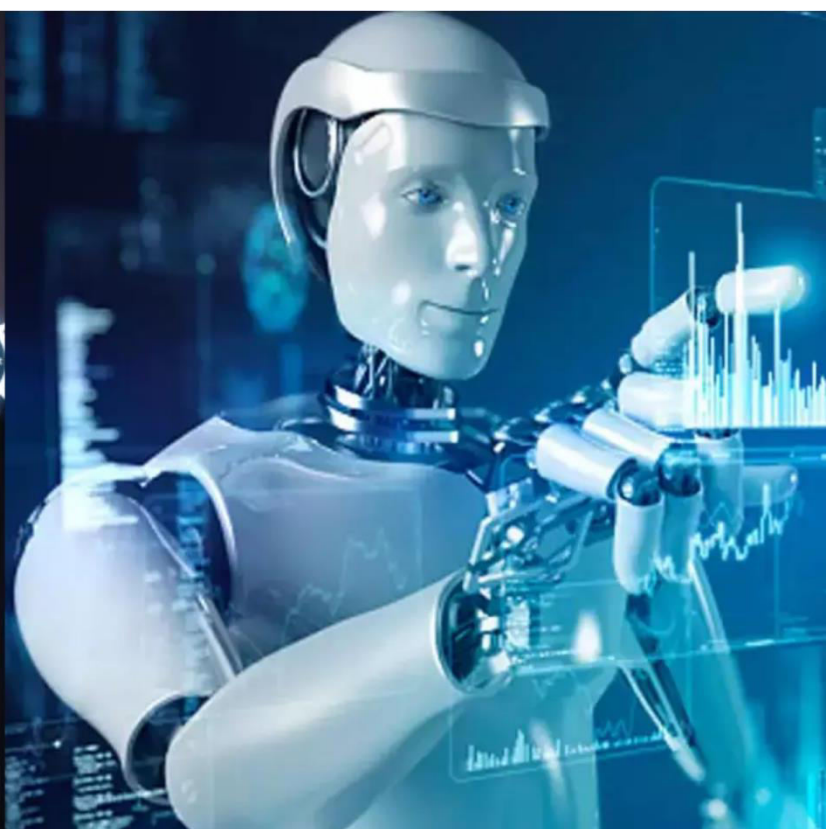




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Implementation of AI Power Product Suggestion System for E-Commerce

Kaustubh Prabhakar Ramteke ¹, Dr. Anjali Babarao Raut ²

P.G. Department of Computer Science & Engineering, H.V.P.M's College of Engineering and Technology, Amravati

Affiliated to Sant Gadge Baba Amravati University, Maharashtra, India ¹

Professor & Head of Department of Computer Science & Engineering, H.V.P.M's College of Engineering and

Technology, Affiliated to Sant Gadge Baba Amravati University, Maharashtra, India ²

ABSTRACT: E-commerce has become a major form of commerce in the digital age, allowing consumers to easily buy goods at any time and from any location. However, the wide variety of products available online frequently results in information overload, making it challenging for consumers to find the best options. To overcome this obstacle, the integration of Artificial Intelligence (AI) and Machine Learning (ML) is essential for developing intelligent and personalized product recommendation systems.

The proposed AI Power Product Suggestion System will leverage AI-driven algorithms to analyze user behavior, purchase history, browsing patterns, and feedback data to predict customer preferences. It may employ techniques such as Content-Based Filtering, Collaborative Filtering, and Hybrid Recommendation Approaches to recommend products that closely align with each user's interests and needs. The results in a shopping experience that is both highly personalized and dynamic. It continuously learns from user interactions, enhancing its prediction accuracy over time. It improves customer engagement and satisfaction while increasing sales conversion rates and customer loyalty on e-commerce platforms. By implementing this system, businesses can gain valuable insights into consumer behavior, optimize marketing strategies, and strengthen their global market position. This minor research work showcases how AI-powered recommendation systems can transform e-commerce platforms into intelligent, user-focused, and data-driven ecosystems, improving both operational efficiency and customer experience. The framework can be further advanced with deep learning, real-time analytics, and context-aware recommendations for next-generation personalized e-commerce systems.

KEYWORDS: E-commerce, Artificial Intelligence and Machine Learning, Content-Based Filtering, Collaborative Filtering, Real time analytics

I. INTRODUCTION

E-commerce is essential to international trade in the current digital era because it provides consumers with quick access to a wide range of goods and services. However, consumers frequently find it difficult to locate goods that fit their interests due to the expanding selection. In order to address this, intelligent product suggestion systems utilizing artificial intelligence (AI) are utilized to improve online purchasing. These AI-powered platforms combine data analytics, machine learning, and user activity tracking to offer customized product recommendations. They provide personalized recommendations in real time by examining information including browsing patterns, ratings, interests, and past purchases. For e-commerce platforms, this increases customer satisfaction as well as sales, conversion rates, and customer loyalty. AI-driven recommendation systems, where personalization is crucial to boosting customer engagement, are a major component of successful e-commerce giants like Amazon, Flipkart, and Netflix. Using methods like collaborative filtering, content-based filtering, and deep learning models, today's AI systems continue to learn and adapt to user behavior, producing more relevant and accurate product recommendations. Thus, the AI Power Product Suggestion System represents a significant advancement in the e-commerce industry, enabling businesses to deliver smarter, more personalized, and efficient shopping experiences while optimizing marketing strategies and operational efficiency.

II. LITERATURE SURVEY

Researchers have developed various recommendation systems to improve personalization in e-commerce platforms. Early recommendation systems mainly focused on collaborative filtering, where recommendations were generated based on the preferences and purchasing behavior of similar users. These methods helped in identifying user interests but faced challenges such as data sparsity and cold-start problems. Content-based filtering approaches were introduced to recommend products by analyzing item features and user preferences. These systems provide personalized suggestions based on previous user interactions; however, they are limited by their dependence on available product information and may fail to recommend new products.

In recent years, the development of artificial intelligence and machine learning has allowed researchers to improve recommendation accuracy by using techniques such as deep learning, neural networks, clustering, and hybrid recommendation models. Artificial intelligence-powered models can evaluate large customer data, find hidden patterns and provide more meaningful product recommendations. By taking into account both user behavior and product characteristics, these systems enhance the quality of recommendations. The development of scalable and adaptive recommendation systems that continuously learn from consumer interactions is the focus of recent research.

Recommendation systems powered by AI and machine learning have demonstrated promise in enhancing customer satisfaction, engagement, sales conversion, and retention in e-commerce platforms. The development of intelligent product recommendation systems has been a major focus area in artificial intelligence and e-commerce research. Over the past two decades, various techniques Researchers have proposed various techniques over the past two decades to enhance the personalization and accuracy of product suggestions. This section reviews existing literature and highlights key contributions in the field of AI-based recommendation systems. Early research on recommender systems primarily focused on collaborative filtering, where recommendations are generated based on the preferences and behavior of similar users. Resnick et al. (1994) introduced one of the earliest collaborative filtering systems, GroupLens, which used user ratings to predict preferences for news articles. Later, Sarwar et al. (2001) extended this approach to item-based collaborative filtering, which improved scalability and efficiency for large datasets. Content-based filtering emerged as another major technique, where the system recommends products similar to those a user has previously interacted with. Pazzani and Billsus (2007) explored the application of machine learning algorithms to analyze item features and construct user profiles. However, these systems often suffered from the “cold start” problem, where new users or items lacked sufficient data for accurate recommendations.

To overcome the limitations of individual approaches, researchers developed hybrid recommendation systems combining both collaborative and content-based methods. Burke (2002) proposed several hybrid strategies, including weighted and switching hybrids, to improve recommendation diversity and accuracy. These models demonstrated improved performance across domains such as movies, books, and e-commerce platforms. With the advancement of AI, machine learning and deep learning have significantly enhanced recommendation capabilities. Koren et al. (2009) introduced matrix factorization techniques that improved prediction accuracy in large-scale datasets like Netflix. More recent studies, such as Zhang et al. (2019), explored deep learning-based recommender systems, leveraging neural networks to capture complex user-item relationships and contextual information.

In the e-commerce context, AI-powered recommendation systems have become a critical component of business success. Companies such as Amazon, eBay, and Flipkart employ sophisticated algorithms that analyze massive datasets in real time to deliver personalized shopping experiences. Studies by Ricci et al. (2015) and Aggarwal (2016) highlight how recommendation systems improve customer satisfaction, loyalty, and conversion rates. Recent advancements have also introduced context-aware, social, and real-time recommendation systems that incorporate additional factors such as location, time, social influence, and sentiment analysis to improve accuracy and relevance. These systems represent the next generation of AI-driven personalization in digital commerce.

III. PROBLEM STATEMENT

With the rapid growth of e-commerce platforms, customers are exposed to millions of product options across various categories. This vast product diversity often leads to information overload, making it difficult for users to find products that match their preferences and needs. Traditional search-based systems depend heavily on keywords and manual filters, which are often unable to deliver truly personalized results.

As a result, customers may spend more time browsing, become frustrated, or abandon the site without making a purchase. Similarly, e-commerce businesses face challenges in retaining customers, optimizing product visibility, and increasing sales conversion rates. Therefore, there is a need for an intelligent, automated system that can analyze user behavior, predict customer interests, and suggest relevant products dynamically and accurately. An AI-powered product suggestion system aims to address these challenges by leveraging artificial intelligence and machine learning techniques to provide personalized product recommendations, improving both user experience and business performance.

IV. PROPOSED FRAMEWORK AND METHODOLOGY

The proposed framework presents an **AI-based intelligent product recommendation framework** designed to provide personalized product suggestions to customers in an e-commerce environment. The framework uses Artificial Intelligence (AI), Machine Learning (ML), and recommendation techniques to analyze customer behavior and recommend relevant products for e-commerce is given below:

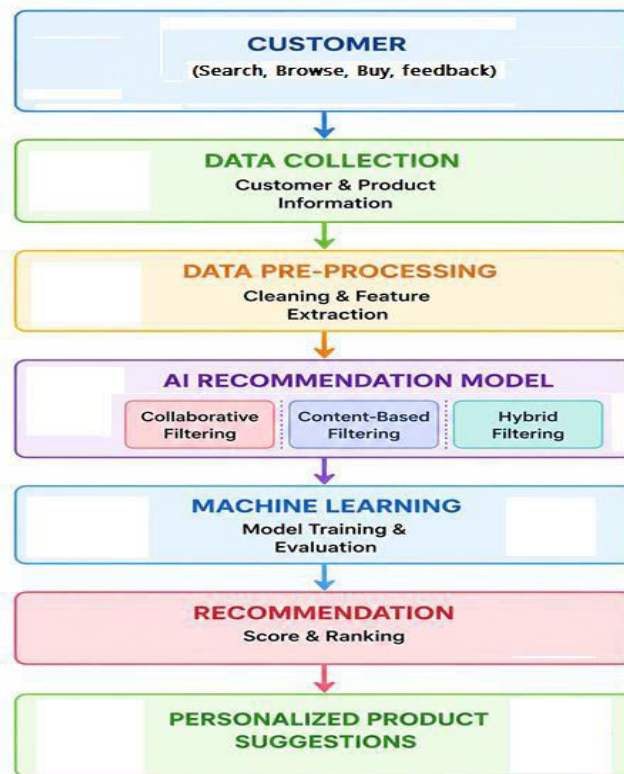


Fig. 1 Proposed AI based Framework product suggestion for e-commerce

Methodology for Proposed System: It defines the systematic approach followed for developing the AI-based Personalized Product Recommendation System for E-commerce Platforms. This study focuses on designing a machine learning-based recommendation framework that analyses customer data, identifies user preferences, and generates personalized product suggestions.

The proposed system works understanding through **Customer Interaction Module**. This module collects customer activities from the e-commerce platform, including:

1. Product search
2. Browsing history
3. Previous purchases
4. Customer reviews
5. Feedback and preferences

This information helps the system to understand customer's interests and shopping patterns. The proposed methodology consists of the following steps:

1. Data Collection

The collected data is stored and managed for further processing. Customer-related data such as user profiles, browsing history, purchase records, product details, Customer reviews and ratings, and interaction patterns are collected from available datasets or e-commerce sources. .

2. Data Pre-processing Module

Before applying AI algorithms, the collected data is processed to improve accuracy. This stage includes: Data cleaning, transformed by handling missing values, removing duplicate and irrelevant data, handling missing values, Feature extraction, Data transformation and preparing the data for analysis and model training. .

3. Feature Extraction and User Behavior Analysis

Important features such as user preferences, product characteristics, purchase patterns, and interaction history are identified to understand customer behavior.

4. Recommendation Model Development

The Machine learning techniques such as **collaborative filtering, content-based filtering, and hybrid recommendation approaches** are applied to develop the recommendation model. These techniques analyze user preferences, product characteristics, and interaction patterns to generate personalized product recommendations for customers.to build the recommendation model.

5. Model Training and Evaluation

The developed model is trained using customer data and evaluated using performance measures such as accuracy, precision, recall, and recommendation relevance.

6. Personalized Recommendation Generation

The trained model generates customized product recommendations based on individual user preferences and previous interactions.

7. Performance Analysis and Improvement

The results are analysed to improve recommendation quality, scalability, and adaptability of the system. This methodology aims to develop an intelligent and adaptive recommendation system that enhances customer experience, reduces search effort, and improves business performance in e-commerce platforms.

V. IMPLEMENTATION

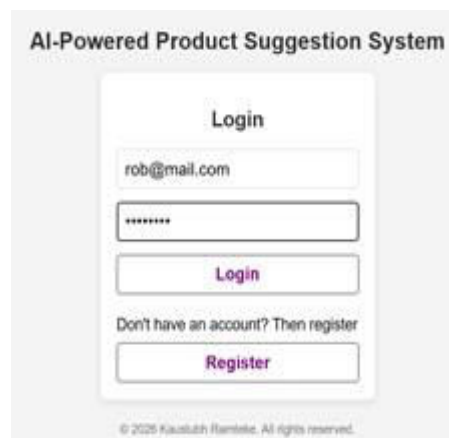


Fig. 5.1 (i) Screen shot of New User Registration or Login form

Back

View Profile

Customer Dashboard

Available Product(s)

Place an Order

Product ID	Name	Description	Price(₹)	Stock(s)
1	Nirma	Washing powder for clothes	50.00	116
2	Samsung Galaxy S10	Smartphone mobile phone	32000.00	73
3	Apple iPhone 10	Apple smartphone new generation	65000.00	1
4	ParleG Biscuit	Biscuits for children	5.00	190
5	50-50 cookies	Cookies for children	5.00	125
6	Britannia Bourbon	Cookies for kids	20.00	104
7	Nike jacket	Womens jacket	7000.00	8
8	Sugar lipstick	Sugar mat lipstick(nude color)	750.00	61
10	Sony Bravia 32 inch Smart TV	Smart android tv	49999.00	20

Order History

Product Suggestion Chatbot

Fig. 5.2 (ii) Screen shot for Customer Dashboard

5	50-50 cookies	Cookies for children	5.00	125
6	Britannia Bourbon	Cookies for kids	20.00	104
7	Nike jacket	Womens jacket	7000.00	8
8	Sugar lipstick	Sugar mat lipstick(nude color)	750.00	61
10	Sony Bravia 32 inch Smart TV	Smart android tv	49999.00	20

Order History

Order ID	Ordered Product(s)	Bill(₹)	Ordered																
1	<table border="1"> <thead> <tr> <th>Product Name</th> <th>Quantity</th> <th>Price(₹)</th> <th>Total Price(₹)</th> </tr> </thead> <tbody> <tr> <td>Samsung Galaxy S10</td> <td>1</td> <td>32000.00</td> <td>32000.00</td> </tr> <tr> <td>50-50 cookies</td> <td>1</td> <td>5.00</td> <td>5.00</td> </tr> <tr> <td>Nirma</td> <td>2</td> <td>50.00</td> <td>100.00</td> </tr> </tbody> </table>	Product Name	Quantity	Price(₹)	Total Price(₹)	Samsung Galaxy S10	1	32000.00	32000.00	50-50 cookies	1	5.00	5.00	Nirma	2	50.00	100.00	32110.00	10 Nov 2025,
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Product Name	Quantity	Price(₹)	Total Price(₹)																
Britannia Bourbon	2	20.00	40.00																
Samsung Galaxy S10	1	32000.00	32000.00																
Nike jacket	1	7000.00	7000.00																

Shopping Assistant

Hi! Ask me something like "Show products under ₹500"

Certainly! We have the "Sony Bravia 32 inch Smart TV" available for ₹49999.00. It's in stock!

Thanks.

You're welcome! How can I help you find products today?

Search products...

Send

Product Suggestion Chatbot

Back

Available Product(s)

ID	Name	Description	Price(₹)	Stock(s)	Action
1	Nirma	Washing powder for clothes	50.00	116	Add
2	Samsung Galaxy S10	Smartphone mobile phone	32000.00	73	Add
3	Apple iPhone 10	Apple smartphone new generation	65000.00	1	Add
4	ParleG Biscuit	Biscuits for children	5.00	190	Add
5	50-50 cookies	Cookies for children	5.00	125	Add
6	Britannia Bourbon	Cookies for kids	20.00	104	Add
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8	Sugar lipstick	Sugar mat lipstick(nude color)	750.00	61	Add
10	Sony Bravia 32 inch Smart TV	Smart android tv	49999.00	20	Add

Cart

Cart Items Size: 0

Product Name	Quantity	Price(₹)	Amount(₹)	Action
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VI. EXPERIMENTAL RESULTS AND ANALYSIS

The results of the proposed AI-Powered Product Suggestion System were analysed to evaluate its ability to provide relevant and personalized product recommendations. The system considers user browsing behavior, purchase history, ratings, feedback, and product characteristics to identify user preferences and generate suitable recommendations. The analysis indicates that personalized recommendations can reduce the time required for users to search for products and can improve the relevance of the displayed products. Content-Based Filtering is useful for recommending products with characteristics similar to those previously viewed or purchased by the user. Collaborative Filtering can identify products preferred by users with similar behavior, while the Hybrid Recommendation approach combines both sources of information to provide more comprehensive recommendations.

The system also benefits from continuous user interaction. As additional browsing, purchasing, rating, and feedback data become available, the recommendation model can update its understanding of user preferences. This makes the recommendation process more dynamic and adaptive. For quantitative evaluation, metrics such as Precision, Recall, F1-Score, Mean Average Precision (MAP), and Recommendation Accuracy can be used. Higher Precision indicates that a larger proportion of recommended products are relevant to the user, while higher Recall indicates that the system is able to identify a greater proportion of relevant products. These metrics provide a systematic basis for comparing different recommendation techniques. Overall, the analysis demonstrates the potential of AI and Machine Learning techniques to improve personalized product recommendations in e-commerce. The proposed system can support better customer interaction and provide businesses with useful insights into consumer preferences. Further improvements can be achieved by incorporating larger datasets, deep learning algorithms, real-time analytics, and context-aware recommendation techniques.

VII. CONCLUSION

In conclusion, the AI-Powered Product Suggestion System provides an effective and intelligent solution to the problem of information overload in e-commerce platforms. By analyzing user behavior, purchase history, browsing patterns, and feedback, the system can generate personalized product recommendations using Content-Based Filtering, Collaborative Filtering, and Hybrid Recommendation techniques. Such recommendations can improve the accuracy and relevance of product suggestions, enhance customer satisfaction and engagement, and potentially increase sales conversion and customer loyalty. From a business perspective, the system can also provide valuable insights into consumer preferences and support more effective marketing strategies. Overall, the proposed framework demonstrates the potential of AI and Machine Learning to make e-commerce platforms more personalized, efficient, and user-centric. In the future, the system can be enhanced through deep learning, real-time analytics, and context-aware recommendation techniques to provide more adaptive and accurate recommendations.

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Web Resources:

- 1) <https://www.iieta.org/journals/ts/paper/10.18280/ts.410615>
- 2) <https://www.scalacode.com/blog/how-ai-is-transforming-e-commerce-product-recommendations/>
- 3) <https://www.zoho.com/commerce/academy/ai-powered-product-recommendations.html>
- 4) <https://iphotechnologies.org/blog/ai-recommendation-systems-in-ecommerce>
- 5) <https://proto.ai/ai-recommendation-guide/>
- 6) <https://gracker.ai/cybersecurity-marketing-101/ai-driven-product-recommendations>
- 7) <https://www.krishtechlabs.com/blog/ai-powered-product-recommendations-boosting-digital-commerce-sales/>



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