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Review on Machine Learning Algorithm Based Health Care Monitoring System

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Abstract- Machine Learning is modern and highly sophisticated technological applications became a huge trend in the industry. Machine Learning is Omni present and is widely used in various applications. It is playing a vital role in many fields like finance, Medical science and in security. Machine learning is used to discover patterns from medical data sources and provide excellent capabilities to predict diseases. In this paper, we review various machine learning algorithms used for developing efficient decision support for healthcare applications. This paper helps in reducing the research gap for building efficient decision support system for medical applications.

Keywords- Machine Learning; Medical Science; Disease Prediction; Healthcare; Decision Support System

I. INTRODUCTION

Artificial intelligence (AI) and related technologies are increasingly prevalent in business and society, and are beginning to be applied to healthcare. These technologies have the potential to transform many aspects of patient care, as well as administrative processes within provider, payer and pharmaceutical organisations. There are already a number of research studies suggesting that AI can perform as well as or better than humans at key healthcare tasks, such as diagnosing disease.

Today, algorithms are already outperforming radiologists at spotting malignant tumours, and guiding researchers in how to construct cohorts for costly clinical trials. However, for a variety of reasons, we believe that it will be many years before AI replaces humans for broad medical process domains. In this article, we describe both the potential that AI offers to automate aspects of care and some of the barriers to rapid implementation of AI in healthcare. A type of AI of relevance to healthcare Artificial intelligence is not one technology, but rather a collection of them.

Most of these technologies have immediate relevance to the healthcare field, but the specific processes and tasks they ABSTRACT support vary widely. Some particular AI technologies of high importance to healthcare are defined and described below. Machine learning – neural networks and deep learning Machine learning is a statistical technique for fitting models to data and to 'learn' by training models with data. Machine learning is one of the most common forms of AI; in a 2018 Deloitte survey of 1,100 US managers whose organisations were already pursuing AI, 63% of companies surveyed were employing machine learning in their businesses. It is a broad technique at the core of many approaches to AI and there are many versions of it.

In healthcare, the most common application of traditional machine learning is precision medicine – predicting what treatment protocols are likely to succeed on a patient based on various patient attributes and the treatment context. The great majority of machine learning and precision medicine applications require a training dataset for which the outcome variable (eg onset of disease) is known; this is called supervised learning. A more complex form of machine learning is the neural network – a technology that has been available since the 1960s has been well established in healthcare research for several decades and has been used for

categorization applications like determining whether a patient will acquire a particular disease. It views problems in terms of inputs, outputs and weights of variables or 'features' that associate inputs with outputs. It has been likened to the way that neurons process signals, but the analogy to the brain's function is relatively weak. The most complex forms of machine learning involve deep learning, or neural network models with many levels of features or variables that predict outcomes. There may be thousands of hidden features in such models, which are uncovered by the faster processing of today's graphics processing units and cloud architectures.

A common application of deep learning in healthcare is recognition of potentially cancerous lesions in radiology images. Deep learning is increasingly being applied to radiomics, or the detection of clinically relevant features in imaging data beyond what can be perceived by the human eye. Both radiomics and deep learning are most commonly found in oncology-oriented image analysis. Their combination appears to promise greater accuracy in diagnosis than the previous generation of automated tools for image analysis, known as computer-aided detection or CAD. Deep learning is also increasingly used for speech recognition and, as such, is a form of natural language processing (NLP).[1]

Rule-based expert systems -Expert systems based on collections of 'if-then' rules were the dominant technology for AI in the 1980s and were widely used commercially in that and later periods. In healthcare, they were widely employed for 'clinical decision support' purposes over the last couple of decades 5 and are still in wide use today. Many electronic health record (EHR) providers furnish a set of rules with their systems today. Expert systems require human experts and knowledge engineers to construct a series of rules in a particular knowledge domain. They work well up to a point and are easy to understand. However, when the number of rules is large (usually over several thousand) and the rules begin to conflict with each other, they tend to break down. Moreover, if the knowledge domain changes, changing the rules can be difficult and time-consuming. They are slowly being replaced in healthcare by more approaches based on data and machine learning algorithms.[2]

Administrative applications -There are also a great many administrative applications in healthcare. The use of AI is somewhat less potentially revolutionary in this domain as compared to patient care, but it can provide substantial efficiencies. These are needed in healthcare because, for example, the average US nurse spends 25% of work time on regulatory and administrative activities. The technology that is most likely to be relevant to this objective is RPA. It can be used for a variety of applications in healthcare, including claims processing, clinical documentation, revenue cycle management and medical records management. Some healthcare organisations have also experimented with chatbots for patient interaction, mental health and wellness, and telehealth.

These NLP-based applications may be useful for simple transactions like refilling prescriptions or making appointments. However, in a survey of 500 US users of the top five chatbots used in healthcare, patients expressed concern about revealing confidential information, discussing complex health conditions and poor usability. Another AI technology with relevance to claims and payment administration is machine learning, which can be used for probabilistic matching of data across different databases. Insurers have a duty to verify whether the millions of claims are correct. Reliably identifying, analyzing and correcting coding issues and incorrect claims saves all stakeholders – health insurers, governments and providers alike – a great deal of time, money and effort. Incorrect claims that slip through the cracks constitute significant financial potential waiting to be unlocked through data matching and claims audits.[3]

II. HEALTHCARE USING MACHINE LEARNING

The hazardous improvement of health-related information given new opportunities for developing recuperate of a patient, Machine learning shows a vital performance in health-care and these are mostly enforced to healthcare, which includes computer-aided diagnosis, image registration, image annotation, image-guided medical aid, and image database retrieval, multimodal image fusion, medical image segmentation, where deficiency might be incurable. Machine learning has probably limited social impacts in the health-care field [4]. Machine learning provides the solution for decreasing the increasing price of health-care and serving to create

an improved patient-clinician communication. ML solutions will be used for an inordinateness of health-relevant uses; some include serving to clinicians identify a lot of customized prescriptions and therapy for patients and additionally serving to patients identify once and if they must record follow up appointments.

Currently, in health-care, a huge quantity of information has become accessible. It contains EMRs that consist of information which may be either unstructured or structured [5]. Structured health information is the data that's simple to analyze in a database and they will carry a set of statistics and classes as well as however not restricted to patient weights, and even generic symptoms like stomach pain, headache, etc. [6]. The bulk of medical knowledge is unstructured information within the variety of numerous completely different notes, images, audio and video recording, reports, and discharge summaries. It's terribly exhausting to quantify and analyze a conversation between the supplier and the patient; the conversation is incredibly personalized and might take many alternative directions [7].

Applications of ML in Healthcare- The algorithms of Machine learning are useful in identifying complicated patterns within prosperous and huge data. This facility is especially well-suited to clinical applications, particularly those people who rely on advanced genomics and proteomics measurements. It is often used utilized in numerous illness diagnosing and detection. In medical applications, machine learning algorithms will manufacture higher decisions regarding treatment plans for patients by suggestions of implementing useful health-care system [8]. Healthcare management is utilizing this method to forecast wait times for patients in exigency department waiting for places.

These models use factors like patient information, discomfort levels, exigency department charts, and even the layout of the hospital room itself to conclude wait times. Using the prognostic model, clinics will think hospital room admissions. So machine learning application could profit patients by decreasing price, rising accuracy, or diffusing experience that is in brief offer.

III. DIFFERENT TECHNIQUES USED BY ML

Support Vector Machine -Support Vector Machine (SVM) which is designed in 1990's. To achieve machine learning (ML) tasks support vector machine (SVM) is used, and it is a simple and prominent process. During this technique, a collection of training samples is given each sample is divided into different categories. Support vector machine (SVM) mainly used for classification and regression problems [9].

Naive Bayes- classification Statistical classifiers are the example for Bayesian classifiers. Naive Bayes identify the class membership probabilities based on given class label.It performs one scanning of data and hence classification is easy.

Decision Tree Decision Tree (DT) -is mostly used technique for classification containing internal node and one leaf node with a class label? The top nodes of the decision tree (DT) Proceedings of the are called as root nodes. The decision tree is very popular because the construction is very simple, which won't require any parameters.

K-nearest neighbor- K-nearest neighbor is frequently used approach for classification of samples. By using this technique we can calculate distance measure from N number of training samples.

Fuzzy Logic- Fuzzy Logic which is evolved from Fuzzy set theory. These values are lies in between 0 and 1. It is a very popular method which is used in engineering applications.

IV. LITERATURE SURVEY

This paper analyzes the concept of classification analysis and the properties of decision tree, and gives the implementation process of ID3 algorithm. The medical examination data of medical examination information management system of Xi'an Shiyou University Hospital from 2013 to 2020 are selected as the training sample set and discretized, and a direct data model suitable for classification analysis is designed. ID3 algorithm is employed to classify and analyze the sampled data set, and the classification rules are extracted. Using the prediction conclusions of these classification rules, physical examination doctors can quickly and

scientifically predict the possibility of chronic diseases of each university teacher. It can provide information technology support for the screening and prediction of chronic diseases and personalized intervention of chronic diseases. Zhang (Quancheng et.al.2021)[10]

Detection of Heart Disease To increase the accuracy of diagnosing in the Heart disease Machine Learning Techniques are frequently used. Dataset considered from the UCI Machine Learning Repository. [11] proposed a machine learning algorithm for detection and analysis of heart disease by utilizing Naive Bayes algorithm, Support vector machine .By utilizing Naïve Bayes algorithm provides 74% accuracy and SVM offer 94.60%. Otoom has performed Support Vector Machine, Bayes Net to predict coronary heart disease.The accuracy provided by SVM is 88.3%, Bayes Net provides 84%.

B. Analysis of diabetic Diseases -To increase the accuracy of scrutiny of diabetic diseases various machine learning techniques are used. Dataset considered from the UCI Machine Learning Repository. Iyer proposed a machine learning algorithm to predict diabetic disorder by using Naive Bayes and Decision trees. Naive Bayes gives 79.56% accuracy and decision tree provides 76.95% accuracy .Dash and Sen performed Machine learning algorithms for diagnosing diabetes disease. Logiboost, CART algorithms are used and Logiboost provides the correctness of 77.479% .

Machine Learning in Disclosure of Breast cancer It is one of the top cancer that occurs in a woman and it is the second main leading reason for woman in the United States and in Asia countries. Some machine learning algorithms are used to predict breast cancer. The data considered from WISCONSIN dataset UCI machine learning repository. Williams et al. used a j48, Naive Bayes to identify breast cancer risks in the United States. The experiment is performed through WEKA tool. They conclude j48 is the best algorithm for the prediction of breast cancer it gives 94.2% accuracy, and Naive Bayes gives 82.6% .To predict breast cancer Senturk et al. used several classification models like Support Vector Machine (SVM), Naive Bayes (NB), K-nearest neighbor, and Decision tree (DT). K-NN gives 95.15% accuracy and SVM gives 96.40% accuracy [12].

Majali et al. used decision tree and Frequent Pattern in data mining to predict the breast cancer. They conclude decision tree gives 94% accuracy [13]. D. Diagnosis of Thyroid Disorder To predict thyroid diseases machine learning techniques are used. Classification algorithms that are support vector machines and Decision tree are used and dataset considered from UCI repository. Papageorgiou EI, Papandrianos NI proposed advanced approaches for thyroid diagnosing diseases using fuzzy map utilizing data mining algorithms [14-15]. The below table summarizes different ML techniques used for diagnosis of various diseases.

Table 1: Ml Techniques For Diagnosis Of Various Diseases

S.no	Reference	ML Technique used	Disease	Accuracy
1	Chaurasia and Pal [1]	J48	Heart Disease	84.35%
		SVM		85.03%
2	Vembandasamy[2]	NaiveBayes	Heart Disease	86.41%
3	Kumari and Chitra [3]	SVM	DiabeticDisease	78%
6	Venkatesan etal [6]	DecisionTree	BreastCancer	85%
7	Sivakami [7]	DT+SVM	Breast Cancer	78%
9	M.R.Nazari Kousarrizi et al[9]	SVM	ThyroidDisease	80.62%

V. CONCLUSION

Machine learning (ML) techniques are crucial in different business fields. Healthcare field facing more problems and it is becoming more expensive. Several ML techniques are used to rectify them. This paper presents various ML techniques for prediction of various diseases like heart disease, breast cancer, diabetic disease and thyroid disease. From the earlier study, it is recognized that naive Bayes provides 86.41% of accuracy for the diagnosis of heart disease. DT+SVM gives 96.40% of accuracy for the breast cancer diagnosis, and SVM provides 79% of accuracy for the detection of diabetic disease. In future, we are trying to improve the accuracy of breast cancer prediction by using different machine learning algorithms.

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