A WEB-BASED RECOMMENDATION SYSTEM FOR LEARNERS USING NATURAL LANGUAGE PROCESSING

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Abstract - A recommendation system for learners has received major attention in recent years as a means to cope with information explosion in learners' recommendation systems as well as provide relevant recommendations to learners. A web-based recommendation for learners using Natural Language Processing is facing an important significant part in facilitating learners to help them in finding suitable learning materials which allow them to achieve their learning goals. While the general recommendation system has a big success in tackling the congestion problem in other domains and providing accurate recommendations, the learner recommendation system, on contrary, does have some concerns differing in learner characteristics such as learner autonomy, level of expertise, and indicators of the level. This paper presents a module which can be used by the learners to get the recommendation of journals, books and also presents how programmable search engines can be used for learner's information search.

Key Terms - Natural Language Processing(NLP), Recommendation module, Content-based Recommendation, Collaborative Recommendation, hybrid recommendation, E-learning, Programmable search engine.

I. INTRODUCTION

Web based recommendation system for learners using NLP particularly on learners and suggests materials based on learners' context. The materials can include recommendations of books, Journals, learning videos, and so on. The main problem in this system is to deploy the recommendation module, particularly for learners, and to suggest learners' relevant materials to the users based on users' preference with high accuracy and other problem includes Lack of Data, Changing Data, Changing User Preferences, Complexity

Recommender systems have evolved into a significant tool for supporting users to make educated selections and choices, especially in the era of substantial data in which learners have to make choices from a huge number of results. Quite a lot of Recommender system models and techniques have already been proposed and nearly all of them have achieved great success. Amongst them, the content-based and collaborative Recommender algorithms are two representative ones. Their efficacy has been demonstrated by both research and industry communities. This work aims to build a recommendation system that comprises the content-based filtering algorithm, collaborative filtering algorithm and also the programmable search engine.

This paper is divided into four modules that is book recommendation module which recommends user relevant books in context to similar authors, similar interests and top rated books, Journal recommendation Module which recommends user relevant Journals in context to Similar Users and Similar Interests, Visualization Module which Analysis of the dataset in the form of Graphs and figures, Learner's Search which returns web pages related to learning context, Returns Images related to learning context.

II. WHAT IS THE RECOMMENDATION SYSTEM, EXACTLY?

Recommendation system is a process of suggesting contents to the user. This comes under an information filtering system which analyzes how a user would rate or prefer a material. To address this in simple words, it is a kind of algorithm that uses data from the user's previous behaviors and does a similarity analysis to propose relevant products to them. Recommendation Systems are used to forecast user preferences on commercial and non-profit websites. Analysis of user data and extraction of important information for further predictions are the fundamental functions of recommendation systems. Learners can make use of the recommendation to choose materials from a universe of options or to interact with other users who share their interests, as the recommendation system also detects others who share their interests. Recommender systems are designed to recommend circumstances to the user on the basis of a variety of factors. The recommendation systems predict the probable product that users are interested in or most likely to buy.

Typically, this system relates to a sizable volume of data in the form of information present by filtering information structured based on the information/data provided by the user. It also includes other factors that give importance to the user's preference and interest. It finds out the pattern between the user and his interest and computes the similarities between them for recommendation.

There are many things that could be recommended. This may include content such as movies, books, reports, articles, jobs, and so on. Netflix uses the recommender system that is capable of recommending movies in addition to web series to all people. Similarly, YouTube uses recommendation algorithms that suggest different videos which match the interests of the user. In the same way there are a wide variety of examples and uses of recommender systems that are widely used in this modern era.
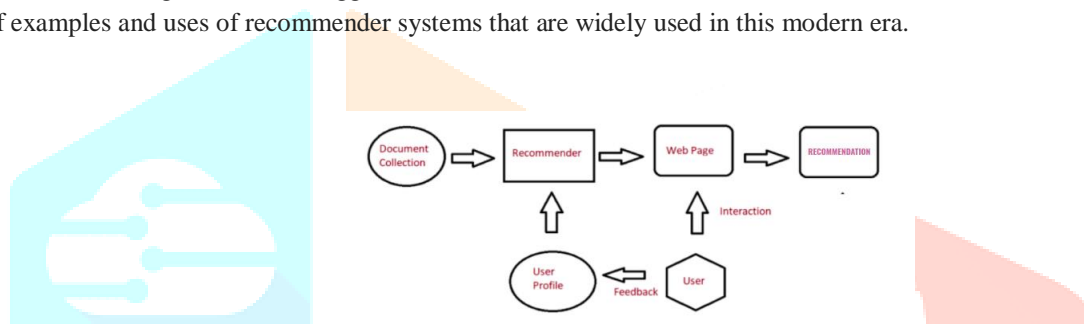

Fig 1: Block Diagram of Recommendation System

The above figure 1 depicts a Recommender model which is trained with a document collection dataset. The data set is taken from IBM book recommendation data set.

The data set consists of a user rating table in this dataset it consists of user id and ratings. User ID is the primary key of rating data set it and user ID is the foreign key of book data set these two tables can be linked using user ID. Users table data set consist of user ID location and age group. In the users dataset user ID is the primary key. Book dataset consists of ISBN Book title year Publication Publishers. Ratings table consists of user ID ISBN book ratings. The tables can be linked using primary key and foreign key users table and book table can be linked using user ID ratings table can be linked using ISBN.

Data preprocess techniques like missing value detection can be removed or replaced by average values. Necessary data preprocessing techniques are performed and clean data is fed to the recommendation module. Which is connected to the User Interface which is connected to the Web page User will give input as text, keyword to recommendation model the recommendation model by interacting in the web page. Recommender model uses recommendation algorithms and suggests the relevant materials to the user in the form of text, web pages.

III. RELATED WORK

Shun-Feng Su, Xi-Jun Chen [1] in their work discusses the targets on some specific attributes which helps in making e-learning recommendation systems different from other recommendation systems. He also discusses the complexity of the recommendation system and focuses on challenges and future direction on the e-Learning recommendation system.

Mojtaba Salehi, Isa Nakhai Kmalabadi [2]in their work Concentrates on specific algorithms which can take over the traditional recommendation systems by considering precision, recall and FI scores and also discusses which attributes or more suited for e-Learning platform based on this consider the algorithm which can satisfy learners real learning choice accurately and with updated data in it.

Salam Fraihat, Qusai Shambour[3] speaks about the uses and advantage of semantic recommender which helps in area of e-learning recommendation for individuals that is in providing important advertises to assist the learners helping them to find the relevant Los in

the field where learner is interested in. The author also presents the formula for semantic recommendation which utilizes intra and extra semantic attributes between LOs.

Zhendong Niu, Shanshan Wan presents [4] Concentrates on an influence dependent filtering model that is independent of rating the data as information. IFL is applied to the recommendation model to make them optimize which will help in presenting a more accurate and adoptive learner model. The author presents the model which will cluster the similar learners as one group and display the recommendation based on the similarity.

Karim Dahdouh, Ahmed Dakkak, Lahcen Oughdir, and Abdelali Ibriz [5] Targets in creating an allocated recommender system of learning courses for helping students in taking more optimal learning resources. This also recommends a list of desirable classes for college students according to their interest attributes to improve learner satisfaction and performance by showing them individualized and adapted advice and academic resources.

Pradnya V. Kulkarn and etal[6] Offers a study on an overview of recommendation systems and the specific field of eLearning Suggestion System. Emphasis was given to the prominent approaches applied in this area until now.

Hayder Murad, Linda Yang [7] recommend a framework that supports the enhancement of an individualized eLearning recommender system incorporating the techniques regarding student profiling, expertise estimation, assessment, and even feedback as a way to increase students' learning method by recommending the web video learning elements based on scholar profile and expertise level

Reema Sikka and etal[8] recommend a methodology that helps in building a software bot that takes into consideration data mining associated with it. He also proposes a model which helps in understanding users' behavior. These kinds of recommendation models can help learners to find their way to the web materials by finding relevant resources faster.

Oana Maria Teodorescu[9] Gives a personal set of questions on recommendation modules depending on both their current status and the status of these colleagues who have previously worked on recommendation modules. Visual stats of the trial-and-error results in words of knowledge coverage of the strategy map show appealing initial results.

John Taurus and etal[10] offer a recommendation approach combining CF and ontology for suggesting individualized learning materials to online students taking into account the learner characteristics. In our method, ontology can be used to include learner characteristics in the recommendation process. Fresh results show that our proposed ontology-based suggestion approach outperforms the VOIR algorithm on its own.

From [1-10] , the following observations are made:

- Lack of Data is the main issue in recommendation system
- Recommendation system often have a concern from the cold-start or data sparsity problem
- The learner's real recommendation can be accurately returned if the data and preferences are updated in real-time

IV. METHODOLOGY

Various forms of recommendation systems based on textual evaluation, comparative opinion, user ratings, buying trends, user profiles, and other factors have been created in recent years. Machine learning is used to tackle a variety of problems, but one of the most well-known applications is product recommendation.

A web-based Recommendation System for Learners using Natural Language Processing uses content based recommendation and collaborative filtering. The process of collaborative filtering is based on collecting and evaluating data on user activity. This involves tracking the user's online behavior and forecasting what they will like based on their shared interests.

There are four modules through which the work is implemented:

A. **Book Recommendation Module:** A book recommendation module can be used by the learners to get the suggestion of the book which he is interested in. The main goal of this module is to predict the learner's interests and suggest books to them based on their interests. It takes into consideration the user's reviews and filtering them, a book recommendation module can consider several aspects such as book content and quality. The purpose of this module is Recommendation of books to the learners which takes Input as Text (title of the book), and Number (number of books for recommendation) and the function of this module is to perform content-

based filtering which recommends books based on content like similar authors etc. and produce the output which is list of Recommended books

Figure 1 Book Recommendation Module

Book Recommendation module has 2 input fields text and number field and a button which performs a book recommendation function (Figure 1). After giving input to the input fields i.e., Title of the book, Number of the book and clicking recommend book button the recommendation function is performed and output will be given in output field i.e., list of books for recommendation and if the entered book name doesn't match the database book name, then the error message will be displayed as invalid book name.

B. **Journal Recommendation Module:** This module is used by the learners to get the suggestion on the journals they are interested in. Journal recommendation module takes into account the user ID as well as ratings of journals to recommend the journals to similar users. The purpose of Journal Recommendation Module is to show the recommendation of Journals to the learners which takes input as text(name of the journal) and Number(number of books for recommendation) (Figure 2) and performs collaborative filtering which uses User id for the recommendation and perform similarity recommendation and gives output as list of recommendations of the journal

Figure 2: Journal Recommendation Module

Here there are 2 input fields user ID and number of journals to recommend and when the user clicks on recommend journals button the list of recommendation of journal will be displayed and if the user ID does not belong in the database error message will be displayed as user does not exist

C. **Learner's Search:** Whenever any learner uses the internet to search for any information the content all over the web will be displayed which will result in learners to take more time and may deviate from learning so to avoid this problem learner's Search can be used. In this search engine the content related to education will be displayed to the learner. The programmable search engine is used here to create learners' search engine. Learner's Search can be used to perform information search for learners' content which takes input as text and performs a programmable search engine which returns results only on particular websites restricted to the learners and the output will be List of web search pages for learners.
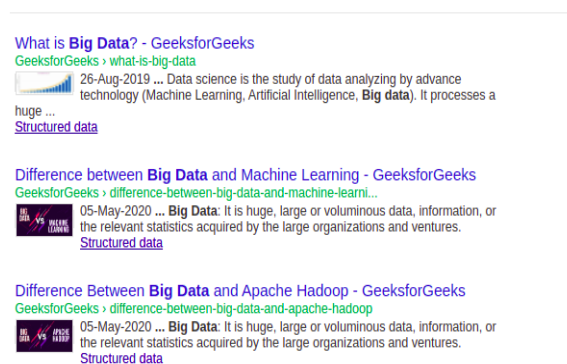

Figure 3 Learner's Search module

When a learner clicks on the search button the search function is performed and output of restricted pages will be displayed based on learning context and if learner tries to search for content which does not belong to restricted web page the output will be displayed as no results(Figure 4)
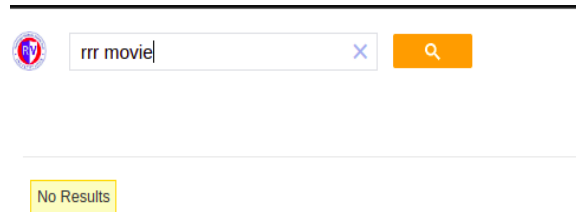

Fig 1.4 Learner's Search Module

D. **Visualization:** Visualization model can be used to understand the behavior of the data. The purpose of this module is to analyze and visualize Recommendation data by comparing with the attributes in the dataset and understanding the relationship between them. This can be done by creation of Graphs and figures using Matplotlib and visualizing data.
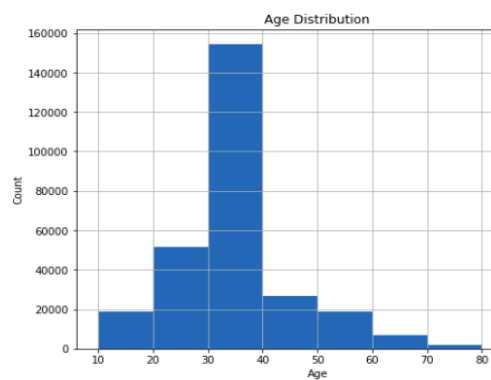

Figure 5 Age group of people and Count of Book they read

Analysis: Figure 5 depicts that People with the age group 30-40 read more books than others.

From the above modules the outcome is learning of various Data preprocessing techniques, Deploying Content based filtering and collaborative filtering, working with programmable search engines and Visualization of data from recommendation.

V. RESULTS AND DISCUSSION

Machine learning is used to tackle a variety of problems, but one of the most well-known applications is product recommendation. A Web-Based Recommendation System for Learners using NLP uses content-based recommendation, collaborative based filtering and hybrid filtering. The process of collaborative filtering is based on collecting and evaluating data on user activity. This involves tracking the user's online behavior and forecasting what they will like based on their shared interests.

Integrating recommendations into systems is a worthwhile investment in today's digital world. Recommendation systems not only improve user experience and engagement, but they also help organizations produce more revenue. A Web-Based Recommendation System for Learners using NLP includes modules like Book Recommender which recommends books, Journal Recommender which recommends journals, Visualization which is used for analyzing the data and Learner's Search a restricted information search for learner's based on learning context.

Web based recommendation for learners results in returning top recommendations for learners. It results in giving personalized results for users using userId, learning context, similar author, similar user etc. Book Recommender uses content-based filtering to return top recommendations. Journal Recommender uses collaborative filtering to return top recommendations. Anvil software is used for easy creation of user interfaces. Learner's search engine results in displaying web pages for learners which use Natural Language Processing. Thus, recommendations for learners can be used by learners for quick and easy personalized searching.

VI. CONCLUSION

Learners' recommendation can be used to manage the recommendation for learners. This can be used to get recommendations in an optimal way which saves time and will be safe for educational purposes. Learner's recommendation system is a Web-based recommendation system that suggests learners' relevant materials to the users based on users' preference with high accuracy. The main function of this system is to suggest materials based on the learner's context. suggest the materials i.e., learning courses, books, Journals, learning sites etc. Learner's information search module is used to restrict learners for learning content only.

VII. FUTURE WORK.

Recommender systems can have a huge impact on the future world. Some of the uses of the recommender system can include the functionality to predict seasonal purchases in e-commerce based on suggestions, identify important patterns in a transaction and provide better recommendations to users, this can help enhance customer retention and loyalty. Recommender systems will be useful in most enterprises, and developers encourage everyone to learn more about this intriguing field. In the educational domain, lack of data is the major problem so improvising the efficiency in collecting the data, improving the accuracy of the recommendation and using more customized recommendation as per learner's wish can be the future work.

VIII. ACKNOWLEDGMENT

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