

Conversational AI based Chatbot for Bank Information Retrieval using Dialog Flow for RBI /Tax/Defense

Vidya Gogate¹, Rohit Venugopal² and Subha Subramaniam³

¹⁻³Shah & Anchor Kutchhi Engineering College, Mumbai

Email: vidya.gogate@sakec.ac.in, rohit6071@sakec.ac.in, subha.subramaniam@sakec.ac.in

Abstract— One of the most significant breakthroughs in recent years has been the development of transformer-based models, such as Open AI's GPT-3 and Google's BERT. These models leverage large-scale pre-training and fine-tuning to achieve state-of-the-art performance on a wide range of NLP tasks, including Chatbots. GPT-3, for example, can generate human-like text and engage in coherent and contextually appropriate conversations, thanks to its ability to process and generate language based on vast amounts of training data. The application of Chatbots spans numerous domains, including customer service, healthcare, education, and entertainment. In customer service, Chatbots are used to handle routine inquiries, provide support, and improve response times, as demonstrated by studies conducted by companies like IBM and Sales force. Despite their advancements, Chatbots face several challenges that continue to be the focus of research. Ensuring natural and contextually appropriate responses remains a critical issue, particularly in maintaining coherence over extended conversations. In this paper, we are using Dialog Flow as a chatbot, Fast Api as a web framework, Mongo DB as a Database. The user can query Chatbot via multiple mediums like Web, Dialog flow Messenger and Telegram through Text and Voice input. Bank Info Bot is a Chatbot that provides information about banks when the user inputs their IFSC Code using conversational AI.

Index Terms— Chatbot, Dialogflow, FastApi, Conversational AI.

I. INTRODUCTION

The application of Chatbots spans numerous domains, including customer service, healthcare, education, and entertainment. Chatbots and conversational AI are often used interchangeably, but they're not quite the same thing. Think of basic chatbots as friendly assistants who are there to help with specific tasks. They follow a set of predefined rules to match user queries with pre-programmed answers, usually handling common questions. However, it's important to be aware of their limitations. If you ask a basic chatbot something outside of its programmed knowledge, it may respond with a generic "Sorry, I don't understand." But there's a whole world of conversational AI beyond basic chatbots, where intelligent systems can understand and respond to human language in a more sophisticated manner. Conversational AI refers to the technology that integrates artificial intelligence, natural language processing (NLP), and machine learning (ML) to make chatbots smarter and capable of having more human-like conversations. Conversational AI agents get more efficient at spotting patterns and making recommendations over time through a process of continuous learning. In healthcare, Chatbots assist with patient triage, appointment scheduling, and providing medical information, as evidenced by research on systems like Babylon Health and Ada Health.

Educational Chatbots, such as Duolingo's language-learning assistant, provide personalized tutoring and feedback, enhancing the learning experience. Addressing bias and ethical concerns in Chatbot interactions is another significant area of study, as highlighted. The integration of multimodal inputs, such as speech and visual cues, is also an emerging field, aiming to create more immersive and interactive Chatbot experiences. A Chatbot is a term used to refer to a piece of software that can simulate human conversation. They listen carefully, and their responses are always well thought out. There are currently available digital assistants that can be triggered via speech, in addition to Chatbots that can be engaged via voice or text. Bots can behave differently depending on the manner in which artificial intelligence is implemented on the backend. This makes it possible for businesses to provide clients more than just straightforward logical solutions. Chat software, which frequently gives the impression that only one person is participating in the conversation, is considered to be inferior to Chatbots. Chatbots are more conversational in nature, whereas digital or intelligent assistants go beyond the capabilities of Chatbots to carry out actions that are helpful to the user. When it comes to the self-service choices that banks offer, the vast majority of customers go into the experience with extremely low expectations because these options are typically subpar. The customer must regularly call the call center in order to complete the self-service transactions. With the support of organizations and technical infrastructure, artificial intelligence-based chatbots can be successful in providing quality customer services and enhance customer satisfaction. The positive attitude and BI towards the usage of chatbot in banking, in turn, leads to the adoption of the technology to fulfill the needs of customers.

A. Growth of Banking Industry

As per the Reserve Bank of India (RBI), India's banking sector is sufficiently capitalised and well-regulated. The financial and economic conditions in the country are far superior to any other country in the world. Credit, market and liquidity risk studies suggest that Indian banks are generally resilient and have withstood the global downturn well. The Indian banking industry has recently witnessed the rollout of innovative banking models like payments and small finance banks. In recent years India has also focused on increasing its banking sector reach, through various schemes like the Pradhan Mantri Jan Dhan Yojana and Post payment banks. Schemes like these coupled with major banking sector reforms like digital payments, neo-banking, a rise of Indian NBFCs and fintech have significantly enhanced India's financial inclusion and helped fuel the credit cycle in the country. Indian Fintech industry is estimated to be at US\$ 150 billion by 2025. India has the 3rd largest FinTech ecosystem globally. India is one of the fastest-growing Fintech markets in the world. There are currently more than 2,000 DPIIT-recognized Financial Technology (FinTech) businesses in India, and this number is rapidly increasing.

B. Chatbots: Types, Operation, Application Area, Inadequacies

Chatbots have made our lives easier by providing timely answers to our questions without the hassle of waiting to speak with a human agent. Many of us have interacted with these chatbots or virtual assistants on our phones or through devices in our homes—such as Apple's Siri, Amazon Alexa and Google Assistant. You may have interacted with these chatbots via SMS text messaging, social media or with messenger applications in the workplace. When assessing the various types of chatbots and which could work best for our business, we have to place our end user at the centre of this decision. What are the users' goals and expectations from business, and would they prefer to select from a simple menu of buttons, or would they need the option to correspond in open-ended dialogue for nuanced questions? Also, consider the state of business and the use cases through which we'd deploy a chatbot, whether it'd be a lead generation, e-commerce or customer or employee support chatbot. If working for a smaller company, such as a startup, with limited active users and minimal amounts of frequently asked questions that our chatbot conversation designers would need to pre-program, a rules or keyword recognition-based chatbot may sufficiently address your business needs and satisfy customers without much lift. However, for medium to larger sized companies that house vast amounts of user data that a chatbot could self-learn from, an AI chatbot could be an advantageous solution to provide detailed, accurate responses to users and enhanced customer experiences. Conversational search leverages Large Language Models (LLMs) for retrieval-augmented generation (RAG), designed to generate accurate, conversational answers grounded in your company's content. Move away from manually building rules-based FAQ chatbots - it's easier and faster to use generative AI in combination with your knowledge base to automatically generate answers in response to the wide range of questions you might receive from your customers. When thinking about generative AI's impact on chatbots, think about how your business can take advantage of creative, conversational responses and when this technology makes the most sense for your business objectives and the needs of your customers.choosing the right type of chatbot depends on your business needs and the tasks you want the chat bot to perform. Rule-based

chatbots are best for simple tasks, while AI-powered ones are better suited for more complex tasks. Hybrid chatbots offer the best of both worlds and can be a cost-effective solution for businesses. Conversational artificial intelligence (AI) refers to technologies like chatbots or voice assistants, which users can talk to. They use large volumes of data, deep learning, machine learning, and natural language processing to imitate human conversations, answer questions in real-time and optimize interactions with end users by supporting them to find information or accomplish complex tasks, without the need to speak with a human agent.

C. Comparison of four universal types of Chatbots

TABLE I

Type of chatbot	Menu or button-based chatbots	Rules-based chatbots	AI-powered chatbots	Voice chatbots
Operation	Depending on what the user clicks on, the simple chatbot may prompt another set of options for the user to choose until reaching the most suitable, specific option. Essentially, these chatbots operate like a decision tree.	Employs conditional if/then logic to develop conversation automation flows. A conversation designer program predefined combinations of question-and-answer options so the chatbot can understand the user's input and respond accurately.	The machine learning algorithms underpinning AI chatbots allow it to self-learn and develop an increasingly intelligent knowledge base of questions and responses that are based on user interactions. Deep learning, the longer an AI chatbot has been in operation, the better it can understand what the user wants to accomplish and provide more detailed, accurate responses	AI chatbots, deployed on voice channels and use text to speech and speech to text technology. With NLP and through integrating with computer and telephony technologies, can understand spoken questions, analyze users' business needs and provide relevant responses in a conversational tone.
Application	These chatbots offer simple functionality and can be helpful for answering users' repetitive, straight-forward questions	Operating on basic keyword detection, these kinds of chatbots are relatively easy to train and work well when asked pre-defined questions.	Conversational AI chatbots can remember conversations with users and incorporate this context into their interactions. Being deeply integrated with the business systems, the AI chatbot can pull information from multiple sources that contain customer order history and create a streamlined ordering process.	These elements can increase customer engagement and human agent satisfaction, improve call resolution rates and reduce wait times.
Inadequacy	1. This kind of chatbot may take longer to understand the customers' needs, 2. If a user's need is not included as a menu option, the chatbot will be useless since this chatbot doesn't offer a free text input field.	These chatbots struggle to answer questions that haven't been predicted by the conversation designer, as their output is dependent on the pre-written content programmed by the chatbot's developers.	The time it takes to build an AI chatbot can vary based on factors such as the technology stack and development tools you are using; the complexity of the chatbot; the desired features; the data availability; and whether you need it to integrate with other systems, databases or platforms. With a user friendly, no-code/low-code platform you can build AI chatbots faster.	Some users may be frustrated by the Interactive Voice Response (IVR) technology they've encountered, especially when the system can't retrieve the information a user is looking for from the pre-programmed menu options and puts the user on hold.

D. Challenges of conversational AI technologies

Conversational AI is still in its infancy, and widespread business adoption began in recent years.

Language input

Language input can be a pain point for conversational AI, whether the input is text or voice. Dialects, accents, and background noises can impact the AI's understanding of the raw input. Slang and unscripted language can also generate problems with processing the input.

However, the biggest challenge for conversational AI is the human factor in language input. Emotions, tone, and sarcasm make it difficult for conversational AI to interpret the intended user meaning and respond appropriately.

Privacy and security

Since Conversational AI is dependent on collecting data to answer user queries, it is also vulnerable to privacy and security breaches.

Developing conversational AI apps with high privacy and security standards and monitoring systems will help to build trust among end users, ultimately increasing chatbot usage over time.

User apprehension

Users can be apprehensive about sharing personal or sensitive information, especially when they realize that they are conversing with a machine instead of a human. Since all of your customers will not be early adopters, it will be important to educate and socialize your target audiences around the benefits and safety of these technologies to create better customer experiences. This can lead to bad user experience and reduced performance of the AI and negate the positive effects. Additionally, sometimes chatbots are not programmed to answer the broad range of user inquiries. When that happens, it'll be important to provide an alternative channel of communication to tackle these more complex queries, as it'll be frustrating for the end user if a wrong or incomplete answer is provided. In these cases, customers should be given the opportunity to connect with a human representative of the company. Finally, conversational AI can also optimize the workflow in a company, leading to a reduction in the workforce for a particular job function. This can trigger socio-economic activism, which can result in a negative backlash to a company.

E. Research work

Conversational AI starts with thinking about how your potential users might want to interact with your product and the primary questions that they may have. You can then use conversational AI tools to help route them to relevant information. Here are the ways to start planning and creating a conversational AI.

- Find the list of frequently asked questions (FAQs) for your end users. You can always add more questions to the list over time, so start with a small segment of questions to prototype the development process for a conversational AI.
- Use FAQs to develop goals in your conversational AI tool. Your FAQs form the basis of goals, or intents, expressed within the user's input, such as accessing an account. Once you outline your goals, you can plug them into a competitive conversational AI tool, like Watson Assistant, as intents. From here, it's needed to teach our conversational AI the ways that a user may phrase or ask for this type of information. If we take the example of "how to access my account," you might think of other phrases that users might use when chatting with a support representative, such as "how to log in", "how to reset password", "sign up for an account", and so on.
- If you're unsure of other phrases that your customers may use, then you may want to partner with your analytics and support teams. If your chatbot analytics tools have been set up appropriately, analytics teams can mine web data and investigate other queries from site search data. Alternatively, they can also analyze transcript data from web chat conversations and call centers. If your analytical teams aren't set up for this type of analysis, then your support teams can also provide valuable insight into common ways that customers phrase their questions.
- Use goals to understand and build out relevant nouns and keywords. Think of nouns, or entities, that surround your intents. In this example, we've been focused on a user's bank account. As a result, it makes sense to create an entity around bank account information. A number of values might fall into this category of information, such as "username", "password", "account number", and so on. To understand the entities that surround specific user intents, you can use the same information that was collected from tools or supporting teams to develop goals or intents. These nouns will precede or follow the primary ask.
- Put it all together to create a meaningful dialogue with your user. All of these elements work together to create a conversation with your end user. The intents allow a machine to decipher what the user is asking for and entities act as a way to provide relevant responses. For example, you might envision the dialogue between a conversation AI and a user with a forgotten password. Together, goals and nouns work to build a logical conversation flow based on the user's needs.

Bank Info Bot is a Chatbot that provides information about banks when the user inputs their IFSC Code. IFSC stands for Indian Financial System Code. It is an 11-digit alphanumeric code that is unique to each bank branch in India. The Reserve Bank of India (RBI) uses IFSC codes to identify and classify branches, and to facilitate electronic payments and money transfers. IFSC codes are used for online fund transfers via NEFT (National Electronic Funds Transfer), IMPS (Immediate Payment Service), or RTGS (Real Time Gross Settlement). According to Google, there are 1,33,034 total bank branches in India including Small Finance Banks and MNC Banks. No bank information is directly available online. Even if it is available online, we only get basic information like Bank Name, Address, State, District and Contact number. The contact number is not necessarily right all the time. But we do not get the crucial information like email id's and the right contact numbers when we want. So one has to search all the web for the information and this is of course time consuming. This gives rise to the necessity of a solution which can be resolved by developing a bot that can cater to various use cases, from simple information retrieval to more complex financial operations. The emergence of chatbots is the new

disruptive force in the financial sector that has changed the way consumers communicate. In particular, the banking industry, the introduction of Chatbots driven by Artificial Intelligence has changed the face of the bank-customer interface. This paper explores the feasibility of the growing use of chatbot by the banking industry. The banking sector in any country plays a major role in the economy of country. It also tests the latest chatbot features to decide if it can satisfy the ever-changing needs of core banking.

F. Bank Info Bot System Model

Technologies used: As shown in the proposed model i.e. fig 1, User can query Chatbot using:

- Visual Studio Code
- Github
- Python
- FastApi
- BeautifulSoup
- DialogFlow
- Telegram
- MongoDB

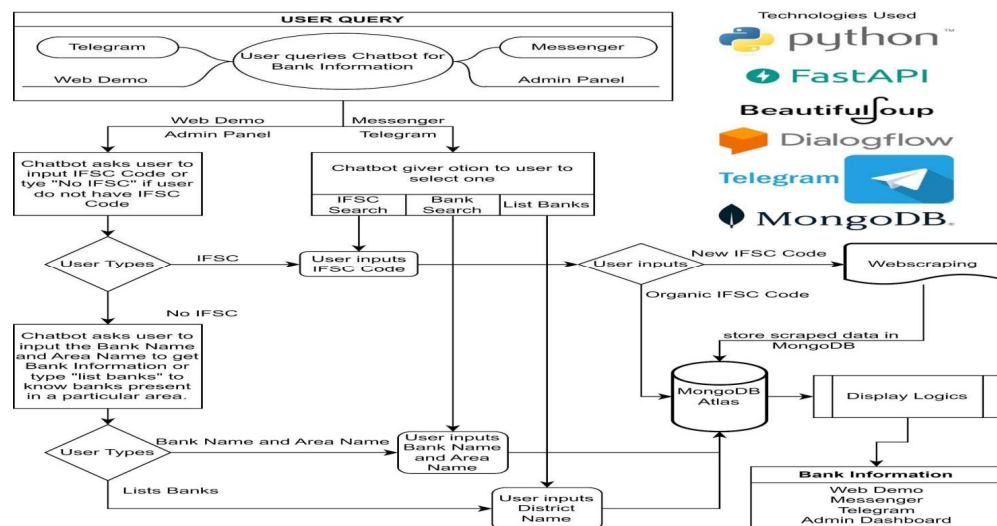


Fig 1

G. Working

We are using DialogFlow as a chatbot, FastApi as a web framework, MongoDB as a Database here. We will be scraping information using Websites <https://ifsc.bankifsc.com> and <https://www.askbankifsc.com> respectively. We have partial information in the Website <https://ifsc.bankifsc.com> which includes Bank Name, Address, State, District and Contact number. The other partial information is scrapped from <https://www.askbankifsc.com> which includes Bank Name, Address, State, District, Contact number and Email ID as well. The common information is compared and then processed for the output whereas the unique information goes in as it is. The user can query Chatbot via multiple mediums like Web, Dialogflow Messenger and Telegram through Text and Voice input. The IFSC queries get logged in MongoDB and the results also get stored there, and when there is a repeat IFSC query, it will first look in knowledge. If not then it will go outside. The integration capabilities of the Bank Info Bot are particularly noteworthy. It can be embedded into various messaging platforms such as Telegram, Slack, Messenger, LINE, and more. This flexibility allows organizations to deploy the bot within the communication tools they are already using, facilitating smoother workflows and better user experiences. Furthermore, the Bank Info Bot can be customized to fit the specific needs of different organizations. Customization options include setting up predefined queries, configuring response formats, and integrating with internal databases or systems. This adaptability ensures that the bot can cater to various use cases, from simple information retrieval to more complex financial operations. Understanding potential risks and considerations now it's time to look at the considerations which financial institutions and Income tax organization must address when deploying bespoke chatbots, ranging from privacy concerns, regulatory

compliance, algorithmic bias and human oversight. By understanding and proactively addressing these challenges, such institutions can support the potential of chatbot technology while mitigating its associated risks. The users basically can query via 4 different routes: DialogFlow Admin Panel, DialogFlow Web Demo, Messenger, Telegram. DialogFlow Admin Panel and DialogFlow Web Demo has fully text-based entries like for instance, initially if a user queries “Hey” or “Hello”, the chatbot will reply back with “Welcome to Bank Info Bot!

II. RESULTS AND DISCUSSION

Please enter IFSC Code (eg: UTIB0003785) for Bank Information or simply type "No IFSC" or "I do not have IFSC code" if you don't have IFSC Code.”. Based on this the user can type IFSC code directly or else can seek the “No IFSC” option.

If the user routes to the “No IFSC” option the chatbot will reply with “No issues!!! Please enter the Bank Name and Area Name to get Bank Information (eg: Axis Bank in Vikhroli area) or type "list banks" to know banks present in a particular area.”. Based on this the user can type Bank Name and Area name directly or else can seek the “List Banks” option.

Messenger and Telegram have option based and text-based entries like for instance, initially if a user queries “Hey” or “Hello”, the chatbot will reply back with “Welcome to Bank Info Bot! Please select any one option”. And then we have 3 buttons “IFSC Search”, “Bank Search” and “List Banks” and the user has to click any one button.

TABLE II

IFSC Search	Bank Search	List Banks
This option is for the users who have the bank IFSC Code and they can use them to get the information of Banks.	This option is for the users who do not have the bank IFSC Code, so they enter Bank Name and Area Name to get the information of Banks in a particular area and from there they can IFSC Code which can be used for IFSC Search.	This option is for the users who need to list all banks in a particular area.
		

II. CONCLUSION

By using the Bank Info Bot, users similar to RBI, Income tax department and Defense can effortlessly obtain detailed bank information in a structured and efficient manner. This powerful tool is designed to streamline the process of accessing crucial banking details, making it an invaluable resource for both individuals and organizations. The bot can seamlessly integrate with a wide range of applications and platforms, enhancing its versatility and usability across different environments. One of the key advantages of the Bank Info Bot is its

ability to provide real-time information. Whether users need to look up branch addresses, IFSC codes, SWIFT codes, or other essential banking details, the bot ensures that the information is up-to-date and accurate. This reduces the risk of errors and enhances the reliability of the data being accessed.

Overall, the Bank Info Bot is a comprehensive solution that transforms how banking information is accessed and utilized. Its real-time data provision, integration flexibility, customization options, and robust security measures make it an essential tool for modern organizations. By adopting the technology of Bank Info Bot, organizations can improve efficiency, ensure data accuracy, and enhance user experience across multiple platforms and applications, ultimately leading to better-informed decisions and more streamlined operations.

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