

Design of Smart Chatbot for Medical Application using Natural Language Processing

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Abstract - People are increasingly using voice assistants and chatbots to connect with systems. The days of interacting with a service only through a keyboard are long gone. Artificial Intelligence and Natural Language Processing developments have supported these new types of user interaction. Many software services are using conversational bots as a standard user interface. Conversational Bots will come in really handy whenever we need any human level interaction using the system. For minor issues, the user must travel to the hospital for a check-up, which takes additional time. Because of the dread of the COVID-19 sickness spreading, no one wants to go to the hospital right now. This problem can be solved by utilising a medical Chatbot that can respond to a variety of user questions.

The proposed solution is to develop a chatbot that mimics a human interaction in order to assist customers with their banking needs and give a more personalised experience. Artificial intelligence advancements, machine learning techniques, greater decision-making aptitude, and enhanced domain and corpus availability have boosted the practicality of incorporating a conversation bot into applications.

Keywords: AI; chat bots; (KBQA) Knowledge Base Question Answering ; functionalities

INTRODUCTION

Chatbots are automated services that individuals communicate via a messaging app. Instead of conversing with another human, the user converses with a bot that is either guided by simple rules or learns through experience (data). These are computer programmes that use machine learning algorithms natural language processing (NLP) techniques, and databases to initiate and maintain conversations with users in near - real support to patients. Every chatbot has a distinct function, and health bots are developed to assist with medical concerns. They can be used to achieve a variety of goals, from improving the patient experience and assisting medical personnel to strengthening healthcare systems and revealing valuable insights. Healthcare chatbots are by far the most advanced and influential artificial intelligence (AI)-powered health

technology, poised to revolutionize the way, medical care providers, and patients communicate with one another. number in the running text. The order of reference in the running text should match with the list of references at the end of the paper.

Healthcare chatbots have the ability to provide a wide range of services. They may provide health-related relevant information. They can assist in the scheduling of appointments and afterward provide reminders. While they cannot offer official diagnoses, but can give patients a likely diagnosis if users disclose them specific symptoms.

Alan Turing (1950) [1] invented the "imitation" game or the Turing test, which gave birth to the concept of a chatbot. The goal of this game was to see if a computer could emulate human behaviour. ELIZA, the first chatbot, was created in 1966 [11].

The ALICE (Artificial Linguistic Internet Computer Entity) chatbot was established in the 1980s. This bot employed keyword matching with minimal context recognition, but it was a crude system that couldn't keep a dialogue going between humans and bots. Since it was developed using Artificial Intelligent Markup Language (AIML) [12], this bot was deemed significant. AIML was created with the goal of defining the pattern matching principles that interconnect user submitted words and sentences. Chatbot production is a lot easier now than it was a few years ago, although chatbots have been around for decades as mention above; nonetheless, their popularity has exploded in the last few years.

State of Art Developments

For a variety of reasons, it's critical to be aware of the present state of various methodologies and approaches used in the development of chatbots in the medical field. Conducting such a survey can assist researchers in identifying the many strategies that have been employed in the future, as well as building on existing approaches to produce more intelligent chatbots that deliver a more natural experience to the user. It's also crucial to assess the present state of chatbot development in terms of creating chatbots for various applications. As a result, we conducted a scoping analysis of the available literature on chatbot development in the medical area, as well as constructing and

identifying the primary components involved in chatbot creation, as well as a description of approaches utilized in chatbot development.

Siri, IBM Watson, Google Allo, and other similar services are well-known. These bots are attempting to tackle a basic problem by acting as an intermediary and assisting users in being more productive. They accomplish this by allowing the user to focus less on how data will be retrieved and the input format that may be required to obtain certain data. Bots become increasingly clever as they process user data and get new insights from it. Chatbots are popular since they provide exactly what you're looking for.



Figure1: World renowned chatbots

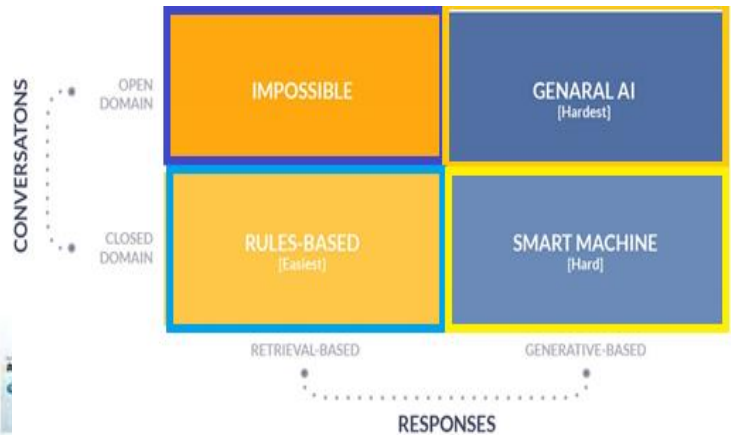
There are many benefits of using chatbot

- ✓ As a Healthcare Consultant, a Chatbot: It will be especially relevant for persons who suffer from chronic illnesses like diabetes, asthma, or HIV/AIDS.
- ✓ Meanwhile, instead of going through an unnecessary process, your healthcare workers can spend time genuinely caring for patients by using a chatbot as a hospital administrator.
- ✓ Chatbot as an Elderly Care Provider: Your application can come in handy not only for the elderly patients but also for people with visual or mobility impairments.
- ✓ Chatbot as a Red Panic Button: This is how you can turn your app into a red panic button, which may warn your user about a dangerous symptom or call for emergency help.
- ✓ Chatbots Generate Income: Chatbots have proven to be effective in increasing income for businesses. When compared to their competition, businesses who start with chatbot help or create a new chatbot to support consumer enquiries do well in the market.

We understand that chatbots are a kind of interfaces to the end users, but it's crucial to realise that they're an artificial intelligence application, which means they have their own taxonomy. Let's look at a typology of bots in terms of their goal and answers now that we've covered the basics of bot language comprehension.

Generalist bots are also known as Open Domain bots. Alexa, Google Home, Siri, and Cortana are examples of open domain/generative-based voice assistants that we use today. These bots attempt to converse in a human-like manner. Again, it responds to questions (such as FAQs) posed by the majority of people. They cannot, however, respond to a domain-specific inquiry.

Specialist bots are bots that belong to a closed domain. It might be simple (retrieval-based) or difficult (generative-based) to design depending on the type. The bot in this project is a specialist bot that operates on a closed domain/retrieval-based system.



Amazon

First and foremost, we can distinguish between different types of conversational AI based on the scope of the operation (whether it is strictly specialised in one domain, such as a weather bot or a Doctor bot, or simply a general conversationalist) and how it computes the user's response from the input (will it retrieve the predefined response or will generate the response corresponding to the input).

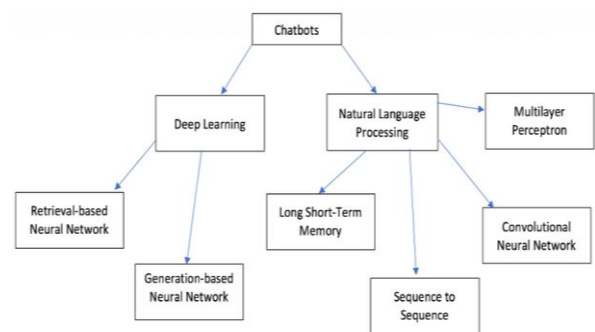


Figure Taxonomy of chatbots



Figure : benefits of using chatbot

Motivation

We frequently pass the time by speaking with various chatterboxes available on the internet, so creating one for medical use was an intriguing notion. During a pandemic, it will be beneficial for people to supply answers to the most often asked questions or to keep up with the newest news via web resources. We also considered incorporating it with speech-to-text technology. Chatbots are increasingly being used in various fields as shown in Figure2: including medical industry to help patients gain access to information while also reducing physician workload. For connecting with patients, many commercial chatbot solutions have been developed as web or mobile applications.

Chatbot Forecasts & Predictions

By 2021, more than 50% of enterprises will spend more per annum on bots and chatbot creation than traditional mobile app development (Gartner).

By 2021, nearly one in six customer service interactions globally will be handled by AI (Gartner).

According to Opus Research, chatbots will see an estimated investment of \$4.5 billion by the year 2021 (Opus Research).

85% of customer interactions will be handled without human agents by 2021. (Smallbizgenius).

\$5 billion will be invested in chatbots by 2021 (Chatbots Magazine).

By 2021, customer service interactions globally will be handled completely by AI, will increase 400% from 2017 (Gartner).

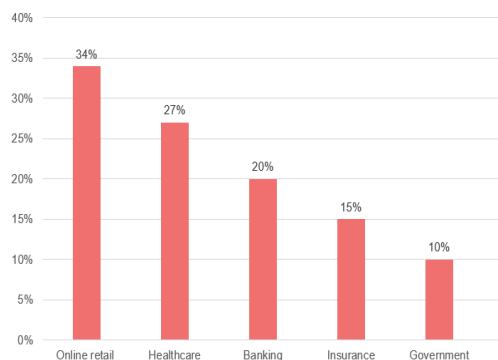


Figure2: Chatbot adoption across different industries

Chatbots are available twenty-four hours a day, seven days a week. They would never request vacation time or become fatigued like human employees. They will complete the same or new jobs with the same efficiency and performance every time. Patients must be annoyed when a customer service phone number says, "Please call us between 9:00 AM and 6:00 PM" only to acquire some information. But designed program never say this.

Problem Statement

The first task is to realise natural language understanding, which entails establishing the appropriate mechanism for a software system to understand natural language inquiries in the same way that a human would. The main problem entails extracting relevant data from a domain-specific database in order to generate answers that may be sent back to the user.

To design a Smart Chatbot to simulate a General Physician using artificial intelligence concepts from natural language processing and machine learning algorithms. (1) User question understanding (Intent Detection): To understand and process a user's inquiry, natural language understanding (NLU) and natural language processing (NLP) are used.

(2) Knowledge base storage and retrieval: To be able to store and query medical questions and answers, a domain knowledge database is required.

Objective

The goal of this project is to see if natural language processing (NLP) could be used to categorise electronic dialogue data from patients with questions and replies from medical expert for use in the construction of a chatbot.

To understand the medical domain for building the healthcare chatbot

To collect the data related to the domain via files or web scrapping

Preform pre-processing using NLP techniques

Build a chatbot engine using NLP & ML Algorithms to process the query posed by user

Use the Speech technology to respond for the query

Evaluate the performance of the chatbot

Scope

Healthcare chatbots will never substitute doctors. But they provide plenty of opportunities to facilitate their job or to improve their performance. The proposed model of chatbot helps the patients or users to request a query related to the disease, symptoms the chatbot will provide response in fraction of a second. Artificial intelligence and deep learning algorithms are used by the chatbot to understand the user input and offer a meaningful answer. Doctors, nurses, patients, and their families could all benefit from a chatbot. Better patient information organisation, prescription administration, assisting in emergencies or first aid, and providing a solution for minor medical difficulties are all scenarios where chatbots could step in and relieve the burden on medical staff. Accessibility: They're really easily available 24/7. Without having to dial a number and follow

the obnoxious “Press 1 for this and Press 2 for that” in the IVR, the customer may open the website and begin asking inquiries or addressing their issues. With just a few pieces of information, they may rapidly get to the point.

Methodology

The goal of this project was to investigate the technical aspects and development methodologies associated with chatbots used in the medical field to help patients and medical professionals stay connected without having to be physically present to answer the queries posed by patient related to disease. Patients can ask a question, and the bot will respond using both text and voice message interactions.

CONCLUSIONS

Depending on the logistical and specific responsibilities of the technology, physicians saw both costs and benefits connected with chatbots. Chatbots could be useful in health care for supporting, motivating, and coaching patients, as well as expediting administrative duties; in other words, chatbots could act as a proxy for nonmedical caregivers. However, there are still questions about the inability.

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