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Hospital Queuing Recommendation by Using Patient Treatment Time Prediction Model

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Abstract— Now a days, to minimize patient wait delays and patient overcrowding is one of the major challenges faced by hospitals, mostly used Effective patient queue management. Annoying waits for long periods result in substantial human resource and time wastage and which increase the frustration endured by patients. The total treatment time of all the patients before him is the time that he must wait for each patient in the queue. It would be favorable and excellent if the patients could receive the most efficient treatment plan and know the adumbrated waiting time through a mobile application that updates in real time. Hence, we propose a Patient Treatment Time Prediction (PTTP) algorithm to predict the waiting time for each treatment task for a patient. To develop such idea, we use realistic patient data from various hospitals to obtain a patient treatment time model for each task. The treatment time for each patient in the current queue of each task is anticipated which us based on this large-scale, realistic dataset, similarly based on the predicted waiting time, a Hospital Queuing- Recommendation (HQR) system is developed. HQR appraises and calls an adequate and convenient treatment plan recommended for the patient. Realistic dataset and the requirement for real-time response, which is result of the large-scale, the PTTP algorithm and HQR system decree competence and low-latency response. We use an Apache Spark-based cloud implementation to achieve the aforementioned goals. Extensive experimentation and simulation results establish the effectiveness and appropriateness of our proposed model to recommend an effective treatment plan for patients to curtail their wait times in hospitals.

Keywords— Apache Spark, Patient Treatment Time Prediction, RF (Random Forest) Algorithm, CART Algorithm.

I INTRODUCTION

Currently, most hospitals are jam-packed and lack effective as patient queue management. As each patient might require different phases/ operations, such as a checkup, various tests, e.g., a sugar level or blood test X-rays or a CT scan, minor surgeries, during treatment, now a days, patient queue management and wait time prediction form a challenging and complicated job. Each of these aspects /operations are going to known as treatment tasks or tasks in this paper. Each treatment task can have changeable time concerns for each patient, which makes time prediction and recommendation highly complicated. A patient is usually required to undergo examinations, inspections or tests according to his condition. In such a case, more than one task might be required for each and every patient. In most of cases, some tasks are independent, while others might have to wait for the completion of dependent tasks. Most patients must wait for unpredictable but long periods in queues, in waiting mode for their turn to accomplish each treatment task. In this paper, we focus on helping patients complete their treatment tasks in a predictable time and helping hospitals schedule each treatment task queue and avoid jam-packed and futile queues. We use extensive realistic data from various hospitals to develop a patient treatment time consumption model. The realistic patient data are analyzed anxiously and precisely based on important parameters, such as patient treatment start time, end time, patient age, and detail treatment content for each different task. We establish and appraise different waiting times for different patients based on their conditions and operations performed during treatment. e.g. surgery or plaster can't be done sooner X-rays. T asks {*A*,*B*,*D*} are required for *Patient*1, at that time task *D* must wait for the completion of *B*. Tasks {*E*,*B*,*C*, *A*} are required for *Patient*2, and tasks {*ad*, *E*,*C*} are required for *Patient*3. Moreover, there are different numbers of patients waiting in the queue of each task, for example, 5 patients in the queue of task *A* and 3 patients in the queue of task *B*. In this paper, a Patient Treatment Time Prediction (PTTP) model is trained based on hospitals' factual data. The waiting time of each treatment task is anticipated by PTTP, which is the sum of all patients' waiting times in the ongoing queue. Then,

according to each patient's requested treatment tasks, a Hospital Queuing-Recommendation (HQR) system recommends an adequate and comfortable treatment strategy with the infinitesimal waiting time for the patient.

II METHODOLOGY

a. Acquiring input data that is outcome of different procedures, tasks and strategies: medium sized Hospital has the capacity of 9000 to 15000 number of patients per day depending on certain statistics and figures while 120000 to 200000 are number of treatment records that is input in hospital database. These inputs are gathered from many procedures conducted in a medical institution like medical examination or tests of a patient, registration of admission procedure, Drug Delivery, inspection, discharge card information of patient, prescription of patient, payment of bills and many other procedures. Various database formats are used to store the input data for different treatment procedures.

b. Selecting the data dimensions that are unique: The input data which is generated inside a hospital under treatment procedures from various tasks are created in different contents and different formats in addition to the various dimensions. We have to decide on correlative features of the input data in order to train the model for the time employment of a patient for each procedure which is already conducted. The information can be a patient's card number, gender, age of the patient, date of birth of patient etc. The information related to the treatment procedure and the time taken for treatment or task can be another feature. There are more innovative aspects of the treatment data which will not be taken for the reason that they are useless to the PTTP algorithm which we are going to use in our project. These include data such as name of the patient, telephone number or address, gender, age of patient or date of birth of patient etc.

c. Calculation of feature variables that are new to the input data: many features that are vital to the input data has to be calculated in order to train the PTTP model. These attributes or features include the consumption of time taken by a patient for every treatment procedure that is going to apply, the time of the treatment such as the day or date and the time range or treatment that is conducted.

III ARCHITECTURE DESIGN

In this project, a Patient Treatment Time Prediction (PTTP) model is trained and which is based on hospitals' historical data. The waiting time of each treatment task is calculated and finally predicted by PTTP, which is the summation of all patients' waiting time in the present queue. Then, according to each patient's requested treatment tasks, a Hospital Queuing-Recommendation (HQR) system recommends an adequate and agreeable cure plan with the least waiting time for the patient.

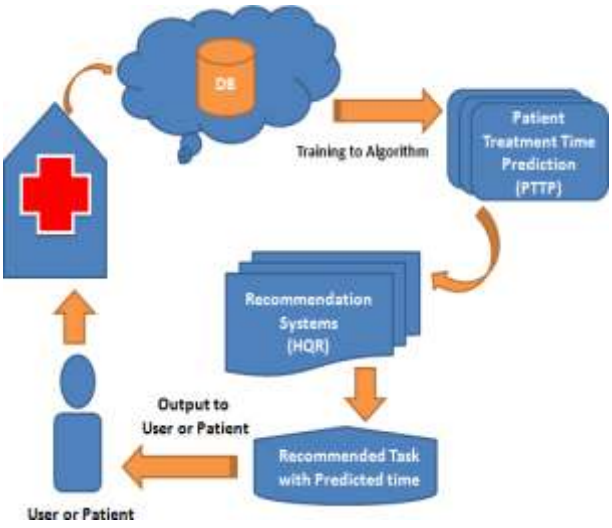

Figure 1. System Architecture.

IV ADVANTAGES

1. Reduces the patients waiting time.
2. Help to manage hospitals schedule each treatment task queue.
3. Avoid jam-packed and ineffective queues.

V CONCLUSION

In this paper, we have presented an technique a PTTP algorithm which is supported huge data information and so the Apache Spark cloud environment is planned. A random forest optimization algorithm is behaved for the PTTP

model. The queue waiting time of each treatment task is supported the trained PTTP model. A parallel HQR system is developed, and which is a economical and convenient treatment plan is suggested for each patient. Comprehensive experiments and application results show that our PTTP algorithmic rule and HQR system succeed high skillfulness and performance.

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