

Review on State of Art Data Mining and Machine Learning Techniques for Intelligent Airport Systems

Chamath Malinda Ariyawansa
Department of Computing
Informatics Institute of Technology
University of Westminster
Colombo, Sri Lanka.
e-mail: chamathariyawansa@gmail.com

Achala Chathuranga Aponso
Department of Computing
Informatics Institute of Technology
University of Westminster
Colombo, Sri Lanka.
e-mail: ach.chathuranga@gmail.com

Abstract— It is a generally accepted fact that the Airport is the focal point of the country which creates a lasting impression of its people. The challenge faced by airports today is the complexity of players and processes, and the inability of multiple systems to share and analyze data. In order to face this challenge, many airports have implemented isolated solutions. While these solutions may improve specific processes or functions they are not holistic enough. The airport ecosystem must become more ‘intelligent’ to optimize its supply chain, share real-time information, predict certain outcomes and track, manage and locate all of its assets. So the need of the hour is to create a unified, integrated, resourceful and ready to use platform to make intelligent decisions and assist airports to reach its next level.

The aim of this paper is to review selected data mining techniques that can be integrated in to such system. Entities such as airlines, airport retails sector and the airport itself is considered for this cause and the data mining techniques that can be applied to these entities to improve the current airport systems such as flight delay prediction, passenger profiling, segmentation, association rule mining are discussed to find better approaches for an intelligent airport system.

Keywords—Data mining; Machine learning; prediction; profiling; segmentation; association rule mining

I. INTRODUCTION

An airport is a gateway to a country. The stakeholders of the airport who belongs to all entities handling and servicing air passengers face an uphill task to provide qualitative service. Always they are on lookout of ways means to cut costs and generate revenue and at the same time striving to provide quality service. [1].

According to Bogicevic et al. [2] passenger satisfaction, ideal airport experience and real time information distribution to manage disruptions are the key three business components for airports to be successful commercially and operationally. Passenger self-service to reduce queue time, maximize terminal facilities, tracking passengers using Bluetooth beacons and provide useful information for airport are some examples for isolated solutions adopted by the airports to improve passenger services. These are not holistic enough.

As quoted by SITA one of the world’s leading figures in air transport communications and information technology, there are several reasons for airports for not being able to deliver such platform over the past years. One main reason is the lack of common situational awareness. The airport system should be able to track, manage and share real time information with necessary stakeholders about all its assets and capacity to optimize passenger services. Inefficient overlaps of data and resources because the systems and processes have evolved individually or with minimal communication each other is the other reason. Because of this, the system is able to manage specific field of the airport but fail to address as an integrated time based supply chain [3].

Data is the lifeblood for an intelligent airport system. The decisions and results the system produce depends solely on data it receives. Due to legacy system design, current airport systems are unable to access the full range of data relevant to the situation or the data has been expired. Therefore, the next generation airport systems will use the current architectures and technologies with single sourced holistic data with shared access to the full system. It will also improve the value, accuracy and consistency of the data as well. [4].

The airport system should be intelligent enough to cater to all the problems discussed above if they want to reach to the next level. The current technologies and resources are well within the boundary to do so. Cloud infrastructure can feed on-demand resources with infinitely extensible processing, bandwidth and storage. Data pooling and query platforms can be used to connect data and create structure by merging, conditioning streams and archived data. Business intelligence, data mining and visualization software that reveals trends and useful information can also be included to such system and finally using predictive analytics integrated into workflow to unlock data value and improve profitability, a successful airport system can be crafted. [5]. Therefore the need of the hour is to create a unified, integrated and ready to use platform to assist airports to provide better services for the passengers.

The purpose of this paper is to review the state of art data mining techniques and algorithms to integrate into such a system. The advantages and disadvantages of those techniques, algorithms and data sources are discussed here in order to find suitable approach for the data analytics layer of such a system.