

# DAYANANDA SAGAR UNIVERSITY

Devarakagalahalli, Harohalli Kanakapura Road, Dt, Ramanagara, Karnataka 562112



**SCHOOL OF  
ENGINEERING**

**Bachelor of Technology  
in  
COMPUTER SCIENCE AND ENGINEERING  
(Artificial Intelligence and Machine Learning)**



**Mini Project  
" BANKING CHATBOT "**

By

**C Vishnu Vardhan - ENG22AM0007.**

**Deekshitha M - ENG22AM0010.**

**Gaana Shree S - ENG22AM0014.**

**Gayatri Govinda Setty - ENG22AM0017.**

**Under the supervision of**

**Prof. Pradeep Kumar K**

**Dr. Mary Jasmine**

**Prof. Mitha Guru**

**Assistant Professor, Artificial Intelligence & Machine Learning, SOE**

**DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING**

**(Artificial Intelligence and Machine Learning)**

**SCHOOL OF ENGINEERING**

**DAYANANDA SAGAR UNIVERSITY,**

**BANGALORE**



**SCHOOL OF  
ENGINEERING**

**School of Engineering  
Department of Computer Science & Engineering  
(Artificial Intelligence and Machine Learning)**

Devarakaggalahalli, Harohalli Kanakapura Road, Dt, Ramanagara, Karnataka 562112



**CERTIFICATE**

This is to certify that the Mini-Project titled “**Banking Chatbot**” is carried out by **C Vishnu Vardhan (ENG22AM0007), Deekshitha M (ENG22AM0010), Gaana Shree S (ENG22AM0014), Gayatri Govinda Setty (ENG22AM0017)**, bonafide students of Bachelor of Technology in Computer Science and Engineering(Artificial Intelligence and Machine Learning) at the School of Engineering, Dayananda Sagar University,

**Prof. Pradeep Kumar K**  
Assistant Professor.  
Dept. of CSE(AI&ML),  
School of Engineering  
Dayananda Sagar University

**Dr Jayavrinda Vrindavanam**  
Head of Department  
CSE (AI-ML)  
School of Engineering  
Dayananda Sagar University

**Prof. Mitha Guru.**  
Assistant Professor  
Dept. of CSE(AI&ML),  
School of Engineering  
Dayananda Sagar University

**Dr. Mary Jasmine**  
Assistant Professor  
Dept. of CSE(AI&ML),  
School of Engineering  
Dayananda Sagar University

## ACKNOWLEDGEMENT

It is a great pleasure for us to acknowledge the assistance and support of many individuals who have been responsible for the successful completion of this project work.

First, we take this opportunity to express our sincere gratitude to School of Engineering & Technology, Dayananda Sagar University for providing us with a great opportunity to pursue our Bachelor's degree in this institution.

We would like to thank **Dr.Udaya Kumar Reddy K R , Dean, School of Engineering, Dayananda Sagar University** for his constant encouragement and expert advice. It is a matter of immense pleasure to express our sincere thanks to **Dr. Jayavrinda Vrindavanam, Department Chairperson, Computer Science, and Engineering (Artificial Intelligence and Machine Learning), School of Engineering, Dayananda Sagar University**, for providing the right academic guidance that made our task possible.

We would like to thank our guide **Prof. Pradeep Kumar K, Prof. Mitha Guru and Dr. Mary Jasmine Assistant Professor, Dept. of Computer Science and Engineering(Artificial Intelligence and Machine Learning), School of Engineering, Dayananda Sagar University**, for sparing their valuable time to extend help in every step of our UG Research project work, which paved the way for smooth progress and the fruitful culmination of the research.

We are also grateful to our family and friends who provided us with every requirement throughout the course. We would like to thank one and all who directly or indirectly helped us in the Research work.

# TABLE OF CONTENTS

Topics	Page
ABSTRACT .....	1
CHAPTER 1 INTRODUCTION.....	2-5
1.1. Introduction .....	3
1.2. Scope.....	4
CHAPTER 2 PROBLEM DEFINITION .....	6-7
2.1. Objectives .....	7
CHAPTER 3 LITERATURE SURVEY.....	8-12
3.1. Chatbot technology: description and previous research.....	9
3.2. Chatbot technology in the banking industry.....	10
3.3. Chatbot technology in the banking industry.....	11
3.4. Banking technologies' adoption by customers.....	12
CHAPTER 4 PROJECT DESCRIPTION.....	13-15
4.1. Key features .....	14
4.2. Technologies used. ....	15
CHAPTER 5 REQUIREMENTS .....	16-17
5.1. Hardware.....	17
5.2. Software .....	17
CHAPTER 6 METHODOLOGY.....	18-27
6.1. Input understanding.....	19
6.2. Entity Recognition.....	19
6.3. Indent Recognition.....	19
6.4. Context management.....	20
6.5. Response Generation.....	20
6.6. User interaction loop.....	20
6.7. Learning and improvement.....	21
CHAPTER 7 RESULTS .....	22-24
CHAPTER 8 CONCLUSION .....	25-26
REFERENCES .....	27

## **ABSTRACT:**

A banking chatbot is one of the easier and smarter ways to get banking related information anytime, anywhere at fingertips. Despite every single bank having its own banking application available on mobile, it is still a problem managing these applications as they occupy more memory storage, and it will sometimes contain bugs. To overcome such problems, we introduce a sample banking chatbot that replies based on user input instantly. This conversation is end-to-end encrypted and only used in reinforcement training of chatbot. Natural Language Processing and Machine Learning concepts are used to build this chatbot. The programming language used to build this chatbot is Python (v.2023.22.1). HTML and JavaScript are used to implement this bot in browser. It uses reinforcement learning to learn from its previous conversations, but the information of user is kept safe without violating safety protocols.

# **CHAPTER 1**

## **INTRODUCTION**

## 1.1 INTRODUCTION:

In the rapidly evolving landscape of the financial industry, banking chatbots have emerged as transformative tools, leveraging cutting-edge technologies to redefine customer interactions. These digital assistants, powered by artificial intelligence and natural language processing, play a pivotal role in enhancing operational efficiency, customer engagement, and overall service quality within the banking sector. Additionally, banking chatbots contribute to financial literacy by providing information on banking products, investment options, and financial planning. They can educate users on budgeting, savings strategies, and investment opportunities, empowering individuals to make informed financial decisions. At its core, a banking chatbot is a virtual assistant programmed to engage in real-time conversations with users, offering a wide array of services through intuitive and user-friendly interfaces. These interfaces can take the form of text-based chat or voice interactions, providing customers with the flexibility to access their accounts, perform transactions, and seek information effortlessly. The primary goal of banking chatbots is to streamline routine tasks, enabling customers to check balances, transfer funds, and obtain transaction details seamlessly. By automating these processes, chatbots not only expedite service delivery but also empower human agents to focus on more complex and personalized customer interactions. This efficiency translates into time and resource savings for both financial institutions and their clients.

## 1.2 SCOPE:

The scope of banking chatbots is expansive, driven by their ability to revolutionize various facets of the financial industry. Here are key areas where banking chatbots demonstrate significant potential:

### **1.2.1 Customer Service and Support:**

**24/7 Availability:** Chatbots provide round-the-clock customer service, addressing queries and concerns outside regular business hours, enhancing accessibility for users across different time zones.

**Instant Responses:** Automation enables instant responses to customer inquiries, leading to a faster and more efficient problem resolution process.

### **1.2.2 Financial Planning and Advice:**

**Investment Guidance:** Chatbots can offer personalized investment advice based on user preferences, risk tolerance, and financial goals, contributing to a more informed investment decision-making process.

**Budgeting Assistance:** Banking chatbots help users manage their finances by offering insights into spending patterns, budgeting tips, and savings strategies.

### **1.2.3 Security and Fraud Prevention:**

**Fraud Detection:** Through continuous monitoring, chatbots can identify and alert users about potentially fraudulent activities, adding an extra layer of security.

### **1.2.4 Enhanced User Experience:**

**Omni-Channel Integration:** Chatbots seamlessly integrate with multiple communication channels, including websites, mobile apps, and social media, providing a consistent and cohesive user experience.



### 1.2.5 Cost Efficiency:

**Resource Optimization:** Implementing chatbots can lead to cost savings by optimizing resource allocation and improving overall operational efficiency. As technology continues to advance, the scope of banking chatbots is likely to expand further, introducing new capabilities and transforming the way financial institutions and customers interact.

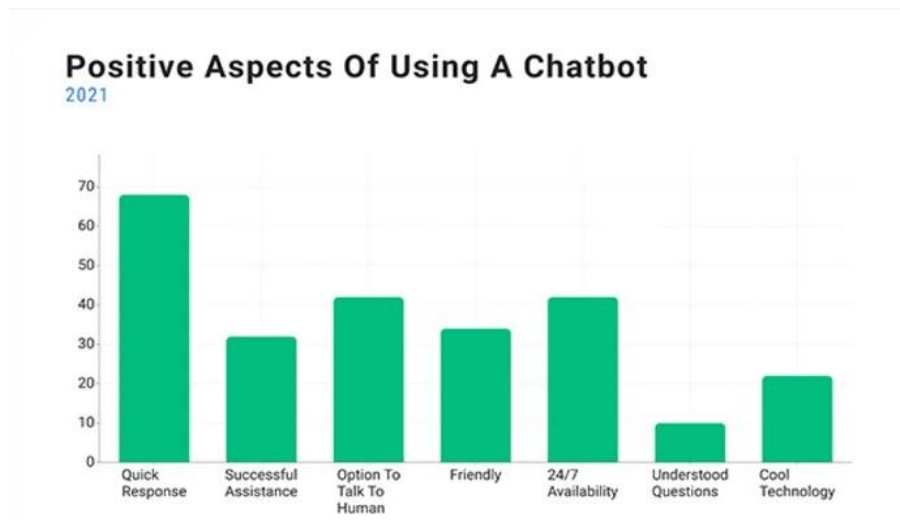


Figure 1.1 A graph indicating positive aspects of using chatbots.

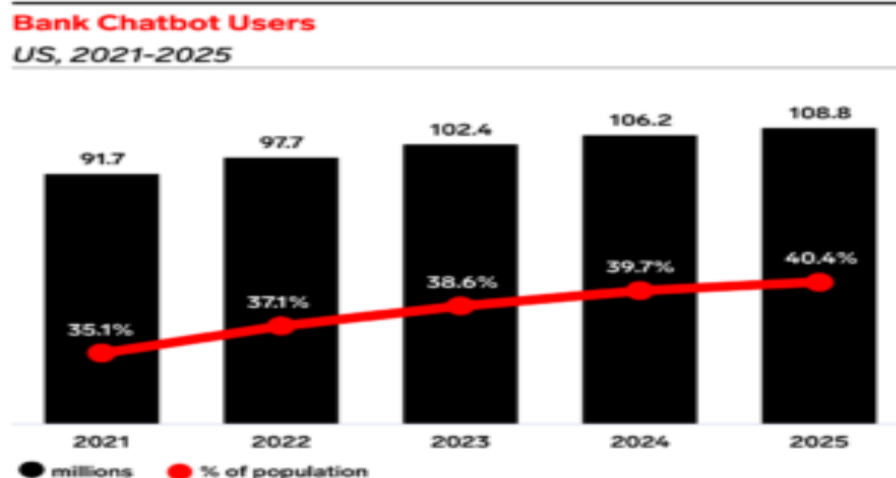


Figure 2.2 A graph indicating usage of banking chatbots in future.

## **CHAPTER 2**

# **PROBLEM DEFINITION**

## **2.0 PROBLEM DEFINITION**

In earlier, people have to spend three to four hours to go for bank transaction sometimes cost of transaction was more than that of money deposited or withdrawn. e-banking allows customers to conduct financial transactions on a secure website. Nowadays user-friendly technology is becoming more popular among customers, most of the banks are providing e-banking facility.

### **2.1 OBJECTIVE:**

Today, most of the customers are increasingly using the technological banking facilities available in the banking sector. it reduces cost and saves time. from the customers perceptive towards technological banking provides a convenient and effective way to manage finance that is easily accessible 24 hours a day in 7 days a week. on the other hand, online banking has certain problems such as lack of knowledge to operate the technology, set-up cost, legal issues, lack of relationship among banker and customer, security and privacy issues for some people the user-friendly technology really simplifies their lifestyle, while for others it is very much threatening and complex. therefore, in this context, it is necessary to study the perception of customers' challenges towards user friendly technology.

## **CHAPTER 3**

### **LITERATURE REVIEW**

## 3.0 LITERATURE REVIEW

### 3.1. Chatbot technology: description and previous research

A chatbot application is a computer program that mimics human conversations in its natural format, including text or spoken language, using artificial intelligence techniques, such as Natural Language Processing (NLP), image and video processing and audio analysis (Bala et al., 2017). 16 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.

### **3.2 Chatbot technology in the banking industry**

Chatbots applied in the financial industry can assist customers in managing financial transactions 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. 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.

### 3.3 Chatbot technology in the banking industry

Chatbots applied in the financial industry can assist customers in managing financial transactions 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 on behavioral intention. Trivedi (2019) examined customer experience of using banking chatbots and its impact on brand love adopting the Information Systems (IS) success model among.

### **3.4 Banking technologies' adoption by customers**

The banking industry has been profoundly influenced by technological evolution in recent decades and consumer adoption of banking technologies is a widely researched topic in the literature. Thus, a more in-depth look into the processes behind the adoption of banking chatbots can be gained through there view of the existing literature on the adoption of other technologies applied in the banking sector, such as i-banking and m-banking. Several theories have been implemented in order to analyze the adoption of different IT systems. According to Hanafi Zadeh and Khedmatgozar (2012), the most influential theoretical models applied in i-banking adoption studies, are the Diffusion of innovation theory (DIT), the Technology acceptance model (TAM), the Decomposed theory of planned behavior (DTPB), the Extended technology acceptance model (TAM2) and the Unified theory of user acceptance of technology (UTAUT),the latter becoming dominant in the literature in recent years. Shaikh and Karafuto(2015) analyzed and synthesized existing studies of m-banking adoption and concluded that the most frequently used adoption models were TAM, followed by DIT and TAUT, while several studies applied a combination of different technology acceptance models (e.g. TAM and DIT).Several of the above mentioned models are composed of intention to use or actual usage as the dependent variables. Consequently, the key dependent variables in the i-banking adoption literature (Yousafzai, 2012) are behavioral intention to use and actual usage of the technology, while in m-banking adoption, besides the two earlier mentioned dependents, attitude is also adopted to analyze technology acceptance (Shaikh and Karjaluoto, 2015).



## **CHAPTER 4**

### **PROJECT DESCRIPTION**

## 4.0 PROJECT DESCRIPTION

The Intelligent Banking Assistant is an AI-powered chatbot designed to enhance customer interaction and support within the banking sector. The chatbot aims to provide a seamless and efficient way for customers to access information, perform transactions, and receive assistance with their banking needs through natural language conversation.

### 4.1 Key Features:

The following aspects are key features of Banking chatbot:

➤ **4.1.1 Account Information:**

Users can inquire about their account balance, recent transactions, and other account details through a conversational interface.

➤ **4.1.2 Transaction Support:**

The chatbot facilitates fund transfers, bill payments, and other common transactions, guiding users through the process and ensuring security measures are followed.

➤ **4.1.3. Product Information:**

Users can gather information about various banking products such as savings accounts, credit cards, loans, and investment options. The chatbot provides details on features, eligibility criteria, and application procedures.

➤ **4.1.4 Customer Support:**

The chatbot assists users with common queries related to account management, card-related issues, and general banking inquiries. It can also escalate complex issues to human agents when necessary.

➤ **4.1.5 Security Measures:**

The chatbot incorporates robust security protocols to ensure the confidentiality of user information. This includes multi-factor authentication for sensitive transactions and the ability to recognize and respond appropriately to security-related queries.

➤ **4.1.6 Personalization:**

The chatbot is designed to learn from user interactions, providing personalized recommendations, and tailoring responses based on individual customer preferences and transaction history.

➤ **4.1.7 Integration with Banking Systems:**

The chatbot integrates with the bank's core systems to access real-time data, ensuring accurate and up-to-date information is provided to users.

## **4.2 Technologies Used:**

➤ **4.2.1 Natural Language Processing (NLP):**

For understanding and interpreting user input.

➤ **4.2.2 Machine Learning (ML):**

To improve the chatbot's performance over time through continuous learning from user interactions.

➤ **4.2.3 API Integration:**

Connecting the chatbot with the bank's backend systems to access account information and perform transactions.

➤ **4.2.4 Security Protocols:**

Implementing encryption and secure authentication mechanisms to protect user data.

## **CHAPTER 5**

# **REQUIREMENTS**

## **5.0 REQUIREMENTS**

### **5.1 HARDWARE:**

#### **5.1.1 System requirements:**

- For windows: windows 7 (with .NET framework 4.5.2), windows 8.1, or windows 10.
- For macOS: macOS 10.10 Yosemite or later.
- For Linux: ubuntu 18.04, Debian 9, fedora 28, or red hat enterprise Linux (RHEL) 7.4 or later.

#### **5.1.2 Processor:**

- 200 MB of available hard-disk space.

#### **5.1.3 Disk space:**

- 1.6 GHz or faster processor.

### **5.2 SOFTWARE:**

#### **5.2.1 Text editor:**

- Visual Studio Code.

#### **5.2.2 Translator:**

- Python (v2023.22.1)
- Pylance (v2023.12.1)

#### **5.2.3 Browser:**

- Safari, Microsoft edge or Google chrome.

## **CHAPTER 6**

# **METHODOLOGY**

## 6.0 METHODOLOGY

Open AI based banking chatbot work by leveraging natural language processing (NLP) and machine learning (ML) techniques to understand and respond to user inputs in a conversational manner. Below is step by step working of chatbot.:

### 6.1. Input Understanding:

- **User Input:** When a user interacts with a chatbot, they provide input in the form of text or by selecting available options.

- **NLP Processing:** Natural Language Processing is used to understand the user's input. This involves breaking down the input into meaningful components, such as identifying entities, extracting intent, and recognizing the context. The responses are broken down into two components long and short responses. After breakdown of responses AI uses its decision tree algorithm for further steps.

### 6.2. Intent Recognition:

- The chatbot determines the user's intent, i.e., what the user is trying to achieve or communicate. This is often done using machine learning models, such as classifiers or neural networks, that have been trained on labeled data to recognize different intents.

### 6.3. Entity Recognition:

- In addition to understanding intent, the chatbot identifies entities within the user's input. Entities are specific pieces of information relevant to the user's request. For example, if the user says, "Failed transaction to a friend but money is not credited yet." the entities might include keywords like Failed transaction and not credited. Based on this classification AI will try to get more clarity in given statements like to whom, amount

credited and date when transaction took place because in above conversation user didn't enter all important details, so AI recognizes missing information is user's input.

## **6.4. Context Management:**

- Chatbots often need to maintain context to have coherent and meaningful conversations. They remember the user's previous inputs and use this context to generate more relevant responses. Context management can be done using various techniques, including memory networks or recurrent neural networks. For example, if sentence formation or grammatically wrong statements are classified into non-recognizable inputs, these inputs are marked as -1 in AI's memory.

## **6.5. Response Generation:**

- Once the intent and entities are identified, the chatbot generates a response. This can involve retrieving pre-defined responses from a knowledge base, using templates, or even generating responses dynamically based on the context. Some responses, non-recognizable responses which are marked as -1 in AI's memory prompt a message telling user to be more specific about input message.

## **6.6. User Interaction Loop:**

- The chatbot sends the response back to the user, and the interaction continues in a loop. The chatbot may ask clarifying questions to gather more information or provide additional details. This continues until the user ends conversation by sending message like Exit or Stop. The AI is not case-sensitive, it will recognize both cases as one.



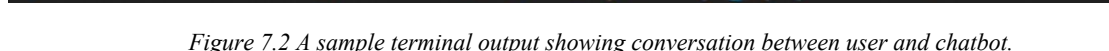
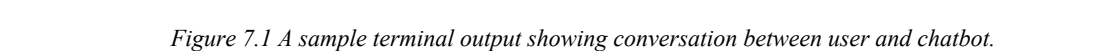
## **6.7. Learning and Improvement:**

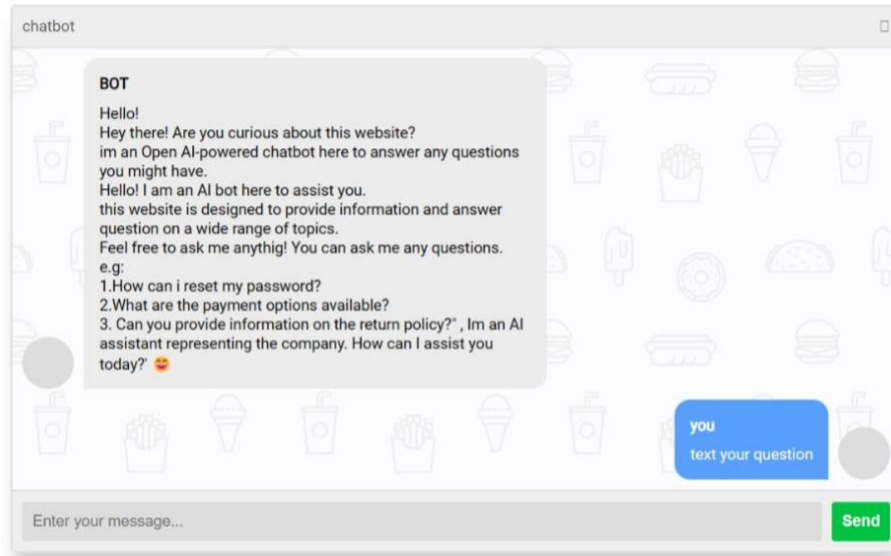
-AI chatbots are designed to learn from user interactions over time. They use reinforcement learning or supervised learning to improve their performance based on feedback and new data. Continuous learning helps chatbot adapt to changing user behavior and language trends. With this learning chatbot will be able to understand abbreviations and slang words being used in user end input.

## **CHAPTER 7**

# **RESULTS AND ANALYSIS**

Open AI based chatbot developed has undergone some tests run and below are screenshots of working of chatbot. As already explained in methodology about working of chatbot first figure indicates response of recognizable message by chatbot and figure explains non-recognizable message.





*Figure 7.3 A sample of chatbot appearance in browser*

As result of run few trials in which we have come across situation where Chatbot understood few statements and asked user when statement was not clear. The data set used is limited data hence we didn't face any problem in backend. This chatbot wasn't having with much accuracy in compare with SBI Bank. SIA. Customer queries. HDFC Bank. EVA. Banking queries.

## **CHAPTER 8**

## **CONCLUSION**

## 8.0 CONCLUSION

In conclusion, the development and implementation of a banking chatbot represents a significant stride towards enhancing customer engagement, accessibility, and efficiency within the banking sector. The Intelligent Banking Assistant, as presented in this report, offers a cutting-edge solution to address the evolving needs of digital-savvy customers. The chatbot, equipped with Natural Language Processing (NLP), secure authentication measures, and seamless integration with banking systems, empowers users to perform a myriad of transactions, inquire about account information, and seek personalized assistance effortlessly. Its multichannel support ensures that customers can interact with the chatbot through various platforms, making banking services more accessible and user-friendly. In essence, the development of the banking chatbot is not just a technological milestone; it is a strategic investment in delivering a superior customer experience, fostering financial inclusion, and staying ahead in the era of digital banking. The journey does not end here but represents a continuous commitment to excellence, adaptability, and customer-centricity in the realm of modern banking services.

## REFERENCES

- [1] <https://umni.bg/en/blog/chatbot-trends-in-banks-and-financial-institutions/>
- [2] Tarbal, J. (2020). Chatbots in Financial Services: Benefits, Use Cases & Key Features | 2020 .
- [3] Trivedi, J. (2019). Examining the Customer Experience of Using Banking Chatbots and Its Impact on Brand Love: The Moderating Role of Perceived Risk. Journal of Internet Commerce.
- [4] <https://www.artificial-solutions.com/blog/chatbots-financial-services-benefits-use-cases>.
- [5] Bala, K., Kumar, M., Hulawale, S., Pandita, S. (2017). Chat-bot for college management system using AI. International Research Journal of Engineering and Technology, 4(11).