IJCSE International Journal of Computer Sciences and Engineering Open Access
Research Paper Volume-5, Issue-8 E-ISSN: 2347-2693

An Effective Patient Treatment Plan Recommendation with Predicted Treatment Time Using Hadoop

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Available online at: www.ijcseonline.org

Received: 11/Jul/2017, Revised: 25/Jul/2017, Accepted: 17/Aug/2017, Published: 30/Aug/2017

***Abstract*—**satisfactory patient queuing system to limit patient waits and patient congestion is a specific problem confronted by most of the hospitals. Unavoidable and irritating waits for prolonged intervals result in generous human efforts, misuse of time and also raise the dissatisfaction persisted by patients. For each individual in the line, the absolute treatment time of overall patients leading him endures the time that fellow should stay. It could be helpful and ideal if patients could have the knowledge about the treatment design and learn the foreseen time for holding up. Thus, a Patient Treatment Time Prediction (PTTP) method is used to estimate the delay time of treatment activities for an individual. We make use of patient factual records of different clinical centers to get a person's treatment time consumption procedure for each treatment duty. Over the vast extent, and practical data set, the treatment time for an individual in the line of each operation is anticipated. Build upon the forecast delay time, a Queuing Recommendation (QR) process is produced. Queuing Recommendation framework computes and predicts the proficiency and helpful treatment schedule prescribed for the patient. To accomplish this, patient records are collected from different clinical centers and stored in the Hadoop environment. Enhanced Random Forest (RF) technique is used to educate the treatment time consumption. Thus, every individual in line can be suggested completing their treatment activities in the easiest way and with the appropriate time.

***Keywords*—**Waiting time, PTTP, Queuing Recommendation, Random Forest, Hadoop

I. INTRODUCTION

Right now, hospital administrators are having pressure on patient queuing system. In most hospitals, patient ought to take a line to wait for so long as they get the chance to obtain the remedy from health care personnel. This is the traditional fashion, accompanied by a maximum of hospitals. However, prolonged queues are undesirable and needless burden to the public in addition to the hospital staff. This hassle inspired the studies to broaden a patient queuing system to restrict the amount of time wasted for the patients involved.

Waiting time estimation and an effective therapy plan form a complicated task. As a patient undergoes in numerous treatment activities, which includes a casual check-up, tests like scanning, blood test, x-ray consistent with their situation. So each therapy may have a different time necessities and also an individual may need to wait in diverse queues for specific treatment responsibilities.

For solving the issues related to patient waiting times, an effective patient queue management system should be made to help the hospital administration. To be able to finish the needed treatment in a shortest duration of time and to avoid lengthy waits, there is a need to determine the duration of treatment activity in actual time. Therefore, a patient treatment time prediction (PTTP) [1] process has to prepare to estimate the delay time for patients. As mentioned before that for each individual in line, the calculated treatment time of the considerable range of patients before him is the time that he or she should stay in the line. Stand on this fact the time need to wait for all treatment activities is anticipated by PTTP which is the aggregate of each individual treatment time consumption at present queue. With the anticipated wait times a QR framework is created.

To accomplish this, the PTTP process cantered on hospital's historic records. The majority of the records of hospitals are huge, distributed and unstructured. Handling and evaluation of these records from diverse hospitals are in reality a tough job. And also clinics generate a big quantity of data each day. Those facts keep an amazing price to a workflow control, scientific statistics in the health care enterprise. However, the complexity and sensitivity of patient information underscored the boundaries of conventional data evaluation, storage and processing. Therefore, new and effective technologies consisting of cloud computing, data discovery strategies are important to accumulate and acquire expertise underlying big data.

Section I contains the motivation and introduction to the proposed work. Section II contains previous studies on classification and regression techniques and also processing of big data using Hadoop storage. Section III presents the proposed model of Queuing Recommendation which uses PTTP method. Section IV explains the implementation of modules to build Queuing Recommendation framework, and shows some important simulation results. And also reviews the performance of the Queuing Recommendation framework by comparing the previous results. Section V concludes the overall research work with future directions.

II. RELATED WORK

To strengthen the definiteness for data research with constant components, different advanced techniques are offered for grouping and regression.

Tyree, Paykin, Agarwal and Weinberger [2] have imported a backsliding tree theorem for parallel enhanced network search grouping.

Breiman (2001), gives the method of random forest is a classifier algorithm through a choice tree, which is an appropriate algorithm of information discovery for big data analysis. And it is broadly used as a part of many fields, for example, quick activity recognition clearly by selective voting for random forest and TOP-K sub volume research [3], hearty and exact shape display coordinating utilizing random forest relapse voting [4], and a major information explanatory system for distributed botnet location also uses random forest. The trail brings about these papers exhibits the viability and naturalness of the method. Bernard (2012) has given a dynamic preparing technique to strengthen the precision in the calculation of random forest.

In the research of Wang, Ding and Dong (2016) taking into account weighted tree a method of random forest was proposed to order high-dimensional riotous information. Nonetheless, the first irregular timberland calculation utilizes a conventional direct voting in the voting procedure. In that case, Biau (2012) reviewed that, the random forest containing riotous choice trees would likely prompt a false prediction value about test data set.

Distinct recommendation models have been adapted and given in relevant areas. A navigation recommendation scheme that discovers individual properties and navigation-class verities given in Cheng, Chen and Hsu (2013) reviewed papers. But there is no sufficient algorithm to evaluate therapy consumption time in the current studies.

Adomavicius and Tuzhilin (2005) [5], presented an outline of the existing suggestion strategies, for example, content-based, community oriented, and half proposal approaches. The quickness of information discovery and examination for enormous information is an imperative feature [6].

Distributed computing, disseminated registering, and supercomputers offer fast figuring power. [7] States that Apache Hadoop is leading cloud staging which generally utilized as a part of parallel processing and information examination.

III. PROPOSED MODEL

Here, we concentrate on fulfilling the patient requirements that are finish medication activities in predictable time and an efficient therapy plan for queuing and avoid stressful lines in hospitals. We utilize enormous suitable info from different clinical centres to emphasize a person therapy time utilization mechanism. The feasible individual records are studied deliberately and thoroughly over vital parameters, for example, treatments begin time and end time, precise therapy content, individual age for each unique treatment activity. We distinguish and figure diverse waiting time circumstances for various patients over their activities and situations while receiving treatment.

To accomplish this, we make use of the process of Random forest to educate the therapy time consumption on each person and time traits. Later we develop the PTTP mechanism. As patient therapy time consumption is a repeated variable, a classification and regression tree (CART) [8] [9] version is taken as meta-classifier that canters the RF process. Due to the shortcomings of the original RF and the factors of the individual record, RF algorithm processed in four elements to get powerful outcomes from high dimensional, repeated nature of therapy time, huge volume and riotous patient data. The PTTP on progressed RF process has symbolic advantages in terms of efficiency and performance when it compared with the initial RF process. Thus, PTTP process is modeled by employing an enhanced RF algorithm to calculate the individual wait time.

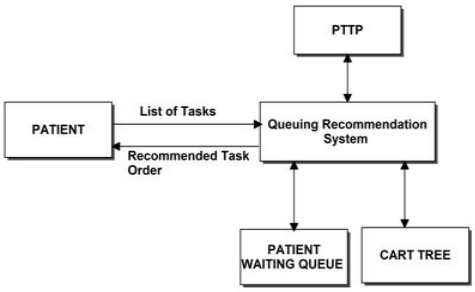

Figure1. Proposed Model

Algorithm
Input:
X: Current patient's treatment record.
The processed PTTP model based on RF algorithm

Output:
The scheduled tasks with estimated waiting time
Steps followed
1: For every treatment activity in the record X
2: Create an array to keep patient list for individual task
3: Estimate the treatment time for every task of patient from PTTP algorithm

4: Aggregate the predicted waiting times
5: Append the calculated waiting time to the list
5: Sort the list in ascending order.
6: Insert records of the dependent treatment tasks (if any) before the present task.

Therefore, the therapy time utilization of individual in the line is evaluated by the prepared PTTP mechanism. The entire wait time for each assignment at the present time can be anticipated, like to patient$_1$ {T_A=25(min)}, T_B=35(min)}, and {T_C=30(min)}. Then tasks are arranged in an increasing series as per the estimated wait times. A queuing proposal is performed for every individual at the queue, such as suggested queuing to patient1 is {A; C; B}, and patient2 is {A; C}. Hence as per the requested treatment activities by patients a Queuing-Recommendation (QR) scheme assigns an adequate and helpful therapy design with the estimated wait times for patients.

IV. RESULTS AND DISCUSSION

Implementation: Implementation deals with system layout that explaining the arrangement, units, interfaces, and features of a system to reach specific needs. In this project we are designing a Queuing advice framework for patients to reduce their wait times at clinics. To achieve the indicated work, PTTP mechanism is implemented using Hadoop storage. Different interfaces designed to serve the required input to the implementing algorithm and obtain the treatment schedule as output for patients.

A. Admin module:

Admin is a permitted character to the system who manages queue for the hospital. Admin can add the trained data set as input to the PTTP program such as patient age, gender, undergoing tests. This trained information firstly must be gathered and stored through hadoop in manual way by the admin before execution of the algorithm.

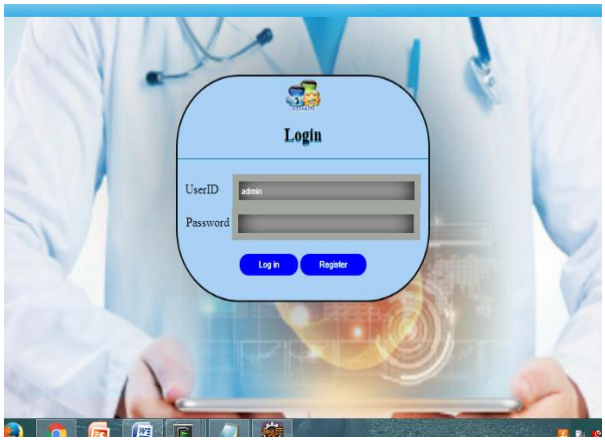

Figure 2. Admin Login

Figure 3. Adding Patients to the sysytem

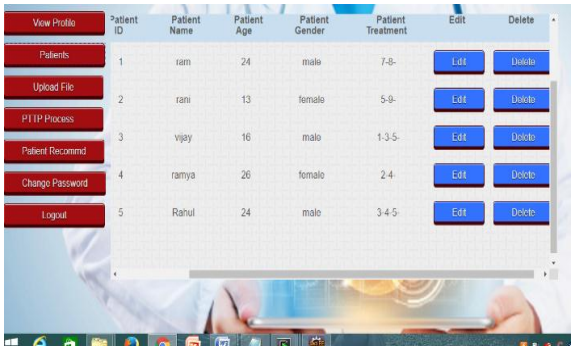

Figure 4. Patient Details

B. PTTP process module:

From the input data, which is inserted by the admin, patient assigned treatments will be considered. The accurate waiting times are calculated by processing the trained data set entered as input and the previous patient treatment times along with the current registered patient information on the current queue line. Based on the priority over the treatments, and the average treatment time and the gender of the patient, new treatment slot will be recommended with appropriate wait time.

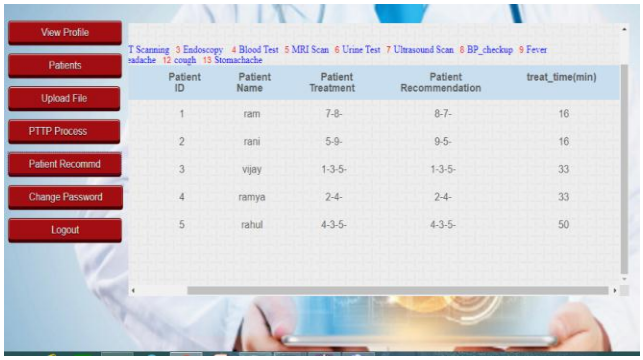

Figure 5. Patient Treatment Plan Recommendation with Predicted Treatment Time

Experimental Results: To review the performance about our QR framework a study on common delay times for patients having QR instances and not having QR instances

are observed. The conclusion of the study is given in the figure described by a graph. It is simple to discover from the figure that the choice of the common delay time for individuals with instances of having QR is higher than the instances of not having QR.

Furthermore, the more medication activities are required for every individual is 2, the common delay time of an individual is almost 18 minutes in the absences of QR, while 16 minutes by the presence of QR. If there is a need of six medication activities it is about 76 minutes for the first case, while 53 minutes for the second case.

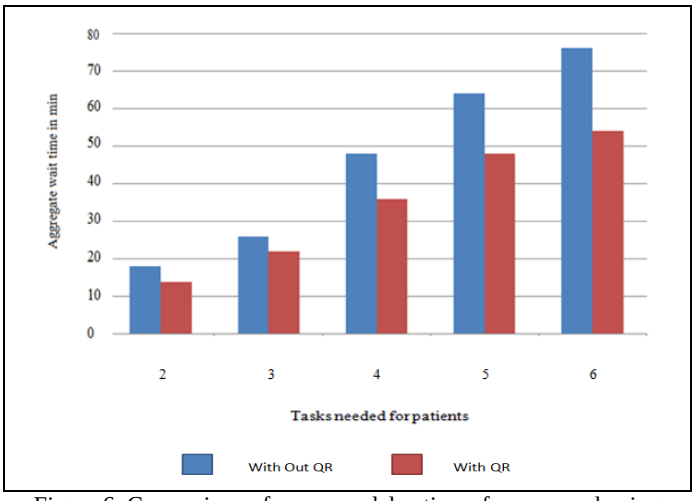

Figure 6. Comparison of common delay times for persons having QR and without QR

V. CONCLUSION AND FUTURE SCOPE

In this project, an effective Queuing system has designed by PTTP mechanism. An enhanced method of random forest utilized to prepare the PTTP design and using Hadoop framework to store the huge patient data. The developed system produces the precise wait time and more favourable treatment schedule for patients in the hospital queue to avoid waiting hassles. This system can improve patient satisfaction and also improve hospital services.

With rapid inventions and growing web population, data is increasingly being produced every second. Consequently, the capacity of the data assessment is not always constrained to the study of archival data. It is suitable if regularly update the mining results. Thus an incremental version of PTTP mechanism over streaming data is usually recommended as further work.

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