

A Multi-Criteria Recommender System for Tourism Using Fuzzy Approach

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Abstract

Recommender Systems have been widely used in Information and Communication Technology (ICT). The main reason for this extensive use is to decrease the problem of information explosion. Collaborative Filtering techniques, which attempt to predict what information will meet a user's needs based on data coming from similar users, are becoming increasingly popular as ways to combat information overload. Collaborative Filtering techniques usage has shown significant advantages in tourism service recommendations. Accuracy improvement of Collaborative Filtering techniques for tourism recommender systems has been an important issue in the previous studies. Therefore, this study aims to improve the recommendation accuracy of Collaborative Filtering techniques for tourism recommender systems. In this study, the method of recommendation is developed using fuzzy C-means algorithm for user-based and item-based models. Two similarity measures, Pearson Correlation and Cosine, are used for similarity calculations of users and items in both user-based and item-based models. Mean Absolute Error (MAE) is then used as an evaluation metric to show the accuracy improvement of proposed method. The experimental results on TripAdvisor dataset with several comparisons are presented to show the enhancement of proposed method predictive accuracy. The experimental results demonstrated that the user-based model of recommendation which uses fuzzy C-means algorithm remarkably improves the recommendation predictive accuracy with MAE=0.72 in relation to the item-based recommendation model with MAE=0.73. Since the proposed recommender system improves the accuracy of Collaborative Filtering techniques, the recommender system will be a promising recommendation method for item recommendation task in tourism domain.

Keywords: Recommender systems, Tourism, Multi-Criteria, Fuzzy clustering

1. Introduction

The application of Information and Communication Technologies (ICT), specifically the internet, by human being is growing day by day (Zhang et al., 2014). People are more relied to internet for performing their tasks and solve their problems (Bilge and Kaleli, 2014). It provides information for thousands of users, who are seeking new products and services, and make available the comparison between different brands and companies (LoStorto, 2013).

Although the availability of various options that internet provides, has its own advantages, but recent statics claim that providing several choices for users or online customers is not only inconvenient but also it damage users' state of well-being (Ricci et al., 2011). The availability of various options is called information overload (Nilashi et al., 2014b) or information explosion (Lucas et al., 2013). This problem is one of the side effects of massive development of internet and it causes difficulty for users to find proper information, tailored to their needs and interests (Cramer et al., 2008).

To eliminate the problem of information overload and enhance customer relationship, the application of Recommender Systems has increased impressively,

because they have proved to be helpful in facing information overload (Ricci et al., 2011; Nilashi et al., 2014a) and increase user satisfaction (Vahid et al., 2016; Pu et al., 2012., Finn et al., 2009).

Recommender Systems help online users in decision making and buying process in e-commerce settings (Jannach et al., 2012; Nilashi et al., 2014a,b; Nilashi et al., 2015a,b). Application of Recommender Systems leads to higher level of user satisfaction, due to the fact that recommenders help user to make decisions with higher quality between options that are less general and more tailored to their needs and preferences, in a limited knowledge constraints, less time consuming and less effort requiring procedure (Zhang et al., 2014; Pu and Chen, 2010).

One of the most recent applications of Recommender Systems has occurred in context of tourism industry. It has been noticed in last decades that tourism is a very important industry due to its significant profitability for countries (Agarwal, 2013). It is affirmed by World Travel & Tourism Council, that nearly 11% of the worldwide GDP (Gross Domestic Product) is allocated to travel and tourism domain (Lucas et al., 2013).

Introduction of internet to the travel and tourism industry has dramatically changed the way of searching for