SBT to assess the impact of BDA on customer’s online behaviour

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ABSTRACT

With the rise of social network sites, almost every person has a profile. This profile contains various likes and dislikes about various items. It also contains their valence about other users on the network. In this paper a cloud-based recommendation engine is proposed which provides recommendations about various products given that a user likes a product X taking the balance theory of likes and dislikes over the network. This project can be used to provide personalized recommendations for advertisements or can be used by the user to explore other potential items that he may be interested in.

Keywords— Structural Balance Theory, Hybrid collaborative filtering, Singular Value Decomposition, the Recommendation system

1. INTRODUCTION

Big data analytics is the often complex process of examining large and varied data sets or big data to uncover information including hidden patterns, unknown correlations, market trends and customer preferences that can help organizations makes informed business decisions. On a broad scale, data analytics technologies and techniques provide a means to analyze data sets and draw conclusions about them to help organizations make informed business decisions. Big data analytics is a form of advanced analytics, which involves complex applications about various products given that a user likes a product X taking the balance theory of likes and dislikes over the network. This project can be used to provide personalized recommendations for advertisements or can be used by the user to explore other potential items that he may be interested in.

In order to recommend an appropriate product which the user likes, Structural Balance Theory is used i.e., “Friend’s friend is a friend” rule. On the basis of the user profile stored over a network, the features which are necessary to recommend a product to the user such as, user ratings given to the product are taken and similar users are found who gave the similar ratings to the product using CF using SVD [Single Value Decomposition] technique and the similarity between the users is also done using cosine similarity measure in order to find most similar user.

2. EXISTING SYSTEM

The time-aware recommendation is introduced, where time is considered as an important factor for predicting product quality. However, here only considers the objective quality prediction, without considering the subjective preferences of different users. It also has overfitting problem.

CAP approach is introduced to predict the missing quality of items, which is mainly based on the clustering idea; afterwards, precise item recommendation is realized. However, CAP requires that the user-product rating matrix in dense; and therefore, CAP is not suitable for item recommendation with sparse rating data.

CF-based recommendation approach is proposed, which recommends product items to the target user by considering the product items liked by user target’s similar friends. However, when user target does not have any similar friend, the recommendation accuracy of is low.
3. PROPOSED SYSTEM

The objective of the project is to provide personalized recommendations based on the user profile over a network. A cloud-based interface is implemented which can be viewed over a browser. There are mechanisms to simulate a social network by importing an entire dataset containing all the user data. In this project, a machine learning algorithm is explored by taking the balance theory and collaborative filtering into consideration.

4. MODULES

4.1 The Web module

This consists of a front end application and a backend application. There will be a user interface to add a user Id. This user Id will have some records like likes/dislikes etc. Basically, there will be the profile of the user. Now based on this profile, recommendations will be given to the user using the structural balance theory. The idea is that the user's Id/Name will be added to an input field and then this will be passed to the backend layer. The backend layer will then ask the machine learning layer if there are any recommendations for this particular user.

4.2 The machine learning layer

As a first step, there will be the profile of various users in a dataset file. This file will be processed using machine learning algorithms and a model will be trained on the basis of the profile. This model will be called from a flask web server. The web module will request the flask web server using a REST API and the server will respond in a JSON format with the details.

4.3 Structural balance theory

Balance Theory is a theory of attitude change, proposed by Fritz Heider. The hypothesis implies that attitudes of the group members will tend to change in such a way that one's friend’s friends will tend to become one's friends. Example: Balance theory is also useful in examining how celebrity endorsement affects consumer’s attitudes toward products.

5. RECOMMENDATION SYSTEMS

A recommendation engine filters the data using different algorithms and suggests the most relevant items to users. In technical terms, A recommendation system’s job is to develop an objective function which can predict how much a user will like an item. If $U=\{\text{users}\}$, $I=\{\text{items}\}$ then $F=\text{Objective function and measures the usefulness of item I to user U, given by :}$

$$F: U*I \rightarrow R$$

where $R=\{\text{recommended items}\}$.

5.1 User-based collaborative filtering

Collaborative filtering methods are based on collecting and analyzing a large amount of information on user’s behaviours, activities or preferences and predicting what users will take based on their similarity to other users. A key advantage of CF approach is that it does not rely on machine analyzable content and therefore it is capable of accurately recommending complex items such as movies without requiring an “understanding” of the item itself.
5.2 Content-based filtering
Content-based filtering methods are based on a description of the item and a profile of the user’s preference. In a content-based recommendation system, keywords are used to describe the items; besides user profile is built to indicate the types of item this user likes.

5.3 Hybrid recommendation systems
The hybrid recommendation system is a combination of User-based collaborative filtering and content-based filtering. These methods can be used to overcome some of the common problems in recommendation systems such as cold start and sparsity problem.

5.4 Machine Learning Algorithm Used: SVD (Singular Value Decomposition)
Singular Value Decomposition is a matrix factorization method which is used in various domains of science and technology. Furthermore, due to recent great developments of machine learning, data mining and theoretical computer science, SVD has been found to be more and more important. SVD is an approach used for dimension reduction. In linear algebra, the SVD is a Matrix Factorization of a real or complex, square or non-square matrix. Consider a matrix A with m rows and n columns with rank r. The A can be factorized into three matrices:

\[ A = U \Sigma V^T \]

U is a \( m \times r \) unitary matrix. (left singular vector)
\( \Sigma \) is a \( r \times r \) diagonal matrix with non-negative real numbers.
\( V^T \) is the conjugate transpose of the \( r \times n \) unitary matrix. (right singular vector)

The diagonal values of \( \Sigma \) are known as Singular values of M.

The Basic idea of SVD is that taking a high dimensional, high variable set of data points and reducing it to a lower dimensional space that exposes the substructure of original data more clearly and orders it from most variation to the least.

5.5 Advantages of the proposed system
- Suitable for sparse data sets
- Integration of user-based CF and item-based CF in order to give high-quality recommendations.
- Hence increasing customer reliability and satisfaction.
- Personalized and accurate recommendations are given to the user.

6. CONCLUSION
In this project a cloud-based recommendation engine is implemented which provides recommendations about various products given that a user likes a product X, taking the balance theory of likes and dislikes over the network. This project can be used to provide personalized recommendations for advertisements or can be used by the user to explore other potential items that he may be interested in.

7. REFERENCES


