Big Data Analysis with Hadoop on Personalized Incentive Model with Statistical Hotel Customer Data

Sungchul Lee, Department of Computer Science, University of Nevada Las Vegas, Las Vegas, NV, USA
Eunmin Hwang, William F. Harrah College of Hotel Administration, University of Nevada Las Vegas, Las Vegas, NV, USA
Ju-Yeon Jo, Department of Computer Science, University of Nevada Las Vegas, Las Vegas, NV, USA
Yoohwan Kim, Department of Computer Science, University of Nevada Las Vegas, Las Vegas, NV, USA

ABSTRACT

Due to the advancement of Information Technology (IT), the hospitality industry is seeing a great value in gathering various kinds of and a large amount of customers’ data. However, many hotels are facing a challenge in analyzing customer data and using it as an effective tool to understand the hospitality customers better and, ultimately, to increase the revenue. The authors’ research attempts to resolve the current challenges of analyzing customer data in hospitality by utilizing the big data analysis tools, especially Hadoop and R. Hadoop is a framework for processing large-scale data. With the integration of new approach, their study demonstrates the ways of aggregating and analyzing the hospitality customer data to find meaningful customer information. Multiple decision trees are constructed from the customer data sets with the intention of classifying customers’ needs and customers’ clusters. By analyzing the customer data, the study suggests three strategies to increase the total expenditure of the customers within a limited amount of time during their stay.

KEYWORDS

Big Data, Decision Tree, Hadoop, Information Technology, R

INTRODUCTION

With the goal of exceeding the needs and expectations of the customers who are sophisticated and continuously evolving more than ever (Ahmad and Atefeh, 2011, Teare, 1998), hospitality industry professionals are inclined to renovate themselves accordingly in every possible way and willing to invest significant amount of time and money to find effective marketing strategies in expanding their customer base. Also, it is evident that exploring and integrating the potential technologies within the hospitality industry is a necessary step for a business to be distinguished from others (Neuhofer, Buhalis, and Ladkin, 2015). More importantly, gathering and analyzing customer data have become an essential step and even more important for hospitality industry to understand customers in depth. Big data analytics can bring new perspectives in comprehending the customer behavior patterns along with exploring multiple variables that have been widely researched by hospitality industry professionals and scholars (Xiang, et al., 2015).

Recently, customer data available to hospitality researchers and industry practitioners has been dramatically increased due to the emergence of Internet of Things (IoT) (Sungchul, Juyeon & Yoohwan, 2014), web service (Candace & Ju-yeon, 2015) and IT (Ibrahim et al., 2015). The various kinds and...
large amounts of data can be called big data (Yuri et al., 2014). The potential value embedded in big data is phenomenal. For example, by analyzing the texts of financial news articles, the future stock prices can be predicted close to the actual price (Schumaker, et al., 2009). Also, researchers are already finding ways to utilize the search queries of the Google search engine in predicting the influenza epidemics early to reduce their impacts (Ginsberg, et al., 2009). Using big data, we can analyze detailed information of customers and various aspects of customer behavior (Jaap et al., 2013). Moreover, certain customer behaviors can be predicted via big data (Zheng et al., 2015). Therefore, numerous companies are actively seeking ways to utilize customer data on their behavioral patterns with the goal of constructing efficient marketing strategies toward target customers (Mark & Csaba, 2007). For example, the online store Amazon is already giving its customers suggestions on related products when they navigate or purchase specific items (Konstan & Riedl, 2012). Such related products are carefully selected by analyzing the customers’ behavioral patterns. By doing so, Amazon increases its chances to sell its products to customers.

According to American Hotel & Lodging Association (AHLA), 25.1 million international travelers account for 20% of all lodging sales in the United States (AHLA, 2014). The hotel/motel which travelers check in and stay during their visit not only works as a customer-processing center which manages customer response times (Jones, et al., 1994) but also serves as a central information center offering various information and suggestions on activities customers may want to participate in. It also implies that hotels have a potential access to the customers’ data to attract them to their properties by offering suitable personalized services. For example, upon checking in to a hotel, customers can be offered with coupons or complimentary services depending on the spending levels of customers (Dutta & Roy, 2006). Also, to offer appropriate personalized services, hotels can categorize customers depending on various aspects, such as the income level, reserved options in rooms, and etc. Moreover, throughout their stay at a hotel, customers are exposed to massive information and advertisements of goods and services provided by the hotel.

Yet, it is crucial for the hospitality industry to note that offering personalized services to customers does not directly generate or increase the buying needs of customers. This is due to the fact that majority of research on personalized service focuses simply on gathering and analyzing customers’ data from the past (Ahmad & Atefeh, 2011). The ways of integrating personalized services to meet the needs of customers require a careful consideration of their preferences. Therefore, it is essential for the hospitality industry to understand how to utilize the customer data in order to identify the customer preferences which later can be used to serve their needs in an exceeding level. Smith (2010) also noted that having a blueprint on how the extensive amount of customer data can be interpreted and utilized is a key to improving the hospitality operations.

The rest of this paper is organized as follow. Next section introduces the basic concept of Personalized Incentive. The framework of big data processing with Hadoop is explained in HADOOP FOR HANDLING BIG DATA Section (IBM, 2014). By utilizing big data set, this study identifies the characteristics, preferences, and patterns of customers. For this purpose, a synthetic customer data set is created. METHODOLOGIES Section shows the process of generating the synthetic customer data with statistical modeling where customers are clustered into 216 groups based on their behaviors. In KENDALL RANK CORRELATION COEFFICIENT Section the customers’ information is analyzed to understand their behaviors, and the prediction model is presented in PREDICTION MODEL Section. STRATEGIES Section proposes real time marketing strategies applicable for hospitality professionals using big data.

**BASIC CONCEPT OF PERSONALIZED INCENTIVE**

Although it is difficult to measure the value of time and the degree of potentials embedded in lost time (Kahle, 1997), it is evident that customers have a limited amount of time available to spend at a tourism destination. Therefore, it is necessary for hospitality industry to find and construct appropriate
BDS: Browser Dependent XSS Sanitizer
www.igi-global.com/chapter/bds/188240?camid=4v1a

Design Patterns and Design Principles for Internal Domain-Specific Languages
www.igi-global.com/chapter/design-patterns-design-principles-internal/71820?camid=4v1a