Chapter 50

Application of Genetic Algorithm and Back Propagation Neural Network for Effective Personalize Web Search–Based on Clustered Query Sessions

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ABSTRACT

In this paper novel method is proposed using hybrid of Genetic Algorithm (GA) and Back Propagation (BP) Artificial Neural Network (ANN) for learning of classification of user queries to cluster for effective Personalized Web Search. The GA- BP ANN has been trained offline for classification of input queries and user query session profiles to a specific cluster based on clustered web query sessions. Thus during online web search, trained GA –BP ANN is used for classification of new user queries to a cluster and the selected cluster is used for web page recommendations. This process of classification and recommendations continues till search is effectively personalized to the information need of the user. Experiment was conducted on the data set of web user query sessions to evaluate the effectiveness of Personalized Web Search using GA optimized BP ANN and the results confirm the improvement in the precision of search results.

1. INTRODUCTION

There is an emergent need for effective informative retrieval in order to satisfy the information need of the user. Research has been done for improving the precision of search results using Personalization of web search in (Kim, Lee, Lee, & Kang, 2010; Leung, Ng, & Lee, 2008; Zhu, Xu, Ren, Tian, & Li, 2007;. Liu, Yu, & Meng, 2004; Peng, & Lin, 2006; Teevan, Morris & Bush., 2009; Zhou, Lawless, & Wade, 2012; Chirita, Firan, & Nejdl, 2007; Psarras and Jose, 2006; Shen,Tan & Zhai, 2005 ;Yin, Shokouhi & Craswell, 2009, Gao et al., 2007, Cui et al., 2003, Billerbeck et al., 2003).

It is found that most of the techniques of personalized web search based on recommendations classify current users to the cluster of user web query sessions who search on the web with the similar intent as that of current user. The selected cluster is used to generate the web page recommendations where the quality of recommendations depends on the accuracy of classification of current user to a cluster of users. (Arzanian, Akhlaghian, & Moradi, 2010; Nasraoui & Petenes, 2003;Chawla & Bedi,2008,Chawla & Bedi, 2007; Bedi & Chawla,2010; Chawla,2012a; Chawla,2012b; Chawla,2013; Chawla, 2014a; Chawla, 2014b). Artificial neural network has been found to perform well for classification problem. The feed-forward neural network architecture is commonly used for supervised learning. Feed-forward networks are often trained using a back propagation-learning scheme. (Vishwakarma, 2012) Artificial Neural Network has been applied in various fields like signal processing, pattern recognition, computer vision, intelligent control, nonlinear optimization, data fusion and data mining, knowledge discovery etc. (Zhang & Wang, 2008).

The main contribution of this paper is which makes it different from other related work based on neural network is the use of hybrid of Back propagation neural network and Genetic Algorithm for effective classification in the domain of Information retrieval since there is no work done which applies hybrid of BP ANN and Genetic algorithm for effective Information retrieval. The advantage of using hybrid of BP ANN and GA is that it performs the effective classification based on neural network learning without any local minimum problem.

Thus the hybrid of Genetic Algorithm(GA) and BP ANN is proposed for classification of user queries to clusters for effective Personalized Web Search(PWS) proposed in (Chawla & Bedi,2007) where web page recommendations to user's queries are then based on a cluster of users, and not just a single user. The users are grouped into clusters according to certain similarity criteria between their user models and the relevance of a certain document or item to a user is based on the information of other users who belong to the same group in a collaborative manner. The flowchart of the proposed approach is given in Figure 1.

Experiment was conducted to compare and evaluate the performance of PWS (with TFIDF vector model) and PWS (with/without GA optimized BP ANN) for effective web page recommendations. The results show the improvement in the average precision of search results using GA- BP ANN by retrieving more and more relevant web page recommendations in comparison to PWS(without GA optimized - BP ANN) and PWS(with TFIDF). Thus the effectiveness of GA optimized BP ANN has been confirmed in accurate classification of user query/sessions to clusters for generating web page recommendations relevant to the information need of the user.

The rest of the sections are organized as follows: Section 2 explains the Background required for understanding the proposed approach, section 3 describes the proposed work, section 4 presents the experimental study and section 5 concludes the paper.

2. BACKGROUND

2.1. Information Scent

Information scent is the measure of sense of relevance of clicked web page based on web usage data with respect to the information need of user. The Inferring User Need by Information Scent (IUNIS)

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