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A Framework Design for Centralised Monitoring of Patient Disease Diagnosis for Better Improvement

Ashwini B. Sable, A. S. Kapse

Abstract: ***Healthcare recommendation systems have garnered significant attention in recent times due to their capacity to improve patient outcomes and treatment. This literature review intends to assess the current state of patient healthcare referral systems by examining relevant studies, techniques, and findings. The report focuses on key research areas, challenges, and viable strategies for the future in the field of patient-centred health recommendation systems. Currently, healthcare administration is in high demand due to its significant advantages in managing hospitals or medical practices. Health management systems are increasingly affecting the entire world daily. The rising demand for healthcare is attributed to various factors, including the availability of healthcare solutions. The health prediction system is an online initiative designed to provide user support and advice. This study proposes a technology that allows consumers to receive immediate online health guidance from an intelligent healthcare system. The system encompasses a multitude of disorders and symptoms associated with different bodily systems. Data mining technologies can be utilised to identify the most probable disease related to a patient's symptoms. By logging into the system, a doctor can retrieve and review their patient's information and reports within the doctor's module. Physicians can analyze the patient's browsing history and the specific information they are seeking, taking into account their medical prognosis. The doctor has access to his data. The database administrator can incorporate additional disease information, including the type of disease and its associated symptoms. The data mining system runs based on the condition's name and symptoms. The administrator has access to the database, which includes information on diseases and their associated symptoms. Recommender systems employ diverse machine learning techniques in various domains, such as healthcare recommendation systems (HRS), to advise and promote services or entities to users. Due to the vast array of algorithms documented in the literature, the science of artificial intelligence is now widely employing machine learning techniques in various application domains, including the HRS. Nevertheless, the process of selecting an appropriate machine learning algorithm for a health recommender system seems to be time-consuming.***

Keywords: Management, Data mining, Recommendation System, Artificial Intelligence, Domain

I. INTRODUCTION

In today's society, medical services have become an immense necessity due to their ability to manage hospitals and medical facilities effectively.

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The rate at which the medical care framework is advancing and being implemented worldwide. Medical care arrangements are a contributing factor to the increased demand for healthcare sectors. Some of these options pertain to the global demand for healthcare, including medical services, policies, and health plans. The patient's diagnosis is the primary factor in designing any framework for improved therapy in these medical services. This framework reduces the need for manual tasks to maintain the document's structure. It also employs a simple process to support the database and receive data updates. With minimal time, the framework design enables the history and diagnosis process, along with recommendations for doctors. Currently, individuals afflicted with a specific condition are required to undergo a costly and time-consuming consultation with a medical practitioner. Moreover, if the user is located at a considerable distance from a medical professional or healthcare facility, it may be arduous for them to determine the nature of their ailment. If an automated program can implement the method outlined above, it has the potential to save time and money, making the process more convenient for patients. The Healthcare Management System is an online program that utilises reported symptoms to generate predictions about potential diseases for users. The Healthcare Management System comprises aggregated data collected from relevant health websites and diagnoses provided by clinicians for individual patients. This approach enables the user to determine the probable condition based on the symptoms provided. As internet usage continues to rise, people are increasingly drawn to the opportunity to acquire new knowledge and information. Due to the lack of convenient alternatives for treating specific illnesses, individuals often turn to the internet to seek answers to their health issues. This is mainly because accessing the internet is more convenient than visiting hospitals or seeing doctors. The accessibility of the system's health records and historical diagnosis procedure to the public renders it potentially beneficial [6].

Currently, there is a significant need for healthcare management due to its invaluable role in efficiently operating hospitals and doctors' offices. Globally, the utilization of healthcare management systems is increasing regularly. Some advantages of this system include an enhanced understanding of healthcare management services and health policies, as well as a strong preference for high-quality medical facilities. Effective healthcare administration is crucial for maintaining competitiveness in the market and delivering superior patient care in an ever-evolving world.

Healthcare management systems, also referred to as healthcare information management systems, are designed to help healthcare professionals efficiently collect, store, retrieve, and share patient healthcare information. These solutions reduce the level of human effort required to manage and preserve records in both physical and digital formats. Data is stored in databases, facilitating easy retrieval and updating of information. These systems also dedicate significant resources to developing a framework that facilitates improved self-management [7].

II. EXISTING SYSTEM

In the modern digital era, individuals are facing an increased prevalence of severe or multiple medical diseases as a result of their inactive lifestyles. In recent years, a substantial volume of medical data has been collected, including information about patients' health states, medical reports, lab test results, and disease treatment plans. Many websites often have access to this digital health information. Due to the rapid expansion of web services in recent years, a vast amount of information is now accessible to the general public. Consumers are currently facing challenges in accessing valuable information about medical issues due to the significant expansion of online information. Users encounter challenges in navigating and filtering through the vast amount of material accessible online to retrieve the specific information they require. Healthcare recommendation systems aim to address the issue of excessive medical information by providing reliable and personalised recommendations to patients based on their particular health concerns, thereby tailoring the user experience. Given the increasing number of individuals affected by various health disorders, it is imperative to prioritize the provision of suitable treatment for severe illnesses [8].

Online healthcare service-based solutions have garnered significant attention from the scientific community during recent pandemic situations. However, this objective cannot be fully achieved without implementing data-driven mechanisms (such as machine learning and big data analytics), which can serve as facilitators for the early identification and treatment of patients without requiring hospitalization. Multiple types of recommender system frameworks are available. Some examples are content-based recommender systems, context-based recommender systems, and hybrid recommender systems. These diverse recommender systems present a range of challenges, including concerns about dependability and reliability. Several techniques offered aim to enhance the existing problems in their recommender system. Deep learning is regarded as a promising algorithm among all existing algorithms. The process involves analysing data dimensions, where higher-level concepts are distinguished from lower-level concepts. This study proposes the use of an intelligent recommender system, employing a deep learning-based algorithm for disease categorisation, to address the significant problems present in current healthcare recommender systems. The aim is to assess patient data and provide effective solutions. A fuzzy inference system is specifically engineered to compute the degree of risk for patients. This proposed intelligent recommender system offers suggestions to patients based on the risk anticipated by the fuzzy inference system [9].

Currently, customers face difficulties in finding valuable information to improve their well-being due to the vast amount of healthcare data scattered across multiple websites on the Internet. Furthermore, healthcare professionals face challenges in prioritising patient-centred decision-making due to the overwhelming volume of medical data, including information on medications, diagnostic tests, and recommended treatments. These issues underscore the need for implementing recommender systems in the healthcare sector to support effective and precise decision-making by both end-users and healthcare professionals. This post provides a comprehensive analysis of the literature on healthcare recommender systems. Unlike previous comprehensive surveys, this study offers valuable insights into various scenarios and methodologies for making informed suggestions. Examples of these include suggestions for food, prescriptions, health projections, healthcare service recommendations, and advice from healthcare specialists. To ensure a comprehensive understanding of recommendation systems, we also develop practical illustrations. Now, let's discuss the challenges involved in developing future healthcare recommender systems [10].

III. LITERATURE SURVEY

Harms, J. G. [2019] explained a procedure for carrying out word segmentation. He suggested calculating the character spaces in the sentences in his algorithm. All different kinds of character gaps should be present in the character spaces. They consist of word gaps, punctuation, and letter gaps. The method is based on the quantity of blank space or characters between each sentence unit. The character spaces in the sentence are first identified, and then the gaps are averaged to obtain the mean character space. The sentence that needs to be divided into segments is then subjected to this average gap distance. Points of tokenization are defined as locations where the character space exceeds the average character space. Since there is typically a larger space between words than the average, tokenization occurs in the spaces in between words in sentences [1].

Nurgalieva, L. [2019] proposed utilizing NLTK to implement word segmentation. A Python library called Natural Language ToolKit (NLTK) is designed to offer NLP services. It has tokenizers built in. Users must import the package to utilise the appropriate tokeniser, which is available as a set of functions. The NLTK contains many tokenisers, such as standard, letter, word, classic, lowercase, N-gram, pattern, keyword, and path. The most commonly used tokeniser is the word-punkt tokeniser, which punctuates phrases at empty spaces. The NLTK tokenizers' precision, quickness, and efficiency are impressive. Additionally, since the package already runs the algorithms at the backend, no implementation is necessary [2].

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Amershi, S. [2019] demonstrates how to segment words using the CRF (Conditional Random Fields) algorithm. The system is trained by this approach to account for character spacing. The algorithm recognizes the character gap in the test sentence using the training it received. The system maintains a gap distance threshold value. The test text divides at specific spots if the number of gaps exceeds the predetermined threshold. CRF makes the procedure time-consuming because the system needs a lot of training [3].

Holzinger, A., & Jerome [2017] presented a technique for POS Tagging termed latent analogy. The latent semantic mapping (LSM) approach is employed in this algorithm. Training with the available corpus is necessary. The LSM maintains the tagged features of the trained corpus. New phrases are now assigned to the LSM for tagging, and analysis is conducted to identify the training data sentences that are most similar to the test sentence. The term "sentence neighbourhood" refers to this. If two sentences have the same subject matter, sentence neighbourhood holds for both of them. The POS tags associated with those sentences are then mapped to the test sentences after the intended matching sentences have been identified from the trained data [4].

Clark, L., et al. [2019] present a method for POS tagger implementation utilising neural networks. There are "n" hidden layers in this algorithm. These layers are based on the number of iterations or combinations required to tag the desired sentence accurately. Each word in the phrase is given the proper POS tag at each layer of the algorithm before being passed on to the subsequent layer for tag accuracy verification. Unless the following layer supplies the same tags as the preceding layer, this keeps occurring. The standard method of storing a dictionary of tags for the target language is another way to construct the POS tagger. The NLTK tagger shows to be quick and resource-effective when compared to the three algorithms above. The neural network technique, however, delivers the maximum accuracy because it goes through numerous iterations [5].

IV. PROPOSED SYSTEM

Predicting human diseases with precision remains challenging despite efforts to improve treatment efficacy and speed. A global epidemic of multimodal diabetes is endangering lives worldwide. It affects various vital physiological organs, including the heart, nerves, retina, and kidneys. An intelligent healthcare recommendation system accurately forecasts and recommends diabetes diagnoses by employing state-of-the-art machine learning models and data fusion techniques on healthcare data. In recent times, several machine learning models and methodologies have been introduced to predict the progression of diabetic illness. Nevertheless, these algorithms are insufficient in effectively managing the vast amount of complex datasets related to the diabetic condition. An innovative healthcare recommendation system, utilizing deep machine learning and data fusion, is proposed for the management of diabetes. [11].

By employing data fusion, we may alleviate the excessive burden on the system's processing resources and enhance the effectiveness of the proposed system, enabling us to forecast and recommend this life-threatening illness with more precision. Subsequently, the ensemble machine learning model is trained to make accurate predictions regarding the likelihood of diabetes occurrence. This study evaluates an intelligent recommendation system using a widely recognized dataset on diabetes. The findings are then compared to the latest developments in the field. The suggested system's accuracy was compared to existing deep machine learning approaches, and it attained a 99.6% accuracy rate. Consequently, our proposed method is more efficient in predicting and suggesting multimodal diabetic condition. The improved disease diagnosis efficacy of our proposed method supports its utilization in automated diagnostic and recommendation systems for diabetic patients [12].

A recommendation system utilises deep learning principles and algorithms to suggest potential diagnoses by analysing past preferences and applying additional filters. The fundamental concept behind these algorithms is to detect patterns in patient data behaviour, whether it pertains to an individual's usage of a specific service or their diagnosis. The methods for collecting data vary greatly depending on the particular disease or recommendations being offered [13].

V. RESEARCH METHODOLOGY

Various entities, including healthcare systems, hospitals, health insurers, universities, and governmental institutions, collectively possess a significant volume of data. Prescriptions, clinical information, medical records, patient information, vital signs, X-rays, CT scans, and biometric fingerprints are among the diverse types of data sources. Healthcare automation systems, a subset of artificial intelligence, utilise reasoning processes and domain-specific information to generate insights that resemble those provided by human professionals.

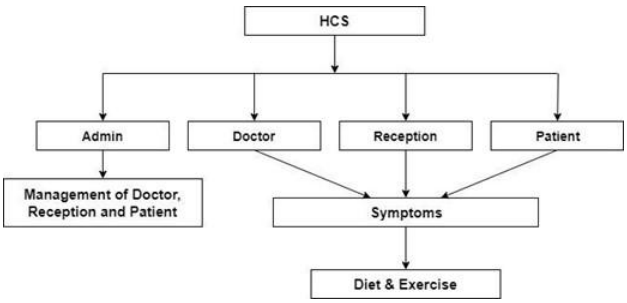

Fig.1 Overall Main Structure of Project

Similar to any other recommender domain, we first need to comprehend the various. The various groups include:

- Nutritional information: developing suggestions to improve nutrition. The doctor may recommend dietary changes to help patients recover from illness or disease by ensuring that they receive the proper nourishment. Recommendations could include eating a balanced diet, making food swaps, opting for less spicy meals, or implementing dietary adjustments.

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- Physical activity: Depending on the patient's needs, recommend the type of yoga and exercise they should engage in to facilitate a quick recovery. Location, sickness, weather, and other factors may be considered when assessing the patient.
- Diagnosis: By examining the symptoms displayed in similar cases, a doctor can formulate a diagnosis for a patient.
- Therapy/pharmaceutical: developing suggestions for various pharmaceutical regimens for a specific condition or patient-specific therapy.
- The process of data analysis makes up the second component of the framework. Health-related suggestions may be produced as a result of the data analysis process. The patients who will be using this domain should be discussed beforehand. Medical researchers, practitioners, and patients are the system's final patients.
- In addition to these end users, the health recommender system (HRS) can also be advantageous to researchers, physicians, and pharmacists. The ultimate goal of these recommender systems should be to reduce healthcare costs [14][15].

VI. IMPLEMENTATION AND RESULT

Machine learning methods are utilized to extract valuable information from data, facilitating the examination of patterns and the development of prediction models. Implementing these approaches in the healthcare industry offers numerous benefits, including the ability to handle large volumes of data beyond human capabilities, the creation of precise forecasts using machine learning models, and valuable diagnostic support for medical professionals. These arduous and time-consuming procedures can be expedited, resulting in time and energy savings. The objective of our research project, referred to as 'The Health Prediction System,' is to identify potential signs of illness. However, there are still some outstanding difficulties. Machine learning models are prone to overfitting, a phenomenon that can result in erroneous predictions. The diagnosis cannot be based exclusively on symptoms, as many patient characteristics, such as lifestyle, gender, and ancestry, might influence the development of an illness [16]. An individual's medical history is stored digitally in an electronic health record (EHR). A longitudinal record of patient health data is generated through one or more interactions in any healthcare setting. The terms "term" and "Computer-based Patient Record" (CPR) are often used synonymously. The document encompasses essential patient data, including demographics, concerns, prescriptions, physician observations, vital signs, immunisation records, medical history, laboratory findings, radiographic reports, personal statistics, progress notes, and billing details. The Electronic Health Record (EHR) system can enhance clinician efficiency by automating the process of managing data in intricate clinical scenarios. It can generate a comprehensive record of a patient's clinical interactions and support other care-related responsibilities, such as quality control, reporting outcomes, and making evidence-based decisions.

An Electronic Health Record (EHR) system incorporates data for many purposes. The system enables nurses to communicate about hazardous situations, doctors to assess patient diagnostic information and treatment efficacy, administrators to utilise the data for billing purposes, and researchers to acquire new knowledge. The key functions of EHR are to facilitate clinical treatment and streamline billing processes. This encompasses other functionalities, such as enhancing patient satisfaction and convenience, improving diagnostic accuracy and health outcomes, increasing patient engagement and care coordination, optimising cost savings, and improving general population health. Most modern EHR systems are designed to consolidate data from multiple sources, including administrative, nursing, pharmacy, laboratory, radiology, and physician records, among others. Any department can produce electronic papers [17].

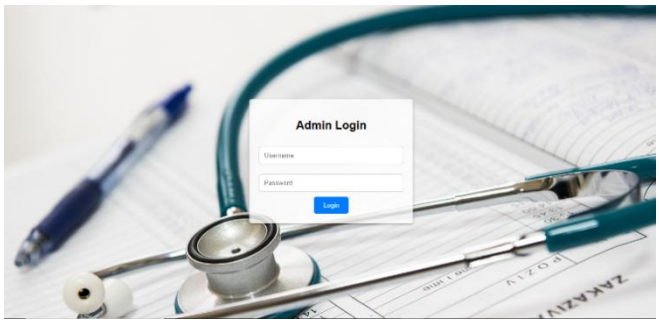

Fig. 2 Admin Login

The above illustration shows how the user interacts with the system, and the accurate result is displayed to the user upon completion of symptom clarification. And the user has been consulted by a doctor.

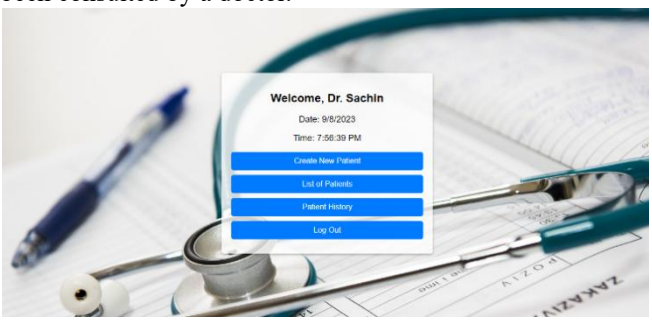

Fig. 3 Doctor's Dashboard

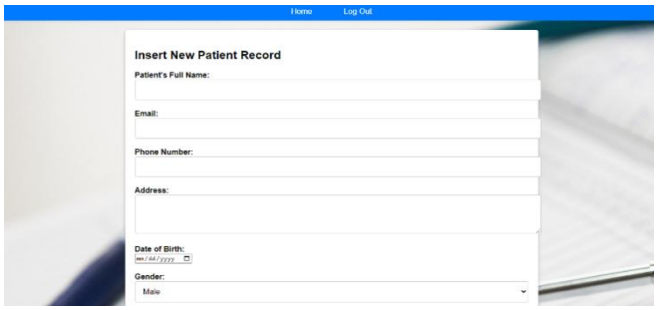

Fig. 4 Form for Creation of Patient Profile

It displays a patient sign-up form for hospital registration, which medical practitioners use to collect patient details before their hospital stay. The patient registration form is a valuable tool in medical clinics for facilitating online patient registration. It means it is used to collect personal patient information.

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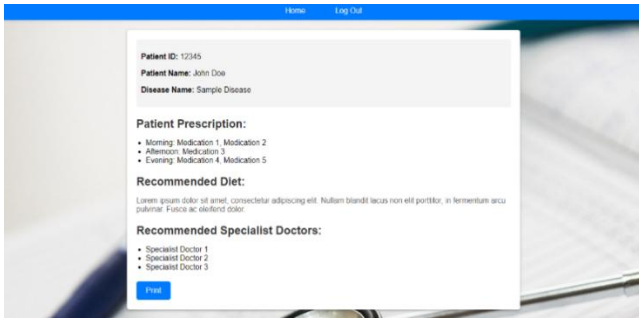

Fig. 5 Display of Patient Prescription and Recommended List of Doctor and Diet

The above figure illustrates that a patient record serves as a repository of information about a single patient. Health care professionals generate this information as a direct result.

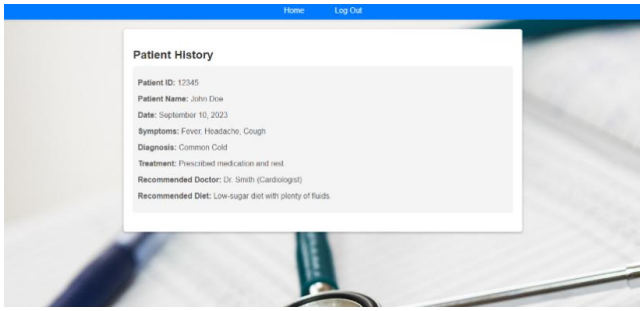

Fig. 6 Display of Patient Detail

The above figure shows the patient profile, which enables the doctor to form a picture of the patient's current lifestyle, including home, work, and recreational activities, to identify any factors that may be contributing to the patient's health status.

VII. CONCLUSION

Consequently, the framework design enables a swift completion of the history and diagnosis procedure, together with the provision of recommended doctors. Medical services are an essential requirement in our modern era, as they facilitate the administration and operation of clinics or clinical offices, as well as the daily development and global implementation of the medical care framework. A critical criterion for the planned expansion of wellness areas is the accessibility of medical treatment. Several of these choices enhance global interest in healthcare, strategy, and welfare. When developing a framework for enhanced treatment, the most critical factor to consider is the patient's diagnosis. The primary objective of this project was achieved, which involved developing an intelligent recommendation system capable of providing patients with optimal guidance on the need for a medical examination the following day. The proposed methodology aims to reduce patient costs and time commitments while enhancing the quality of healthcare decisions based on evidence. This research aims to develop an intelligent recommendation system that utilises an advanced time series prediction model to provide valuable suggestions to patients with chronic conditions in a telehealth scenario. Both patients and medical professionals can utilise the system to enhance their decision-making processes and minimise the burden of unnecessary tests on patients. Additionally, it provides a powerful method for minimising the likelihood of receiving incorrect guidance.

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Ethical Approval and Consent to Participate	No, the article does not require ethical approval or consent to participate, as it presents evidence.
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Authors Contributions	All authors have equal participation in this article.

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