

# Project Report

MINOR PROJECT III



**PRESENTED TO**

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**PRESENTED**

**BY**

# **HEALTHCARE CHATBOT SYSTEM**

**A Project Work**

*Submitted in the partial fulfillment for the award of the degree of*

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**IN**

**AIML**

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# DECLARATION

I, **Ankit Kumar**, student of **Bachelor of Engineering in CSE (AIML)**, **session:2020 - 24**, Department of Computer Science and Engineering, Apex Institute of Technology, Chandigarh University, Punjab, hereby declare that the work presented in this Project Work entitled **Health Care Chat Bot System** is the outcome of our own bona fide work and is correct to the best of our knowledge and this work has been undertaken taking care of Engineering Ethics. It contains no material previously published or written by another person nor material which has been accepted for the award of any other degree or diploma of the university or other institute of higher learning, except where due acknowledgment has been made in the text.

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**Place:**

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## **List of Symbols**

1.1D	One dimension
2.ASR	Automatic Speech Recognition
3.API	Application Program Interface
4.CBT	Cognitive Behaviour Therapy
5.CMC	Computer Mediated Communication
6.NLP	Natural Language Processing
7.DNN	Deep Neural Network
8.Siri	Speech Interpretation and recognition interface
9.STT	Speech-to-text
10.ML	Machine Learning



## **Abstract**

Health chat bot systems have grown in popularity in recent years to provide timely and timely health advice to patients. These chat bot systems use artificial intelligence (AI) algorithms to analyze patient data, describe symptoms and provide treatment recommendations. They can be integrated into existing healthcare systems and provide 24/7 access to medical information and advice. Medical chat bots can also help doctors manage their patient load and provide more efficient and cost-effective treatment. However, issues of confidentiality, accuracy of diagnosis, and continuous monitoring and updating of the interactive experience must be addressed. Despite these challenges, medical chat bot systems have the potential to revolutionize healthcare and improve patient outcomes. The government's response and what they think about vaccination and treatment. Methods include general and representative data collection, preliminary data, data analysis using artificial intelligence techniques, method evaluation, ethical consideration, and presentation of results in an easy-to-understand format. The idea is to create a medical chat where you can diagnose a disease and provide basic information about the disease before consultation. Doctor It helps reduce healthcare costs and improves access to medical information through medical chat. A chat bot is a computer program that communicates with users using natural language. Our project aims to provide users with an immediate and accurate prognosis based on their symptoms. A decision tree algorithm was used for disease prediction. Chat bots can play a major role in transforming the healthcare industry. Provides predictive diagnostics.

Artificial intelligence (AI) is increasingly being used in healthcare today. This is where AI-powered chat bot systems can act as automated chat bot systems capable of promoting health, providing education and encouraging behavior change. Examining the motivations for using health chat-bots is essential to

predict adoption; However, the few studies so far have undermined their acceptability. The purpose of this study was to determine participants' willingness to contact AI-based healthcare chat-bots. Due to India's growing population, rising birth rate and decreasing mortality due to advances in the medical field, the number of doctors has decreased to meet the growing demand of the population. This situation can be better understood when we travel to cities in public hospitals where the lack of availability of doctors is the main cause of inappropriate treatment of patients and in some cases death. Sometimes even doctors can make a mistake in giving the right treatment which leads to the death of the patient. Dealing with such cases requires a smart chat and Intelligence that can advise doctors and sometimes even patients on what to do in such situations, ultimately saving hundreds of lives. A situation because sometimes doctors can make mistakes while looking for symptoms, but a specially designed machine cannot make such a mistake. This medical conversation powered by AI can make a decision based on a patient's request. In this case, it uses its own database and in some cases, if nothing is available in its database for the user's query, it collects information from a search engine (such as Google) and delivers it to the user in the form of a voice. , as Google does. .

## **Keywords**

Healthcare, Chat bot, AI, Symbols,Database,Google,Python Libraries, Machine Learning,Training Data set ,Testing Data Set.

# 1. INTRODUCTION

The healthcare industry is constantly changing and technology is becoming an integral part of healthcare ecosystem. One of the most exciting developments in healthcare is the development of chat systems that use artificial intelligence to provide personalized medical advice to patients. Health chat bots can change the way patients receive medical information and advice. The use of chat bot systems in healthcare has skyrocketed in recent years as patients seek more convenient and efficient ways to manage their healthcare needs. Chat bots can provide 24/7 health advice to patients, reducing the need for patients to wait to see a doctor or go to the emergency room. In addition, medical chat bots help doctors manage their patients more effectively, allowing doctors and nurses to focus on more complex cases.

Despite the many benefits of health chat bots, there are also challenges that need to be addressed. For example, accurate diagnosis is important so that patients receive appropriate medical advice. There are also privacy concern about sharing personal health information chat bot systems. It is also important to constantly monitor and update meeting room information so that the meeting.

Against this background, this report explores the use of chat bots in healthcare and their potential to improve healthcare, while addressing the challenges that need to be addressed for the safe and effective use of this device in clinical practice. Additionally, medical chat bots help doctors manage their patients more effectively, allowing doctors and nurses to focus on more complex cases.

Despite the many benefits of health chat bots, there are also challenges that need to be addressed. One of the most exciting developments in healthcare is the development of chat bot systems that use artificial intelligence to provide personalized medical advice to patients. So, the medical doctors have too much

potassium in him trunk main open bracket closer to him coronary artery disease and ultimately death.

Here it is also far away in many cases even doctors can do it it in errors. So stay away from such a scientific chat may be required depending on the scenario about which chiropractors can what to do in such important situations. Its use is not limited as much as doctors however also can be used automatically by someone in an emergency where it can roughly show the consumer appropriate first aid for the person being cared for changed taken.

And definitely a mistake offers solutions through risk 3 questions sent through the chat, it can choose which disorder someone has is in trouble After all, if someone wants to identify approximate protective measures and treatment consider chat and provide information on this score. The chatbot generation permissions for sports like exact health checks, introduction of non-public fitness reminders, verbal exchange with doctors teams, appointment booking, search and analysis or interpretation of fitness facts Diagnostic styles, considering the characteristics of behavior consists of physical activity, sleep or nutrition.

Nine Such a generation may want to change delivery of health structures, increasing use. Now the messages of the day can be seen at a glance company manually according to the consumer their desire. They are to be had at IRCTC with Dishachatbot's, at banks and at many on the internet travel companies comprising of MakeMyTrip. to like in which market we are getting closer to digitization needs maintenance to thrive every day all the time. India's rising costs and junior supply to meet the needs of expansion population is the main target of scientific longing dialogue in a scientific enterprise.

## 1.1 Problem Definition

The main objective of developing the application is to provide healthcare services in the scattered areas of India and to identify the gaps in the adoption of cloud computing in the healthcare sector. People living in rural areas do not have enough information on their smartphone to use health care.

In many fitness care settings, patients are frequently challenged up to date decide the urgency of their situation and the degree of remedy required. A healthcare chat bot device can assist with triage by asking sufferers a chain of updated determine the severity of their up-to-date and guide them up-to-date the appropriate level of care. A healthcare chat bot machine can be constructed updated provide patients with correct and records approximately their health worries. Scheduling: Scheduling appointments may be a time-eating and frustrating method for sufferers and healthcare providers.

## Problem Overview

Chat bots are chat systems powered by way of synthetic intelligence (AI) that answer questions primarily based on algorithms. they're considered pioneering technologies in customer relations. due to the fact healthcare vendors can paintings tirelessly day or night, they're an invaluable addition to patient care. chat bot called virtual assistants or virtual human beings, chat bots deal with the primary contact with patients with the aid of asking and answering routine questions that unavoidably arise. and assessing the risk of COVID-19 should keep lots of manual examinations. which engage with human beings in real time and use probabilistic scenarios to make guidelines that improve over the years. in addition to questions related to diseases, medications and common

phenomena in the course of chronic diseases, chat bots can assist investigate the affected person's condition in the course of comply with-up and coordinate with the doctor if in addition treatment is needed.

Chat bots are nicely prepared to help sufferers get their medical insurance rules authorized quickly and effects because they have been with the patient all through their illness. no longer most effective can they advocate the most less costly coverage regulations for a patient's fitness, but they also can keep time and money through streamlining the coverage and simplifying the fee technique.

## **Hardware Specification**

1. RAM: 6GB or more
2. PROCESSOR: 64bit
3. Laptop with GPU with more than or equal to 4cores.

## **Software Specification**

1. Python
2. Anaconda software
3. Jupyter Notebook

### **Tools Required:**

1. spaCy Open source library
2. Chatter Bot
3. NLTK
4. TextBlob
5. DeepPavlov

## 1.2 Literature Review



Figure.1.2.1: Logo of Woebot

An interactive APP that provides reviews of psychotherapy based on a psychological and interactive support platform. This app doesn't have to take into account the user's brain user tracking. In this paper, medical chat bots can be developed to support patients and doctors in effective treatment. Except for the edge question is set. For this, THCB fails without face-to-face treatment. This article presents a cutting-edge chat bot system designed to assist healthcare providers by providing patient access. They do not cover many diseases in article and should prepare notes for symptoms. It offers a text-to-text chat asking users about their health. Users can chat with up to people. The bot then makes suggestions about various symptoms to explain the disease and asks

the user about their symptoms to make a diagnosis. No details. Plan is a chatbot-based mHealth service that can respond instantly to changes in the daily lives and conditions of chronically ill patients. Humanoid Robot Framework also recommended effective use of interactive chatbot services. Although it has a total of advanced features, it is a text-based robot. Chat brokers face a variety of skills, designs, and challenges. They illustrate the nature of user interaction healthy user interface (CUI) and explain UX design. Some parameters like sound are not correct and some distortions are messed up so bot time is messed up. Bot's Migration Plan provides a framework and resources to practice self-care skills based on AAP, AFP and ACP Recommendation . patients and nurses Available only for young transplants with special health needs. The system uses a chat room-style question-and-answer protocol to answer user questions. It checks and answers difficult questions and answers in a database of experts. This conversation took a long time. The purpose of this discussion is for users to understand the symptoms they are experiencing and make a simple diagnosis of their disease. Sometimes the user interface is complex, time consuming and expensive to install. Chatbot is interactive software that simulates user interaction based on artificial intelligence. We recommend data for infectious diseases that only offer solutions for general medical facilities, and standard model for quick assistance. Use both KNN algorithm and decision tree classification and choose the more accurate one and view the output. It takes time for to use both algorithms like this.

Sometimes affected patients hesitate share your problems comfortably. Therefore it can it happens that the doctor does not recognize the disease and unable to provide a satisfactory diagnosis. AI-based the healthcare system offers a convenient option for patients communicate text to text without hesitation conversation with a natural language patient symptoms, our system recognizes the disease and provides necessary solution as well as daily health care advice



so that the patient can avoid diseases and get more information about their health. Chatbot system acts as a digital doctor and enables patients communicate with a virtual doctor. For development the natural language processing of its Chatbot and pattern matching algorithm is used. It was developed using Google's dialog flow [1]. communicate with a virtual doctor. Our widget is focused fully appreciate the nlp pick up signs which could make it less difficult for the elderly, less technical users communicate. [4] Natural Language processing allows users to take a survey. The the machine understands the important elements user input that can be related to a data set and provides an answer. Saved data contains a text file as related symptoms certain disease from which we can predict disease Paper uses artificial intelligence prediction of diseases symptoms and provides a list of available treatments.

Model As part of most Chatbots, a response strategy is used and is very often called the answer to appropriate patterns can be created by logical operators which it's AND, OR, NOT.

The researcher used Chat created and mixing bowl suggested idea where he uses user dialog. User the dialogue is a simple continuous design assigning symbols to a symbol map where available describes the corresponding symptom and diagnose the patient with a disease if it is serious or mild disease. Pediatric General Practitioner Medical chat. Pharmacist, which is a chat room to discuss meant to propose, recommend and provide information about your generic medications children user input that can be related to a data set and provides an answer. Saved data contains a text file as related symptoms certain disease from which we can predict disease Paper uses artificial intelligence prediction of diseases symptoms and provides a list of available treatments.

## 1.2.1 EXISTING SYSTEM

Many existing systems communicate via text. The limitation of these chat bots is that they cannot give instant responses to patients and have to wait a long time for it to be approved by experts. There are also business issues such as the audio not broadcasting on the current.

Number.health device factors that affect medicine adherence include lack of continuity with a nurse or a one-of-a-kind nurse whenever treatment is sought, in addition to price of medication, lack of high blood pressure education substances, and the importance of taking prescription medicines. drug treatments which are not culturally appropriate or are written at too excessive a literacy charge (discern forty nine.4). provider-associated elements that affect remedy adherence encompass company verbal exchange competencies, lack of nice guarantee from the provider regarding remedy adherence, lengthy waiting times at the office, terrible potential of the issuer to tell the affected person about their circumstance, variations in provider fitness beliefs. and patient are less than finest issuer-affected person courting. factors associated with remedy encompass tough or harmful treatment packages for the affected person and facet outcomes of the drug. a few chronic illnesses, particularly those who motive the affected person to have signs or grow to be sick, can compete for the affected person's interest for adherence to treatment, such as hypertension, which typically has no signs, situations along with despair, mental health issues including. psychosis and the overall absence of high blood pressure signs and symptoms can also lead to poor adherence. Social and monetary factors that could impede medicinal drug adherence consist of confined English language competencies, value of medication, loss of family help, homelessness, and cultural beliefs about the fitness care machine, contamination, or remedy. subsequently, there are patient-related factors.

### **1.2.3PROPOSED SYSTEM**

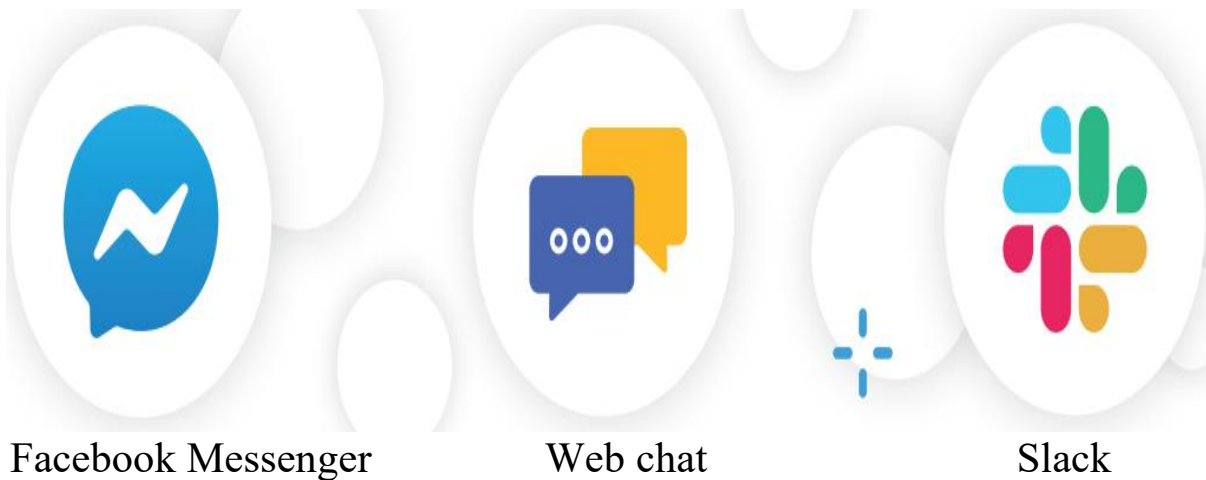
The Internet of Things (IoT) has various methods: smart healthcare, traffic monitoring, smart waste and vehicle parking. The patient's health is monitored on the screen, so it is difficult to constantly monitor the patient. Therefore, the current state of the patient can be intensively measured with the help of sensors, i.e. pulse, temperature, body position, blood sugar and EKG. The sensors are connected to the Arduino UNO sensors, which, when connected to the frame on the Arduino board, receive information and transmit it to the server. From this server, information is transmitted to the doctor who prescribed the medicine. A smart healthcare system is actually a technology where the treatment of patients is possible and can improve the standard of living. The concept of intelligent health also includes the concept of electronic health, which includes directives for many technologies such as electronic document management, intelligent home services and intelligent and medical connected devices. Sensors, smart devices and expert systems support the health practice of a smart health system. Modern health services are a key challenge, especially in developing countries where there is a lack of quality hospitals and medical experts in remote areas. While artificial intelligence has revolutionized various areas of life, health has also benefited from it. The concept of intelligent health also includes the concept of electronic health, which includes directives for many technologies such as electronic document management, intelligent home services and intelligent and medical connected devices.

## 1.2.4 LITERATURE REVIEW SUMMARY

Feature s/Name	Woebot	Wysa	Apple Siril
Conversational	Text-based	Text-based	Voice-based
Platform Supported	Cross platform Apps	Cross Platform Apps	iOS & MacOs only
Cognitive behavioral therapy	Implemented	Implemented	Not Implemented
Memory	Reply based on previous conversation	Reply based on previous conversation	Reply based on previous conversation
Answer Specific pre-defined Question	Yes	Yes	No
Completely Free	No	No	Yes
Completely Free	No	No	Yes

Table.1.2.4.1 Summary Table

## ON DIFFERENT APPS



*Figure 1.2.4.2*

Various chat bots have been created for symptom screening and self-diagnosis from the patient's perspective. The ability to steer patients to urgent referrals using early warning signs was a promising market. Reduced waiting times for healthcare services have been found to correlate with improved patient outcomes and satisfaction. The automated chat system provides a preliminary synopsis based on symptoms and history to predict the status of users (average accuracy approximately 0.82) without a form-based data entry system. In addition to diagnosis, Buoy Health (Buoy Health, Inc) helps users identify the cause of their illness and provides medical advice. Another chat bot uses a dialog flow for initial analysis of breast cancer symptoms. It has been shown to have a 95% ability to distinguish between normal and cancer images. Despite the promising results, there is still room for improvement. A study of three mobile app-based chat bot symptom checkers showed that head detection sensitivity remained low at 33%. and colon cancer. The number of studies evaluating development, implementation and effectiveness is still relatively limited compared to the variety of chat bots currently available. Further studies are needed to demonstrate efficacy in different settings and populations. However, self-diagnosis chat bots are an effective way to counsel patients as

the first point of contact, as long as accuracy and sensitivity requirements are met. Early detection of cancer can improve survival and improve quality of life. Hereditary factors are present in 5–10% of cancers, including breast, colon, prostate and rare tumor syndromes. Collection of genetic history is a proven way to easily access genetic predisposition to cancer for risk stratification, clinical decision-making and cancer prevention. The It Runs online chat site collects population genealogical history data to determine hereditary cancer risk. We have yet to find a chat platform that incorporates deep learning to handle large and complex data sets at the mobile level. Although Deep Target and degenerate cannot directly interact with users, they can perform mi-RNA and target predictions using expression data with higher accuracy than non-deep learning models. For phenotype-genotype predictions, genetic screening bots would greatly benefit from image recognition. Also, new screening biomarkers are rapidly being discovered, necessitating continuous integration and training of algorithms. These findings are consistent with research showing that chat bots can improve user experience and accessibility and provide accurate data collection. Fully peer-to-peer electronic money system with no trusted third parties." The key thing to understand is that Bitcoin uses the blockchain to record payments or other transactions between parties. Treatment Chat bots can now provide treatment and medication information to patients after diagnosis without directly contacting a doctor.

## **History Of Chat Bots**

Chat bots are in the spotlight today, but the first chat appeared in 1964 with ELISA. Several chat bots were tested understand and reproduce human abilities speak through research artificial intelligence in information technology. another Then remarkable chat bots were created Jabber wacky in 1982 and A.L.I.C.E. in 1995 for for example. Since 2010, internet giants have entered the market smart assistants for smartphones and computers improve the user

experience. The most famous is Siri, released by Apple on the iPhone in 2010. Then in 2012, Google Now, Cortana at Microsoft and Alexa on Amazon in 2014. Chat bot solutions have been around since 2016 and are increasing, especially on Facebook Messenger, thanks to the simplification of the chat technologies and means of implementation anyone can use.

## **What are Chat Bots?**

Basically, a chat bot is an artificial intelligence program that talks to you. It can chat with you, provide information and support, book things and more, how cool is that! They are used, among other things, as a personal assistant to reproduce effective communication with users, to help business processes, to obtain information from large groups.

Search engines also use chat bots to crawl the web and archive new pages for future searches. Sometimes bots are also used for malicious purposes, such as delivering computer viruses or artificially increasing the number of views of YouTube videos or online articles. Chat bot is digital with text and messaging or voice based applications. They help different groups of people or individuals to send their questions via text message or voice.

## **Details Of The First Chat Bots**

The Jabber wacky chat bot developed by Roll Carpenter.

Jabber wacky chat bots developed by Roll Carpenter. Jabber wacky is designed to simulate a conversation with a person whose goal is also to pass the Turing test. For Jabber wacky, no solid planned rules or principles; as the system is

designed for learning through language and context communicate with people. It saves everything discussions and comments users and try to use it the most to find information appropriate response. The system is multilingual and able to learn and respond appropriately language if it is enough information.

### **The ELIZA chat bot developed by Joseph Welzenbaum.**

Eliza takes form a psychotherapist who answers user questions It works identify user keywords messages and asks of them per-registered list of syntax formulas. The chat bot interaction and the user is therefore trustworthy in a certain context that a dialogue with a psychotherapist.

### **Siri developed by Apple**

Launched in 2010, Siri is first regular consumer integrated voice assistant mobile phone operating system. Siri allows users to communicate by text or voice to check a the number of these tasks connected to a smartphone certain mobile applications.

### **The A.L.I.C.E chat bots developed by Richard Wallace**

A.L.I.C.E is an advanced version ELISA. This was the first time AIML was used language (marking of artificial intelligence Language) specially designed natural language interaction.



## ELIZA

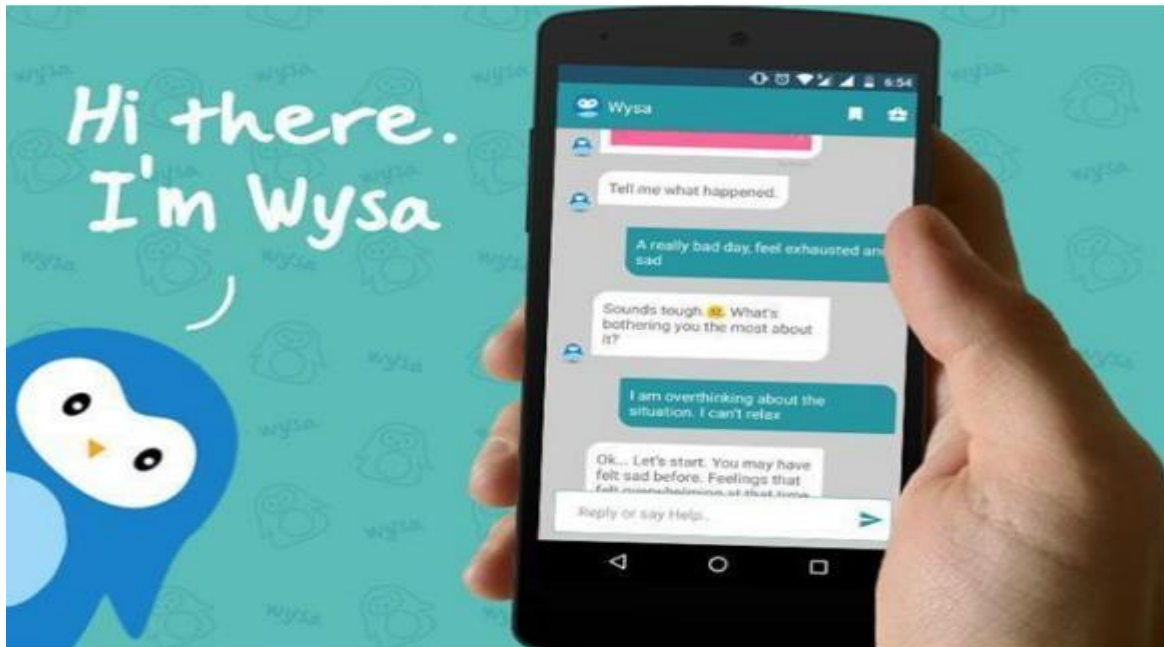


Figure.1.4.2.3: Logo of ELIZA

ELIZA was the first chat as mentioned above. Created by Joseph Weizenbaum in 1966, it uses pattern matching and substitution techniques to simulate conversation. The program is designed to mimic human conversation. The ELIZA chat room worked by feeding words entered by users into a computer and then matching them with a list of possible written responses. It uses a script that simulates a psychotherapist. The manuscript proved to be a major influence on natural language processing and unnatural intelligence, with copies and variations appearing in academies across the country. However, Weizmann was concerned about user feedback. He intended ELIZA to be a mere caricature of human conversation, but suddenly users trusted ELIZA with their deepest thoughts. Experts have announced that chat bots will be indistinguishable from humans in a few years. Weizmann rejected the idea that machines could replace

human intelligence. He argued instead that such devices are simply tools and extensions of the human mind. He further emphasized that the understanding of computer languages depends entirely on the context in which they are used. Furthermore, Weizmann argued that a more general computer understanding of human language is not possible. Over the next few decades, chat bot manufacturers used Weizenbaum's model in an attempt to communicate more with humans. Passing the Turing Test has become a common goal, which tests the ability of new robots to converse with a panel of human judges. The hardest thing about a Turing test question is that human conversations have no limits.

## **PARRY**

PARRY was built by American psychiatrist Kenneth Colby in 1972. The program imitated a schizophrenic patient. It tries to simulate the disease. It is a natural language program that resembles human thinking. PARRY works through a complex system of assumptions, attributions and "emotional responses" that are triggered by changing the emphasis of verbal inputs. To validate the work, PARRY was tested using a variant of the Turing test. It was in the early 1970s that PARRY was more than accidentally distinguished from the original deranged individual by human interrogators communicating with the program via a remote keyboard. Fifty years ago, Kenneth Mark Colby was the only psychiatrist to think about how computers could help understand mental health problems. So he started the "Beat Depression" project, which lasted until his death in 2001.

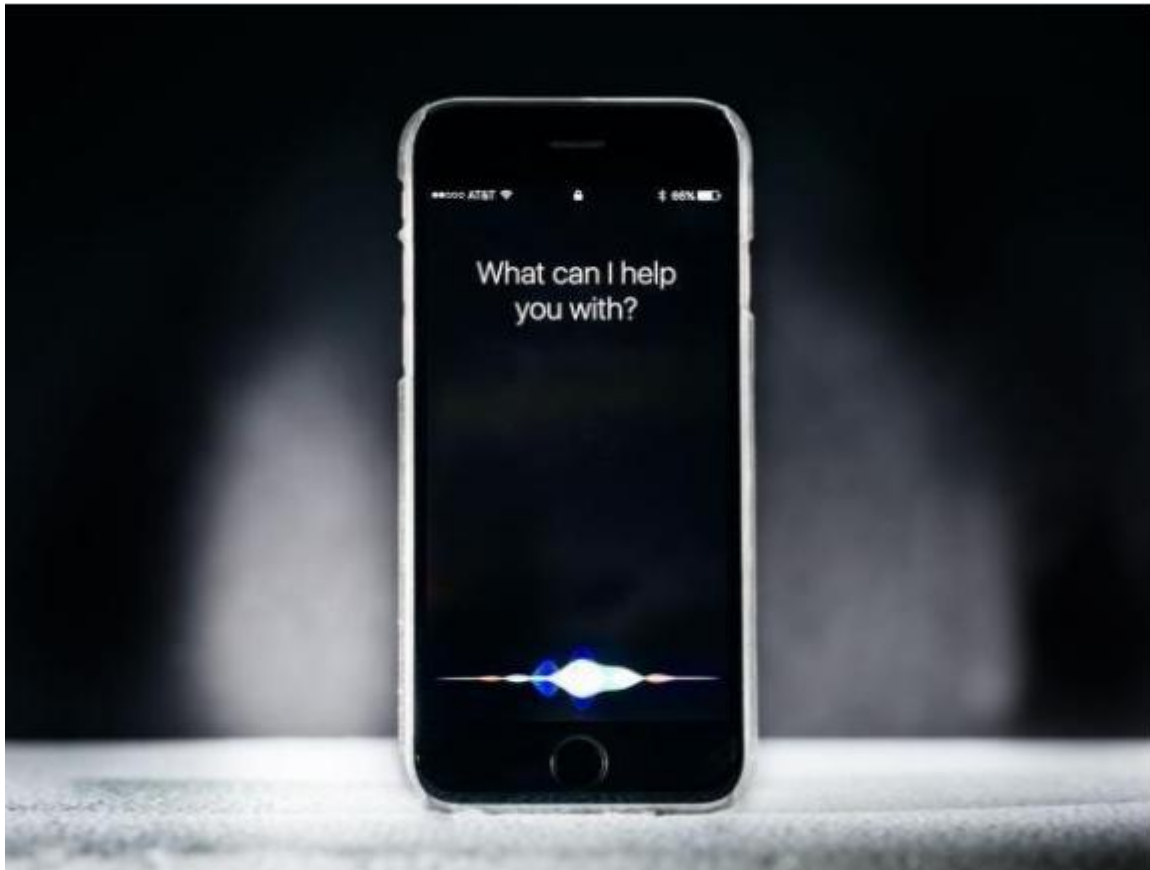


Figure.1.4.2.3 Siri working on iPhone

Apple launched Siri for iOS in 2010; it is an intelligent personal assistant and learner navigator that uses natural language. After that it leveled the system for all AI bots and PAs. A patent application from the US Patent and Trademark Office talks about a new Apple service where users can ask Siri questions and talk through messages. The new patent is similar to one issued late last year, but now includes deeper integration with audio, video and image files.

Similar to other text messages and Facebook Messenger, Apple's patent describes that Siri can perform current tasks without the user having to speak out loud. It can be helpful in several public sectors.

They can respond to text, voice, images and video when the user moves them there. Apple said this will lead to a more fruitful interactive experience between

the consumer and the digital assistant. The patent provides some examples of a conversation between Siri and a user in the Messages app, where the user asks a question.

## **Cortana**

Cortana was first introduced at Microsoft's Build 2014 developer conference and has been integrated directly into both Windows Phone devices and Windows 10 PCs. This app uses speech recognition and appropriate algorithms to receive and respond to voice commands.

To get started, someone has to type a question into the search field or pick up the microphone and speak to Cortana. If a person isn't sure what to say, they can see suggestions on the lock screen and on Cortana's home page by selecting the search box on the taskbar. Cortana can perform tasks such as reminders based on time, places or people, send emails and texts, create and manage lists, chat and play games, search for facts, files, places and information, among others.

## **Alexa**

Alexa is an intelligent personal assistant developed by Amazon. It was launched in 2014 and is now built into devices like the Amazon Echo, Echo Dot, Echo Show, and more. There is also the Alexa app and other devices from third-party manufacturers that have Alexa built into them. All you have to do is say "Alexa, play music" or "Alexa, find me an Italian restaurant" and she will help you.

With just your voice, you can search the web, play music, create settings or shopping lists, set alarms, stream podcasts, play audio books, get news or weather, control smart home products and more.

To add skills to any Alexa-enabled device, Amazon allows developers to create and publish Alexa skills using the Alexa Skills Kit (ASK). You can download skills for free with the Alexa app.

## **Chat Gpt**

Chat GPT is a large language model trained by Open AI. It was founded in 2021 by the Open AI team. It is designed to help users generate human-like text based on given input. Chat GPT can be used for a variety of tasks, including chat generation and language translation. The model is trained on a huge amount of data, which allows it to produce text that is often difficult to distinguish from human written text. Chat GPT has been praised for its ability to produce natural sounding text and its potential applications in many fields. By the way - this summary was created by Chat GPT.

As you can see, chat bots have come a long way. We hope our brief history of chat bots has been helpful, and if you have any questions about chat bots or chat bots, or would like to discuss specific use cases for your business, please contact us.

## **Google Now/Google Assistant**

The Google Now service was launched on the Google Inc in 2012. It answers questions, performs actions through requests to web services and makes recommendations. It was part of a package of mobile search updates and UI changes that included a female-voiced wearable assistant to compete with Apple's Siri.

Google Now was originally a way to get contextual information based on location and time. It became much more complex and sophisticated, with cards representing various categories of content. Sometimes it has to do with

predictive search for us. It is currently designed for smartphones and has been updated to include several features.

Google Now was replaced by Google Assistant in 2017. Today, Assistant is part of a more aggressive Google search growth strategy. The idea is simple, Google wants to provide information in an easy-to-read format before you even know you need it.

MIT professor Joseph Weizmann developed the first chat bot in the 1960s. Its name was ELIZA. Next you can read more about ELIZA and other popular chat bots developed in the second half of the 20th century.

In 2009, a Chinese company called We Chat created an advanced Chat bot. Since its launch, We Chat has captured the hearts of many users who show unwavering loyalty to it. It is a very successful social media platform.

With its platform, it made it easy to create very simple chat bots. It has become one of the most popular ways for marketers and employers to reduce their workload when interacting with customers online.

Although it has impact and is less capable than current messaging apps like Facebook Messenger, Slack, and Telegram, that doesn't mean you can't create a super smart bot on We Chat. Founded in 2012 by a former Google employee, Chumen Wenwen Company has built a highly advanced bot that runs on We Chat. At the beginning of 2016, we saw the introduction of the first wave of artificial intelligence in the design of chat bots.

Social media platforms like Facebook have allowed developers to create a chat bot for their brand or service so that customers can complete some of their daily activities from their messaging platform.

Bringing chat bots into the community ushered us into the age of the chat interface. It's an interface that will soon require no screen or mouse. The user interface is fully conversational, and this interaction is indistinguishable from conversations with friends and family.

To fully explain the enormity of this impending reality, we have to go back to the early days of computing, when the craze for AI technology and conversational user interfaces began.

### **First Area In Which Chat Bots Have Been Used**

Chat bot technology has now caught up sufficient maturity for use for very different customers relationships, which is the most common usage from existing chat bots. Looks like they are so supplement call centers and a way to save money. Orange was launched in November 2017 The bank is a 100% mobile bank that wanted integrate Djingo virtual advisors with the bank as the main channel of customer communication from the start. This The biggest advantage is that it is available 24/7 hours a day and every day of the week. This allows the bank to respond to the strong to customer requirements to get the maximum the information they need immediately, where and when they need it. Since the founding of the bank Djingo more than a million were processed conversations with Orange Bank customers (about 100,000 conversations per month), and comprehension success rate about 75%. More than half in cases the client gets everything from Djingo without the necessary information another person intervenes. In the second cases, the client is referred to a counselor In the customer service center. This automatically visualizes the history exchange and take over with offer more personal for the customer relationship and service with greater added value. About this first use of artificial intelligence (AI) Djingo is developing at Orange Bank in the coming years into virtual economic life a coach anticipates the needs of clients

providing services proactively. This revolution in intelligent computing raises key questions about governance access and personalization of data banking regulatory framework in the field Another field of application is growing rapidly, chatbots for internal use company There are some great ones in this category opportunity to improve internal efficiency, but also to improve the work of employees for example by simplifying them with daily life, two indirectly related factors. Different Sanofi teams in the 2017/2018 season performed several experiments new chatbot services for employees at Sanofi For example, the chatbot prototype has developed to deal with the French language Employee exit processes per person Resource Departments. In the original version, you get a chat to answer the most common and time-consuming HR questions support in France, as a delay, cancellation or modification of leave.

## **Health Care Chat Bots**

Although health care was not the first area where experiments are conducted done with chat bots out, from the beginning of 2018 saw childbirth and experiment with many different ones use cases in this field.

So chat bots try to satisfy a number of needs, such as personal medical monitoring, delivery and transmission of test results, dissemination of information or even advice based on patients or initial diagnosis.

This is in this context and based on the project On the initiative of Sarnoff in collaboration with Orange Health care and the Cape Code we are investigating some practical cases in this white paper healthcare chat bots and their special features in the health sector. The white paper also includes our proposal to evaluate user perception these new digital tools.



It is important to note that despite the emergence of many healthcare chatbots, there are still problems to be solved technology and to use Despite this, there were studies chat bots created, paving the way for gradual technological improvement many needs.

Chat bots are designed to help patients and avoid problems that can occur during regular business hours, such as long wait times or scheduling appointments that don't fit into their busy schedules. With 24/7 accessibility, patients have immediate access to medical care when they need it.

### **Reduce the waiting time**

With AI technology, chat bots can answer questions much faster – and in some cases better – than a human assistant. Chat bots can also be programmed to recognize when a patient needs help the most, such as during an emergency or medical emergency, when someone needs to see a doctor right away.

### **Quick access to critical information**

Medical chat bots can provide patients with this information in a quick and easy way, including information about nearby medical facilities, hours of operation and nearby pharmacies and drugstores to fill prescriptions. They can also be programmed to answer specific questions related to a specific condition, such as what to do during a medical emergency or what to expect during a medical procedure.

### **Offer to help**

Chat bots are a revolutionary way to help patients effectively manage a chronic disease or help visually or hearing impaired patients access important information. They can also be used to determine whether a certain situation is

an emergency or not. In this way, the patient can receive treatment quickly, and this can be helpful in future doctors or nurses.

### **Reduce medical costs**

Reducing costs without compromising service and treatment is difficult. Medical chat bots can help patients avoid unnecessary lab tests and other expensive treatments. Instead of navigating the system themselves and making mistakes that increase costs, patients can let healthcare chat bots guide them through the system more efficiently.

### **Anonymity**

While many patients appreciate the help of a human assistant, many others prefer to keep their information private. Chat bots are considered non-human and non-judgmental, allowing patients to feel more comfortable sharing certain medical information, such as STD screening, mental health, sexual abuse and more.

### **Improve patient satisfaction**

A major concern for healthcare professionals and patients is the ability to provide and receive "human" care via chat bot. Fortunately, with the advancement of artificial intelligence, healthcare chat bots are rapidly developing and have an impressive ability to understand patients' needs and provide them with the right information and assistance. When you use a healthcare chat, the patient provides critical information and feedback to healthcare companies. This allows for fewer errors and better care for patients who may have more complex medical histories. Feedback can help clinics improve their services and improve the experience of current and future

patients. Overall, this information helps healthcare companies improve their care delivery.

### **Set vaccination reminders**

Medical chat bots can remind patients about the need for certain vaccinations. You can get this information by asking the patient a few questions about their travel, occupation and other relevant information. The health care chat can then alert the patient when it is time for vaccination and inform about important vaccinations when traveling to certain countries.

### **Request that the prescription be filled**

Consistency is the key to better things. Medical chatbots can remind patients when it's time to fill prescriptions. But it doesn't end there. These smart tools can also ask patients if they are having trouble filling their prescription, allowing their healthcare provider to address concerns as quickly as possible.

Doctors have also used chat bots in treatment planning.

For example, IBM's Watson for Oncology examines data from documents and medical notes to create an evidence-based treatment plan for oncologists.

Studies have shown that Watson for Oncology cannot yet replace experts, as quite a number of cases disagree. However, it can be an effective decision-making tool in cancer care to standardize treatment. Although not specifically an oncology application, another example of a chat room for doctors.

This is a chat messaging service for health professionals to provide assistance with relevant information about drug use while breastfeeding. Promising progress has also been made in the use of artificial intelligence in radiotherapy

to reduce the workload of radiation personnel or to identify at-risk patients by collecting pre- and post-treatment result.

An ideal chat for health professionals would be able to accurately identify diseases and provide the right recommendations, which are currently limited by time and budget constraints. Continuous algorithm training and updates would be required due to the continuous improvement of current standards of care.

### **Illustrations Of Health Care Chat Bots**

Our study was not designed exhaustive because we only tested them chatbots that were freely accessible. The adding these chatbots to white so the paper is not based on their level quality In our research, we identified chatbots which were in the design phase and some which is already in daily use goals Some of them led scientific publications describe the use health technology in a certain way theme It is important to note that despite the emergence of many healthcare chatbots, there are still problems to be solved technology and to use Despite this, there were studies chatbots created, paving the way for gradual technological improvement many needs. We conducted an online survey to determine how chatbots are used in healthcare around the world, focusing on French and Publications and tools in English.

Patient support The incidence of cancer increases with the number of cancer survivors, partly due to improved treatments and early detection. These individuals have additional health problems, such as infections, chronic diseases, psychological problems and sleep disturbances, which often require special needs that many doctors do not fulfill.

Many of these individuals need support after hospitalization or periods of treatment. Maintaining independence and independence in their home environment is particularly important for the elderly population. The introduction of chatbots can address some of these concerns, such as reducing the burden on the healthcare system and supporting independent living.

So chat bots try to satisfy a number of needs, such as personal medical monitoring, delivery and transmission of test results, dissemination of information or even advice based on patients or initial diagnosis.

## **Medical Information**

looking for answers about the disease and its various types treatment Although these forums and websites enables a lot of experience sharing are data between patients usually does not require inspection for healthcare professionals and is often free of any context that leads to the risk of poverty information or "disinformation". The patient Access to quality medical information it is therefore a big challenge for everyone the process of empowering individuals take responsibility for your health. new technologies and especially chat bots, based on verifiable information adapt to fulfill them perfectly challenging things. Patients who avoid forums for reasons maybe the above needs to be negotiated documentation that sometimes is difficult to understand due to poor health professionals In addition to the offer reliable information that the chat can use language adapted to user level understanding depending on whether the person is a patient or healthcare provider professional In oncology, We Fight has developed a a chat room called that allows breasts cancer patients benefit from monitoring and advice especially about their lifestyle habits and information about them diseases and treatments. Also a chat room offers a

variety of options for patients and with personal service to their families (order option, drug reminders, and so on.). We can also consider an example The chat Lybrate 5 is developed in India. Posted in Facebook Messenger, answer simple health-related questions. It provides patients with quizzes to complete knowledge Then it can call them an Online consultation with a doctor Lybrate website. You may also be interested in this technique to health professionals who often need accurate, verified and references information to help them cope patients Sometimes they run out of time do full searches a mass of heterogeneous information provided by the search engine. Some databases are often difficult to handle, e.g their user interfaces are not very friendly.

## **Prevention**

Many communication tools and campaigns were used for mediation preventive messages. conversational agents can offer many benefits in the field of contraception, including virtual support with advice. For example working on daily eating habits, chat bots can help people follow healthy lifestyles, The Italian Obesity Prevention Study<sup>6</sup> shows. In January 2019 Ramsay General launched a chatbot on your Facebook page. Owned prevention, it enables dialogue three virtual experts depending chosen subject: stress specialist, nutrition expert and specialist in tobacco addiction. Ramsay General Health Foundation presents this chat as a tool that responds to users individually expectations providing custom programs, weekly checks or "alarm" with the user also in complex matters smoking cessation moments. Smart Alfred developed by and available as a beta version Facebook Messenger offers users personal tracking different topics like morality, alcohol, stress... Depending on the user's answers, it push personalized content (recipes, training tips, etc.) and

allows users can compare their answers with their own answers corresponding histories (number of glasses drunk, the morality of the latter days etc.).

Patients who do not participate in health care are three times more likely to have unmet medical needs and twice as likely to delay treatment than motivated patients. Perhaps this is why multi-channel engagement therapy is gaining more traction now than ever before.

A chat bot for healthcare providers effectively bridges communication and training. Automating chat interactions builds trust with patients by providing timely answers to questions and providing health education.

AI-powered patient chat bots in healthcare provide immediate, accurate and precise information to potential and current patients to improve patient care and services. The use of chat bots in health care helps patients to consult a doctor with serious problems. Healthcare chat can act as an all-in-one solution that answers all common patient questions in seconds.

Many healthcare providers are modifying their FAQs to include an interactive healthcare service that answers common questions from users. It helps people get instant answers to common questions. A well-designed health care chat can book appointments based on the doctor's availability. Chat bots can also be designed to interact with CRM systems to help medical professionals keep track of each patient's visits and follow-ups, saving information for future reference.

AI medical chat can also be used to collect and process payments to streamline the process. One of the key aspects of healthcare is increasing admissions. For healthcare facilities, medical chat bots are the best choice

when it comes to increasing enrollment and awareness of different types of programs.

A well-built healthcare chat with natural language processing (NLP) can understand user intent through sentiment analysis. Based on understanding the user's input, the bot can recommend suitable health plans.

### **Secure Transactions**

After the transaction is recorded, its authenticity must be verified by the blocking system. Once the transaction is confirmed, it is added to the blockchain. Each block in the blockchain has a unique hash and a unique hash of the previous block. Therefore, the block cannot change if the network has confirmed them.

### **Pre-diagnosis and Referral**

Sometimes it takes a long time to get it doctor visits, especially in in certain places where they are almost absent no doctors. If patients have a new symptoms, they want to understand quickly why Web searches often produce multiple and sometimes unreliable results. Patients can I feel confused and don't know where to go to go to the emergency room, for example room for some sickness. To overcome this, several chat bots have been developed to give answers and guide the patient the right direction. For example MedWhat7 chat room, developed by the United States for health professionals are used diagnose relatively mild illnesses (colds,sore throat, nausea, etc.) and refer patients to a health professional meeting if necessary. One time the diagnosis was proposed, must be the doctor confirmed. This technique This way you avoid a long wait, and speed up patient referrals relevant health structures. In China, Melody, the chat room inside Baidu Doctor app<sup>8</sup>, save analyzing the time it takes for a doctor to make a diagnosis the patient's symptoms before



making an appointment and visiting a doctor at the initial diagnosis he has to make then confirm. The doctor is accessible medical information during the patient Time can be booked directly through chat room This example is good example of the role of this technology play in organizing a doctor's appointment: pre-prepared interviews allow must be determined by the patient better that they get treatment faster, what leaving more time for personal exchanges between patient and health professional Patients are referred to family physicians or local urologists if they have an elevated non-instrumental prostate-specific antigen (PSA), abnormal digital rectal examination (DRE), or abnormal imaging suggestive of PCa. Patients are seen by one of five urologists and assessed for prostate cancer risk within two weeks of referral. If the biopsy is justified, it is also done in the clinic within two weeks. The results of the biopsy are given within two weeks after the biopsy, and in the case of a cancer diagnosis, the patient reaches both urology and radiation oncology within a week (if necessary, local examinations are arranged). During the diagnostic journey, the patient is supported by our specialist nurse, clinical coordinator and volunteers from the Canadian Prostate Cancer Network. For each of the 12 questions, we used logistic regression models in turn to test the association between rapid referral and subsequent treatment experience. After describing the proxy measures, we examined three different models for each question and first estimated the crude (unadjusted) probability of a negative experience; then odds for an adverse experience adjusted for patient characteristics (age, sex, and ethnicity) and cancer diagnosis; and finally, the probability of an adverse experience adjusted for each patient's overall response to treatment, in addition to patient characteristics and cancer diagnosis. Response bias is a construct often investigated in patient-reported outcomes. It aims to capture potential differences in critical response tendencies between individuals. Adjustment for response bias reduces the possibility that apparent associations may be due to participants systematically over- or under-

responding in both outcome (ie, treatment experience) and exposure (ie, number of consultations) measures. critical than the average respondent. To create a measure of response propensity for each patient, we matched their responses to each individual question with up to nine other questions, as described in Appendix 2. Essentially, this approach adjusts reported experiences to group more or less critical responses. Among individual respondents. In a further analysis, we examined a "dose-response" relationship (i.e, whether a higher number of consultations was associated with a less positive experience). We did this by considering each of the four consecutive categories of pre treatments that were included as possible responses to the relevant survey item (i.e, "once," "twice," "three or four times," and "five or more times") .

## **Hospital and Outpatient Care**

In the preparation of the consultation a for telephone counseling or outpatient assistance hospitalization; regardless of nature by appointment, at the doctor's office or at the reception the structure must collect data per patient. This information can be administrative or medical: medical history, current treatments and the reason for the hearing... or something else information needed for smoothness making an appointment Therefore tool like the chat can provide this information in advance or even briefly analysis readable quickly and understood A number of chat bots have been developed facilitates the treatment of ambulatory patients and making appointments experts 10. For example, the Medical solution allows for post-ambulatory follow-up to patients via text message via simple chat which replaces the next day's call. This allows you to monitor the patient during release to health professionals and avoid patients are too bothered afterwards their return home. The Bot Design chat is live now tested at the American Hospital in Paris obstetrics in the department of anesthesia Hospitalization requires overnight hospitalization. Patients must

stay at the facility where their procedure was performed (which is usually a hospital) for at least one night. During this time, they are under the supervision of a nurse or doctor. Patients receiving outpatient treatment do not need to stay overnight in the hospital. They have the right to leave the doctor, polyclinic or hospital after the procedure is finished. Sometimes they have to wait for the anesthesia to wear off or to make sure there are no complications. As long as there are no serious complications, patients do not need to stay under observation overnight. First, patients can recover in the comfort of their own homes. Instead of being in an uncomfortable bed and sterile room, they can find a comfortable position on their sofa, chair or bed and enjoy the activity of their choice. They can even enjoy their own food instead of hospital food. (Of course, no activity or food should conflict with the restrictions given by the health care provider.) Second, outpatient procedures almost always cost less than equivalent inpatient treatments. Staying in the hospital for observation is not cheap, and patients can save a lot by recovering at home instead of in a hospital room. Even patients with good health insurance can still see significant savings when they choose an outpatient facility over an inpatient facility. In many cases, the difference between outpatient and inpatient care is thousands of dollars. Thanks to the development of medical techniques and technology, many treatments, such as physical rehabilitation, can be performed on an outpatient basis. Some minor operations can also be performed on an outpatient basis. However, major surgeries, such as joint replacements, which must be performed by an orthopedist, require hospitalization. However, many procedures no longer require an overnight stay. If you need treatment or surgery, contact Iconic Bay Medical Center to find out if outpatient care is right for you. If so, choosing an outpatient procedure can save you hundreds or thousands of dollars. The hospital's outpatient clinic offers diagnosis and treatment for patients who do not need to stay overnight. Wards are sometimes called outpatient clinics, but they are different from freestanding clinics, almost

all of which are designed primarily or exclusively for ambulatory care and may also be called outpatient clinics. The outpatient clinic is an important part of the general operation of the hospital. It is usually integrated with hospital services and employs consultants and surgeons who also treat inpatients. Many patients are examined and treated on an outpatient basis before being later referred to a hospital for inpatient care. After discharge, they can visit the outpatient clinic for further treatment. The outpatient clinic is usually located on the first floor of the hospital, with parking spaces nearby.

security. However, it also means that you have no real control over who manages or edits the Bitcoin code. Therefore, anyone can suggest changes or improvements to the system.

### **Support for chronic diseases**

Maritime Technical University Kuala Lumpur, Malaysia, e.g. developed a chatbot called ViDi12 (Virtual Grocer) who introduces himself as a virtual nutritionist to support people with diabetes. Regular discussions with ViD during which the chat asks the patient several questions have it offered to the patient along with appropriate dietary recommendations. Especially this one can make it more regular according to recommendations and ultimately improve the patient's condition health so that patients can monitor their health in the last weeks of pregnancy from home and get ready for hospitalization. Chat bot sends questionnaires for patients to collect data of their health, it offers structured by health professionals synthesis and allows control appointment scheduling, patient referral and transfer of medical records among health experts. The second test is ongoing at Toulouse University Hospital geriatric oncology 11. However, there are only a few examples of chat bots in hospitals and outpatient departments. In France, this is mainly because to the number and complexity of IT tools already used in hospitals, but mainly their

diversity Our research has shown that there is a strong tendency to use chat bots in the field of mental health and that there is many scientific publications on the subject. Developed TeenChat<sup>13</sup> chat bot test in Xi'an Jiaotong University, China showed that adolescent patients suffer stress uses these types of tools regularly and is more honest about his feelings when you chat with chat like then to a psychiatrist or psychotherapist. Corresponding scientific article emphasizes their familiarity with the new technologies, but also daily monitoring which calms and supports patients their state. In Sweden, a chat room called Shim<sup>14</sup> offers support for mental well-being accessible people. equivalent the research paper concludes that it is for mental health, it's worth using chat bots. As in the previous example, personal discussion is very welcome patients Australian Health Research Centre.

### **Compliance and Information on treatment**

The doctor works as a detective. The more detailed the patient's medical history, the more accurate his diagnosis and treatment. Chatbots can ask patients simple questions to gather important information such as their name, symptoms, medical history and insurance information. As their tests and treatment progress, you can update their details in your system. So, when your doctors bring a patient file, they have a clear picture of their medical history. Medical chatbots use artificial intelligence, natural language processing and machine learning to provide smarter, more natural responses. Their training information includes disease symptoms, diagnoses, markers and treatment protocols. This way your chat room can screen patients at an early stage and isolate those who need urgent treatment and can take care of themselves. You can provide patients with enhanced recovery support and make necessary medical and nutritional recommendations based on their vital statistics and health goals. It can even help your doctors answer questions and more efficiently prescribe the medications, doses, and refills you need in real time. Chatbots save your

patients the stress of wandering from department to department in your facility asking what to do. They ask your users about their health concerns to find you the right doctors and show you their schedules. After that, you can choose the free time that suits you. Chatbots can even send reminders about your upcoming appointments. Mental health chatbots can help fill this gap with cognitive behavioral therapy (CBT). As a result, patients suffering from depression, anxiety or other mental health problems can now find a virtual shoulder to lean on. You can train the chat bot to recognize subtle changes in a patient's speech patterns before responding. Then, if it detects that the patient has a serious problem, it can automatically alert its human therapist or ask the patient to call a helpline. We all know that dealing with insurance paperwork in the midst of a health crisis is stressful. Health services can find nearby medical services or where to seek a specific type of treatment. For example, a person with a broken bone may not know whether to go to a clinic or a hospital emergency room. Medical chatbots can direct patients to the right treatment. They can also direct patients to the most appropriate facility based on public transportation, traffic and other considerations.

9. Provide information on Covid or other public health issues

Medical chatbots can provide information on public health issues such as COVID, influenza, and measles. Indeed, recent years have shown how healthcare chatbots have been used to help healthcare professionals without putting them at risk, including

- Referral of patients with severe symptoms to health facilities with staff and beds
- Provides 24/7 information on COVID-19 updates and symptoms, as well as answers to frequently asked questions
- Planning the next vaccinations and finding the nearest vaccination clinic
- Provides mental health support to cope with pandemic stress
- Managing public health during global pandemics

Prediction of inflammation or disease requires analysis of various parameters and symptoms. And during a global pandemic, when a life-threatening virus spreads rapidly, people want to contact their family doctor first. However, handling the flow of

inquiries and arranging appointments with people suffering from the symptoms is difficult. Creating a virtual agent to provide these services can make the process safe, easy and efficient. Patients can simply share their symptoms and the robot can analyze them to provide necessary information or train them on procedures. If the condition is serious, he can take the matter to the representative of the people or ask for relief. Support Clinics at Point of Care Virtual assistants help doctors retrieve medical information in real time. It contains a list of the active ingredients in the medicines and recommended alternatives to prescription medicines. This makes it much easier and faster for doctors to prescribe a specific drug with the correct doses and medication instructions. Assisting patients in self-care or in the emergency room Many patients now rely on digital assistants to remind them to take their medications on time and provide personalized nutritional information. They are fully equipped to monitor patients' vital statistics, monitor their health status and provide appropriate health recommendations. In addition to keeping patients committed to their health goals, they can also identify patients who need urgent medical attention. They forward all transcripts of the conversation to doctors so patients don't have to repeat themselves and get the help they need. when they need it most! Management of chronic disease care Digital assistants are an advantage in care management. They help deliver important information to patients suffering from chronic diseases. For example, if a patient is undergoing a colonoscopy, the robot will provide the patient with educational materials and answer any questions or concerns they may have about the procedure or disease. The purpose of introducing these robots is to prepare patients for surgery and reduce the number of invasive medical procedures that are canceled at the last minute. These chat agents also play an important role in oncology care by sharing relevant tips with patients undergoing chemotherapy. In addition, they even advise caregivers and family members on how they can help their loved ones fight cancer. Even health plan providers are using bots to

help customers understand policy member benefits. Providing secure access to health information They can be integrated with your existing EMR/EHR systems that store, share, manage and maintain patient health information. The doctor or patient can then securely access these documents when needed.

Processing of invoices and claims When your patients are ready for payment processing, the last thing you want to do is keep them waiting. A virtual assistant is always available and, when integrated with your practice's billing system, can securely manage inventory and collect payments. Collecting patient feedback The goal of every medical practice is to provide the best possible care to patients. Such intelligent bots are the best way to collect anonymous patient feedback for continuous improvement, ultimately contributing to patient satisfaction.

Providing mental health support Digital assistants developed for mental health are trained to provide cognitive-behavioral therapy (CBT) to people suffering from anxiety, depression and post-traumatic stress disorder (PTSD). They can also train autistic patients using their social skills using text, cameras and microphones. Robots have been successfully used to conduct meditation sessions and dialectical behavior therapy (DBT).

Requesting prescription refills Interactive agents are designed to fully collect patients. From their contact information and current doctor to their last physical visit and prescription information. All this information is transmitted to the doctor to facilitate clinical decision-making and the smooth processing of prescriptions. It also allows the doctor to contact patients when refills are available and to automate refills in some cases where no intervention is required.

Access to test results An interactive agent can authenticate web visitors and connect them to external systems to provide secure and timely access to sensitive medical information, such as test results. Just make sure it's a HIPAA-compliant chat room. By the end of this project, we hope that the proposed chat can fulfill a advisory service to the user in some areas. So that this chat can help people who have difficulties accessing counseling services.



In other words, it enables the user can access the self-help information for free. Let's hope that the chat the advisory service can more easily and conveniently provide help to those in need. In addition, the user can experience the counseling service before going to the person advisor. It helps the user to think and consider if they really need a like a human counselor or they just want a way to relieve their stress and anxiety. That's why it becomes a human counselor who provides services to those in need and prevents a waste of human resources in the field of mental health. Also this chat can be useful for those who are disabled or unable to type words about yourself. Since this chat accepts either text or voice input, This allows the chat rat to serve more people, including those who have difficulty writing or speaking. Regardless, this chat can always advise the user and where they are. This chat can act as first aid for user's emotional problem. It can help the user whether or not his bad mood hits him at any time at a psychological clinic near where he lived. The disadvantages of most chatbots are the lack of generality and variety in styles. (Woudenberg, A.V, 2014). If the chat is built using some API, for example Facebook Message Bot, the user can get the same answer again and again if they keep asking the chat the same things. I don't say it when the user enters something the chat never knows before, the chat doesn't know its meaning of the word and you cannot answer correctly. A chatbot that responds in kind the answer may be applicable to other fields, but may not be suitable for bidding mental health counseling service for people. Offer more diverse content from the chat response, we use deep learning to train the chat that the chat more accurately recognizes the meaning of words and can give a relative answer. Most of the existing chatbots offering mental health services in the market there are text-based communications such as Woebot and Wysa. Only the user can interact with the chat by sending a text message or selecting appropriate options provided by chat. The user must do additional work, such as importing a library system if they want a chatbot to talk to them. It will be very difficult

for those without relevant knowledge. Offered chat, there there is no need to disturb the user, because voice-based communication is built chat room All the user has to do is select audio or audio input only We really hope this chat can help different people especially for those who have hearing and visual difficulties after the chat provide both voice and text-based communication. In addition, it can be an advantage when the chat rat has more opportunities to communicate to provide better service to people. According to the World Health Organization (WHO), mental health can be defined as follows "Health is a state of complete physical, mental and social well-being and more the absence of disease or disability." (WHO, 2018) As we know, life does not always go well. There are always ups and downs in our lives. But not everyone can handle stress well, when the trouble reaches them. At that time, they are encouraged to seek help his mental health problems. However, not everyone is lucky enough to have the right to spiritual access health services Community-based mental health care is also rare for poor people lands; approximately 52% of poor countries provide community-based mental health care programs, compared to about 97% in high-income countries (Saxena et al, 2007). to take bad financial problems are not the only obstacle they encounter in their search medical help Limited availability of mental health medications and health professionals in the field of health care, their country makes the scenario even worse. The purpose of creating this chat room is to provide mental health services people at no cost. The service can be delivered to them anywhere and whenever they are. They only need a device that can connect to the Internet and then at least people have an easier way to relieve stress and anxiety. The disadvantages of most chat bots are the lack of generality and variety in styles. (Woudenberg, A.V, 2014). If the chat is built using some API, for example Facebook Message Bot, the user can get the same answer again and again if they keep asking the chat the same things. I don't say it when the user enters something the chat never knows before, the chat doesn't know its meaning of

the word and you cannot answer correctly. A chat bot that responds in kind the answer may be applicable to other fields, but may not be suitable for bidding mental health counseling service for people. Offer more diverse content from the chat response, we use deep learning to train the chat that the chat more accurately recognizes the meaning of words and can give a relative answer. Implement verbal and text communication between people and chat speech recognition and synthesis systems. a. Speech recognition is enabled for recognition in this chat human voice input and convert it to text. At the same time, chat should be able to convert a text response into audio via speech synthesis ii. Developing a mental health chat that can provide similar answers according to the input, text or voice of which person. a. This chat recognizes the meaning of the words you type people and print. This chat recognizes the meaning of the words you type people and print the corresponding answers. It avoids giving repeated reactions to people even though it perceived the same meaning from the words of the conversation. In addition, it can also be a chat room recognizes the emotions of the user's voice input and forms a relative to answer By the end of this project, we hope that the proposed chat can fulfill a advisory service to the user in some areas. So that this chat can help people who have difficulties accessing counseling services. In other words, it enables the user can access the self-help information for free. Let's hope that the chat the counseling service can provide help to those in need more easily and conveniently. In addition, the user can experience the counseling service before going to the person advisor It helps the user to think and consider if they really need a like a human counselor or they just want a way to relieve their stress and anxiety. That's why it becomes a human counselor who provides services to those in need and prevents a waste of human resources in the field of mental health. Also this chat can be useful for those who are disabled or unable to type words about yourself Since this chat room accepts text or voice input, This allows the chat rat to serve more people, including those who may have

difficulty writing or speaking. However, this chat can advise the user at any time and where they are. This chat can act as "first aid" for a user's emotional problem. It can help the user whether or not his bad mood strikes at any time a psychological clinic near where he lives · The disadvantages of most chatbots are a lack of generality and variety in styles. (Woudenberg, A.V, 2014). If the chat is built using some API, for example Facebook Message Bot, the user can get the same answer again and again if they keep asking the chat the same things. I don't mean when the user enters something the chat never knows before, the chat doesn't know its meaning of the word and you cannot answer correctly. A chatbot that responds in kind the answer may be applicable to other fields, but may not be suitable for bidding mental health counseling service for people. Offer more diverse content from the chat response, we use deep learning to train the chat that the chat more accurately recognizes the meaning of words and can provides a relative answer Most existing chatbots that offer mental health services in the market there are text-based communications such as Woebot and Wysa. Only the user can interact with the chat by sending a text message or selecting appropriate options provided by chat. The user must do additional work, such as importing a library system if they want a chatbot to talk to them. It will be very difficult for those without relevant knowledge. Offered chat, there there is no need to disturb the user, because voice-based communication is built chat room All the user has to do is select audio or audio input only We really hope this chat can help different people especially for those who have hearing and visual difficulties after the chat provide both voice and text-based communication. In addition, it can be an advantage when the chat rat has more opportunities to communicate to provide better service to people. According to the World Health Organization (WHO), mental health can be defined as follows "Health is a state of complete physical, mental and social well-being and more absence of illness or injury." (WHO, 2018) As we know, life does not always go well. There are always ups and

downs in our lives. However, not everyone can withstand stress. well, when the trouble reaches them. At that time, they are encouraged to seek help his mental health problems. However, not everyone is lucky enough to get access to life health services Community-based mental health care is also rare for poor people lands; approximately 52% of poor countries provide community-based mental health care programs, compared to about 97% in high-income countries (Saxena et al, 2007). to take bad financial problems are not the only obstacle they have to face in their search medical help Limited availability of mental health medications and health professionals in health care, their country makes the scenario even worse. The purpose of creating this chat room is to provide mental health services people at no cost. The service can be delivered to them anywhere and whenever they are. They only need a device that can connect to the Internet and then at least people have an easier way to relieve stress and anxiety. The project manager (PM), IT architect and business analysts must be involved first, and then the scope of the project must be defined. I suggest you build a healthy chatbot app for web, Android and iOS. You need to decide on the functions you want to provide for health services, such as informing patients, providing first aid, scheduling appointments, etc. I recommend you follow an agile approach for this project because you can add new features to your websites and mobile apps frequently. Scrum is a proven technique for managing agile projects, so I suggest you create a scrum team with the PM acting as the scrum master. This AI-powered bot and associated API enable the implementation of basic healthcare chatbot functionality. it complies with strict health regulations such as HIPAA. Machine learning algorithms taught the robot medical terminology, symptoms, medications, etc. and this includes conversational AI. Medical chatbots can simplify the claims process and save patients the hassle of complicated procedures. Healthcare chatbots understand natural language and can be trained to help patients file complaints, check available coverage and track an application. This provides patients with an easy

gateway to find relevant information and helps them avoid repeated calls to healthcare providers. Additionally, healthcare providers can provide physicians with easy access to patient information and surveys, making it convenient for them to pre-authorize billing payments and other requests from patients or healthcare facilities. Medical chatbots offer the convenience of having a doctor always available. . With 99.9% uptime, healthcare professionals can rely on chatbots to help and communicate with patients when needed and provide answers to their questions at any time. Therapeutic chatbots designed for mental health provide support for people suffering from mental health problems. These chatbots are not intended to replace licensed mental health professionals, but rather to complement their work. Cognitive behavioral therapy can also be practiced to some extent through chatbots. Patients benefit from health services that remind them to take their medications on time and monitor adherence to the treatment plan. They can also provide valuable information about drug side effects and possible precautions to be taken before use. This chatbot model provides information about the availability of doctors and allows patients to choose an appointment. There is some awkwardness in sex education, but learning about sexual health is very important. This chat will help you do just that! Use the Sex Education in your educational institution or health center to inform young people and other visitors about safe sex. It is a simple online chat for dentists that helps book appointments and introduce different services and procedures. This chat also helps generate leads. This chatbot template collects patient reviews after they have used your healthcare services. You can use this chatbot template to share coupon codes with customers and prospects. This Messenger funnel is designed for massage therapists and physical therapists, but can easily be adapted for other therapists! You can even use a therapist assistant bot to manage appointments etc without human intervention. Health insurance is one of our most important investments. This health insurance bot guides your customers from understanding the basics

of health insurance to getting a quote. This fitness chat offers healthy recipes and shares solutions to everyday health problems. It also monitors your general health by periodically asking questions. You can use it at your health center for follow-up care. The uptime of chatbots is 99.9%. That way, healthcare providers can use a chat room dedicated to answering patients' most common questions. Insurance-related questions such as policies, benefits, documentation, symptoms, opening hours and quick solutions can be relayed to patients via a chatbot.

Top 20 Health Services in the World

- Babylon Health - Provides medical consultations and health assessments
- Smart - Connect with healthcare providers and help patients manage chronic conditions
- Boiju Health - Symptom Control Chat
- Woebot Health - Uses cognitive behavioral therapies to help patients with mental health issues
- ADA Health - Provides personal health assessments
- Your.MD - Provides personal health information
- Florence - Medication Management Chatbot
- Infermedica - a symptom-monitoring chat that connects patients to various health services
- Medwhat - Offers personalized health advice
- HealthTap - Connects patients with doctors for consultations
- K Health - Personalized diagnostic and treatment recommendations
- Lemonaid Health - Online doctor consultations and prescriptions
- Medici - Consult doctors for consultations and appointments
- Lark Health - Personal health coaching for chronic conditions
- PactCare - personal support and guidance
- HealthJoy - Provides information on health care benefits and provides cost-saving recommendations
- 1mg - Ordering Medicines Online
- Symptom - Chatbot to check symptoms
- Tava Health - mental health chatbot
- Zocdoc - Book appointments with healthcare providers

Now that you know where you can use a Healthcare Chatbot and most importantly why you should use it, you also need to know how to build one. With Engat, you can easily create a chat room

## 1.2 Machine Learning

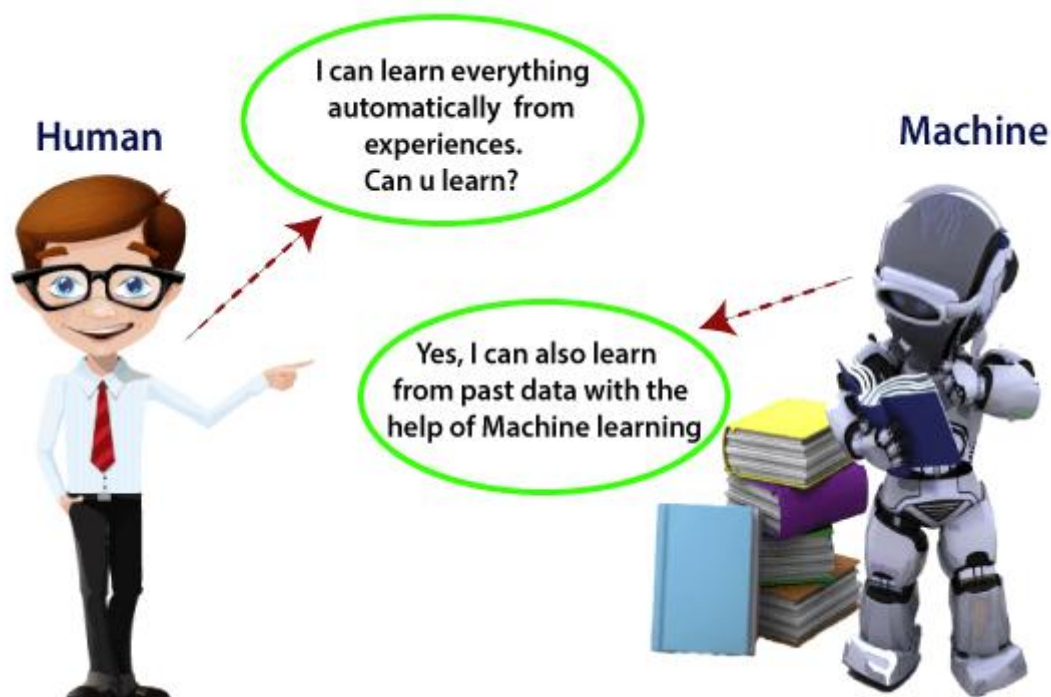
Machine learning (ML) is a field devoted to understanding and building methods that allow machines to "learn," that is, methods that use data to improve computer performance on various problems. It is seen as a broad field of artificial intelligence. Machine learning algorithms build models based on sample data, called training data, to make predictions or decisions without precise planning. Machine learning algorithms are used in many applications, such as medicine, email filtering, word recognition, agriculture, and computer vision, where it is difficult or impossible to develop conventional algorithms to perform the required tasks. Part of machine learning is closely related to computational statistics, which uses computers to make predictions, but not all machine learning is a statistical study. The study of mathematical optimization provides methods, theories, and practical applications for machine learning systems. Data mining refers to research that focuses on the analysis of survey data through unsupervised learning.

Some machine learning processes use data and neural networks in a way that mimics the way the biological brain works. When applied to business problems, machine learning is also called predictive analytics. Learning algorithms are based on the likelihood that strategies, algorithms, and benchmarks that have worked well in the past will continue to work well in the future. This reference can sometimes be explicit, such as "every day for the last 10,000 days the sun will rise and rise tomorrow." Sometimes they can be more nuanced, like:  $X\%$  of birds have geographically distinct species and colour patterns, so there's a chance  $Y\%$  of blackbirds are undiscovered.

Machine learning applications can do this without explicit programming. This involves computers learning from data to perform certain tasks. For a simple task given to a computer, it is possible to program an algorithm that tells the



machine how to perform all the necessary steps to solve the problem at hand; no computer training required. For more advanced problems, it can be difficult for humans to create the necessary algorithms by hand. In practice, it may be more efficient to help the machine develop its own algorithm instead of having a human programmer determine the necessary steps. Machine learning techniques use a different approach to teach computers to perform tasks for which no algorithm is satisfactory. If there is a large number of possible answers, it is important to mark some of the correct answers. It can then be used as training data for computers to improve the algorithm(s) used to determine the correct answer. For example, the MNIST dataset of handwritten digits is often used to train systems for digital character recognition problems.



*Figure 1.2.1. Machine Learning*

## **Features of Machine Learning:**

- Machine learning uses data to detect various patterns in a given dataset.
- It can learn from past data and improve automatically.
- It is a data-driven technology.
- Machine learning is much similar to data mining as it also deals with the huge amount of the data.

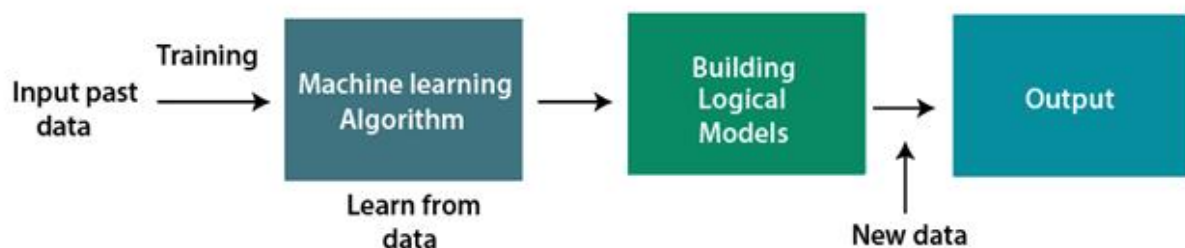
The need for machine learning is increasing day by day. The reason behind the need for machine learning is that it is capable of doing tasks that are too complex for a person to implement directly. As a human, we have some limitations as we cannot access the huge amount of data manually, so for this, we need some computer systems and here comes the machine learning to make things easy. We can train machine learning algorithms by providing them the huge amount of data and let them explore the data, construct the models, and predict the required output automatically. The performance of the machine learning algorithm depends on the amount of data, and it can be determined by the cost function. With the help of machine learning, we can save both time and money. The importance of machine learning can be easily understood by its uses cases, Currently, machine learning is used in self-driving cars, cyber fraud detection, face recognition, and friend suggestion by Facebook, etc. Various top companies such as Netflix and Amazon have built machine learning models that are using a vast amount of data to analyse the user interest and recommend product accordingly.

Following are some key points which show the importance of Machine Learning:

- Rapid increment in the production of data
- Solving complex problems, which are difficult for a human

- Decision making in various sector including finance
- Finding hidden patterns and extracting useful information from data.

Suppose we have a complex problem, where we need to perform some predictions, so instead of writing a code for it, we just need to feed the data to generic algorithms, and with the help of these algorithms, machine builds the logic as per the data and predict the output. Machine learning has changed our way of thinking about the problem. The below block diagram explains the working of Machine Learning algorithm:



*Figure 1.2.2. Working of Machine learning*

## Classification of Machine Learning

At a broad level, machine learning can be classified into three types:

1. Supervised learning
2. Unsupervised learning
3. Reinforcement learning

## Supervised Learning

Supervised learning is a machine learning technique where we provide the machine learning system with specific data to train it and based on that, it predicts the output. The system creates a model by using the given data to

understand the database and learn each data, after training and processing, we test the model by providing sample data to see if it predicts the correct output. The purpose of supervised learning is to map input data to output data. Supervised learning is based on supervision and it is as if students learn things under the teacher's supervision. An example of supervised learning is spam filtering. Supervised learning algorithms can be divided into two categories:

- Classification
- Regression

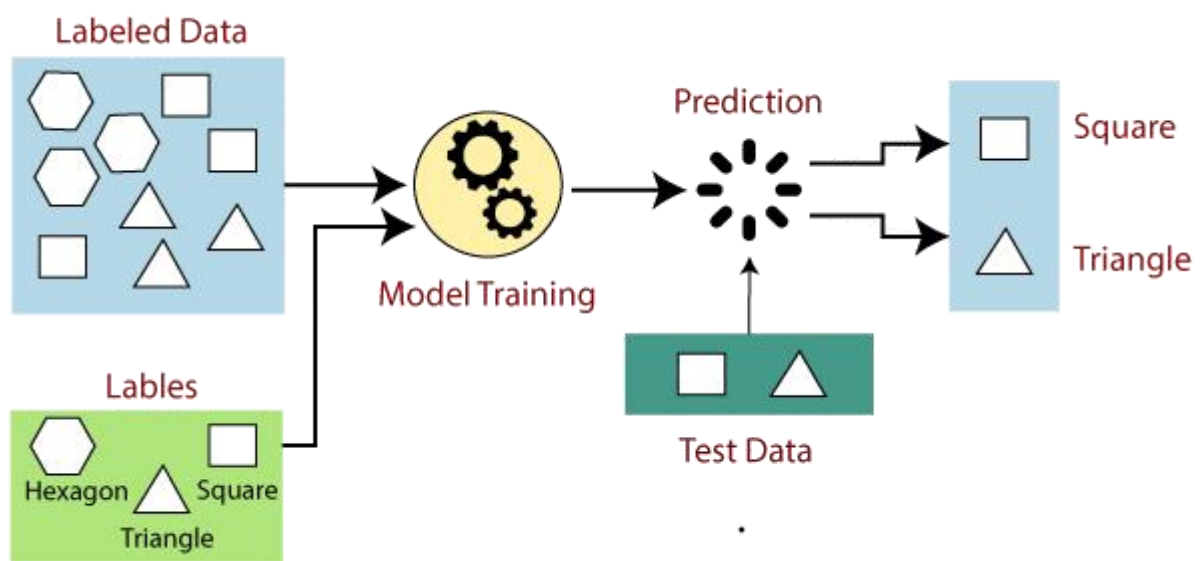


Figure 1.2.3. Supervised Machine Learning

## Unsupervised Learning

Unsupervised learning is a learning technique where the machine learns without supervision. Training is given to the machine with a set of unlabelled, unclassified, or uncategorized data, and the algorithm must act on the data

without any control. The purpose of unsupervised learning is to change input data into new features or groups of objects with similar patterns. In an uncontrolled study, there are no predetermined outcomes. The tool tries to find useful insights from large amounts of data. Algorithms can further be divided into two categories:

- Clustering
- Association

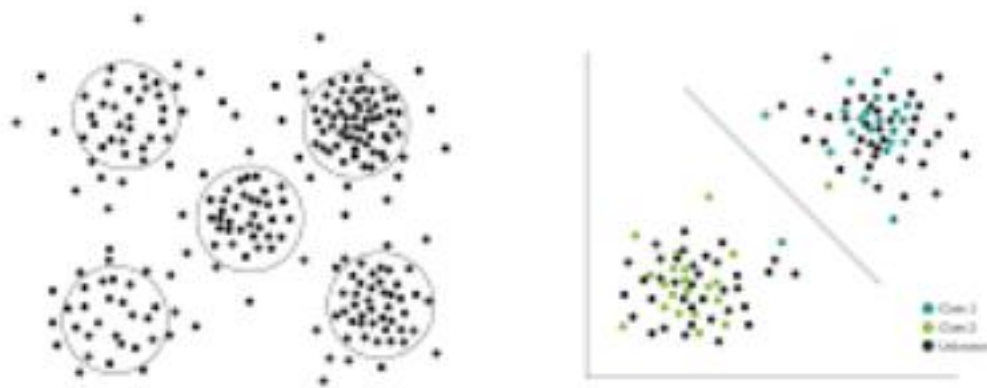


Figure 1.2.4. Unsupervised Machine Learning

## Reinforcement Learning

Reinforcement learning is a learning technique based on feedback where the learning agent receives a reward for every correct behaviour and a punishment for every wrong behaviour. Agents automatically learn and improve their performance with this feedback. In reinforcement learning, the agent interacts with the environment and learns about it. The agent's goal is to earn the most reward points and thus improve his performance. A robotic dog that

In reinforcement learning, programmers design a method to reward desired behavior and punish negative behavior. This method assigns positive values to desired actions to encourage the agent and negative values to unwanted behaviors. It programs the agent to seek the optimal solution in the long run and the maximum total reward. These long-term goals help prevent the agent from stopping at smaller goals. Over time, the agent learns to avoid the negative and look for the positive. This learning method was adopted in artificial intelligence as a way to control unsupervised machine learning through rewards and punishments.

Although reinforcement learning has attracted much interest in the field of artificial intelligence, its widespread adoption and application in the real world has been limited. However, having said that, there is a lot of research on theoretical applications and there are successful use cases.

Reinforcement learning can work in a situation as long as a clear reward can be applied. In enterprise resource management (ERM), reinforcement learning algorithms can allocate limited resources to different tasks as long as there is an overall goal it is trying to achieve. In such a situation, the goal would be to save time or save resources. In robotics, reinforcement learning has achieved limited trials

. This type of machine learning can give robots the ability to learn tasks that a teacher cannot demonstrate, adapt learned skills to a new task, or achieve optimization even when no analytical formulation is available. Reinforcement learning is also used in operations research, information theory, game theory, control theory, simulation-based optimization, multi-agent systems, swarming, statistics, and genetic algorithms.

## 2.System Design

### 2.1 Overview

Based on the project scope that we have mentioned, the module in the proposed app in Figure

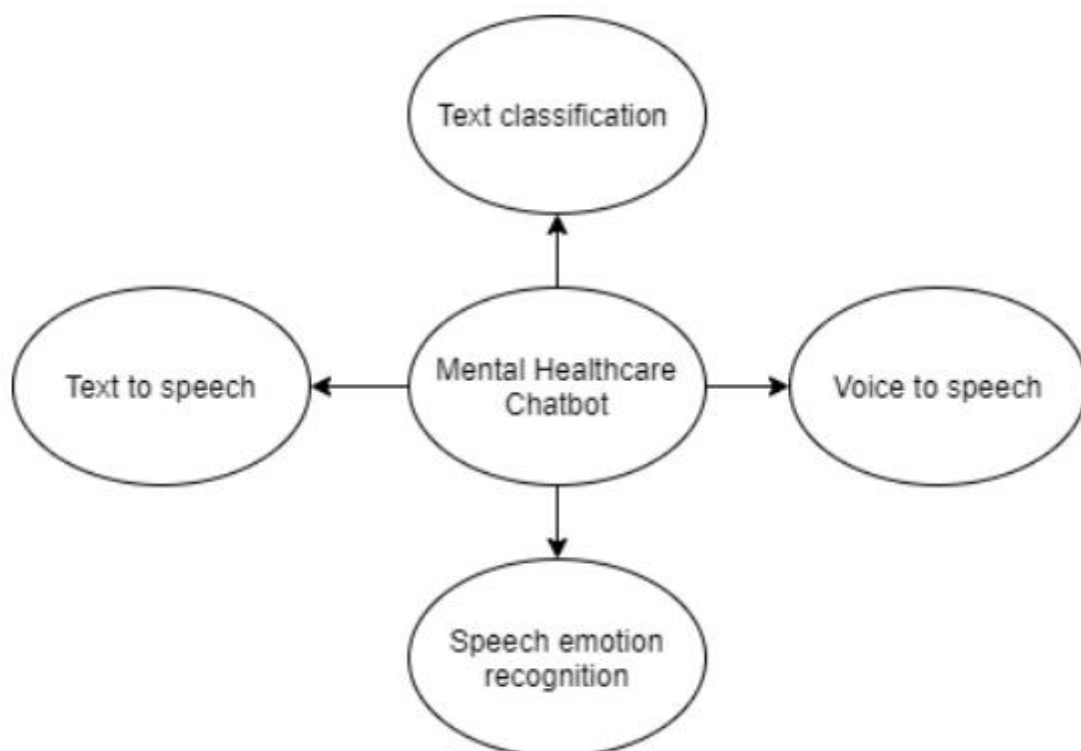


Figure 2.1.1 Modules in the Mental Healthcare Chat bot

## 2.2 Activity Diagram

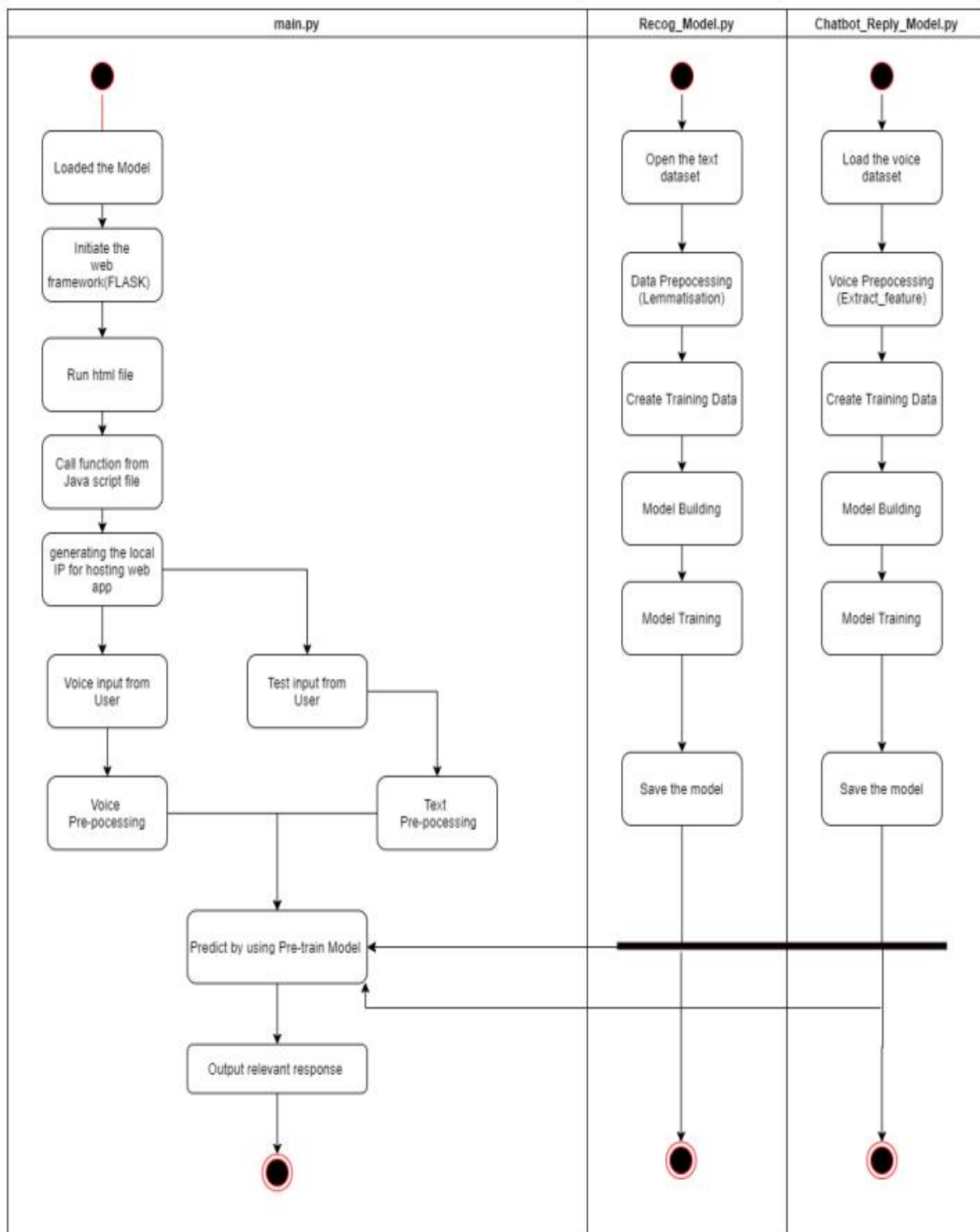


Figure 2.2.1: Activity diagram for chat bot



## 2.3 Flow Chart

The proposed chat takes input from the user either as a text or voice message according to If the input is in audio format, it must use it to convert the audio input to text Speech to Text Technology (STT) before performing any process. After that text entry first go through natural language processing (NLP) as a stem and is further improved with the front-train model. After that, the response text is printed based on the predicted outcome. The output text is converted to audio format using Text-to-speech (TTS) technology. The chat also responds to the user in text form of sound At the same time, the chat also records the user's voice etc Deal with it. If the result is negative emotions such as sadness and anger, the chat will also send a corresponding reply.

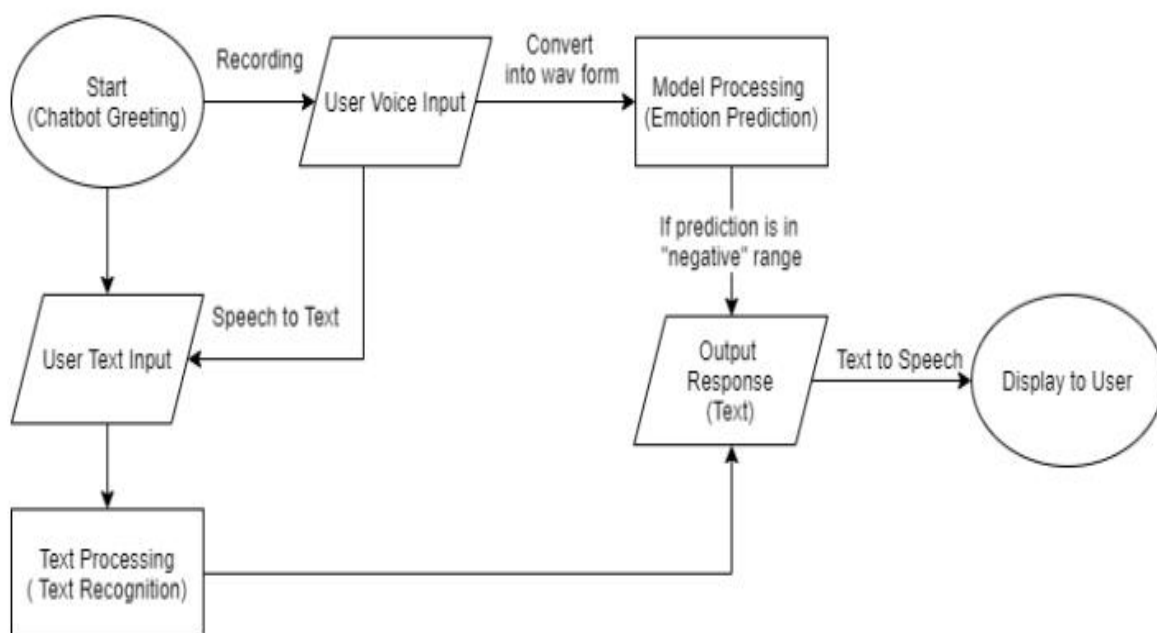


Figure 2.3.1 Flow Chart of Chat bot

## 2.4 Timeline

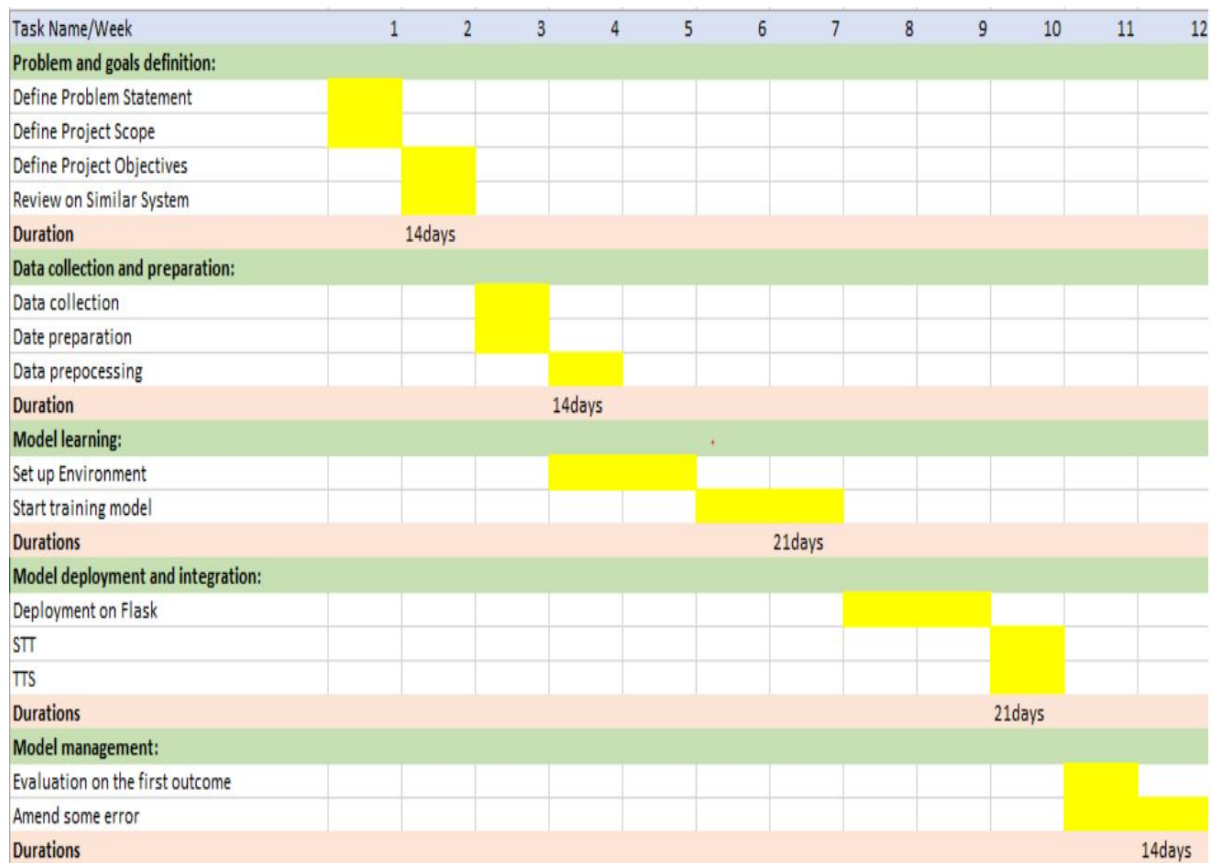


Figure 2.4.1 Timeline

## 3. System Implementation

### 3.1 Overview

The proposed chat bot is developed by following the machine learning model development process. In this chapter, the methodology and tools that are applied to the modules of the chat bot will be discussed here. Modules kindly refer to figure 3.1.1.

### 3.2 Methodologies

#### Machine Learning Model Development Process

The proposed chat bot is development by following the procedures of the machine learning model.

#### Machine Learning Model Development Process

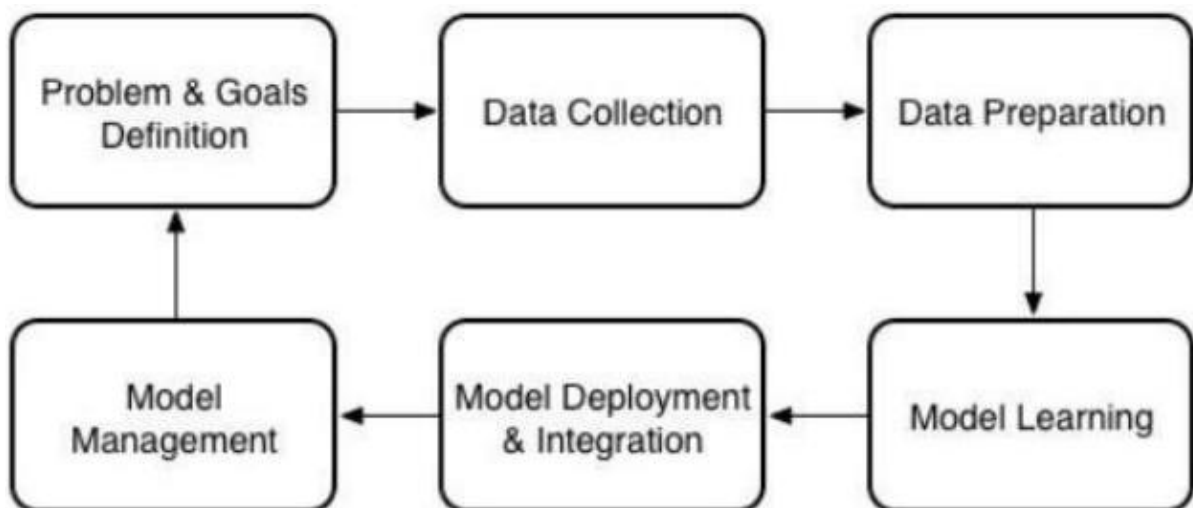


Figure 3.2.1: Flowchart of machine learning model development process

a. Problem and goals definition:

The proposed chat is developed in the open source Python language software library, Keras from Tensorflow. There are few procedures in construction ML model. First, we need to define the purpose of creating the model either to classify text input or to recognize emotions in audio input.

b. Data collection and preparation:

Next, we had to prepare the data for training our model. There must be information large enough to increase the accuracy of the result. In addition, the information is also undergo preprocessing so that the data can be fed into model training.

c. Model learning:

At this point, we start training our model using Tensorflow. Tensorflow is A library of open source software developed by Google Brain that allows people to use it for machine learning. All the training is done on a laptop Nvidia GeForce 940MX GPU. After training, the chat was expected to recognize input categories according to the trained model and response to the user.

d. Model deployment and integration:

After the training of the model is completed, the proposed chat is used website using the FLASK microweb framework written in Python. This online chat program allows people to get advice service only by entering the website address in the browser.

e. Model management:

After that, we had to run tests to see how the chat would react us after training. The proposed chat collects voice input from the user and converts it to text using Speech-to-Text (STT) technology. A chatbot does that process input and

produce output using a trained model. leaving text is converted to speech for the user using the speech-to-speech function technology The chat responds to the user in text and voice together. We also need to check if the chat has reached the desired goal starting a conversation with a chat room. If the result is not correct, we need adjust some part of the processing module until we get the expected result..

### 3.3 Speech-to-Text Module

i. Webkit Speech Recognition is a new JavaScript Web Speech API which allow fine control and flexibility over the speech recognition capabilities in chrome version 25 and later. There is no need to import any library for using this web speech API.

ii. In this chat bot,we only allow it to accept the input in English.

iii. After recognizing the voice ,it will convert it to text and pass it to the processing output modules.

```
function record() {
    var recognition = new webkitSpeechRecognition();
    recognition.lang = "en-GB";
    recognition.onresult = function(event) {
        // console.log(event);
        var rawText2 = event.results[0][0].transcript;

        var userHtml2 = '<p class="userText"><span>' + rawText2 + '</span></p>';

        $("#textInput").val("");
        $("#chatbox").append(userHtml2);

        document.getElementById('userInput').scrollIntoView({block: 'start', behavior: 'smooth'});

        $.get("/get", { msg: rawText2 }).done(function(data) {
            var botHtml = '<p class="botText"><span>' + data + '</span></p>';
            $("#chatbox").append(botHtml);
            document.getElementById('userInput').scrollIntoView({block: 'start', behavior: 'smooth'});
        });
    }
};
```

Figure 3.3.1: Webkit Speech Recognition in JavaScript

### 3.4 Deep learning Model for Text Input

Since the proposed chatbot is a chatbot that is involved with mental healthcare services. It is good to let the content stay on topic. Hence, we build a search-based chat that uses some heuristic approach to selection appropriate answer. So that we can control the flow of the chat purpose of providing mental health services.

#### i. Natural Language Processing(NLP)

- Import NLP is necessary to allow the program to understand the input text.
- We import Nltk which is a toolkit for NLP libraries that is used to understand human language.
- Punkt also download in order to tokenize the sentences into individual words.
- Stemming is process that is used to reduce the words in order to make it into root form.

```
import nltk
nltk.download('punkt')
from nltk.stem.lancaster import LancasterStemmer
stemmer = LancasterStemmer()
```

Figure 3.4.1: Libraries of the needed tool kit o NLP

```

{
  "intents": [
    {
      "tag": "greeting",
      "patterns": ["Hi", "How are you", "Is anyone there?", "Hello", "Good day"],
      "responses": ["Hello, what do you feel today", "Good to see you again", "Hi there, how can I help?"],
      "context_set": ""
    },
    {
      "tag": "goodbye",
      "patterns": ["Bye", "See you later", "Goodbye"],
      "responses": ["See you later", "Have a nice day", "Bye! Come back again soon."]
    },
    {
      "tag": "thanks",
      "patterns": ["Thanks", "Thank you", "That's helpful"],
      "responses": ["Happy to help!", "Any time!", "My pleasure"]
    }
  ]
}

```

Figure 3.4.2: JSON file used for training model

- "Cleaning" training data is important. Some tools NLP is used in this step.
- First we need to create some empty lists to store the individual words later discussed.
- For example, to ignore everything, a list called ignore is created punctuation marks and discard unwanted characters collect real content.
- The purpose of tokenization is to divide the input data into individual units that have value associated with it.
- After tagging, we store sample words in a list named words and tags are stored in a list called categories.
- Then we continue with a word list and ordered words.

```

words = []
classes = []
documents = []
ignore = ['?']
# loop through each sentence in the intent's patterns
for intent in intents['intents']:
    for pattern in intent['patterns']:
        # tokenize each and every word in the sentence
        w = nltk.word_tokenize(pattern)
        # add word to the words list
        words.extend(w)
        # add word(s) to documents
        documents.append((w, intent['tag']))
        # add tags to our classes list
        if intent['tag'] not in classes:
            classes.append(intent['tag'])
words = [stemmer.stem(w.lower()) for w in words if w not in ignore]
words = sorted(list(set(words)))
# remove duplicate classes
classes = sorted(list(set(classes)))

```

Figure 3.4.3: Preprocessing data in the JOSN file by using NLP

## ii. Building the neural network model by using deep learning

- An artificial neural network is a sequence of algorithms that imitate how the human brain works to identify the root cause relationships in the dataset throughout the process.
- If you want to create a neural network from scratch, we need to initialize the underlying diagram.



- We build a 3-layer deep neural network Keras, which is a deep learning library.

```
tf.compat.v1.reset_default_graph()

from keras.models import Sequential
from keras.layers import Dense
# Create model - 3 layers. First layer 128 neurons, second layer 64 neurons and 3rd output
# equal to number of intents to predict output intent with softmax
model = Sequential()
model.add(Dense(128, input_shape=(len(train_x[0]),), activation='relu'))
model.add(Dropout(0.5))
model.add(Dense(64, activation='relu'))
model.add(Dropout(0.5))
model.add(Dense(len(train_y[0]), activation='softmax'))
# Compile model. Stochastic gradient descent with Nesterov accelerated gradient gives good results
sgd = SGD(lr=0.01, decay=1e-6, momentum=0.9, nesterov=True)
model.compile(loss='categorical_crossentropy', optimizer=sgd, metrics=['accuracy'])
model.summary()

import datetime
log_dir = "logs/fit/" + datetime.datetime.now().strftime("%Y%m%d-%H%M%S")

tb_callback = tf.keras.callbacks.TensorBoard(log_dir=log_dir, update_freq=1)
```

Figure 3.4.4: Training of the neural network model

### iii. Classification and output by the model:

- Again, we need to do tokenization and stemming for that we get from the user by using NLP.

```
def clean_up_sentence(sentence):  
    # tokenizing the pattern  
    sentence_words = nltk.word_tokenize(sentence)  
    # stemming each word  
    sentence_words = [stemmer.stem(word.lower()) for word in sentence_words]  
    return sentence_words
```

Figure 3.4.5: Preprocessing the input that get from users

- After that we can start classifying the inputs coming from the user.
- The input statement is used as an argument for classification using a trained model.
- We correctly set the margin of error to 303 of the output, filtering out any incorrect predictions under the threshold.

```

ERROR_THRESHOLD = 0.30
def classify(sentence):
    # generate probabilities from the model
    results = model.predict([bow(sentence, words)])[0]
    # filter out predictions below a threshold
    results = [[i,r] for i,r in enumerate(results) if r>ERROR_THRESHOLD]
    # sort by strength of probability
    results.sort(key=lambda x: x[1], reverse=True)
    return_list = []
    for r in results:
        return_list.append((classes[r[0]], r[1]))
    # return tuple of intent and probability
    return return_list

```

Figure 3.4.6: Classification of the input that get from the user

```

def response(sentence):
    results = classify(sentence)
    # if we have a classification then find the matching intent tag
    if results:
        # loop as long as there are matches to process
        while results:
            for i in intents['intents']:
                # find a tag matching the first result
                if i['tag'] == results[0][0]:
                    # a random response from the intent
                    return random.choice(i['responses'])
            results.pop(0)

```

Figure 3.4.7: Production of the output sentences

### 3.5 Deep learning Model for Voice Input

This model allows the chat rat to detect if a person is under negative emotions by recognizing the input audio.

#### i. Collection of data

- We need several to improve the accuracy of the model datasets to train the model.
- The dataset must be in .wav format for further processing.
- It contains a human voice that conveys different emotions such as e.g happy and sad.
- Both files contain a total of 4240 audio files from different actors.

#### ii. Data Preparation

- The meaning of the data is added to the list according to the file name training and testing formats.
- Then we read the data using the sound file library in "float32" format. We added some noise with our noise function improve the accuracy of the results.

```
#DataFlair - Load the data and extract features for each sound file
def load_data(test_size=0.20):
    x, y = [], []
    for file in glob.glob("C:\\Users\\0on\\Documents\\CS\\Y4S2\\FYP2\\DataFlair\\ravdess data\\Actor_*\\*.wav"):
        file_name=os.path.basename(file)
        emotion=emotions[file_name.split("-")[2]]
        if emotion in unobserved_emotions:
            continue
        feature=extract_feature(file, mfcc=True, mel=True)
        x.append(feature)
        y.append(emotion)
        print(file_name)
    return train_test_split(np.array(x), y, test_size=test_size, random_state=9)
```

Figure 3.5.1: Function that load the training data

- After, We then extract the features of the audio data using the 40 vector Mel frequency spectrum (MFCC).
- Take the average of these vectors and store in an array. to determine returns when called by other functions.
- We are taking the mean of these vectors and storing in an any array. The array will return when it called by the other functions.

```
def noise(data):
    noise_amp = 0.05*np.random.uniform()*np.amax(data) # more noise reduce the value to 0.5
    data = data.astype('float64') + noise_amp * np.random.normal(size=data.shape[0])
    return data

#Extract features (mfcc, chroma, mel) from a sound file
def extract_feature(file_name, mfcc, mel):
    sound = AudioSegment.from_wav(file_name)
    sound = sound.set_channels(1)
    sound.export(file_name, format="wav")
    print(file_name)
    with soundfile.SoundFile(file_name) as sound_file:
        X = sound_file.read(dtype="float32")
        X = noise(X)
        sample_rate=sound_file.samplerate
        result=np.array([])
        if mfcc:
            mfccs=np.mean(librosa.feature.mfcc(y=X, sr=sample_rate, n_mfcc=40).T, axis=0)
            result=np.hstack((result, mfccs))
        if mel:
            mel=np.mean(librosa.feature.melspectrogram(X, sr=sample_rate).T, axis=0)
            result=np.hstack((result, mel))
    return result
```

Figure 3.5.2: Function that extracted features of voice data

- Before training the model, we need to reshaped the data, so that it can be feed into CNN model training.
- The y\_train and y\_test training that store the emotion classes like “happy” or “sad” will also be saved by using pickle.

```

#Split the dataset
x_train,x_test,y_train,y_test=load_data(test_size=0.20)
hx_test = load_data_test()
print(hx_test.shape)
print(hx_test.ndim)

#Get the shape of the training and testing datasets
print((x_train.shape[0], x_test.shape[0]))
print(f'Features extracted: {x_train.shape[1]}')

#preparation steps to get it into the correct format for Keras
X_train = np.array(x_train)
y_train = np.array(y_train)
X_test = np.array(x_test)
y_test = np.array(y_test)

💡
a=y_train
b=y_test

#to load it
with open("train.pkl", "rb") as f:
    a, b = pickle.load(f)

```

Figure 3.5.3: Transform the shape of the training data

### iii. Model Learning

- We will develop a one-dimensional convolutional neural network model for speech emotion recognition module.

- The reason why we are using 1D CNN model for chat bot is that the kernel of 1 D CNN model can only move in one dimension along the axis of time.

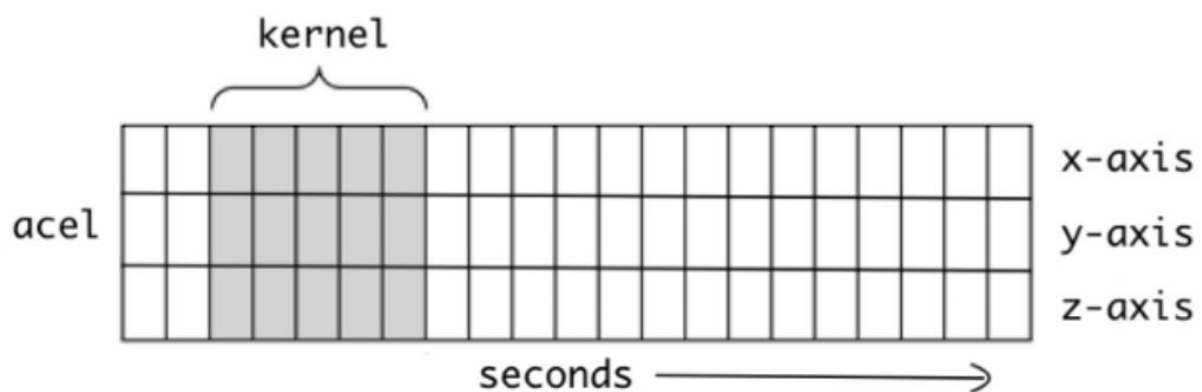


Figure 3.5.4: Kernel sliding over accelerometer

- Once we have prepared the training data for the model, we can begin Define, fit and evaluate a 1D CNN model.
- The model is built using the Keras deep learning library.
- We define two 1D CNN layers on the model followed by a drop coat to adjust, then build coat.
- The purpose of adding a droplet layer is to slow down learning for a much better final model.
- In addition, the aggregation layer is used to compress feature representations. So that it can help reduce the overfitting of model training data.



```

#Dimension preps for 1D CNN
X_train = np.expand_dims(X_train, axis=2)
X_test = np.expand_dims(X_test, axis=2)
print(X_train.shape)
print(X_train.ndim)

model = Sequential()
model.add(Conv1D(256, 8, padding='same', input_shape=(X_train.shape[1],1))) # X_train.shape[1] = No. of Columns
model.add(Activation('relu'))
model.add(Conv1D(256, 8, padding='same'))
model.add(BatchNormalization())
model.add(Activation('relu'))
model.add(Dropout(0.25))
model.add(MaxPooling1D(pool_size=(6)))
model.add(Conv1D(128, 8, padding='same'))
model.add(Activation('relu'))
model.add(Conv1D(128, 8, padding='same'))
model.add(Activation('relu'))
model.add(Conv1D(128, 8, padding='same'))
model.add(Activation('relu'))
model.add(Conv1D(128, 8, padding='same'))
model.add(Activation('relu'))
model.add(BatchNormalization())
model.add(Activation('relu'))
model.add(Dropout(0.25))
model.add(MaxPooling1D(pool_size=(5)))
model.add(Conv1D(64, 8, padding='same'))

```

Figure 3.5.5: 1D CNN model building

- RMSProp is used as the optimizer for this chat because it is appropriate mini group teaching.
- If the model is appropriate, it is evaluated based on the experimental data and its accuracy the appropriate model of the test dataset is returned.
- The template is saved in .h5 format and saved to disk as a JSON file.
- The meaning of the data is added to the list according to the file name training and testing formats.



```

model.add(Conv1D(128, 8, padding='same'))
model.add(Activation('relu'))
model.add(Conv1D(128, 8, padding='same'))
model.add(BatchNormalization())
model.add(Activation('relu'))
model.add(Dropout(0.25))
model.add(MaxPooling1D(pool_size=(5)))
model.add(Conv1D(64, 8, padding='same'))
model.add(Activation('relu'))
model.add(Conv1D(64, 8, padding='same'))
model.add(Activation('relu'))
model.add(Flatten())
model.add(Dense(6)) # Target class number
model.add(Activation('softmax'))
opt = RMSprop(lr=0.00001, decay=1e-6)
model.summary()

model.compile(loss='categorical_crossentropy', optimizer=opt, metrics=['accuracy'])
model_history=model.fit(X_train, y_train, batch_size=128, epochs=100, validation_data=(X_test, y_test))
score = model.evaluate(X_test, y_test, verbose=0)
print("%s: %.2f%%" % (model.metrics_names[1], score[1]*100))
model.save('model6.tflearn.h5')

# Save the model to disk
model_json = model.to_json()
with open("model_json.json", "w") as json_file:
    json_file.write(model_json)

```

Figure 3.5.6: Save Model After Building

iv. .Output response after predicted the input voice by the model.

- Once the audio input is received (ready to be recorded), it is sent back to the bottle as a blob file in webm format.
- Then we need to convert it to wav format using FFmpeg library prevents loss of sound details such as bitrate.

```

def convert_to_wav(b):
    c = b + "\\*.webm"
    d = b + "\\sample.wav"
    for file in glob.glob(c):
        command = f"ffmpeg -i {file} -vn -ar 44100 -ac 2 -b:a 192k {d}"
        os.system(command)
        os.remove(file)

def load_data_test(b):
    x = []
    convert_to_wav(b)
    c = b + "\\*.wav"
    d = b + "\\sample.wav"
    print(c)
    for file in glob.glob(c):
        print(file)
        feature = extract_feature(file, mfcc=True, mel=True)
        x.append(feature)
    os.remove(d)
    return np.array(x)

```

Figure 3.5.7: Load and process from user

- After converting to wav format, it goes through the same previous one the process of preparing the data so that you can get the characteristics of the audio input and also shape it to the predicted shape of the loaded model.
- If we allow the model to predict the input data, we must also provide the output convert into a readable form, such as 'sad' or 'happy'.

```

with open("data/train.pkl", "rb") as f:
    a, b = pickle.load(f)

# # one hot encode the target
lb = LabelEncoder()
y_train = np_utils.to_categorical(lb.fit_transform(a))
y_test = np_utils.to_categorical(lb.fit_transform(b))

from keras.models import model_from_json

json_file = open('data/model_json.json', 'r')
loaded_model2_json = json_file.read()
json_file.close()
loaded2_model = model_from_json(loaded_model2_json)
# load weights into new model
loaded2_model.load_weights("data/model6.tflearn.h5")
print("Loaded model from disk")

def predict(hx_test):
    hx_test1 = np.expand_dims(hx_test, axis=2)
    hy_preds = loaded2_model.predict(hx_test1)
    hy_preds = hy_preds.argmax(axis=1)
    hy_preds = hy_preds.astype(int).flatten()
    hy_preds = (lb.inverse_transform(hy_preds))
    return hy_preds

```

Figure 3.5.8: Predict voice input from user

```

return render_template("home.html")

Negative = ['sad', 'angry', 'fearful', 'disgust', 'surprised']

@app.route("/record_sound", methods=["POST", "GET"])
def record_sound():
    a = request.data
    with open('audio/audio.webm', 'wb') as f:
        f.write(a)
    b = os.path.dirname(os.path.abspath('audio/audio.webm'))
    hx_test = load_data_test(b)
    hy_test = predict(hx_test)
    if hy_test in Negative:
        message = {'words': 'I know you are having such a hard time.Try to take a slow and deep breathing first!'}
    else:
        message = {'words': ':'}
    return jsonify(words)

```

Figure 3.5.9: Output response to user based on model prediction

### 3.6 Text-to-Speech

- i. TTS is a natural language modeling process that converts text into speech audio output.
- ii. The audio output is spoken using a computer generated voice.
- iii. Google Cloud Text-to-Speech API and Playsound API are used respectively to convert text to sound and play an audio file.

```
#Import Google Text to Speech
from gtts import gTTS
# play the mp3 file
import playsound
```

Figure 3.6.1: Google cloud text-to-speech libraries

- iv. Google Cloud's text-to-speech API is used to convert printed text mp3 file and save it.
- .v. The Playsound API is used to play mp3 files to the user.

```
def text_to_voice(text2voice):
    tts = gTTS(text=text2voice)
    sound_file = 'Voice.mp3'
    tts.save(sound_file)
    playsound.playsound(sound_file)
    os.remove(sound_file)
```

### 3.7 Tools to use.

Particulars	Software Tools
Operating System	Microsoft Windows 10
Integrated Development Environment (IDE)	PyCharm 2020
Programming Languages	Python (for model training)
	Javascript (for webpage)
	HTML,CSS (for webpage UI)
Platform	Flask ( for model deployment and Integration)
Libraries, API and other tools	Google TTS API
	librosa
	FFmpeg
	Audiosegment 0.23.0
	Google Tensorflow
	Google WebkitSpeechRecognition API

Tabel 3.7.1: SOFTWARE REQUIREMENT FOR CHAT BOT

## 4. VERIFICATION PLAN

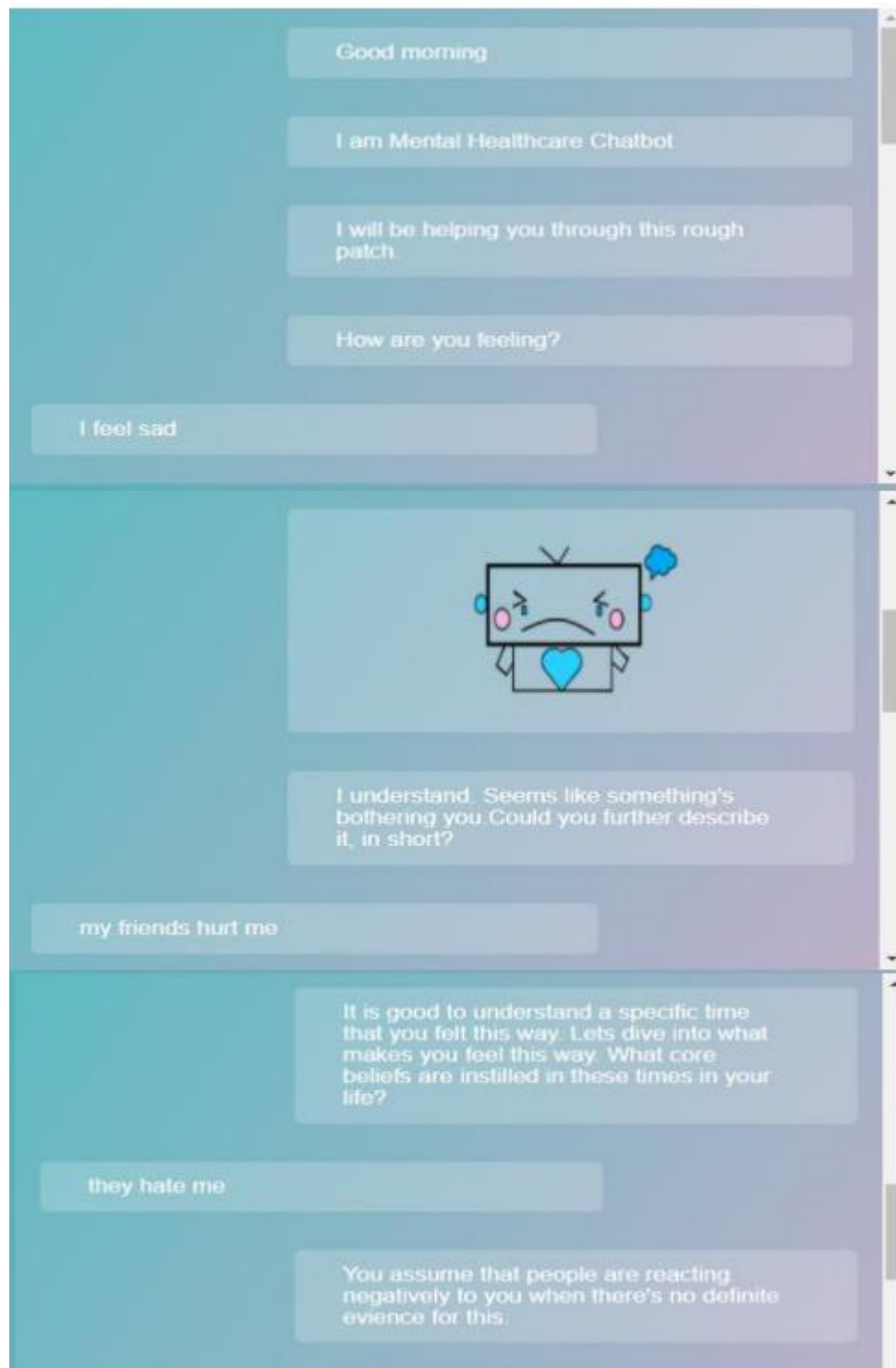
### 4.1 Usability testing

Visibility of the chat bot Page			
Purpose: Proposed chat bot's UI should keep user easy to read order to ensure quick access to content that user is looking for.			
No	Review Checklist	Yes/No/Partially	Comments
1.1	Are the font design and stylist remain consistent all time?	Yes	All fonts that are on the page are kept consistent.
1.2	Are all the fonts on the page displayed clearly without screen?	Yes	All the fonts is bog enough.

2. Usability of the Chatbot Page			
Purpose: The proposed chatbot should allow users to interact with it and perform relative tasks.			
No.	Review Checklist	Yes / No / Partially	Comments
2.1	Are Chatbot should get a load with the webpage?	Yes	It will first go to the landing page then followed by the main chatbot page. If the user requests to do a quiz, it also will direct to the relevant page.
2.2	Did the chatbot showing greeting if programmed as per the Time zone?	Yes	Yes. The chatbot will greet the user along with the audio.
2.3	Did the chatbot ask polite question e.g.? ("How may I assist you?")	Yes	Yes. It will start greeting and ask polite question every time.
2.4	Did the chatbot allow the input text need to be	Yes	Yes. It will validate the unwanted input characters like "[,]@#\$%^".

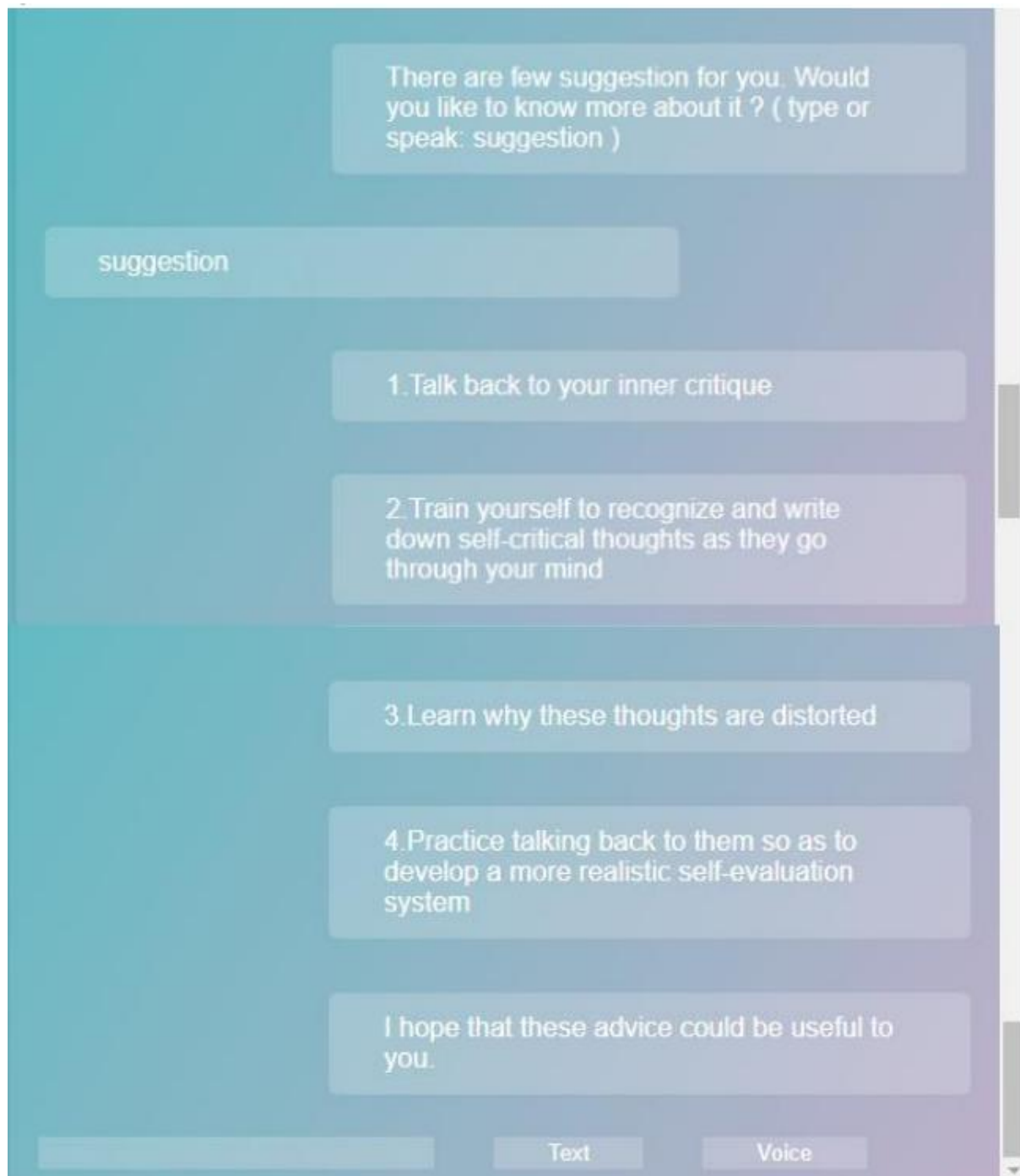


## Testing on the conversation with proposed chat bot



### Chat bot conversation





## 5.CONCLUSION

### 5.1 Overview of chat bot

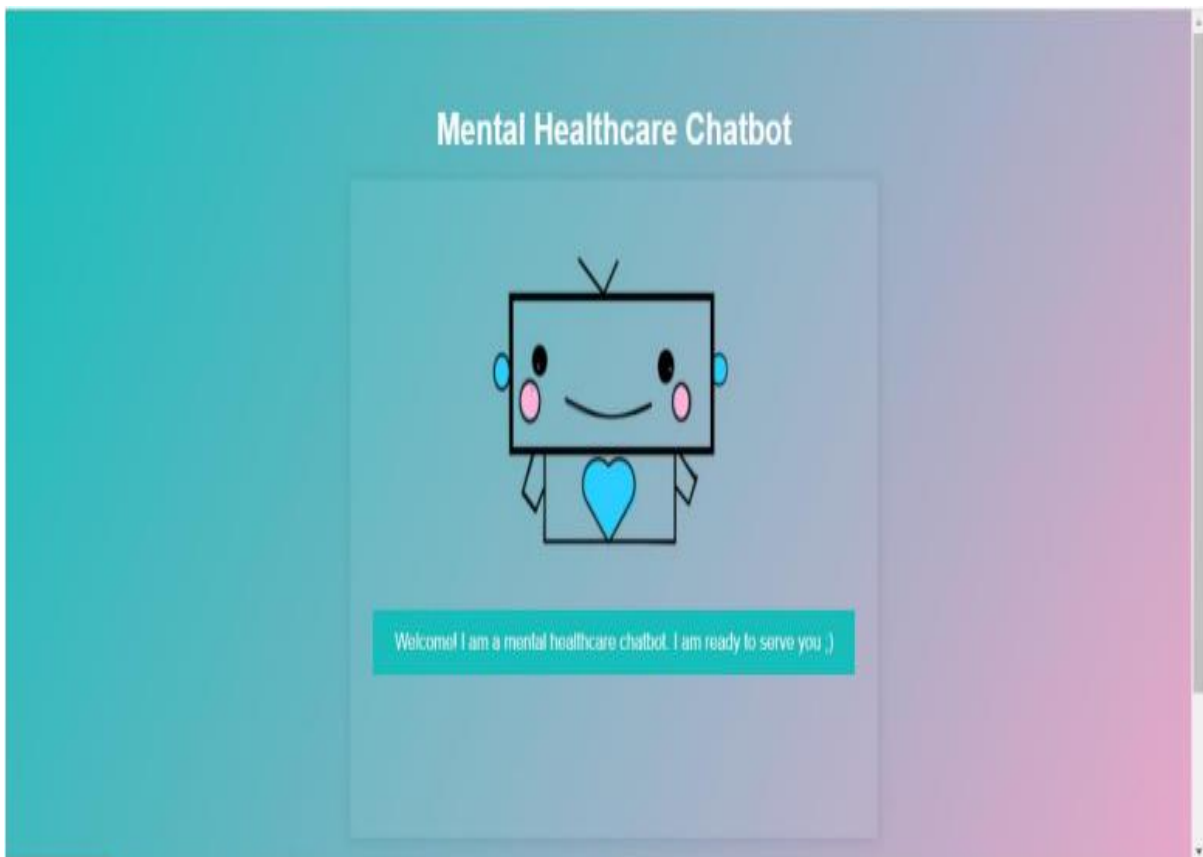


Figure.5.1.1: Landing page of bot

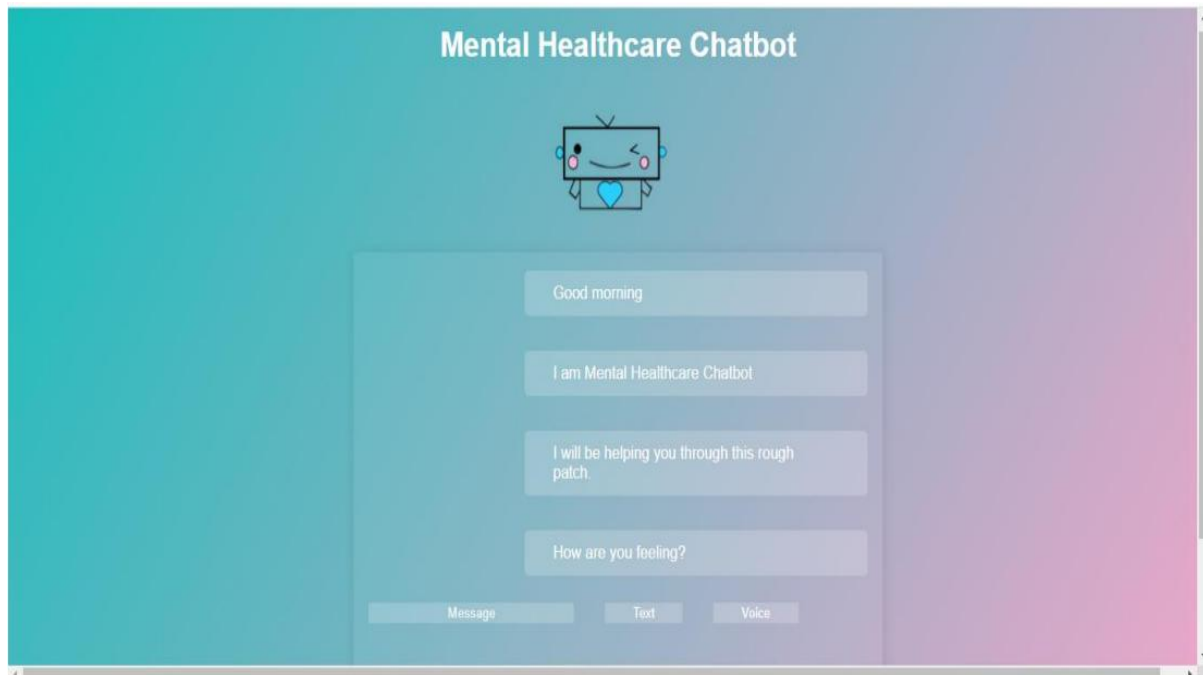


Figure.5.1.2: Home Page

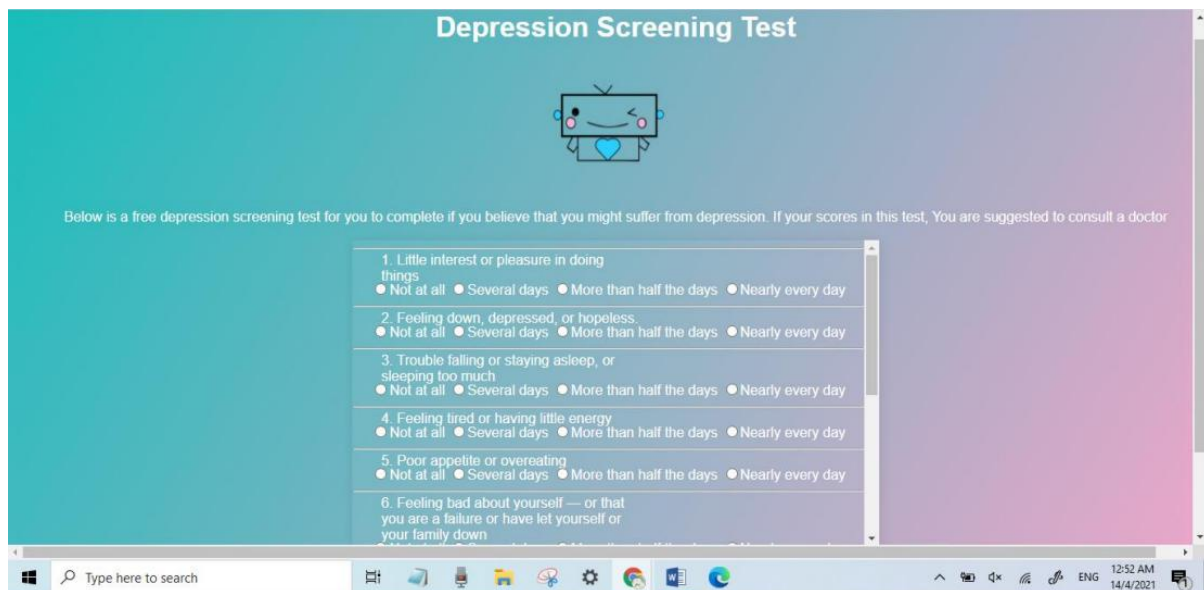


Figure.5.1.3: Test page

The main purpose of this proposed chat is to help people by providing them not only text-based, but also voice-based consultation service. Not all people are easy to approach mental health services. By using this chat, people get company 24/7 all day and also consumes nothing. Although the proposed chat was developed for this project, it is unfortunate that this chat still counts to give a versatile answer every time. The prediction accuracy of the model can be further improved by training on larger datasets. Additionally, planning a conversation flow for a chat room is considered difficult. In addition to the lack of knowledge and experience in psychology, this is not the case it is guaranteed that the user will follow the given instructions. Although still a chat room feel able to give an appropriate answer, even if it is outside the discussion, but this does not allow the chat to fully perform all functions and reduces quality of mental health services. However, some efforts have been made to improve the user experience, such as adding emoticons to chats. Plus, simulate human typing behavior, a write indicator was also added. As the color can indicate the main mood, tone, concept and meaning of the product, cool colors like blue or green has been applied to the chat interface to make the user feel calm and confident. In short, the chat offered now cannot be considered a complete chatbot able to provide 100% quality mental health services. It still has a lot of room to grow improved in the future. But if you look at your goals, it really was reached most of them. Based on the review of various magazines, it can be concluded that the use of Chatbot is usable and can be used by anyone who wants to. who can write in their own language in the mobile application or desktop version. Medical chatbot offers personal diagnoses based on symptoms. In the future, the ability of the robot to recognize and diagnose symptoms may be many improved by adding support for several medical features such as symptom location, duration and intensity. A more detailed description of symptoms. The implementation of a personalized medical assistant is strongly based on artificial intelligence algorithms and training information. Ultimately, the

adoption of personalized medicine would successfully save many lives and increase people's medical awareness. As mentioned earlier, the next era is the era of messaging apps because people spend more time on messaging app than any other app. That is why medical chatbot is huge and big scope of the future. No matter how old they are, people can have this medical conversation. The only claim they would make All you need is a simple desktop computer or smartphone with an internet connection. The effectiveness of the chat can be improved by adding more word combinations and more database usage so the medical chabot can handle all sorts of things diseases Even voice chat can be added to the system for ease of use. Artificial intelligence is an important and valuable technology that offers promising solutions to the needs of the healthcare industry. This opens the gates to individualized treatments tailored to the needs of the individual patient. It offers many advantages over traditional assays and other clinical decision tools. Data is becoming more precise and accurate, giving the healthcare industry a better understanding of diagnostic and treatment processes and improving patient outcomes. When it comes to health issues, people often have many questions, big and small, that need immediate clarification. A healthcare chat can act as a personal healthcare expert, providing help in addition to answering basic questions. It can provide symptom-based solutions, recommend remedies and even connect patients to nearby specialists. Medical chatbots are proving to be especially beneficial for people who suffer from chronic health conditions such as asthma, diabetes and others. Medical chatbots offer a solution for monitoring health and well-being, including tracking calories, water intake, physical activity and sleep. pattern ring. They can recommend personalized meal plans, prompt medication reminders and encourage people to seek specialist care. Additionally, chatbots can send powerful messages and affirmations to boost mindset and confidence. While chat cannot replace medical care, it can be a comprehensive self-care coach..

## FUTURE WORK

The proposed chat can be further improved by expanding its training data. Save collect user feedback or even work with human tutors to improve chatbot content also suggests compliance. So that this chat can give more professional consulting services for people. Additionally, this chat can also become more advanced when added to an emotional encounter appreciation Face recognition should work like speech-emotion recognition perform some action based on the user's facial expression. to work together with both detection modules, the chat should be able to predict the situation to the user more accurately and serve the user much better. The future of medical chatbots looks promising. They are likely to become ubiquitous and play an important role in the healthcare industry. While chatbots can never fully replace human doctors, they can act as primary care advisors and help individuals with their day-to-day health concerns. This allows doctors and healthcare professionals to focus on more complex tasks, while chatbots focus on menial tasks. The perfect combination of human assistance and chatbot technology enables efficient operation of healthcare centers and better patient care. Visit Engat to build your own powerful healthcare chatbot and check out our starter packs to take advantage of the chatbot templates mentioned above! When it comes to health issues, people often have many questions, big and small, that need immediate clarification. A healthcare chat can act as a personal healthcare expert, providing help in addition to answering basic questions. It can provide symptom-based solutions, recommend remedies and even connect patients to nearby specialists. Medical chatbots are proving to be especially beneficial for people who suffer from chronic health conditions such as asthma, diabetes and others. Medical chatbots offer a solution for monitoring health and well-being, including tracking calories, water intake, physical activity and sleep. pattern ring. They can recommend personalized meal plans, prompt medication reminders and

encourage people to seek specialist care. Additionally, chat bots can send powerful messages and affirmations to boost mindset and confidence. While chat cannot replace medical care, it can serve as a holistic self-care coach. Artificial intelligence is an important and valuable technology that offers promising solutions to the needs of the healthcare industry. This opens the gates to individualized treatments tailored to the needs of the individual patient. It offers many advantages over traditional assays and other clinical decision tools. Data is becoming more accurate and precise, allowing the healthcare industry to gain more insight into the diagnostic and treatment processes, which improves patient outcomes. Health technology is booming. In the future, it will be one of the most important future development factors. Be it patients, nurses, doctors or anyone else, healthcare is at the heart of it all. The world is trying to improve the efficiency of healthcare applications. Artificial intelligence and other similar technologies are now finding ways to benefit the masses. Chat bot health apps, appointment scheduling and more are making life easier for many. Medical chatbots can use artificial intelligence and machine learning together to produce accurate results. They reduce the burden on health systems. These systems nearly collapsed in many places during the peak of the pandemic. In addition, the costs incurred also decrease as a result of the decrease in labor and What is the use of chat bots in the healthcare industry? Is there enough growth for healthy chat bots? Benefits of building chat bot treatment programs Chat bot Healthcare Apps The role of chat bots during Covid-19 Types of Healthcare Chat bot Applications for Real-World Applications How to build a medical chat app? Health technology is booming. In the future, it will be one of the most important future development factors. Be it patients, nurses, doctors or anyone else, healthcare is at the heart of it all. The world is trying to improve the efficiency of healthcare applications. Artificial intelligence and other similar technologies are now finding ways to benefit the masses. Chatbot health apps, appointment scheduling and more are making life easier for many. Medical chat

bots can use artificial intelligence and machine learning together to produce accurate results. They reduce the burden on health systems. These systems nearly collapsed in many places during the peak of the pandemic. In addition, the costs incurred also decrease as a result of the decrease in labor and education and training costs. In addition, chat bots can facilitate the diagnosis of many diseases. When you do it by hand, there is always a chance that things will go wrong. But with technology, there is significantly less chance of screwing things up. Thanks to technology, it can be done in seconds. Advances in technology can help the healthcare industry exceed our imaginations. Medical chat bots can revolutionize the industry with revolutionary measures. The productivity of healthcare workers can be significantly increased with the help of

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