

A Parallel Patient Treatment Time Prediction Algorithm and Its Applications in Hospital Queuing-Recommendation in a Big Data Environment

ABSTRACT

Effective patient queue management to minimize patient wait delays and patient overcrowding is one of the major challenges faced by hospitals. Unnecessary and annoying waits for long periods result in substantial human resource and time wastage and increase the frustration endured by patients. For each patient in the queue, the total treatment time of all the patients before him is the time that he must wait. It would be convenient and preferable if the patients could receive the most efficient treatment plan and know the predicted waiting time through a mobile application that updates in real time. Therefore, we propose a Patient Treatment Time Prediction (PTTP) algorithm to predict the waiting time for each treatment task for a patient. We use realistic patient data from various hospitals to obtain a patient treatment time model for each task. Based on this large-scale, realistic dataset, the treatment time for each patient in the current queue of each task is predicted.

Based on the predicted waiting time, a Hospital Queuing-Recommendation (HQR) system is developed. HQR calculates and predicts an efficiency and convenient treatment plan recommended for the patient. Because of the large-scale, realistic dataset and the requirement for real-time response, the PTTP algorithm and HQR system mandate efficiency and low-latency response. We use an Apache Spark-based cloud implementation at the National Supercomputing Center in Changsha to achieve the aforementioned goals. Extensive experimentation and simulation results demonstrate the effectiveness and applicability of our proposed model to recommend an effective treatment plan for patients to minimize their wait times in hospitals.

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INTRODUCTION

Currently, most hospitals are overcrowded and lack effective patient queue management. Patient queue management and wait time prediction form a challenging and complicated job because 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

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