

ITINERARY PREDICTIVE ANALYTICS: DEEP LEARNING BASED PREDICTION OF PATIENTS' FIRST VISIT ITINERARY USING NATURAL LANGUAGE PROCESSING OF PREVISIT CLINIC NOTES

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ABSTRACT

Growing population creates growing healthcare needs, and adequately catering to these needs poses a problem. Majority of hospitals still utilize manual methods for patient scheduling and predicting future appointments, resulting in longer wait times, hospital burnout and inadequate use of resources. A variety of avenues have been explored, including priority patient routing, tele-health, neural networks for improving ER efficiency, predicting no-shows, consultation duration variations, and optimizing operating room utilization. Addressing this issue, a study was conducted using 700 pre-visit notes of pancreatic patients to determine the requirement of endoscopic or biliary procedure. Through natural language processing and traditional or transfer learning algorithms, data could directly be sent to EPIC for nurses to assess in further decision making. Performance of the models was above average with the transfer learning method outperforming the traditional method. Although limited by less dataset and fewer circumstances to test the models on, the results exposed potential for future development with the possibility of patients reporting their chief concerns, in turn analyzed by algorithms, ultimately creating a smooth and effective patient itinerary.

Keywords— Itinerary Prediction, Patient Scheduling, Patient Visits, Natural Language Processing, Deep Learning.

INTRODUCTION

Providing timely access to health care is a significant concern in the United States. Delayed access to health care services can lead to poor health outcomes due to delays in diagnosis and treatment [1]. Waiting on the phone to schedule a physician's appointment or a procedure is an unpleasant experience for the patients. However, it is still a manual process in most health care facilities. Appointment scheduling is the first significant step to delivering efficient and timely health care services and determining patient satisfaction. Various factors affect the appointment systems, including the efficiency of the scheduling staff, patient and physician preferences, and available information technology [2]. Additionally, traditional scheduling systems fix appointments for future dates, which results in patient care time scheduled well in advance. As a result, patient wait times increase, and patients with long wait times tend to miss long-scheduled appointments [3]. Waiting time for procedures or routine healthcare increased recently, leading to overwhelming emergency admissions. Unlike the traditional system, the advanced access appointment scheduling system allows patients to choose their convenient time. A systematic by Rose KD et.al; found that despite the reduction in wait times using advanced access, patients were not satisfied with the scheduling system or overall care [4].