Deep Learning Applications and Challenges for Healthcare System: A Review

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Abstract: Deep Learning is recent biz word in artificial intelligent as well as it is the third wave of artificial intelligence research. World is rapidly growing toward the automation almost every sector is going automated their services, products and industry through AI. The recent research is indicating that deep learning application and challenges for healthcare system is big challenge although so many improvement and advancement in healthcare system in the past few decades. In the recent covid_19 pandemic has indicated so many loop holes in the healthcare automation system worldwide. Our discussion focused on deep learning automation healthcare system. This paper aims to provide to identify the more challenges and application of deep learning in healthcare system, as automation and ease of system is forever directly comparative to success of any system. Our work will enable researchers and professionals to know deep learning application challenges in healthcare system critical analysis on tools proposed.

Key Words: Deep Learning, Artificial Intelligent, Healthcare, Covid_19, Automation

1. Introduction

Deep Learning is a sub branch of machine learning that teaches computers perform as task as naturally to humans: the real examples of DL is driverless cars, recognize stop sign, pedestrian signals etc. Deep learning has getting excellent consideration recently due to good reason and achieving lots of results in recent era. Moreover, in deep learning model computers performed tasks directly from text, image and sound. DL models given high level accuracy, performance like human level, the set models worked on big data and large data neural network architectures which contains many layers.[1]

In recent years, deep learning (DL) and artificial intelligence (AI) have become biz word across the technologies society, including in the field of healthcare system. Lots of work has been done in the healthcare system and medicine but covid_19 highlighted more work and research areas in the healthcare system.

Real Time Deep Learning Work Examples: Mostly, deep learning application used for automated industries driving to robust medical devices. [2]

Driving Automotive: Many researchers using deep learning to detect automatic objects such as traffic lights and stop signs, using deep learning also detects pedestrian that facilitate to decreases accidents.

Automation for Defense: Through the deep learning technique to identify the objects from satellites to the concerned areas of interest as well as to identify secure or insecure zones for troops.

Medical Research Automation: In the 21st advent medical research is most important and core sector, however, lots of automation has been done but lots of improvement needed through deep learning to set the high-dimensional data for accurately results.

Industrial Automation: improve the workers safety using through deep learning which helping to run heavy machines automatically and safely.

Electronics: Deep learning also used from home assistance devices that respond our voice though deep learning applications.

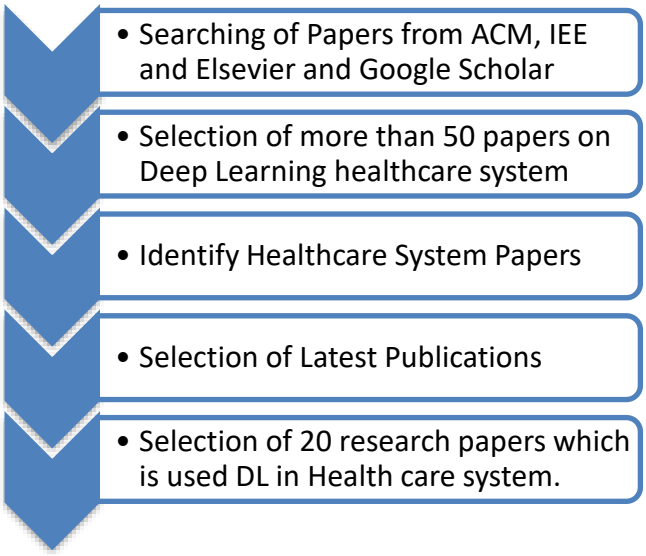

Figure 1 – Evaluating Research Papers

2. Literature review

Igbe Tobore et al.[1] In this paper they mainly focused on deep learning techniques and applications to identify the automation up-gradation in medical and healthcare system. They focused on biomedical devices and implemented medical images processing through deep learning applications. The disadvantage of this technique is mostly data is on unstructured format which is cannot be processed by DL methods as well as clinical/health data are expensive to acquire the dataset restrain inconsistent and incomplete records However, ML algorithms with less memory and computational requirement may be produced same results. They have recommended DL algorithms to meet the challenges of accurate medical perditions and results. Furthermore, the researchers focused on high performance, big data to compute the accurate data analysis as big challenge of healthcare sectors.

Eui Jin Hwang et al. [2] In this paper they have focused Chest X-ray computed tomography and radiography. They have investigated different dimension of the chest X-ray through deep learning technology and applications. The main challenge of this study is accuracy DL algorithm can be predicting accurate dots which are mostly needed for the diagnosis of accuracy and validate actual clinical practice. Furthermore, they performed multiple task/ experiment to measure the accuracy and data analysis on convolutional neural network (CNN) algorithm. They reviewed different applications of DL algorithm and performed tasks on radiology and discussed different possible scenarios regarding their implementation accuracy in clinical practice.

Riccardo Miotto et al.[3] present the review paper and find out the different dimensions of potential research on deep learning implication in healthcare system. They are principally focused on biomedical data and heterogeneous biomedical data. In this article, they reviewed the recent literature, surveys and applications on applying deep learning technologies to automate the health care systems. Moreover, they suggested the deep learning approaches through data analysis and transforming big biomedical data into improved human health through the DL approach.

Maryam M Najafabadi, et al.[4] explore the big data analytics in deep learning algorithms challenges, they reviewed multiple conventional machine learning and Deep learning algorithms, Deep Learning has an advantage to providing a quick solution to address the accurate data analysis as well as the learning problems and found in huge volumes of input data. Furthermore, DL explicitly extracting automated complex and unstructured data volumes. They present two approaches one is develop the application algorithm of deep learning for data analytics and second is identify the unique challenges posed by DL algorithms.

Connor Shorten et al.[5] This papers is mainly focused covid_19 and deep learning relationship, they presented deep learning concepts how to fight with COVID-19 SARS-CoV-2 and COVID-19 and save the human from loss. However, they performs different task on Deep Neural Networks and DL algorithms, they also performed tasks on different data domains in Natural Language Processing, Computer Vision, Life Sciences, and Epidemiology etc.

They explain deep learning algorithms much helped to beat the covid_19 and such pandemics. Justin Ker et al. [6] In this paper they have focused on deep learning application on medical images, they have don experiment on medical images and classification and they were focused on localization, detection, segmentation, and registration. They performed tasks on Convolutional Neural Networks (CNN) they present the technique to combat and automated medical images, However, their research obstacles, emerging trends, and possible future directions DL and AI so far.

Neha Sharma et al. [7]In this papers authors indicated the importance of AI and Deep Learning, they emphasis how the deep learning helped to beat the Covid_19 pandemic, they have discussed different Covid_19 scenario, They also think that through ECRM and GPU technique achieved good and dynamic testing in healthcare system specially in the pandemic. Hamidreza Bolhasni et al. [8] The researchers focused on IoT used in healthcare system, they reviewed multiple papers to identify the way forward using IoT for medical applications and healthcare applications with the help of deep learning. Furthermore, this paper presented comprehensive review to identify the deep learning algorithms and frameworks to ease the healthcare system.

Tianming Zhao at al. [9] The researchers focuses on DL, they indicated that Deep Learning (DL) is great advantage for run the powerful system and servers of health care system which may reduce the human risk such as in the pandemic. In this paper they focused and compare mobile based deep learning applications which are used for healthcare system as well as they compare and summarize the state of art deep learning techniques which is used for healthcare applications. Furthermore, they also listed the software and hardware used for DL also indicated the future work and areas. Khan Muhammad at al. [10] in this paper they focused on deep learning techniques using brain in tumor classification (BTC) result through radiologists for a better diagnostic/ results analysis. They reviewed multiple research papers on deep learning techniques and algorithms in depth and find out the best possible solution to combat brain in tumor classification (BTC) in terms of diagnostic results. They mainly focused on convolutional neural network models for the review results.

3. Critical evaluation

Before you start to prepare your paper, first write and save we have many research papers related with Deep Learning Artificial Intelligence and Healthcare systems. In some papers have models and tools are proposed to address healthcare issues in deep learning while others some more medical automation are instigated after our review we have to summarized in the fallowing compare and contrastable.

(Table 1- Critical Analysis of Research Papers)

Lit. Ref	**Context of Research**	**Problem Discussed**	**Technique Used**	**Model/ Tool/ Proposed**
1	DL/ Healthcare System	Deep Learning Intervention for Health Care Challenges through Biomedical	DL Algorithms	Yes

2	Deep Learning	Clinical Implementation of Deep Learning in Thoracic Radiology	Convolutional neural network (CNN) algorithm	Yes
3	Deep Learning/ HealthCare	The Survey on Deep Learning and Healthcare System	CNN and RNN Models	No
4	Deep learning/Big Data	Deep learning applications and challenges in big data analytics	Large-scale models	No
5	Deep learning/ Health Care	Deep Learning applications for COVID-19	Natural Language Processing NLP	No
6	Deep learning/ Health Care	Deep Learning Applications in Medical Image Analysis	VAEs and GANS	Yes
7	Deep Learning and Heath Review	Machine Learning and Deep Learning Applications-A Vision	ECRM and GPU	Yes
8	Deep/ Learning and IoT	Deep Learning Application for IoT in Healthcare: A Review	CNN and DNN Approach	No
9	Deep Learning and Heath Care System	A Survey of Deep Learning on Mobile Devices: Applications, Optimizations, Challenges, and Research Opportunities	Model-oriented optimization mechanisms	No
10	Deep Learning and Heath Care System	Deep Learning for Multigrade Brain Tumor Classification in Smart Healthcare Systems: A Prospective Survey	Deep learning-based BTC methods	No

4. Future work

During our work we have analyzed the issues associated with healthcare system using deep learning techniques and algorithms. No doubt deep learning (DL) and Artificial Inelegance (AI) is great potential reduce human interaction with patients, as well as excellent competence to give best result / diagnosis. On the other hand, using DL in pandemic like covid-19 is great option to concentrated human loss. . In our future work we will propose a model for healthcare system to deal with emergency pandemics. Our work will contribute in Deep Learning.

5. Conclusion

Our objective of this study was to review different scientific research papers in which using deep learning for healthcare system is discussed. This paper elaborated various algorithms and techniques used in healthcare system through deep learning. During our literature review we came to know that no doubt deep learning is great advantage for healthcare system typically for accurate diagnosis as well as the findings of any disease. Furthermore, this paper presents the comprehensive review research about how deep learning can tackle the tele-health medicine, automatic health monitoring system, bio medical monitoring system, health monitoring machines, recognition human activity, data fusion and many more application discussed. Moreover, literature review deep learning application and challenges mainly focused on medical diagnosis equipment's, health monitoring tools, tele-medicine systems and home bases health monitoring applications. In this paper we reviewed more than 20 research papers which are almost latest publications. This study considers identifying many research paradigms toward deep learning for healthcare system or incited to how to defeat like covid-19 pandemic. In nut shell, this research will help scientist, engineers and doctors to develop the robust healthcare system in future.

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