

Hospital Inpatient Caring By Markov Decision Process

Pooja S. Choudhari¹, Ashwini B. Atole², Shubhada S. Mali³, Pradnya V.

More⁴dinesh B. Hanchate⁵

¹⁻²⁻³⁻⁴⁻⁵Department Of Computer Engineering, Vidya Pratishthan's College Of Engg., Baramati-413133, Pune, Maharashtra, INDIA,

Abstract: Many challenges have been faced by the health care system involving high rates of drug-resistant and hospital-acquired disease, failures of care delivery leading to preventable adverse health events and skyrocketing costs. Over treatment, substandard implementation of health care and lack of success to get the premium practice for prophylactic supervision and safety of patient has enormous and has straight impact or measures on one and other outcome and costs of health care. Contradictorily, both the increase in electronic health data of patient's availability and the development occurring of scientific approach for analyzing the details suggests its probability for making its utilization in terms of machine learning methods and artificial intelligence for improving standards and cost reduction for taking care of patient. It enable important application for patients to become primary aware about their disorders and provide doctors to have a viewing care on their patient even when they are out of sight from patient.

IndexTerms: Electronic Health Record, Clinical Decision Support System, Transaction Success Probability, Markov Decision Process (MDP), Health Inpatient Care (HIC)

I. Introduction

A. Overview

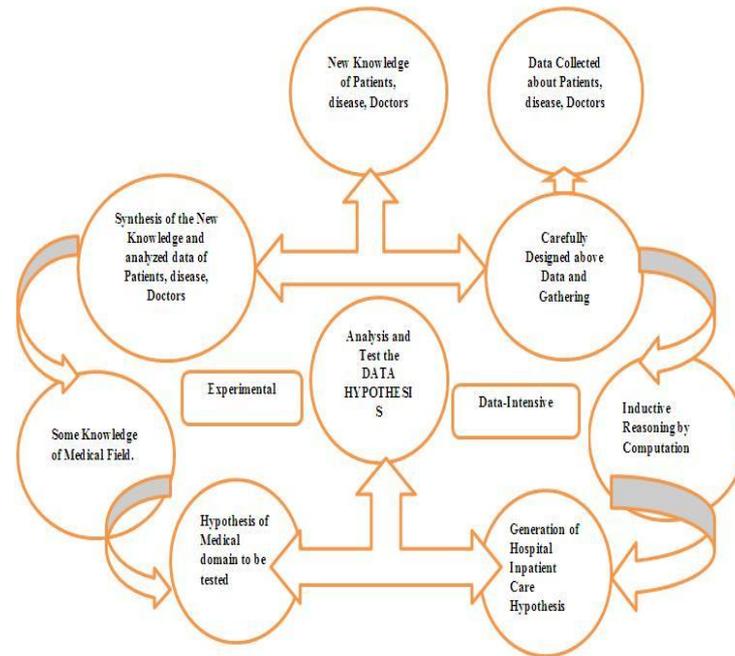
The process of data analysis from various views and making its summary into beneficial data is known as Data mining. The software for Data mining fits in a number of logical tools for data analysis. The system of health care generally comes up with various challenges that include drug addiction, unaffected and health center obtained infections and non-fulfillment of delivering care and improper care implementation and non-fulfillment in adopting good practice for safety performances and preventive care. The biggest demand for data mining is to precisely make an impact on a process of the bio-medical research, making researchers enable for creating theory of novel to answer the cardinal question. Formulating of general and flexible way for the integration of mixed knowledge and data source in its research is difficult to remember and depended highly on the particular fundamental research questionnaire.

The data mining's real effect is known when it goes further of emphasis on the warehousing and extraction methods, and in to the real effect that could enable in making comprehends of the underpinnings molecular of bio logical process. In order for the discover of the optimistic path for the integration of pertinent details which would be helpful in and clinical and translational discoveries pinpointing the findings of novel, in order to understand the process of decision by the help of current discoverers finding the discoveries as put forward by automatic system that is required. Nevertheless, at current level nothing much is understood regarding how researchers literally interpreting the details.

As MDP technique is implemented for improving the standards and reducing the cost of HIC. The condition of patient who needs to get admitted to hospital is known as Inpatient Care. The ready use of medical technologies such as vent, defibrillators, dialysis, chemotherapy, surgery, and pharmaceuticals permit people to survive disease-related events such as heart attacks, and draw out the life of those suffering from incurable illness. EHR also known as Electronic Health Records had the wide availability because of the guideline of the HITECH Act also known as Health Information Technology for Economic and Clinical Health Act that offer the motivation to providers of health care for adopting electronic health records to advance the processes at clinic and improves the outcome [1]. Moreover another approach which may improves the care of patient focus on statistical learning method of machine for finding the abnormal pattern in huge quantity of data of health care. Currently we have a well-develop collection for learning method of machine that relies on scanning of fast subset in order to search the pattern in huge data set, in efficient way and find out data record subsets.

The Figure 1 Data-Driven and Knowledge-Driven Approach to Science illustrate a model for extracting the New Knowledge in Medical Technology in the Process of Data Mining. It Emphasis various process undergoing in Mining the data and Explore the Significant Knowledge.

Fig.1. Data-Driven and Knowledge-Driven Approach to Science for HIC



B. Problem Statement

Relatively Data mining is a field of new research whose chief goal is to get information from tremendous amount of data. A major effect for evaluating tools of data mining in applications of health care and medical for tool developing which could be helpful for making accurate and timely decision. The objective of such evaluation for discussing the magnitude and part of the area of discovery for predictive mining of data and framework proposed that can manage the problems of evaluating and making use of models of data mining in clinic health care. Based on fast subset scanning to detect patterns in big data sets a variety of machine learning algorithms has been developed. In the setting of patient care, our initial linchpin is to find out abnormal care pattern which impact the treatment of patient and non-profits like Health Care Cost Institute had devoted in giving insurance of health data that asserts the objective of minimizing the cost use up improving the standard and coverage availability. Supply descriptive sources, highly multivariate data for a large patient population and time stamped that empowers the utilization of artificial intelligence technique to care connect outcome and practice. In an Existing Technique Electronic Health Record leads to Complications such

The possible risk of patient’s privacy destruction has been noteworthy legal and moral consequence, needing utmost caution in utilization data of health due to this flowchart. The complexity and size of data and the format and content variability among various provider, its type of data and setting for care that will hugely create challenges.

C. Objectives

We analyze the problem of improving inpatient health care system and providing antibiotic suggestion based on doctor’s report. Design of a database is the procedure of promoting a data model featuring database. This model involving logical data needs all the physical and logical choices of design and storage of physical parameter that needs to create design in a DDL that could be utilized for database generation.

We build a system which would be detecting considerable variation automatically that cares among the group which had considerable impact on the outcome of patient.

Challenges group is presented by making utilization of enormous amount of data streaming for monitoring real time of safety and health of patient.

The effect of sub classification on the score of propensity in bias removing, and balance the property of scores propensity with data that is not complete.

II. Related Work

A. Solution and Mechanism

The basic role of Artificial Intelligence while taking care of patient had been mainly in diagnosis of

patient and analysis of image, the upcoming act on greater act on for Artificial Intelligence applied for improving various perspectives of process of patients care. Consider the example that includes personalized treatment for maximizing efficiency and reducing the after effect, approving correct sequence of diagnosis test, by looking at health and safety of population of patient, and finding knowledge of medical which could have direct impacts on care standards. However such technique enables the efficient and accurate abnormal detection

Fig. 2. System Architecture

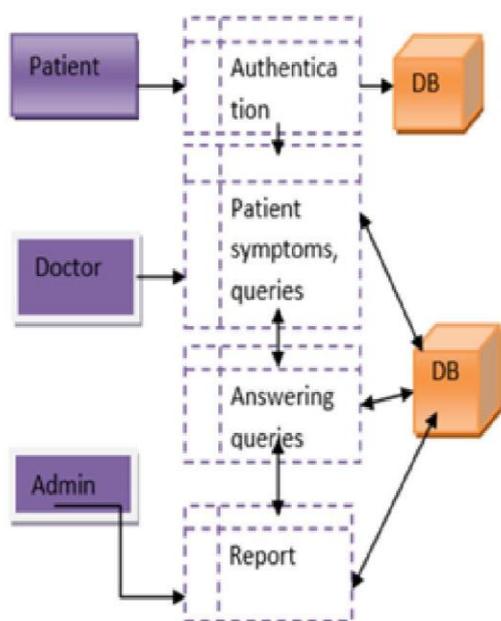


Fig. 3. Report generation in web application



Figure: report generation in web application.

Bill_No	Patient_ID	Report_ID	Bill_Amount
1	PatientID1000	PCRRPTID1000	1500.00
2	PatientID1000	CBCID1000	1600.00
3	PatientID1000	ECHOID1000	1600.00
4	PatientID1000	ECHOID1000	1600.00

patterns in sets of general data, different crucial test remains for an applications in identification of abnormal care patterns of patient. We would like in identifying the patterns of patient care which is not corresponding with the outcome, yet like to be the informal factor that outcomes the influence. Now we are developing the system which would be detecting substantial variation automatically in care among the group which had notable impact on the outcome of patient. Victory Challenge are pertinent to domain of health care that involves the capability for incorporating massive volume of not structured text details such as medical literature, patients electronic health records and more, answer to queries in natural language, enrich the performance by user interaction learning and supplying the probabilistic reasoning to support clinicians in creating evidence based decisions. Figure System Architecture illustrates the Data Flow between the patients, doctor, and admin. The patient gets the authentication and came to know about their disorders from web application through database. They can consult doctors through web application and doctors identify the patient disorders they answer the queries asking by patients. At last the admin report about the patient queries and it will be hosted in the web application.

B. Ad-Hoc Algorithm

Ad-Hoc Algorithm is a powerful yet insufficient algorithm for Markov decision process since it put the most of the efforts assisting full space of state that turned out to be not required in much of the case. For overcoming of such a difficulty, different ways were put forward. These method use analysis and heuristic search to avoid some unnecessary backups.

We considered the Markov Decision Process (MDP): $M = (S, A, P, R, \gamma)$. Given a state s_i , the probability of a transition to a state s_j given action is given by P_{ij}^a and results in an expected reward of R_i^a . In this uncontrolled case, we use P_{ij} and R_i to stand for the transitions and rewards [2] (taken as it is from [2]).

Algorithm 1: AD-HOC ALGORITHM: It uses a Clinical Decision Support which is value-function-based method often analyze the error of a value function V in terms of the one-step lookahead error, V is current value and P is next value for the corresponding states of function, γ is discounted reward

```

STEP 1: Input: an MDP  $M$  the threshold value
STEP 2: Initialize  $V$  arbitrarily
//OUTPUT: Analysis Report.
//INPUT: Patient's Electronic Health Record (EHR),
//Electronic Medical Record (EMR)
a. Send Analysis Report
b. Submit EHR or EMR
while each state  $s \in s_i$  do
    1. Calculate the Bellman Error BE
        
$$BE(V[s_i]) = R_i + \gamma \sum_j P_{ij} \times V[s_j] - V[s_i] \quad (1)$$

    2. Calculate bellman residual  $V[s_i]$ 
        if  $BE \geq V[s_i]$  then
            return  $V[s_i]$ 
    
```

III. Methodologies and Algorithm

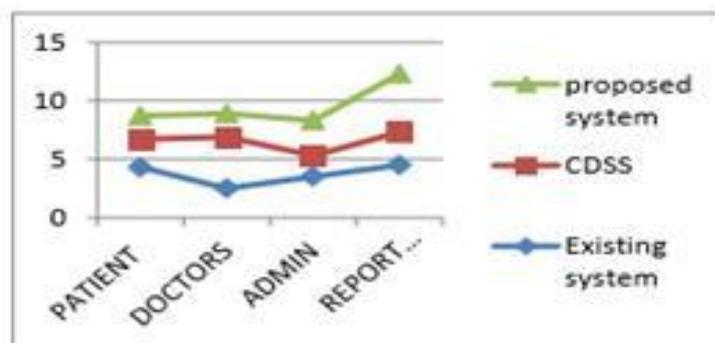
We analyze the problem of improving inpatient health care system and providing antibiotic suggestion based on doctor's report. Sensitive analysis is guided to concentrating on inpatient health care and supporting artificial intelligence of queries based, report based antibiotic advice, by using ad-hoc algorithm. The methodologies include

Algorithm 2: GIVEN INPUT AND EXPECTED

```

OUTPUT
for AUTHENTICATION do
Input: User identities such as Username, Password.
Output: Granting Access privilege
for PATIENT MODULE do
Input: Patient Profile Information such as contact number, address, etc.
Output: Granting Access privilege to the particular user.
for DOCTOR MODULE do
Input: Doctor Profile information such as contact number, address, etc.
Output: Granting Access privilege to the particular user.
for IN PATIENT CARE do
Input: User has to know the records.
Output: User Records will have been updated by doctors. .
for ADMIN MODULE do
Input: Admin Profile information such as contact number, address, etc.
Output: Granting Access privilege to the particular user.
for APPOINTMENT SHEDULING do
Input: User has to request Appointment.
Output: Admin check and give appointment to patient.
    
```

Fig. 4.Doctors identification, Clinical Decision Support Systems (CDSS) and proposed system



IV. Simulation And Results

The new head ways in learning of machine and Artificial Intelligence builds the anticipating the model and making real time inferences from a huge population of patient for the purpose that includes alert, predicting the length of stay and stratifying risk. Most of approaches anchor on censorious care, utilizing psychosomatic data which are recorded routinely in ICUs. In the proposed system AI along with clinical decision support system using Ad-hoc algorithm Provide a significant application to both the in-patient care units and the doctors.

The inpatient care and the doctor's viewing the patient disorders through web application. Then the queries in the particular patient record will be forwarded to the report generation. This web application gives the primary awareness to the patient to know about their disorders to doctors through this web application.

The graph in Figure 4 illustrates the doctor's identification much easier through web application using Ad-hoc algorithm. The existing system provides increase efficiency in inpatient care application.

V. Conclusion And Future Enhancement

This paper produces upcoming way which may improves care of patient that focus on statistical learning method of machine for finding abnormal pattern in massive quantity of data of health care. It could identify the self-similar subsets of data record and combinations of attribute value which enable identifying patient care patterns. As part of our future work, the upcoming work hold the huge prospective for making use of Artificial Intelligence for improving much of the aspect in the process of HIC. Consider this ex-ample as a future improvement, we planned to allocate the doctors for patient generated by application itself, involve personalized treatment for maximizing the outcomes and reducing after effect, approving correct sequence of diagnostics test, observing safety and health of patient populations, and searching the knowledge of medical which could make direct effect on the care quality and allocating with time schedule.

References

- [1]. Neill, D.B.: Using articial intelligence to improve hospital inpatient care. IEEE Intelligent Systems (2013)
- [2]. Ronald Parr, G.T.C.P.-W. Lihong Li, Littman, M.L.: An analysis of linear models, linear value-function approximation, and feature selection for reinforcement learning. Proceedings of the 25 th International Conference on Machine Learning, Helsinki, Finland (2008)