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# Q Smart Banking Chatbot

Chandrakanth. B<sup>1</sup>, Lokesh. B<sup>2</sup>, Krishna Teja. S<sup>3</sup>, Mrs. D.Madhuri<sup>4</sup>

<sup>123</sup>UG Scholar, Dept. of AI&DS, St. Martin's Engineering College, Secuenderabad, Telangana, India – 500100

<sup>4</sup> Assistant Professor, , Dept. of AI&DS, St. Martin's Engineering College, Secuenderabad, Telangana, India – 500100

[Chandrakanthpatil0202@gmail.com](mailto:Chandrakanthpatil0202@gmail.com)

## Abstract:

The purpose of the project is to make any domain-specific website, in our case banking, more usable by integrating a chatbot that serves as an interface for customer inquiries about services. This reduces customer interaction time with websites, thereby valuing their time and improving their overall experience. As part of this project, we explored and attempted to create an intelligent chatbot that could extract relevant information, recognize various intents and execute the pre-mapped actions. To create a contextual assistant for the above purpose, we used the RASA framework. To train the model, we constructed a custom dataset that includes multiple intents and entities. Additionally, we provide some python scripts (RASA actions) that will be executed when some intents are detected. Our solution consisted of creating a pipeline having a chatbot and several actions triggered by the chatbot. These actions will connect with the database and then provide the required data or make changes according to the user's query and display the feedback back to the user via the chat widget.

**Keywords:** *Cholangiocarcinoma, Pathology Imaging, Hyper Spectral Imaging, RGB Imaging, Tissue Differentiation, Spectral Data Interpretation.*

## 1.INTRODUCTION

At a very basic level chatbot can be considered to be an agent which can interact with a user like a human (voice or text) and understand what the user wants from it and provide a specific set of services to the user according to the user's demands. Chatbot also acts as an information-gathering tool using which the organization can know their customer base more clearly and understand their needs. Chatbots are used in a wide range of domains right from health care services to customer relationship management services. A chatbot broadly comprises three subsystems which are Natural Language Understanding(NLU) which understands what the user is trying to communicate or what is the intent of the provided sentence, Dialog Management which maintains the state of communication by remembering what key pieces of information have been provided by the user and how to drive the conversation ahead and Natural Language Generation(NLG) which handles the part where the chatbot figures out what the bot should respond to back to the user. RASA is an open-source Natural Language Processing (NLP) tool that is used

to build virtual assistants and contextual chatbots. RASA provides two main modules Rasa Open Source and Rasa Action Server. Rasa Open Source has Rasa NLU to recognize the intent of communication and Rasa core to decide what to do next and how to proceed with the conversation. Rasa Action Server allows the hosting of Python scripts to perform certain custom tasks like processing or modifying databases in the backend. This paper presents a chatbot deployed on a banking website that offers certain services like checking account balance, making a transaction, and many more to users right in the chat window. Q Smart Banking Chatbot is an AI- powered virtual assistant designed to enhance customer experience in the banking sector. This chatbot leverages Natural Language Processing (NLP) and Machine Learning (ML) to provide seamless, real-time interactions with customers, automating routine banking tasks while ensuring security and efficiency.

The purpose of the project is to make any domain-specific website, in our case banking, more usable by integrating a chatbot that serves as an interface for customer inquiries about services. This reduces customer interaction time with websites, thereby valuing their time and improving their overall experience. As part of this project, we explored and attempted to create an intelligent chatbot that could extract relevant information, recognize various intents and execute the pre-mapped actions. To create a contextual assistant for the above purpose, we used the RASA framework. To train the model, we constructed a custom dataset that includes multiple intents and entities. Additionally, we provide some python scripts (RASA actions) that will be executed when some intents are detected.

## 2. LITERATURE SURVEY

Intelligent chatbot systems are popular issues in the application fields of robot system and natural language processing. As the development of natural language processing and neural network algorithms, the application of artificial intelligence is increasing in Chatbot systems, which are typically used in dialog systems for various practical purposes including customer service or information acquisition. This paper designs the functional framework and introduces the principle of RASA NLU for the Chatbot system, then it integrates RASA NLU and neural network (NN) methods and implements the system based on entity extraction after intent recognition. With the experimental comparison and validation, our developed system can realize automatic learning and answering the collected questions about finance. The system analysis of two methods also validate that RASA NLU outperforms NN in accuracy for a single experiment, but NN has better integrity to classify entities from segmented words. Artificial Machine Intelligence is a very complicated topic. It involves creating machines that are capable of simulating knowledge. This paper examines some of the latest AI patterns and activities and then provides alternative theory of change in some of the popular and widely accepted postulates of today. Based on basic A.I. (Artificial Intelligence) structuring and working for this, System-Chatbots are made (or chatter bots). The paper shows that A.I. is ever improving. As of now there isn't enough information on A.I. however this paper provides a new concept which addresses machine intelligence and sheds light on the potential of intelligent systems. The rise of chatbots in the finance sector is the latest disruptive force that has changed the way customers interact. In the banking industry, the introduction of Artificial Intelligence has driven chatbots and changed the face of the interaction between bank and customers. The banking sector plays an important role in development into any country. It also explores the existing usability of chatbot to assess whether it can fulfill customers ever-changing needs.

Inspired by recent work in machine translation and object detection, we introduce an attention-based model that automatically learns to describe the content of images. We describe how we can train this model in a deterministic manner using standard backpropagation techniques and stochastically by maximizing a variational lower bound. We also show through visualization how the model is able to automatically learn to fix its gaze on salient objects while generating the corresponding words in the output sequence. We validate the use of attention with state-of-the-art performance on three benchmark datasets: Flickr9k, Flickr30k and MS COCO.

This paper [1] presents the use of the RASA framework for building smart context remembering chatbots, it also describes how Rasa NLU works and how its performance is elevated by using intent recognition and entity extraction. It also compares the accuracies of entity extraction using Rasa NLU and a NN, results show Rasa NLU performs better to extract entities when whole sentences are provided as compared to neural networks which require segmented inputs. This paper discusses Rasa by implementing a chatbot related to the finance domain, using which the users can inquire about stock-related information.

RASA NLU can introduce a vital component in intelligent chatbot systems. We can compose the system to extract the entity after intent recognition. This can be further improved for complicated sentences and more entities.

This paper [2] briefly discusses advancements in the field of AI and how this has led to major shifts in some organizations about how they operate. It further mentions how the banking industry has moved to use chatbots for providing an interface to customers so that they can have an assistant throughout the day for service. This paper also gauges the ability of current chatbots to provide all the services that a user needs.

It includes several strategies for managing dialogue in the banking and finance industry based on ontology. Although further use of AI can make the chatbot not only respond to questions but also self-learning to improve itself in more stages, improving user service quality and also reducing human load.

### Chatbots and Virtual Assistant in Indian Banks

This paper discusses the adoption of chatbots and virtual Assistants by different category of banks (private sector banks and public sector banks) in India. The research paper presents a brief introduction of banking industry in India, history, characteristics, and architecture of chatbots and virtual assistants. The research paper also included basic features, way to connect, services offered, accuracy, technology providers of chatbots and virtual assistants implemented by Indian banks. Research paper concluded that Indian banks are aggressively investing in chatbots and virtual assistant technology but features are limited. Most of the questions answered by chatbots/ virtual assistant are routine for which data is already available on websites of the banks. Secondly, awareness of chatbots/ virtual assistants is very low among the customers and employees of the banks. It necessitates enhancement of existing capabilities of chatbots/ virtual assistant deployed by Indian banks and awareness with respect to usefulness among employees and customers.

### Smart banking chatbot:

Get started with MATLAB for deep learning and AI with this in-depth primer. In this book, you start with machine learning fundamentals, then move on to neural networks, deep learning, and then convolutional neural networks. In a blend of fundamentals and applications, MATLAB Deep Learning employs MATLAB as the underlying programming language and tool for the examples and case studies in this book. With this book, you'll be able to tackle some of today's real world big data, smart bots, and other complex data problems. You'll see how deep learning is a complex and more intelligent aspect of machine learning for modern smart data analysis and usage. You will Use MATLAB for deep learning Discover neural networks and multi-layer neural networks Work with convolution and pooling layers Build a MNIST example with these layers. The purpose of the project is to make any domain-specific website, in our case banking, more usable by integrating a chatbot that serves as an interface for customer inquiries about services. This reduces customer interaction time with websites, thereby valuing their time and improving their overall experience. As part of this project, we explored and attempted to create an intelligent chatbot that could extract relevant information, recognize various intents and execute the pre-mapped actions. To create a contextual assistant for the above purpose, we used the RASA framework. To train the model, we constructed a custom dataset that includes multiple intents and entities. Additionally, we provide some python scripts (RASA actions) that will be executed when some intents are detected. Our solution consisted of creating a pipeline having a chatbot and several actions triggered by the chatbot. These actions will connect with the database and then provide the required data or make changes .

## Chatbot technology in the banking industry

Chatbot applications offer benefits for both companies and consumers. First, chatbots enable consumers to get in touch with companies anytime from anywhere using their own mobile devices, thus they can get quick and relevant responses to their questions. Second, the implementation of these applications allows companies to target consumers in a more direct and personal way, and companies can save on personnel costs in the area of customer services. In addition to the benefits of the technology, the usage of chatbots may also involve several risk factors, including issues regarding data security and financial risks (Vieira and Sehgal, 2017; Richad et al., 2019). Recently published scientific papers analyzed the adoption of chatbot technology in the tourism industry (Melián-González et al., 2021), in the health care industry (Laumer et al., 2020), and in the field of higher education (Almahri et al., 2020). Regarding the adoption of chatbots applied in the financial industry, only a few studies examined the acceptance of these applications in the context of the insurance sector (Cardona et al., 2019) and the banking sector (Gupta and Sharma, 2019; Quah and Chua, 2019; Trivedi, 2019; Richad et al., 2019; Sarbabidya and Saha, 2020). Although several studies have examined the factors influencing the acceptance of chatbots, the findings carried out in different fields may not be transferable for financial services (Cardona et al., 2019). Specific research is required in case of banking. Chatbots applied in the financial industry can assist customers in managing financial transaction such as reviewing an account, reporting lost cards or making payments, renewing a policy or handling a refund (Tarbal, 2020).

In the literature, there are several recently published studies that focused on chatbot technology applied in the financial industry (Cardona et al., 2019; Gupta and Sharma, 2019; Quah and Chua, 2019; Richad et al., 2019; Trivedi, 2019; Sarbabidya and Saha, 2020) (Table 1). Cardona et al. (2019) studied the adoption and diffusion of chatbots in the context of insurance, concluding that the majority of the participant were familiar with the technology and would prefer to use it at the beginning of the advisory process, while one third of the participants rejected the adoption of chatbots. Gupta and Sharma (2019) examined the customers' attitude towards chatbots in the banking industry and the findings of the study revealed positive correlation between the positive attitude for chatbots and their utility, accessibility and threats. Quah and Chua (2019) explored the effectiveness of the use of chatbot technology in Singapore's banking industry and investigated chatbot functionality to determine if it would meet customer expectations. They found that detailed information provided by the banking chatbot was the most important factor for consumers, followed by fast response, functionality, interactivity, ease of use and data privacy and protection. It was also found that some of the users were not satisfied with the banking chatbot because it didn't provide an immediate answer when needed. Richad et al. (2019) investigated the acceptance factors of chatbot technology in the banking industry in Indonesia in case of Millennials based on TAM, and found that innovativeness, perceived usefulness, perceived ease of use and attitude towards using the chatbot had significant effect.

intention. Trivedi (2019) examined customer experience of using banking chatbots and its impact on brand love adopting the Information Systems (IS) success model among. The results showed that system quality, information quality and service quality had significant impact on customer experience, system quality being the strongest predictor. Perceived risk reduced the impact of the three quality dimensions on customer experience, and customer experience of using the chatbot led to love for the brand that provided the technology. Sarbabidya and Saha (2020) found that the role of chatbots in customer service of the banking industry was positively affected by advisory services, ease of use and convenient service, cost effective and efficient service, customer-friendly service, customized service, relationship banking services, responsive service, trustworthy service, value-based useful service and maintaining customers security and privacy.

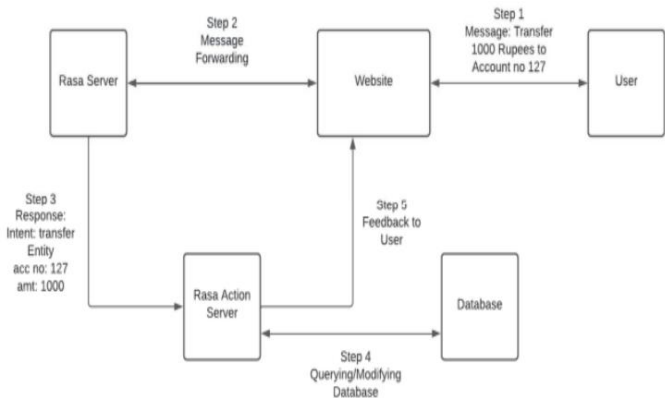
### 3. PROPOSED METHODOLOGY

In this project we have employed Artificial Intelligence technique to process text data and then employ machine learning algorithms to predict answers for user questions. Chatbot will take user queries and then employ ML algorithm to predict answer and then this answer will be given as output to the user. To get accurate answer we have evaluate performance of multiple algorithms like Random Forest, KNN and SVM. In all algorithms Random Forest is giving best accuracy. In the competitive banking area, the customer expects quick responses increasing the load for banks to catch up with the requirements. This project aims to develop a website with a chatbot that is not only capable of having conversations with the customer but also has the ability to listen to commands and make changes to the database.

#### Advantages:

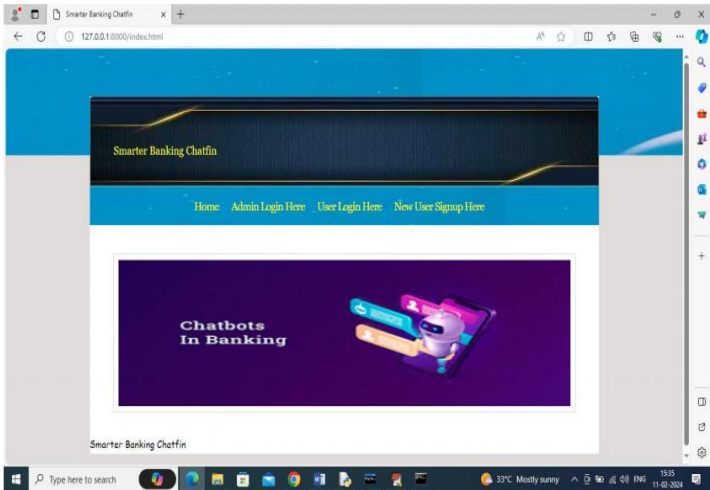
To implement this project we have designed following modules

- 1) Admin Login: using this module admin can login to system using username and password as 'admin' and then can train ML algorithms. Admin can view list of sign up users and can view all interaction between all users and Chatbot.
- 2) New user sign up: using this module user can sign up with the application.
- 3) User Login: registered user can login to system.

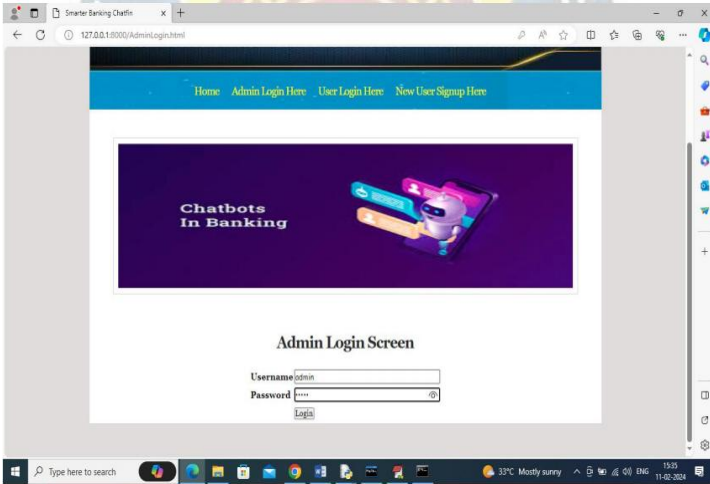


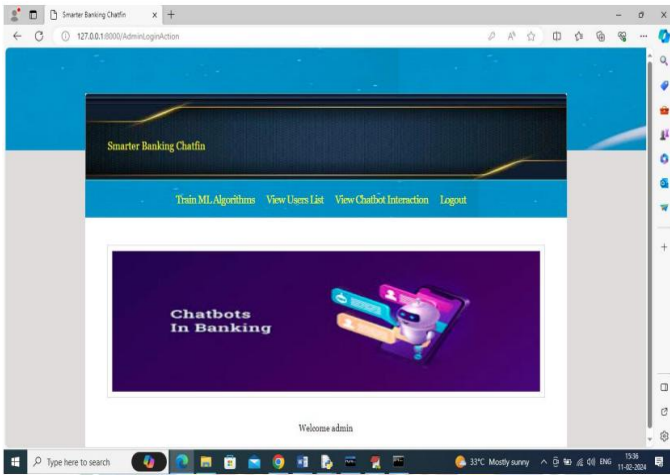
### 4. EXPERIMENTAL ANALYSIS

To run project double click on run.bat file to get below screen

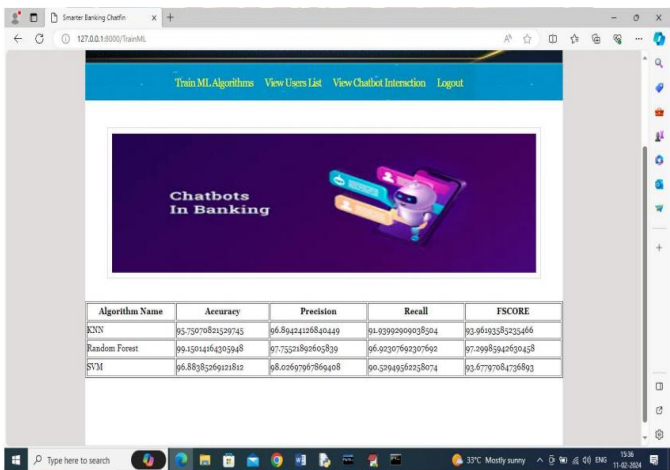


In above screen click on 'Admin Login Here' link to get below login page.

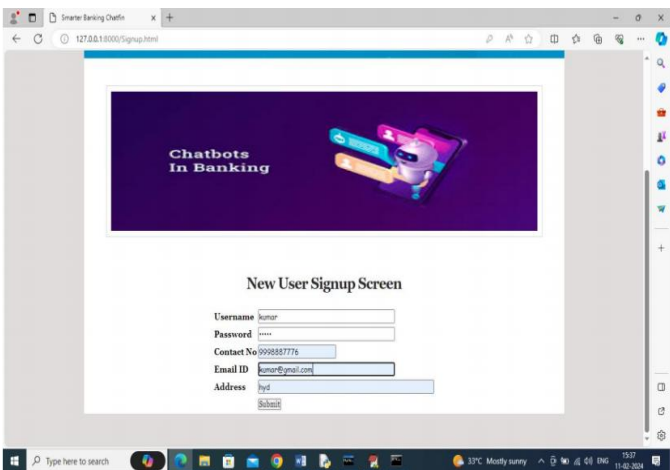




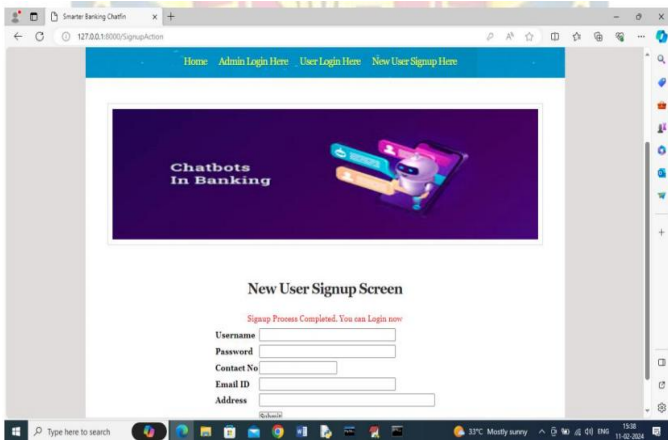
In above screen click on 'Train ML Algorithms' link to train algorithms and get below page



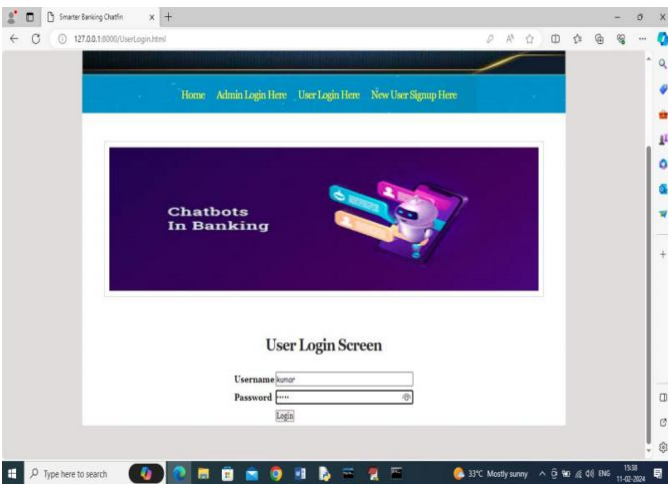
In above screen can see result of all ML algorithms and in all algorithms Random Forest got high accuracy and now 'Logout' and sign up new user.



In above screen user is entering sign up details and then press button to get below page.

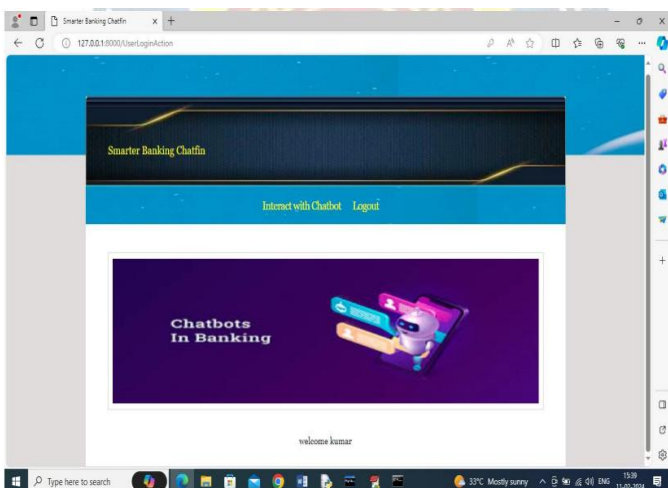


In above screen sign up task completed and now click on 'User Login' link to get below page

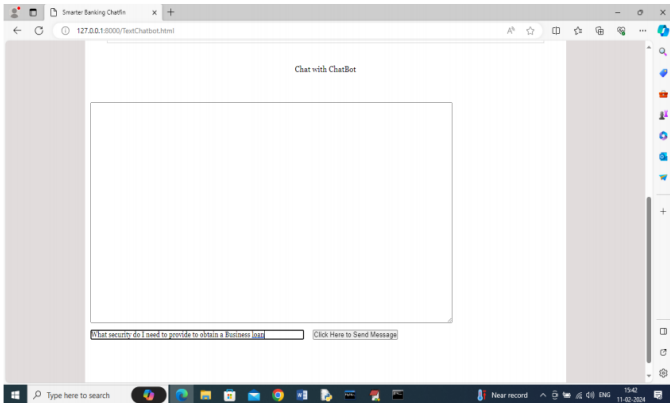


In above screen user is login and after login will get below page

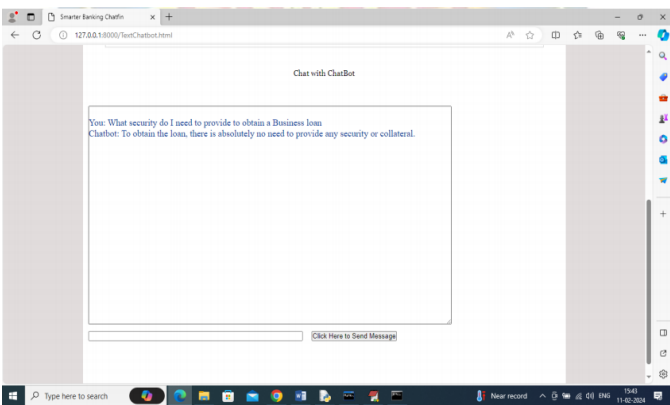
In above screen for given text will get below image



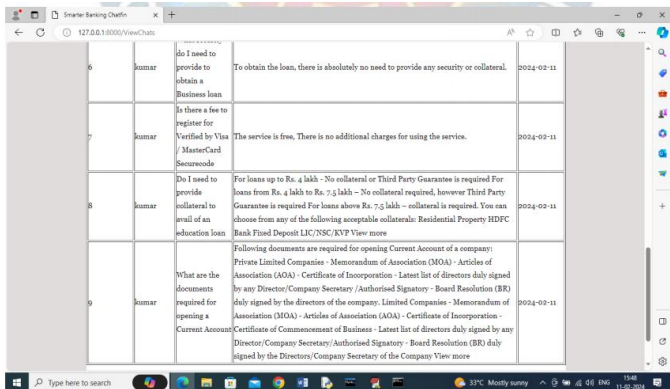
In above screen click on 'Interact with Chatbot' link to get below page



In above screen in text box I entered some text and then press button to get reply from Chatbot like below page.



In above text area 'You' refers to user question and then can see Chatbot answer and similarly you can ask any question from dataset and get reply.



In above screen admin can view which users ask what questions and what is the Chatbot reply along with date can be viewed by admin.

## 5. CONCLUSION

Implementation of this project would make the user experience of a customer on the website, more friendly and seamless. A chatbot can also act as an information-gathering tool that would help the organizations to inspect the needs of customers and then implement them. Performance can be enhanced by using various procedures of machine learning. Chatbots can be integrated with voice commands to enhance the user experience. More banking services can be simplified by the use of a powerful chatbot. The quality of chatbots can be improved in the future by research in the field of banking. Security of chatbots will have to be improved as the security will be improved, people will be willing to share their information with the chatbot and also data collection will get easier. In the banking domain, contextual assistants need to cover more Indian languages thereby increasing the usability of chatbots. Implementation of this project would make the user experience of a customer on the website, more friendly and seamless. A chatbot can also act as an information-gathering tool that would help the organizations to inspect the needs of customers and then implement them. The aim of the current study is to identify those factors that have an influence

on consumers' intention to use chatbot technology applied in the banking industry. A special adoption model was developed for banking chatbots, extending the TAM model. Data is collected through an online, self-administrated questionnaire and the conceptual model is examined using the PLS-SEM method.

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