EMERGING ROLE OF ARTIFICIAL INTELLIGENCE IN PRODUCT RECOMMENDATION

Pritesh Somani[1]

ABSTRACT

This short paper deals with the role of Artificial Intelligence in recommending the right set of products to customers especially for the E-Commerce websites. This paper highlights different product recommendation strategies used by business organizations at the same time the challenges faced by them in effective implementation of product recommendation along with the jargons associated with use of product recommendation. It also provides further insights on the actual working methodology behind recommending correct set of products to customers. A few Case studies on best possible use of Artificial Intelligence by different E-Commerce organizations is also presented towards better understanding of recommendations.

Keywords: Artificial Intelligence, recommendations, strategies

Received: 23 June 2023 / **Revised:** 30 July 2023/ **Accepted:** 5 August 2023

DOI: https://doi.org/10.37497/rev.artif.intell.educ.v4i00.11

[1] Assistant Professor,Balaji Institute of International Business (BIIB), Sri Balaji University, Pune (SBUP). Email: pritesh.somani@biibpune.edu.in ORCID: https://orcid.org/0000-0001-8590-2959

Introduction

Every startup or be it a well-set business firm in today's techno friendly environment strives to improve communication between their products and customers. Each and every business organization is trying to come up with one or the other form of mechanism that is similar to a sort of suggestion system in order to improve the customer experience and in turn help in increasing the sales of products to a great extent. In order to ensure customers, see only those products related communication which they are interested in product recommendations proves to be a great savior.

Product recommendation is a type of e-commerce customization in which suggestions are dynamically generated for a customer on a webpage, application or even on the advertising panel board of the e-mail platform being used by the customer, based on data such as shopping traits along with their browsing pattern so as to assist the customers with an one-to-one personalized shopping experience. Product recommendations are especially useful for those business organizations dealing in vast and diverse category of products.

Majority of the online merchants consider product recommendation solution as a must-have in their marketing plan, tailored recommendations are widely used across by e-commerce websites, it is actually quite difficult to implement and most of the retailers struggle to strike a balance between scalability and the control needed especially as per the need and requirement of the customers. On the other hand, hindrances in getting the correct data on time, lack of quick decision making and recommending relevant product to correct set of customers is a big challenge for majority of the e-commerce portals hence correct and relevant usage of Artificial Intelligence is must for the e-commerce portals in order to provide relevant product recommendations as per choice and preferences of the customers.

Terms used in association with Product recommendations

In order to develop better clarity towards working of product recommendations it is necessary to have a clear understanding about the terms associated with product recommendations. The associated terms are: personalization, recommendation engine, collaborative filtering, content- based filtering along with hybrid recommendations.

1. Personalization: E-commerce personalization is quite feasible these days owing to innovations in the field of online marketing and digital services. Product recommendations are

made available on the basis of customers' purchase history, usage history, access history and even cookie-based personalization. Relevant set of content is recommended for customers using a particular recommender system with the purpose of enhancing specific business outcomes that helps in providing solution thereby creating a win-win situations for all the associated stakeholders.

2. Recommendation Engines: The Recommendation Engine is a software programme which scrolls through the catalogue for products that may be of interest to customers. It's essentially a data filtering tool which analyses the available information using fundamental algorithm and generates relevant product recommendations for the customer as per their browsing history.

3. Collaborative Filtering: This strategy is based on the preferences given by customers towards their purchases and recorded in the system. One of the main advantages of this strategy is that it is not dependent on machine analysis thereby making it capable of recommending complex products like movies and music etc.

4. Content based Filtering: This strategy is based on the description of product and at the same time preferences given by customers. Product are frequently associated with a variety of tags, and users' preferences are compared to them based on their tag history. It may result in

finding the most suitable products for the users. This is essentially digging up the user's past, extracting information on products liked by them and recommending most appropriate set of products.

5. Hybrid recommendation system: This method is a combination of Content and Collaborative filtering. Predictions obtained with content and collaborative methods individually can be combined with another set of algorithms to form the hybrid method. The hybrid technique has proved to be more effective in providing relevant reviews.

Working of Product recommendations

Data and machine learning technology are used to provide the best of the product recommendations. Data is an essential component for the success of recommendation engine because it is the foundation from which patterns are created. Recommendations will be more efficient and effective at making appropriate revenue-generating ideas if it has more relevant data. Following are the different steps in working of Product recommendations:

1. Data collection

Collecting data of customers is the first stage in constructing of an recommendation engine. There are two categories of Data that can be collected, Implicit data refers to the information collected from different sources like web search history, clicks, cart history and purchase pattern history of the customers. Explicit data refers to the data acquired from user reviews and ratings, as well as likes and dislikes, and comments given on the product performance. At the same time, demographics and psychographics details of customers are also used to identify identical set of customers, as well as their data usage similarities are synchronized to recommend similar set of products.

2. Data storage

Once the required data has been collected, it must be stored in appropriate manner. The amount of data will keep on multiplying in an enormous manner over time. This necessitates the availability of substantial, scalable storage. Different forms of storage are available depending on the sort of data collected by the marketers.

3. Data analysis

The collected raw data has to be put down for analysis which can be analyzed in different manner including real time analysis where in the collected data is processed as soon as it is collected and batch analysis in which the collected data is processed on regular intervals.

4. Data Filtering

Filtering is the final stage. Depending on whether collaborative, content-based, or hybrid model recommendation filtering is employed, different matrixes or mathematical rules and formulas are applied to the data. The resulting output is the product recommendations offered to the customers.

Review of Literature

1. Zang.et.al. (2011) in their research work on “The role of online product recommendations on customer decision making and loyalty in social shopping communities” stated appropriate product recommendations has a positive influence on customer loyalty. In the model developed by them three major constructs were taken in to consideration screening, evaluating and decision-making quality which is presented through the benefits received by

the customer in the entire product buying process. It was concluded through the study benefits received by the customers in form of relevant product recommendations through the online shopping retailer helps the retailer in earning long term loyalty of customers.

2. Kakkar and Monga (2017) in their research paper on "A Study on artificial Intelligence in E-commerce" stated Artificial intelligence has the ability to gather and evaluate massive amounts of data and thereby support in appropriate decision making. This technique is now being used in e-commerce to detect consumer buying patterns based on surfing, purchase history, credit checks, and account information. Many e-commerce companies have begun to use Artificial intelligence in various forms to better understand their customers and provide a better customer experience.

3. Singh (2021) in his paper on "A Study of Artificial Intelligence and E-Commerce Ecosystem – A Customer's Perspective" opined the e-commerce ecosystem has been growing at an exponential rate, and it has developed and adapted even in the face of worldwide pandemic situation resulting in to nationwide lockdowns. In a relatively short period of time, India's e-commerce ecosystem has become a critical component of the Indian economy along with the growth of Indian digital users. Artificial Intelligence systems have been critical in the exploration of the vast data generated by customers at rates ranging from 1 MB to 1.7MB per second per day and as a result, the e-commerce industry has implemented A.I. driven systems and formulated an ecosystem in which both the operator and the user funnel in services and commodities, while the user funnels in data.

Product recommendation strategies

There are different sort of product recommendation strategies working in different manner to recommend best of the products to customer depending on their shopping history. Following are few of the product recommendation strategies:

1. Most popular product strategies

Displaying "Top Items," or items ranked as "most purchased" or "best," is a frequent suggestion approach. The weighted sum of all interactions, such as purchases, adds-to-cart, and product views, is used to rate items. When a data feed is synchronized, the system prioritizes new interactions over old ones and adjusts scores. As this method isn't usually based on hyper-personalized user data, it's particularly beneficial when little is known about a user or when a user's behaviour indicates they're only browsing the site. It's perfectly fine for keeping on

display top grossing items and let the company stand out from the crowd. It further helps in selling the brand as well as the popular items they offer by assisting and enhancing the product discovery experience.

2. User affinity

Marketers may make appealing product recommendations to those set of customers whom they matter most using affinity-based techniques. Users are exposed to a variety of products as they browse through a particular site and engage with various products, including color, brand, style, and user affinities and preferences, resulting in rich, user affinity profiles for each site visitor. This method allows recommendations to be tailored to each customer in unique manner. Affinity profiles have a weighted score based on the relationship between interactions and product attributes. The algorithm then uses these scores to make recommendations and can work in real-time, recognizing any dynamic changes in customer preference too.

3. Similarity

As the name suggest "Similarity" technique, display products that are similar to one of the products purchased by consumer or a bundle of products generally bought together currently

in view, taking into account the item's popularity. Complex algorithms are used to determine the metrics, which are calculated using categories and keywords from the data feed and result in a similarity "score" for each item. Customers are then shown only those products with the highest similarity scores.

4. Viewed together

This strategy is based on the view that the consumer is presently exploring and may plan to buy it at a later stage. Other products in similar category are scored on the basis of number of times they have been viewed in a single session with the original product in view. When an item is frequently viewed with a variety of other objects, the algorithm considers the relationship to be weak, reducing the likelihood of it being recommended. This method is suitable for every product page maintained by the e-commerce portals.

Challenges in implementation of product recommendation strategies

1. Cold start

The cold start problem is often known as customer cold-start, it generally occurs when database of the organization has no information about the customer or their preferences when they first visit their website or download their application, and so fails to provide recommendations. New items, similarly, have no reviews, likes, clicks, or other user successes, therefore no recommendations may be provided.

2. Data sparsity

This issue originates from the fact that a major lot of customers will only rate a small proportion of the available items - especially if the catalogue is extensive. As a result, there is insufficient data to identify related people or objects, resulting in a sparse user-item rating matrix.

3. Scalability

The scalability of recommendations with huge, real-world datasets is a serious issue in today's product recommendation systems. With small datasets, a recommendation system may perform effectively and deliver correct results, but with huge datasets, it may begin to produce inaccurate or inefficient results. Furthermore, certain recommendations techniques are mathematically expensive to execute, larger the dataset, longer it takes to analyze and generate recommendations from it and the more it will cost the company to do so.

Artificial Intelligence in E-Commerce: Case examples

1. Amazon

Alexa is one of Amazon's most well-known and popular Artificial Intelligence product. It contributes significantly towards the development of Amazon's customized marketing algorithms. Amazon uses artificial intelligence to predict which products will be in high demand and to deliver personalized suggestions to customers based on their recent searches. Out of the total sales approximately 35% of the business is generated through the help of Alexa.

2. Jingdong

Beijing-based JD.com teamed up with Siasun Robot & Automation Co Ltd. to optimize warehouse operations using automation technology such as robots. The fundamental

concept was to increase the speed and efficiency of product sorting and distribution in warehouses, lowering expenses and increasing the operating income. J.D. plans to use artificial intelligence to cut the number of employees from 1,20,000 to 80,000 over the next ten years in order to boost efficiency by eliminating manual labor and thereby increase profit margins.

3. Alibaba

When we think about Alibaba, we typically think of A.I. products like T-mall Genie and Ali Assistant. Alibaba intended to improve its competitiveness by implementing A.I. Their customer care assistance chatbot now processes 95% of all client enquiries, both written and spoken, and it is quite powerful. Furthermore, Alibaba claims that A.I. algorithms aid in the operation of internal and customer support operations, such as smart product and search recommendations. Alibaba also use A.I. to assist in the mapping of the most effective delivery routes. According to Alibaba, smart logistics has resulted in a 10% reduction in vehicle utilization and a 30% reduction in trip distances.

4. ASOS

Fashion retailing giant ASOS continues to invest in A.I. and speech recognition systems in order to influence customer behaviour. It has also made a significant investment in picture recognition technology by launching a visual search feature which allows the ASOS app to match users' photos with similar clothes for sale online.

5. Rakuten

Japan based e-commerce player, Rakuten, continue to invest heavily in their A.I. set up in order to understand their customers behaviour which is necessary for success of any e-commerce business. With the help of Rakuten institute of technology they are able to evaluate their database comprising of around 200 million products in order to forecast the sales with a higher degree of accuracy. At the same time, they are in a better position to segment their consumers in a more accurate manner using real time data. As far as their application is concerned, they are using image-based technology with the very basic objective of improvising on customer satisfaction at the same time improve their sales productivity.

Contribution of Artificial Intelligence towards growth of Online shopping

1. Target market and advertising

With the growing advances in machine learning and artificial intelligence deep personalization approaches are now a practical reality. It is quite feasible to zero in on what your customers actually want and deliver the message that will resonate best by evaluating massive data from purchase histories and other customer interactions.

2. Seamless automation

Automation aims to complete a task with as little human involvement as possible that may include using a C.R.M. or marketing platform to schedule e-mails, using Zapier to automate processes or utilizing advanced technologies to assist with hiring. A.I. can assist you in automating the monotonous chores that keep your online store running smoothly. Product recommendations, loyalty discounts, special product recommendation and other such tasks can be automated with help of Artificial Intelligence.

3. Efficient sales process

Artificial intelligence can help the organization in having a robust sales process by collecting appropriate data from customers at the same time taking appropriate follow up with reference to abandoned shopping carts and also keeping the customers engaged in their shopping process with frequently asked questions directed through their chatbots.

Conclusion

Without a doubt, A.I. has helped in improving the popularity and now plays an important part in the new digital era. It is in the best interest of E-Commerce websites to use recommendation engines in order to keep themselves upfront in this competitive market and gain more number of consumers. In today's competitive environment recommendations are becoming more common, especially with the application of artificial intelligence, which is both time-saving and pragmatic. Artificial intelligence has enhanced the productivity of recommendation engines, which are now more focused on the customer's visual preferences rather than the just the product description.

References

Kaptein, M., & Parvinen, P. (2015). Advancing E-Commerce Personalization: Process Framework and Case Study. International Journal of Electronic Commerce, 19(3), 7-33.

Mrukwa, G., & Netguru. (2021, July 5). How to Build a Product Recommendation System using Machine Learning. Netguru. https://www.netguru.com/blog/product-recommendation-machine-learning

Novoseltseva, E. (2022, March 26). Artificial intelligence in eCommerce: facts, use cases. Apiumhub. https://apiumhub.com/tech-blog-barcelona/artificial-intelligence-ecommerce/

Retta, L. (2020, September 21). Choosing the right product recommendation strategy. Dynamic Yield. https://www.dynamicyield.com/lessons/product-recommendation-strategies/

Singh, R. (2021). A Study of Artificial Intelligence and E-Commerce Ecosystem – A Customer's Perspective. IJRESM, 4(2), 78–87.

Shaikh, S., Rathi, S., & Janrao, P. (2017). Recommendation System in E-Commerce Websites: A Graph-Based Approach. IEEE 7th International Advance Computing Conference (IACC), 931-934.

What Is a Recommendation Engine and How Does It Work? (2020, September 10). Appier.Com. https://www.appier.com/blog/what-is-a-recommendation-engine-and-how-does-it-work

What are product recommendations? How do they work? Kibo Commerce. (2022, February 15). https://kibocommerce.com/blog/product-recommendations/

Zhang, H., Zhao, L., & Gupta, S. (2011). The role of online product recommendations on customer decision making and loyalty in social shopping communities. International Journal of Information Management, 38(1), 150-156.