AI Based Chatbot To Answer FAQs

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Abstract

It is the era of the intelligent machines now. Artificial intelligence and machine learning have advanced. Computers have started to impersonate people using deep learning. Talkative software agents that are actuated by natural Chatbots, also known as language processing, are a great example of a machine like that. This essay offers a survey on methods used and chatbots that are already in use. It talks about the Comparative strengths, weaknesses, and limitations of the current chatbots. Comparing features and technical specifications of the 11 most popular chatbot application platforms. According to research, 75% of customers have had unfavorable interactions with customer service, and it is still challenging to make remarks that are profound, insightful, and long-lasting. Before then, handwritten procedures, rules, and models were used to create chatbots. These models were quickly replaced by end-to-end neural networks as deep learning gained popularity. A strong generative-based approach for the construction of conversational answers challenges is Deep Neural Networks in particular. This study conducted a thorough investigation of recent reviewing more than 70 recent works in the field of chatbot literature. The study compares various academic works using a method. This study also talked about the reasons that current chatbot models don't take into account when creating responses and how this affects the conversation's tone.

Keywords— Chatbot, Artificial Intelligence, Machine Learning, Neural Networks, Deep Learning, Natural Language Processing.

I. INTRODUCTION

A chatbot is a software application with a conversational interface that enables users to communicate with it in the same way they would with a human. A piece of software, sophisticated enough to resemble human interactions is known as a virtual chatbot. Virtually all customer interactions involve conversational bots, such as when a client is messaged immediately. Since the creation of the first chatbot, their functionality and user interface have advanced, and their importance to the technical community cannot be understated. But even now, modelling interactions in this area is still quite difficult. Conversational agents are now utilized in numerous applications, despite the fact that they are far from flawless [1]. An extensive review was undertaken, where related material published over the previous few years was studied, and a newly proposed neural network model is now trained with conversational data, in order to understand the capabilities and limitations of current chatbot methodologies and designs. Advanced research and development initiatives use deep learning and NLP techniques, and dialogue development uses AI and ML algorithms. Research and development (R&D) are still working on and testing in various areas. Government agencies, companies, and non-profit organizations employ conversation agents most frequently. However, the medical industry is not properly utilizing chatbots. By aiding patients via text messages, applications, or instant chatting, a chatbot can assist patients with tasks linked to their medical care. Both interface-based and code-based virtual bot development frameworks are widely available on the market. Both methods, nevertheless, have drawbacks in terms of adaptability and usability in having genuine interactions. The majority of popular intelligent personal assistants, like Cortana from Microsoft, Google Assistant from Google, and Alexa from Amazon, do have some functional restrictions. It can be accessed from anywhere at any time. Retrieval-based agents are now being used to store conversions that correspond to genuine interactions with people. There are a lot of intelligent personal assistants on the market right now, and most of them are built around retrieval- or rule-based techniques that produce respectable results [1].
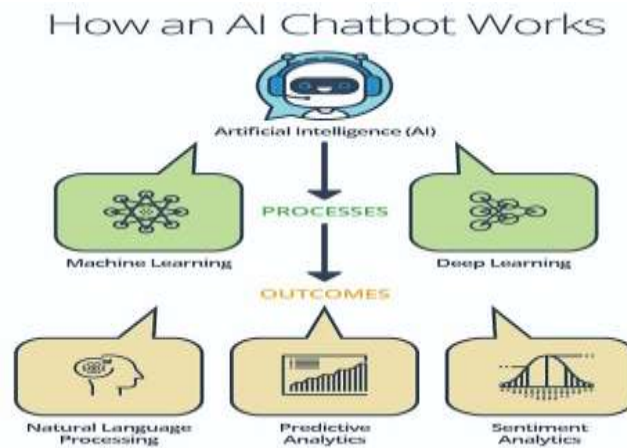
Fig 1 Workflow of AI chatbot

II. LITERATURE REVIEW

A. Defination of chatbot

A conversational software system known as a chatbot is developed to mimic human communication abilities that instinctively engages with a user. Indicative of a fresh, contemporary method of customer support powered by chatting interface-based artificial intelligence. A conversational software system known as a chatbot are built on artificial intelligence (AI) methods that recognizing meaning and emotion in natural language, and designing for meaningful answers for instance, it makes it simple for clients to receive convenient answers to their questions without having to stand in line for phone service or send a number of emails. Chatbots can decrease the amount of human customer calls, typical response time, and customer cost care. However, achieving these functionalities is not simple, because it necessitates a variety of intricate system interactions. The term "chatbot" refer to a sophisticated chat system or a conversational agent.
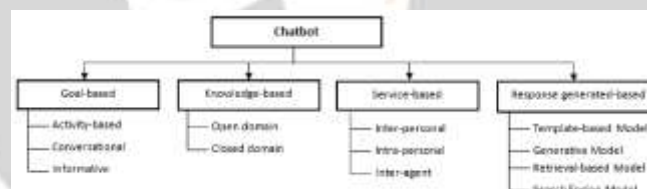
B. Taxanomy of chatbot

Fig 2 Taxonomy of Chatbot Application

1. Goal-based chatbot

The major criteria used to categorize goal-based chatbots are to attain the aspired goals. They are intended for a certain task. It's set up for quick exchanges, to gather information, to finish the work on time. For instance, a business uses chatbots on their websites to assist clients in enlightening them or solving their issues.

2. Knowledge based chatbot

Knowledge-based chatbots are categorized according to the information they learn from training data or the amount of data they have access to. There are two main data sources: open-domain and closed-domain sources. Open-domain data sources react and adequately reply to general inquiries. A prime example of an open-domain is Allen AI Science. Further Quiz Bowl Open-domain data sources are focused on one particular area of expertise. The dataset itself contains the answers to the query, including those for MCTest, bAbI, and Daily Mail.

3. Service based chatbot

The facilities offered to the customer determine the classification of service-based chatbots. It could be used for business or personal reasons. For instance, customers can order a meal from McDonald's or a logistics company can provide copies of dispatch documents via chatbot rather than telephone calls.

4. Response generated based chatbot

Chatbots that use response generation are categorized depending on the response generation action they take. The Response models use natural language for input and output text. The dialogue coordinator is in charge of combining response models. Dialogue will elicit a response. The manager does three actions. It starts by using every response model to provide a collection of answers. Then returns a priority-based response Third, if no urgent answer is given, the model selection policy chooses the response.

III. APPLICATIONS OF CHATBOT IN VARIOUS DOMAINS

A. Messaging applications

Many businesses today have merged their standard business functions on messaging platforms like WhatsApp or Messenger on Facebook. They are utilised in business sales, marketing, or just plain customer interaction service. Facebook permits programmers to use Messenger's billions of users for bot purposes and it can be a terrific way for companies to network the target group. More than 30,000 bots were present. Within six months of Messenger's launch, this was created by multiple businesses and programmers using Messenger as a platform. By the end of September 2017, the number had risen to over 100,000. KLM and Aeroméxico were two of the airlines that had customer support for Facebook Messenger users long before Facebook made Messenger a standalone app for virtual assistance by developers and businesses whose participation in the presently stated goals and services for newer virtual assistants are being tested. Many companies as in banks, media outlets, healthcare facilities, retail chains of hotels and restaurants, enterprises, and e-commerce websites and government entities use chatbots to handle basic questions and to improve consumer interaction. A 2017 study found that chatbots were so unimportant that 4% of businesses used them. However, research from 2016 also revealed that 80% expected to use them by 2020[3].

B. As a part of Organizations applications and websites

Integrated chatbots into their consumer portals on their websites conveniently and safely perform. An online retailer called IBM Watson Assistant provided a framework for Rare Carat to give information to prospective diamond purchasers which is superior to earlier technology.

C. Customer Services

Chatbots and virtual assistants are in high demand, and the demand for enhanced customer involvement is expected as major banking and fintech firms continue to grow and are preparing to incorporate chatbots to advance client services faster and at a lower cost to their customers. In the present era, chatbots are capable of displacing other forms of communication, such as email, SMS, or phone [3].

D. Politics

A chatbot called Semantic Analysis Machine, or just SAM. Located in New Zealand, the chatbot was developed by Nick Gerritsen. It allows for the sharing of political viewpoints on issues like healthcare, environmental issues, education, and more [3].

E. Toys

A business called ToyTalk worked with Barbie. toys to make a doll with an internet connection (Hello Barbie) which is integrated with chatbot inbuilt functionalities, ToyTalk had previously produced a variety of mobile characters used in leisure activities. The actions of these characters are determined by a specific characteristic, and restricted to carrying out built-in discussions. This has varied consequences for their characters in particular. For each character or a storyline various toys are also available. Watson, an IBM computer, has been essential for these instructive chatbots. Numerous devices utilize speech recognition as a fundamental skill when speaking to children [3].

F. Platforms for internal use

Some businesses are investigating various approaches which allows them to incorporate chatbots across several internal divisions including customer service and human resources inquiries or IoT-based initiatives. A chatbot named Mila was created by Overstock.com, which seeks to automate quick yet tedious tasks. Some in addition to Lloyds and Royal Bank of Scotland Renault, Banking Group, and numerous more companies that use internal departments should use chatbots instead of call centers as a method of making initial contact. As it heralded an era of change and growth, chatbots critical period since Facebook subsequently permitted Chatbots can be used on the Messenger platform. Most IT Architects are creating sophisticated chatbots that can communicate information, gaining knowledge and accessing practical experiences inside is considerably easier, which has also assisted in cutting costs that vary substantially from functional service desks. Intelligent Chatbots are capable of both simple and complex tasks. Due to the fact that they are driven by contemporary technology like Natural Language Processing and Machine Learning creation, natural language comprehension, and deep learning as well as many others [3].

G. Chatbot Sequences

Chatbot Sequences employ scripted messaging sequences that function similarly to autoresponder sequences. These sequences are created either through user opt-in use of certain terms that people use when making interactions. Decision Tree theory is applied to constructing robust chatbot sequences that will work every time a user when a question is asked, the decision tree directs the machine to return the appropriate responses to the user interface in the end [3].

IV. RELEVANT WORK

Since 1966, there have been numerous advances in chatbot technology. This field has benefited from contributions. Previous chatbots never communicated in natural language, such as text or speech. Today's technology includes chatbots, which become more well-known, and large companies like Google, Amazon and Microsoft are making investments in this area to develop structures that other companies can utilize for their own for things like customer service or online purchases [4]. The extensively used frameworks and methodologies are listed below. Services provided by businesses and recent changes in the last few years. The contemporary chatbots make use of Deep Learning and Natural Language Understanding features like automatic speech recognition (ASR) that are learned [4].

A. Dailogflow by google

A program called Dialogflow aids in conversational user interface for web and mobile apps. Currently the Google Cloud platform includes Dialogflow, which assists companies offering the newest technological services in the databases, cloud computing, and machine learning and AI. Dialogflow is able to examine both speech and text-based user's input. The use of NLU facilitates the translation of human language into computer language and vice versa. However, it goes a little bit further to understand vocabulary such as "sentiment analysis," "accents," summaries and comprehension inquiries that it has never had any training [4].

Fig 3 Dailogflow algorithm

B. Amazon Lex

An AWS service called Amazon Lex is utilized for creating interactive user interfaces for text-based and inputs made using voice. The launch of this service was in April 2017 and it initially served as the virtual assistant for Amazon Alexa. Alexa Voice Service served as a platform for developers to create Alexa-based service, although Amazon Lex has recently been used for its practical use for speech and text-based functions alike. Because it's connected with AWS, it can handle databases. Amazon Lex uses NLU & ASR just like Dialogflow, but a different idea is the Speech Language System (SLU) that they have incorporated into their framework, SLU allows the chatbot to process responses and learn from them. Users input is accurate and serves the user's objective by utilizing appropriate business procedures [4].

Fig 4 Architecture of informational chatbot

C. Microsoft Azure Bot Service

Bot Framework Service is offered by Microsoft Azure, and it can be created in various languages, including Python, C#, JavaScript, or.NET. Among the six levels of Azure Bot to accomplish their objective, a corporation or freelance developer, planning, construction, testing, and publication are among them evaluating and connecting. This structure aids developers with a variety of design standards for organizing the design of the finished item. Several essential traits of this bot framework includes natural language processing, adding knowledge resources that will efficient response times, handling numerous models simultaneously, simple contextually based scripting, adding graphics buttons and cards to improve the user experience. On numerous platforms, including Facebook, a bot can be used for SMSs, Telegram, Microsoft Teams, Kik, Messenger Cortona & Twilio [4].

Fig 5 Azure bot implementation workflow

D. Watson Assistant by IBM

The IBM Cloud offers the Watson Assistant service that employs REST APIs. They are functional as an application-specific solution. Due to its excellent and simple to use user interface, IBM Watson Assistant has received recognition for its usability. When an end-user enquiry is received, the assistant routes it to the dialogue skill. The dialogue skill helps to control the conversation's flow by further interpreting and comprehending user input. The dialogue captures all the data required to react or carry out a request on behalf of the user [4].
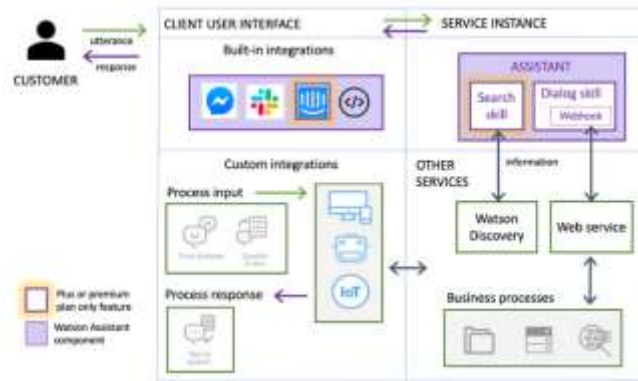
Fig 6 IBM Watson Implementation

E. Facebook Messenger bot

1. Virtual assistants in group chats:

Bots do not speak casually like other members, although they provide daily news updates, weather updates, and sports receipts for payments, news, and many more.

2. Chat Extensions

Facebook introduced the Discovery tab, which offers a variety of bots utilized, the many types of bots, current trends, and ability to find. Users of Facebook can also play games and book airline tickets, work together while communicating on a music playlist using particular apps [4].

3. QR Scan

Additionally, companies have worked with Facebook to create users that can utilize bots to assist clients with their necessary inquiries to communicate with the bots directly, scan the QR code. In order, for the Facebook Messenger bot to function, web hooks on the URL of the business server, where the services for messaging are hosted [4].

F. RASA- Open Source Conversational AI

Rasa provides the architecture and resources essential for highly effective, durable, and exclusive contextual assistants that work. Better text-based and voice-based applications can be made by developers. RASA is a free software program. This leverages a fundamental machine learning foundation building element for voice-based, automated texting conversations. RASA offers the capacity for holding conversations linking to several messaging channels and using APIs. RASA NLU aids in purpose entity extraction, categorization, and response retrieval in conversations are carried out using RASA Core and chatbots choose what to do after that. RASA Core employs technology utilizing a learning model rather than numerous if/else statements choosing what course of action to take next [4].

Fig 6 RASA's Message Handling Technique

G. Sequence to Sequence

Using many to many RNN architectures, Seq2Seq is employed to decode. In encoder-decoder architecture a text vector representing the input sequence is loaded into the encoder. The encoder then creates some intermediate data. Vectors of information or thinking are represented. The thought vector generated by the encoder is then supplied input to the decoder. Lastly, the decoder analyses the thinking vector and word-by-word conversion of

the sequence and generates numerous outputs from the decoder in the shape of desired order. The encoder-decoder can be divided into two models: a generative model and a retrieval model. Each hidden target in the neural attention mechanism is compared to the source in a hidden state, computing attention vector score and keeping the memory's attention vector intact to select the preferred candidate [4].
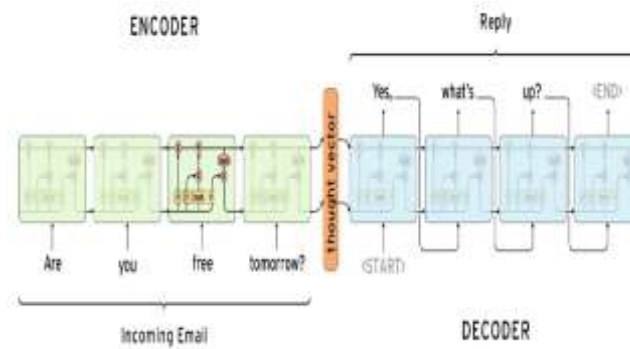

Fig 7 Seq2Seq Model

H. Google's Neural Machine Translation

The Neural Machine Translation (GNMT) model developed by Google is a neural machine translation to other languages module English and linguistics. The GNMT model contains the following: built-in encoder-decoder architecture for sequence modelling LSTM cells, either uni-directional or bi-directional. In the encoder, the bottom layer network is bidirectional in nature: the green nodes gather input from left to right. There are also leftover layers that start with the third layer from the bottom in the diagram representation. Additionally, there are certain levels that are in the encoder network, it is unidirectional. Developers must employ a bottom decoder. Only levels to obtain recurring attention context will be communicated subsequently to all the other decoder layers [4].
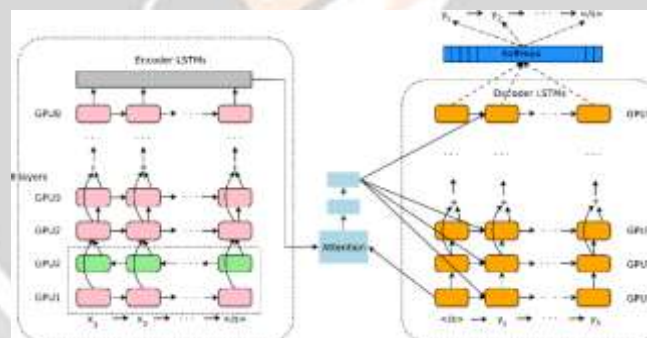

Fig 8 The model Architecture of GNMT

I. Deep Reinforcement Learning

Goal-Oriented (GO) Deep Reinforcement Learning uses chatbots. These chatbots are employed to search solutions to particular problems, such as booking reservations, purchasing tickets. One method used by a GO chatbot is through the use of supervised learning and an encoder-decoder that responds to user dialogues, and another method is through using chatbot training with reinforcement learning either a rule-based user simulator or the trial-and-error method with actual users. The GO chatbot's dialogue system consists of three main components, as seen in the below image which include Natural Language, Dialog Manager (DM), Natural Language Understanding (NLU) and Generator (NLG) [4].

V. FUTURE SCOPE

Any college or university can take the initiative to integrate in their website. The chatbot can provide educational data in addition to being expanded by including additional data sources. Then it will be both beneficial to students and other visitors. The chatbot therefore can offer a variety of information based on the developer's requirements and configuration. NLP, or natural language processing, can be added to the chatbot to improve it [2].

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