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IMPACT FACTOR:

A Study on Customer Review Based Product Recommendation in E-Commerce Using Artificial Intelligence

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Abstract

Recommendation plays a very vital role in human life. Human beings rely a lot on recommendations from their daily routines to taking any big decision i.e., purchasing new things, organizing a function, recruiting a resource, buying furniture, or a new home. People reliance on recommendations and take their decisions based on the recommendation received from various sources.

As the title suggests our recommendation system is based on customers' reviews. While shopping through an e-commerce website, if the customer gets confused in selecting a product out of many available options, then the e-commerce platform provides a comparison option based on the features of the product, but what if the user can read the reviews of the product and then can decide that with which product, he/she should go for purchase. Further, it is very much difficult or we can say next to impossible for the customers to walk through the thousands of available reviews of any single product and then compare with other product to decide that with which product he/she should proceed for purchase.

To recommend a product based on reviews we need to deal with the text and hence improved frequent pattern mining has been implemented to extract the relevant content and finally artificial

intelligence applied to the extracted relevant content. We have also tested our output in a machine learning algorithm named Random Tree to validate our developed algorithm.

Our proposed framework is divided into four phases, which include phase 1 - Products on the e-commerce website. Phase 2 - Users' reviews and ratings. Phase 3 - Improved frequent pattern mining. And in final Phase 4 - Artificial Intelligence has been implemented.

1. Key Words

E-commerce, Artificial Intelligence, Review, Rating, Recommendation System, Frequent Pattern Mining,

2. Introduction

The term artificial intelligence is a very broad and umbrella term. The paper focuses primarily on the issues of decision making with the help of Artificial Intelligence and data mining. The aim of the paper is to aware people that Artificial Intelligence makes the right decision in product purchase. As there is constant change in consumer behaviour, Recognition of necessities and desires of consumers is a must. We must prepare products that are in line with theses necessities and desires.

3. Objectives of Present Study

To explore the existing techniques in the conventional methods of product recommendation in e-commerce.

- 1.** To identify the current challenges in the product recommendation system in e-commerce.
- 2.** To model a novel method of recommendation systems in e-commerce through frequent pattern mining and AI to replace the existing issues.
- 3.** To provide greater reliability and a further improvement in the random performance of the e-commerce recommendation system.
- 4.** The recommendation system will not only enhance the satisfaction among customers but also influence the conversion rate of goods.

Literature Review

This section is concerning the audit an investigation of different existing methods in this suggestion procedure of the internet business framework. The current procedures alongside the different examination hypotheses have been talked about in this section. Much existing examination alongside their results, faults, and merits are talked about in this section. This section has examined the different important results of the current specialists in the pertinent classifications of a web-based business suggestion framework that has prompted aiding the satisfaction of the flow research goals.

Discussion

E-commerce

The term E-trade or E-business alludes to the business exchanges among organizations, (B2B) or the business exchange among organizations and their clients (B2C) which will be totally or somewhat led over the web or comparable PC organizations. The business relies upon data points of interest. Increasing more clients, savoring and holding existing clients, and the proper expectation of the purchaser conduct will additionally upgrade the accessibility of items and administrations, and henceforth, the benefit. With the fast improvement of the web and data innovation, internet business dependent on the virtual economy has been broadly pulled in and it has steadily formed into the foundation of the rising business. With the wide growth of internet technology e-commerce plays a vital role in the global marketing sector. In today's scenario without the usage of e-commerce, no company can competitively sell its products. An e-commerce recommender system is one such applicative tool that enhances the chances of exponentially increasing the rate of the product value using the concept of a customer review-based product recommendation system. In this study, we have uncovered the e-commerce recommendation system using the broad aspects of artificial intelligence and frequent pattern mining.

E-commerce is more than just ordering products online and providing online catalogs but at the same maintaining its global presence on the online platform of the world Wide Web where it is completely based on the choice of the customers. However, there are a lot of techniques the AI professionals are applying in the form of processes to underline the online trading procedure starting from sourcing to settlement. The e-commerce sector is growing rapidly with its various types of trading in the form of wholesale trading, consumer trading, business to business trading and many more across the various marketing sector. E-commerce is an important area apart from the mass product sale or selling in the auction where the selling and buying of the products predominantly depend on the customer's point of view. This system of commerce is dependent on the unique process of interaction between the seller and the buyer in many forms like product reviews, product surveys, and tracking of the customers' view items. This commercial technique is uniquely banded by technological advancements in the form of artificial intelligence, business intelligence, data mining, and its implementation.

Role of Recommendation in E-Commerce

With the progression of data innovation, web-based business is growing quickly and has additionally made ready for consistent availability of internet business related cycles whenever and anyplace. Helped by distributed computing, the Quality of Service (QoS) and Quality of Experience

(QoE) of online business have encountered huge upgrades. Upheld by large information, internet business is getting more astute than more clever administrations and applications are developing. The job or an element of recommender structures is fundamental with respect to executing redid and savvy benefits and has extraordinary significance in the improvement of keen online business.

E-commerce Product

This is the very first phase in the product recommendation framework, in this phase, we have identified six products (i.e., Smart Phone, Television, Refrigerator, Laptop, Washing Machine, and Air Conditioner) in the electronic segment in e-commerce website to collect data. We wanted to collect an ample amount of data in terms of rating and reviews of the customer to provide enough amount of data to our proposed model, further, we have observed that products in the electronic segment are having a greater number of reviews and rating compare to others and hence we have identified six different product categories namely fridge, television, laptop, smartphones, air condition, and washing machine.

Artificial Intelligence

In this phase of the recommendation framework, Artificial intelligence is used to recommend the product to the customer based on the received information from the previous phase. Steepest Ascent hill-climbing algorithm is used to find the finest neighbouring node to meet the goal state and that product is being recommended, further, in improvement, we have evolved steepest Ascent hill-climbing algorithm to the next level and provide the level of recommendation i.e. Most recommended, Most likely recommended, Recommended, less recommended and not recommended at all.

Python Script

In our paper work to obtain customers' reviews and ratings of products from different e-commerce websites, we have developed a python script in collab of Google which is a cloud-based information knowledge workplace.

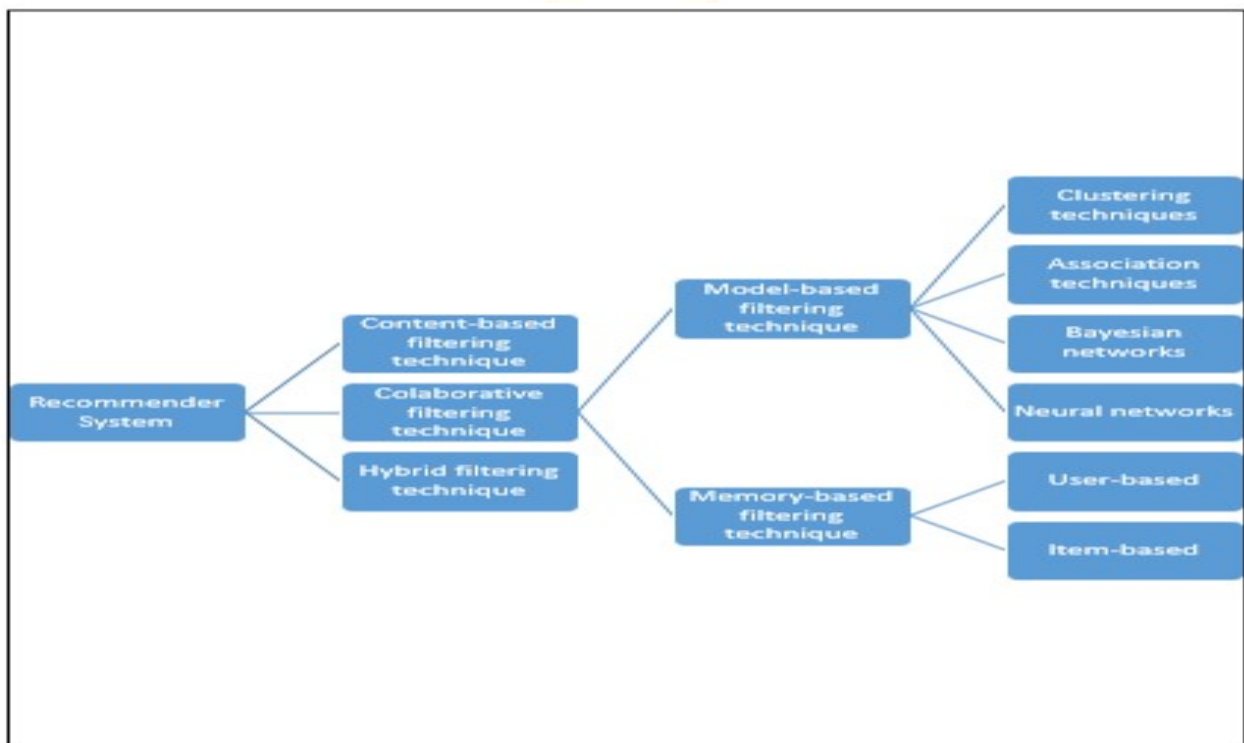
Data Refining

Data pre-processing is very important, any step moving forward without a 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 a bag of word model to find keywords for further use.

Recommendation System

The huge extent of things data on the Web is unprecedented difficulties to the two clients and online relationship in the web business condition. Clients each occasionally experience burden in pursuing down things on the Web. A specific item on the web could be suggested dependent on the top dealers on a website, by thinking about the socioeconomics of the buyer, or by dissecting the previous

purchasing conduct of the clients which goes about as a forecast for future purchasing conduct. There are a few types of proposals. They incorporate recommending items to the client, giving customized item data, short and smart network assessment, and furthermore demonstrating network audits. The recommender frameworks incorporate the cycles that are directed generally by hand, as physically making strategically pitch records, and furthermore the activities that were performed to a great extent by the PC. Recommendation systems are used by the organizations involved in the e-commerce business through the means of online brand awareness and online sales. It is a highly effective technique for suggesting potential customers, existing customers, and new ones. Though the recommendation system the e-commerce portals like Flipkart and Amazon are recommending relevant goods to their review-based customers through the recommendation system effective mode of online takes



The origin of the content-based filtering is from the material recovery and material cleaning process. The article recommendation takes place based on content-based filtering and it indicates better customer perception in terms of textual information in the form of news webs and documents. These items are usually based on the weights and keywords. To analyze the textual feature content of the recommended substances. Founded on the detected predilections of the users and the content preference analysis the nearest function of neighbor is used for the analysis and clustering of the textual feature content.

Conversion of viewer-browsers to buyers

Generally, the guests of the site frequently take a gander at the site without buying anything. Here, the recommender frameworks could assist buyers with discovering the items they wish to buy.

Increase in cross-sell

The recommender framework improves the strategic pitch by proposing extra results of the client's decision. If the given proposals are great, the normal request size increments. The significant model is proposing more items in the checkout cycle of a shopping basket. The proposal framework investigates an information base of buyer inclinations to conquer the difficulties of fragment-based mass advertising by giving every client an individual arrangement of suggestions. The proposal frameworks are the innovations that could assist the organizations with concluding on whom to propose. Such sort of frameworks permits the web crawlers and the promoting organizations to recommend commercials or offers to show dependent on buyer conduct. Online proposals were favored as they react rapidly to the client's inclinations.

Benefit of Recommendation System

The primary point of the retail organizations is to build up a drawn-out relationship with the clients which prompts higher lifetime esteems. Personalization dependent on a client's set of experiences of inclinations and buys is the most troublesome sort of personalization to actualize. Personalization is now normal in web promotion and is generally utilized in web-based business. Profound personalization constructs a client relationship over the long haul, utilizing the set of experiences created to give better proposals.

Data Mining

Information mining is the way toward producing non-clear fundamental data for the chiefs from huge data sets. The term information mining was utilized to depict the assortment of examination methods used to deduce the guidelines from colossal datasets. One such notable case of information mining in web-based business is the improvement of affiliation runs the connection between the things that show the connection between buying one thing and different things.

Customer Review and Rating

In the second phase of the recommendation framework, we have developed a python script to scrape product detail from the e-commerce websites. In an attempt to extract the required data of the product we scraped the following product detail using python script, Brand, Product, Model, Users' Review, Users' Rating, Price. We have manually selected features like users' ratings and reviews and took it forward in the next phase of the recommendation framework.

Conclusion & Future Scope

- This research instigated the product recommendation system for the e-commerce website, which recommends the most likely to purchase products at different levels of

recommendation to the customer using Steepest-Ascent Hill climbing algorithm respectively and content-based filtering, based on the customers' rating and review.

- For the customers' convenience, we developed a script and scraped data directly from the e-commerce websites. NLP is used to processed customers' reviews and extracted relevant information from the reviews, further based on the rating and reviews both collectively we have developed two algorithms namely Steepest-Ascent Hill climbing and Improved Steepest-Ascent Hill climbing.

- Our procedure has a limitation of a cold start problem in the recommendation system. For the newly launched product or the product which has no reviews and rating given from the customer is not covered in this paper. For the future scope, we could focus on the cold start problem in the recommendation system with our proposed Improved Steepest-Ascent Hill climbing algorithm.

References

1. D. Turban, E., Outland, J., King, D., Lee, J.K., Liang, T.-P., Turban, Electronic commerce: A managerial and social networks perspective. 2018.
2. C. J. Witten, I. H., Frank, E., Hall, M. A., & Pal, Data Mining: Practical machine learning tools and techniques. Morgan Kaufmann., 2016.
3. L. F. Qin Z., Chang Y., Li S., E-Commerce Strategy of Industries. Springer, Berlin, Heidelberg, 2014.
4. C. Y. Li and Y. C. Ku, "The power of a thumbs-up: Will e-commerce switch to social commerce?" *Inf. Manag.*, vol. 55, no. 3, pp. 340–357, 2018, doi: 10.1016/j.im.2017.09.001.
5. Y. Zhang, H. Abbas, and Y. Sun, "Smart e-commerce integration with recommender systems," *Electron. Mark.*, vol. 29, no. 2, pp. 219–220, 2019, doi: 10.1007/s12525-019-00346-x.
6. V. Y. Yoon, R. E. Hostler, Z. Guo, and T. Guimaraes, "Assessing the moderating effect of consumer product knowledge and online shopping experience on using recommendation agents for customer loyalty," *Decis. Support Syst.*, 2013, doi: 10.1016/j.dss.2012.12.024.
7. M. Hsu, C. Chang, and L. Chuang, "International Journal of Information Management Understanding the determinants of online repeat purchase intention and moderating role of habit: The case of online group-buying in," *Int. J. Inf. Manage.*, vol. 35, no. 1, pp. 45–56, 2015, doi: 10.1016/j.ijinfomgt.2014.09.002.
8. S. Heinrich, "Serious Business: How to attract and persuade customers without being salesy.," *BoD–Books on Demand.*, 2015.

9. K. Palanivel, “Development of Agent-based Personalized Recommender System for effective Human-Computer Interaction,” BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI, 2012.
10. H. Banaee, M. U. Ahmed, and A. Loutfi, “Data Mining for Wearable Sensors in Health Monitoring Systems: A Review of Recent Trends and Challenges,” *Sensors*, pp. 17472–17500, 2013, doi: 10.3390/s131217472.
11. J. Lu, D. Wu, M. Mao, W. Wang, and G. Zhang, “Recommender system application developments: A survey,” *Decis. Support Syst.*, vol. 74, pp. 12–32, 2015, doi: 10.1016/j.dss.2015.03.008.
12. M. W. Gage, “A Stand-Alone Methodology for Data Exploration in Support of Data Mining and Analytics,” California Polytechnic State University, 2013.

