

## Hybrid Book Recommendation Engine

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**Abstract**— Today, with the advancements in mobile technology and internet being a basic necessity in homes, people mostly prefer to buy and sell things online. With hundreds of websites and billions of products to select from, it becomes very difficult to know what a customer wants. Capturing interests of users and allowing them to narrow to best products has become the next thing. Most of the recommendations are based on conventional content, context and collaborative recommendations algorithms. All these algorithms alone fail to recommend best and efficient recommendations to user. So, there is a need to evolve a unique algorithm which combines the features of conventional algorithm along with its new features. A hybrid recommender system combines different recommender algorithms which fail individually and provide a unique and novel mix of recommendations.

**Keywords**— Hybrid, Recommendation, Ontology, Collaborative filtering, content-based filtering, Artificial Intelligence, Slope One, Min-wise independent permutation.

### INTRODUCTION

Most of the recommendations are based on conventional content, context and collaborative recommendations algorithms. All these algorithms alone fail to recommend best and efficient recommendations to user. So, there is a need to evolve a unique algorithm which combines the features of conventional algorithm along with its new features. Recommendation systems were evolved as intelligent algorithms, which can generate results in the form of recommendations to users. They reduce the overhead associated with making best choices among the plenty. Now, Recommender systems can be implemented in any domain from E-commerce to network security in the form of personalized services. They provide benefit to both the consumer and the manufacturer, by suggesting items to consumers, which can't be demanded until the recommendations. Every recommender system comprises of two entities, one is user and other is item. A user can be any customer or consumer of any product or items, who get the suggestions. Input to recommendation algorithm can be a database of user and items and output obviously will be the recommendations. As in our case, inputs consist of database of customer and database of books and output denotes the book recommendations. Generally, Input belongs to recommendation algorithms lies into one of the following categories:

Rating based input:

It consists of votes of so many people called groups, who rate the particular item on the given scale of minimum to maximum. Collaborative based recommendation systems use this type of input.

Content based input:

It consists of users information such as the interest, date of birth, priorities etc. This type of information is hard to find for a particular user, so normally explicitly filled by the user. Content based recommendation systems take this type of inputs.

### REMAINING CONTENTS

#### Ontology

An ontology is an engineering artifact:

It is constituted by a specific vocabulary used to describe a certain reality, plus a set of explicit assumptions regarding the intended meaning of the vocabulary. Ontology is used for database which is very efficient for generating recommendation than sql database.

#### Purpose

This hybrid book recommendation engine evaluates the possibility to combine the various recommendations techniques and incorporated with proposed hybrid algorithms to improve recommendation performance by exploiting the complementarities of different algorithms. It describes the conventional Content, Collaborative Filtering and Context Filtering recommendation approaches along with their precision, recall and accuracy parameters. On the bases of this study, Hybrid approach has been proposed in order to improve the basic algorithm. At this point, it is essential to include a categorization of the previously described algorithms based on different criteria. Finally, this paper has presented a number of utilized evaluation metrics, from which some were used to measure quality, while others to measure performance. Recommender systems are an extremely potent tool utilized to assist the selection process easier for users. Likewise, this analysis authenticated that the hybrid recommendation algorithm is a competent system to

recommend Books for e-users, whereas the other recommender algorithms are quite slow with inaccuracies. This recommender system will assuredly be a great web application, which can be club with todays high demanding online purchasing web sites.

## Existing System

This study specifies the various conventional algorithms that are still used by some of the most top rated book purchasing websites. This case study specifies those algorithms along with their flow charts as follows:

**Content based Book Recommendation Engine** This type of system generates recommendations from source based on the features associated with products and the users information. It gives recommendation as a user specific classification problem and learn a classifier for the user's likes and dislikes based on product features. So, in case of recommending books above figure describes the flowchart of content based book recommendation algorithm.

**Collaborative based Book Recommendation Engine** In Collaborative recommendation engines, suggestions are generated on the basis of ratings given by group of people. It identifies users with a rating history similar to the current user and generates recommendations for the user. Most of the book recommendation engines based on this algorithm, described by the flowchart of collaborative based book.

## Proposed System

All conventional recommendation algorithms suffer from the limitation of quality, accuracy, precision of recommendations criteria. The proposed system is a Hybrid Book recommendation system which aims at combining the various features of content, collaborative filtering and context based recommendation system. It provides an easy to use graphical user interface for user profiles and book information management. It generates optimal recommendations for the people that have not sufficient personal experience or competence to evaluate the, potentially overwhelming, number of alternatives offered by a website. To overcome the existing Book recommendation problem Hybrid Recommendation Algorithm has been proposed. It is a fusion of Content, Context, and Collaborative Recommendation algorithms. Complete description of proposed algorithm is as follows:

- Input: User Database and Book Database
- Output: Book Recommendations

## Study of the system

### Slope one collaborative filtering for rated resources

To drastically reduce over fitting, improve performance and ease implementation, the Slope One family of easily implemented Item-based Rating-Based collaborative filtering algorithms was proposed. Essentially, instead of using linear regression from one item's ratings to another item's ratings ( $f(x)=cx+d$ ) it uses a simpler form of regression with a single free parameter ( $f(x)=c+d$ ) The free parameter is then simply the average difference between the two items' ratings. It was shown to be much more accurate than linear regression in some instances, and it takes half the storage or less.

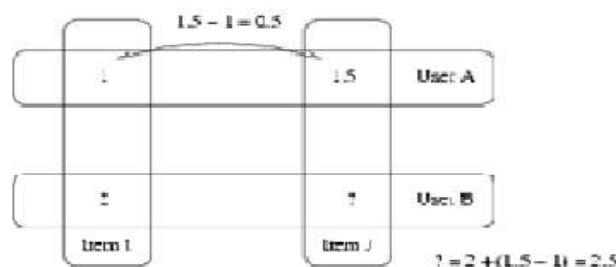


Figure 1

Example:

- User one gave a 1 to Item I and an 1.5 to Item J.

- User second gave a 2 to Item I.
- How do you think User second rated Item J?
- The Slope One answer is to say 2.5 ( $1.5 - 1 + 2 = 2.5$ ).

Min-wise independent permutations

In order to implement the MinHash scheme as described above, one needs the hash function  $h$  to define a random permutation on  $n$  elements, where  $n$  is the total number of distinct elements in the union of all of the sets to be compared. But because there are  $n!$  different permutations, it would require  $(n \log n)$  bits just to specify a truly random permutation, an infeasibly large number for even moderate values of  $n$ . Because of this fact, by analogy to the theory of universal hashing, there has been significant work on finding a family of permutations that is "min-wise independent", meaning that for any subset of the domain, any element is equally likely to be the minimum. It has been established that a min-wise independent family of permutations must include at least different permutations, and therefore

$$|\text{cm}(1, 2, \dots, n)| \geq e^{n - o(n)}$$

Figure 2

that it needs  $(n)$  bits to specify a single permutation, still infeasibly large. Because of this impracticality, two variant notions of min-wise independence have been introduced: restricted min-wise independent permutations families, and approximate min-wise independent families.

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#### CONCLUSION

This paper has covered the core of recommendation experiments, and has examined how to incorporate information from metadata into recommendation algorithms. In addition, it evaluates the possibility to combine the various recommendations techniques and incorporated with proposed hybrid algorithms to improve recommendation performance by exploiting the complementarities of different algorithms. It describes the conventional Content, Collaborative Filtering and Context Filtering recommendation approaches along with their precision, recall and accuracy parameters.

On the bases of this study, Hybrid approach has been proposed in order to improve the basic algorithm. At this point, it is essential to include a categorization of the previously described algorithms based on different criteria. Finally, this paper has presented a number of utilized evaluation metrics, from which some were used to measure quality, while others to measure performance. Recommender systems are an extremely potent tool utilized to assist the selection process easier for users. Likewise, by utilizing, this analysis authenticated that the hybrid recommendation algorithm is a competent system to recommend Books for e-users, whereas the other recommender algorithms are quite slow with inaccuracies. This recommender system will assuredly be a great web application,

#### REFERENCES:

- [1] G. Adomavicius and A. Tuzhilin, Toward the next generation of recommender systems: A survey of the state-of-the-art and possible extensions, IEEE Trans. Knowl. Data Eng.
- [2] G. Linden, B. Smith, and J. York, Amazon recommendations: Item- to-item collaborative filtering, IEEE Internet Comput., Feb. 2003.
- [3] Michael Hashler, Recommender Lab: A Framework for Developing and Testing Recommendation Algorithms Nov. 2011.

[4] O. Celma and P. Herrera, A new approach to evaluating novel recommendations, RecSys '08: Proceedings of the 2008 ACM conference on Recommender systems, New York, NY, USA, 2008, ACM

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