard

1.6. OBJECTIVES

The major goal of the suggested structure is to apply DL-based methods to increase the Accuracy and quickness in identifying and classifying the virus's problems.

The process of transforming a user-oriented description of an input into a computer-based system is known as input design. This layout is critical for avoiding data entry errors and directing management in the appropriate direction for receiving accurate data from the computerised system.

• It is achieved through the development of user-friendly screens.

• To manage big amounts of data during data entering goal of input design is to make things better data entering as simple and error-free as possible. The data entry page has been designed in such a way that allows for complete data manipulation. It also gives you access to your records.

• Once the data has been entered, it will be validated. Information can be entered on screens. The user is never caught off guard since appropriate messages are given as needed. As a result, the purpose of input design is to create an input layout that is simple to understand.

2. APPLICATIONS

- This application helps in healthcare
- Patients or Doctors easy to access

3. CONCLUSIONS

This work investigated the research topic of AI-based approaches that are suitable for dealing with the introduced conceptual structures and platforms. Pneumonia concerns. Pneumonia diagnostic systems have been included into several procedures, RNN, LSTM, GAN, and ELM are among examples.. The primary concerns with Pneumonia have been investigated and described in this work, including Geographical issues, high-risk groups, and recognition and radiology are all factors to consider .We also demonstrated a mechanism for selecting relevant models for parameter estimate and predictiona mixture of clinical and non-clinical datasets These systems help AI specialists analyse massive datasets and doctors train machines, design algorithms, and optimise the studied data for faster and more accurate viral identification.. We emphasised how appealing they are since they have the capacity to establish a collaborative workspace for AI specialists and physicians However, while AI facilitates the process, overcoming Pneumonia, real studies should be carried out because A complete grasp of the benefits AI-based solutions for Pneumonia have yet to be proven, and new techniques are needed for issues of this magnitude are required.

The goal is to use artificial intelligence (AI) and medical research to create a classification tool for recognising Pneumonia infection and other lung diseases.

Pneumonia and non-pneumonia were the two conditions studied. There are two steps to the suggested AI system. Chest X- In Stage 1, ray volumes are classed as pneumonia or non-pneumonia. If the X-ray is of the pneumonic kind,, stage 2 receives information from stage 1 and classifies it as Pneumonia positive or Pneumonia negative.

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