# Study on Medical Image Processing using Deep Learning Techniques



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## Abstract

The medical field is evolving with its highest possibilities of new technologies so that the treatment level gets increased. Most of the medical fields are evolving by involving different latest technologies to understand the problem in the body and then classify the problems in to provide exact treatment to the patient. The images of the affected area are examined by the image processing method to study the medial image and classify the exact problem. Even it can provide a possible solution to problems. Many deep learning technologies are effectively working almost in every field of medical treatment. The current study is developed to find the working method of the Deep learning technology to stud the images and process them to find out the accurate solution to be implemented by the doctor.

***Keywords:*** *Medial images processing, Deep learning model, Algorithms, Medical treatment*

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## Introduction

The healthcare data of the previous times is gone, the majority of the healthcare industry has switched to the deep learning method, and rather the majority of the data in the medical sector is evolving with the addition of different technologies. The medical images of the patients about understanding the exact problem in the body makes the job more advanced for the maximum percentage of cases. However, with the addition of the latest technology about various leanings of technology, understanding images is getting easier for doctors. Technology cannot only identify the problem but also provide proper solutions for that.

In the current study, the use of deep learning techniques will be discussed. The objective of the research will be mentioned in the study. The use of deep learning over the machine will also be discussed in this study. The importance of deep learning in medical imaging will be described in this context. Several challenges in the progress of deep learning and the solution to that problem will also be discussed in the literature review part of the study. The data type and data collection techniques will also be mentioned in this study.

## Aims and objectives

The study aims to analyze the processing method of the deep learning techniques in the image processing available in the medical field, even the majority of the system of medical image processing was done by machine learning method previously but now the deep learning method is getting more advanced in terms of increase of technical advantages in image processing, so the takeover of deep learning over machine learning is also to be developed properly.

### Objectives:

1. To find out the entire working process of image processing by deep learning method.
2. To find out the neural network structure with the deep learning structure.
3. To find out the future chances of deep learning to analyze the images in the medical field.

## Overview of deep learning

The majority of the medical field or other processes are running with the addition of the latest technology in their work to get better results. However, the best result from the technology is the key feature of the treatment in

the medical field. Among many other technologies, the majority of artificial intelligence and machine learning made various difficult jobs easier. Machine learning has the availability to identify the problem about the problem in the body of the patient and artificial intelligence can provide the solution to the problem to get that patient's health quickly (Hesamian et al.2019). However, there are some problems still occurring in the machine learning process where the identification of the problem was only from the external layers making machine learning was failed to get deeper to find the exact route of the period, however, the solutions are also getting provided based on probability.

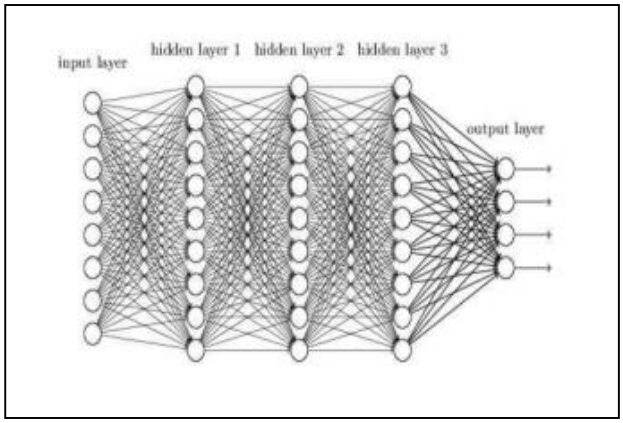


Figure 1: Deep neural network

(Source: Li et al.2021, p.93)

Thus, deep learning was developed where most of the problems and the combinations of the solutions are recorded in deep learning. Deep learning has the combination of different algorithms like the Support Vector Machine (SVM), Bureau Network (NN), Recurrent Neural Network (RNN), Long Shorty Term Memory (LSTM), Extreme Learning Model (ELM), Generative Adversarial Networks (GANs) (Li et al.2021). All these algorithms are well developed to handle different problems related to the different problems of the body. After collaborating with all these algorithms the deep learning method is extremely affected by the positive reaction from the majority of the suing medical field technicians and doctors.

**Use of deep learning over machine learning**

The traditional method of identifying probes in pictures of the human body was by the pictures from the wound or the radioactive photos (Maier et al.2019). So the majority of the picture processing system has evolved to machine learning where the majority of the radioactive imaging had the best results. The majority of the machine learning had the most important results in the identification of different problems n the picture identified. However, it came after a long time of unsuccessful identification of the various problems in the pictures which were extremely internal; the internal problems are like lumps or tumors in the lungs or the internal parts of the body. Thus the entire system of machine learning needed upgradation of identifying different problems.

| Gaps | Future |
|---|---|
| **Pediatrics** | Addressing gaps in future |
| **Other degenerative diseases** | Limitations of the current system |
| **Multi-class classification** | Application is the point-of-care solution |
| **Laboratory-based solution** | Dedicated vs. multi-purposed systems |

Table 1: various gaps in medical imaging with future

(Source: Maier et al.2019, p.117)

Hence, deep learning had the introduction to be used in the identification of different problems in the picture processing of the medical field (Cai et al.2020). Most deep learning technology is filled with different algorithms used to identify the various problems of the body. Thus, the identification and the solution-providing method get evolved to their highest possibility. The deep learning method is used in various fields of medical treatment more rapidly, so much of the medical field is evolving with the help of the latest technology.

Accurate diagnosis of the disease is based on image acquisition and interpretation of the image. Substantially is improved by image acquisition devices over the present few years. The radiological images are getting currently much higher resolution. However, the benefit of the interpretation of the automated image is getting started. Computer vision is one of the best machine-learning applications. Traditional machine learning can rely heavily on expertly crafted features for the interpretation of images.

The extensive differentiation of patient-to-patient data cannot reliable in the traditional learning method. The ability to shift machine learning through big data and complexity has evolved over the last few years. At present deep learning is involved in every area and especially in the analysis of medical images. It is estimated that it will hold around 300 million dollars in images of the medical market by 2021. It is one of the most effective and essential machine-learning approaches.

**Neural network with a deep learning structure**

A neural network is mainly a network that is mainly inside the human body or the the brain. The majority of neural network has the structure of the human body that works more actively with the help of technology (Zhou et al.2019). Deep learning and its different algorithm are filled with these artificially developed neural networks, which are very helpful to get the most possible patterns of the working or the possibility of problems occurring in the body. The majority of neural networks can find out the possible solution from deep learning.

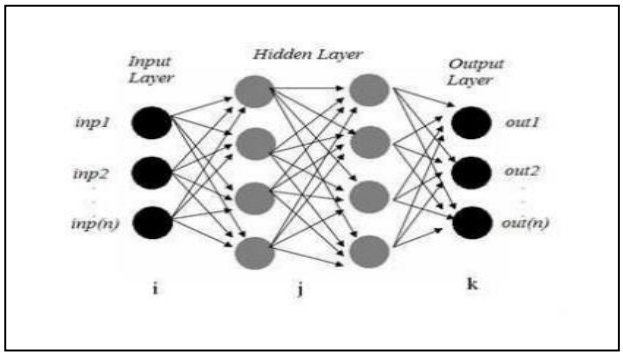


**Figure 2: Neural Network architecture**

(Source: Zhou et al.2019, p.64)

**Deep learning for the medical imaging**

Medical imaging processes can identify the various internal problems of the body with the help of deep learning and much of the latest technology. Deep learning is filled with different types of algorithms that can understand the different types of problems in the body (Razzak et al.2018). Implementation of deep learning in medical imaging can grow their system. The automated image-learning tools which are used in machine learning are the key factors that enable to improve the image quality diagnosis and interpretation.

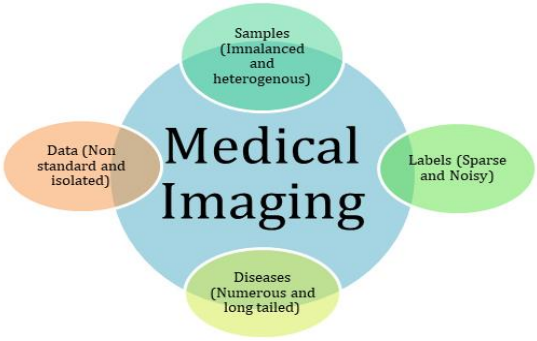


Figure 3: medical imaging and its various features

(Source: Razzak et al.2018, p.14)

Deep learning and its different algorithm are used to find out the exact problem area in the picture it finds the entire solution available for the external problem while the other algorithms complete the inner analysis of the picture. Thus, the entire analysis of the entire picture with the solution to both problems makes the doctors find the perfect combination of solutions to save the patient.

**Future of deep learning**

Deep learning and its effectiveness is proving its facilities to solve various problems in the medical industry but still, it is not the only solution which is problems solved faster, but the latest technology evolving and shortly deep learning might get replaced with various types of latest technology to get the better solution (Anwar et al.2018).

| Trends | Gaps |
|---|---|
| **Concentration, medical, and cancer** | Gender quality indicators for the cross-study comparison |
| **Retrospective nonclinical image data** | 2d vs. 3d images |
| **Mostly public medical dataset** | Data manipulation, pre-processing |
| **The deep architecture of imaging technique** | Augmentation of data |

Table 2: Various trends and their futures

(Source: Anwar et al.2018, p.22)

In the healthcare sector interoperability is the backbone of critical improvement. The concept of an ATM network says that healthcare data should be standardized and also shared between the providers. The health standardization bodies have to define some standards and guidelines to achieve interoperability. An independent opinion on EHR is provided by authorized testing and certifying. There are two types of certifications that are used to evaluate the system such as CCHIT and ARRA.

**Data analysis and findings**

There are several types of data such as qualitative data, and quantitative data. In this research qualitative data are used. After the collection process of the data analysis of those data is essential. Through the analysis, accurate information can be provided to the researcher to study the research briefly. Qualitative data as numerical data helps to maintain the research. This data are helpful to the researcher as they can be able to find the problems of the research, as well as the solution, which can be found through this data. Statistical data helps to know the statistical value of the study.

There are two types of methods for the collection of data. These are primary data collection techniques and secondary data collection techniques. Primary data are collected from surveys and face-to-face interviews. On the other hand, secondary data collection techniques are produced by books, websites, journals, social media, etc. in this mentioned research secondary data collection techniques are used. This collected data helps the researcher to find the essential information for this study. The secondary data collection method provides a huge amount of data for this research. These data help the researcher find the problems of the research and the solution can also find out by this data.

The entire that is discussed the study is developed by collecting data from different journals books or oater published materials related to the same topic. The majority of the data collection is secondary data collection, so the entire sources available about the topic were searched perfectly (Savadjiev et al.2019). The data collection had to sort out the data that was gathered from various sources. To search for the exact relevant data the majority of the relevant data was gathered by applying the exclusion method to reject the data which is outdated, not readable, or in a different language than English, even the data that is not analyzing the exact topic rather than discussing something else mainly has rejected too. Hence, data analysis is very effective to get exact data to include in it.



**Findings and discussion:**

After getting through the entire study the findings from the study were created for the betterment of image processing in the medical field. Most of the medical need better analysis of the data to get the best result for the treatment of the patient. Therefore, machine learning was rejected and deep learning is getting adopted due to its different positive effects available for the various analysis of the treatment procedure (Du et al.2020). The comparison between machine learning and deep learning might be helpful to identify the exact base of different problems available in the image processing system and the entire method might resolve those issues from the image processing system.

**Conclusion**

After completing this study is getting established about the conclusion is that entire medical image processing via the usage of various machine learning methods and technology is getting more advanced to get more exact data about the relevant topics. Even the majority of the media sector people are involving advanced technology to get better results to analyze the images, thus the treatment of the patient gets more accuracy and the entire process advances with the entire medical field all over the world. The current study has very effectively discussed the majority of the topic related to it.

**Future scope**

The medical field is rising to its higher possibilities from ancient times. From ancient times, the medical field and its different methods of treatment are evolving to their highest possibilities. However, the current method of treatment or analyzing the images taken for the treatment of the patient is evolving to its best possibilities. The latest version to analyze the images in the medical sector was machine learning, but now it has been changed by deep learning. Thus in the future if new technology arrives at the current gaps in the current

technology might be identified by this study very effectively. The medical field personalities might get statistical data related to the contrary of deep learning and machine learning.

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