



AI-Driven Price Negotiation Chatbot for E-Commerce Platforms

Vishwas Thammali¹, Dr.G.Purna Chandar Rao²

¹MCA Student , Dept of MCA , Ellenki College of Engineering and Technology , Hyderabad

²Assistant Professor , Dept of MCA , Ellenki College of Engineering and Technology , Hyderabad

Abstract— Online shopping has become an important part of everyday life, but most e-commerce platforms do not provide customers with the option to negotiate product prices as they can in traditional stores. This project presents a Price Negotiating Chatbot for an e-commerce website that enables users to interact with a chatbot and negotiate product prices through text or voice communication. The system combines Natural Language Processing (NLP) with Machine Learning techniques to understand user requests and generate reasonable price offers. Support Vector Machine (SVM) and K-Nearest Neighbors (KNN) algorithms are used to estimate a fair negotiation price based on product information and historical pricing data. The chatbot also supports order placement, review submission, and sentiment analysis of customer feedback. Developed using Python, Flask, and MariaDB, the proposed system enhances customer engagement by providing a more interactive shopping experience while maintaining a balance between customer satisfaction and seller profitability.

Keywords — E-Commerce, Price Negotiation, Chatbot, Artificial Intelligence (AI), Natural Language Processing (NLP), Machine Learning, Support Vector Machine (SVM), K-Nearest Neighbors (KNN), Flask, Sentiment Analysis.

I. INTRODUCTION

The rapid growth of e-commerce has transformed the way people purchase products and services. Online shopping platforms provide customers with convenience, a wide range of product choices, and quick access to competitive prices. Despite these advantages, one important aspect of traditional shopping is often missing in online marketplaces—the ability to negotiate product prices. In physical stores, customers can interact directly with sellers and bargain to obtain a better deal. However, most e-commerce websites display fixed prices, limiting customer involvement during the purchasing process. This gap has created the need for intelligent systems that can automate price negotiation while maintaining customer satisfaction and business profitability [1], [3].

Recent developments in Artificial Intelligence (AI), Machine Learning (ML), and Natural Language Processing (NLP) have enabled the development of intelligent chatbots capable of understanding user queries and providing instant responses. Modern chatbots are widely used in e-commerce for customer support, product recommendations, order tracking, and complaint handling. Their ability to communicate naturally with users makes them an effective solution for improving customer engagement and reducing the workload on customer service representatives [4].

The proposed Price Negotiating Chatbot extends the functionality of traditional customer service chatbots by introducing automated price bargaining. Instead of displaying only fixed prices, the chatbot interacts with customers, understands their negotiation requests, and suggests reasonable discounted prices based on historical product data and predefined pricing constraints. Machine learning techniques can analyze product attributes and previous pricing information to estimate a fair negotiation price that benefits both the customer and the seller [2]. This approach helps businesses maintain profitability while providing customers with a more personalized shopping experience.

The chatbot supports both text-based and voice-based interactions, making the negotiation process more natural and user-friendly. Customers can browse products, negotiate prices, confirm purchases, and submit reviews within the same platform. In addition, sentiment analysis can be used to evaluate customer feedback, helping sellers understand customer satisfaction and improve their services [5], [6].

The proposed system is implemented using Python, Flask, and MariaDB, with machine learning algorithms such as Support Vector Machine (SVM) and K-Nearest Neighbors (KNN) for price prediction. By combining conversational AI with intelligent pricing strategies, the system provides a practical solution for enhancing customer interaction and increasing sales in e-commerce platforms. Furthermore, recent studies and industry discussions highlight the growing importance of AI-driven negotiation systems in shaping the future of online commerce and personalized digital shopping experiences [7], [8].



II. RELATED WORK

“Artificial Intelligence Based Price Negotiating Ecommerce Chat Bot System,” A. Porselvi, Pradeep Kumar A.V., Hemakumar S., and Manoj Kumar [1]

This study proposed an Artificial Intelligence-based chatbot that automates price negotiation in e-commerce platforms. The chatbot enables customers to negotiate product prices through natural language conversations instead of relying on fixed pricing strategies. The system integrates Artificial Intelligence techniques with machine learning to analyze customer requests and generate suitable counteroffers while maintaining seller profitability. The authors emphasized that an intelligent negotiation mechanism improves customer satisfaction by providing a shopping experience similar to traditional offline bargaining. The chatbot also reduces the workload of customer support teams by handling negotiation automatically. The proposed approach demonstrates that AI-powered negotiation can increase customer engagement, improve conversion rates, and support better decision-making during online purchases. This work provides a strong foundation for developing intelligent price negotiation systems that combine conversational interfaces with predictive pricing models for modern e-commerce applications.

“Negotiation Assistant Bot of Pricing Prediction Based on Machine Learning,” Tingwei Liu and Zheng Zheng [2]

This research presented a machine learning-based negotiation assistant designed to predict reasonable product prices during online negotiations. The proposed system analyzes historical pricing data, customer preferences, and product-related attributes to estimate a fair negotiation price. The authors explored the use of predictive models to assist both buyers and sellers in reaching mutually beneficial agreements while minimizing pricing conflicts. By learning from previous negotiation outcomes, the system continuously improves its pricing recommendations and supports dynamic decision-making. The study highlighted that machine learning algorithms can effectively balance customer expectations with business profitability, making automated negotiation more practical for real-world applications. The research demonstrated that intelligent pricing prediction enhances negotiation efficiency, reduces manual intervention, and creates a personalized shopping experience. The findings encourage the integration of machine learning techniques into conversational commerce systems for smarter and more adaptive online marketplaces.

“An Overview of Chatbot Technology,” Eleni Adamopoulou and Lefteris Moussiades [4]

This paper provided a comprehensive overview of chatbot technology and its applications across various industries, including healthcare, education, customer support, and e-commerce. The authors discussed the evolution of chatbots from simple rule-based systems to advanced conversational agents powered by Artificial Intelligence and Natural Language Processing. The study explained how modern chatbots understand user intent, process natural language, and generate meaningful responses that improve user interaction. Various chatbot architectures, development techniques, and implementation challenges were also reviewed. The paper emphasized that AI-driven chatbots significantly reduce response time, improve service availability, and enhance customer satisfaction through continuous support. Furthermore, the study highlighted the growing importance of integrating machine learning with conversational systems to deliver personalized services. This survey serves as an important reference for researchers developing intelligent chatbot applications for automated customer assistance and online business environments.

“E-Negotiator Chatbot for E-commerce Websites: Implementation,” Rushikesh Khandale, Shashank Sombansi, Siddharth Mishra, Mohd Fahad Shaikh, and Pooja Mishra [5]

This work focused on implementing an intelligent chatbot capable of performing automated price negotiation on e-commerce websites. The proposed system combines negotiation strategies with Natural Language Processing to communicate effectively with customers and recommend suitable prices. The chatbot begins with an initial offer and gradually adjusts prices according to predefined business rules and customer responses. The implementation demonstrated that automated negotiation can improve customer engagement while reducing dependency on human customer service representatives. The authors highlighted the importance of maintaining a balance between customer satisfaction and seller profit by defining minimum acceptable prices during negotiation. The proposed chatbot supports interactive communication and creates a more realistic online shopping experience similar to traditional bargaining. The study concluded that integrating AI-based negotiation into e-commerce platforms can increase customer retention, improve sales performance, and streamline the purchasing process.

“E-Negotiator Chatbot for E-commerce Websites,” Rushikesh Khandale, Shashank Sombansi, Siddharth Mishra, Mohd Fahad Shaikh, and Pooja Mishra [6]

This study introduced an intelligent negotiation chatbot that enables automated bargaining between



customers and online sellers. The proposed system applies Artificial Intelligence and Natural Language Processing techniques to understand customer requests and generate negotiation responses during product purchases. The chatbot follows predefined negotiation strategies while considering product pricing constraints to ensure fair transactions for both buyers and sellers. The authors explained that traditional e-commerce platforms often lack negotiation features, reducing customer interaction compared to physical shopping environments. By introducing conversational negotiation, the system enhances customer satisfaction and encourages users to complete purchases with greater confidence. The research also discussed the practical implementation of chatbot-based negotiation and highlighted its potential to increase sales and improve the overall shopping experience. The proposed framework demonstrates how conversational AI can transform modern e-commerce platforms into more interactive and customer-friendly digital marketplaces.

III. DATASET DETAILS

The dataset used in this study consists of product information collected from an e-commerce platform to support automated price negotiation. Each record represents a product with attributes such as product ID, product category, product name, product description, product image, original selling price, and minimum negotiable price. The dataset also includes pricing information that enables the chatbot to determine an appropriate negotiation range for each product. These records provide valuable information for training machine learning models to estimate fair prices while ensuring that negotiations remain within acceptable limits for both customers and sellers. Since real-world e-commerce data may contain missing values, duplicate records, or inconsistent price information, the dataset undergoes preprocessing to improve data quality before model development. The dataset is organized to represent various product categories with their corresponding pricing details, allowing supervised machine learning algorithms to learn pricing patterns effectively. This structured dataset serves as the foundation for developing an intelligent price negotiation chatbot capable of generating realistic and profitable price offers during customer interactions.

Before training the prediction models, the dataset undergoes several preprocessing steps, including handling missing values, removing duplicate entries, and normalizing numerical price attributes to ensure consistency across all product records. Relevant features such as original price and minimum negotiable price are extracted and prepared for model training. The processed dataset is then

divided into training and testing subsets using an 80:20 ratio, where 80% of the records are used for training the machine learning models and the remaining 20% are reserved for performance evaluation. This partitioning strategy enables the models to learn pricing relationships while accurately assessing their performance on unseen data. The proposed system utilizes Support Vector Machine (SVM) and K-Nearest Neighbors (KNN) algorithms to predict suitable negotiation prices based on product information. The processed dataset enables the chatbot to provide intelligent, fair, and dynamic price recommendations, thereby improving customer satisfaction while maintaining seller profitability in the e-commerce environment.

IV. PROPOSED METHODOLOGY

The proposed methodology presents an intelligent Price Negotiating Chatbot for an e-commerce website that enables customers to negotiate product prices through both text and voice interactions. Initially, the e-commerce product dataset is uploaded into the system, where each record contains product details such as product ID, product name, category, description, original price, minimum negotiable price, and product image. Before model training, the dataset undergoes preprocessing to remove missing values and inconsistencies while normalizing price-related attributes. After preprocessing, the cleaned dataset is divided into training and testing sets using an 80:20 ratio, where 80% of the records are used for model training and the remaining 20% are reserved for testing. The processed data are then supplied to machine learning models to learn the relationship between the original product price and the negotiable price.

Following data preparation, the proposed system employs Support Vector Machine (SVM) and K-Nearest Neighbors (KNN) algorithms to predict a fair negotiation price for each selected product. When a customer browses the product catalog and selects a product for negotiation, the chatbot retrieves the corresponding product information and predicts an initial discounted price using the trained machine learning models. Customers can interact with the chatbot using either text messages or voice commands. If the user requests the "first price," the chatbot provides the predicted negotiation price. If the customer is still unsatisfied and requests the "final price," the chatbot offers an additional predefined discount while ensuring that the final amount does not fall below the seller's minimum acceptable price. Any unsupported query is handled by returning an appropriate response indicating that the request is not recognized.



The chatbot is developed using Python, Flask, and MariaDB, providing a user-friendly web interface for registration, login, product browsing, price negotiation, order confirmation, and customer review management. The system also supports speech recognition for voice-based negotiation and sentiment analysis to classify customer reviews as positive, negative, or neutral. After successful negotiation, customers can confirm their purchases, and all transaction details are stored in the database for future reference. The overall architecture includes product dataset uploading, preprocessing, SVM and KNN model training, price prediction, chatbot interaction, order processing, sentiment analysis, and performance evaluation.

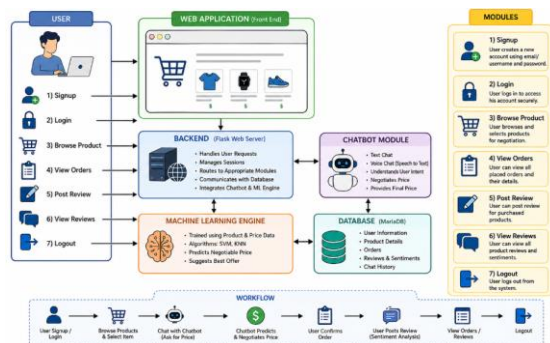


Figure 1. System Architecture for AI-Based Price Negotiating Chatbot on E-Commerce Website

The proposed methodology is designed to automate the product bargaining process while maintaining a balance between customer satisfaction and seller profitability. Initially, users register and log into the system before browsing the available products. After selecting a product, the chatbot predicts a suitable negotiation price using the trained machine learning models. Customers may continue the negotiation through text or voice until a satisfactory price is obtained. Once the negotiated price is accepted, the order is confirmed and stored in the database. Customers can also submit product reviews, which are automatically analyzed using sentiment analysis techniques to determine customer opinions. Finally, the performance of the negotiation system is evaluated through price prediction accuracy, successful negotiation outcomes, order history, sentiment classification results, and graphical performance analysis, demonstrating the effectiveness of the proposed AI-driven e-commerce negotiation framework.

V. RESULT AND DISCUSSION

The experimental results demonstrate the effectiveness of the proposed AI-based Price

Negotiating Chatbot for an e-commerce website. Initially, the product dataset containing product details, original prices, and negotiable prices was uploaded into the system. The dataset was preprocessed to remove inconsistencies and prepare the pricing information for machine learning-based negotiation. The processed data were used to train the Support Vector Machine (SVM) and K-Nearest Neighbors (KNN) models for predicting suitable negotiation prices. When a customer browses the available products, the chatbot retrieves the selected product information and predicts a reasonable negotiated price. The system supports both text-based and voice-based interactions, allowing customers to negotiate product prices using simple conversational commands. During text-based negotiation, the chatbot responds to the "first price" command by suggesting an initial negotiated price and provides an additional discount when the customer requests the "final price." Similarly, the voice-based chatbot recognizes predefined voice commands and generates appropriate negotiation responses. The experimental observations show that the chatbot successfully performs automated price negotiation while maintaining a balance between customer satisfaction and seller profitability. Furthermore, the system records customer orders and performs sentiment analysis on user reviews, enabling comprehensive transaction management and customer feedback analysis.

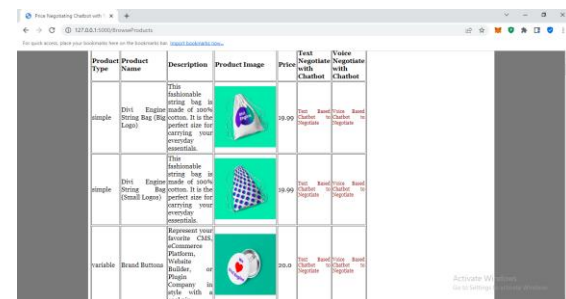


Figure [2] Product Browsing Screen

Figure 2 illustrates the Product Browsing interface of the proposed Price Negotiating Chatbot system. The screen displays the available products along with their product type, product name, description, product image, and original price. Each product includes two negotiation options: Text-Based Chatbot and Voice-Based Chatbot. This interface allows customers to browse products and select their preferred negotiation method before purchasing.

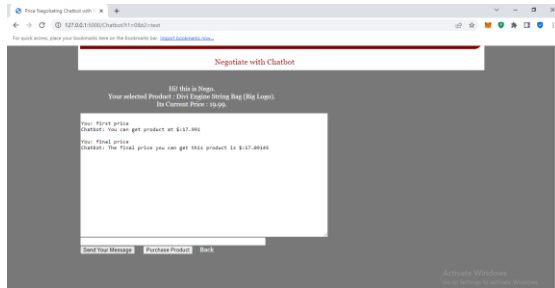


Figure 3: Text-Based Price Negotiation

Figure 3 presents the Text-Based Chatbot negotiation interface. After selecting a product, the chatbot displays the product name and current price. When the customer enters the command "first price," the chatbot predicts and displays an initial negotiated price. If the customer enters "final price," the chatbot offers an additional discount while ensuring that the negotiated amount remains above the minimum acceptable selling price. This interaction provides an intelligent and user-friendly online bargaining experience.

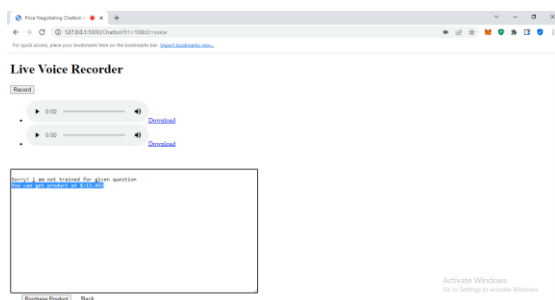


Figure 4: Voice-Based Price Negotiation

Figure 4 shows the Voice-Based Chatbot interface developed for automated price negotiation. The system records the customer's voice through the microphone, converts the speech into text using speech recognition, and processes the recognized command. If the spoken command matches supported negotiation phrases, the chatbot returns the negotiated product price. Otherwise, it displays an appropriate response indicating that the command is not recognized. This feature enhances accessibility by allowing customers to negotiate prices through voice interaction.

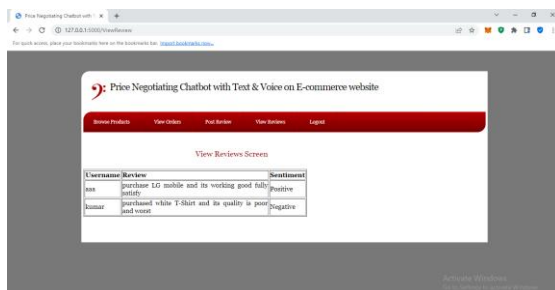


Figure 5: Customer Review and Sentiment Analysis

Figure 5 illustrates the View Reviews module of the proposed system. After completing a purchase, customers can submit product reviews, which are automatically analyzed using sentiment analysis techniques. The interface displays the username, customer review, and predicted sentiment category such as Positive or Negative. This module enables sellers to evaluate customer opinions and monitor product satisfaction, thereby supporting better business decisions and service improvement.

DISCUSSION

The experimental results demonstrate that the proposed Price Negotiating Chatbot successfully automates the online bargaining process by integrating machine learning, conversational AI, and sentiment analysis into a single e-commerce platform. The product browsing module allows customers to explore available products and choose either text-based or voice-based negotiation. The chatbot accurately responds to predefined negotiation commands and generates reasonable price offers based on trained machine learning models. The voice negotiation module further enhances user convenience by supporting speech-based interaction through automatic speech recognition. In addition, the order management functionality records completed purchases, while the sentiment analysis module classifies customer reviews into positive and negative categories, enabling sellers to understand customer feedback effectively. Overall, the developed system provides an intelligent, interactive, and user-friendly shopping environment by combining automated price negotiation, order management, and customer opinion analysis. These results indicate that AI-powered conversational negotiation can improve customer engagement, enhance online shopping experiences, and support more effective decision-making for e-commerce businesses.

VI. CONCLUSION

The proposed Price Negotiating Chatbot for an E-Commerce Website demonstrates how Artificial Intelligence and Machine Learning can enhance the online shopping experience by introducing an automated price negotiation mechanism. The system enables customers to negotiate product prices through both text and voice interactions, making online shopping more interactive and engaging. By utilizing machine learning algorithms such as



Support Vector Machine (SVM) and K-Nearest Neighbors (KNN), the chatbot predicts reasonable negotiation prices while ensuring that the final price remains within an acceptable range for the seller. In addition, the system provides useful features such as product browsing, order management, and sentiment analysis of customer reviews, contributing to improved customer satisfaction and business efficiency.

Although the proposed chatbot performs effective price negotiation, there is still scope for improvement. The current negotiation strategy follows predefined rules and may occasionally offer prices that reduce seller profitability if repeatedly accepted by customers. Future work can focus on integrating more advanced negotiation models, reinforcement learning techniques, or intelligent negotiation agents such as KBAgent to achieve more adaptive and personalized bargaining strategies. Furthermore, incorporating large language models and knowledge-based conversational systems similar to modern virtual assistants can significantly improve the chatbot's ability to understand user intentions and conduct more natural negotiations. Overall, the proposed system provides a practical and efficient framework for intelligent price negotiation and represents a promising step toward the next generation of AI-powered e-commerce applications.

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