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Recommendation System for E-Commerce Product Based on Customer Review and Rating

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ABSTRACT: Product recommendation in e-commerce plays vital role, overloaded information put consumers in a fix to find the best suited product for them. Recommending a product by analysing these overloaded information could ease the selection process of selecting one most fitted product out of many. In our research work we are getting the information on the products specifically review and rating to work on and by applying machine learning algorithm and the aid of artificial intelligence we recommend the product to the consumer. Further, we have used Bag-of-Word model to deal with NLP of the collected reviews of the product. Consequently, Python and WEKA is used to implement web scraping to collect the information and testing proposed framework and its accuracy. These results further can advance the recommendation system for e-commerce business and improve the business growth.

KEYWORDS: Machine Learning, Python, Recommendation, pattern mining, artificial intelligence

I. INTRODUCTION

In recent years the term e-commerce became very important for the giant business houses, customer-centered e-commerce sites evolved and changed drastically in order to gain more and more customer.[1] E-commerce has important in socio-economic implications. Change in the habits of consumption from the consumer's side and business changes needs to be address and adhere to the novel circumstances changes the way of marketing and strategies of business[2]. This is in a way social revolution as it is happing so rapidly. In this day and age author surprise whether a traditional shopping centers will predestined to withdraw[3]. In an era of e-commerce, social knowledge can be accessed by agents and experience through word of mouth can be shared.[4] The tremendous growth of e-commerce joined with the acceptance of online social networks puts remarkable influence to the global economy.[5] Customers' behaviors for shopping changes dramatically, and it brings new kind of e-commerce termed social commerce.

In e-commerce business, recommendation system plays key role, it has become an important component of e-commerce[6]. Users' information and preferences are collected by the recommendation system (i.e. shopping, traveling, books, movies, and cab) by explicitly or implicitly[7]. Recommendation system plays a vital role in our daily routine. Items are automatically suggested by the recommendation system in which users are interested[8]. Large amount of data being used to provide accurate recommendation which may include demographics of user, location, buying pattern and many more.[9]

The hazardous development in the measure of accessible computerized data and the quantity of guests to the Internet have made a potential test of data over-burden which obstructs auspicious access to things of enthusiasm on the Internet[10]. Search engines like Google, Altavista to retrieve information are available and it resolved the problem of accurate information retrieval but personalized and priority based information in which user is interested is not achieved. This circumstances raises the claim for the recommendation system.[11]

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II.LITRATURE REVIEW

Consistently, recommender structures have been pondered extensively and are isolated into different classifications. The audit on different powerful strategies, for example, probabilistic model, statistic based proposal, visit design based calculation are reviewed in this paper.[12]

Authors have reviewed 88 different research papers, white papers and book and identified principles, methods and evaluation in recommendation system. Recommendation system has been broadly categories in three different categories namely Content-based filtering, Collaborative filtering and Hybrid filtering. Evaluation metrics for recommendation system has also been discussed, which indicate the importance of statistical accuracy of Mean Absolute Error (MAE) and Root Mean Square Error (RMSE) to validate the model developed for the recommendation.[5]

Hybrid recommender model based on Bayesian networks has been developed by authors in which static topology has been used to represent the user profile and dynamic topology for managing target item-dependent relationships. MAE used as the evaluation measure between user rating and predicted rating.[12]

Mobile coupon recommendation system has been implemented by the authors, to recommend the mobile coupon to the users based on collaborative filtering method. Consumer's usage pattern has been observed to deal with the problem of information overload. NFC method used to collect the users data implicitly to reduce the user's troublesomeness, further to recognize buying information of same consumer, collaborative filtering technique of recommendation system has been used.[13]

In an attempt, authors have applied hybrid of k-means and cuckoo search to the dataset of Movielens, for better movie recommendation system. Performance has been measured through RSME, MAE, t-value, and SD. Through specific number of clusters, consistent modified movie recommendation and high performance accuracy was provided [14]

The above examination expresses that by building up the algorithm involving incessant example mining and man-made brain-power (AI) shows high exactness, handling rate and better insight system for item proposal in E-trade.

III. RESEARCH METHODOLOGY

For this research paper, the input is obtained from the e-commerce web sites by web scraping, a python script has been generated to do web scraping. Customer rating and review on different electronic items such as Laptop, Smart Phones, Air Conditioner, Refrigerator, Washing Machine and Tele Vision. Parameters such as review, rating, model, and price were collected and the dataset was obtained in CSV format.

Further, python script has been generated to find frequent pattern in data and knowledge discovery, based on which recommendation can be implemented. In process we have used Bag-of-Word model to identify the frequent pattern on which ML and AI implemented to find out the best product to be recommended.

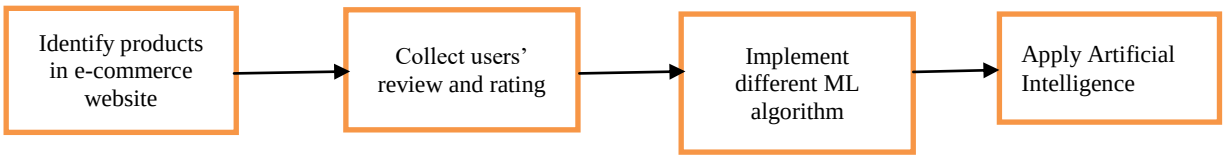

Fig 1. Proposed system – Block diagram

1. Data / Information Collection

Data collection is one of the most basic and necessary task to be completed, in order to move forward in research work, a researcher needs to collect data, and data can be available from the various sources. In our research work we have collected data from the e-commerce websites following figure illustrate the way we scrap the data from e-commerce websites.

In data collection, we have developed new python script in Google Colab by configuring selenium framework to run robot script on web pages for web scraping we have also installed chromium driver to automatically allow script to move to the next web page in chrome browser, pandas library files was imported in python script to convert scraped data into the tabular form. Appropriate code in python script has been generated using Xpath to extract the exact data from the XML file scraped and final generated CSV file exported for the further use.

2. Pre-processing and Learning

Data pre-processing is very important, any step moving forward without clear understanding and doing proper pre-processing may lead to massive error or we may put ourselves into a mash. Hence it is highly required to perform data pre-processing which includes data cleaning and then implementing bag of word model to find key words for the further use. Following figure depicts the way we achieve pre-processing task.

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3. Recommendation and Prediction

In experimental procedure, after data collection and pre-processing, it is predicting or recommending the product, a user will be interested in or most likely to purchase. For the final recommendation we have prepared a product final matrix from the learning or pre-processing phase and given it as an input to the steepest accent hill climbing algorithm to predict the final product recommendation.

4. Implementation of algorithm

Heuristic search used by the Hill Climbing for mathematical optimization in the arena of Artificial Intelligence. In Steepest-Ascent Hill climbing technique, before selecting any node, it first inspects all the neighbouring nodes and then selects the node nearest to the goal state as of next node. In our algorithm we used the same technique to find the goal state.

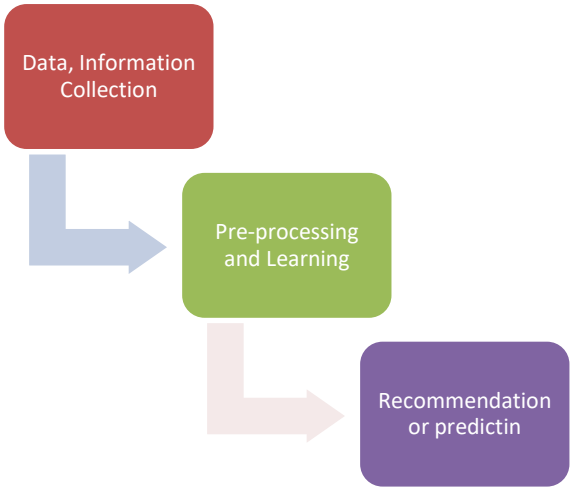

Fig 2. Recommendation Process

IV. RESULT AND DISCUSSION

1.Dataset

Performance evaluation of the system, which takes input of file containing 75026 records of different products such as Mobile Phones, Refrigerator, Television, Air Conditioner, Washing Machine, and Laptop which has the following attributes Review, Rating. Classification of the extracted data is given bellow.

1	AC	2636	6	18
2	Laptop	4570	2	6
3	Mobile Phone	31880	9	27
4	Refrigerator	11090	7	21
5	TV	13930	7	21
6	Washing Machine	10920	7	21
Total	6	75026	38	114

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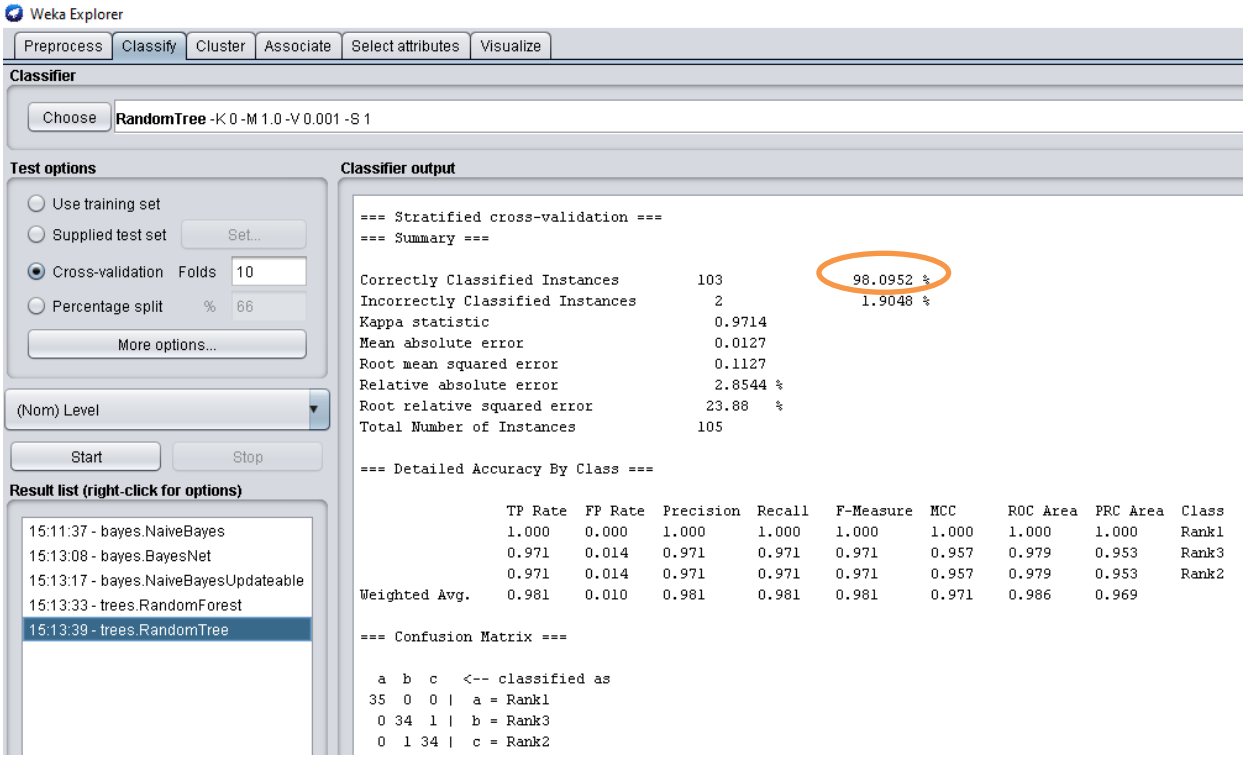
2.Performance evaluation

Wide range of available metrics are used to measure the accuracy of the developed recommendation system. Two classified categories of metrics used to estimate the recommendation quality and evaluation the accuracy of recommendation system. RMSE, MAE, RAE are among the few popular prediction metrics to evaluate the quality and accuracy of the developed recommendation system.
Random tree algorithm has been tested against the generated result from the recommendation system

2.1 RMSE
Root Mean Square Error (RSME) is variant of Mean Square Error (MSE), and before summing an errors it square the errors. Root Mean Square Error method has been used quite frequently as a performance evaluator. The recommended and observed rating difference is processed through this method. In our observed result in Weka the RSME is 0.1127.[15]

2.2 MAE
MEA is Mean Absolute Error measures, difference between recommendation and actual rating and its absolute standard deviation is measured by MEA. The interpretation and implementation of this method is very easy and hence it is used most frequently. In our observation the MEA given is 0.0127.[15]



V. CONCLUSION

In conclusion, this research avails an effective e-commerce recommendation system which uses steepest accent hill climbing algorithm to find out the product to be recommended to the users based on given input and comparison. This research has one limitation of cold-star problem, means a product which has no review or a novel introduced product cannot be consider as an input as it does not contains any review or rating. Further in future enhancement an algorithm could be developed to provide level of recommendation to the user based on which user can select appropriate one.

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