

Banking Queue Waiting Time Prediction based on predicted service time using Support Vector Regression

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Abstract—Prediction using different machine learning approaches have been applied in the last few decades in different areas and research fields. Waiting time is an undeniable fact for every queue and it is very important to develop a system that predicts its duration in real life with minimum error. In this paper we applied several machine learning algorithms and among them we chose Support Vector Regression (SVR) in a real-life Banking queue dataset that contains real-life queues of multiple Banks where we predicted waiting time for everyone in the queue. Moreover, we have compared the result of prediction using SVR with different classifications and clustering methods such as K-nearest-neighbor and K means Clustering. We have shown the feasibility of applying SVR in prediction of waiting time in banking queues of developing countries for everyone, which is applicable, and it performs well in queue analysis.

Keywords—Support Vector Regression, Regression, Queue Analysis, Waiting Time Prediction, Queue Management

I. INTRODUCTION

Over the years waiting in a queue has been one of the tedious tasks all over the world. People face queues almost every day in their life. We often observe queuing at Public service counters, Hospitals, Immigration Service, Airport Security Check, transport ticket counters. Moreover, waiting in the queue is an uncertain fact people dealing with everywhere as a result a queued person does not have any idea how much time it will cost to complete their task from his/her position in the queue. This waiting time often depends on the service time on the counter.

Prediction on this area has already become one of the most important tasks for this research. Using different machine learning approaches on predefined structured data prediction on queue waiting time can be accomplished. For supervised learning different classifiers such as Support Vector Machine, K nearest neighbor and Support Vector Machines can be used to classify the previous data that can be found through some time frames. Also, some common regression machine Learning Algorithms such as Support Vector Regression and Linear Regression can be used for continuous response value. For unsupervised learning clustering algorithm such as K-means can be used to the system to learn from the dataset by clustering the similar data to separate groups. Moreover, intensive study on the dataset is the main cornerstone for this research. Without

preprocessed well defined dataset it is very difficult to predict certain facts and obtain high accuracy rates.

In this paper we are going to discuss on a research model that have been used for predicting waiting time on a queue based on the service time using different machine learning approaches. Different machine learning approaches on a predefined test dataset have been used [10], which contains different information about the people standing or waiting in the queue. Different algorithms are implemented for evaluation on the same dataset and found significant results on predicting waiting time on a queue for everyone. A comparison between the implemented machine learning approaches for classification, regression as well as clustering are illustrated in this research which provides a very understanding answer to the selection of a proper. As a result, this paper will address a valid and accurate solution to the problem of prediction of queue time which will further help in better queue management.

II. BACKGROUND STUDIES

Among various machine learning approaches used all thought our research, Support vector machine (SVM) analysis is one of the popular tools for classification and regression, first proposed by Vladimir & Vapnik along with his colleagues in 1992 [1]. When SVM is applied to a regression problem it is just termed as support vector regression [2]. SVM regression is considered a nonparametric technique because it relies on kernel functions. Various fields such as time series prediction, approximation of complex engineering analyses, convex quadratic programming and choices of loss functions SVR has been applied in [3]. Delay in queue systems in banking sector has been proposed in [13] where the predictive model had been compared with many other popular methods. The model had been compared with models crafted from Queuing Theory, Deep Learning, Gradient Boost Machine [16] and Random Forest [15]. In [14], a queue probability tool had been proposed for a single line queue.

Prediction using SVR got several significant successes previously along the last decade. Especially for time related prediction with real life data, the algorithm quite huge achievements. In a Precise traveling time prediction with a route guidance system that can suggest optimal alternate route or warn traffic have been proposed in [2] where