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Mehrbakhsh Nilashi, Karamollah Bagheri Fard, Mohsen Rahmani, Vahid Rafe

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A Recommender System for Tourism Industry Using Cluster Ensemble and Prediction

Machine Learning Techniques

Mehrbakhsh Nilashi *, Karamollah Bagheri Fard, Mohsen Rahmani *, Vahid Rafe

Faculty of Computing, Universiti Teknologi Malaysia, Malaysia

Department of Computer Engineering, Faculty of Engineering, Arak University, Arak 38156-8-8349

* Corresponding authors e-mail addresses: nilashidotnet@hotmail.com; rahmanimohsenir@hotmail.com

Abstract. Recommender systems have emerged in the e-commerce domain and are developed to actively recommend the right items to online users. Traditional Collaborative Filtering (CF) recommender systems recommend the items to users based on their single-rating feedback which are used to match similar users. In multi-criteria CF recommender systems, however, multi-criteria ratings are used instead of single-rating feedback which can significantly improve the accuracy of traditional CF algorithms. These systems have been successfully implemented in Tourism domain. In this paper, we propose a new recommendation method based on multi-criteria CF to enhance the predictive accuracy of recommender systems in tourism domain using clustering, dimensionality reduction and prediction methods. We use Adaptive Neuro-Fuzzy Inference Systems (ANFIS) and Support Vector Regression (SVR) as prediction techniques, Principal Component Analysis (PCA) as a dimensionality reduction technique and Self-Organizing Map (SOM) and Expectation Maximization (EM) as two well-known clustering techniques. To improve the recommendation accuracy of proposed multi-criteria CF, a cluster ensembles approach, Hypergraph Partitioning Algorithm (HGPA), is applied on SOM and EM clustering results. We evaluate the accuracy of recommendation method on TripAdvisor dataset. Our experiments confirm that cluster ensembles can provide better predictive accuracy for the proposed recommendation method in relation to the methods which solely rely on single clustering techniques.

Keywords: Tourism, Recommender Systems, TripAdvisor, Cluster Ensembles, Multi-criteria CF

1. Introduction

Artificial Intelligence (AI) approaches are appearing at the forefront of research in information retrieval and information filtering systems. Recommender systems are a good example of one such AI approach. Such systems have been developed to actively recommend relevant information to users, typically without the need for an explicit search query. They have emerged in the e-commerce domain and are one way to address this issue. Based on the needs of individuals, recommenders assist them in finding the right items (Mettouris and Papadopoulos, 2013; Bordogna and Pasi, 2010; Shambour et al., 2016; Nilashi et al., 2015b). Collaborative Filtering (CF) techniques in recommender

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