Study on Artificial Intelligence in Healthcare

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***Abstract*— We have seen during this pandemic, India, there are many dangers to the healthcare system which calls for the need to encourage hospitals o switch an electronic healthcare information system from paper-based medical records to an electronic medical related data that offers e-healthcare information and integrates well with computer-based judgment making systems. With the growing interest in AI centered robust information technology (IT) infrastructure is critical in addressing such national issues as the need to improve the protection and quality of health care, as well as the rising health care costs in the health sector. Network technology and communication are presently noticeable improvements in information technology and to a great extent affect the medical services. The necessities of both patients as well as suppliers of healthcare/Medicare facilities shall be addressed. An AI enabled hospital or medical system is essential, challenging, and achievable. This paper focuses on the Medical, hospital related uses of IT, such as better clinical decision-making, imaging and history taking, reduced duplication of diagnostics, better reliability of medication, increased utilization of health facilities and preventive health initiatives.**

Keywords--- Healthcare system, Artificial intelligence, Mobile Agent, Multi-agent system, Machine Learning, Network technology.

I. INTRODUCTION

The article reveals that India's healthcare system is in desperate need of context-sensitive decision-making to deal with this virus and help them get proper suggestions in real time to prevent its spread. There is want to stepped forward scientific selection making, repetition of diagnostic trying out reduction, imaging and records taking, higher medicinal drug management, expanded adoption of showing packages and preventive fitness measures. This paper is an attempt to get the quick review on use of Artificial Intelligent in healthcare system. AI acts like a human intelligence many a time while delivering the output. In order to give a result-driven technology for correct transmission, examining and forecast while keeping a track of patient's history and then using this information for further work, agents system based on AI can be employed.

Artificial intelligence (AI) is the self-contained Program with precise instructions to perform work tasks which a human being can do [11]. Using learning patterns, these programmers may assist people in understanding and processing language, recognizing sounds, recognizing objects, and solving problems. Machine learning (ML) is basically an emerging a method for improvising an algorithm with time. The refinement approach makes use of a massive quantity of information and is achieved automatically, permitting the set of rules to evolve which will enhance the synthetic intelligence's precision [10].

II. LITERATURE REVIEW

The paper [5] proposed an application for the Prediction of adherence to remedy the usage of not unusual place variables and arranging the facts utilizing Support Vector Machine (SVM) for sufferers struggling with coronary heart failures (HF).The dataset comprised of 76 HF patients and was preprocessed on the basis of 10 characteristics namely gender, education, spouse, age, spouse, monthly income, time of HF diagnosis followed by, daily frequency of medication, EF, MMSE-K, medication awareness and finally the functional class NYHA. For simulation, an SVM software library called LIBSVM was used. Since SVM follows a format, the collected data had to be transformed by assigning appropriate numbers. On the basis of factors such as precision, sensitivity, positive predictive value (PPV) and similarly the negative predictive value (NPV) and accuracy, the performance assessment was carried out. Feature selection in this research is done by using combination. The best model was found by comparing SVM with its 4 kernel functions (i.e. Polynomial, Linear, RBF, & Sigmoid). Then paper assured a comparatively best results with greater accuracy RBF and SVM. However, various limitations such as small dataset, medication compliance was not directly measured and since the data was based on patient information, it may result in disapproval of statistical guarantee due to inaccuracy.

A Multi-Agent Based m-Health Care System Intelligent Architecture [6] proposed a system that is a convenient mobile application that helps to assess the normal and emergency status of patients with the aid of real-time and historical data and alerts them. It consisted of six agents who play different roles, they are:

- Agent for Patient Monitoring
- Agent for Gate
- Agent for monitoring Supervisor
- Agent for Managers
- Agents for Doctor
- Agent for making Decision.

The interrelated system architecture comprised:

- Body Area Network (BAN) sensors which captures biological signals; WBSN- a wearable body sensor and PPHS- patient's personal device.

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- A hub between patient and hospital using Intelligent Medical Server (IMS).
- Hospital System responsible for deciding the actions. Hence the system provides cost effectiveness since various medical tests can be avoided due to continuous monitoring, security by using RFID tags and flexibility as transmission can be done through Bluetooth, Zigbee and WLAN.

However, accuracy may be an issue due to false real time predictions by sensors.

[7] Proposed a web based SVM approach called e-Doctor for automatic medical diagnosis where statistical medical information consisting of arithmetical or logical parameters about a disease is given as an input by the user and prediction is made by this system. The several use cases supported by this paper are

- Diagnose in which the input is chosen from a specific list of diseases and its presence in the patient is predicted by the system.
- New Disease is a use case in which various new parameters are entered by the user as well as a summary of the disease before moving on to the next use case.
- Train in which record of a new disease is created, updated, and the doctor is re-trained on how to use cases, and thus the system is trained.
- Other use cases include deleting disease and observation of patient's medical history. The author states that the satisfactory result were obtain through a prototype when heart symptoms tested. So it becomes easy to identify the heart diseases.

Using Support Vector Machine [8], the Smart Healthcare Monitoring System proposed a gadget the use of SVM in particular designed to song disabled and aged human beings in actual time via way of means of transmitting an emergency message to caregivers while sensors connected with sufferers seize vital fitness conditions. The framework consists of Four levels. The IoT Box the first level contains three IoT based Sensors namely temperature sensors, pressure monitoring sensor, and pulse monitoring sensor respectively using an IoT microcontroller. The next level is the personal digital assistant with an internet connection which is responsible for creating an emergency message on identifying any abnormal change. Level 3 is data analysis where SVM is used for classifying cases and level 4 is the message bot which sends alert message to caretaker and patient's doctor. Hence this system can be utilized for development in the medical evaluation of patients. However, an issue may arise if there is an error or failure in sensor's functioning.

In [4] the authors demonstrate mobile agents' application to the extremely complex, variable sense in the healthcare crisis decision making system. The use of mobile agents to demonstrate the deployment of an ambulance service in real-time is highlighted in the paper which is of extreme importance rather than just theories; the paper concentrates on practical implementation. The author notes that a mobile agent is an independent programmer who skillfully transports itself entirely between the network nodes, carrying data along and the needed execution state to continue execution at the goal host from the second it halted on the first host. Hence this agent makes a selection on when and where to move and how to go about the execution without consulting the user repeatedly. Agents possess the property of autonomy and collaboration, unlike conventional paradigms.

Application of Support Vector Machine for Heart Failure Adherence to Medication Prediction [5]. Research shows statistical and machine leaning are used in collaboration, the SVM is a brand new form of prediction method developed with the help of Cortes and Vapnik [1]. On seeking a hyperplane, SVM attempts to distinguish instances. The key benefit of the SVM is the capability to solve the 'high-dimensionality problem' with relative ease, i.e., the problem that occurs when there are a large number of input variables relative to the number of observations available [2]. In addition, since the SVM is a data driven approach and possible without a theoretical context, it exhibits a significant classification capacity when the sample sizes is small [3]. This technique has recently been used to develop the methods of disease detection in clinical environments [4, 5]. In addition, in solving classification problems in bioinformatics, SVM has demonstrated high performance [6, 7]. Hence using standard variables, this system predicts adherence of HF patients to medication with relative ease.

A Literature Review of Medical Applications Using Multi-Agent Systems [9] provides literature survey of a multi-agent system used in medical applications that provides a brief overview of different implementations, especially in diagnosis and concept-oriented approaches in this area. This paper highlights the different advantages and disadvantages of agent based systems which include flexibility, reliability, extensibility, uniformity and portability, autonomous learning capability, accuracy, pro-activeness, robustness, efficiency, etc. but also absence of any universally accepted healthcare ontology which is a boon for communication between systems developed in different areas, lack of intelligent and autonomous agents for mobile devices resulting in less usage of this system.

Comparative Study of Machine Learning Techniques with inside the Medical Field [12] is a take a look at to apprehend the numerous techniques for performance with inside the scientific subject the usage of AI and its subfields like Machine Learning and Image Process. The creator states that the algorithms primarily based totally on ML famous great accuracies in outcomes and sensitivity with inside the recognizable evidence wanted in scientific subject. A take a look at on unique proposed methodologies concerning numerous algorithms for the ML ranges has been revealed.

Smart Assistant for Doctors [13] demonstrates use of Artificial intelligence and various algorithms that may help assist doctors during their treatment. This paper demonstrates with the help of a scenario where the data sets used is a real time for fast and accurate diagnosis of a decease on an enter variable consisting of patient's symptoms, beyond history, age, lengthy spell illness etc.

[14] This paper explains about the management of healthcare institution by the use of computer application deployed at medical centers, typically, every organization has their own Heath care system and it is very difficult to share medical data with other institutions. The use of cellular agent era for dispensed eHealth packages is mentioned on this paper. The authors also describe some successful capabilities based on this: specifically, about integration of medical information, and importantly about emergency situations. This paper describes three successful cases for new eHealth systems. A mobile agent-based application comprising many key aspects of today's healthcare systems, such as distributed information collection and interoperability between medical centers, will be presented as the first framework. Primary objective of this study is to achieve virtual record of electronic patient medical information among the distributed patient's medical details in hospitals. Hence, it welfares from the mobile agent technology dependent on the local searches carried by roaming agents in order to eliminate the need for a central repository.

A Literature Review of Healthcare Mobile Agents Applications [15] This paper addresses technology created using mobile agents for mobile, distributed computing which is generally used in fields right from network to knowledge management. MA makes it much easier to collaborate distributed models like cloud computing as well as sensor networks. MA can migrate themselves from one node to another, and also extend an infrastructure for execution of an autonomous agents. This is tremendous study carried out in MA recent years and a feasible approach to the implementation of systems that are independent in the healthcare sector. Therefore, the suitability and efficacy of mobile agents for a wide range of healthcare applications, including health data integration, telemedicine, the medical information management, storage and security along with coordination of various medical activities has been examined in the paper.

Mobile Agent Technology for Tele tracking Healthcare [16] this paper shows allotted computing through the cell tool for an international tele tracking healthcare device, which incorporate the disposition of any sort of fitness service, in addition to scientific employees like physicians, emergency employees, and diverse healthcare providers, with the assist of cell computing devices. Each person can get admission to the equal information. The authors introduce a brand new tele tracking assistant device primarily based totally on well-known retailers that may be used anytime, anywhere, and on any laptop on this paper.

The article in [17] is a research which shows gaining an identical advantage for the various services enabled on healthcare system, this paper explains knowledge-intensive agents or components as providers and customers. Information Technology Increasingly, this dynamic integration of human-centered tasks relies on information technology. Since healthcare is a data-intensive and technology-driven world, it necessitates a fusion of multiple computerized systems with various user experiences so as to deliver quality efficient services within a short period. In such settings, the machine complexities can most effective be treated the usage of methods that facilitate machine integration and adaptation.

The researcher in article [18] shows that in order to achieve an improved version for ML algorithm several techniques have been discussed in this paper. The author explains about ML algorithm and use of ELM on a Medical dataset.

The authors in [19] this article focuses on the automated car which can take dynamic decision and can move as per the requirement. This article exhibits a use of IoT in integration with machine learning algorithm. These kind of technologies can be employed at the hospital so that it can provide an IPD medicines to the admitted patients in the hospital. Especially in a Covid 19 kind of situation these kind of autonomous car can deliver the medicines as per the route feed to it. This paper additionally elaborates at the style of system studying algorithm.

The research on Data Visualization in Pandemic situation [20] in this paper the author explains about the statically analysis of the visualization of data in 1920 pandemic situation further the authors also states that the improvement in pandemic situation achieved with the help of visualization. In this paper, the authors have shown graphical representation of data visualization with ML algorithms, big data and python. This article also focused Covid 19 (Corona Virus) data visualization.

The article [21] is a contribution towards a health monitoring system where the author explains about tracking a patient's status at home especially senior citizen patients living alone. Additionally, the paper additionally explains approximately Malaria and Pneumonia convalescing instances of sufferers and the observe objectives at the periodic tracking and looking after your family time to time. So the paper introduces a novice system to automate patient health tracking system with IOT for monitoring heath status and inform the relatives.

III. FINDINGS

Healthcare information systems have the expertise, skills, and resources needed to capture, process, use, and exchange patient data in order to facilitate the delivery of systematic healthcare and promote health. It is really very important today, when we have witness a huge collapse because of the pandemic, it is greatly required that automatic healthcare system which will take a decision on behalf of a user must be deployed. This study, explains about the challenges of maintaining information in healthcare and managing record in medical field such as Safeguarding privacy and security, Technical problem.

The paper discusses various information technologies for the solution and in order to support the healthcare with the help of new technologies like AI, Agent based systems and machine learning. This article is a systematic study of all the artificial intelligence based techniques on healthcare data. This study presents a variety of tracking systems which can be used for keeping track of health status from remote locations. Additionally, the study exhibits various IoT techniques with the Machine Learning enable system. From wide range of nodes across the internet the patient healthcare information can be transferred. When dealing with the patients' healthcare data, it is moderately

possible that the data can be in variety of the form so use of distributed database is suggested in many literatures.

Use of ELM based algorithm to improve an accuracy are also discussed in this article. This article will encourage new researcher to do further investigation on the use of Artificial intelligent technology in the field of Medical and healthcare domain for more precise and accurate results. Table 1.1 shows an analysis on techniques used for improving healthcare system over past 12 years.

Table 1.1 Analysis on technics used for improving healthcare system over last 12 years

Papers	Year	Techniques/Technology
[4]	2008	AI based Mobile Agents
[5]	2010	SVM
[6]	2011	Pervasive Computing
[7]	2013	SVM
[8]	2018	SVM
[11]	2017	IoT
[13]	2018	Fuzzy Logic
[14]	2010	AI based Mobile Agents
[15]	2015	AI based Mobile Agents
[16]	2019	AI based Mobile Agents
[18]	2020	Optimization
[19]	2020	CNN

This analysis can be easily understood by a following Chart 1.1 shown below. In addition to this if we try to see the usages of different techniques in comparison, can be seen in the pie Chart 1.2

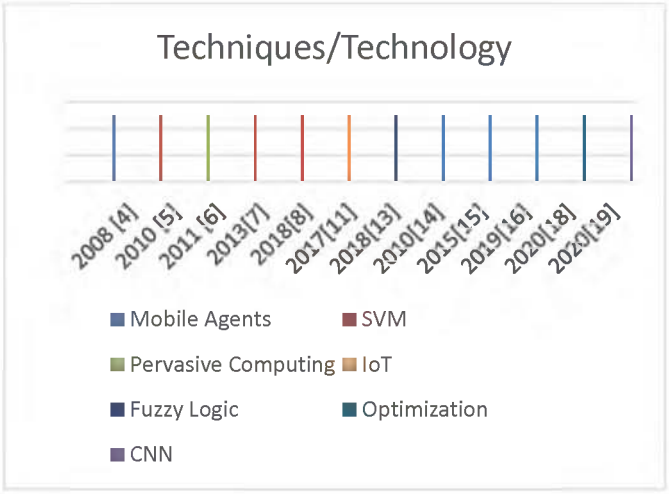

Chart 1.1 Analysis on technics used for improving healthcare system over last 12 years

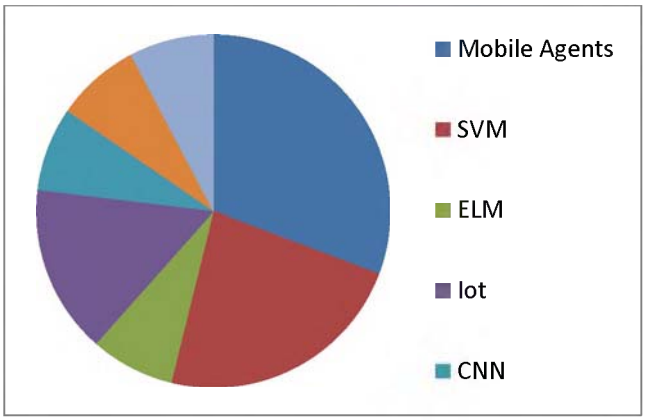

Chart 1.2 Comparative study on usage of different AI Technics in HealthCare

IV. CONCLUSION

In India, healthcare services face immense challenges in terms of excellence, convenience, affordability and inequity. In order to combat and anticipate new diseases, healthcare must finance emerging technologies including Artificial Intelligence (AI), the Internet of Things (IoT), Big Data, and Machine Learning. We intend to analyse the position of AI as a key technology to analyses and prepare us. We want to look at how AI can be used to research, prepare for, and fight COVID-19 (Coronavirus) and other pandemics. This systematic analysis focuses on the use of various strategies based on AI to strengthen the healthcare system. New ML or other AI technologies may help solve a range of difficulties in the provision. This systematic review focus on use of different AI based techniques for improving the healthcare system. New machine learning (MwlL) or artificial intelligence (AI) technologies may be able to help with a variety of issues, including context-aware decision-making and timely access to proper medical care.

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