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CLASSIFICATION AND PREDICTION FOR HOSPITAL ADMISSIONS THROUGH EMERGENCY DEPARTMENT

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Abstract- *Crowding within Emergency Departments (EDs) Can have serious negative effects on patients. EDs need to explore the use of novel approaches to improve patient experience and reduce overcrowding. One possible approach is the use of data mining to predict ED admissions using machine learning techniques. We use two algorithms to build the predictive models: Logistic Regression and Random Forests.*

Drawing on logistic Regression, we identify several factors related to hospital admissions including hospital site, age, arrival mode, care group, previous admission in the past month and previous admission in the past year. Practical implementation of the models produced in this study would provide a snapshot of predicted admissions from an emergency department at a given time, allowing for advance planning of resources, and inpatient movement to prevent bottlenecks, as well as analysis of the predicted and actual admission rates When interpretability and key consideration, EDs should consider adopting logical regression models, although GBMs will be useful for giving an accuracy amount.

Key Words: **Emergency department, triage, GBM, hospital admissions.**

1. INTRODUCTION

The main function of emergency department is to treat patients who are suffering from injuries, severe complications or acute serious illness. Emergency departments do not treat people who have come for regular/general checkup. To ensure this a sorting mechanism called triage process is used to give priority to patients. In this critical patients are given importance when compared to other non-critical patients. So, the patients waiting in emergency department may crowd the hospital, and this may have many negative impacts on management, patients, etc; Therefore , there is a need to develop new methods which will help to improve patient flow, prevent overcrowding and reduce the waiting time. All this can be done with the help of various machine learning techniques by predicting the patient's admission.

2. EXISTING SYSTEM

Emergency Department (ED) crowding can have serious negative consequences for patients and staff, such as increased wait time, ambulance diversion, reduced staff morale, adverse patient outcomes such as increased mortality and cancellation of elective procedures. Previous research has shown ED crowding to be a significant international problem, making it crucial that innovative steps are taken to address the problem. There are range of possible causes of ED crowding depending on the context, with some of the main reasons including increased ED attendances, inappropriate attendances, a lack of alternative treatment options, a lack of inpatient beds, ED staffing shortages, and closure of other local EDs. The most significant of these causes is the inability to transfer patients to an inpatient bed, making it crucial for hospitals to manage patient flow and understand capacity and demand for inpatient beds.

3. PROPOSED SYSTEM

It focusses on the use of machine learning algorithms to develop models to predict hospital admissions from the emergency department and the comparison of the performance of different approaches to model development. It draws on this data to achieve two objectives: The first is to create a model that accurately predicts admission to hospital from the Emergency Department. The second is to evaluate the performance of common machine learning algorithms in predicting hospital admissions.

4. METHODOLOGY

When the patient arrives in the emergency department, a triage process is carried out. If the patient is in serious condition then directly to that patient gives emergency medicine if that patient can get cure with it or else taken to surgery. Another case is handled by the ED is that when certain patient arrives in emergency department as during the triage process if patient is declared to be dead, then those patients directly death without giving admission in the emergency department. The working of model is such that, as soon as the patient arrives in the emergency department, a casualty officer does the triage of the patient and meanwhile s/he checks the past history of the patient. If the patient is old, then according to the medical history of the patient, the officer decides whether the patient will get admitted to hospital or not as the records in database contain the complete history such as last time when the patient got admitted, what disease does that patient is suffering, etc. So as the patient is being get treated by the doctor, in that time the inpatient bed is made ready for that

patient. If the patient is new then, that record is added to the database of hospital patients and triage is done.

5. RESULTS AND DISCUSSIONS

Here the evaluation of performances for each algorithm is calculated using confusion matrix. We have got precision, recall, f-1 score and accuracy for classification tasks. The performance metrics score for this dataset is varied with each algorithm. We have got better accuracy for gradient boosting algorithm where there is slight downfall for extreme gradient boosting algorithm. Logistic regression and naive bayes algorithm took the next places respectively. While random forests algorithm scored the least accuracy for this dataset. Without calculating this performance metrics score we cannot decide which algorithm is the best fit for the data set and classifications task. So we have taken multiple options for this task and calculated which one best fits for this classification. For performance we have taken logistic regression and random forests and predicted the admission percentage. We have taken the relative feature importance and predicted the hospital admissions percentage for each attribute. We can plot the line graphs for this relative feature importance, so that we can identify the key attributes that are majorly responsible for the admission count.

6. CONCLUSIONS AND FUTURE WORK

The prediction model for hospital admission involves a survey of different methods. It also comprises of different machine learning algorithms such as logistic regression and random forests machine which are used to predict the hospital admission from emergency department. So, the random forest algorithm performs better when compared to the other. Implementation of these algorithms makes the decision makers of the hospital to plan and manage the hospital resources much more effectively based on the patient flow. In future different models regarding deep learning and machine learning can be used to implement other models.

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