Patient Treatment Time Prediction for Out Patient Department OPD
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Abstract:
The hospitals are becoming major parts of people's life. The number of patients visiting hospitals increases everyday due to more health consciousness among people. Nowadays the Out Patient Department (OPD) services of most of the hospitals are facing long queues and waiting time problems which result in patients' dissatisfaction. For each patient in the queue, the total waiting time of all the patients before them is the time that they must wait. The waiting time for consultation and further checkups and tests in hospitals are one of the main reasons behind patients to unavail the services of that particular hospital. It will be more convenient and preferable if the patients could receive the most efficient treatment plan along with the predicted waiting time of their consultation time to their corresponding doctors on their mobile applications in real time. So we create time prediction algorithm in order to accurately calculate the patient's waiting time and also implementing another secure method for viewing the prescription information on individual patient's mobile application. Through this system the doctors can upload the patient's prescription information to server database, that data is encrypted using AES algorithm for high security. The patient can view their prescription information by logging to their mobile application.

Index Terms: Apache Web server, Token Generation, Time Prediction Algorithm, GCM

I. INTRODUCTION
The medical field has made remarkable progress in end of twentieth and the initial twenty first centuries. This progress is a health society is possible. This emerges high specialized hospitals for serving patients. Nowadays most of the hospitals are overcrowded with patients (majorly out patients) who were visiting on each day. This overcrowding is due to lack of effective OPD queue management system in hospitals, which is due to waiting time prediction of each patient with their treatment timings that doctors takes and other tasks such as scanning, pharmacy, testing, etc. This is a challenging and complicated job for calculating the timings because every patient in OPD queue may come for just consultation of doctor, check-up, treatment, etc., Each treatment task can have varying time requirements for each patient of different age groups. For instance consider three patients (patient1, patient2, patient3) and a set of treatment tasks can be dependent on previous one, e.g., surgery or bandage cannot be done before X-rays. Tasks \{t1, t2, t4\} are required for patient1, whereas tasks t4 must wait for the completion of t2. Tasks \{t5, t2, t3, t1\} are required for patient2, and tasks \{t4, t5, t3\} are required for patient3. Moreover, there are different numbers of patients waiting in the queue of each task, for example 7 patients in queue of task t1 and 5 patients in queue of task t2. In this paper, this algorithm model is trained based on hospitals historical data. The waiting time of each treatment task is predicted by this algorithm, which is the sum of all patient’s waiting times in the current queue. Then, according to each patient’s requested treatment tasks, this hospital system recommends an efficient and convenient treatment plan with the least waiting time for the patient. To compute all of the required treatment tasks in the shortest waiting time, the waiting time of each task is predicted in real-time. Because the waiting queue for each task updates, the queuing recommendation is recomputed in real-time. Therefore, each patient can be advised to complete his treatment activities in the most convenient way and with the accurate waiting time.

Abbreviations and Acronyms (to be edited)

A. OUR CONTRIBUTIONS
In this paper, we propose an algorithm for calculating the accurate time prediction of hospital treatments of individual patients and followed by collectively, this algorithm can make use of huge trained data sets of calculating the waiting time of patients in OPD queues. Considering the real time requirements, enormous data of various individual hospitals, and complexity of the system, we make the use of big-data and cloud computing techniques for more efficiency and scalability. The huge data sets of hospitals are stored in a server which can be accessed through internet, for temporary storage of user data when main server turned off and token update to user mobile when it’s switched off is done using the Google cloud manager. The GCM is used for push notifications in android mobiles. For the secure storage of patient details and their prescriptions the AES algorithm is used for encryption and the decryption.

II. RELATED WORK
Capacity Reservation and Cancellation of Critical Resources. This paper addresses the design of contract for reserving the
We choose the accuracy as the index that notes tree's classification ability and set it as the tree's weight. Leveraging community-contributed data for personalized recommendation is one of the active research problems since there are rich contexts and human activities in such explosively growing data. In this work, we focus on personalization travel recommendation and show promising applications by leveraging the freely available community contributed photos[15]. We propose to conduct personalized travel recommendation by further considering specific user profiles or attributes as well as travel group types. Instead of mining photo logs only, we exploit the automatically detected people attributes and travel group types in photo contents. By information theoretic measures, we demonstrate that such detected user profiles are informative and effective for travel recommendation especially providing a promising aspect for different locations and their travel path. A probabilistic Bayesian learning framework which further entails mobile recommendation on spot is introduced as well. We experiment on more than 10 million photos collected from 19 major cities worldwide and conduct the extensive investigation of profiling activities in communities according to temporal and spatial information. The experiments confirm that people attributes of individual and groups are promising and orthogonal to prior works using travel logs only and can further improve prior travel recommendation methods especially for different predictions by further leveraging user contexts via mobile devices. The Existing random forest has less accuracy with highly noisy data. To overcome above problem the new algorithm is implemented by weighting the trees in random forest to increase accuracy.

III. ALGORITHM

Our algorithm is proposed based on both patient and time characteristics. This algorithm is processing on trained datasets from the massive and noisy hospital treatment data.

A. PROBLEM DEFINITION AND DATA PREPROCESSING

1) PROBLEM DEFINITION

Prediction based on analysis and processing of massive noisy patient data from various hospitals is a challenging task. Some of the major challenges which faced are following:

(1) Most of the data in hospitals are massive, unstructured, and high dimensional. Hospitals produce a huge amount of business data every day that contain a great deal of information, such as patient information, medical activity information, time, treatment department, and information of the treatment task. Moreover, because of the manual operation and various unexpected events during treatments, a large amount of incomplete or inconsistent data appears, such as a lack of patient gender and age data, time inconsistencies caused by the time zone settings of medical machines from different manufacturers, and treatment records with only a start time but no end time.

(2) The time consumption of the treatment tasks in each department might not lie in the same range, which can vary according to the content of tasks and various circumstances, different periods, and different conditions of patients. For example, in the case of a CT scan task, the time required for an old man is generally longer than that required for a young man.
(3) There are strict time requirements for hospital queuing management and recommendation. The speed of executing the model is also critical.

**Algorithm 1: calculation of average time**

Input:
- `table-name`, `department`

Output:
- `average-time`

Process:
- TRY
  - `connect->database(table-name)`
  - generate resultset
  - resultset<->executeQuery
  - resultset to integer
  - return resultset
CATCH
- `sqlexception`

**Algorithm 2: token generation using time prediction**

Input:
- `average_time`, `name`, `department`

Output:
- `predicted treatment time`

Process:
- IF `average>0`
  - execute `Query(table_name, department)`
  - `current_time<->calculate current time in milli seconds`
  - `total_time<->local_time-current_time`
  - `return total_time`
- IF `total_time>0`
  - `CONVERT total_time to integer`
  - `return converted value`
- TRY
  - `accurate_time<-> current+average_time+time`
  - `connection statement`
  - IF `executeUpdate()>0`
  - generate `TOKEN<-> accurate_time-average`
  - ELSE
  - `return token generation failed`

Our above algorithm 1 deals with the problem of calculating average time of the patient’s history. The input for the algorithm has two important parameters has `table-name`, `patient-department`. The map in java is used for searching the index based on unique value. The workflow process of this algorithm starts with the execution of query using `EXECUTEQUERY` statement and storing it in result set. Finally, the result set is converted to integer and returned. Our algorithm 2 deals with the calculation of the predicted treatment time of patient. The input for the algorithm is average time, name, and department. The output of the algorithm is predicted time. If the current average time is greater than zero then, execute the query statement and calculate the current time in milliseconds. Finally calculate the total time has the subtraction of local-time and current-time. Check the total time for the condition greater than zero. At last convert them to integer. Return the accurate time has the addition of current-time, average-time, time.

**B. DATA PROCESSING**

In this algorithm, the input data given are department, Patients-In-time, patients-Out-time, Phone number. The input data are processed in our algorithm for calculating the accurate waiting time of each patient. The input data for algorithm is given as the trained datasets before executing the algorithm. The In time and out time of each patient in trained datasets are main data processed in out-timing prediction algorithm? The average of the differences of in time and Out time given in datasets are average time.

**C. CHOOSE SAME DIMENSION DATA:**

In this Algorithm, the datasets are classified into different dimensions of data. Thus the algorithm is designed in the way to access the data based on the uniquely identified in datasets. The unique identifier is department name of patient. The patient requesting for token generation is processed in above way. There may be different varieties of datasets found for each patient in hospitals but we suggested same dimension of data from each patient in various hospital departments for entering into our database.

**D. CALCULATING OUTPUT:**

In this algorithm, the output is accurate waiting time for each patient in the OPD queue. The Output is predicted using the trained datasets entered in the datasets as an input and the patient history along with current registered patients waiting time.

**IV. IMPLEMENTATION**

The time prediction algorithm is implemented using java. Various interfaces for this system is created for giving input for the algorithm and output interface on user (patient) mobile applications.

1) **NETWORK MANAGER INTERFACE AND DATASETS**

The network manager interface is created on the website which needs authentication of the network manager. They can insert the trained datasets of the input of the time prediction algorithm such as patient’s gender, age, and treatment in time and out time of individual patient. The network manager can also manage the patient queue of hospitals manually when required. The trained datasets should be stored manually by the network manager before executing the time prediction algorithm.

2) **DOCTOR ADDING PRESCRIPTION:**

The Interface for adding prescription to patient is provided in the web server. The Doctor can add prescription to the patient available now by using window. The Prescription is completely encrypted before storing into the database using AES algorithm for security purpose. Only the particular patient to whom the prescription has been prescribed can be viewed on their personal mobile interface. No other patients from hospital can view the prescription other than the particular patient.
3) PATIENT’S USER INTERFACE:

The patient interface is an android application. In android application has the numerous functionalities for patients as listed,

1) patient new registration

2) patient login

3) Token Generation

V. CONCLUSION

In this paper, Out Patient Time scheduling system is proposed. The system consists of doctor’s interface as apache web server and patient’s user interface has android application. The time prediction algorithm is implemented on the classified patient history (treatment time) and accurate waiting time is predicted for the current patient in Out Patient Department. The prescription adding option is included for doctor, also to ensure security AES algorithm is implemented. The prescription can also be viewed by patients through android application.

VI. REFERENCES

Basic format for books:


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