

Price Negotiating Chatbot on Ecommerce Website with Voice

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Abstract—E-commerce platforms are rapidly growing and becoming an important part of modern shopping systems. However, most online shopping websites do not provide negotiation features similar to offline markets. Customers often compromise on products due to fixed pricing systems. To overcome this issue, this research proposes an AI-Based Price Negotiation Chatbot for E-Commerce Websites. The system uses Machine Learning algorithms and Natural Language Processing techniques to negotiate product prices with customers through text and voice interaction. The chatbot predicts suitable negotiation prices using Support Vector Machine (SVM) and K-Nearest Neighbor (KNN) algorithms based on product datasets containing product price, category, ratings, and minimum negotiable prices. The proposed system improves customer interaction, increases satisfaction, and helps sellers automate negotiation processes efficiently. The application is developed using Python, Flask, and MariaDB. Experimental results show that the chatbot provides effective price negotiation and enhances the overall online shopping experience.

Index Terms—Artificial Intelligence, Chatbot, E-Commerce, Machine Learning, Price Negotiation, SVM, KNN, NLP

I. INTRODUCTION

E-commerce websites have become one of the most popular platforms for purchasing products online. Customers can easily browse products, compare prices, and place orders from anywhere. Although online shopping provides convenience, one important feature missing in most e-commerce systems is price negotiation. In traditional offline markets, customers often negotiate with shopkeepers to get products at reasonable prices. However, online shopping platforms generally provide fixed product prices,

forcing customers to either purchase at the given price or leave the product.

systems to improve customer experience. AI techniques help in product recommendation, customer support, sales prediction, and automated services. Chatbots are one of the most useful AI applications that provide instant responses to customer queries without human intervention. Integrating negotiation functionality into chatbots can improve customer satisfaction and increase user engagement on ecommerce platforms.

This research proposes an AI-Based Price Negotiation Chatbot that allows customers to negotiate product prices through text and voice communication. The chatbot predicts suitable product prices using Machine Learning algorithms such as Support Vector Machine (SVM) and K-Nearest Neighbor (KNN). The system uses product datasets containing product details, ratings, discounts, and minimum negotiable prices to generate optimized negotiation prices.

The proposed system is developed using Python Flask framework and MariaDB database. The chatbot supports both text-based and voice-based negotiation. Customers can negotiate product prices, place orders, post reviews, and view purchase history. Sentiment analysis is also performed on customer reviews using Natural Language Processing techniques.

The main objective of this research is to automate the product negotiation process in e-commerce websites and provide a smart, interactive, and user-friendly shopping experience. The system helps both customers and sellers by improving sales opportunities and customer satisfaction.

II. LITERATURE REVIEW

The rapid growth of e-commerce platforms and Artificial Intelligence (AI) technologies has significantly transformed online shopping systems. Technologies such as Machine Learning (ML), Natural Language Processing (NLP), and intelligent chatbots are playing an important role in improving customer interaction and automating online services. This literature review focuses on existing research related to AI-based chatbots, price negotiation systems, and machine learning techniques used in ecommerce applications.

C. Batra (2026) introduced an AI-Based Price Negotiation Chatbot for E-Commerce websites that uses Natural Language Processing and machine learning algorithms such as Support Vector Machine (SVM) and K-Nearest Neighbors (KNN) for generating dynamic negotiated prices. The study emphasized the importance of intelligent automation in improving customer interaction and negotiation efficiency. The system achieved improved response time and negotiation accuracy but required large datasets and proper model training for better performance.

Building upon chatbot technologies, the IJIRT Research Team (2026) proposed a Chatbot for Price Negotiation Using Machine Learning and NLP. Their work focused on combining Natural Language Processing with machine learning models to understand customer intent and automate the negotiation process. The research demonstrated improved negotiation efficiency and reduced manual effort in customer support systems. However, the implementation involved high computational complexity and increased development cost.

Research by the AI Research Group (2025) explored an AI-Enabled Price Negotiation Chatbot Using Ensemble Learning techniques. Their system combined multiple machine learning models to improve price prediction accuracy and negotiation performance. The study showed that ensemble learning methods provided better robustness and improved prediction efficiency compared to individual algorithms. However, the model increased computational complexity and training time.

Similarly, the Smart Commerce Research Team (2024) developed a Smart E-Commerce Chatbot Using Deep Learning and NLP techniques for

automated customer interaction and intelligent response generation. Their research demonstrated high accuracy in understanding user queries and improved customer engagement through personalized responses. However, the system required high computational resources and large datasets for training deep learning models.

Lalit Ahire et al. (2024) proposed Developing a Price Negotiation Chatbot for E-Commerce Websites using machine learning algorithms for price prediction based on user behavior and product data. Their system improved sales conversion rates and customer interaction by introducing intelligent price negotiation features in online shopping platforms. The study highlighted that chatbot-based negotiation systems enhance user satisfaction and create a more interactive shopping experience. However, the implementation required complex model management and significant computational power.

III. METHODOLOGY

The overall design of the proposed Price Negotiating Chatbot on E-Commerce Website consists of a user interface, chatbot module, Natural Language Processing (NLP) unit, machine learning models, Flask backend server, and database system, as shown in the system architecture. The user interacts with the chatbot through a web-based interface using text or voice input. The chatbot receives the user query and forwards it to the NLP processing module. The NLP module processes the input using techniques such as tokenization, intent recognition, and entity extraction to understand the user's request. Important information such as product name, expected price, and negotiation intent is extracted from the user input. The processed data is then transferred to the Flask backend server, which acts as an intermediate layer between the chatbot, database, and machine learning models.

The backend retrieves product details such as original price, minimum price, category, and product information from the database. Machine learning algorithms such as Support Vector Machine (SVM) and K-Nearest Neighbors (KNN) analyze the retrieved product data and user input to predict an optimal negotiation price. The predicted price is generated based on historical product data, pricing patterns, and predefined seller constraints. The

negotiation logic ensures that the generated price remains within acceptable limits for both buyers and sellers. The chatbot then sends the negotiated price back to the user through the web interface. If the user is not satisfied, the negotiation process continues dynamically until a mutually acceptable price is achieved. Once the user accepts the final price, the order confirmation details are stored in the database successfully.

The system is implemented using Python and Flask framework, while MySQL/MariaDB is used for database management. NLP libraries such as NLTK and spaCy are used for text processing and intent recognition. Machine learning libraries such as Scikitlearn are used to implement SVM and KNN algorithms for price prediction. The frontend interface is designed using HTML, CSS, and JavaScript to provide an interactive and user-friendly environment for customers.

IV. SPECIFICATIONS

The proposed Price Negotiating Chatbot is a web based e-commerce system that allows users to negotiate product prices through chatbot interaction. The system uses Artificial Intelligence (AI), Natural Language Processing (NLP), and Machine Learning (ML) techniques to provide intelligent and real-time price negotiation. The chatbot processes user queries through text or voice input and predicts suitable negotiated prices using Support Vector Machine (SVM) and K-Nearest Neighbors (KNN) algorithms. Product details such as original price, minimum price, and category are stored in the database and used during negotiation. The system is developed using Python and Flask framework for backend processing, while HTML, CSS, and JavaScript are used for frontend development. NLP libraries such as NLTK and spaCy are used for text processing, and Scikitlearn is used for implementing machine learning models. MySQL/MariaDB databases are used for storing product and user information. The hardware requirements include a minimum Intel i3 processor, 4GB RAM, and 20GB storage for smooth system performance.

V. PROPOSED FRAMEWORK

The proposed framework is an AI-Based Price Negotiating Chatbot developed for e-commerce websites to provide intelligent and real-time price negotiation. The system combines Artificial Intelligence (AI), Natural Language Processing (NLP), and Machine Learning (ML) techniques to simulate human-like bargaining between users and the chatbot. The framework starts when the user selects a product and sends a negotiation request through the chatbot interface. The chatbot processes the user input using NLP techniques such as intent recognition and entity extraction. The processed data is forwarded to the Flask backend server, which retrieves product details from the database. Machine learning algorithms such as Support Vector Machine (SVM) and KNearest Neighbors (KNN) analyze the product information and predict an optimal negotiation price. The chatbot then displays the negotiated price to the user. If the user is not satisfied, the negotiation process continues until a final price is accepted.

The framework improves customer interaction, enhances user satisfaction, and provides a smarter and more flexible online shopping experience.

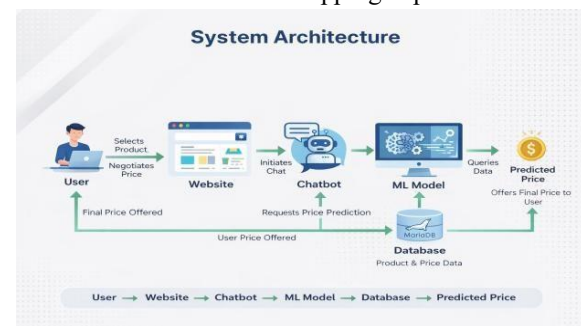


Figure 1 : System Architecture of Price Negotiating Chatbot

VI. RESULTS AND DISCUSSION

The results and discussion section presents the performance analysis and effectiveness of the proposed Price Negotiating Chatbot system developed for e-commerce applications. The system integrates Artificial Intelligence (AI), Natural Language Processing (NLP), and Machine Learning (ML) techniques to provide intelligent and real-time product price negotiation. Machine learning

algorithms such as Logistic Regression, Support Vector Machine (SVM), K-Nearest Neighbor (KNN), and the Hybrid Model (SVM + KNN) were implemented and evaluated using different performance metrics.

The experimental analysis includes algorithm accuracy comparison, model performance evaluation, negotiation outcome analysis, confusion matrix analysis, training and validation accuracy analysis, and average negotiated price analysis across different product categories. The obtained results demonstrate that the proposed hybrid model achieved better accuracy and negotiation performance compared to individual machine learning algorithms. The following figures and tables illustrate the performance and effectiveness of the proposed system.

Accuracy Comparison of Different Algorithms

The below figure shows the comparison of accuracy obtained by different machine learning algorithms used in the proposed system. Logistic Regression achieved an accuracy of 84.12%, Support Vector Machine (SVM) achieved 90.23%, and K-Nearest Neighbor (KNN) achieved 89.15%. The proposed Hybrid Model (SVM + KNN) produced the highest accuracy of 94.37%, demonstrating better prediction performance and improved negotiation accuracy.

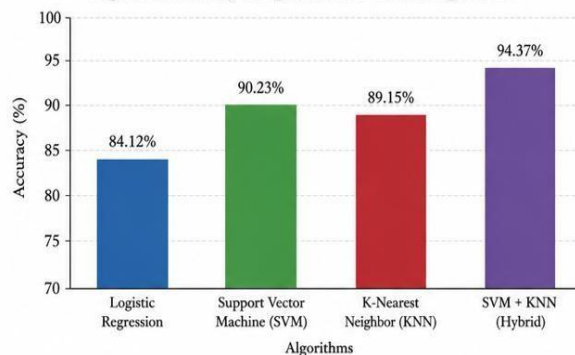


Figure 2: Accuracy Comparison of Different Algorithms

Performance Evaluation of Machine Learning Models

The below table presents the performance evaluation of different machine learning models using metrics such as Accuracy, Precision, Recall, and F1-Score. The hybrid model achieved superior results compared

to individual algorithms, proving its effectiveness in generating optimized negotiated prices.

Table 1: Performance Evaluation of ML Models

Algorithm	Accuracy (%)	Precision (%)	Recall (%)	F1-Score (%)
Logistic Regression	84.12	84.05	84.12	84.02
Support Vector Machine (SVM)	90.23	90.18	90.23	90.21
K-Nearest Neighbor (KNN)	89.15	89.10	89.15	89.11
SVM + KNN (Hybrid Model)	94.37	94.32	94.37	94.34

Negotiation Outcome Analysis

The below figure shows the analysis of negotiation outcomes generated by the chatbot system. The results indicate that 72.16% of negotiations were successful, 20.40% were partially negotiated, and only 7.44% of negotiations were unsuccessful. This demonstrates the effectiveness of the chatbot in achieving successful price negotiations with users.



Figure 3: Negotiation Outcome Analysis

Confusion Matrix Analysis

The below figure represents the confusion matrix of the Hybrid Model (SVM + KNN). The model correctly classified most negotiation outcomes with an overall accuracy of 94.37%. The confusion matrix demonstrates the reliability and efficiency of the proposed hybrid model in prediction and classification tasks.

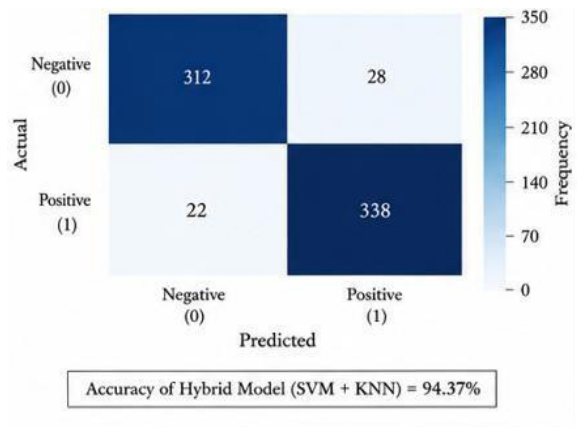


Figure 4: Confusion Matrix – Hybrid Model (SVM + KNN)

Training and Validation Accuracy Analysis

The below figure illustrates the training and validation accuracy of the hybrid model across different epochs. The graph shows that both training and validation accuracy improved gradually with increasing epochs, indicating stable model learning and improved prediction performance.

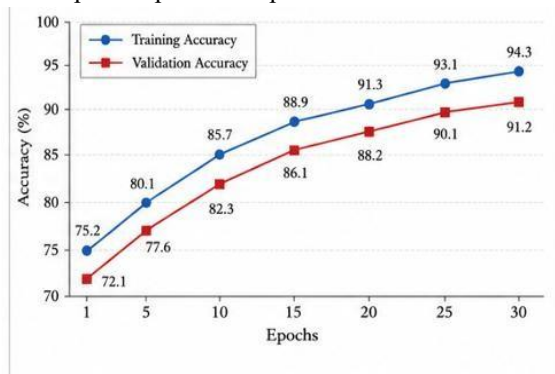


Figure 5: Training and Validation Accuracy – Hybrid Model

VII. CONCLUSION

In conclusion, this paper focused on developing an intelligent Price Negotiating Chatbot for E-Commerce Websites to improve customer interaction and provide a flexible online shopping experience. The proposed system addressed the limitation of fixed pricing in traditional e-commerce platforms by introducing an AI-based negotiation mechanism that allows users to bargain product prices through chatbot interaction.

The research utilized Artificial Intelligence (AI), Natural Language Processing (NLP), and Machine Learning (ML) techniques to enable intelligent communication and dynamic price prediction. An Ecommerce Product Dataset containing product details such as original price, minimum price, and category was used for training and testing the machine learning models. Preprocessing techniques were applied to clean and normalize the dataset for better model performance.

Machine learning algorithms such as Support Vector Machine (SVM) and K-Nearest Neighbors (KNN) were implemented to predict optimal negotiated prices based on user input and product information. Natural Language Processing techniques including intent recognition and entity extraction enabled the chatbot to understand user queries and generate appropriate responses during the negotiation process. The system was developed using Python and Flask framework, which integrated the user interface, machine learning models, and database management system effectively. During the experimentation phase, the chatbot demonstrated efficient real-time negotiation, accurate price prediction, and smooth interaction with users. The system successfully generated negotiated prices within acceptable limits while maintaining a balance between customer satisfaction and seller constraints.

Overall, the proposed chatbot system demonstrated the practical application of AI-driven technologies in modern e-commerce platforms. The integration of NLP and machine learning techniques improved user engagement, automated the negotiation process, and created a smarter and more interactive online shopping environment.

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