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Product Recommendation based on User Sentiments through Collaborative Filtering, Content Based Algorithm & Sentimental Analysis

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Abstract— Systems that make recommendations have shown to be quite useful in day-to-day routing. Social networking sites and online commerce are extremely important in daily life. More than 3.5 billion people use the internet for a variety of things. In general, customers have to look hard before finding a desirable product. Implementing Apache Hadoop server for Big Data Processing is suggested in order to avoid this issue. The suggested solution would make an effort to suggest products based on how similar and popular they are among customers. In order to produce more accurate findings, this project will try to create its own consumer behavior analysis and classification programmer. For the purposes of evaluation and recommendation, the Amazon dataset will be used. The key concern for performance measurement will be computation time for single node and multi node cluster.

Index terms: Area-efficient, Low power, CSLA, Binary to excess one converter, Multiplexer.

I. INTRODUCTION

Internet users find it extremely difficult to get the needed information due to the expanding internet community and demanding daily schedule. When a person searches for information and finds irrelevant results, the issue worsens. Large amounts of data and inadequate search tool knowledge make it difficult to find or extract the desired information. The whole study's conclusion states that "Recommendation System is a comprehensive application or tool that combines user preference or self-collected knowledge for forecasting user desire and investigates the best possibility of relevancy among information." In a variety of domains, including product, branding, shopping, and product search, recommendation systems may be useful. Based on previous transactions, the product suggestion algorithm provides a selection of pertinent products. Depending on the popularity and visits of the friends, they might make offers. According to: The main rationale behind any Friends recommendation system may be friends rating, priority, area, influence, etc.

1. Making a new product recommendation to a user who is active based on a user's predicted interests.
2. Investigate user lifestyle to provide online retailers with ideas for products based on past purchases made by customers.
3. Endorsing pertinent goods and active clubs.

Because it is used to recommend news, movies, books, and a variety of other things, recommendation systems are quite popular. Moreover, recommendation systems in various ways make product recommendations utilising collaborative and content-based filtering. The models created by collaborative filtering techniques are based on the prior actions of a user (things previously chosen or purchased, and/or numerical ratings given to those items), as well as comparable choices made by other users.

1.1 A System of Recommendations

The method used for knowledge mapping and suggestion teaching can be used to categorise a recommendation system. Here is an explanation of them:

1.A recommendation system based on knowledge
2. A recommendation system based on content
3. A recommendation system based on collaboration
4. Demographic advocate

1. a recommendation system based on knowledge

Knowledge systems generate a multitude of findings and decision criteria manually or automatically before making recommendations. It places a strong emphasis on explicit domain knowledge of the needs and preferences of the user. This system has a number of flaws, including a bottleneck issue with knowledge processing and an inheritance issue with user profile building and linking to preexisting data. It is advised to use an automatic knowledge-based system where data entry is liable to change depending on the situation.

2. A recommendation system based on content

Traditional There is a content-based recommendation system at the data source depending on user desire and content. It contrasts and pulls data from data sources and web pages, matching it to user preferences. To determine the most popular and in-demand material, it also makes use of popularity rankings and usage statistics. It makes advantage of this idea to rank and classify material based on popularity and demand. It typically looks at the descriptions attached to products or current content and compares them to user preferences.

3. A recommendation system based on collaboration

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An alternate strategy to the previous strategies, collaborative-based or so-called social-based techniques try to address the shortcomings of content-based strategy. It makes use of other users' profiles in the same community and suggests fresh products that the user hasn't yet rated or viewed on the presumption that other users with comparable profiles share interests in the same community. As a result, recommendations are made based on user similarity and come from the list of goods that other members of the same community have found interesting.

4. A recommendation system based on demographic data

A user's demographic profile, which includes information like gender, age, date of birth, education level, and other personal characteristics, is used by a demographic recommender system to generate recommendations.

1.2 Big Data: Hadoop is a common occurrence in big data research. The Hadoop framework and Hadoop environment technology are maintained and managed by the nonprofit organisation Apache Software Foundation (ACF) [2]. To manage enormous amounts of sensitive data at any given time, big data environments include frameworks like Mongo DB, NoSql, Pig, and many others. The HDFS, a distributed file system, is one of several Hadoop-related technologies [3]. To support data warehouse applications using Hadoop servers, the Hive component was created. Hadoop uses the MapReduce programming methodology. Hadoop uses the Pig querying language, which is comparable to SQL but is used for relational databases. The Sqoop provides connectivity for MySql users to upload data to HDFS and Hive. Other tools created in the Hadoop ecosystem can be used to experiment with large data and hone one's own abilities.

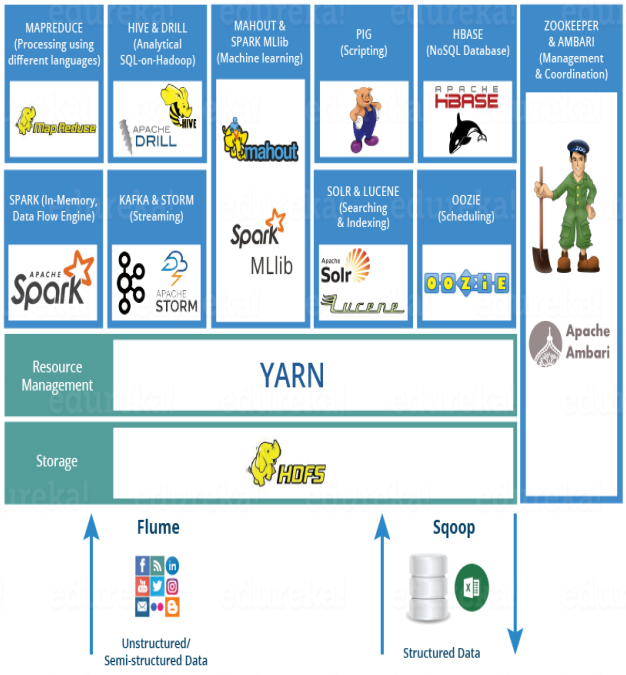

Figure 1: Block Representation of Hadoop Components

Figures 1.1 and 1.2, respectively, depict the Hadoop ecosystem and core Hadoop as blocks.

II. RELATED WORK

A novel recommendation system was created by Riyaz P. A. et al. in [1] Suggested solution employing a collaborative filtering method. It is implemented using the MapReduce paradigm for big data in Apache Hadoop. The suggested solution employs a data extraction, data analysis, algorithm realisation, and data storage strategy. This study offers an Amazon-based scalable collaborative filtering method for big data.

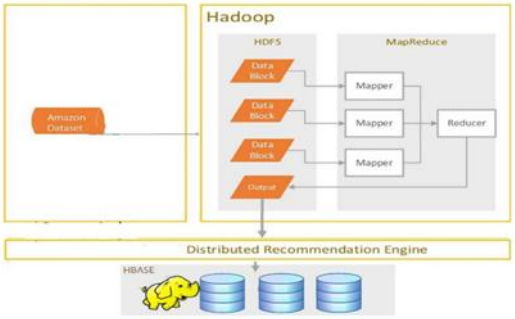

Figure 2: System architecture of existing work

III. PROBLEM STATEMENT

E-commerce-based online shopping portals focus on providing a wide range of product diversity and streamlining the purchasing process. Customers do not have to bother about visiting numerous stores, comparing items, and making a purchase. Although these websites offer a variety of buying options, they also raise customer expectations. The modern consumer wants to make numerous purchases in a short amount of time. This creates a need for individualized shopping websites that suggest products or offer specialized product views based on consumer interest. Customer reviews may be quite important in this dimension. Moreover, previous purchases can be used to evaluate consumer interest and purchasing demand. According to the survey on consumer analytics, a number of algorithms have been developed to evaluate customer behaviour for Cause/Effect analysis, predictive behaviour, and data visualisation. For easy product viewing and a seamless purchasing experience, other product recommendation plug-ins have been developed in the same vein. To recommend more precise and ideal outcomes, mining methods are integrated with collaborative filtering, content mining, and ranking algorithms. The analysis of existing solutions reveals that the majority of product recommendations use popularity and ranking indices calculated using customer views and ranking algorithms. Analyzing product categories and categorizing purchasing remains a difficult task. E-portals offer online customization based on product sale rather than product nature as a result. Although little research has been done in this area, much improvement is anticipated. Small-scale data analysis is the most significant obstacle in the field currently in existence. The evaluation and development of all conventional recommendation work has been done for tiny data sets. Large amounts of data not only change the nature of the data but also

provide numerous challenges while mining. Another issue is that existing solutions do not incorporate the analysis of consumer behaviour and the nature of the product.
The full problem statement is summarized as follows:
1. Improving the algorithm for product recommendations for large datasets.
2. Combination of product nature and customer behaviour
3. The vehicle's cold start issue
To resolve all of the aforementioned issues, a solution based on similarity, popularity, and consumer nature index for product suggestion is a significant task.

IV. METHODOLOGY

The amount of data on the internet is so vast that millions of results can be found after only one search. Getting the one we want can be really difficult. As the search produces undesirable results, the issue becomes worse. These results are a result of the technologies being used to obtain the needed data performing poorly.
A recommendation system is a method of presenting material to users that they may find interesting. User behaviour is watched, and recommendations are made in accordance with it. The required set of data is returned. One of the most popular approaches in use today is web personalization. When there is too much information available, the web According to the entire study, web customization in the area of product suggestion may help to raise the standard of content mining and suggest more helpful and pertinent pieces of information. Three modules, which are given below, make up the entire suggested solution;
Module 1: Method for Parsing
Module 2: Techniques for Filtering
Module 3: Sentiment Analysis Method,
Module 4: Collaborative Filtering and Content-Based Recommendation in
Step 1: A changeable memory size Amazon Dataset from the electronics and video game industries has been taken into consideration.

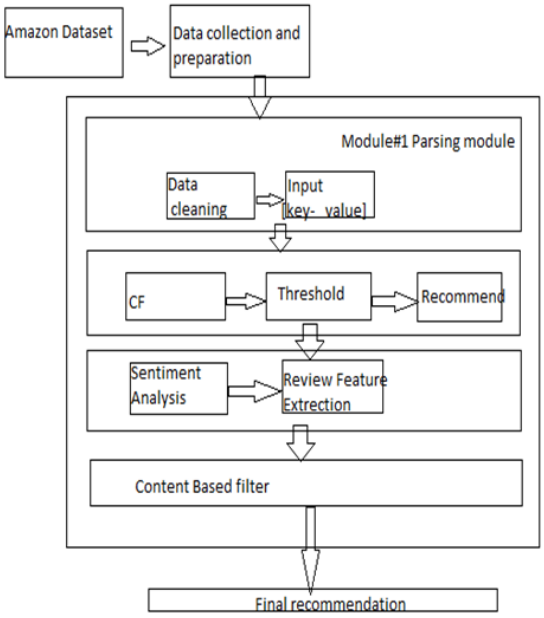

Figure 3: Suggested Architecture

Step 2: After that, the entire dataset was transferred from its original location to HDFS.
Step 3: Load desired dataset from HDFS to Mysql for processing and cleaning purposes. This is done by the Data Collecting and Preparation module.
In order to get more accurate results, the complete solution has since been processed through three distinct modules.
First Module: Parsing It has been built to remove undesirable anomalies and prepare input for the mapper in the form of Key and Value in Module Step 4: Data Cleaning and Input Preparation.
Item Suggestion for Module 2 The item recommendation algorithm has been built at Module Step 5. Here, the Collaborative Filtering technique has been utilised to calculate how closely user traits and product type resemble one another. To extract upper level recommendations, the threshold value has been kept.
Sentiment Technique, Module 3
Step 6: Sentiment analysis using the Stanford API was employed to track user review sentiment.
Collaborative filtering and content-based recommendations in Module 4
Step 7: The algorithm for collaborative filtering has been incorporated to determine the weight of similarity between user preferences and product attributes. Step 8: Final recommendation based on collaborative filtering with sentiment analysis and content-based algorithm is generated as Result. Content-based algorithm is also included to analyse frequency of popular terms used in user reviews.

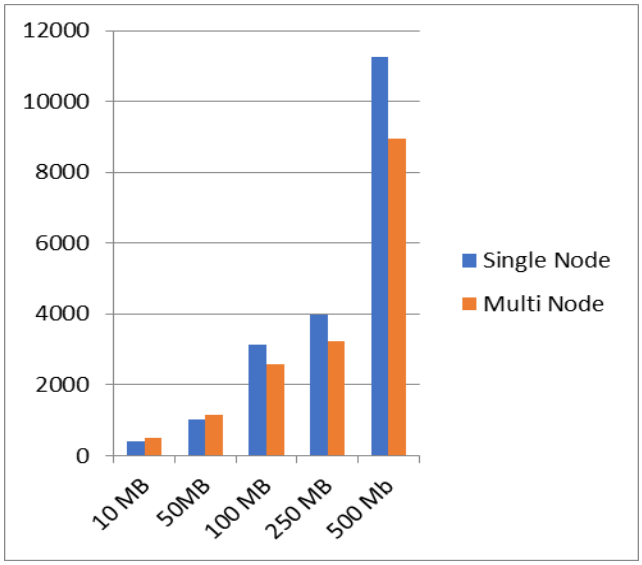

Figure 4: Result Analysis

EXPERIMENTAL ANALYSIS:
Using the Hadoop ecosystem, an experimental investigation of the suggested approach has been conducted. Performance of the suggested approach has been evaluated using Java Technology and the Hadoop-MapReduce Framework.
A Hadoop 2.7.1 ecosystem has been used for the experimental analysis, with two Intel I3-based machines serving as slave nodes and an 8GB RAM master node. The performance of a suggested method on various data sizes has been evaluated

using different file sizes. This is a brief analysis of the suggested solution.

V. CONCLUSION

The complete work expects an integrated solution based on product characteristics and customer behavior for product recommendation. For product suggestion, the entire effort anticipates an integrated solution based on product features and customer behaviour. The following list of points serves as an illustration of the expectations.

1. To create an algorithm for classifying customers for customer behaviour analysis
2. To determine sales trends and popular product lists by calculating product similarity and popularity indices.
3. Product recommendation based on the characteristics of the product and the customer.

The accuracy of the collaborative filtering method is improved by combining sentiment analysis with it, and the item cold start problem is then solved using a content-based approach.

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