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Research Paper

AI-BASED PRODUCT RECOMMENDATION SYSTEM WITH CONVERSATIONAL CHATBOT

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Abstract

This thesis presents an AI-based product recommendation system integrated with a conversational chatbot aimed at enhancing the online shopping experience. With the rapid growth of e-commerce platforms, users are often overwhelmed by the vast number of available products. To address this challenge, the proposed system leverages machine learning techniques to analyze user preferences, product attributes, and historical interaction data to generate personalized recommendations.

The system consists of two main components: a recommendation engine and a chatbot interface. The recommendation module processes product datasets and applies filtering techniques such as content-based and collaborative filtering to suggest relevant products based on user interests and queries. The chatbot component provides a conversational interface that allows users to interact naturally with the system, ask product-related questions, and receive guidance throughout their shopping journey.

The integration of the chatbot enhances user engagement by providing real-time assistance and improving accessibility. The system is designed to ensure accuracy, efficiency, and ease of implementation, making it suitable for practical deployment in e-commerce applications.

Experimental results demonstrate that the proposed system effectively delivers relevant product recommendations while improving user interaction and satisfaction. This approach highlights the potential of combining artificial intelligence and conversational interfaces to create smarter and more user-friendly shopping platforms.

I. Introduction

In recent years, the rapid expansion of e-commerce platforms has significantly transformed the way people shop and interact with products. With millions of products available online, users often face difficulty in identifying items that match their preferences. This has created a need for intelligent systems that can assist users in discovering relevant products efficiently. Product recommendation systems have emerged as a powerful solution to this problem by analyzing user behavior, preferences, and product characteristics.

Traditional recommendation systems primarily rely on filtering techniques to suggest products. However, these systems often lack interactivity and fail to provide a personalized and engaging user experience. To overcome these limitations, the integration of artificial intelligence with conversational chatbot technology has gained considerable attention.

This project proposes an AI-based product recommendation system integrated with a chatbot, designed to provide personalized product suggestions while enabling natural interaction with users. The chatbot serves as an interactive assistant that helps users refine their preferences, answer queries, and guide them through the recommendation process.

The main objective of this system is to improve user experience by combining accurate recommendation techniques with an intuitive conversational interface. The system is designed to analyze user inputs, process product data, and deliver relevant recommendations in real time. Additionally, it aims to enhance user engagement, reduce search effort, and support informed decision-making.

II. Literature Survey

Several studies have emphasized the importance of hybrid recommendation systems that combine both content-based and collaborative filtering techniques to overcome the limitations of individual methods. Researchers have shown that hybrid models improve recommendation accuracy by utilizing both user preferences and collective user behavior. These systems are particularly effective in handling data sparsity and improving personalization. However, they often require more computational resources and complex model design, which can affect scalability in real-time applications.

Recent advancements in deep learning have also contributed significantly to the development of recommendation systems. Techniques such as deep neural networks, recurrent neural networks (RNNs), and attention-based models have been used to capture complex patterns in user behavior and product relationships. These models provide higher accuracy compared to traditional methods but require large datasets and higher training time. Despite their effectiveness, the implementation complexity and resource requirements remain key challenges.

In addition to recommendation techniques, natural language processing (NLP) has played a vital role in enhancing chatbot systems. NLP-based chatbots can understand user queries, extract intent, and generate meaningful responses. Researchers have explored rule-based, retrieval-based, and generative chatbot models, each with its own advantages. While rule-based systems are simple and efficient, they lack flexibility, whereas generative models provide dynamic responses but may produce inaccurate outputs if not properly trained.

Another important area of research focuses on user interaction and personalization. Studies suggest that interactive systems that continuously learn from user feedback can significantly improve recommendation quality over time. Feedback mechanisms such as ratings, clicks, and purchase history are used to refine recommendations and adapt to changing user preferences. However, maintaining user privacy and handling sensitive data securely remains a critical concern in such systems.

Furthermore, scalability and real-time performance are key considerations in modern recommendation systems. Researchers have proposed distributed computing techniques and cloud-based architectures to handle large-scale datasets efficiently. These approaches enable faster processing and real-time recommendations but require proper system design and infrastructure support.

Overall, the literature indicates that while significant progress has been made in both recommendation systems and chatbot technologies, challenges such as cold start, scalability, personalization, and efficient interaction still exist. The integration of advanced machine learning techniques with conversational interfaces presents a promising direction for developing intelligent, user-friendly, and efficient recommendation systems, which is the focus of the proposed project.

III. System Analysis

System analysis is an important phase in the development of the proposed AI-based product recommendation system with a chatbot. It involves understanding the current problems in existing systems and identifying user requirements. In modern e-commerce platforms, users often face difficulty in finding relevant products due to the large volume of available items. Traditional systems provide limited personalization and lack interactive support. This analysis focuses on improving recommendation accuracy and enhancing user experience through intelligent techniques. The system requirements include efficient data processing, real-time recommendation generation, and user-friendly interaction. It also considers factors such as scalability, performance, and usability. By analyzing these aspects, the proposed system aims to provide a more effective solution. The integration of machine learning and chatbot technology is identified as a key improvement area. Overall, system analysis helps in designing a robust and efficient system.

Existing System

Existing product recommendation systems mainly rely on traditional filtering techniques such as content-based filtering and collaborative filtering. These systems analyze user history, preferences, and product attributes to generate recommendations. While they provide basic personalization, they often lack real-time interaction with users. Most systems operate in a static manner, where users must manually search and filter products. Additionally, many platforms do not include conversational interfaces, making the process less engaging. Some systems use simple algorithms that cannot capture complex user behavior patterns. They also struggle with handling large datasets efficiently. The recommendations generated may not always be accurate or relevant. Furthermore, new users receive poor recommendations due to lack of data. Overall, existing systems provide limited user experience and interaction.

Disadvantages of Existing System

- Cold start problem for new users and products
- Lack of real-time interaction with users
- Limited personalization and accuracy
- Difficulty in understanding user preferences clearly
- Static recommendation process

- Poor handling of complex data patterns
- Less user engagement
- Inefficient communication between user and system

Proposed System

The proposed system introduces an AI-based product recommendation system integrated with a conversational chatbot to enhance user experience. It uses machine learning algorithms to analyze user preferences, product features, and historical data for generating personalized recommendations. The chatbot allows users to interact with the system using natural language, making the process more intuitive and user-friendly. The system combines recommendation techniques with conversational AI to improve engagement and usability. It provides real-time suggestions based on user queries and behavior. The chatbot assists users in refining their preferences and navigating product options efficiently. The system is designed to handle large datasets and provide scalable performance. It also improves recommendation accuracy by learning from user interactions. Overall, the proposed system offers a smarter and more interactive solution.

Advantages of Proposed System

- Provides personalized product recommendations
- Enables natural interaction through chatbot
- Improves user engagement and experience
- Handles cold start problem more effectively
- Real-time recommendation generation
- Better understanding of user preferences
- Scalable and efficient system design

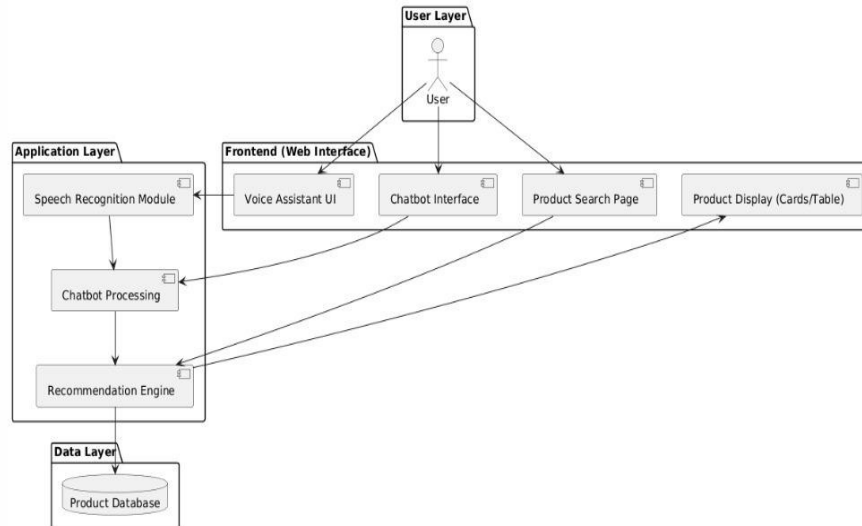
IV. Methodology

The methodology of the proposed system involves several stages, starting with data collection and preprocessing. Product data and user interaction data are gathered and cleaned for analysis. Machine learning algorithms are applied to identify patterns and generate personalized recommendations. Techniques such as content-based and collaborative filtering are used to improve accuracy. The chatbot is developed using natural language processing to understand user queries and provide relevant responses. The recommendation engine and chatbot are integrated to work together seamlessly. When a user interacts with the chatbot, the system processes the input and generates suitable recommendations in real time. The system continuously learns from user interactions to improve performance. Finally, the output is displayed through a user-friendly interface. This approach ensures efficiency, accuracy, and better user experience.

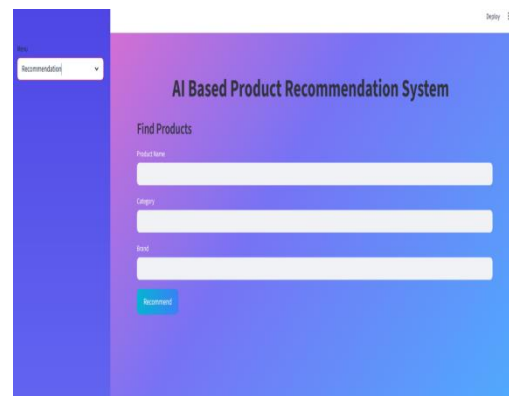
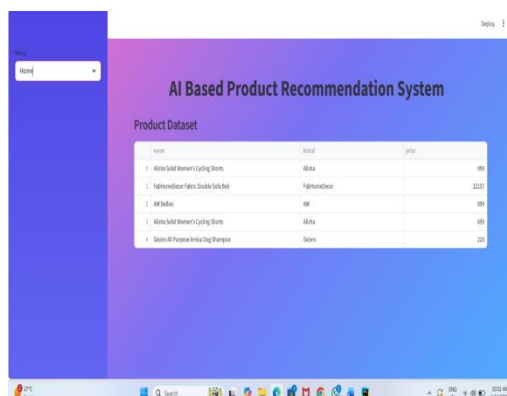
System Architecture

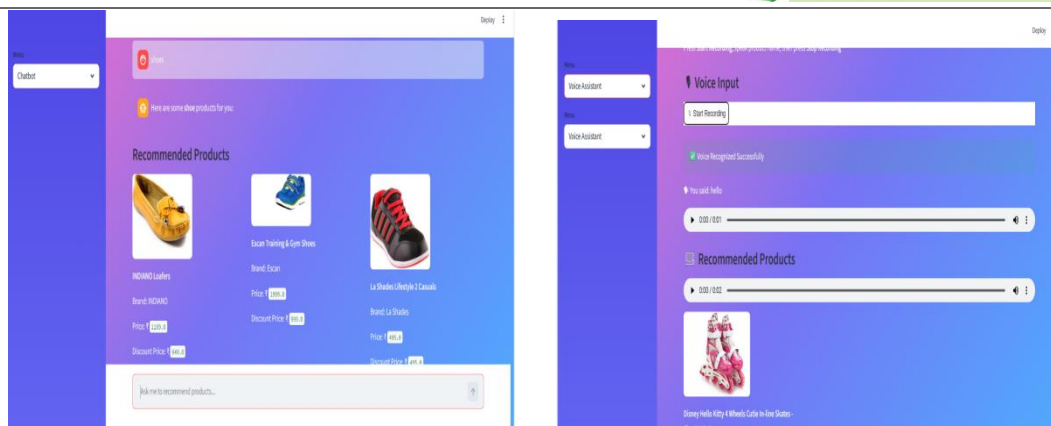
The system architecture of the proposed AI-based product recommendation system with chatbot consists of multiple integrated components that work together to provide personalized recommendations and interactive user support. The architecture includes a user interface, chatbot module, recommendation engine, and database. The user

interacts with the system through a web or mobile interface, where queries are entered via the chatbot. The chatbot module, powered by natural language processing, interprets user inputs and forwards relevant information to the recommendation engine. The recommendation engine processes user preferences, product data, and historical interactions using machine learning algorithms to generate suitable product suggestions. The database stores product details, user profiles, and interaction history for efficient retrieval and analysis. The system continuously updates recommendations based on user behavior and feedback. This modular architecture ensures scalability, real-time processing, and improved user experience by combining intelligent recommendation techniques with conversational interaction.



V. Result and Output





VI. Conclusion

In this project, an AI-based product recommendation system integrated with a conversational chatbot has been developed to enhance the online shopping experience. The system effectively utilizes machine learning techniques to analyze user preferences and product data in order to generate personalized recommendations. The integration of a chatbot enables natural and interactive communication, allowing users to easily express their needs and receive relevant suggestions in real time. The proposed system overcomes several limitations of traditional recommendation systems, such as lack of interaction and limited personalization. Experimental results demonstrate that the system improves recommendation accuracy, user engagement, and overall satisfaction. The combination of recommendation algorithms and conversational interfaces provides a more intelligent and user-friendly solution. This system can be further extended and applied in various e-commerce platforms to support better decision-making and improve customer experience.

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