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Machine Learning Based Recommendation System for E-Commerce Platforms

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***Abstract*—Business that happens online is done with a different scope these days in the digital market.The businesses that happen online are also made to sell products and make profits. This constant evolution of online consumer behavior leads to change in scope for the digital business all the time. An advanced recommendation system, which makes use of intelligent techniques, has become a powerful tool for online transaction systems. A smart recommendation will pull useful information from the particular user's preferences, choices, tastes, hobbies from earlier data. In addition, this study serves as.**
According to a new study by Infosys, over the years, e-commerce firms have started to prefer AI-enabled personalization instead of traditional and explicit recommendations. Several algorithms can analyze large amounts of data to provide recommendations that are highly accurate. The report also highlights how the arrival of things like Natural Language Processing (NLP) or visual search may cause precise recommendations on artificial intelligence shortly.
The overall outcome showcases the potential of Intelligent Recommendation System to bring disruption in e-commerce. In addition, future Intelligent Recommendation Systems must be more robust, adaptive, and efficient to keep pace with constantly changing user needs and expectations.In sum, findings of the paper show how much IRS can change the e-commerce sector. In addition, the new IRS developed to meet changing user demands should be more powerful and effective.
***Keywords*—Intelligent Recommendation System, E-commerce, Machine learning, Deep Learning, Artificial Intelligence**

I. INTRODUCTION

A. Background

Walmart, Amazon, Alibaba, Flipkart, and Shopsy are major players. Recommendation systems help users to choose the perfect item according to their specifications. Also, it assisted recommendation to choose the mentioned effort by a user and the current shopper data. The number of online shoppers is increasing everyday due to a boom in E-commerce. The system assists users in making the correct decision for selecting the right product continuously.

The recommender systems which rely upon some input to output rated items are called traditional recommender systems. Common recommender systems are collaborative, content-based, hybrid recommender systems. When group members have preferences, collaborative filtering provides recommendations among them. Satisfied.Due to these limitations AI technology has been introduced in recommender system for better results. A few other ML and DL options came along to offer better functions for recommender systems. The algorithms of ML and DL include analyzing huge data and then drawing the conclusion for which product is best suitable for a particular customer. It uses the pattern.

The E-commerce field is witnessing continuous research growth. An investigation of the review article looks at the artificial intelligent-based recommendation systems in the E-commerce. Different approaches based on machine and deep learning.

B. Objective of the review

The main purpose of the present survey paper is to review recommendation system based on ML and DL by emphasizing research survey papers published during the last five years. It furthermore finds out how M/L and DL machines personalize RS's with the help of user behaviour and user preference and complementary product suggestions. Additionally, the survey examines both the rising trends of IRS and the key challenges in implementation.

Section 2 of the paper outlines references that combine ML and DL methods in a recommendation system. Section 3 discusses the detailed application of Artificial Intelligence (AI) technologies in an e-commerce recommendation model. Section 4 discusses how recommendation models contribute to the efficiency of e-commerce applications. Section 5 focuses on the practical implication of recommendation models. In addition, Section 6 outlines future directions, Section 7 presents limitations, and Section 8 concludes the study.

II. LITERATURE REVIEW

A. Machine Learning Approaches

The e-commerce sector is set to benefit from supervised learning, unsupervised learning, semi-supervised learning, and reinforcement learning. These machine learning strategies will enhance client experience, optimize transactions and improve revenue through better recommendation models. Loukili et al, [14] aims to improve the e-commerce experience through personalized recommendations of drivers of recommender systems an important to builds user engagement. In addition, the system involves developing an algorithm that uses association rules through the Frequent Pattern-Growth algorithm to deal with the suggestion of products on the basis of the behavior of a past customer. The results indicate that the utilization of algorithm can significantly increase the likelihood of purchasing the suggested item. Considering the above mentioned the personalized recommendations are very important for enhancing the engagement of customers, and deal e-commerce platforms.

Another work [15] utilized BH-GWO optimisation combined with fuzzy logic that raises the sentiment analysis andenhanced RS. Optimization technique improves the classification accuracy by improving feature extraction process with efficient tuning of various parameters. The novel BH-GWO method will be created in this paper which will utilize the concepts from grey wolf optimizer (GWO) and Black Hole (BH) for improved accuracy of classification. In addition, the classification accuracy of a number of benchmark datasets has helped to measure the BH-GWO system.

As such, Magesh et al. [16] suggested a recommendation model that has integrated with Microsoft's ML.NET platform to automate the entire process of working with recommendation models. The recommendation model uses 37 ML.NET components to create a recommendation model that uses matrix factorization and logistic regression to extract information from product scores and customer feedback. Therefore, the aim of the proposed model is to give an efficient product recommendation to the customers in an e-commerce site based on the product rating and feedback. The UEL Store e-commerce website along with UCI sentiment labelled dataset has tested the designed model.

B. Deep Learning Approaches

Latha and Rao [7] proposed a DL-based product recommendation model developed using deep learning and word embedding-based features for Amazon datasets. TF-IDF was the feature extraction method used. The proposed model has performed significantly based on the CNN model and a skip-gram based embedding. The values for recall, precision, and accuracy of this model are 94.80, 93.64 and 96.92%. In the same way,

In [16], Tran and Huh recommend model planning has been proposed for better sequential recommendation accuracy. It records the sequence of user behaviors over a defined period of time. In agreement with this, Ramshankar and Joe Prathap in [15] improve the recommendation quality by employing the adaptive fuzzy sentiment classification using an optimization approach. They.

In addition, Gulzar and colleagues put forth an ordered clustering-based recommendation algorithm tailored for e-commerce platforms. Also, Khalte and colleagues introduced a customer centric decision support system using Multi Objective optimization and collaborative filtering for e-commerce platforms. To tackle ambiguity and cold-start issues in e-commerce platforms, Khaledian et al. [19] proposed collaborative.

C. AI-driven Approaches

The topic taken into consideration for their study is The e-commerce network is a directory of recommendation systems that they may apply within their framework for the purpose of shopping. The client shopping is what most of this is based on. In addition to this, it improves e-personalizing with the co-creation of content in the catalog curation.Johnpaul et al. [12] utilized variety of ML techniques to study user behaviour and improve e-commerce platform. With the help of a machine learning technique, the authors of the paper propose analyzing user rating and time-interval for better customer insight.

The relevance of artificial intelligence in recommendation systems is highlighted by Shirkhani et al. [13]. The e-commerce industry is developing rapidly by the day.A research by Ramshankar and Joe Prathap [15] offered an investigative framework to detect fake reviews and slander users. A Hierarchical Dual-Attention Recurrent Neural Network (HDAN) was used for the detection of fake reviews. The model successfully identified the phoney/negative.

In addition, Khaledian et al. [19] studied and suggested effective recommendation techniques to resolve these problems. The objective of the proposed was to design an intelligent system comprising of efficient recommendation approaches that overcome the limitations of scalability and computations of traditional approaches for large scale e-commerce systems.

The results from their experiments indicate that the accuracy of the suggested method is higher than that of.

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III. UTILIZATION OF AI TECHNOLOGY IN E-COMMERCE RECOMMENDATION MODELS

A. Types of Recommendation model in E-commerce

A recommendation system (RS) is an Information Filtering System (IFS) that helps content and services to users and customers by suggesting personalized products they may like. Modern e-commerce solutions incorporate artificial intelligence (AI), machine learning (ML), and deep learning (DL) for their highly effective recommendation strategies. So, what is recommendation engine? There are many potential areas where recommendation systems may be applied including media, music, and e-commerce. Collaborative filtering, content filtration and hybrid filtration are the popular recommendation strategies that combine both the above-mentioned filtering methods. As a result, collaborative filtering strategy is employed to analyze users.

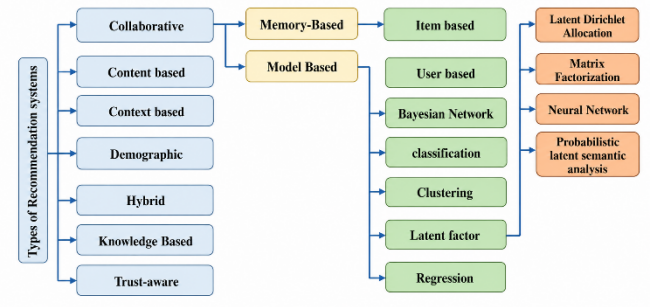

Figure1.Thetypesofrecommendationmodels

The traditional recommendation models that we use have a lot of challenges taking place in them. A variety of problems like system cold-start, data sparsity, etc take place. Moreover, they do not employ any methods of deep learning. Several recent studies propose the use of social-network-based collaborative filtering and ensemble deep learning to address these problems. A hybrid recommendation framework was introduced by a few studies simultaneously. This framework of recommendation is intelligent.
Employing DNN on user feedback can assist a model in comprehending semantic knowledge through high-order interaction. The product is influenced by user reviews' interaction. This model is utilized by users to extract details from complex product descriptions and reviews. This allows for an accurate understanding of the quality and performance of the product. A model is built for classification.

B. Key Components in AI-Driven Recommendation System

In view of the latest continuous developments, a new way of systems emerged called Artificial Intelligence (AI) which drives innovation by recommending new conducts, services, or contents to targeted users in a very precise and accurate.
Recent studies have enhanced traditional collaborative filtering approaches with ML based recommendation models in order to provide better recommendations. A smart personalised grocery recommendation system using ML and DL approach, intelligent grocery shopping list was created using customer's past purchase history, present store offers and item availability. A couple of deep learning models including gated recurrent unit (GRU) as well as recurrent neural network (RNN) as well as useful ML models applied. The two DL models outperform the traditional ML models.

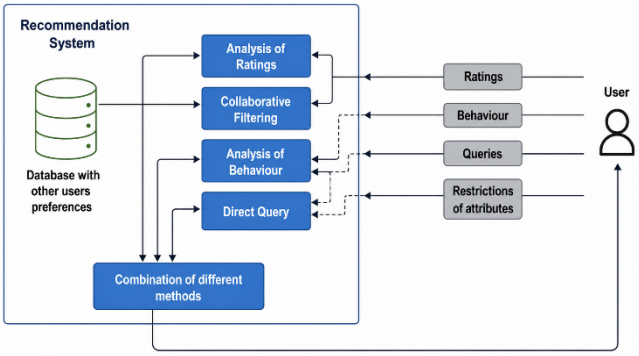

Figure2. KeyElementsInterconnectedinRecommendationSystem

The system that uses text has some limitations due to which the recommendation systems were based on the image. The visual approach employs a machine learning algorithm to offer product suggestions. In this paper, the Principal Component Analysis (PCA), the Singular Value Decomposition (SVD) and K-Means++ have worked for the similarity of images of the same product. The fashion website dataset contains a large collection of images related to various fashion products. The outcomes received after doing the experiment on a large dataset.

C. AI Powered Enhancement in Recommendation System

The recommendation system or RS helps in product recommendations to customers based on their interests, browsing history, and buying behaviour. Using different AI algorithms personalization is possible. Personalized Recommender Systems also provide customized coupons, ads, discounts, and offers according to the user's interest. This boosted customer engagement, loyalty and sales for e-commerce platforms. People generally enjoy recommending shopping platforms. This is because studying three different recommendation models, contributes to the pleasant user experience. The end of such studies depended on comparing them which was done to compare a non.

Personalized recommendation systems assist e-commerce businesses in creating superior items and enhancing customer satisfaction through more pertinent and precise suggestions. User behaviour is analyzed with clickstream analysis, purchase history analysis, and search query analysis. Clickstream analysis tracks the paths customers take as they navigate the website of an e-commerce firm. The buying preference of a customer is analyzed based on their previous purchase from the store in purchase history analysis. To determine the customer's interest, the company's searching behaviour is analyzed in search query analysis. E-commerce companies are coming up with advanced AI-driven personalisation that Amazon,

Numerous researchers found that the use of AI and ML enables the quality of recommendation and predict customer behaviour. Machine learning techniques such as decision trees, clusters, neural networks and predictive analytics came in handy for marketing and customer retention. The SGNR model utilized social graphs neural networks to enhance recommendation accuracy. In the paper published by Chen et al, the authors propose to utilize graph neural networks with dynamic reinforcement learning to tackle the problem of cold-starts. Based on the experimental results, SGNR outperforms DRL-based methods and recommenders in relevance and effectiveness, compared with traditional personalized e-commerce systems.

D. Real world Application with AI- based Recommendation system

AI-enhanced recommendation systems (RSs) function as a professional data information filtering technology which are used by e-commerce sites which depend on interest of client to make customized recommendations. The client company, their browsing strategy, purchasing history, and customer profiles of similar types are looked at. This, in turn, increases the online shopping experience. The effectiveness of e-commerce platforms is improved due to constant personalization of recommendations to consumers and this increases consumer engagement, retention and revenue. With the Help of AI a proposal framework analyzing huge data of the.

Today, online stores employing intelligent agents improve the quality of recommendations and personalization of customers. The smart recommendation system has become a necessary component of e-commerce development. Due to this, the application of the stimulation of AI technology patterns allows users to discover new products of interest more effectively. A combination of machine learning (ML) and deep learning (DL), artificial intelligence is often used for predicting the interest of users. A.I. has been shown to outperform regular recommendation techniques, according to research.

One of the main advantages of a recommendation system is that it allows us to find new or suitable products using various techniques such as rating, ranking, customer reviews.

Major companies including Amazon, Walmart, Alibaba and Netflix use AI-powered recommendation strategies to drive conversion rates and user engagement by offering personalized experiences. Moreover, e-commerce is growing at a fast pace. In 2021, total retail sales in Canada equalled nearly $713 billion. In the recent years, e-commerce sales witnessed positive year-on-year growth. According to Statista, the year-on-year growth was $5.8 trillion to $6.4 trillion in 2022.

IV. THEORITICAL CONTRIBUTION

The recommendation system employs some of the most advanced methods known as Machine Learning (ML) and Deep Learning (DL). It evaluates the actions of buyers and suggests products for its clients. The enhancement of recommendation robustness, as well as customer satisfaction and engagement, hinges primarily on the collaborative filtering, content-based filtering, and hybrid recommendation techniques.

The hybrid approach utilises collaborative techniques and content-based techniques using more advanced machine learning (ML) techniques for forming suggestions. A recommendation system similarly takes into consideration individual user preferences, regional interest and purchasing behaviour to give recommendation contextual and personal. These recommendations that are contextual, personalized are important in addressing cold.

Recent studies on e-commerce platforms have introduced four theoretical frameworks focusing on customer trust, responsiveness, and recommendation systems. These studies examine how customers respond to changes in the online shopping environment and analyze the influence of demographic factors on recommendation effectiveness. The findings provide valuable insights for marketers and researchers in designing more effective recommendation strategies for e-commerce platforms. Furthermore, the real-time integration of recommendation systems can help businesses better understand evolving customer preferences and continuously optimize recommendation models for improved performance. The effectiveness of these systems can be evaluated using metrics such as user satisfaction, conversion rates, and click-through rates.

Recommendation algorithms today combine both the psychological and the behaviour of the user. Ideas like self-perceived identity and internal motivation help us understand vendors making recommendations to consumers. These psychological indicators help recommender systems to recommend better products. It helps the analysis of decision-making and creates a strong bond between the customer and the e-tail platform. Recommendation systems unify NN with classic CF methods to enhance prediction accuracy and achieve explainability. The recommendations are generated by using data-driven and collaborative filtering techniques in this system.

Cold-start problems are a major issue to overcome for intelligent recommendation systems in e-commerce. This problem refers to the issue of behavioral recommendation systems having useless recommendations for users with little or no prior data. For instance, intelligent e-commerce recommendation systems do not qua the items to new users when they do not have past purchasing history. Likewise, these algorithms aren't able to recommend new products to the customers due to lack of prior buying data.

Knowledge-Based Recommender Systems can work as a useful solution here. This recommendation system is a smart one, as it makes use of the people involved and their explicit knowledge to define things. Moreover, it utilizes manufacturers or users' explicit knowledge to define object attributes.

V. METHODOLOGY

A. Research Question

How deep learning techniques are used in personalized recommendation systems? What advantages do they have compared to traditional ML? Deep learning techniques possess several advantages over conventional machine learning techniques in recommendation systems. It has greater learning capability for non-linear functions, making it truly effective for many issues. This is a model where the learning algorithm finds a higher-level feature.

In what ways can personalization benefit e commerce? Personalized marketing employs smart marketing techniques to provide you with products and services along with communications designed to meet your individual needs.

B. Source Selection

The review of this paper specifically deals with intelligent recommendation system (IRS) which will reform the e-commerce. A critical exclusion criterion tested is the research of published studies during the past five years. For this study, deep search mechanism was used, which contains various online databases including and careful analyses of selected literature. In addition, the language of publication is also a critical exclusionary criterion; we configured the search engine to exclude non-English publications, and also Not specific to e-commerce and study having insufficient experiments before retrieving the results for searching on digital libraries. In addition, we performed a manual analysis by checking the title, abstract conclusion and keywords of the paper. After this, we will select the relevant study excluding irrelevant ones. Analysis means to read and judge the relevance of every document in a manual way.

Table1.Summaryofthesearchresultsbasedonthe database.

DatabaseName	NumberofStudy
IEEE	3
MDPI	5
Springer	8
Taylor&Francis	3

Sciencedirect	7
Willey	1
ResearchGate	7
Others	30
Total	63

The research has given top priority to few sources like IEEE, MDPI, Springer and Science direct as has already been shared in table 1. Probably because those are considered top quality publications in the area of data and technology engineering.

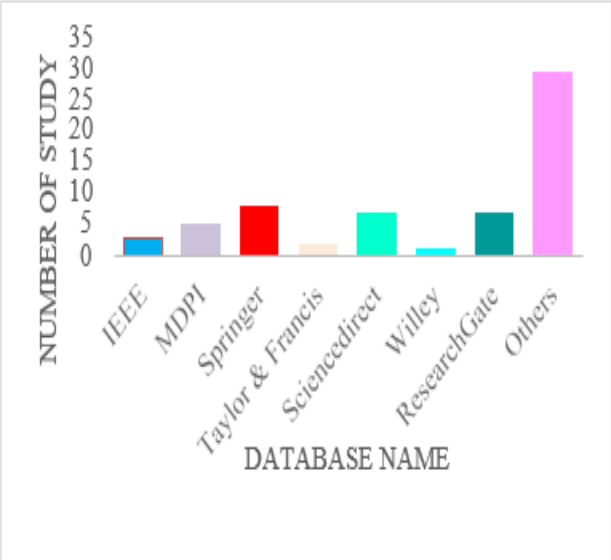

Figure3.ThePublicationdetails

Both sources are known for peer-reviewed and highly technical research papers that add to the reliability of a study. Also, the research papers are from credible universities and organizations and are quite recent.The study mainly focuses on deep learning and recommendation systems. As a result, these.

According to figure 1, the proposed review work has examined the recommendation models through standard publications generally. The most recent representation of research papers from the past five years on the subject that will be studied further is presented in the table 2 below.

Table2.Yearwiseexitingstudiesdetails

Year	References
2021	3
2022	8
2023	25
2024	22
2025	5

As explained in table 2, the total references contained in this review paper and the year wise split. Additionally, the decision was taken to utilize more recent studies in this survey paper than old works. It shows the amount of published references used for review on the RS. According to 2021 3 references 2022 8 research paper and 24 papers taken from year 2023, there's peak use in getting reference. Similarly, the research examined a total of 20 papers for the year 2024 and additionally 5 most recent papers for the year 2025 are taken. Figure 2 graphs the entries which have been included in Table 2 and show the respective references on the basis of year.

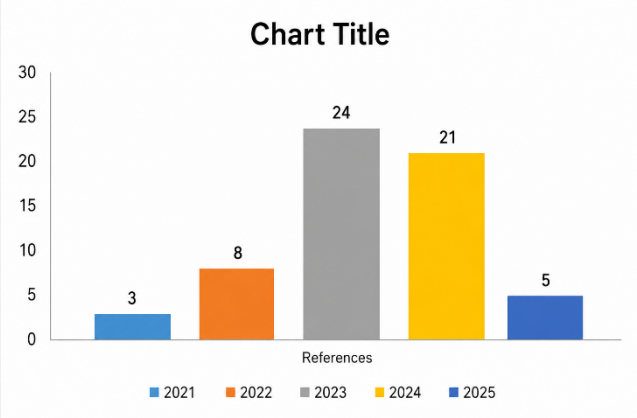

Figure4.DemonstrationYear-WisePublication.

VI. PRACTICAL IMPLIMENTATION

Dynamic content is a key factor for personalized Shopping via Intelligent Recommendation System (IRS) in e-commerce. Looking into user behaviour helps to provide a better shopping experience for the user. Machine Learning (ML) analyzes activity like clicks on a distinct product, browsing, and searching on your shop. In addition, other activities like products purchased and any other activity of the customer store in the central database. Intelligent Recommendation Systems and E-Commerce Many machine learning algorithms use this information to determine the interests of the user. These algorithms also test data to produce choices tailored to the customer and personalize their experience. One more way of providing a better shopping experience is the customization of content. Moreover, popular websites like Twitter and Facebook use dynamic content. Keeps modifying content to enhance the shopping experience continually.

When you use a recommendation system, the user retention is much better in e-commerce. Through intelligent techniques that memorize shopping histories, personalize emails, create wish lists, and more, these smart engines further strengthen this bond between shoppers and stores. As a result, profit increases. Furthermore, the purchase trend analysis system aids stores in providing a personalised shopping experience.

Patrons and loyal consumers appreciate personalized services. Also, fusing this recommendation system with the loyalty system enhances engagement numbers. Likewise, one such integration is a personalized quiz. In a fun interactive quiz, platforms can understand individual better.

Omnichannel integration is making a purchase easier for customers across every platform. Through a predictive model, situations or individuals exhibiting the risk of cart abandonment can be identified for offering discounts or other offers to them for completing the purchase. Customer journey mapping can be further enhanced with session-based recommendation system that analyzes ‘live’ user sessions and changes the product display section based on user activity almost immediately.

Deep Learning (DL) models are constantly learning from newer users, and thereby updating the recommendations based on fluctuating customer tastes and market trends. Besides, context-aware systems use information on geo-location, time and so on to suggest localised products that relate to climate, festivals and events in a locality.

Ethical issues also play an important role in AI recommendation system. Explaining how recommendations work helps with transparency and customer confidence.

When users can adjust their preferences, choose an opt-in data-sharing approach, and select the recommendations that reach them, it empowers consumers to take more control over their private data while actively reinforcing long-term consumer-brand relationships.

AI-powered recommendation systems are more crucial than traditional recommendation systems in today’s e-commerce systems, as shown by the ethical and technological upgrading of recommendation systems.

VII. RESULT AND ANALYSIS

Recent research studies reveal that Intelligent Recommendation Systems (IRS) improve operation of their parent e-commerce system in terms of personalization and recommendation accuracy as well as customer engagement.

According to the study, ML and DL models such as Collaborative Filtering, CNN, LSTM, BERT, and hybrid recommendation approaches produced better recommendation accuracy compared to classical filtering approaches.

According to this study, it was found that the AI recommendation system overcame challenges such as the cold-start problem, data sparsity, and irrelevant products.Utilizing both collaborative and content-based filtering led to more efficient model recommendation relevance tests.Numerous researchers claimed predictive accuracy in their papers. Reported accuracy greater than 90% for CNN-based recommendation systems.In addition, Man and his co-workers were discovered to have better recall and precision scores in their CNN and.The findings also show that the personalized recommendation system influences customer retention, click-through rate, and sales conversion of the platform. E-commerce websites such as Flipkart, Snapdeal, and Amazon.com are using AI driven recommendation engines. The recommendation engines analyze the user's browsing history, purchasing behaviour, ratings as well as reviews to offer more appropriate product recommendations in real-time.

The research was done on the comparison between the traditional recommender system and the AI recommendation system. The AI system was more efficient and effective. It was successful in improving scalability and adaptability. AI-based systems do not rely on the past interaction between the customer and product like traditional systems.Moreover, customer reviews and preferences were studied using sentiment analysis and NLP techniques for better and accurate recommendation offering. This type of system and architecture worked well in visual searching of products as well as predicting customer intent.

The e-commerce industry is undergoing transformation due to the utilization of information technology - inspired systems as mediated by technological and organizational factors. As per the papers analyzed, integration of ML, DL and AI can help the e-commerce platform to offer smarter, adaptive and customer-centric shopping.

VIII. DISCUSSION

According to a review of literature by researchers, E-commerce companies must use recommendation systems which will be driven by AI systems based on ML and DL technique. Hybrid recommendation techniques like collaborative filtering, content-based filtering and sentiment analysis can counter problems like cold-start and data sparsity. E-commerce businesses can use these approaches to enhance personalization and recommendation quality.

An e-commerce site has to gather high-quality user data so that the impact of data sparsity on recommendation performance reduces. E-commerce sites may gather sewing user interaction data, such as browsing history, rating, review, and purchase behavior, to boost recommendation accuracy. E-commerce websites can also use natural.Businesses should invest in systems that can make recommendations for real-time customer choices based on market fluctuations. To enhance user trust and minimize algorithm bias, we should incorporate explainable AI and transparent recommendation systems.

Organizations need a solution that allows them to scale their assets like identity without compromising user privacy and security in today's world. To mitigate bias, misinterpretation or misuse, future recommendation systems will need to incorporate advanced machine learning and devise untapped solutions that push the boundaries of the current system.Researchers should explore new technologies like transformers, GNN, reinforcement learning, quantum systems., to increase scalability, adaptability, personalization, and make recommender system more robust.

IX. REAL - WORLD IMPLICATIONS

Intelligent recommendations use a form of AI which analyses behaviour, ratings, reviews, purchase history etc. The e-commerce sites we are referring to at the top are Amazon, Walmart, Alibaba, Netflix, Flipkart, etc.

Artificial Intelligence, collaborative filtering, and predictive analytics have been used by e-commerce sites like Amazon to improve their product recommendations and customer engagements. Walmart applies Impact AI to enhance its supply chain and stores, and more. Netflix personalizes content using recommendation algorithms to retain users.

AI-based recommendation engines employ other techniques such as Natural Language Processing (NLP), sentiment analysis, image-based search, cloud computing and big data analytics for more accurate recommendations. They use these technologies to do make real.

X. CONCLUSION

IRS in eCommerce have shown that the use of technologies like ML and DL has the potential for an improved experience and increased sales. With the evolution of e-commerce, IRS has become a must-have for businesses in providing tailored shopping experiences as per an individual's choice of consumer. In order to find relevant papers with good quality from the year 2021 to 2025 a comprehensive search on key databases was conducted.

It has covered the AI-based recommendation models, essential components in RS, various algorithms that exploits the personalization approach in RS and ethical issues regarding AI based RS model in detail. The program also integrated up-to-date academic research and real-world instances, as well as practical experiences from top e-marketplaces such as Amazon, Walmart and Alibaba on adopting AI techniques to improve customer satisfaction and operational efficiency. The Analysis has shown that the most commonly used techniques in the area of AI based recommender systems are CNN, Collaborative filtering, sentiment analysis, LSTM, Decision Tree. Yet another contemporary and revolutionary AI technique, termed BERT, also creates significant improvements in the performance of RSs.

In addition to these features, the IRS helps to understand the preference and interest of the user on the product and give suggestions based on the past history of the browsing. Therefore, a high-performing internal revenue service has the capability of increasing sales and customer satisfaction in e-commerce and other online-related business.

XI. FUTURE SCOPE

While the AI technology and ecommerce continue to grow, they will further continue to grow in the future as well. The future of AI in e-commerce holds great potential with development in it. Advances in the algorithms of natural language processing (NLP) will surely be the key stream of growth. The understanding and responding to the queries of the users will become better by AI. Enhancement in language know-how will improve the functionalities of RS. The customer will have a more straightforward and instinctive interaction. As is clear from the fig. 5, the future trends in AI based recommendation system are depicted.

A. Advanced ML techniques:

Improvements in the quality of ML algorithms will only enhance the ability even further. This will empower e-commerce companies with insights into consumer behavior and preferences, among others. They can then provide more accurate personalized recommendations. As a result, the user will experience a much more engaging and immersive way of interacting. Furthermore, companies believe AI-powered image and video recognition technologies will be essential for visual search.

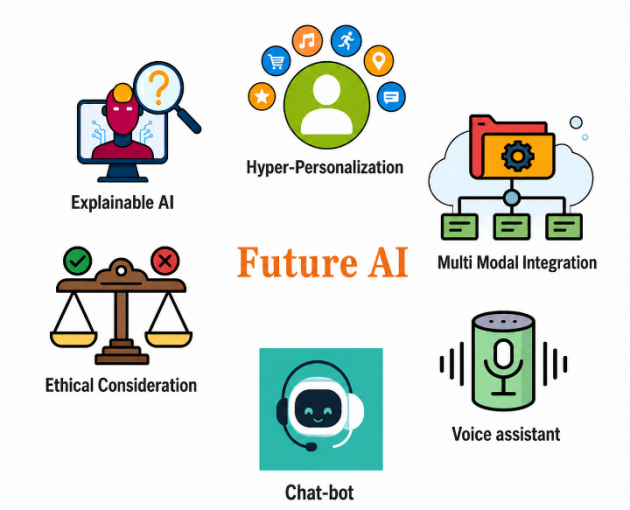

Figure 5. Future patterns in recommendation system

B. Enhanced Search Ability

Shopping has always been changing with innovation Many innovative solutions have been observed by the software developers over the years. These days, the demand for online shopping apps is high. Most organizations are creating eCommerce applications to stay relevant in modern times. Along with us large sum.

C. Improved Visual Recognition

The future of ecommerce could be enlarged by exploring synergies with AI and emerging innovations. Augmented Reality (AR) and Virtual Reality (VR) with Artificial Intelligence (AI) will give a customized shopping experience.

Customers will be able to virtually try on their products, visualize items at home, and interact with the products in ways that far exceed current online shopping experiences. In addition, blockchain cryptocurrencies will make e-commerce transactions secure and transparent. Blockchain offers a solution to the issues of trust online as well as the integrity and security of data.

D. Integration of AI with Internet of Things:

Many computer scientists expect AI automation to rise over the next few years. It has been forecasted that by the.

AI consists of intelligent machines and computer programs which mimic human function. It can do activities using human thought processes. An artificial intelligence machine either run on platform or in soft/hard system. The current stage of development of Artificial Intelligence is narrow AI.

E. Hyper Personalization

AI models can use an array of data sourcing that can range from your browsing history to live interactions. Thus, allowing our recommendations and shopping experience to be personalized.

F. Voice & Conversational AI

AI-based conversations are altering the functions of e-commerce. The luxury online shopping experience can be improved with faster delivery and more seamless virtual sales, similar to luxury physical stores. Due to the sudden surge in voice assistants like Alexa, Siri, Google Assistant, and others, conversational commerce is the need of the hour for better satisfaction and high sales. Using this technology, it will be.

G. Regulatory and ethical consideration

The forthcoming AI enabled recommendation systems should first focus on ethical practices and data transparency. The implementation also needs to keep in mind the regulations like GDPR and CCPA and the fear of AI bias. To obey the regulation, transparency, fairness, and accountability in the collection, application and protection of consumer data is a must.

XII. ACKNOWLEDGEMENT

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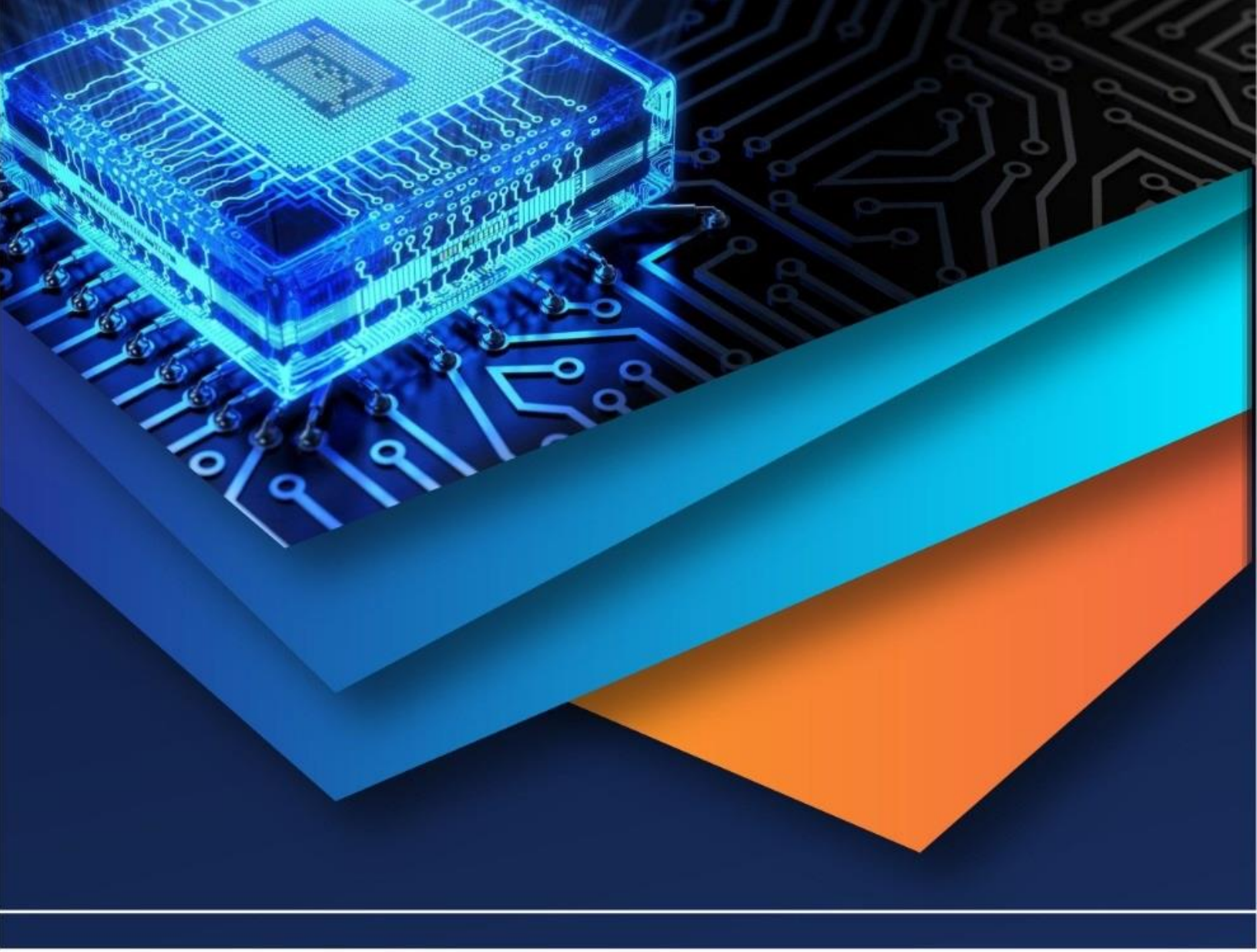

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