

# Price Negotiating Chatbot on E-commerce website

Rohan Asrani<sup>1</sup>, Paras Nandwani<sup>2</sup>, Sahil Sidhani<sup>3</sup>, Vidya Pujari<sup>4</sup>

<sup>1,2,3</sup>Student, Information Technology, Vivekanand Education Society's Institute of Technology, Mumbai, India

<sup>4</sup>Assistant Professor, Information Technology, Vivekanand Education Society's Institute of Technology, Mumbai, India

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**Abstract** – In recent years online shopping has gained a huge boom. With this increase, most of the features of online shopping are developed but some features like negotiating with shopkeepers are not available which is sometimes possible in offline purchasing. We have implemented a chatbot for negotiating on the products. The chatbot interacts with customers and assists them to get a satisfactory price on product(s). With such a system, which impacts on major areas of online shopping there are possibilities in which either the seller of the product or customer's budget gets compromised. To avoid such situations we have developed an algorithm which works along with prediction of old available data to provide a price. Price prediction has less accuracy at times because either irrelevant features/attributes of data are used or some algorithms are not suitable for a particular dataset. Due to this, Ecommerce business does not directly rely on price prediction systems since even a wrong prediction of a single product can result in business losses. Some models also fail when data scales or some feature is unavailable after time on which model prediction was dependent. Then those changes are to be managed to maintain the accuracy and reliability of the model. In our chatbot system we have tried to resolve some of such issues.

**Key Words:** Price negotiation, E-commerce negotiation, Chatbot, Machine Learning, Neural Network, Natural Language Processing

## 1. INTRODUCTION

E-commerce websites today apply various AI techniques to determine most liked products or most sold products which eventually are calculated to provide an effortless search for customers shopping on their website. But at times when the best products are sold at high prices, customers have to compromise on their product. There are also some other problems that customers may face on low cost products. These problems can be eliminated by giving them an opportunity to negotiate on the products.

Negotiation is a combination of both linguistic and reasoning problems. Negotiation is the process of exchanging the highest likelihood of satisfying the needs of both parties [3]. The first party i.e. product seller will provide a minimum price along with the product data that he/she can afford to sell the product at. This price and the product price before negotiation (original price) are the limits for our algorithm.

The chatbot is implemented on the website which uses flask APIs to connect to UI so that we can depict real life implementation of our model.

A chat bot is an artificial intelligence (AI) software that can simulate a natural language conversation (or chat) with a user via messaging applications, websites and mobile apps, or by telephone[1]. Chatbots can solve most of the customer queries without need for a customer executive. The chatbot uses NLP techniques to identify the user intent and replies accordingly.

Besides all these practices, chatbot will also automate the process of negotiation on E-commerce websites. Such a system will help the users to freely interact with the software and upload their product related queries and budget to get the response related to the query. Just like retail and logistics companies use data to plot the most efficient route to deliver goods [5]. It will bring a huge impact on sales and number of customers on the website. The customers will most likely increase due to getting online products at their fair prices.

## 2. RELATED WORK

Solomon, 1998 in his study "Consumer behavior is the study of the processes involved when an individual selects, purchases, uses or disposes of products, services, ideas, or experiences to satisfy needs and desires" [3]. Which is true and many companies have engaged themselves in understanding consumer's behavior to get the most profitable techniques with customer's satisfaction. In 2017, Facebook's FAIR (Facebook Artificial Intelligence Research) group along with Georgia Institute of Technology trained bots over 5000+ negotiation datasets. When they trained their bots to respond based on human likelihood, they resulted to be "overly willing to compromise". When they were trained again with analyzing the human agent's belief, it was found that most of the replies of bots were false.

The most widely used algorithm for this purpose is SVM (Support Vector Machine). This algorithm acknowledges the presence of non-linearity in the data and provides a proficient prediction model. Further there were two different approaches to increase the accuracy i.e. Neural Networks and Natural Language Processing. It was observed that models using NLP gave a higher accurate prediction than Neural

Networks. Algorithms for price prediction mainly include SVM/SVR which has good accuracy but to improve it more, other regressors which perform best can also be used. To combine the prediction of algorithms applied, ensemble learning can have far better results than individual algorithms.

Chatbots seem to hold tremendous promise for providing users with quick and convenient support responding specifically to their questions. The most frequent motivation for chatbot users is considered to be productivity, while other motives are entertainment, social factors, and contact with novelty. However, to balance the motivations mentioned above, a chatbot should be built in a way that acts as a tool, a toy, and a friend at the same time[4]. NLP forms the core of most chatbots. Some chatbots use chatscript or rivescript which are successors of AIML.

More recent applications include i.e. negotiation history from other users will be used as knowledge based for general modeling which will be used while negotiating by the automated negotiating agent. Experiments conducted with people show that the KB Agent negotiates efficiently with people and even achieves better utility values than another automated negotiator, shown to be efficient in negotiations with people[3].

The price prediction may use a variety of algorithms or combinations of them such as SVR, KNN, ANN, etc. These algorithms are suitable to give the first reduction price of the product, while the rest negotiations are handled by negotiation formula. The formula can be the median of difference of the prices or decrease by a random number (within the limits) or a complex computation covering various cases of negotiation.

### 3. PROPOSED SYSTEM

We have used the dataset of e-commerce items containing the price of products and their minimum prices i.e. min price which will be used for negotiating. The website for demonstrating the working is made upon HTML, CSS, JavaScript for front end while the backend uses Flask. Database is made by mariadb.

In an E-commerce website the customers select the product(s) that they wish to buy, then they proceed with ordering the product(s). On our website we have added the chatbot where they purchase the product by placing a button to negotiate. The offer price will be then stored when they are satisfied. They can select whether they want to buy that product or add the product to cart and see for another product(s).

Customers judge the products on E-commerce websites by various factors such as ratings, price, reviews, etc. But for some customers, price plays a crucial role in the decision for purchasing a product.

We have assigned categories to the products which are based on the sales of the corresponding products. The highest selling products are marked as A category and in this category there won't be much negotiation. Since users generally don't bother on the price of highest selling products. The next category is B which are average selling product. In this we offer little more negotiation to increase the sales and profit. The last two categories are C1 and C2 categories which are less selling products and we offer high negotiation on these products in which the C2 category products are basically the products which are of stock clearance type or having rare sale. The customer can negotiate more and can get a better price on these products and also this will help the sellers.

These categories will be updated as per the sales of product, market demand and supply, etc which will help website to earn profit even with negotiation. Using the above categories, we define a price which will set lower limit for negotiation i.e. min price for algorithm.

When the customer asks for the negotiation, then the first negotiated price will be given by Machine Learning algorithms on the available dataset which contains data for products with their price and discount. It will consider the different parameters in the database and accordingly predict the price of the product which will be used for negotiating. The machine learning algorithms used are SVM, KNN. Different dataset attributes (like minimum price, category, likes, etc) are used in the SVM and KNN for prediction of price and then finally the ensembled result of both algorithms is considered and this price is the initial negotiated price. If the customers agreed to buy, they can buy the product at this negotiated price or else they can go for further negotiating the price of that product with the chatbot.

If the customer is not satisfied with the first price, for further negotiation we have created the algorithm which will be using the present product price and the minimum price at which the seller can sell the product. The chatbot negotiates the price of the product with the customer by the price given by them (if they have provided) and the threshold price (min price). Chatbot provides the negotiated price to the customer and if the customer is willing to buy he/she can buy the product at this negotiated price, if not, this process will be repeated. If the customer isn't satisfied even by the final price of the product then they can also see the similar products at a lower to higher price segment in the recommendation section. The recommendation section contains the products depending upon the price and category of the product considered. The customer queries are understood using NLP's package NLTK after which the list of words is passed to Keras dense neural network with relu activation. The neural net is formed of three layers which identifies the intent. First layer 128 neurons, second layer 64 neurons and 3rd output layer contains number of

neurons equal to number of intents to predict output intent with softmax. The optimiser used for is SGD.

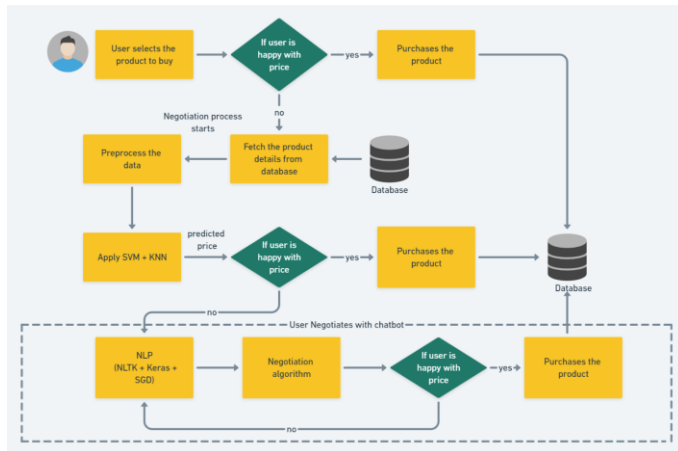


Fig -1: Flowchart

A user can buy the product directly without negotiating. But if the user selects to negotiate, the chatbot will get details from the database. The chatbot can be used for general queries. On starting the negotiation, the backend will execute the machine learning algorithms and give the predicted price which is then provided to the customer. On further negotiation the chatbot will identify the intents for negotiation, if found the negotiation algorithm will work accordingly and the process can continue till min price. The customer at any intermediate price can go for purchasing or can add that product to cart with negotiated price.

The minimum price can be altered by the product merchant and then the prices to the customer will work accordingly. To use such a system in real life e-commerce websites the websites have to cut on some offers and exclusive discounts to maintain the sales and profit while allowing customers to negotiate on products.

Algorithm for negotiation:

- 1) The SVM, KNN is used for price prediction which will be the first negotiated price given to the customer.
- 2) If the predicted price is less than minimum price or higher than the product price or is too less as first price, the price is  $price - (price - min\_price) * 0.1$  (i.e giving 10% less of the total available discount)
- 3) If the customer is satisfied with the price then they can buy the product else can go for further negotiation.
- 4) Else calculate the maximum discount available for the product in percentage
- 5) If customer has given the expected price Calculate what % discount customer is asking for
- 6) If the  $Customer\_discount(in\ Percentage) \leq 0.5$  return previous product price
- 7) If  $max\_discount < Customer\_discount$  then give the negotiate price upto  $max\_discount$

- 8) Else if  $max\_discount > Customer\_discount$  then give the negotiated price upto  $Customer\_discount$
- 9) If customer has not given price but asks to decrease the price then return  $previous\_price - (previous\_price - min\_price) * 0.2$
- 10) If customer is satisfied with the price then they can buy product
- 11) Else repeat from step 5  
(previous price will be stored and next time it will start negotiate from previous price rather than the Product's initial price)

#### 4. RESULT

The customer on the website has negotiate option along with the product. On chatbot opening we have included the price element in chatbot itself so that if there are plenty of messages user may not get confused with price which is currently considered. This is shown in Fig.2. The price for the product is \$71.89.

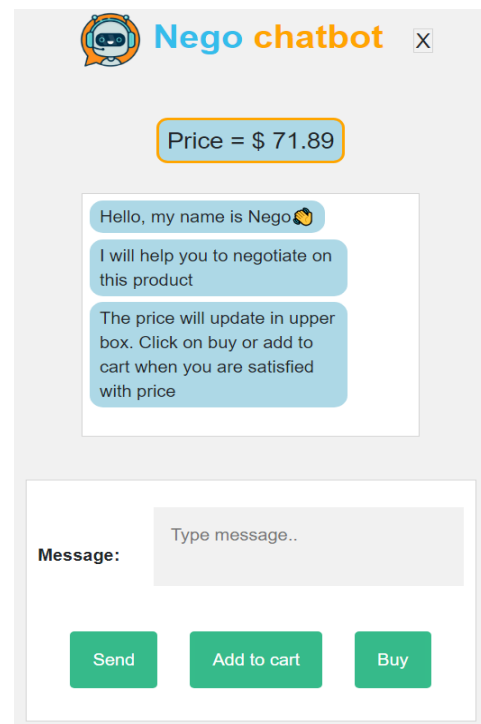


Fig -2: Chatbot Interface

When the user asks for the first negotiation price that bot can give or just ask to start negotiation, the price is calculated by the ensemble of SVR and KNN. The first price here is given as \$68.93. If the user clicks on buy or add to cart, this price would be added.

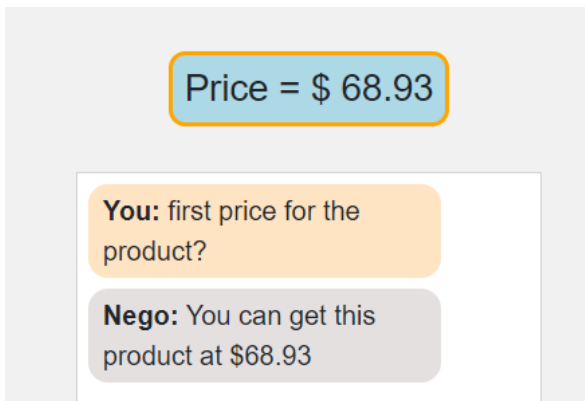


Fig -3: Start price for negotiation

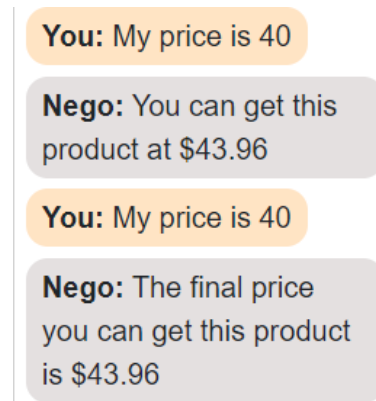


Fig -6: If the price is low for seller

Users can ask general queries about products or website. If the user is not satisfied with the above price, they can type their price or just ask to decrease the price.

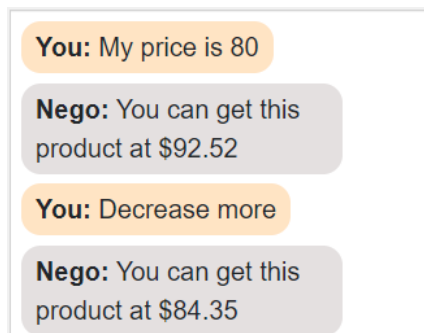


Fig -4: User negotiating on price

In cases where users price is much far from the minimum price, the bot can agree around user's price as shown in Fig.5.

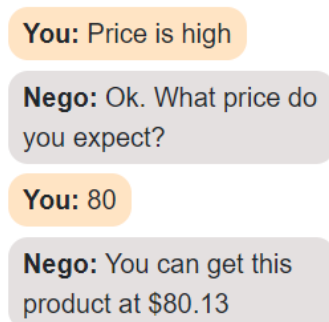


Fig -5: If price is high for user

When the user wants the product at a particular price which is less than minimum price, chatbot gives the same/minimum price. It is shown in Fig.6.

## 5. CONCLUSION AND FUTURE SCOPE

The negotiation on products is a challenging task when it comes to e-commerce systems. We tried a primary chatbot that covers many aspects and cases for negotiation but is not evident to provide the best results.

- The chatbot which we created sometimes falls to the price customers ask for though it is always greater than minimum price but may result in loss for seller if it goes the same for many customers. Such situations have to be handled.
- We used various algorithms such as SVM, KNN but in future there may be some better price prediction algorithms which can be used.
- [Reference 7] shows the ways in which a user can better negotiate with chatbot and get cheaper prices. Such cases should be handled.
- KBAgent is considered to be better when it comes to negotiation, this can be added to our application. An example can be Apple's Siri which has huge knowledge base to provide satisfactory outcomes.

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