OVERVIEW OF VARIOUS OPTIMIZATION TECHNIQUES FOR RECOMMENDATION SYSTEM

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ABSTRACT:

Artificial intelligence and data science has opened the doors of possibilities to help users for optimizing their search results. Ultimately, the search engines are working for providing the exact results to the user upon search. Over last 5 years, number of internet user in India have increased rapidly with the better internet speed and verity of android options available in market. At the end of 2020, the number of internet users in India is forecasted as 650 million which will be around 50% of Indian population. With huge number of users, it becomes very important to provide the optimised search results. Matching the preferences of users in search results may increase the user satisfaction. Many web services, applications and search engines use recommender system to enhance the user experience. Authors have presented the overview of various techniques implemented in optimization of search results for the recommender system.

Keywords: Recommender System, K-means, K-NN, Particle Swarm Optimization, Fuzzy C mean, Bio Inspired Algorithm, Gray Wolf Algorithm etc.

INTRODUCTION:

India has second largest number of internet users in world. The number is continuously increasing with time. With increase in use of online shopping, social media and other entertainment platforms, it becomes essential to drive the users to their expected users. Data science and artificial intelligence had made it possible to study the users search habits, identify the need of customer and provide them the search result which will fulfil their requirement. These search requirements varies with many factors such as moods of customer, season, cost, brand and many other.
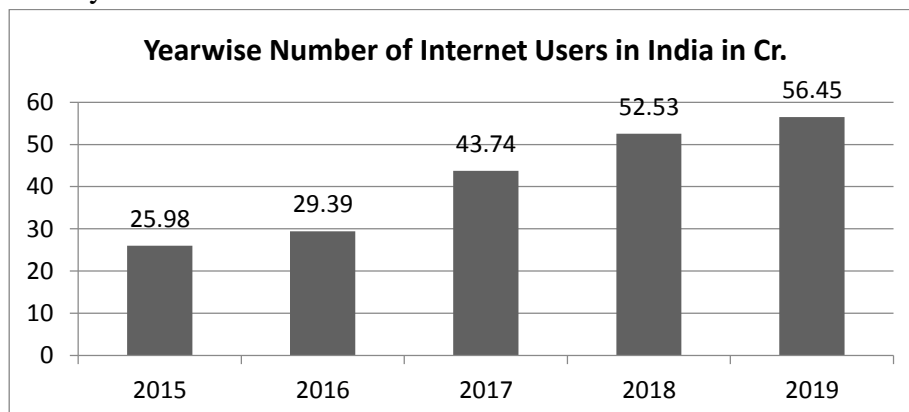
Fig.1: Number of Internet users in India [1]

Number of Digital Video Viewers in India in Cr.

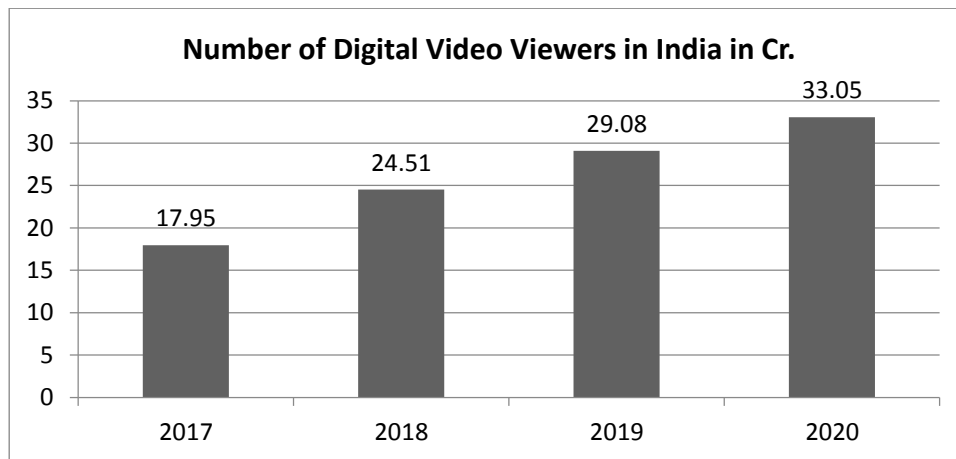| Year	Viewers
2017	17.95
2018	24.51
2019	29.08
2020	33.05

Fig.2: Number of Digital Video Viewers in India [2]

Data shows that, the number of internet and digital video viewers has increase significantly over last 5 years [1-2]. All the video streaming service providers and e-commerce platform provides the recommendation service to users in order to enhance the user experience with ease of use. The recommendation is done on the basis of the user search history over the period and artificial intelligence is involved to predict and analyse the habits accurately [3].

The filtration of data, classification of useful data and its management, these are the basic aspects of data science implemented for recommender system. This task can be implemented with fuzzy-c-mean algorithm for the application of video recommendation system [4].

The general recommendation system for the online videos, books, music or product is based on study of the search results by particular user. While this approach may not be very accurate with plenty of options available. Hence the data need to be analysed over multiple parameters. It will be very much useful to provide the accurate results by means of maintaining the diversity in options every time [5].

K-means algorithm was used in such applications over the years to filter the datasets [6]. User ratings are found one of the trust parameters now days in online shopping. Similar interest of the user is identified, studied and utilised for recommendation [7]. Big data, analysis and data science has been developing so fast in order to handle the huge data securely to enhance the user experience through effective recommendation system [8].

MOTIVATION:

During past few years, researchers have designed the recommender systems for different applications. The various algorithms need to complete the task effectively. The algorithms have advantages and disadvantages under the specific conditions. Analysis of algorithms for identifying which one will provide the accurate results under different conditions of data recommendation needs to be done in order to select the effective algorithm. After the analysis, we can come up with final conclusion that, which algorithm is suitable for various domains of recommender systems.

The user/customer behaviour study is always the topic of keen interest for the service provider and the business owners. It's not easy task to predict requirements of users on virtual environment. User behaviour changed over time with so many factors associated with it. With digital connectivity of users mainly by means of android phones, it is now a days possible to silently record, study and analyse the user habits over the period of time.

The challenges in this system are about handling and analysing database. With software development and availability of modern tools it has become possible now a day to handle data carefully. The data analysis and designing a system to recommend the service, application or product to the end user is always a great achievement as fur as the user satisfaction is concerned.

RECOMMENDER SYSTEM BASICS:

The recommender system basically works on different algorithm; it uses the data associated with user such as on what basis user has made decision to avail the service, to purchase a product, to watch a video, to listen an audio, to read a book or to download a particular application. The data is collected through acceptance of policies by the users for data collection. This data is then filtered according to various services and products in order to further utilise for recommender system.
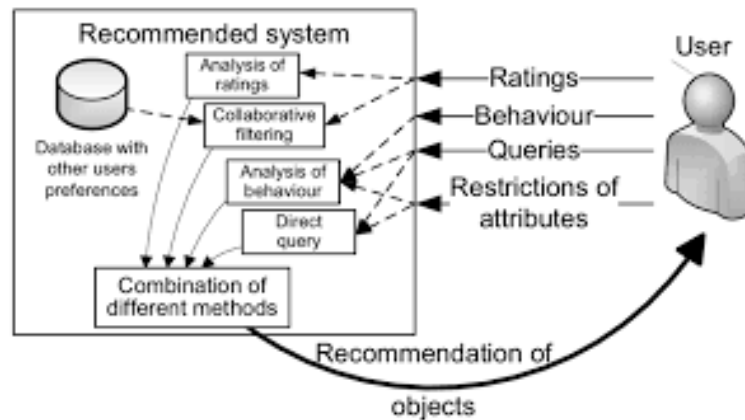

Fig.3: Recommender system basics

On the basis of various filtering techniques of data, the recommender services are designed and developed as shown in below classification.
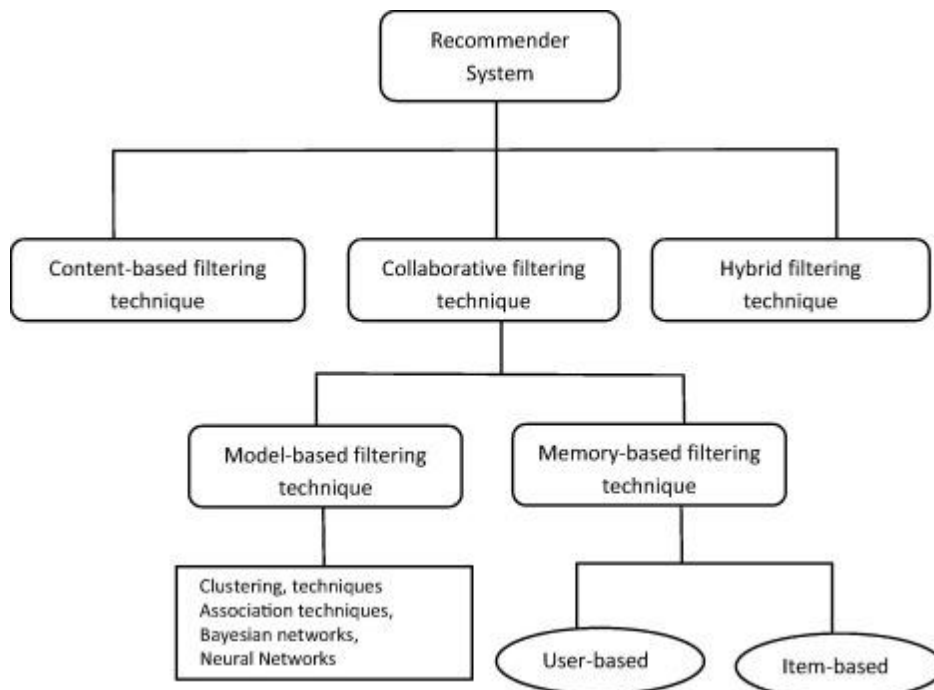

Fig.4: Classification of Data Recommender System

Model based techniques are used in many applications to recommend the options to the user while the user and item based behaviour of the users are studied with data science and the new models are implemented for enhancing the accuracy of data search. Data prediction and analysis are the basis in designing such systems accurately.

FEATURE OPTIMIZATION TECHNIQUES:

K-means:
This is clustering algorithm, generally divides the data in to different clusters. It helps in analysing the dataset of one type. Segmentation of the user behaviours is possible with this algorithm. K-means algorithm is used for initial data segmentation in the system and then any other algorithm for further improvements can be added for enhancing the accuracy further.

K-NN Algorithm:
K-Nearest neighbour algorithm is another technique which works on the basis of data classification. It helps in better classification of the datasets according to the habits of users to classify new data points with reference to the similarity to next nearest component of the dataset.

Particle Swarm Optimization:
It works on the basis of iterations to enhance the results of recommender system. The basic parameter for utilizing this tool effectively is to analyse the personal choices of the users. This is one of the algorithms works on basis of population evolution method. Age, gender, occupations of the user is the basis for optimizing the data analysis with this method.

Fuzzy c mean:
This algorithm operated on the principle of clustering the users with similar behaviour and choices. This is one of the popular methods of clustering the users. This is used to design the recommender system with better accuracy, precision and recall. The similar type of search results will be provided to similar users in this method. It makes data handling effective and the results are accurate.

Bio Inspired Algorithm:
The nature is the effectively solving many problems in computer science. Bio inspired algorithm is inspired with nature. The decision making in this algorithm is on the basis of biological diversity. Bio inspired data clustering is used with several other algorithms in order to optimize the search results.

Gray Wolf Algorithm:
In this algorithm, the data segmentation is done on the basis of hierarchical data sets. The clustering is done on the basis of the relative information and the results are optimised with consideration of different parameters. The results are finalised on basis of few parameters, further accuracy to the results is provided with inclusion of new sets of parameters.

CONCLUSION:

India is at second position in the world after china in number of active internet users. The statistics shows that the trends are exponentially increasing over last few years and it continuous to increase for coming years. With the technology enhancement and development of software solutions, people are keener about user satisfaction. The users with variety of backgrounds and requirement with variety of options available needs support for reaching to the required service or product. Moreover it is also observed that, the recommended products, videos, music, books and applications are also preferred by the users. Authors have presented the overview of the recommendation system for online applications implemented by the researchers in this paper. Basic trends of users, and the technologies used in implementation of recommended system are discussed in this paper.

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