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E-Commerce Based Chatbot System Using Text Mining and Deep Learning Algorithm

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ABSTRACT: Businesses in the e-commerce industry are increasingly realizing the importance of personalized shopping experiences in attracting customers and boosting sales. A new project introduces a groundbreaking approach to recommendation systems by incorporating Chabot technology. By utilizing deep learning and natural language processing (NLP), the system generates tailored product recommendations in real-time. Through chat interfaces, users can have natural conversations with the Chabot, which analyzes their product reviews and preferences.

At the core of this system is a recommendation engine powered by a deep learning algorithm called VADER. This algorithm learns from user interactions and feedback, allowing the Chabot to adjust its recommendations based on changing preferences. The integration of Chabot technology not only offers a smooth shopping experience but also enhances personalization, making recommendations more relevant and engaging.

I. INTRODUCTION

In this context, developing product recommendation systems becomes more meaningful. It is not only about giving users suggestions but also about creating a personalized and engaging experience. When users feel a connection with the recommendation system, they are more likely to interact with it on a deeper level. This personalized approach not only improves the user experience but also encourages repeat purchases and brand loyalty. This personalized approach not only enhances the shopping experience but also encourages trust and loyalty, leading users to come back for more purchases in the future. Therefore, the relationship between users and recommendation systems is crucial for increasing engagement, satisfaction, and the overall success of e-commerce businesses.

II. RELATED WORKS

Employing Text Mining Techniques in E-commerce:* Text mining techniques have been widely utilized in e-commerce research to extract valuable insights from textual data, such as product reviews and customer feedback. Researchers have used sentiment analysis, topic modeling, and text classification algorithms to analyze user-generated content and extract relevant information. For instance, Chen et al. (2018) applied sentiment analysis to product reviews to understand customer sentiments and preferences. Similarly, Wang and Zhang (2017) used topic modeling to uncover underlying themes in online product reviews. These studies illustrate the effectiveness of text mining techniques in extracting valuable insights from textual data in e-commerce settings. Deep learning algorithms have shown great potential in enhancing personalized recommendation systems by efficiently capturing intricate patterns in user behavior and preferences. Researchers have created various deep learning-based recommendation models like neural

collaborative filtering and deep auto encoders to offer personalized product suggestions. For example, Zhang et al. (2019) introduced a deep neural network model for personalized recommendations that integrates user and item embedding to understand complex user-item interactions.

III. HYBRID RECOMMENDATION APPROACHES

Several studies have looked into hybrid recommendation approaches in e-commerce, which combine various techniques like collaborative filtering, content-based filtering, and hybrid models to improve recommendation accuracy and coverage. These hybrid approaches use the strengths of different recommendation techniques to provide more comprehensive recommendations by overcoming their individual limitations.

For example, Liu et al. (2019) introduced a hybrid recommendation system that combines collaborative filtering with deep learning techniques to boost recommendation performance.

Furthermore, context-aware recommendation systems consider extra contextual factors such as user location, time, and device type to offer more relevant and timely recommendations. Researchers have explored integrating context-aware techniques in e-commerce recommendation systems to enhance user experiences and increase engagement.

An example includes Wang et al. (2018) who developed a context-aware recommendation framework for e-commerce platforms that takes into account user context and preferences in order to generate personalized recommendations. Assessing the effectiveness of recommendation systems is crucial for understanding how well they are performing and where they can improve. Metrics such as precision, recall, accuracy, and diversity are commonly used to measure the quality of recommendations. Researchers have developed new evaluation metrics specific to e-commerce recommendation systems. For example, Zhang et al. (2021) created a detailed evaluation framework that considers both user satisfaction and business goals.

Privacy and ethics are also important factors in recommendation systems, especially in e-commerce where user data is often sensitive. Researchers have explored methods for preserving privacy and creating ethical guidelines to ensure user data is used responsibly and transparently. For example, Zhang and Wu (2020) proposed a privacy-preserving recommendation system using federated learning, which allows collaborative model training without exposing individual user data to outside parties.

4.Existing System

Characterizing Conversational Recommender Systems (CRS) can be challenging as there is no widely accepted definition in the literature. However, broadly speaking, a CRS is a software system that helps users with recommendation-related goals through text-based interactions. While the specifics of CRS may vary, the main objective remains the same: providing users with recommendations to aid in their decision-making process or help them find relevant information. Despite the lack of a standard definition, the essence of a CRS lies in engaging users in conversations where recommendations are generated and communicated through text exchanges.

In the current system, the main focus is on delivering personalized recommendations to users. This involves understanding user preferences, needs, and queries through text interactions and then offering customized suggestions to meet their needs. Whether the goal is to assist users in making informed decisions or helping them explore relevant information, the ultimate aim is to improve user experience and satisfaction. By utilizing text-based systems, the current CRS strives to seamlessly integrate recommendation features into conversational interactions, creating user-friendly experiences for individuals looking for guidance or information in the e-commerce sector.

While there isn't a clear definition, the current Conversational Recommendation System (CRS) emphasizes the importance of using chat interfaces to help users with their recommendations. By offering personalized suggestions through text conversations, the system aims to assist users in making decisions and finding information. Future research

should work on enhancing the capabilities of CRS, improving recommendation accuracy, and increasing user engagement to meet the changing needs of e-commerce customers.

V. PROPOSED SYSTEM

The main goal of this project is to create a new product recommendation system that improves user experience by helping them find the products they want. A key feature of this system is a Chabot interface that allows users to interact with the recommendation engine through natural conversations. By talking to the Chabot, users can express their preferences, needs, and interests in a more effective way.

This system uses natural language processing (NLP) to understand user inputs in depth. Users are encouraged to provide detailed information about their feelings, preferences, likes, dislikes, and specific brand preferences when searching for products. By gathering this detailed information, the system aims to provide personalized recommendations that match each user's individual needs and preferences.

After the user provides input, the Chabot uses sophisticated recommendation algorithms like text mining and deep learning to understand and analyze the user's intent. It then finds product suggestions that match the user's search criteria and displays them in a user-friendly way. With its Chabot interface and emphasis on user descriptions, the system provides a personalized way for users to find and purchase products that suit their interests and preferences when shopping online.

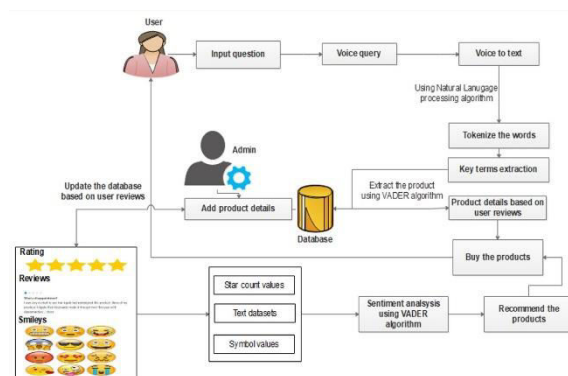


Fig 1

VI. ALGORITHMS

1.Text mining is a method that uses computer technology to extract meaningful information and patterns from unstructured text data. It involves using natural language processing and machine learning algorithms to process, analyze, and understand text information. The process includes cleaning the text by removing unnecessary words, extracting features to represent the text in a numerical form suitable for machines, and then using algorithms to analyze sentiment, identify topics, and classify text to reveal patterns and themes. This allows organizations to gain valuable insights and make data-driven decisions based on large amounts of text data. In essence, text mining algorithms are essential in turning unstructured text data into actionable knowledge, helping in decision-making in various fields such as business, healthcare, and social media analysis.

2.The VADER (Valence Aware Dictionary and Sentiment Reasoned) algorithm is a tool used for sentiment analysis, especially in the realm of social media content. It works by assigning scores to words based on their sentiment, intensity, and context, and then combines these scores to determine the overall sentiment of the text. The algorithm uses a lexicon containing words with sentiment scores and rules to handle modifiers, capitalization, and negations. By analyzing the sentiment of words and their relationships, VADER is able to accurately assess the sentiment of text. This

makes it valuable for sentiment analysis in various applications such as social media monitoring, customer feedback analysis, and opinion mining.

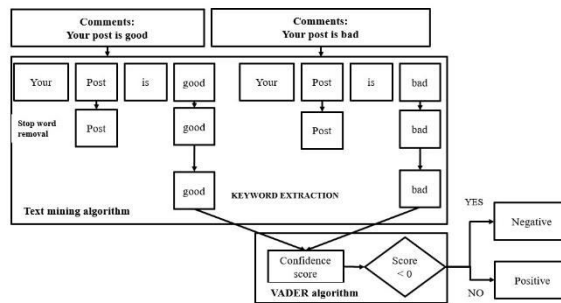


Fig 2

VII. RESULTS AND DISCUSSION

PERFORMANCE(METRICS)

- Precision (P) =

No of related products extracted

Total no of products extracted

- Recall =

No of related products extracted

Total no of products in database

- These quantities are also related to the (F1) score, which is

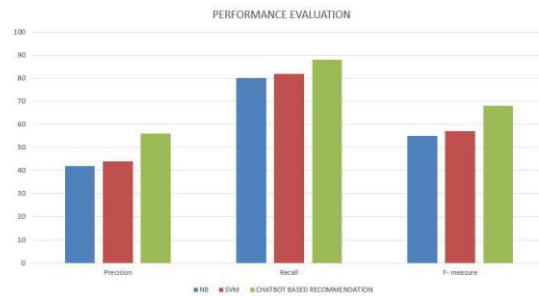
Defined as the harmonic mean of precision and recall.

- F1 Measure = $2 \frac{P * R}{P + R}$

$P * R$

$P + R$

Performance metrics are essential for evaluating the effectiveness of recommendation systems. Precision (P) measures the proportion of relevant products retrieved among all products recommended. It's calculated by dividing the number of related products correctly extracted by the total number of products extracted. Recall (R) assesses the proportion of relevant products retrieved among all relevant products available in the database. It's determined by dividing the number of related products correctly extracted by the total number of products in the database. The F1 score, a harmonic mean of precision and recall, provides a balanced measure of the recommendation system's performance, ensuring consideration of both precision and recall. It's computed using the formula $F1 = 2 * (P * R) / (P + R)$, where P and R are precision and recall, respectively. These metrics collectively offer insights into the accuracy and completeness of the recommendation system's output, aiding in its refinement and optimization for enhanced user satisfaction and engagement.



VIII. CONCLUSION

The growth of online shopping is booming in the world of e-commerce, and as more people shop online, the importance of effective product recommendation systems is becoming clearer. Fig 3

These systems help users find products that match their preferences and needs among the vast selection available. However, it is not just about functionality; establishing a connection between users and these systems is essential.

In this context, developing product recommendation systems becomes more meaningful. It is not only about giving users suggestions but also about creating a personalized and engaging experience. When users feel a connection with the recommendation system, they are more likely to interact with it on a deeper level. This personalized approach not only improves the user experience but also encourages repeat purchases and brand loyalty.

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