

Smart Health Care

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ABSTRACT

Data is the lifeblood of all business. Data-driven decisions increasingly make the difference between keeping up with competition or falling further behind. Machine learning can be the key to unlocking the value of corporate and customer data and enacting decisions that keep a company ahead of the competition. A subset of artificial intelligence (AI), machine learning (ML) is the area of computational science that focuses on analyzing and interpreting patterns and structures in data to enable learning, reasoning, and decision making outside of human interaction. Simply put, machine learning allows the user to feed a computer algorithm an immense amount of data and have the computer analyze and make data-driven recommendations and decisions based on only the input data. If any corrections are identified, the algorithm can incorporate that information to improve its future decision making. Machine learning helps in data-driven decision making, identification of key trends and driving research efficiency. When it comes to healthcare, there are different ways in which machine learning techniques can be applied for effective diseases prediction, diagnosis, and treatments, improving the overall operations of healthcare. Effective machine learning implementation enables healthcare professionals in better decision-making, identifying trends and innovations, and improving the efficiency of research and clinical trials.

Keywords—Doctor, Symptoms, User, Patient, Machine Learning, Healthcare, Prediction, Location, Diseases

I. INTRODUCTION

An outpatient appointment is a contract between a patient and a clinic by which the latter reserves a certain amount of service providers' time and physical assets for the exclusive use of the patient who holds the appointment. Because the vast majority of medical appointments are booked with physicians working in primary care clinics, we focus in this paper on the

design of primary care appointment systems. Patients' satisfaction with an appointment system when they attempt to book a non-urgent appointment is affected by their ability to book with their doctor of choice and at a convenient time of day and also the clinic which is nearby to the patient's location. This will help during an urgent medical condition of a patient to reach the healthcare center on time and book the appointment with the physician of their choice. For

urgent medical conditions, patients want quick access to a physician. Clinics plan for such appointment requests and have open slots each day that allow same-day (urgent) access. What makes the appointment booking problem (the focus of this project) difficult is that booking preferences are different for each patient, and they change over time for the same patient. For example, some patients are willing to see any available doctor if they can have an appointment sooner whereas others prefer to wait until a slot becomes available with their PCP. Some patients are able to visit the clinic only within a short time window because of job-related constraints or personal schedules, whereas others can be quite flexible. Finally, changes in work schedule, distance of the center, availability of a physician, and family size can alter a patient's booking pattern. In addition to all this if a patient is aware of the problem or illness he/she is suffering can also help him to book an appointment of the doctor or specialist in a particular field. It is very important for the patient to have an idea about the consequences of the symptoms he is being suffering from and hence which will help him to choose a doctor accordingly. For the problem features mentioned above, we show that certain types of information that may be retrieved from existing Web based appointment request systems can be used to estimate patients' preferences and improve booking decisions.

II. RELATED WORK

The purpose of this literature survey is to introduce and recognize the restrictions of the disease prediction proposed by other researchers in the corporate field. Our centre of interest would be providing these predictions to the patients or users who want to get the disease information. Doctor appointment still depends on the traditional approach which makes patients stand regularly in the queue for the appointment and from their doctors to consult them.

The proposed system aims at implementing disease prediction for the patients. The idea of designing doctor appointment system for patients is emanated through the exploration and detailed analysis of research paper published by Fetter, R. B., & Thompson J. D. [1]. Patients' Waiting Time and Doctors' Idle Time in the Outpatient Setting. *Health Service Research*, 1(1): 66-90, 2012. DOI: PMC1067302. This system [1] does not work for the nearby doctors and clinic location.

Disease prediction application of this system requires a lot of datasets for the prediction of diseases. This can be shown in another research paper which was published Meherwar Fatima, Maruf Pasha. [2] Survey of Machine Learning Algorithms for Disease Diagnostic. Institute of CS & IT, The Women University Multan, Multan, Pakistan. Department of Information Technology, Bahauddin Zakariya University, Multan, Pakistan. Using machine learning this system [2] is capable of extracting the diseases by providing similar symptoms as input by the patients.

Similarly D. W. Bates, S. Saria, L. Ohno-Machado, A. Shah, G. Escobar [3] also gave a study on analysing and identifying the high risk diseases using analytical symptoms by the users and training them hard precisely for those kind of diseases. The study is as "Big data in health care: Using analytics to identify and manage high-risk and high-cost patients", *Health Affairs*, vol. 33, no. 7, pp. 1123-1131, 2014.

Doctor appointment and Hospital/Clinic appointment applications are been studied in a survey by Hylton, A. & Suresh, S. [4] The study paper named Application of Intelligent Agents in Hospital Appointment Scheduling System. *International Journal of Computer Theory and Engineering*, Vol. 4, No. 4, pp. 625-630, 2012. This system [4] gives a wise study in the applications of different scheduling agents for providing appointments with the doctor and gives referral appointment to the respective doctor in the hospital.

Advantages of E-Recruitment mentioned by Hylton, A. & Suresh, S. [4] are as follows:

- Easy appointment and doctor consultants

- Time efficient
- Greater chance to find right and specialist doctors
- Opportunities for small clinics to eradicate queuing

Doctor recommendation and appointment system is a smart appointment booking system that provides patients or any user an easy way of booking a doctor's appointment online. This is a mobile application that overcomes the issue of managing and booking appointments according to user's choice or demands. The patient or the user can book an appointment based on preferred location. The system will also predict the patients' health problems which will help the user to book appointments of a doctor accordingly. The task sometimes becomes very tedious for the compounder or doctor himself in manually allotting appointments for the users as per their availability. Hence this project offers an effective solution where users can view various booking slots available and select the preferred date and time. The already booked space will be marked yellow and will not be available for anyone else for the specified time. This system also allows users to cancel their booking anytime.

There is no system from above studies and researches which clearly shows a complete system combining the both functionalities of disease prediction and doctor appointment & recommendation. All the previous systems studied [1], [2] and [3] only works for extracting and filtering datasets for low and high risk diseases while none of the study shows us the training of these datasets to achieve best prediction percentage for the respective disease output. Agent scheduling in the research [4] is shown perfectly for appointment system but the nearby location of the clinic and hospital is not provided to the patient. Thus the proposed system is very necessary in order to provide the patient with précised disease prediction and doctor appointment with respective location of the clinic and hospital nearby.

III. METHODOLOGY

Following block diagram is the overview of our system which provides the short overview of our system.



Figure 1. Block Diagram

As shown in block diagram, different tasks of each entity of our proposed system is defined. For each entity our proposed system have different set of input and respective output for that input. In this section we are going to study some features of our system, implementation plan of our system and overview of our system using some labeled charts.

A. Flow chart The working flow of whole system is shown below. From starting with registration to doctor appointment can be seen in the flow diagram. We can also see some of the conditional functions in the system as shown below. Figure 2 shows the work flow diagram(flowchart) of the system.

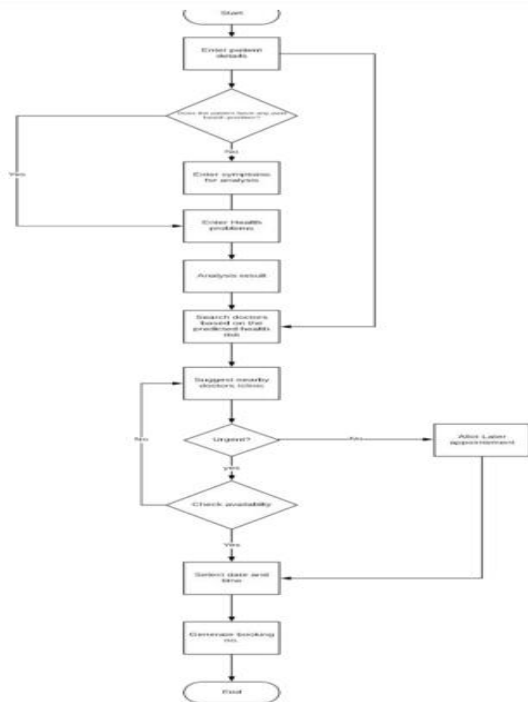


Figure 3. Flowchart

- B. Data Flow Diagram (DFD) It shows the major actors involved in the system which includes Patients, and Doctors. It also shows how the data flow is performed from one entity/actor to the other.
1. Patient Patient performs basic actions in our system which includes registration in Doctor Recommendation and appointment system through a registration page in the android application with is not mandatory only used if patients wants to store its detected disease and appointments. After the registration if patient will provide its symptoms and the app will process and provide a detected disease. Patient can also proceed to fix an appointment with any doctors recommended nearby.
 2. Doctor It is the entity which is responsible for appointment acceptance and report suggestion. Doctors usually accepts or rejects the appointment based on the disease detected by the system. User can also see the location of the doctor's clinic or hospital based on the nearby feature.

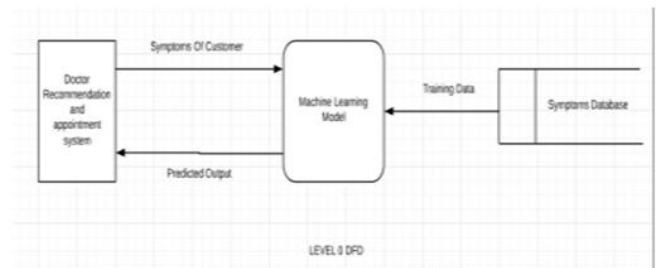


Figure 3. Level 0 DFD

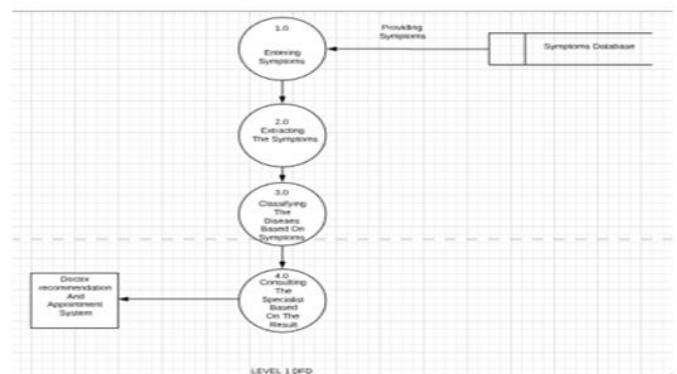


Figure 4. Level 1 DFD

IV. RESULT AND DISCUSSION

Applications such as Practo helps you find online medical services and solutions to enable you to take better care of yourself. While Sminq (android app) only helps in booking appointments online. Ada is a chatbot based app with access the symptoms from the users and provides any predicted disease. These existing systems do not provide location of the nearby hospitals or clinics with respect to the predicted disease specialist doctor. Both disease prediction and doctor recommendation and appointment is done coordinately in Doctor Recommendation and appointment system.

V. CONCLUSION AND FUTURE SCOPE

The proposed system 'Doctor Recommendation and appointment system' will be more effective to find doctors nearby with disease speciality for patients rather than finding them manually or going clinic to clinic. This system can be used in normal conditions when any user doesn't feels well , so by entering the symptoms in the app, user can be able to get notified if its undergoing any normal or serious health issues. The proposed system is not intelligent enough to

provide a 100% precise disease hence further we provide the user with nearby doctors or hospitals or any specialist doctor regarding that particular disease. Another feature that will predict the diseases for the users or patients who provide the symptoms as input to ease the process of doctor recommendation directly with face to face appointment with doctors Another feature which can be added in future is to provide a user interface friendly to the user with the help of AI chatbots and image processing. We will try to provide a user based report with respect to its past information such as predicted diseases of patient/user and the doctors appointed.

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