ISSN No:-2456-2165

Applying Medical Technologies for Diagnoising Medical Images by Using Machine Learning

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Abstract:- Medical imaging is important in a variety of clinical activities, including early detection, monitoring, an opinion, and therapy evaluation of many medical diseases. grasp medical image analysis in a computer vision requires a solid grasp of the principles and operations of artificial neural networks, as well as deep literacy. Deep Learning Approach (DLA) in medical image processing is emerging as a rapidly increasing research subject. DLA has been widely utilised in medical imaging to characterise the presence or absence of a complaint. The vast majority of DLA executions focus on X-ray pictures, motorised tomography images, mammography images, and digital histopathology images. It presents a rigorous assessment of studies based on DLA for bracketing, discovery, and segmentation of medical pictures. This review directs the experimenters' assumptions.

Keywords:- *Artificial Neural Networks, Deep Literacy, Deep Learning Approach (DLA), Motorized Tomography, Mammography Images, Digital Histopathology Images.*

I. INTRODUCTION

Medical image services, such as radiography, colonoscopy, computerised tomography (CT), mammography images (MG), ultrasound images, magnetic resonance imaging (MRI), magnetic resonance angiography (MRA), nuclear medicine imaging, positron emission tomography (PET), and pathological tests, have seen an increase in demand within the healthcare system. In addition, the lack of radiologists makes it difficult and time-consuming to analyse medical pictures. Using artificial intelligence (AI), these issues can be solved. Machine Learning (ML) is an application of AI that can learn without having to be specifically programmed, that learns from data, and that makes predictions or judgements based on historical data.ML makes use of supervised learning, unsupervised learning, and semi-supervised learning, three types of learning advancements. The ML approaches involve feature extraction and the choice of feature selection.

The ideas of cognition and information were the foundation for the idea of deep learning algorithms. Deep learning often possesses two characteristics: (1) many processing layers that may learn unique data features through various degrees of generalization, and (2) unsupervised or supervised learning of feature presentations on each layer. The possibilities of improved DLA in the medical fields of MRI, Radiology, Cardiology, and Neurology have been emphasized in a growing number of recent review studies. supervised deep learning methods include recurrent neural networks (RNNS) and convolutional neural networks. Medical image processing has also been studied using unsupervised learning methods like Deep Belief Networks and Generative Adversarial Networks (GAN'S). DLA can be used to identify abnormalities and categorize certain types of diseases.

II. TECHNOLOGIES USED

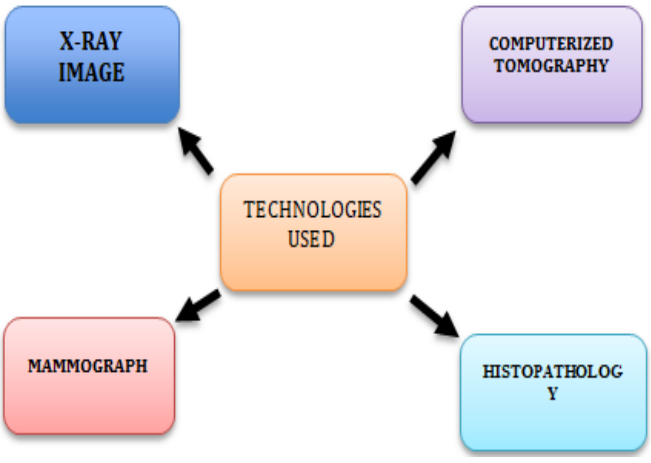

Fig 1 Technologies used

- *X-Ray Image:*

Chest radiography is mainly used in diagnostic procedures to detect conjecture heart failures and lung diseases such as tuberculosis, atelectasis, asthma, pleural effusion, pneumothorax, hyper cardiac inflation, and pneumonia. X-ray images are accessible, inexpensive, and less dose-effective compared to other imaging processes, and it is a powerful tool for mass examination. Deep

ISSN No:-2456-2165

learning methods used for X-ray image analysis. S. Hwang et al. implemented the first deep CNN-based Tuberculosis screening system with a transfer learning technique. Rajaraman et al. proposed modality-specific ensemble learning for the detection of anomalies in chest X-rays (CXRs). These model predictions are combined using many ensemble techniques toward minimizing prediction variance. Class selective mapping of interest (CRM) is used for visualizing the normal regions in the CXR images.

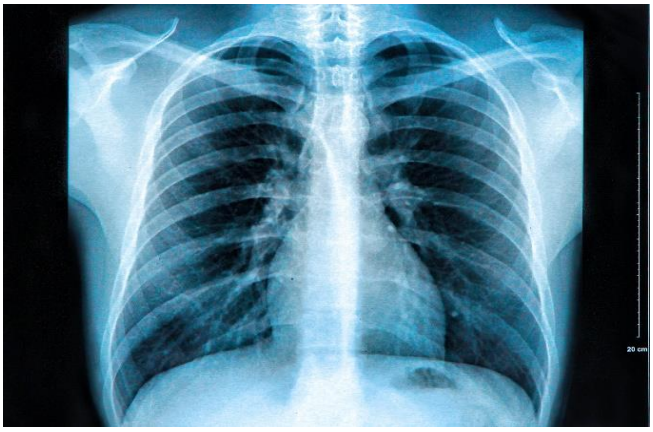

Fig 2X-ray Image

- *Computerized Tomography (CT):*

A special computer program processed this large volume of data to create two-dimensional cross-sectional images of our body.This imaging test helps to detect internal injuries and diseases by providing cross-sectional images of bones, blood vessels,and soft tissues. CT is a high detection capability, reveals small lesions, and provides a more detailed assessment.CT scanning is frequently used for lung nodule identification. The detection of malignant pulmonary nodules is fundamental to the early diagnosis of lung cancer Table 4 summarizes the latest deep-learning developments in the study of CT image analysis. Lietal.2016 implemented to solve the recognition of three types of nodules, that is, solid, semi-solid, and ground glass Balagourouchetty et al. introduced Google Net based on ensemble FC Net classifier for liver lesion classification.Masood et al. implemented the multidimensional Region-based Fully Convolutional Network(RFC) for lung nodule detection/classification and achieved classification accuracy of 97.91%. In lung nodule detection, the feature work is the detection of micronodules (less than 3 mm) without loss of insensitive and accurate.

Fig 3 Computerized Tomography

- *Mammograph (MG):*

One of the top causes of death for cancer-stricken women worldwide is breast cancer. The most popular and reliable method for early detection of breast cancer is magnetic resonance imaging (MG). A low-dose x-ray imaging technique called MG is utilised to see the breast's structure in an order to find breast illnesses.The tumors make up a little portion of the actual breast picture, making it challenging to identify breast cancer on mammography screenings. There are three processes in the analysis of breast lesions from MG: detection, segmentation, and classification. Still major topic of research is the automatic classification and early mass detection in MG. DLA has demonstrated some major breast cancer progress during the previous ten years.

Fig 4 Mammograph

- *Histopathology:*

Histopathology is the examination of human tissue under a microscope and a sliding glass to diagnose conditions such as kidney, lung, breast, and other cancers. Staining is used in histopathology to visualise and highlight a specific region of the tissue. For instance, the nucleus is stained with hematoxylin and eosin (H&E), which gives other structures a pink tone and the nucleus a dark purple hue. A H&E stain has been essential in the past century for identifying various illnesses, diagnosing cancer, and grading. Modern imaging technology includes digital pathology. Deep learning is shown promise in the analysis of histopathology pictures, particularly in the areas of nucleus recognition, image categorization, cell segmentation, tissue segmentation, etc.

Fig 5 Histopathology

III. SOFTWARE REQUIREMENTS SPECIFICATION

A. *Functional Requirements:*

The requirements that specify what all services system can provide the end-user is called the functional requirements. These define exactly what functions the system can do. The functional requirements are closely related to the user requirement specifications. This may include calculations, data processing, technical operations and other such functionality that aim to fulfill the application objectives.

These are captured in the form of use cases, which are the system responses to events by external agents or internal deadlines. Any tracking operations, legal requirements, interface details, authorization levels, transaction, updates, and cancellations, and administrative functions come under functional requirements. The technical architecture of the system is determined by these requirements.

B. *Non Functional Requirements:*

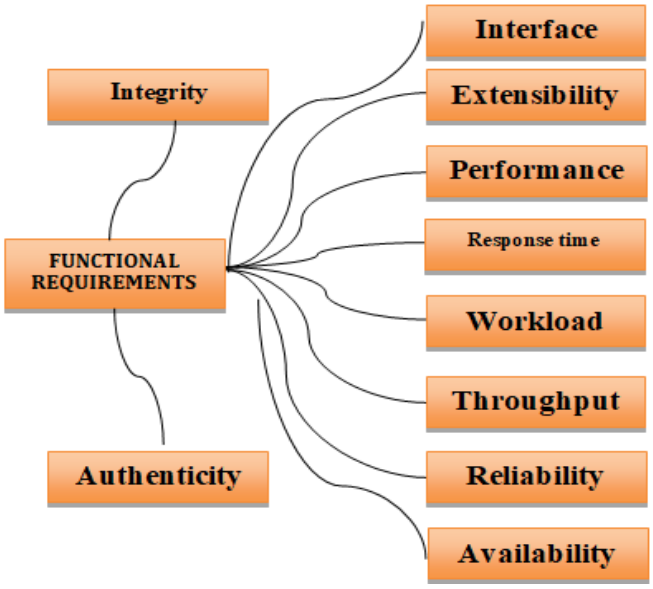

Fig 6 Non Functional Requirements

➢ *Extensibility:*

The design principle that determines the ability of a system to be extended is called extensibility. The expansion could consist of new functionality or a change to already-existing functionality. Overall, the system is enhanced while not affecting existing working functions.

➢ *Performance:*

It is how a system works or performs by taking the input training data and testing it and then classifying and predicting.

➢ *Interface:*

This application interacts with the doctor and show the diagnosed medical images.

➢ *Performance:*

Performance is assessed using following specifications:

➢ *Response time:*

It is the time taken for the system to accept user input and respond to it by displaying some output. The response time must also be consistent and not vary based on the number of concurrent sessions.

➢ *Workload:*

It refers to how much stress or work the system can handle simultaneously. This could be in terms of parallel sessions, number of active users or number of database transactions.

➢ *Throughput:*

The number of samples or bytes of data that are processed per second is referred to as throughput. The data processing rate should be as high as possible to ensure that the outputs are consistent and the user sustains interest in using the system.

➢ *Reliability:* Based on the outcomes of :

➢ *Integrity:* The information has not been modified by non-authorised people.

➢ *Authenticity:* A proof that the information belongs to the correct patient and issued from the right authority.

➢ *Availability:* Warrants an information system to be used in the normal schedule conditions of access.

IV. EXISTING SYSTEM

Most imaging procedures need the patient to remain still while photos are being taken. Since a child only needs to be still for a brief period of time for an X-ray or an ultrasound procedure, we frequently avoid sedated or restrained older children during X-ray procedures. However, smaller children and those who are anxious in unfamiliar surroundings may require assistance lying motionless, typically from parent.

➢ *Limitations of Existing System*

- *Medical imaging complications are uncommon, but they can be serious, possibly resulting in an injury or causing a secondary illness.*
- *Most imaging procedures require the patient to lie still for longer periods of time.*
- *The diagnosis of a disease is delayed because imaging could not be performed.*
- *The diagnosis of image took more time so that the person becomes sick.*

ISSN No:-2456-2165

V. PROPOSED SYSTEM

In the proposed method, we have enhanced medical images by using effective enhancement algorithms, which are the median filter, unsharp mask filter, and contrast-limited adaptive histogram equalization. The proposed methods have been implemented by MATLAB and more than 60 medical images in Different parts of the body have been used to evaluate the performance of the proposed methods. Depending on the medical imaging modalities, input medical images can be improved by up to 80%. This outcome is based on the assessments of professionals who compared input and output photographs.

A. Advantages of Proposed System:

- *Algorithms have been proposed in this approach.*
- *The patient need does not wait for longer time.*
- *The result of the diagnosed image is based on the training data.*
- *The accuracy is more because the system works more accurately.*

B. Machine Learning:

With the use of machine learning (ML), which is a form of artificial intelligence (AI), software programmers can predict outcomes more accurately without having to be explicitly instructed to do so. In order to forecast new output values, machine learning algorithms use historical data as input.

C. Algorithm Used:

➢ *Support Vector Machine:*

To deal with classification and regression issues, the Support Vector Machine (SVM),is one of the most well-liked supervised learning techniques, is used. However, the majority of its makes use of are in Machine Learning Classification problems.

In an order to create the hyperplane, SVM selects the extreme points and vectors. Support vectors, which are used to represent these extreme instances, are what to give the Support Vector Machine method its name. Take a look at the diagram below, where decision boundary or hyperplane is used to categorize two distinct categories.

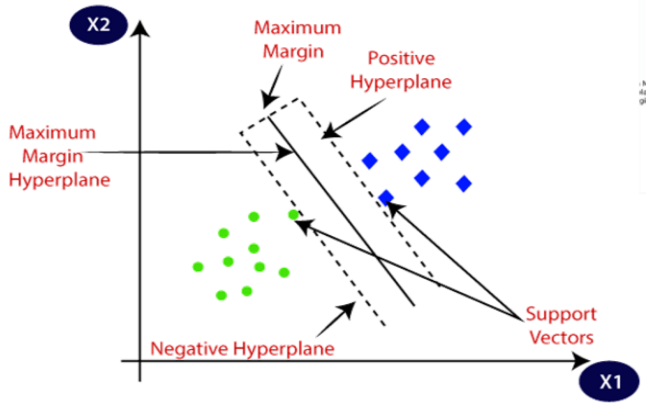

Fig 7 Support Vector Machine

➢ *Random Forest:*

Popular machine learning algorithm Random Forest is a part of the supervised learning methodology. It can be used for ML problems involving both regression and classification. It is based on the concept of ensemble learning, which is a technique for combining several classifiers to handle challenging problems and improve model performance.

As its name suggests, Random Forest is a classifier that averages several decision trees applied to various subsets of the supplied information to improve the predicted accuracy of the dataset. The graph below shows how the Random Forest algorithm works.

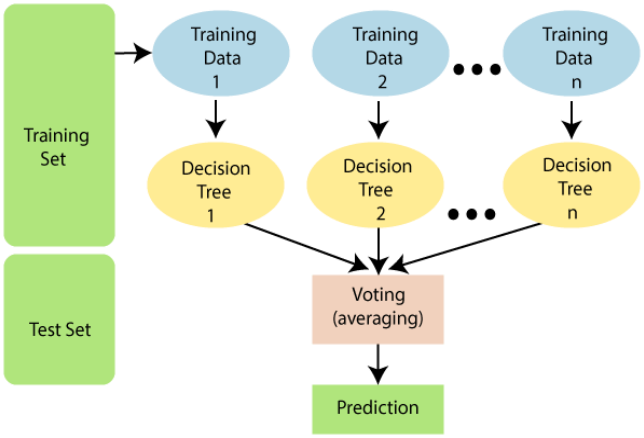

Fig 8 Random Forest

➢ *K-Nearest Neighbour:*

One of the most fundamental supervised learning-based machine learning algorithms is K-Nearest Neighbor.The K-NN algorithm places the new instance in the category that resembles the current categories the most, presuming that the new case and the previous cases are comparable. After storing all the previous data, new data point is categorised using the K-NN algorithm based on similarity. This indicates that new data can be reliably and quickly categorised using the K-NN approach.Although the K-NN approach is most frequently employed for classification problems, it can also be utilised for regression.

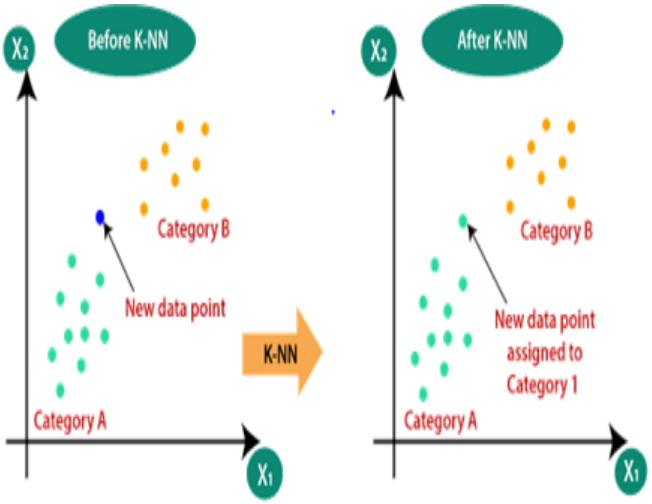

Fig 9 K-Nearest Neighbour

➢ *Convolutional Neural Network:*

A class of deep neural networks called convolutional neural networks (CNN/ConvNet) are most frequently used to assess visual imagery. When we think of neural networks, matrix multiplications typically spring to a mind, yet ConvNet is not a neural network. It employs a special technique known as convolution. Convolution is a mathematical procedure that takes two functions and creates a third function that expresses how the shape of one is changed by the other in mathematics.

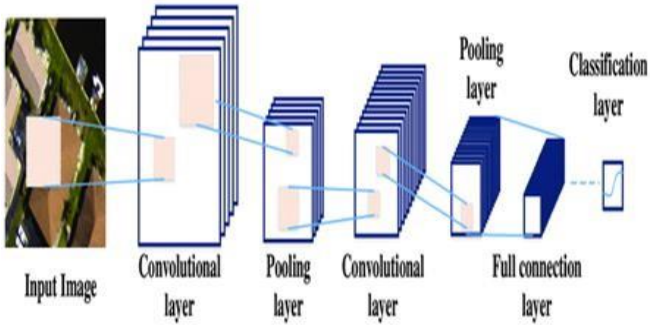

Fig 10 Convolutional Neural Network

➢ *System Architecture:*

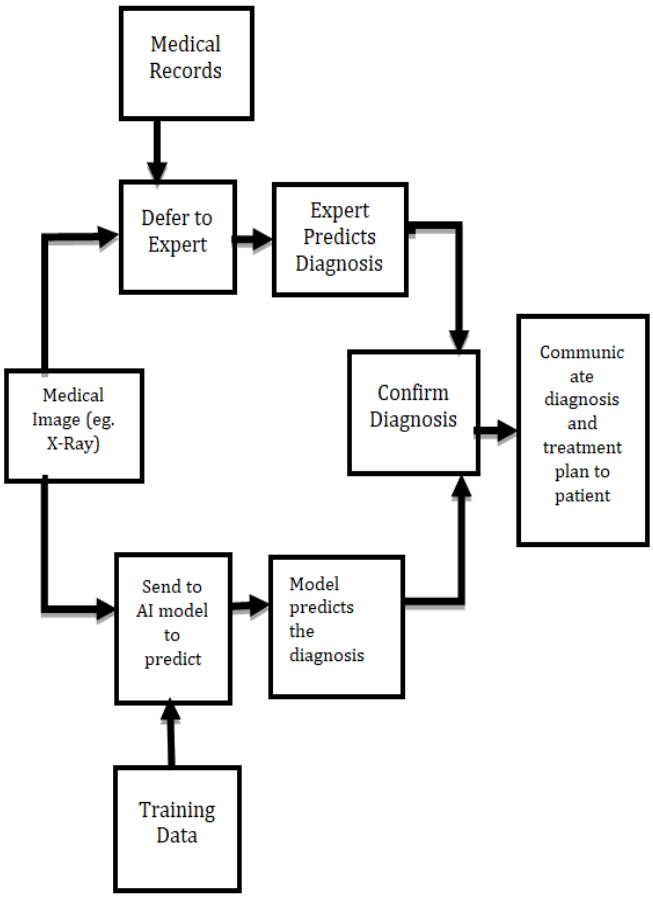

Fig 11 System architecture

➢ *Future Scope:*

Medicine has been transformed by imaging, and this trend is expected to continue quickly as more information about each human biological system becomes available. To that aim, researchers in the field of medical imaging are looking for new methods to use technology and computing power to break down existing boundaries. Real-time, less invasive methods of observing processes like tumour growth and cell division are sought for. Like medical imaging has traditionally done, further future advancements will adapt present technology and practises to provide enhancements.

VI. CONCLUSION

Without evasive surgery, medical imaging would not be able to reveal anything about the human body or the problems that surround it.Diseases may be easier to treat than ever before thanks to medical imaging. Future advancements in medical imaging technology appear to be inevitable..

Diagnostic imaging has mostly been utilised to assess individuals with unusual clinical presentations. Improvements in imaging technology over the past few years have helped these patients' diagnoses more accurately.

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ISSN No:-2456-2165

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