Challenges in Recommender Systems

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Relevance of the topic

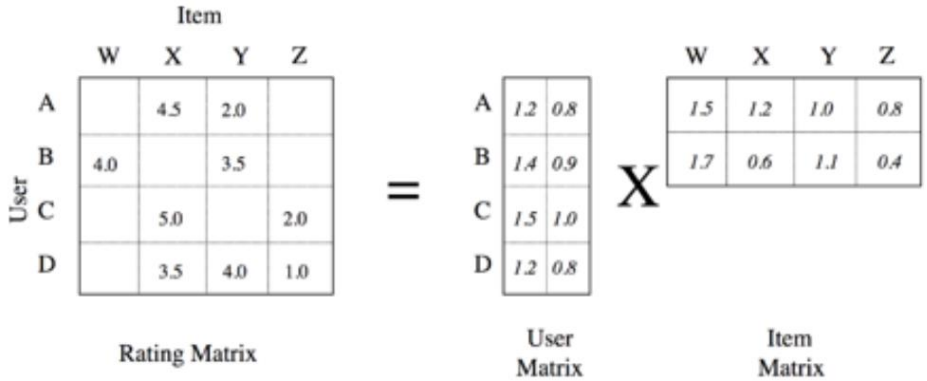
- Information overload on platforms
- Need a way to provide relevant information to users
- Bridge the gap between user and item
- Recommender systems act as a business tool in various domains

Netflix	2/3rd of the movies watched are recommended
Google News	recommendations generate 38% more click-troughs
Amazon	35% sales from recommendations
Choicestream	28% of the people would buy more music if they found what they liked

Challenges in the field

The main challenge of focus: Handling of **Data Sparsity**, including the '**cold-start' problems**

Understanding the challenge



How do Recommender Systems Work?

User Profiles

Item Profiles

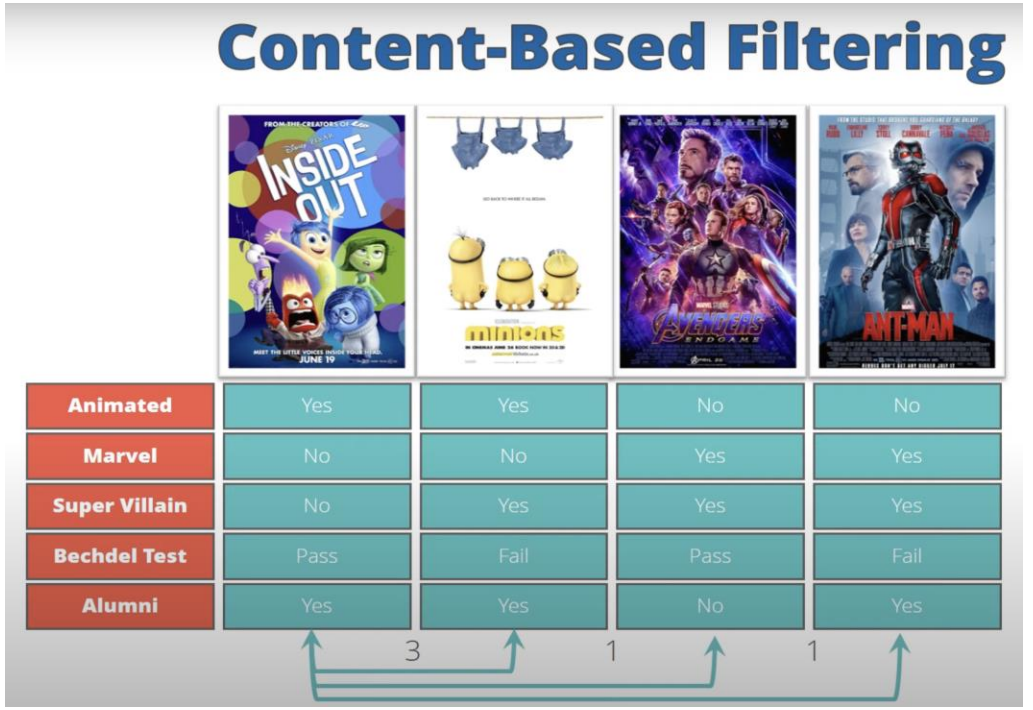
User-Item Matrix (the heart)

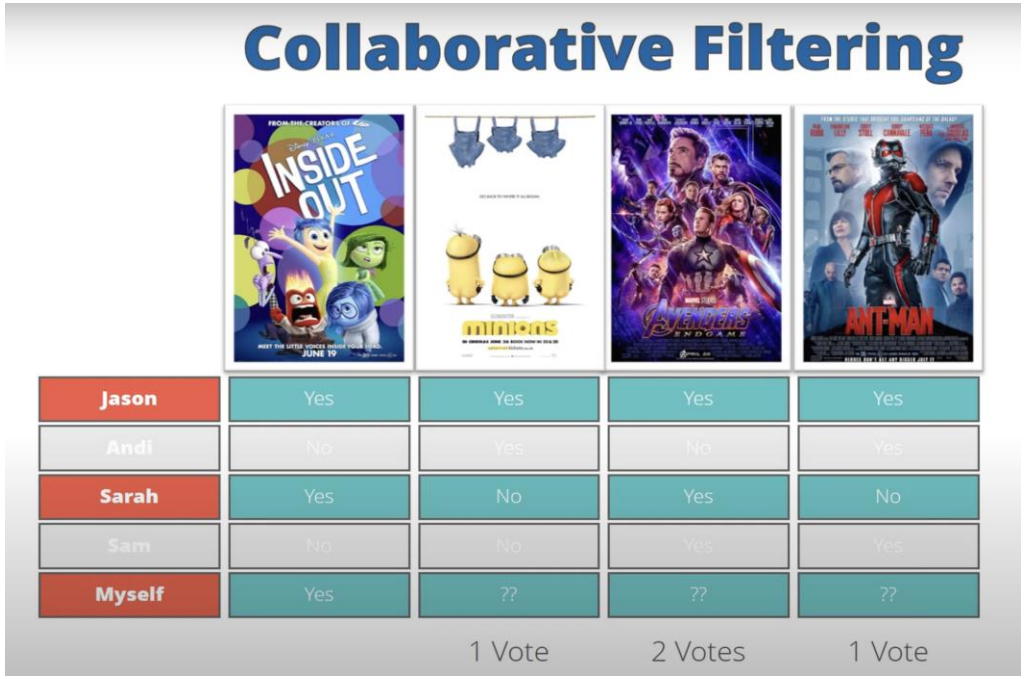
Data Sparsity and Cold-start problems occur when data is missing in the user-item matrix.

Understanding the challenge

The two main filtering techniques:

- Content-based: relies on features and properties of items
- Collaborative: relies on similar user profiles





Literature 1

- Suggests creating implicit trust relationships between users; creating a web-of-trusts
- Using the data of those similar user profiles to deal with missing data in the matrix.
- Critiques: transparency issues, strict privacy settings may cause failure, and might further increase an existing issue of bias in the model

Social Trust as a solution to address sparsity-inherent problems of Recommender systems

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ABSTRACT

Trust has been explored by many researchers in the past as a successful solution for assisting recommender systems. Even though the approach of using a web-of-trust scheme for assisting the recommendation production is well adopted, issues like the sparsity problem have not been explored adequately so far with regard to this. In this work we are proposing and testing a scheme that uses the existing ratings of users to calculate the hypothetical trust that might exist between them. The purpose is to demonstrate how some basic social networking when applied to an existing system can help in alleviating problems of traditional recommender system schemes. Interestingly, such schemes are also alleviating the cold start problem from which mainly new users are suffering. In order to show how good the system is in that respect, we measure the performance at various times as the system evolves and we also contrast the solution with existing approaches. Finally, we present the results which justify that such schemes undoubtedly work better than a system that makes no use of trust at all.

Keywords

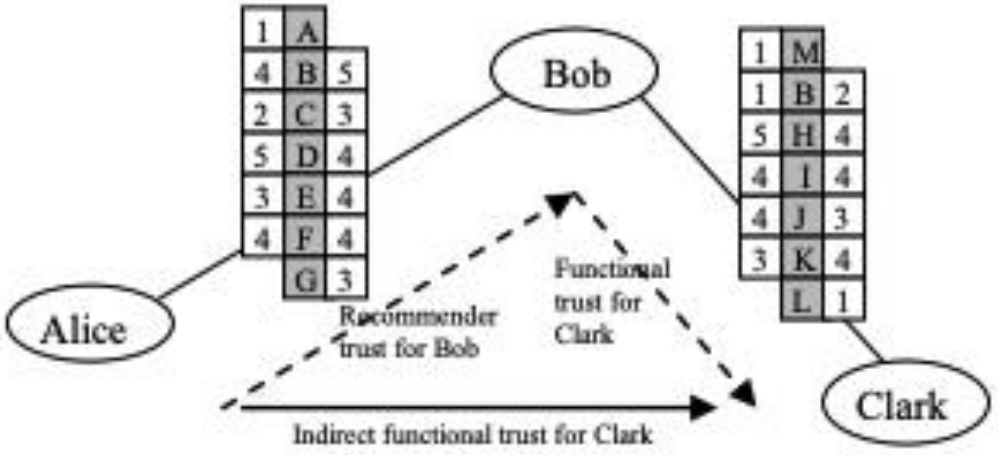
Recommender Systems, Trust Modeling, data sparsity problem Cold-Start problem, Social network.

1. INTRODUCTION

Services offered by recommender systems tend to be hosted in quantities of data to the system for predictions to be computed accurately is described in the literature as *"cold-start problem"*[4].

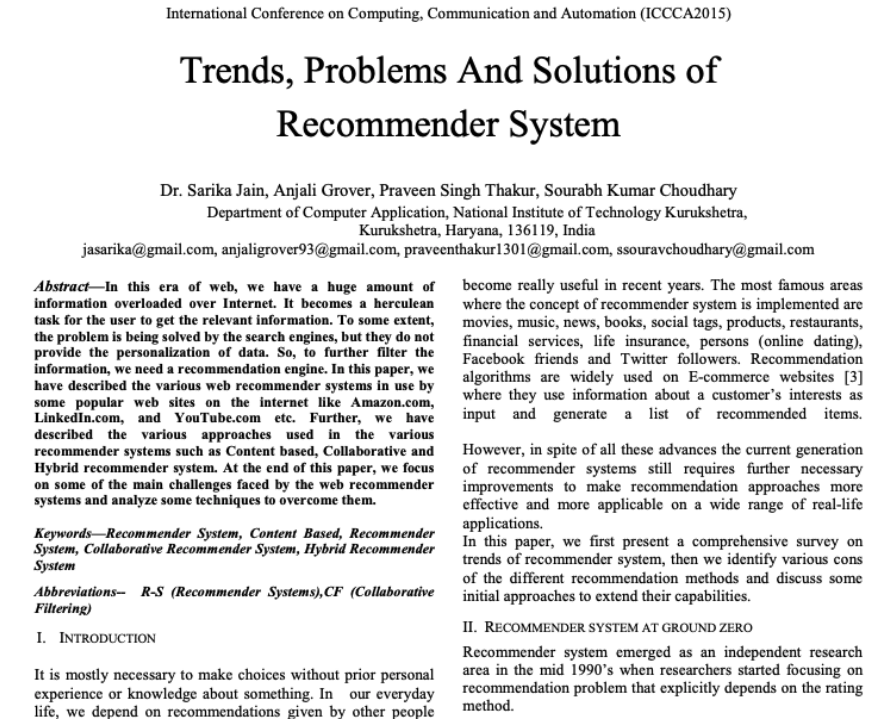
Our approach for overcoming the above problem is based on the idea of extending the neighboring base of new users so that they can be correlated with more participants, not necessarily linked directly with each other via similarity relationships, but been discovered via "friends" as trustworthy for contributing useful data. The trust for them can be inferred via their similar, and hence common, neighbors in a scheme that is known as 'web-of-trust'. In this way, due to the propagation characteristics of trust, it is plausible that similarity between entities that could not be linked previously is becoming exploitable. Users who can be discovered via friends-of-friends might be useful as they may carry valuable experience about some product that is of interest to somebody else. As trust is mainly used for extending the number of relationships between people, users can now cooperate with more participants than before and thus get access to more recommendations. For short we call our system 'hybrid' as it combines both trust networks and traditional recommender systems approaches. We used a framework called "Subjective Logic" for the reasoning of the virtual trust relationships, and since the adaptation to existing recommender system models is a key issue, we used a model that we built our own for inferring trust from the existing users' experiences.

The evaluation we present shows the twofold benefit of this approach as the accomplished reduction of sparsity is accompanied



Literature 2

- Suggests using demographic filtering technique and using time spent on webpages as a factor for ratings of new user and item profiles.
- Critiques: Recommendations might not be personalized enough for each user. If 'time spent' is used as the only factor, then new items and users may have slow growth in the rating matrix.



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Trends, Problems And Solutions of Recommender System

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***Abstract*—In this era of web, we have a huge amount of information overloaded over Internet. It becomes a herculean task for the user to get the relevant information. To some extent, the problem is being solved by the search engines, but they do not provide the personalization of data. So, to further filter the information, we need a recommendation engine. In this paper, we have described the various web recommender systems in use by some popular web sites on the internet like Amazon.com, LinkedIn.com, and YouTube.com etc. Further, we have described the various approaches used in the various recommender systems such as Content based, Collaborative and Hybrid recommender system. At the end of this paper, we focus on some of the main challenges faced by the web recommender systems and analyze some techniques to overcome them.**

Keywords*—*Recommender System, Content Based, Recommender System, Collaborative Recommender System, Hybrid Recommender System

Abbreviations*– *R-S (Recommender Systems),CF (Collaborative Filtering)

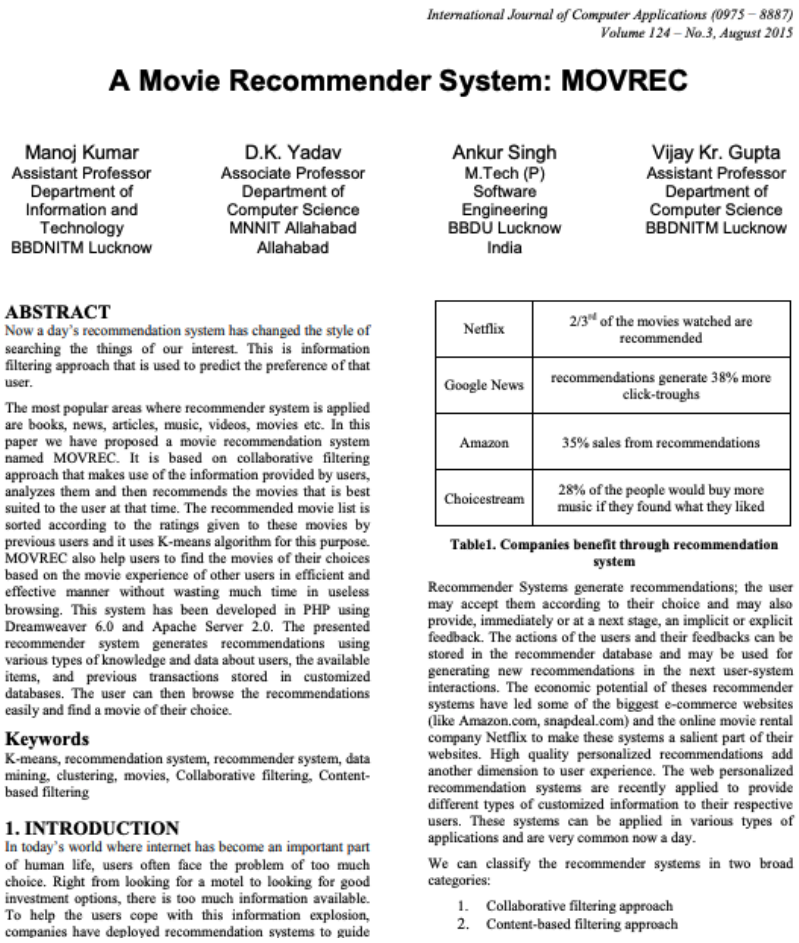
I. INTRODUCTION

It is mostly necessary to make choices without prior personal experience or knowledge about something. In our everyday life, we depend on recommendations given by other people become really useful in recent years. The most famous areas where the concept of recommender system is implemented are movies, music, news, books, social tags, products, restaurants, financial services, life insurance, persons (online dating), Facebook friends and Twitter followers. Recommendation algorithms are widely used on E-commerce websites [3] where they use information about a customer's interests as input and generate a list of recommended items.

However, in spite of all these advances the current generation of recommender systems still requires further necessary improvements to make recommendation approaches more effective and more applicable on a wide range of real-life applications.
In this paper, we first present a comprehensive survey on trends of recommender system, then we identify various cons of the different recommendation methods and discuss some initial approaches to extend their capabilities.

II. RECOMMENDER SYSTEM AT GROUND ZERO

Recommender system emerged as an independent research area in the mid 1990's when researchers started focusing on recommendation problem that explicitly depends on the rating method.



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A Movie Recommender System: MOVREC

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ABSTRACT
Now a day's recommendation system has changed the style of searching the things of our interest. This is information filtering approach that is used to predict the preference of that user.

The most popular areas where recommender system is applied are books, news, articles, music, videos, movies etc. In this paper we have proposed a movie recommendation system named MOVREC. It is based on collaborative filtering approach that makes use of the information provided by users, analyzes them and then recommends the movies that is best suited to the user at that time. The recommended movie list is sorted according to the ratings given to these movies by previous users and it uses K-means algorithm for this purpose. MOVREC also help users to find the movies of their choices based on the movie experience of other users in efficient and effective manner without wasting much time in useless browsing. This system has been developed in PHP using Dreamweaver 6.0 and Apache Server 2.0. The presented recommender system generates recommendations using various types of knowledge and data about users, the available items, and previous transactions stored in customized databases. The user can then browse the recommendations easily and find a movie of their choice.

Keywords
K-means, recommendation system, recommender system, data mining, clustering, movies, Collaborative filtering, Content-based filtering

1. INTRODUCTION
In today's world where internet has become an important part of human life, users often face the problem of too much choice. Right from looking for a motel to looking for good investment options, there is too much information available. To help the users cope with this information explosion, companies have deployed recommendation systems to guide

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Table1. Companies benefit through recommendation system

Recommender Systems generate recommendations; the user may accept them according to their choice and may also provide, immediately or at a next stage, an implicit or explicit feedback. The actions of the users and their feedbacks can be stored in the recommender database and may be used for generating new recommendations in the next user-system interactions. The economic potential of theses recommender systems have led some of the biggest e-commerce websites (like Amazon.com, snapdeal.com) and the online movie rental company Netflix to make these systems a salient part of their websites. High quality personalized recommendations add another dimension to user experience. The web personalized recommendation systems are recently applied to provide different types of customized information to their respective users. These systems can be applied in various types of applications and are very common now a day.

We can classify the recommender systems in two broad categories:

1. Collaborative filtering approach
2. Content-based filtering approach

Literature 3

- Suggests to use a hybrid recommendation system; a mixture of different techniques to filter and then fill out missing data in the matrix.
- Critique: solution was more content-based than collaborative, and so might fail in keeping users engaged

Potential solution

- **Current Best Solution**: use a hybrid filtering model; a mixture of content-based, collaborative, demographic, knowledge-based techniques
- **Potential Solution**: new strategies could be incorporated to the hybrid model for more effectiveness.

  → use implicit trust relationships

  → time spent on a website too can be considered as a measure for calculating ratings and preferences, or to find similar user profiles.

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