

**Project Report**

on

**Help Out- Mental health journaling and supporting  
application based on artificial intelligence**

**Submitted to**

**Sant Gadge Baba Amravati University  
In partial Fulfillment of the Requirement  
For the Degree of  
Bachelor of Engineering in  
Computer Science and Engineering**

**Submitted by:**

**Mr. Lokesh Chandak  
Miss. Sanjana Dhopte  
Miss. Siddhi Taori  
Mr. Shreyash Rane  
Miss. Tejaswini Rakhonde**

**Under the Guidance of  
Dr. J. M. Patil**



**Department of Computer Science and Engineering  
Shri Sant Gajanan Maharaj College of Engineering,  
Shegaon – 444 203 (M.S.)**

**2022-23**

**SHRI SANT GAJANAN MAHARAJ COLLEGE OF ENGINEERING,  
SHEGAON – 444 203 (M.S.)  
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**



**CERTIFICATE**

This is to certify that **Mr. Lokesh Chandak, Miss. Siddhi Taori, Mr. Shreyash Rane, Miss. Sanjana Dhopte and Miss. Tejaswini Rakhonde** students of final year B.E. in the year 2022-23 of Computer Science and Engineering Department of this institute has completed the project work entitled “ **Help Out - Mental health journaling and supporting application based on artificial intelligence**” based on syllabus and has submitted a satisfactory account of his work in this report which is recommended for the partial fulfilment of degree of Bachelor of Engineering in Computer Science and Engineering.

**Dr. J. M. Patil**  
Project Guide

~~22/11/23~~  
**Dr. S. B. Patil**  
Head of Department

**Dr. S. B. Somani**  
Principal

**SHRI SANT GAJANAN MAHARAJ COLLEGE OF ENGINEERING,  
SHEGAON – 444 203 (M.S.)  
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**



## **CERTIFICATE**

This is to certify that **Mr. Lokesh Chandak, Miss. Siddhi Taori, Mr. Shreyash Rane, Miss. Sanjana Dhopte and Miss. Tejaswini Rakhonde** students of final year B.E. in the year 2022-23 of Computer Science and Engineering Department of this institute has completed the project work entitled “ **Help Out - Mental health journaling and supporting application based on artificial intelligence**” based on syllabus and has submitted a satisfactory account of his work in this report which is recommended for the partial fulfilment of degree of Bachelor of Engineering in Computer Science and Engineering.

**Internal Examiner**

**Date:**

**External Examiner**

**Date:**

# Acknowledgement

---

*The real spirit of achieving a goal is through the way of excellence and lustrous discipline. We would have never succeeded in completing our task without the cooperation, encouragement and help provided to me by various personalities.*

*We would like to take this opportunity to express my heartfelt thanks to our guide **Dr. J. M. Patil**, for his esteemed guidance and encouragement, especially through difficult times. His suggestions broaden my vision and guided me to succeed in this work. We are also very grateful for his guidance and comments while studying part of my seminar and learnt many things under his leadership.*

*We extend my thanks to **Dr S.B. Patil** Head of Computer Science & Engineering Department, Shri Sant Gajanan Maharaj College of Engineering, Shegaon for their valuable support that made me consistent performer.*

*We also extend my thanks to **Dr S.B. Somani**, Principal Shri Sant Gajanan Maharaj College of Engineering, Shegaon for their valuable support.*

*Also, we would like to thanks to all teaching and non-teaching staff of the department for their encouragement, cooperation and help. Our greatest thanks are to all who wished me success especially my parents, my friends whose support and care makes me stay on earth.*

**Mr. Lokesh Chandak**  
**Miss. Siddhi Taori**  
**Mr. Shreyash Rane**  
**Miss. Sanjana Dhopte**  
**Miss. Tejaswini Rakhonde**

## Abstract

---

Over the past few years, mental health has become a topic of serious concern globally. Mental health includes emotional, psychological, and social well-being. It influences how we feel, think and act. Moreover, it also helps in knowing how we handle stress, relate to others, and make choices. And the pandemic has undoubtedly added to the stress we live under. The prevalence of mental disorders is high and appears to be growing, yet the majority of individuals are not able to access an adequate treatment. With the advancement in technology, Mental health apps provide a simple and convenient way to work on your mental health. A mental health monitoring system that uses artificial intelligence (AI) could potentially offer several benefits, including early identification of mental health concerns, personalized support, and more efficient and effective treatment. The Application could provide personalized recommendations for support or treatment. For example, it could suggest self-help resources or connect users with mental health professionals. The system could also use predictive analytics to identify individuals who are at higher risk of developing mental health concerns and provide targeted interventions to prevent or manage these issues. However, there are also potential challenges and ethical considerations that need to be addressed when developing a mental health monitoring system using AI. These include issues around data privacy and security, and the need for human oversight and accountability. We develop a mobile application that implements mental health monitoring methods alongside an AI conversation partner as a means to improve mental health outcomes and increase access to care. However, it is important to ensure that such a system is developed and implemented in a way that prioritizes the safety, privacy, and autonomy of individuals and is informed by best practices in mental health care.

**Keywords:** Artificial Intelligence (AI), Mental Health, Health Monitoring System.

# Table of Contents

---

---

<i>Acknowledgement</i>	<i>iv</i>
<i>Abstract</i>	<i>v</i>
<i>Table of Contents</i>	<i>vi</i>
<i>List of Figures &amp; Tables</i>	<i>x</i>
<i>List of Snapshots</i>	<i>xi</i>
<i>Abbreviations</i>	<i>xii</i>
<b>1. Introduction</b>	<b>1</b>
1.1 Preface	1
1.2 Motivation	3
1.3 Problem Statement	5
1.4 Aim	5
1.5 Objectives	5
1.6 Scope of Project	6
1.7 Organization of Project	6
<b>2. LITERATURE SURVEY</b>	<b>7</b>
2.1 Virtual Counselling	7
2.2 Cognitive Behavioural Therapy (CBT)	7
2.3 Large Language Model (LLM)	8
2.4 LLaMA	9
2.5 Alpaca	9
<b>3. METHODOLOGY</b>	<b>10</b>
3.1 Cognitive Behavioural Therapy (CBT)	11
3.1.1 Thought Diary	12
3.1.2 Mood Tracker	14
3.1.3 AI Therapist	15
3.1.4 Counselling Chat	16
3.2 Client Server Architecture	17
3.3 Conversational AI	18
3.3.1 LLMs	19
3.3.2 LLaMA	21
3.3.3 Alpaca	23
3.3.4 GPT3	25
<b>4. DESIGN</b>	<b>27</b>

4.1 Design goals	27
4.2 UI Design	29
4.3 Architecture Diagram	30
4.4 Use Cases	31
<b>5. IMPLEMENTATION</b>	<b>33</b>
5.1 NodeJS	33
5.2 React Native	34
5.3 Expo	35
5.4 Expo Go	38
5.5 Native Base	39
5.6 Express JS	40
5.7 Mongo DB	41
5.8 Cloud Computing	43
5.8.1 Google Cloud Platform (GCP)	43
5.8.2 Azure	43
5.8.3 Open AI	44
5.8.4 Integration	44
5.8.5 Source Code	45
<b>6. CONCLUSION</b>	<b>47</b>
<b>7. FUTURE SCOPE</b>	<b>48</b>
7.1 Referances	49
7.2 Publication Details	51

## List of Figures and Tables

---

Fig 3.1: Cognitive Behavioral Therapy (CBT)	11
Fig 3.2: Features of CBT	12
Fig 3.3.3.1: Large Language Model	19
Fig 3.3.2.2: Working of LLaMaA 7B Model	23
Fig 3.3.3.1: Alpaca AI Model	23
Fig 3.3.3.2: Output generation form Alpaca 7B	24
Fig 4.3.1: Architecture Diagram	30



# List of Snapshots

---

<b>Screenshot 0.2.1: Dashboard</b>	29
Screenshot 0.2.2: Mood Tracker	29
Screenshot 0.2.3: Select Mood	29
Screenshot 0.2.4: Thought Diary	29
Screenshot 0.2.5: Thought Diary Questionnaire	29
Screenshot 0.2.6: AI Chat	29
Screenshot 5.8.5.1: App: <a href="https://github.com/Helpout-G12/App">github.com/Helpout-G12/App</a>	45
Screenshot 5.8.5.2: Server: <a href="https://github.com/Helpout-G12/Server">github.com/Helpout-G12/Server</a>	46
Screenshot 5.8.5.3: Generation prompt for the AI chatbot	46

# Abbreviations

---

CBT	Cognitive Behavioural Therapy
AI	Artificial Intelligence
LLM	Large Language Model
NLP	Natural Language Processing
GPT-3	Third Generation - Generative Pre-trained Transformer
BERT	Bidirectional Encoder Representations from Transformers
ELMO	Embeddings from Language Model
FAIR	Fundamental AI Research
LLaMA	Large Language Model Meta AI
OCD	Obsessive-Compulsive Disorder
PTSD	Post Traumatic Stress Disorder
HTTP	Hypertext Transfer Protocol
TCP/IP	Transmission Control Protocol/Internet Protocol
T5	Text-to-Text Transfer Transformer
UI	User Interface
NPM	Node Package Manager
API	Application programming interface
GCP	Google Cloud Platform

# INTRODUCTION

## 2.1. PREFACE

Mental health is an important public health concern worldwide and should be a prominent part of the healthcare industry. However, the pace of development in this field appears to be quite slow. Recently AI techniques have attracted a lot of attention in different industries, including mental health. With the help of advanced AI techniques and machine learning algorithms, a personalized care that focuses on providing emotional support catered to a specific individual has been facilitated. In this project, we experiment with various systems for mental health monitoring such as virtual counselling, precision therapy, and diagnostic systems by reviewing the algorithms and parameters used in each system. We conclude by developing a mobile application which combines the above-mentioned systems and is designed to provide personalized mental care.

Mental health therapy application refers to the use of technology to provide mental health therapy services to individuals. These mobile applications can take various forms, including smartphone apps, web-based platforms, and virtual reality environments. Mental health therapy applications are designed to provide individuals with access to therapy and counselling services that they may not have otherwise had. They can be particularly useful for individuals who are unable to attend in-person therapy sessions due to distance, mobility issues, or other factors. Some mental health therapy applications offer cognitive-behavioural therapy (CBT) programs, which are designed to help individuals identify and change negative patterns of thought and behaviour. Other applications may provide mindfulness meditation or relaxation exercises to help reduce stress and anxiety.

It's important to note that mental health therapy applications are not a replacement for traditional therapy services. However, they can be a useful tool for individuals who are seeking additional support and guidance in managing their mental health. Convenience: Mental health therapy apps provide patients with the convenience of accessing therapy and mental health resources from the comfort of their own homes. This is especially beneficial for those who may have difficulty leaving their homes or accessing traditional therapy services due to physical or mental health conditions.

There are various factors by which we can say mental health therapy application can be used by patients, such as:

### **Affordability**

Many mental health therapy apps offer affordable or even free services, making mental health treatment more accessible to those who may not have the financial resources to pay for traditional therapy.

### **Accessibility**

Mental health therapy apps can be accessed from anywhere at any time, making it easier for patients to seek help and support when they need it most. This is especially important for individuals who may be struggling with a mental health crisis or who need immediate support.

### **Privacy**

Mental health therapy apps offer a level of privacy and confidentiality that may be difficult to achieve in traditional therapy settings. This can be especially important for individuals who may feel uncomfortable discussing their mental health with others.

### **Personalization**

Many mental health therapy apps offer personalized treatment plans and resources tailored to the specific needs and goals of each patient. This can help patients feel more engaged and invested in their treatment, leading to better outcomes.

Overall, mental health therapy apps can provide patients with a convenient, affordable, and effective way to manage their mental health and well-being.

## **2.2. MOTIVATION**

The society is becoming more health conscious with every passing day, however, there is still a stigma associated with mental health and wellness. Virtual counselling, precision therapy and decision making driven by AI could potentially be an important step in improving mental health and well-being.

The stigma surrounding mental health can act as a strong obstacle to seek help and speak out. The fear of stigma prevents people from discussing their situation with other individuals, including trained professionals. Nearly 66% of people with a known mental health issue never approach a qualified therapist for help.

If stress and anxiety start interfering with daily routine, it indicates a serious issue. This can worsen the situation in the long run. People are found to be more willing to express themselves while talking to a virtual therapist which could have an important therapeutic advantage. The AI bot is likely perceived as non-judgmental, non-opinionated and overall neutral. Moreover, diagnostic systems can help in providing precise treatments to patients that can be customized to fit their budget. Another huge barrier is staff shortages.

Precision therapy techniques help in continuous mental health monitoring. Chatbots and online platforms are always available when you need support. Furthermore, they have probably already worked with more users than an average therapist would have, which is an added advantage. Diagnostic systems help doctors in the decision-making process thus speeding up the decision-making process which helps doctors accommodate more patients each day.

There are various motivations behind making a mental health therapy application, including:

### **5.5.1. Addressing the growing need for mental health services**

With the rising prevalence of mental health conditions, there is a growing need for accessible and affordable mental health services. Mental health therapy applications can help bridge this gap by providing individuals with easy access to mental health resources and support.

### **Improving mental health outcomes**

Mental health therapy applications can help individuals manage their mental health and well-being more effectively, leading to better mental health outcomes.

### **Increasing accessibility to mental health services**

Mental health therapy applications can provide a more accessible alternative to traditional therapy services, particularly for individuals who may have difficulty accessing traditional services due to factors such as physical disabilities, transportation barriers, or social stigma.

### **Filling gaps in mental health care**

Mental health therapy applications can help address gaps in mental health care, such as a shortage of mental health professionals in certain areas or a lack of access to specific types of therapy.

### **Advancing technology in mental health care**

Mental health therapy applications can help advance the use of technology in mental health care and promote innovation in the field.

Overall, the motivation behind making a mental health therapy application is to improve access to mental health resources, provide effective treatment options, and ultimately improve mental health outcomes for individuals.

### **2.3. PROBLEM STATEMENT**

Develop a mobile application to provide mental health support tools. Increasing accessibility to mental health treatment and reducing stigma around mental health. Helping patients disengage from harmful and negative behaviours and improving monitoring and management of symptoms for diagnosis and treatment, while maintaining patient's privacy and confidentiality.

### **2.4. AIM**

- Increasing accessibility to mental health treatment and reducing stigma around mental health by helping patients disengage from harmful and negative behaviours.
- Improving monitoring and management of symptoms for diagnosis and treatment, while maintaining patient's privacy and confidentiality.

### **2.5. OBJECTIVES:**

1. To evaluate the effectiveness of existing smartphone-based mental health apps.
2. To explore the effectiveness of AI based conversational-therapy, using newer models.
3. To analyse collected data and measure effectiveness of the methods implemented.
4. Objectives to develop a smartphone application implementing known effective tools, such as:
  - a. Mood tracking
  - b. AI Therapist
  - c. Thought diary
  - d. Counselling Chatbot

## **2.6. SCOPE OF THE PROJECT**

1. Identify the key requirements and pain points of users in the mental health therapy domain.
2. Develop the core features of the app prototype that showcase its main functionality.
3. Integrate a simplified database to simulate data storage and retrieval functionalities.
4. Design a simple, intuitive user interface for the prototype that provides a glimpse of the app's look and feel. Focus on essential screens and navigation flow to showcase the user experience.
5. Implement a subset of features that highlight the app's value proposition.

## **2.7. ORGANIZATION OF PROJECT**

- Chapter 1. It gives an Introduction of the project.
- Chapter 2. Literature Survey of the research papers referred to get an idea of the previous work done on this project.
- Chapter 3. After reviewing, the methodology of how the project can be executed.
- Chapter 4. The Design process of the App, including design goals, UI, Architecture and Use case analysis
- Chapter 5. How the project was developed and deployed, and the tools and technologies involved.
- Chapter 6. The conclusion derived from this project.
- Chapter 7. Details of the research papers referred.



## **LITERATURE SURVEY**

### **2.1. Virtual Counselling**

Access to treatment pertaining to mental health is a luxury that is inaccessible and unaffordable to most of the people around the globe. Anxiety and depression are commonly observed among college students, with up to 74% of them having their first onset before the age of 24. To tackle this issue, companies are developing software and programs to recognize depression and provide support for the same using machine learning and natural language processing.

### **2.2. Cognitive Behavioural Therapy (CBT)**

Cognitive Behavioural Therapy (CBT) is a popular talking therapy that helps to reframe the way one thinks and behaves, to change the way in which we address problems.

Using CBT, the bot aims to replicate the open ear of a trained professional. It gradually learns about the individual and tailors personalized questions to their situation through repeated conversations. The bot won't do therapy but can be the guide to figure out things on your own. Every day it asks how you are feeling and what you are up to.

It then builds an emotional model of you over time and can help you see patterns in your mood. Various computational techniques were employed based on the selected feature or section.

Cognitive Behavioural Therapy (CBT) is a type of psychotherapy that focuses on helping individuals identify and change negative thought patterns and behaviours that contribute to their mental health issues. CBT has been extensively researched and shown to be an effective treatment for a variety of mental health conditions, including anxiety disorders, depression, and post-traumatic stress disorder.

CBT can be applied in a number of ways in mental health therapy, including:

#### **5.5.1. Identifying and challenging negative thoughts**

In CBT, clients learn to identify negative thoughts and beliefs that contribute to their mental health problems. Therapists work with clients to challenge these thoughts and replace them with more positive and realistic ones.

### **5.5.2. Behavioural activation**

This involves helping clients engage in activities that bring them pleasure and a sense of accomplishment. This can be particularly helpful for individuals with depression who have lost interest in activities they once enjoyed.

### **5.5.3. Exposure therapy**

Exposure therapy involves gradually exposing clients to situations or objects that trigger anxiety or fear in a controlled and safe environment. This can be an effective treatment for anxiety disorders, phobias, and post-traumatic stress disorder.

### **5.5.4. Relaxation techniques**

Therapists may teach clients relaxation techniques such as deep breathing, progressive muscle relaxation, or guided imagery to help them manage stress and anxiety.

### **5.5.5. Problem-solving skills**

CBT can also teach clients problem-solving skills to help them cope with difficult situations and make decisions that are in line with their goals and values.

## **2.3. Large Language Model (LLM)**

A Large Language Model (LLM) is an artificial intelligence system that uses natural language processing (NLP) techniques to understand and generate human language. These models are typically trained on massive amounts of text data, such as books, articles, and web pages, and can learn to recognize patterns and relationships within the language.

LLMs have become increasingly popular in recent years due to their ability to perform a wide range of tasks, including language translation, question-answering, and text generation. Some of the most well-known LLMs include GPT-3, BERT, and ELMO, all of which have been developed by Open AI and Google. One of the key features of LLMs is their ability to generate human-like responses to prompts, which can make them useful for chatbots and other conversational interfaces. However, these models also have some limitations, including their tendency to generate biased or inappropriate responses based on the data they are trained on.

Large language models (LLMs) can be applied to mental health therapy application in a number of ways. One possible application is in the development of chatbots or virtual assistants that can provide mental health support to individuals. These chatbots can use natural language processing (NLP) techniques to understand and respond to users' mental health concerns, providing advice, empathy, and encouragement.

Another potential application is in the analysis of mental health data. LLMs can be trained on large datasets of mental health records, including patient symptoms, treatments, and outcomes. By analysing this data, LLMs can help identify patterns and trends that can be used to improve mental health treatment strategies.

LLMs can also be used to generate personalized mental health interventions based on an individual's specific symptoms and needs. For example, an LLM could be used to generate a customized cognitive-behavioural therapy (CBT) program for an individual with depression, based on their reported symptoms and other relevant data.

## **2.4. LLaMA**

LLaMA is an auto-regressive language model, based on the transformer architecture. The model comes in different sizes: 7B, 13B, 33B and 65B parameters. It was developed by the Fundamental AI Research (FAIR) team of Meta AI.

The primary use of LLaMA is research on large language models, including: exploring potential applications such as question answering, natural language understanding or reading comprehension, understanding capabilities and limitations of current language models, and developing techniques to improve those, evaluating and mitigating biases, risks, toxic and harmful content generations, hallucinations.

## **2.5. Alpaca**

Alpaca is a fine-tuned variant of LLaMA models, introduced by Taori et al. [index] at Stanford University, aimed at following single turn instructions. Alpaca was trained to qualitatively behave similarly to OpenAI's text-davinci-003, colloquially known as GPT3, while being small, cheap and easy to reproduced. It has 4 models:

- 7B
- 13B
- 30B
- 65B

## **METHODOLOGY**

The application of AI in mental health therapy is a promising area that has the potential to revolutionize how mental health care is delivered. Mental health therapy applications can help solve mental health problems in several ways. Principles to be followed in this approach include:

- Accessibility
- Affordability
- Convenience
- Privacy
- Personalization

Timely detection and intervention are crucial in mental health. AI algorithms can analyze large datasets and detect subtle changes in behavior, language, or social interactions that may indicate the onset of mental health issues. By identifying these early signs, AI systems can prompt individuals to seek help or provide recommendations for appropriate interventions, leading to early intervention and potentially better treatment outcomes. AI-powered tools and interventions can enhance treatment outcomes by offering evidence-based techniques and therapeutic interventions outside traditional therapy sessions. Digital therapeutics, for instance, can provide individuals with self-help resources, psychoeducation, and interactive exercises to supplement their therapy. These tools can reinforce therapeutic concepts, promote skill-building, and provide ongoing support, contributing to better treatment outcomes and relapse prevention.

Overall, mental health therapy applications can help solve mental health problems by providing individuals with accessible, affordable, convenient, and personalized therapy sessions that can help them manage their mental health. However, it's important to note that therapy applications may not be suitable for everyone, and individuals should consult with a mental health professional to determine the best course of treatment for their specific needs.

## **2.1. Cognitive Behavioural Therapy (CBT)**

CBT, or Cognitive Behavioural Therapy, is a type of therapy that helps people change their negative or unhelpful thoughts and behaviours. It is based on the idea that our thoughts, feelings, and behaviours are all interconnected and that changing one can help improve the others. During CBT, a therapist helps the person identify their negative thought patterns and beliefs and works with them to challenge and change these thoughts. The therapist may also teach the person coping skills to help them manage their emotions and behaviours in a more positive way.



Fig 3.1 Cognitive Behavioral Therapy (CBT)

Overall, CBT can be a very effective form of therapy for a wide range of mental health conditions, including anxiety, depression, and PTSD. Cognitive Behavioural Therapy (CBT) is a type of psychotherapy that is commonly used in the treatment of mental health disorders such as anxiety, depression, post-traumatic stress disorder (PTSD), and obsessive-compulsive disorder (OCD). CBT is based on the idea that our thoughts, feelings, and behaviours are all interconnected, and that changing one can led to changes in the others. A therapist using CBT will help the person identify negative or unhelpful thoughts and beliefs that may be causing distress or contributing to their problems. Then, the therapist will work with the person to challenge and reframe those thoughts and beliefs in a more positive or helpful way. This can help the person feel better emotionally and behave in more positive ways.

CBT is a goal-oriented and evidence-based form of therapy that focuses on changing negative thought patterns and behaviours to improve mental health. CBT can be applied in a variety of ways, including individual therapy sessions, group therapy, and self-help resources. In recent years, technology has enabled the development of digital CBT tools that can be used in conjunction with traditional therapy or as standalone treatments.

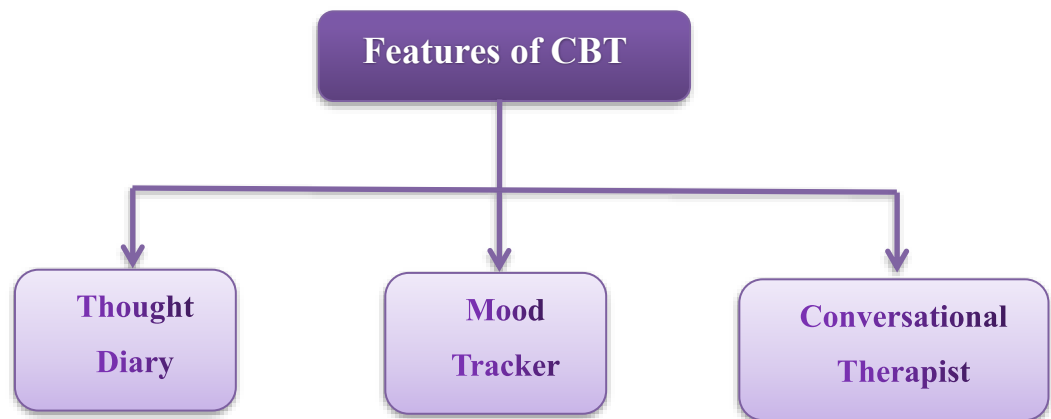


Fig 3.2 Features of CBT

### **5.5.1. Thought Diary**

The Thought Diary is a powerful tool in CBT that can help individuals gain insight into their negative thought patterns and learn to challenge and replace them with more positive and realistic ones. By regularly using a Thought Diary, individuals can build resilience and develop the skills necessary to manage their emotions and cope with difficult situations. A Thought Diary is a tool used in Cognitive Behavioural Therapy (CBT) to help individuals identify and challenge their negative thoughts. CBT is a form of psychotherapy that focuses on the connection between thoughts, emotions, and behaviours. The premise of CBT is that our thoughts and beliefs can influence our emotions and behaviour, and that changing negative thoughts can improve emotional well-being.

## **How to Use a Thought Diary in CBT?**

A thought diary does more than capture a single event, emotion, or thought; it records how we handle multiple situations over time. Its strengths lie in highlighting consistent patterns of how we respond to both commonplace and exceptional events.

The Thought Diary in application records certain sets of questions from the users, they are as follows:

Que 1. When did this thought occur?

Que 2. What was the Situation?

Que 3. How true do you think this thought is?

Que 4. What was your strongest Emotion?

Que 5. What Behaviours did this thought trigger?

Que 6. What Evidence is there that your thought is true?

Thought Diary typically involves the following steps:

- a. **Identifying the situation:** The first step in using a Thought Diary is to identify the situation that triggered the negative thought. This could be a specific event, such as an argument with a friend or a stressful situation at work.
- b. **Recording emotions:** The next step is to record the emotions that were experienced during the situation. This could include feelings such as sadness, anger, anxiety, or guilt.
- c. **Identifying the negative thought:** After identifying the situation and emotions, the individual is asked to identify the negative thought that they had in response to the situation. These negative thoughts are often automatic and unhelpful, and can contribute to negative emotions.
- d. **Challenging the negative thought:** In this step, the individual is encouraged to challenge the negative thought by questioning its validity and looking for evidence that contradicts it. This can help the individual gain a more balanced perspective and reduce the intensity of their negative emotions.
- e. **Replacing negative thoughts:** Once the negative thought has been challenged, the individual is asked to replace it with a more positive and realistic thought. This can help the individual feel more optimistic and hopeful about the situation.
- f. **Reviewing progress:** Finally, the individual is encouraged to review their progress over time by revisiting previous Thought Diaries and reflecting on how their thought patterns and emotions have changed.

The Thought Diary is a simple but powerful tool that can help individuals identify and challenge negative thoughts that are contributing to emotional distress. By regularly using a Thought Diary, individuals can build resilience and develop the skills necessary to manage their emotions and cope with difficult situations.

### **5.5.2. Mood Tracker**

A mood tracker is a tool used in mental health therapy applications to help individuals monitor and track their emotional states over time. It typically involves a simple rating system that allows the user to record their mood on a regular basis, such as daily or weekly.

The function of a mood tracker in mental health therapy applications is to help individuals become more aware of their emotions and identify patterns or triggers that may contribute to their mental health struggles. By tracking their moods over time, individuals can gain insight into their emotional patterns and better understand the impact of different factors on their mental well-being. This information can then be used in therapy sessions to develop personalized treatment plans that address the individual's specific needs and goals.

The function of mood trackers is to help individuals identify patterns and changes in their emotional states, as well as to provide a way to monitor progress and treatment effectiveness. By regularly logging their moods and associated factors, such as sleep, diet, and medication, individuals can gain a better understanding of their emotional triggers and how to manage them. In therapy applications, mood trackers can also provide valuable information to mental health professionals, allowing them to tailor treatment plans and interventions to meet individual needs. For example, if a person is consistently reporting feelings of anxiety at a particular time of day, the therapist may suggest relaxation techniques or mindfulness exercises to be practiced during that time.

In addition to helping individuals monitor their moods, many mood trackers in mental health therapy applications also provide other features, such as the ability to record notes or journal entries, set reminders for self-care activities, and track other health behaviour such as sleep and exercise. These additional features can help individuals develop a holistic approach to their mental health and well-being.



### **5.5.3. AI Therapist**

An AI therapist, also known as a chatbot therapist, is an application that uses artificial intelligence (AI) to simulate a conversation with a human user in order to provide mental health support and therapy. The function of AI therapists in mental health therapy applications is to provide users with a convenient and accessible way to receive mental health support. These chatbots are available 24/7 and can be accessed from a smartphone or computer, making them a convenient option for individuals who may have difficulty accessing traditional in-person therapy. AI therapists use natural language processing (NLP) and machine learning algorithms to analyse and respond to user input. They can provide support and guidance for a variety of mental health concerns, including depression, anxiety, and stress. Some AI therapists also incorporate cognitive-behavioural therapy (CBT) techniques, which are evidence-based approaches to mental health treatment. While AI therapists are not a replacement for traditional therapy, they can serve as a supplement or an initial step towards seeking professional help. They can also provide a way for individuals to track their moods and progress over time, as well as to receive feedback and insights into their mental health.

The function of AI Therapists is to provide a convenient and accessible option for individuals who may not have access to traditional therapy or prefer a more private and anonymous way of seeking support. AI Therapists can offer a variety of services, such as mood tracking, guided meditations, cognitive behavioural therapy (CBT), and self-care advice, among others. AI Therapists can also learn from user interactions, adapting and personalizing their responses over time. This can help to build a sense of trust and rapport with users, and provide a more individualized therapy experience. However, it's important to note that AI Therapists are not intended to replace traditional therapy and should not be relied upon as a sole source of mental health support. They can be a useful tool for individuals as a supplement to traditional therapy or as a starting point for those who may be hesitant to seek help.

The Ultimate functioning of AI Therapists in mental health therapy applications is to provide a convenient and accessible option for individuals seeking mental health support, offering a variety of services and learning from user interactions to provide personalized support.

#### **5.5.4. Counselling chatbot**

Counselling chatbots are another feature commonly found in mental health therapy applications. They use AI and NLP technologies to simulate a conversation with a mental health professional, providing support, guidance, and therapy in a conversational manner. The function of counselling chatbots is to provide a convenient and accessible option for individuals seeking mental health support. Chatbots can offer a variety of services, such as mood tracking, cognitive behavioural therapy (CBT), guided meditations, and self-care advice, among others.

Counselling chatbots can also learn from user interactions, adapting and personalizing their responses over time. This can help to build a sense of trust and rapport with users, and provide a more individualized therapy experience. However, it's important to note that counselling chatbots are not intended to replace traditional therapy and should not be relied upon as a sole source of mental health support. They can be a useful tool for individuals as a supplement to traditional therapy or as a starting point for those who may be hesitant to seek help.

Counselling chatbots have a number of potential uses in mental health therapy applications, including:

- Providing a safe and anonymous space for individuals to seek support: Chatbots can provide a non-judgmental and confidential space for individuals to discuss their mental health concerns, particularly for those who may be hesitant to seek help from a traditional therapist.
- Offering immediate support and guidance: Chatbots can provide immediate responses and support to individuals in distress, offering coping strategies and self-care advice to help manage their emotions in the moment.
- Assisting in the self-assessment and triage process: Chatbots can help individuals identify and understand their symptoms, providing guidance on whether they should seek further professional help or not.
- Providing psychoeducation and evidence-based therapy: Chatbots can offer evidence-based psychotherapy such as cognitive-behavioural therapy (CBT) to individuals, helping them to understand and manage their mental health issues.
- Personalization and 24/7 availability: Chatbots can adapt to the individual needs of users, offering personalized support and advice based on their mood and

behaviour patterns. They can also provide 24/7 support, making it more convenient and accessible for individuals to seek help when they need it.

Overall, the function of counselling chatbots in mental health therapy applications is to provide a convenient and accessible option for individuals seeking mental health support, offering a variety of services and learning from user interactions to provide personalized support.

## **2.2. Client Server Architecture**

Client-server architecture is a computing model where software applications are split into two parts: a client that requests services or resources, and a server that provides those services or resources. The client, which can be a computer program or a device, sends requests to the server over a network. The server, which can be a physical machine or a cloud-based service, processes those requests and returns a response to the client.

This architecture enables multiple clients to access the same resources simultaneously, without requiring each client to have its own copy of the resource. This can lead to more efficient use of resources, such as databases or processing power, and can also make it easier to manage and update applications. Client-server architecture is widely used in web applications, where clients access resources through a web browser, and in enterprise applications, where clients access resources through a custom software application. A client-server architecture is a computing model in which client devices such as computers or mobile devices request resources or services from a central server. In this architecture, the server is responsible for providing resources and services to client devices that request them. The clients are devices that consume the resources or services provided by the server.

The communication between clients and servers is typically done using a network protocol, such as HTTP or TCP/IP. The client sends requests to the server, which processes the requests and sends responses back to the client. This architecture is commonly used in web-based applications, where the client device is a web browser and the server provides web pages and services. It is also used in other types of

applications, such as email clients, chat applications, and database management systems. The advantages of a client-server architecture include centralized control, scalability, and improved security. However, it also requires more complex implementation and management than other architectures, such as peer-to-peer or distributed systems.

### **2.3. Conversational AI**

Conversational AI, also known as chatbot or virtual assistant technology, is a branch of artificial intelligence (AI) that enables computers to simulate human-like conversations with users. Conversational AI systems use natural language processing (NLP) to understand and interpret human language, as well as machine learning algorithms to improve their responses and interactions over time. These systems are designed to converse with humans through text or voice-based interactions and can perform various tasks such as answering questions, providing recommendations, scheduling appointments, and even making purchases.

Conversational AI is widely used in customer service and support, where virtual assistants and chatbots can handle routine inquiries and issues, allowing human agents to focus on more complex tasks. It is also used in other industries such as healthcare, finance, and e-commerce to improve customer experience and automate tasks. Conversational AI (Artificial Intelligence) is a technology that enables machines to understand and carry-on human-like conversations. It is also known as chatbot or virtual assistant technology, and it is designed to mimic human-like communication using natural language processing (NLP), machine learning, and other AI techniques.

Conversational AI enables machines to understand and interpret natural language, including the intent and context behind a message, and respond in a way that is both natural and relevant to the user's request or inquiry. This technology is used to create chatbots, virtual assistants, and other conversational interfaces that can communicate with users through text or voice. Conversational AI is used in a wide range of applications, including customer service, healthcare, education, finance, retail, travel, and entertainment. It can help companies automate customer interactions, provide personalized experiences, and reduce operational costs by eliminating the need for human operators in certain scenarios.

Overall, Conversational AI is a rapidly evolving technology that has the potential to revolutionize the way people interact with machines and enhance the efficiency and effectiveness of many industries.

### 5.5.1. LLMs

LLMs (Large Language Models) are a type of artificial intelligence model that is trained to understand and generate natural language. These models are designed to be very large and complex, with millions or even billions of parameters, and are trained on vast amounts of text data using techniques such as unsupervised learning. LLMs are capable of performing a wide range of language-related tasks, such as language translation, text summarization, question-answering, and even creative writing. They work by breaking down language into smaller units, such as words and phrases, and using statistical analysis to identify patterns and relationships between these units.

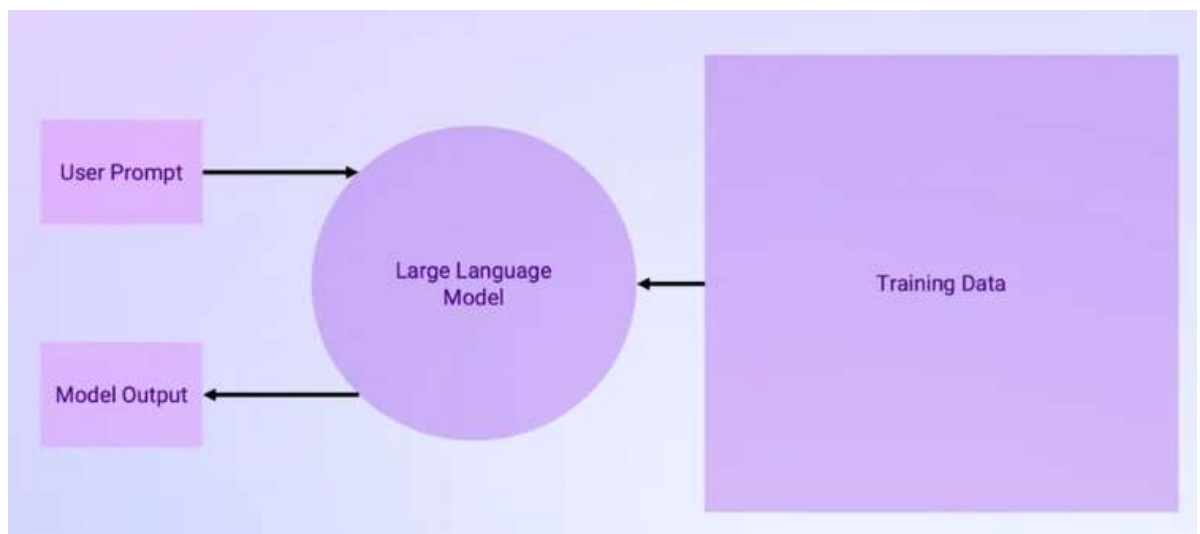


Fig 3.3.3.1: Large Language Model

One of the most well-known LLMs is GPT (Generative Pre-trained Transformer), developed by Open AI. GPT has been used to create a variety of language-based applications, including chatbots, language translation tools, and content generation tools. Other notable LLMs include BERT (Bidirectional Encoder Representations from Transformers) and T5 (Text-to-Text Transfer Transformer).

LLMs are a significant breakthrough in AI, as they enable machines to understand and generate natural language at a level that was previously not possible. They have the potential to revolutionize the way we interact with machines and the way we communicate with each other, and they are already being used in a wide range of applications to improve efficiency, productivity, and user experiences.

A large language model (LLM) is a type of machine learning model that can perform a variety of natural language processing (NLP) tasks, including generating and classifying text, answering questions in a conversational manner and translating text from one language to another. The label “large” refers to the number of values (parameters) the model can change autonomously as it learns. Some of the most successful LLMs have hundreds of billions of parameters. LLMs are trained with immense amounts of data and use self-supervised learning to predict the next token in a sentence, given the surrounding context. The process is repeated over and over until the model reaches an acceptable level of accuracy.

Once an LLM has been trained, it can be fine-tuned for a wide range of NLP tasks, including:

- Building conversational chatbots like ChatGPT.
- Generating text for product descriptions, blog posts and articles.
- Answering frequently asked questions and routing customer inquiries to the most appropriate human.
- Analysing customer feedback from email, social media posts and product reviews.
- Translating business content into different languages.
- Classifying and categorizing large amounts of text data for more efficient processing and analysis.

### 5.5.2. LLaMA

The transformer architecture underpins LLaMA (Large Language Model Meta AI), an auto-regressive language model. It is a cutting-edge foundational large language model developed to assist researchers in this subfield of AI. The model is available in four sizes: 7B, 13B, 33B, and 65B. It was created by Meta AI's FAIR team. The primary application of LLaMA is research on large language models, such as question answering, natural language understanding, or reading comprehension, understanding the strengths and weaknesses of present-day language models and developing techniques for bettering them, assessing and reducing biases, risks, toxic and harmful content generation, and hallucinations. The LLaMA 7B model is a deep learning algorithm that uses a technique called transformer-based architecture to process natural language.

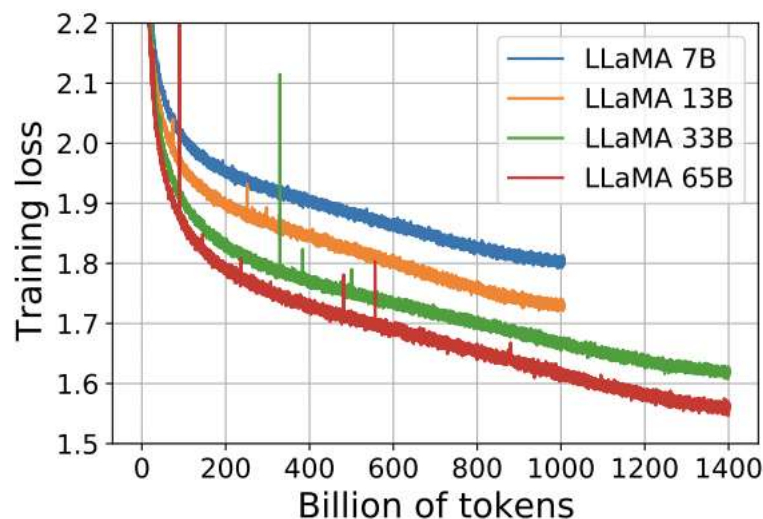


Fig 3.3.2.1 : LLaMA versions with sets of language models

The transformer architecture relies on a series of attention mechanisms that help the model focus on LLaMA (Large Language Model Meta AI), a state-of-the-art foundational large language model designed to help researchers advance their work in this subfield of AI. Smaller, more performant models such as LLaMA enable others in the research community who don't have access to large amounts of infrastructure to study these models, further democratizing access in this important, fast-changing field.

Training smaller foundation models like LLaMA is desirable in the large language model space because it requires far less computing power and resources to test new

approaches, validate others' work, and explore new use cases. Foundation models train on a large set of unlabelled data, which makes them ideal for fine-tuning for a variety of tasks. We are making LLaMA available at several sizes (7B, 13B, 33B, and 65B parameters) and also sharing a LLaMA model card that details how we built the model in keeping with our approach to Responsible AI practices. relevant parts of the input text, allowing it to generate more accurate outputs.

Here's a step-by-step explanation of how the LLaMA 7B model works:

- 1) **Input text:** The model receives an input text that needs to be processed. This could be a sentence, paragraph, or an entire document.
- 2) **Tokenization:** The input text is split into individual tokens (words, phrases, or sub-words), which are then converted into numerical representations that the model can understand.
- 3) **Encoding:** The numerical representations are passed through multiple layers of the transformer architecture, which allows the model to learn the relationships between the different tokens and extract meaningful information from the input text.
- 4) **Attention mechanism:** The attention mechanism helps the model focus on relevant parts of the input text. Specifically, it assigns weights to each token based on how relevant it is to the task at hand. The model then uses these weights to compute a weighted sum of the token embeddings, which gives it a representation of the most important parts of the input text.
- 5) **Decoding:** The model then uses the attention-based representation to generate an output that's appropriate for the task at hand. For example, if the task is machine translation, the output might be a translated version of the input text in a different language.
- 6) **Output:** The model produces an output in the form of text, which can then be used for various language-related tasks, such as summarization, question-answering, and text classification.

Overall, the LLaMA 7B model is a powerful tool that relies on deep learning and attention mechanisms to process natural language and generate accurate outputs for a wide range of language tasks.



### 5.5.3. Alpaca

The Alpaca model is a large language model developed by researchers at the Stanford University. Alpaca was fine-tuned from Meta's LLaMA model by training upon 52K instruction-following examples created by text-davinci-003. The researchers intended that Alpaca has many of the same tendencies as OpenAI's text-davinci-003, but is also tiny and easy to replicate. They have made the training algorithm and data available, and the model weights are available as delta files to be applied to the LLaMA model's weights, in accordance with Meta's licensing policy.

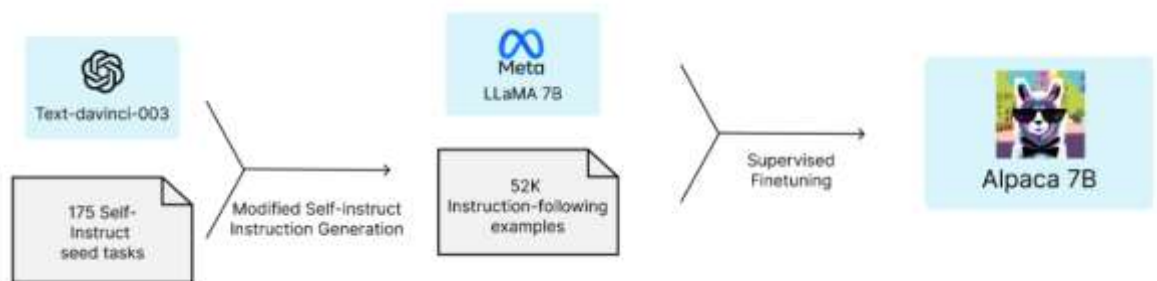


Fig 3.3.3.1: Alpaca AI Model

The researchers extended the self-instruct method by using the 175 human-written instruction-output pairs from the self-instruct seed set to generate instruction-following demonstrations. Text-davinci-003 was then used to generate more instructions using the seed set as in-context examples.

The researchers reduced the cost of the generation pipeline by simplifying it. Using the OpenAI API, this process produced 52K unique instructions and the corresponding outputs for less than \$500. They upgraded the LLaMA models adopting Hugging Face's training framework, which included techniques like Fully Sharded Data Parallel and mixed precision training. On 8 80GB A100s, which cost less than \$100 on most cloud compute providers, fine-tuning a 7B LLaMA model took 3 hours. The researchers suggest that training efficiency should be improved to further reduce costs.

```
Last login: Tue Apr 25 20:39:36 2023 from 106.211.122.177
azureuser@fintune: $ ./script.sh
tee: outputs/0.txt: No such file or directory
main: seed = 1682488021
llama.cpp: loading model from llama.cpp/models/ggml-model-q4_0.bin
llama_model_load_internal: format      = ggjt v1 (latest)
llama_model_load_internal: n_vocab    = 32000
llama_model_load_internal: n_ctx      = 512
llama_model_load_internal: n_embd     = 4096
llama_model_load_internal: n_mult     = 256
llama_model_load_internal: n_head     = 32
llama_model_load_internal: n_layer    = 32
llama_model_load_internal: n_rot      = 128
llama_model_load_internal: ftype      = 2 (mostly Q4_0)
llama_model_load_internal: n_ff       = 11008
llama_model_load_internal: n_parts    = 1
llama_model_load_internal: model size = 7B
llama_model_load_internal: ggml ctx size = 59.11 KB
llama_model_load_internal: mem required = 5809.32 MB (+ 1026.00 MB per state)
llama_init_from_file: kv self size = 256.00 MB

system_info: n_threads = 4 / 4 | AVX = 1 | AVX2 = 1 | AVX512 = 0 | AVX512_VBMI = 0 | AVX512_VNNI = 0 | FMA = 1 | NEON = 0 | ARM_FMA = 0 | F16C = 1 |
FP16_VA = 0 | WASH_SIMD = 0 | BLAS = 0 | SSE3 = 1 | VSX = 0 |
sampling: temp = 0.800000, top_k = 40, top_p = 0.950000, repeat_last_n = 64, repeat_penalty = 1.100000
generate: n_ctx = 512, n_batch = 512, n_predict = 512, n_keep = 0

The following is a conversation between a patient and a therapist. The therapist is a polite, calm, compassionate listener, and aims to help the patient open up and share their struggles and feelings. ["user": "My wife and mother are having tense disagreements. In the past, they've had minor differences. For example, my wife would complain to me my mother is too overbearing; my mother would complain my wife is lazy. However, it's intensified lately. I think the cause is my wife talked back to her once. Now, any little disagreement is magnified, leading to major disagreements. What can I do?", "therapist": "I understand how difficult this must be for you and your family. To help, I suggest developing a communication plan between your wife and mother. This should include setting ground rules regarding expectations, boundaries, and the amount of support needed. Acknowledging their differences and trying to find common goals can also help them move forward in a positive way."] [end of text]
```

Fig 3.3.3.2 : Output generation form Alpaca 7B

One of the key features of ALPACA is its ability to perform both language parsing and common-sense reasoning simultaneously. This means that the model can not only understand the meaning of individual words and phrases, but also the relationships between them and the broader context in which they are used. ALPACA is trained on a range of tasks, including language modelling, question answering, and common-sense reasoning, and it achieves state-of-the-art results on several benchmarks. For example, it has achieved top performance on the SuperGLUE benchmark, which measures a model's ability to perform a range of natural language understanding tasks. One of the key innovations of ALPACA is its use of adaptive computation, which allows the model to dynamically adjust the computational resources it uses based on the difficulty of the task at hand. This allows the model to balance accuracy and efficiency, and makes it well-suited for real-world applications. Overall, ALPACA is a highly advanced language model that is capable of performing range of complex natural language understanding tasks. Its focus on common-sense reasoning is particularly noteworthy, as this is a crucial area for AI systems to master in order to achieve human-like language understanding.

#### **5.5.4. GPT 3**

GPT-3 (Generative Pre-trained Transformer 3) is a language model developed by Open AI, one of the world's leading AI research organizations. It is the most powerful version of the GPT series, which consists of a family of neural network models based on the Transformer architecture. GPT-3 is trained on a massive amount of text data using an unsupervised learning approach. It has 175 billion parameters, making it one of the largest and most powerful language models ever created. The model is capable of performing a wide range of natural language processing tasks, such as language translation, summarization, and question answering. One of the key features of GPT-3 is its ability to generate high-quality natural language text. Given a prompt, the model can generate coherent and grammatically correct text that is often difficult to distinguish from human-written text. This has led to a variety of applications, including language generation for chatbots, virtual assistants, and content creation. GPT-3 has achieved state-of-the-art performance on a range of benchmarks and has demonstrated impressive language understanding capabilities. However, it also has some limitations, such as a tendency to produce biased or offensive text when prompted with certain types of input.

GPT-3.5: Generative Transformer 3 (GPT-3) is a pre-trained autoregressive language model that was launched in 2020 and employs deep learning to generate text that appears to be human language. It generates text that answers questions when specified a cue.

GPT-3.5 is a set of models that improve on GPT-3 and can understand as well as generate natural language and code. GPT-3.5 models can understand and generate natural language or code. Our most capable and cost-effective model in the GPT-3.5 family is gpt-3.5-turbo which has been optimized for chat but works well for traditional completions tasks as well.

New versions of GPT-3 were announced and made available by Open AI on March 15, 2022, under the names "text-davinci-002" and "code-davinci-002". The models, that were trained using data up to June 2021, were identified to be more capable than earlier iterations. On November 30, 2022, Open AI started referring to these models as part of the "GPT-3.5" series and unveiled Chat GPT, a model that had been improved from a GPT-3.5 series model. gpt-3.5-turbo Most capable GPT-3.5 model and optimized for chat at 1/10th the cost of text-davinci-003. Will be updated with our latest model

iteration. It consists of 4,096 tokens and were trained up to Sep 2021 Models in the GPT-3.5 series were developed using text and code from prior to Q4 2021.

Experimenting with gpt-3.5-turbo is a great way to find out what the API is capable of doing. The GPT-3.5 series includes the following models:

- 1) code-davinci-002 is a base model, so good for pure code-completion tasks.
- 2) text-davinci-002 is an Instruct GPT model which is based on code-davinci-002.
- 3) text-davinci-003 is an improvement on text-davinci-002.
- 4) gpt-3.5-turbo-0301 is also an improvement on text-davinci-003, optimized for chat.

Overall, GPT-3 represents a major advance in the field of natural language processing and has the potential to enable a range of exciting applications in the future. However, it also raises important ethical and societal questions about the impact of such powerful AI systems on society.

#### **5.5.5. Which LLM to choose?**

In our research paper titled “The Effectiveness of LLM’s in Mental Health [index],” we compare the options available to us and conclude Alpaca to be the model of choice for our implementation, for the following three properties:

- Cheap: The model is far smaller, and thus computationally cheaper to run than GPT3
- Effective: The model performed at an acceptable level compared to actual therapists, as measured in our research
- Private: The small size of the AI allows for the possibility of users running local instances without sharing private information with third party providers.

For these reasons, we chose Alpaca as our backend model to generate responses to users’ conversations.

# DESIGN

## 4.1 Design Goals

### 4.1.1 User-Centric Design:

Our application prioritizes a user-centered approach, focusing on creating intuitive and engaging user interfaces to enhance the overall user experience. We aim to ensure that users can navigate through different features effortlessly, contribute content seamlessly, and utilize mental health tools effectively.

### 4.1.2 Accessibility:

We are committed to adhering to accessibility guidelines, ensuring that individuals with disabilities can access and utilize our application with ease. We will incorporate features such as adjustable font sizes, high contrast options, and support for assistive technologies, thereby making the app accessible to a wider range of users.

### 4.1.3 Mood Tracking and Thought Diary Integration

We aim to provide a comprehensive mood tracking and thought diary feature within our application. This feature will empower users to record and analyse their emotions and thoughts effectively. We will design this functionality to be user-friendly, intuitive, and capable of providing valuable insights into the user's mental well-being.

### 4.1.4 AI Conversation Partner

Our application will include an AI-powered conversation partner designed to engage users in meaningful and supportive conversations. We aim to develop an AI system that can provide empathetic responses, offer helpful advice, and recognize potential mental health concerns. Additionally, the AI will direct users to appropriate resources if necessary, ensuring they receive the support they need.

### 4.1.5 Content Contribution

We recognize the importance of user contribution in shaping our mental health application. To facilitate this, we will design the app to allow users to contribute their own mental health tools, resources, and techniques. We will implement an easy submission and review process, ensuring that user-contributed content aligns with quality standards and positively impacts the mental well-being of the community.

#### **4.1.6 Personalization and Customization**

Our application will provide users with options for personalization and customization to enhance their experience. Users will be able to select preferred themes, set reminders, and customize notifications. By offering these personalization features, we aim to increase user engagement and encourage regular usage of the app's features.

#### **4.1.7 Data Privacy and Security**

We are committed to prioritizing the privacy and security of user data within our application. We will implement appropriate measures to protect personal information, ensuring compliance with relevant data protection regulations. Users can feel confident in sharing their thoughts and emotions within the app, knowing that their data is secure.

#### **4.1.8 Seamless Integration with Mobile Platforms**

Our application will be designed to seamlessly integrate with both iOS and Android platforms. We will ensure that the app provides a consistent and optimized experience across different devices. Compatibility with various screen sizes, resolutions, and operating system versions will be considered during the development process.

#### **4.1.9 Performance and Stability**

We aim to create a responsive, fast, and stable application. We will implement performance optimization techniques to ensure smooth user interactions, minimizing loading times and delays. Thorough testing on different devices and under varying network conditions will be conducted to guarantee reliable performance.

#### **4.1.10 Feedback and User Support**

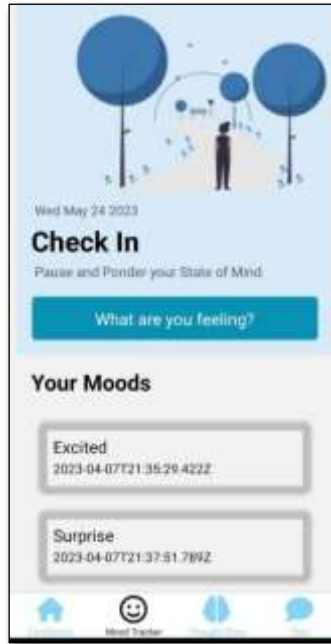
Our application will incorporate mechanisms for users to provide feedback, report issues, and request support. We will establish a responsive and attentive support system to address user concerns promptly and offer assistance when needed. Regular updates and bug fixes will be released to enhance the application's functionality based on user feedback.

By incorporating these design goals into the development of our React Native application, we aim to create a user-friendly, inclusive, and impactful platform that promotes mental well-being and empowers users to contribute to the mental health community.

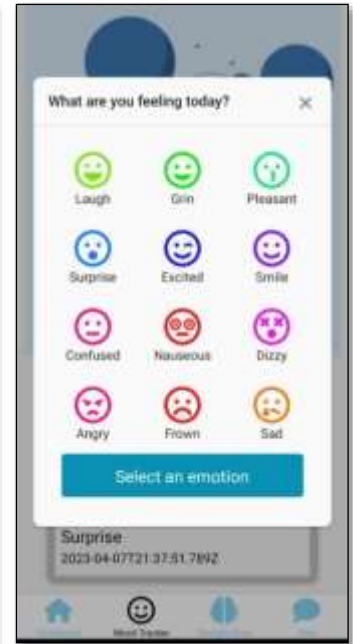
## 4.2 UI Design



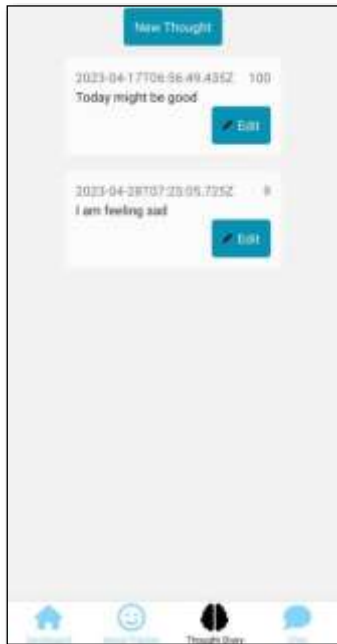
Screenshot 0.2.1: Dashboard



Screenshot 4.2.2: Mood Tracker



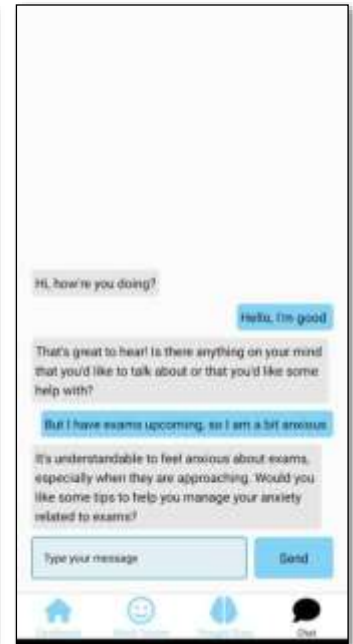
Screenshot 0.2.3: Select Mood



Screenshot 0.2.4: Thought Diary



Screenshot 0.2.5: Thought Diary Questionnaire



Screenshot 0.2.6: AI Chat

### 4.3 Architecture diagram

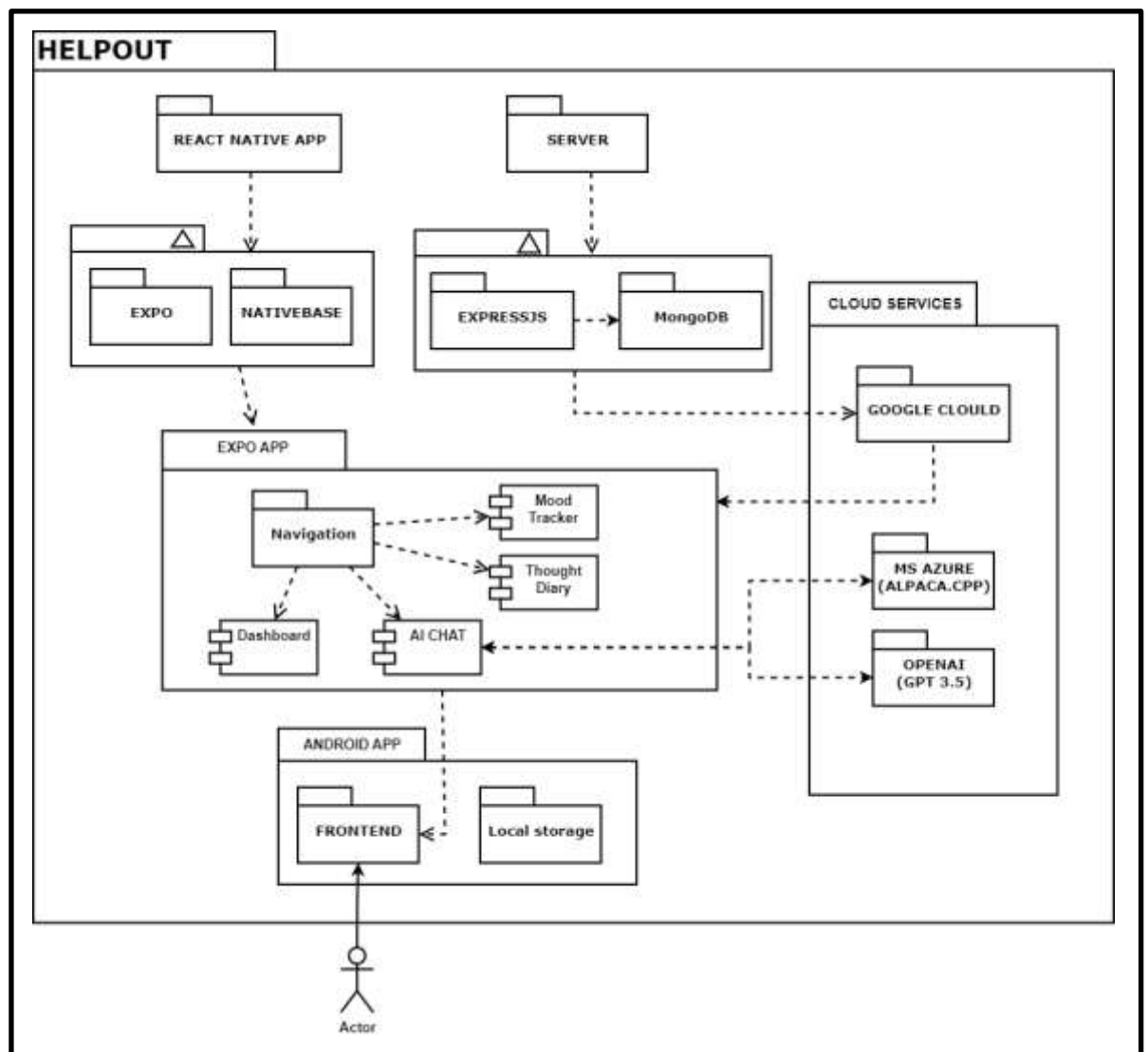


Fig 4.3.1: Architecture Diagram

The App is built upon React Native, using Expo development framework and the NativeBase component library. The app source is then bundled and launched via Expo Go (in testing and development) or compiled and installed (in production).

The App communicates with a cloud server on Google cloud, and the AI chat also communicates with an Azure VM with a server for Alpaca generated results as well as the Open AI API when OpenAI's GPT-based models are selected for use instead.

As shown in the Architecture diagram, the App has a modular design, with a navigation package to navigate across them. This would in future enable the addition of user contributed modules.



## **4.4 Use Case Analysis**

### **4.4.1 Use Case 1: View Dashboard**

- Actors: User
- Description: The user can view a dashboard that presents various statistics and graphs related to their mental health.
- Preconditions: The user must be logged into the app.
- Flow of Events:
  1. The user opens the HelpOut app and navigates to the dashboard section.
  2. The app retrieves and presents relevant statistics and graphs, such as mood trends, activity levels, or sleep patterns.
  3. The user can interact with the dashboard to explore different data representations or access detailed information.
- Postconditions: The user gains insights into their mental health based on the presented dashboard.

### **4.4.2 Use Case 2: Track Mood**

- Actors: User
- Description: The user can track their mood over time using the mood tracker feature.
- Preconditions: The user must be logged into the app.
- Flow of Events:
  1. The user opens the HelpOut app and goes to the mood tracker section.
  2. The app provides options to select or input their current mood, such as happy, sad, anxious, etc.
  3. The user selects their mood or manually enters it.
  4. The app records the mood entry along with the timestamp.
  5. The user may optionally add additional notes or context to the mood entry.
- Postconditions: The user's mood is logged and can be later viewed on the dashboard or used for analysis purposes.

### **4.4.3 Use Case 3: Log Thought in Diary**

- Actors: User
- Description: The user can log their thoughts and feelings in the thought diary feature.

- Preconditions: The user must be logged into the app.
- Flow of Events:
  1. The user opens the HelpOut app and accesses the thought diary section.
  2. The app provides an interface to write or record their thoughts and feelings.
  3. The user enters their thoughts or records an audio message.
  4. The app stores the thought entry along with the timestamp.
  5. The user may categorize or tag the thought entry for easier retrieval.
- Postconditions: The user's thoughts are recorded and can be later revisited or shared with a mental health professional if desired.

#### **4.4.4 Use Case 4: Interact with AI Chatbot**

- Actors: User, AI Chatbot
- Description: The user can engage in conversations with an AI chatbot when they feel the need to talk to someone.
- Preconditions: The user must be logged into the app.
- Flow of Events:
  1. The user opens the HelpOut app and initiates a conversation with the AI chatbot.
  2. The chatbot greets the user and provides prompts or questions to encourage conversation.
  3. The user responds to the chatbot's prompts, sharing their feelings, concerns, or experiences.
  4. The chatbot uses natural language processing to generate appropriate responses and provide support.
  5. The conversation continues as the user and chatbot exchange messages.
  6. The user can end the conversation when they feel satisfied or ready to stop.
- Postconditions: The user receives emotional support and a listening ear through the interaction with the AI chatbot.

These use case analyses provide an overview of the main functionalities and interactions within your HelpOut app. Feel free to expand upon these analyses or add any additional use cases that may be specific to your app.

## IMPLEMENTATION

### 5.1 Nodejs

Node.js is an open-source, cross-platform runtime environment that allows developers to execute JavaScript code outside of a web browser. It is built on the V8 JavaScript engine used in Google Chrome, and it provides an event-driven, non-blocking I/O model that makes it ideal for building scalable and high-performance applications

Node.js is often used for server-side web development, but it can also be used for building command-line tools and desktop applications. Node.js has a large and active community of developers, which has resulted in a vast ecosystem of modules and libraries that can be easily installed using Node Package Manager (npm).

Node.js is commonly used for building server-side applications, such as web servers, APIs, real-time chat applications, and more. It also has a large ecosystem of third-party libraries and frameworks that developers can use to build their applications more quickly and easily.

One of the key benefits of Node.js is its ability to handle large amounts of concurrent connections with low latency, which makes it well-suited for building real-time applications that require fast and reliable data exchange. Additionally, because Node.js is built on JavaScript, developers can use the same language and tools for both front-end and back-end development, which can simplify the development process and reduce the overall complexity of an application.

There are several reasons why developers choose to use Node.js for their projects:

- **Scalability:** Node.js is designed to handle large-scale applications with high levels of concurrency. Its non-blocking IO model allows it to handle a large number of requests without getting bogged down.
- **Efficiency:** Because Node.js uses JavaScript on both the front-end and back-end, it allows developers to use a single language and set of tools across the entire stack, which can increase development efficiency and reduce time-to-market.
- **Speed:** Node.js is known for its fast performance due to its event-driven architecture and non-blocking I/O model.
- **Large ecosystem:** Node.js has a vast and active community of developers, which has resulted in a rich ecosystem of modules and libraries that can be easily integrated into projects using Node Package Manager (npm).

- **Cross-platform compatibility:** Node.js is cross-platform, meaning it can run on Windows, Mac, and Linux operating systems, making it a versatile choice for developers.

Overall, Node.js is a popular choice for building scalable, high-performance, and efficient applications that require real-time data exchange, such as chat applications, real-time data processing, and streaming services.

## **5.2 React Native**

React Native is an open-source framework for building native mobile applications using JavaScript and React. It offers code reusability across multiple platforms, resulting in faster development and cost savings. Native components specific to each platform ensure compatibility and performance.

### **User Contributed Modules**

React Native components allow the incorporation of pre-built modules contributed by the community. This approach expands the functionality and versatility of our application by incorporating diverse mental health tools and resources.

### **Cross-Platform Compatibility:**

React Native enables the development of cross-platform applications, using a single codebase for iOS and Android platforms. This approach saves development time and reduces costs while reaching a wider audience.

### **User-Friendly Interface:**

The NativeBase library provides customizable and high-quality UI components. Intuitive navigation, clear instructions, and interactive tools enhance the user experience.

### **Real-Time Communication and Offline Capabilities:**

React Native allows the implementation of real-time communication features, such as chat or video calling, facilitating direct interaction between patients and therapists or support groups. Offline capabilities ensure uninterrupted usage of the application, allowing patients to complete tasks or exercises even without an internet connection.

### **Integration with Third-Party Tools:**

React Native seamlessly integrates with third-party tools, such as wearables or medical devices, enhancing the application's functionality. Integration with external sources enables the gathering of accurate and real-time data, contributing to personalized treatment plans.

### **Security and Privacy Considerations:**

React Native incorporates built-in security and privacy features to safeguard sensitive patient data. Compliance with relevant data protection regulations ensures trust and confidentiality within the mental health therapy application.

By leveraging the user-contributed module approach and the features provided by React Native, our mental health therapy application can be developed as a comprehensive and user-centric platform, offering cross-platform compatibility, a user-friendly interface, real-time communication capabilities, offline functionalities, seamless integration with third-party tools, and robust data security measures.

## **5.3 Expo**

Expo is a free and open-source platform for developing and deploying mobile applications for iOS, Android, and web platforms. It provides a set of tools and services that make it easier for developers to build, test, and deploy mobile applications without requiring them to have extensive knowledge of native development technologies.

Some common applications of Expo include:

- **Prototyping and testing:** Expo provides a quick and easy way to prototype and test mobile applications. Developers can use the platform to quickly create a new project, add components, and test their application on a device or simulator.
- **Cross-platform development:** Expo provides a cross-platform development environment that allows developers to build applications for both iOS and Android using a single codebase. This can save time and effort compared to building separate applications for each platform.
- **Access to native APIs:** Expo provides access to a range of native APIs that can be used to build mobile applications with features such as camera, location, and push

notifications. These APIs can be accessed using JavaScript, which makes it easier for developers to use them without having to learn native development languages.

- **Community and libraries:** Expo has a large and active community of developers who contribute to the platform and provide support to others. It also has a wide range of pre-built components and libraries that can be easily integrated into projects using the Expo platform.
- **Over-the-air updates:** Expo allows developers to deploy updates to their applications over the air, which means that users do not have to download a new version of the application every time there is an update. This can save time and improve the user experience.
- **Analytics and performance monitoring:** Expo provides analytics and performance monitoring tools that can help developers track how their applications are performing and identify areas for improvement.

## **Debugging**

During our implementation phase, we encountered several challenges in using Expo as a development platform:

- **Poor Dependency Management:** Expo uses its own cli tool to manage dependencies alongside npm, however in case when a dependency has a vulnerability, attempting to upgrade the vulnerable package is prone to messing up the entire dependency tree.
- **Debugging:** Expo provides several options for debugging; however, the bundling and cross compilation can result in some errors originating from untraceable sources. We also encountered Sourcemap generation issues on some platforms, though the cause of the problem was not discovered.
- **Crashing:** Expo apps previewed in Expo Go have a tendency to crash without tracebacks. This is most notable when the styling of the app components has a bug. While Expo, uses and supports plenty of CSS functionalities, styling in expo is not a one-to-one implementation for all CSS. Accidental usage of common CSS was the most painful part of the development process. This was mitigated somewhat by using NativeBase component library, thus avoiding direct CSS writing by developers.

Overall, we found expo to be a difficult but versatile platform that can be used to develop a wide range of mobile applications, from simple to complex, for various platforms. It provides a range of features and tools that can make the development process faster and more efficient, while also providing access to native APIs and community support.

## **5.4 Expo Go**

Expo Go is a mobile application that is used to run and test Expo projects on iOS and Android devices. It allows developers to quickly test their applications on a real device without having to build and deploy a standalone version of the application.

Some common use cases of Expo Go include:

### **Testing**

Developers can use Expo Go to test their applications on a real device to ensure that the application works as intended and that there are no bugs or performance issues.

### **Sharing**

Developers can use Expo Go to share their projects with others, such as stakeholders or team members, for feedback or testing purposes.

### **Demonstrations**

Expo Go can be used to demonstrate the functionality of an application to clients or stakeholders without requiring a separate build or deployment process.

### **Quick iterations**

Expo Go allows developers to make changes to their application and immediately see the results on a real device, which can help speed up the development process and improve iteration times.

### **On-the-go development**

Expo Go can be used to make changes to an application on the go, such as during a meeting or while traveling, without requiring a separate development environment.

Overall, Expo Go is a useful tool for developers who are building applications using the Expo platform. It provides a quick and easy way to test and share applications on a real device, which can help to speed up the development process and improve the quality of the final product.



## **5.5 Native Base**

An open-source UI component library for React Native, facilitating the development of cross-platform mobile apps. Its pre-built UI components provide a native look and feel on iOS and Android devices, making app creation easier with minimal effort. Features like theme customization and multi-language support enhance its usability.

### **Consistent and Intuitive User Interface**

Native Base's pre-built UI components ensure a seamless user experience by creating a consistent and intuitive interface across the app.

### **User Data Collection through Forms**

Customizable form components simplify the collection of essential user information related to mental health and well-being.

### **Visual Elements for Enhanced User Experience**

Native Base's image and icon components enable the use of visual elements to enhance the user experience, such as representing emotions or creating a calming environment.

### **Customization for Branding and Design**

The powerful theming system in Native Base allows developers to customize the app's appearance to align with branding and design guidelines, creating a supportive environment for users.

Overall, Native Base's UI component library is a valuable asset for building mental health therapy applications in React Native. It provides a consistent and intuitive user interface, simplifies user data collection through customizable forms, enhances the user experience with visual elements, and allows customization for branding and design requirements. With Native Base, developers can create functional and visually appealing apps that offer support and guidance to users facing mental health challenges.

## **5.6 Express JS**

Express.js is a popular web application framework for Node.js, which is a runtime environment for executing JavaScript code outside of a web browser. It provides a set of tools and features for building web applications and APIs, including middleware, routing, templating, and much more. Express.js is designed to be simple and flexible, and allows developers to create web applications quickly and easily. Express.js is often used for building server-side web applications, such as e-commerce sites, content management systems, and social networks. It can also be used for building RESTful APIs, which are a popular way to create web services that allow different applications to communicate with each other.

Some of the key features of Express.js include:

### **Routing**

Express.js allows developers to define routes for different URLs and HTTP methods, and map them to specific functions or handlers.

### **Middleware**

Express.js provides a flexible middleware system that allows developers to add functionality to the request-response cycle, such as logging, authentication, and error handling.

### **Templating:**

Express.js provides support for several templating engines, such as EJS and Pug, which allow developers to generate dynamic HTML pages.

### **Error handling:**

Express.js provides a built-in error handling mechanism that allows developers to handle errors and exceptions in a consistent and predictable way.

### **Extensibility:**

Express.js is highly extensible, and provides a wide range of plugins and modules that can be used to add additional functionality to your application.

Overall, Express.js is a powerful tool for building the back-end of a mental health therapy application, and can provide a wide range of features and tools for managing user sessions, authenticating users, handling errors, and integrating with other systems.

## **5.7 MongoDB**

MongoDB is a widely used open-source NoSQL database management system known for its document-based data model and schema less design. It offers several key features and concepts that are beneficial for mental health therapy applications:

### **Document-based data model**

MongoDB stores data in flexible JSON-like documents, making it suitable for handling unstructured or semi-structured data such as patient demographics, medical history, and treatment plans.

### **Schema-less design**

Unlike traditional relational databases, MongoDB does not enforce a fixed schema, allowing for easier data modelling and accommodating frequent changes in requirements and data structures.

### **Scalability**

MongoDB supports sharding for horizontal scaling and replica sets for high availability and automatic failover, ensuring the system can handle increased data volumes and server failures.

### **Querying and indexing**

MongoDB provides a rich query language and supports various types of indexing, enabling efficient retrieval and analysis of data, even in large and complex datasets.

### **Aggregation and MapReduce**

MongoDB supports advanced data analysis and processing through aggregation and MapReduce operations, facilitating grouping, filtering, and analysing data for applications such as patient feedback, progress tracking, and outcome measurement.

### **Integration and drivers**

MongoDB offers drivers and APIs for multiple programming languages, allowing seamless integration with other systems used in mental health therapy, such as electronic health records, telehealth platforms, and mobile apps.

MongoDB can be utilized in mental health therapy applications in the following ways:

1. **Storing patient data:** MongoDB can efficiently store and retrieve patient data, including demographics, medical history, and treatment plans, utilizing its document-based data model and flexible schema.
2. **Analytics and reporting:** MongoDB's aggregation and MapReduce operations enable advanced data analysis, generating reports for therapists to track patient progress and identify areas for improvement, utilizing data from therapy sessions, feedback, and outcome measures.
3. **Integration with other systems:** MongoDB's integration capabilities allow for seamless data exchange with other systems used in mental health therapy, facilitating collaboration among therapists, healthcare providers, and electronic health records.
4. **Research and development:** MongoDB's scalability, performance, and querying capabilities make it suitable for storing and analysing research data, such as clinical trial data, patient surveys, and observational data, supporting evidence-based practices and research advancements.

Overall, MongoDB offers a powerful and flexible solution for mental health therapy applications, enabling efficient data storage, advanced analysis, integration with other systems, and supporting evidence-based decision-making. Its popularity and suitability for modern web applications and big data projects make it a preferred choice among developers and organizations.

## **5.8 Cloud computing**

Cloud computing refers to the delivery of computing services, such as servers, storage, databases, networking, software, and analytics, over the internet or "the cloud." It offers greater flexibility, scalability, and cost-effectiveness compared to traditional on-premises computing models. Users can access these services from a cloud provider, paying only for what they use on a subscription or pay-per-use basis. Cloud computing enables users to access services and data from anywhere with an internet connection, using various devices, leading to improved productivity and reduced hardware costs. In the implementation of the mental health therapy application, cloud computing plays a significant role in providing scalable infrastructure and advanced services. Here's a brief overview of the key cloud computing providers and technologies used:

### **5.8.1 Google Cloud Platform (GCP)**

GCP is a comprehensive cloud computing platform offered by Google. It provides a wide range of services and tools for building, deploying, and managing applications and services in the cloud. GCP offers various services, including virtual machines, storage, databases, machine learning, and more.

The application's webserver and MongoDB server are hosted on a free E2 micro instance provided by GCP. This server, featuring an E2 micro instance with a shared core, 0.25 vCPU, and 1 GB RAM, serves as the primary platform for the application's web-based functionalities and data storage using MongoDB.

### **5.8.2 Azure**

Azure is a cloud computing platform provided by Microsoft. It offers a broad set of services for building, deploying, and managing applications and services through Microsoft-managed data centres. Azure provides a wide range of services, including virtual machines, databases, AI and machine learning, analytics, and more.

In the implementation, an Azure VM, specifically an E4as v4 instance, is utilized for fine-tuning and running the Alpaca Language Learning Model (LLM). This VM offers higher computational resources with 4 vCPUs and 32 GB RAM, ensuring sufficient resources for the execution of the Alpaca LLM model with quick response times.

### **5.8.3 OpenAI**

OpenAI is an artificial intelligence research organization that develops and promotes advanced AI technologies. OpenAI provides access to powerful language models through its API, allowing developers to integrate state-of-the-art natural language processing capabilities into their applications. In the mental health therapy application, the OpenAI API is integrated to connect with GPT-based models, enhancing the chat functionality and enabling context-aware responses.

### **5.8.4 Integration**

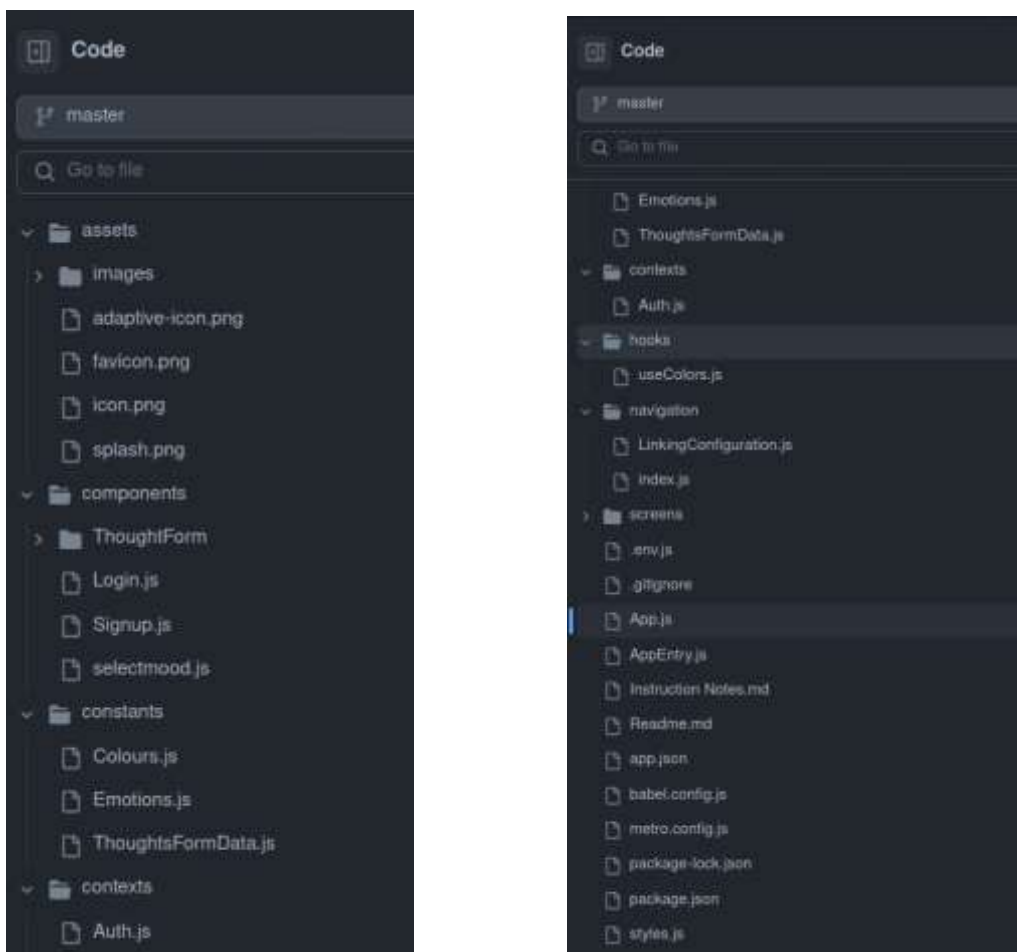
By combining these cloud computing components, the mental health therapy application achieves optimal performance, resource utilization, and integration of state-of-the-art technologies. The GCP server, Azure VM, and OpenAI API work in tandem to enhance the application's functionality, provide a seamless user experience, and improve the quality of care offered to patients. This implementation showcases the benefits of cloud computing in providing scalable infrastructure, advanced machine learning capabilities, and seamless integration of third-party services.

### 5.8.5 Source Code

The full source code for this app has been managed under the github organisation Helpout-G12, available at [github.com/Helpout-G12](https://github.com/Helpout-G12).

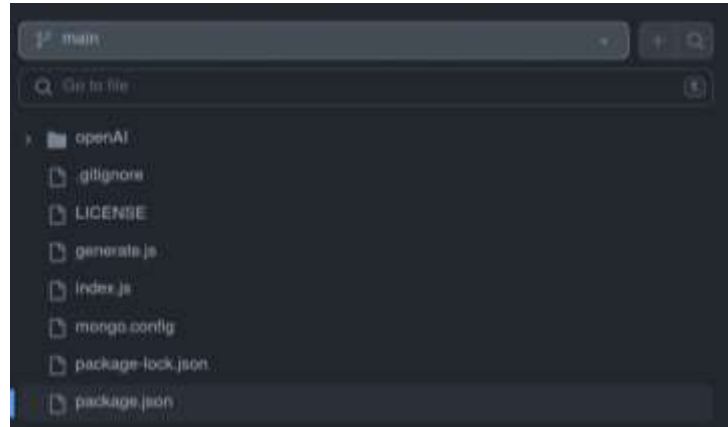
The organization has two repositories under it:

- App : [github.com/Helpout-G12/App](https://github.com/Helpout-G12/App)



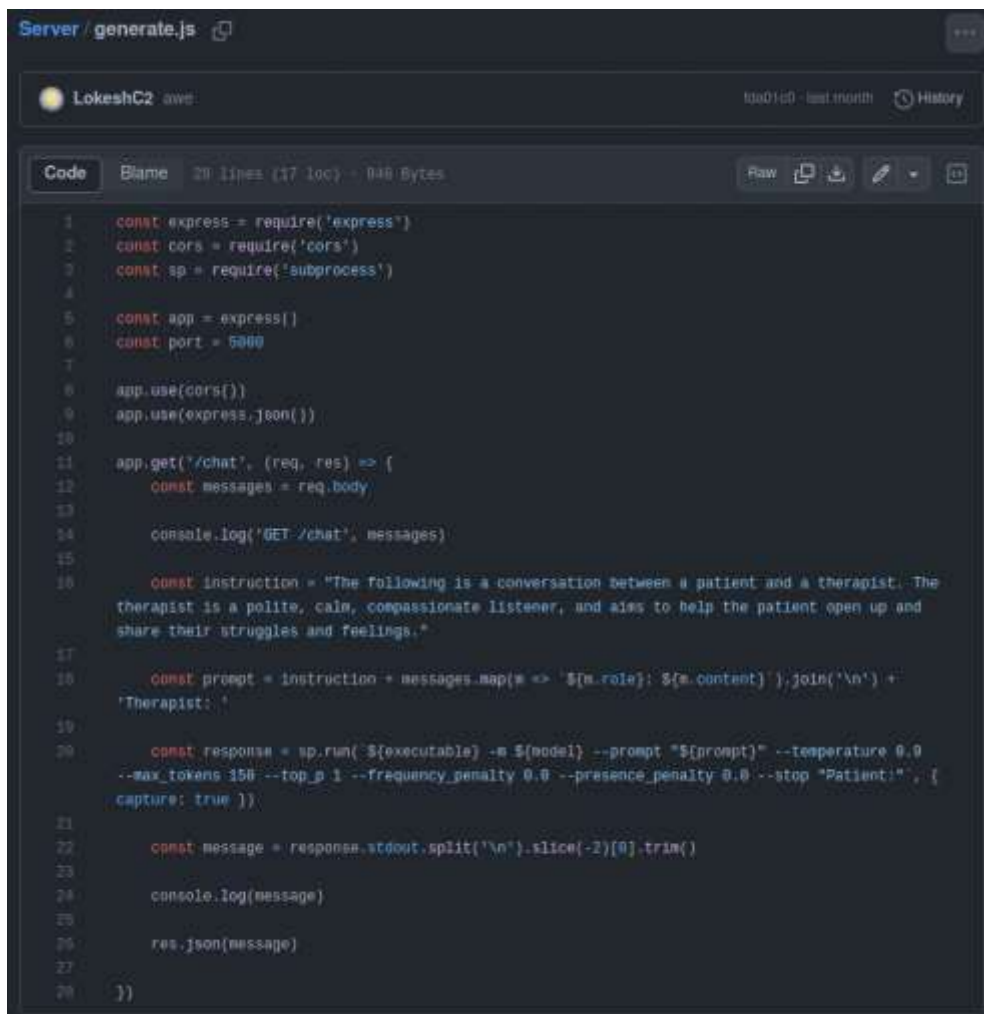
Screenshot 5.8.5.1: App : [github.com/Helpout-G12/App](https://github.com/Helpout-G12/App)

- Server : [github.com/Helpout-G12/Server](https://github.com/Helpout-G12/Server)



Screenshot 5.8.5.2: Server : [github.com/Helpout-G12/Server](https://github.com/Helpout-G12/Server)

The following is the generation prompt for the AI chatbot: The full code was deemed too long to enter into this report. It has been included in the compact disk submitted with the project.



```
Server / generate.js
LokeshC2 awe 10a01c0 - last month History
Code Blame 20 lines (17 loc) - 948 Bytes Raw
1  const express = require('express')
2  const cors = require('cors')
3  const sp = require('subprocess')
4
5  const app = express()
6  const port = 5000
7
8  app.use(cors())
9  app.use(express.json())
10
11 app.get('/chat', (req, res) => {
12   const messages = req.body
13
14   console.log('GET /chat', messages)
15
16   const instruction = "The following is a conversation between a patient and a therapist. The
17   therapist is a polite, calm, compassionate listener, and aims to help the patient open up and
18   share their struggles and feelings."
19
20   const prompt = instruction + messages.map(m => `${m.role}: ${m.content}`).join('\n') +
21   'Therapist: '
22
23   const response = sp.run(`${executable} -m ${model} --prompt "${prompt}" --temperature 0.9
24   --max_tokens 150 --top_p 1 --frequency_penalty 0.0 --presence_penalty 0.0 --stop "Patient:"`, {
25     capture: true })
26
27   const message = response.stdout.split('\n').slice(-2)[0].trim()
28
29   console.log(message)
30
31   res.json(message)
32
33 })
```

Screenshot 5.8.5.3 : Generation prompt for the AI chatbot



## CONCLUSION

In conclusion, we have successfully developed a prototype for our mental health app, achieving our initial goal. Our exploration of Alpaca as an alternative to GPT-3 has shown promising results, indicating the potential of smaller models for further research.

The implementation of Cognitive Behavioural Therapy (CBT) techniques, including the Mood Tracker and Thought Diary, enhances the app's ability to support users in managing their mental health. React Native has been utilized as the development platform, highlighting its growing popularity. However, challenges with Expo have been encountered, underscoring the importance of careful tool selection for stability and efficient development.

Mental health apps have proven effective in providing accessible support and resources. Our prototype contributes to this landscape by offering remote therapy options and educational content. Further refinements, user testing, and feedback collection will drive future improvements, expanding the range of features and enhancing user experience.

In conclusion, our prototype represents a promising step in leveraging technology to promote mental well-being. By harnessing smaller language models and evidence-based techniques, our app aims to provide accessible and effective tools for mental health management.

## **FUTURE SCOPE**

The HelpOut application can be further extended with various modules such as the users or developers might find interesting. This is a benefit of the component-based modular approach of the React Native platform. One potential future direction for the application could be to become a marketplace for productivity tools, coping mechanisms, and self-organisation systems that help all people, not just mental health patients better manage their everyday lives. This can potentially be monetised as well.

Another future direction for this project emerges from the research conducted in selecting the AI model for the Chatbot. The models studied for this project were much smaller. A future study can look at a greater more variety of models, particularly the larger ones such as those with 30B and 65B parameters.

We also envision the possibility of adding more data collection and analysing the data to generate evaluation profiles for individual's mental health. Such a system might help in early detection of stressors and improve the quality of mental health outcomes by providing continuous effectiveness measure by the integrated monitoring tools.

## REFERENCES

- [1].A. Thieme, D. Belgrave, G. Doherty, “Machine Learning in Mental Health: A Systematic Review of the HCI Literature to Support the Development of Effective and Implementable ML Systems”. Microsoft Research, Trinity College Dublin, August 2020, doi : 10.1145/3398069
- [2].T. Althoff, K. Clark, J. Leskovec, “Large-scale Analysis of Counseling Conversations: An Application of Natural Language Processing to Mental Health”. Stanford University, May 2016, doi: 10.1162/tacl\_a\_00111.
- [3].V. Mody, V. Mody, “Mental Health Monitoring System using Artificial Intelligence: A Review”. B. Tech Department of Computer Engineering, NMIMS-MPSTME, March 2019, doi: 10.1109/I2CT45611.2019.9033652
- [4].O. Romanovskyi, N. Pidbutska, A. Knysh, “Elomia Chatbot: the Effectiveness of Artificial Intelligence in the Fight for Mental Health”. National technical university “Kharkiv polytechnic institute”, Kyrpychova str. 2, Kharkiv, 61002, Ukraine, April 2021.
- [5].D. Luitse, W. Denkena, “The great transformer: Examining the role of large language models in the political economy of AI”, July 2021, Doi: 10.1177/205395172111047734M. Wegmuller, J. P. von der Weid, P. Oberson, and N. Gisin, “High resolution fiber distributed measurements with coherent OFDR,” in Proc. ECOC’00, 2000, paper 11.3.4, p. 109.
- [6].J. Howard, S. Ruder, “Universal Language Model Fine-tuning for Text Classification”, University of San Francisco , Jan 2018, doi: 10.48550/arXiv.1801.06146

- [7].R. Taori, I. Gulrajani, T. Zhang, Y. Dubois, X. Li, C. Guestrin , P.Liang, T. Hashimoto, “Alpaca: A Strong, Replicable Instruction-Following Model”.
- [8].B. Peng, C. Li, P. He, M. Galley, J. Gao, “Instruction Tuning With GPT-4”. Microsoft Research, April 2023, doi: <https://doi.org/10.48550/arXiv.2304.03277>
- [9]. H. Touvron, T. Lavril, G. Izacard, X. Martinet, M. Lachaux, T. Lacroix, B. Rozière, N. Goyal, E. Hambro, F. Azhar, A. Rodriguez, A. Joulin, G. Lample, “LLaMA: Open and Efficient Foundation Language Models”. Meta Research”, Feb 2023, doi: <https://doi.org/10.48550/arXiv.2302.13971>

## **PUBLICATION DETAILS**

SR. NO.	PAPER TITLE	CONFERENCE NAME	PUBLICATION DATE	ISSN NUMBER
1.	The Effectiveness of LLMs in Mental Health	INTERNATIONAL JOURNAL OF ADVANCED RESEARCH IN COMPUTER AND COMMUNICATION ENGINEERING	April 2023 Volume 12, Issue 4	2278-1021 (Online) 2319-5940 (Print)



The image shows the cover of a Certificate of Publication for the International Journal of Advanced Research in Computer and Communication Engineering (IJARCCE). The cover features a blue and yellow color scheme with a globe in the top right and bottom left. The journal's title is prominently displayed at the top. Below the title, it states that the journal is a monthly peer-reviewed and refereed journal with an Impact Factor of 8.102. It is indexed by Google Scholar, Mendeley, and is NAAS Accredited Science Journal. The journal is also ISO 3297:2007 Certified and has a Thomson Reuters ID of I-8645-2017. A horizontal banner displays logos for Google Scholar, DOI, Crossref, Mendeley, and PlumX Metrics. The central text reads "Certificate of Publication" followed by the author's name, "JAIKUMAR M. PATIL", in purple. Below the name, it lists the author's credentials: PhD, Dept. of CSE, Shri Sant Gajanan Maharaj College of Engineering, Shegaon, India. The certificate states that the author published a paper entitled "The Effectiveness of LLMs in Mental Health" in Volume 12, Issue 4, April 2023. The DOI is 10.17148/IJARCCE.2023.124201 and the certificate number is IJARCCE/2023/6-1. At the bottom, it identifies the publisher as Tejass Publishers ORGANIZATION and the Editor-in-Chief as IJARCE. The website www.ijarce.com is listed at the very bottom. On the right side, there is vertical text in multiple languages: SERTIFIKAT, 証明書, 證書, Сертификат, CERTIFICADO, 證書, CERTIFICATE, 证书, POTVRDA.

**IJARCE**

**INTERNATIONAL JOURNAL OF ADVANCED RESEARCH IN  
COMPUTER AND COMMUNICATION ENGINEERING**

A monthly peer-reviewed / Refereed journal

**Impact Factor 8.102**

Indexed by Google Scholar, Mendeley, NAAS Accredited Science Journal

ISO 3297:2007 Certified

Thomson Reuters ID I-8645-2017

Google Scholar doi Crossref MENDELEY PlumX Metrics

*Certificate of Publication*

**JAIKUMAR M. PATIL**

PhD, Dept. of CSE, Shri Sant Gajanan Maharaj College of Engineering,  
Shegaon, India

Published a paper entitled

**The Effectiveness of LLMs in Mental Health**

Volume 12, Issue 4, April 2023

DOI: 10.17148/IJARCCE.2023.124201

Certificate# IJARCCE/2023/6-1

ISSN (Online) 2278-1021  
ISSN (Print) 2319-5940

Tejass Publishers  
ORGANIZATION

Editor-in-Chief  
IJARCE

www.ijarce.com

SERTIFIKAT 証明書 證書 Сертификат CERTIFICADO 證書 CERTIFICATE 证书 POTVRDA











The image is a certificate of publication for the International Journal of Advanced Research in Computer and Communication Engineering (IJARCCE). It features a blue and yellow color scheme with a globe in the background. The text is centered and includes the journal's name, impact factor, indexing information, and the author's details. Logos for Google Scholar, DOI, Crossref, Mendeley, and PlumX Metrics are displayed. The certificate is signed by the Editor-in-Chief and includes the publisher's name and website.

**IJARCCCE**

**INTERNATIONAL JOURNAL OF ADVANCED RESEARCH IN  
COMPUTER AND COMMUNICATION ENGINEERING**

A monthly peer-reviewed / Refereed journal

**Impact Factor 8.102**

Indexed by Google Scholar, Mendeley, NAAS Accredited Science Journal  
ISO 3297:2007 Certified  
Thomson Reuters ID I-8645-2017

Google Scholar doi Crossref MENDELEY PlumX Metrics

**Certificate of Publication**

**SHREYASH RANE**

Student, Dept. of CSE, Shri Sant Gajanan Maharaj College of Engineering, Shegaon, India

Published a paper entitled  
**The Effectiveness of LLMs in Mental Health**

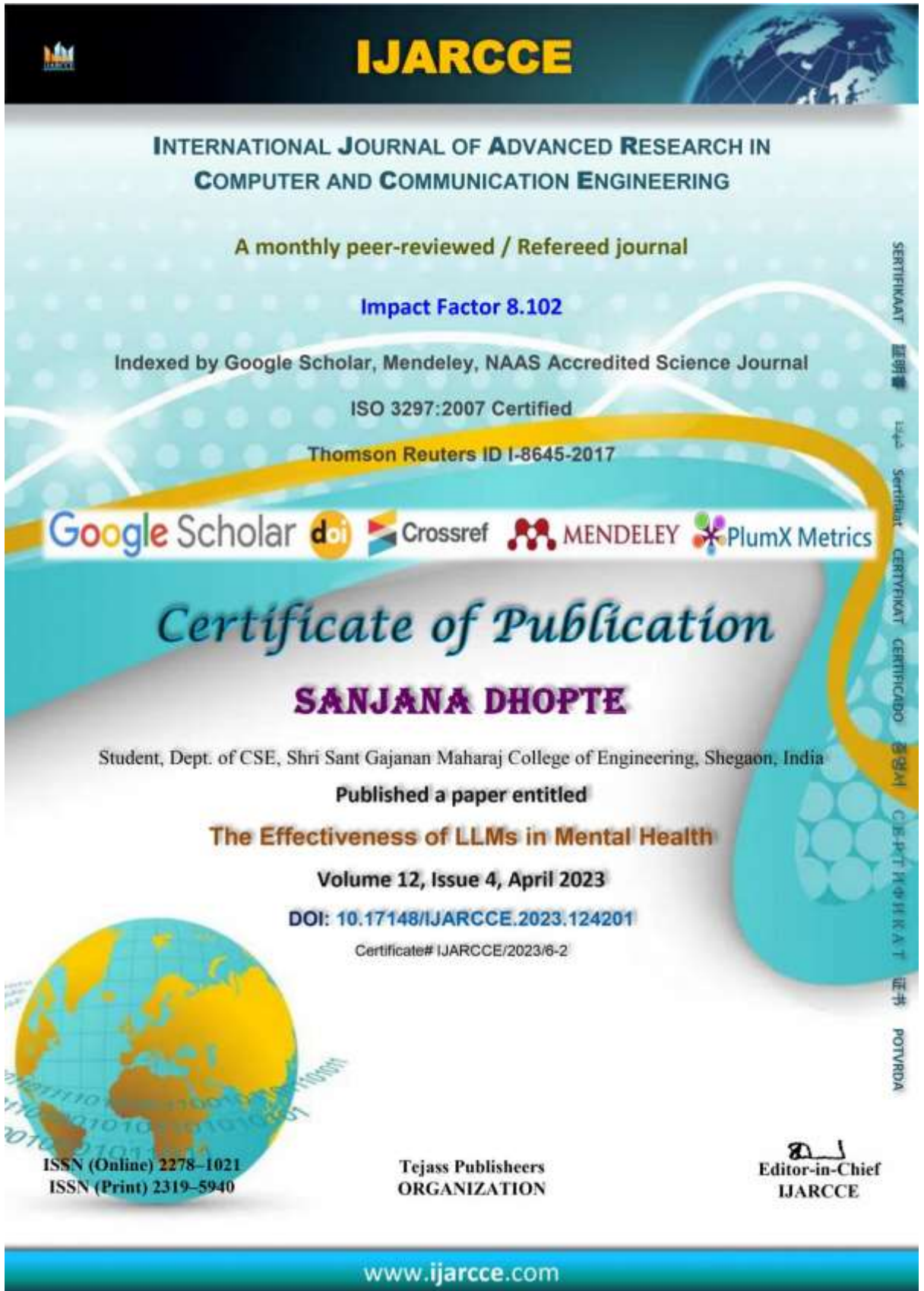
Volume 12, Issue 4, April 2023  
DOI: 10.17148/IJARCCCE.2023.124201  
Certificate# IJARCCCE/2023/6-6

ISSN (Online) 2278-1021  
ISSN (Print) 2319-5940

Tejass Publishereers  
ORGANIZATION

Editor-in-Chief  
IJARCCCE

www.ijarccce.com





**IJARCCCE**

**INTERNATIONAL JOURNAL OF ADVANCED RESEARCH IN  
COMPUTER AND COMMUNICATION ENGINEERING**

A monthly peer-reviewed / Refereed journal

**Impact Factor 8.102**

Indexed by Google Scholar, Mendeley, NAAS Accredited Science Journal  
ISO 3297:2007 Certified  
Thomson Reuters ID I-8645-2017

Google Scholar  Crossref  MENDELEY  PlumX Metrics

**Certificate of Publication**

**SANJANA DHOPTÉ**

Student, Dept. of CSE, Shri Sant Gajanan Maharaj College of Engineering, Shegaon, India

**Published a paper entitled**

**The Effectiveness of LLMs in Mental Health**


**Volume 12, Issue 4, April 2023**

**DOI: 10.17148/IJARCCCE.2023.124201**

Certificate# IJARCCCE/2023/6-2

ISSN (Online) 2278-1021  
ISSN (Print) 2319-5940

Tejass Publishereers  
**ORGANIZATION**

  
Editor-in-Chief  
**IJARCCCE**

www.ijarcce.com

SERTIFIKAT 証明書 証書 証明書 証明書 CERTIFICADO 證書 CERTIFICATE 证书 POTVRDA





The image shows the cover of a certificate of publication for the International Journal of Advanced Research in Computer and Communication Engineering (IJARCCE). The cover features a blue and yellow color scheme with a globe in the background. The journal's name is prominently displayed at the top in yellow and blue. Below the name, it states that the journal is a monthly peer-reviewed and refereed journal with an impact factor of 8.102. It is indexed by Google Scholar, Mendeley, and NAAS Accredited Science Journal, and is ISO 3297:2007 Certified with a Thomson Reuters ID of I-8645-2017. Logos for Google Scholar, DOI, Crossref, Mendeley, and PlumX Metrics are shown. The certificate is for Tejaswini Rakhonde, a student at Shri Sant Gajanan Maharaj College of Engineering, Shegaon, India, who published a paper titled 'The Effectiveness of LLMs in Mental Health' in Volume 12, Issue 4, April 2023. The DOI is 10.17148/IJARCCE.2023.124201 and the certificate number is IJARCCE/2023/6-4. The publisher is Tejass Publishereers ORGANIZATION, and the Editor-in-Chief is IJARCE. The ISSN (Online) is 2278-1021 and the ISSN (Print) is 2319-5940. The website www.ijarce.com is listed at the bottom.

**IJARCE**

**INTERNATIONAL JOURNAL OF ADVANCED RESEARCH IN  
COMPUTER AND COMMUNICATION ENGINEERING**

A monthly peer-reviewed / Refereed journal

**Impact Factor 8.102**

Indexed by Google Scholar, Mendeley, NAAS Accredited Science Journal

ISO 3297:2007 Certified

Thomson Reuters ID I-8645-2017

Google Scholar doi Crossref MENDELEY PlumX Metrics

**Certificate of Publication**

**TEJASWINI RAKHONDE**

Student, Dept. of CSE, Shri Sant Gajanan Maharaj College of Engineering, Shegaon, India

Published a paper entitled

**The Effectiveness of LLMs in Mental Health**

Volume 12, Issue 4, April 2023

DOI: 10.17148/IJARCCE.2023.124201

Certificate# IJARCCE/2023/6-4

ISSN (Online) 2278-1021  
ISSN (Print) 2319-5940

Tejass Publishereers  
ORGANIZATION

Editor-in-Chief  
IJARCE

www.ijarce.com

SERTIFIKAT 証明書 証書 証明書 証明書 CERTIFICADO 證書 證書 CERTIFICATE 证书 POTVRDA



# The Effectiveness of LLMs in Mental Health

Jaikummar M. Patil<sup>1</sup>, Sanjana Dhopte<sup>2</sup>, Siddhi Taori<sup>3</sup>, Tejaswini Rakhonde<sup>4</sup>, Lokesh Chandak<sup>5</sup>, Shreyash Rane<sup>6</sup>

PhD, Dept. of CSE, Shri Sant Gajanan Maharaj College of Engineering, Shegaon, India<sup>1</sup>

Student, Dept. of CSE, Shri Sant Gajanan Maharaj College of Engineering, Shegaon, India<sup>2,3,4,5,6</sup>

**Abstract:** It has an impact on everyone's health, which is why mental illness should be prioritized in the healthcare industry. However, it appears that this field is developing at a somewhat slow pace. AI (Artificial-Intelligence) technologies have recently received a lot of attention in a variety of fields, including mental health. Advanced AI approaches and machine learning algorithms have made it possible to provide personalized care that primarily focuses on providing emotional support tailored to a specific individual.

We explore the possibility of using large language models like OpenAI's GPT3 and Facebook's Llama and Stanford's Alpaca to provide an effective conversational partner to people suffering with such mental health conditions where it may be helpful, such as depression and anxiety disorders. We compare the performance of the chatbots based on their responses to questions from counselchat.com dataset of therapist responses, and use the GPT4-davinci, the largest GPT4 model, as a judge to evaluate the quality of responses.

**Keywords:** AI (Artificial intelligence), LLMs (Large Language Models), Fine-tuning, chatbot, depression, anxiety, mental health.

## I. INTRODUCTION

Mental illness is an increasing public health concern across the globe. In a single year, 43.6 million adults (18.1%) in the United States struggle with mental illness (National Institute of Mental Health, 2015). Along with the person who is suffering with a mental illness, family, friends, and communities are all affected. Many mental health issues can be successfully resolved with psychotherapy and counseling (World Health Organization, 2015). Interestingly, it is far from apparent how to conduct successful counseling sessions.

These conversations are free-form, with no predetermined limits, and include multiple options that could have an enormous effect on someone's life. People have been found to be more willing to express themselves when interacting with a virtual therapist, which could have a substantial therapeutic benefit. [2] The AI bot is most likely seen as nonjudgmental, non-opinionated, and impartial. Furthermore, diagnostic systems can assist in giving patients with precise therapies that can be customized to their budget. Staff shortages are another major impediment. Precision therapy techniques aid in the constant monitoring of mental wellness. When you require assistance, chat-bots and internet platforms are always available. [3].

## II. LITERATURE SURVEY

A. Thieme et al., [1] research explores that it is vital to be careful not to translate and abstract away too much from the person and their unique context in data analysis, interpretation, and representation when using ML techniques to the capture and assessment of diverse human needs and experiences.

T. Althoff et al., [2] The project focuses on the creation of a collection of unique computational discourse analysis algorithms suitable for large-scale datasets and their application to the discovery of actionable discussion tactics linked with better conversation outcomes.

V. Mody et al., [3] research shows the benefits and limitations of AI technologies as a way of identifying and intervening in mental health issues. Chat-bots are a convenient approach to offering mental health services through a gadget. Precision Therapy and Diagnostic Systems aid in the early detection of illness and the provision of personalised treatment options.

O. Romanovskiy et al., [4] paper offers the findings of a controlled investigation on the usefulness of the Elomia chat-bot in reducing the likelihood of depression, anxiety, and unpleasant emotional impacts. The following psychological research methodologies were employed in the study: 1) Patient Health Questionnaire-9 (PHQ-9) to screen for depression; 2) General Anxiety Disorder-7 (GAD-7) to screen for generalised anxiety disorder; 3) Positive and Negative Affect





Schedule (PANAS) to screen for prevalent (positive / negative) emotional impacts. Regular use of Elomia assists to reduce the high susceptibility to depression (up to 28%), anxiety (up to 31%), and negative consequences (up to 15%).

D. Luitse et al., [5] research looks into the place of LLMs in the political economy of AI. Using GPT-3 as an example, this study argues that present tendencies in NLP threaten accelerate processes of monopolisation and reliance on hyper-scaling AI corporations. While LLMs are theoretically reusable components that developers can employ in a variety of applications, their size, as well as compute and memory needs, make them challenging to manage.

J. Howard et al., [6] research highlights ULMFiT (Universal Language Model Fine-tuning for Text Classification) which is a study proposal for an effective and extremely sample-efficient transfer learning method that may be applied to any NLP use. It also focuses on many unique fine-tuning strategies that, when combined, prevent catastrophic forgetting, and enable robust learning over a wide range of activities.

R. Taori et al., [7] focuses on Alpaca 7B, a model improved from the LLaMA 7B model through 52K instruction-following demos. Preliminary analysis of single-turn instruction following suggests that Alpaca, despite being unexpectedly small and easy/cheap to copy, operates in a manner similar to OpenAI's text-davinci-003. Alpaca also has numerous common language model flaws, such as delusion, toxicity, and stereotypes. It also compares the models text-davinci-003 and LLaMA 7B.

B. Peng et al., [8] The paper shows the efficiency of instruction tuning with GPT-4 as well as model checkpoints improved from LLaMA. This includes ongoing work in numerous aspects, including data and model scale of LLM models like as Vicuna, GPT-4, and LLaMA 7B.

H. Touvron et al., [9] focuses on building a succession of language models to attain the greatest possible performance at various inference budgets by training on a larger number of tokens than is generally used. The resulting models, known as LLaMA, have parameters ranging from 7B to 65B and competitive performance when compared to the best available LLMs. LLaMA-13B, for example, surpasses GPT-3 on most benchmarks despite being 10 times smaller.

### III. METHODOLOGY

Cognitive Behavioural Therapy (CBT) is a prevalent talking therapy that assists in restructuring one's thoughts and behaviours in order to strengthen the way we approach challenges. The bot uses CBT to mimic the open ear of a trained professional.

Through frequent chats, it eventually learns about the individual and tailors personalised queries to their position. The bot will not provide treatment but instead serve as a guide to help you figure things out on your own. Every day, it asks how you are and what you are doing. It then develops an emotional model of you over time and can assist you in detecting patterns in your mood.

LLM (Large Language Models) : An artificial intelligence (AI) algorithm known as a large language model (LLM) employs deep learning methods and extraordinarily big data sets to understand, gather, generate, and predict new text. It is a machine learning model that can perform a range of natural language processing (NLP) tasks, such as generating and classifying text, interacting with people to answer questions, and translating text across different languages.

LLMs are trained on a large quantity of data and can predict the next token in a phrase using self-supervised learning. The process is repeated repeatedly until the model's accuracy is deemed to be sufficient. A majority general-purpose dataset with a statistical distribution similar to the task-specific dataset is used by the majority of LLMs for pre-training. When the model is being fine-tuned, high-level features that may be employed for particular tasks are taught to it through pre-training.

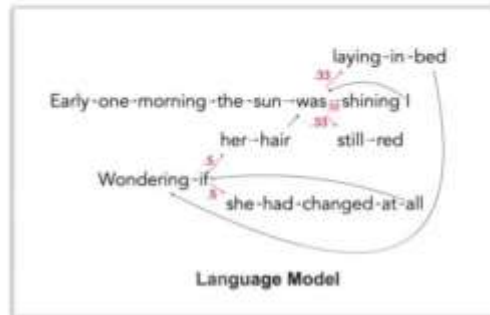


Fig. 1 Basic language model concept

A. Data Collection

It is challenging to find high-quality data in the field of mental health. We obtained our information from counselchat.com. It includes a collection of reasonably high-quality therapist responses to mental health queries from genuine patients. Counselchat.com is an example of a professional community. It is a platform designed to assist counsellors in developing their reputation and making meaningful contact with potential clients. Therapists answer to client inquiries on the site, and users can like the responses they find most useful. It is crucial to note that this data only includes responses posted by verified professionals. Another thing to note is that this is not a conversation between a therapist and a patient. It only involves a single talk turn.

There are a total of 31 topics in the platform, with submitted responses that range from 317 for "depression" to 3 for "military issues." The website currently has 307 therapists those who have contributed, and the majority of them are on the West Coast of the United States. PhD. level psychologists, social workers, and licensed mental health counselors are among those with this certification.

The dataset is supplied as a csv file with the following ten columns:

- questionID — A distinct question identifier that is exclusive to each question
- questionTitle — the subject of the counsel chat question.
- questionText — The individual's query to counselors.
- questionLink — A link to the latest location of the question (which may or may not be live).
- topic — the subject under which the inquiry was listed.
- therapist Info — an overview of each therapist, typically including a name and specialty;
- therapistURL — a link to the therapist's bio on counselchat.com
- answerText — The therapist's response to the question;
- upvotes — The number of up votes received by the answer-text;

Most queries receive only a few responses, with 75% receiving two or fewer total responses. However, many questions elicit a high level of therapist participation.

B. Data Preprocessing

We use only two features from the counsel chat dataset: "question Text" and "answer Text". the data is cleaned to remove HTML tags and other encoding artifacts and compiled into a JSONL file, with each line in the following format:

```
<instruction-prompt> \n
{"user":<user-prompt>,"therapist":<therapist-completion>}
```

C. Model Training and Evaluation

GPT\_3.5: Generative Transformer 3 (GPT-3) was launched in 2020 using deep learning to generate text that resembles human language. When we give it prompt, it generates text that provides answers. The pre-trained auto-regressive language model GPT-3.5 model set enhances the GPT-3 model and has the ability to understand and produce both plain



language and computer code. GPT-3.5 models are able to interpret and produce code or natural language. Our most powerful and economical model in the GPT-3.5 series is the GPT-3.5-turbo, which was basically design for chat but also performs admirably for more conventional completing tasks. On March 15, 2022, Open AI released new GPT-3 iterations under the names "text-davinci-002" and "code-davinci-002". It was determined that the models that were developed using data up to June 2021 were more effective than earlier iterations. Open AI unveiled Chat GPT, a model that had been enhanced from a GPT-3.5 series model, on November 30, 2022, and began referring to these models as a part of the "GPT-3.5" series. GPT-3.5-turbo. The most powerful GPT-3.5 model, which is chat-optimized, costs only one-tenth as much as the text-davinci-003, updated using the most recent model iteration. It has 4,096 tokens and was trained till September 2021. The language and code used to create the models in the GPT-3.5 series date back to before Q4 2021. Figuring out what the API can accomplish by experimenting with GPT-3.5-turbo is an incredible way to learn more about it. The GPT-3.5 series includes the following models:

1. code-davinci-002 is a base model, and it is good for pure code-completion tasks.
2. text-davinci-002 is an InstructGPT model which is based on code-davinci-002
3. text-davinci-003 is an improvement on text-davinci-002
4. GPT-3.5-turbo-0301 is also an improvement on text-davinci-003, optimized for chat.

1) *LLaMA 7B.*

The transformer architecture underpins LLaMA (Large Language Model Meta AI), an auto-regressive language model. It is a cutting-edge foundational large language model developed to assist researchers in this subfield of AI. The model is available in four sizes: 7B, 13B, 33B, and 65B. It was created by Meta AI's FAIR team. The primary application of LLaMA is research on large language models, such as question answering, natural language understanding, or reading comprehension, understanding the strengths and weaknesses of present-day language models and developing techniques for bettering them, assessing and reducing biases, risks, toxic and harmful content generation, and hallucinations. The LLaMA 7B model is a deep learning algorithm that uses a technique called transformer-based architecture to process natural language.

The transformer architecture relies on a series of attention mechanisms that help the model focus on relevant parts of the input text, allowing it to generate more accurate outputs. Here's a step-by-step explanation of how the LLaMA 7B model works:

1. Input text: The model receives an input text that needs to be processed. This could be a sentence, paragraph, or an entire document.
  2. Tokenization: The input text is split into individual tokens (words, phrases, or sub-words), which are then converted into numerical representations that the model can understand.
  3. Encoding: The numerical representations are passed through multiple layers of the transformer architecture, which allows the model to learn the relationships between the different tokens and extract meaningful information from the input text.
  4. Attention mechanism: The attention mechanism helps the model focus on relevant parts of the input text. Specifically, it assigns weights to each token based on how relevant it is to the task at hand. The model then uses these weights to compute a weighted sum of the token embeddings, which gives it a representation of the most important parts of the input text.
  5. Decoding: The model then uses the attention-based representation to generate an output that's appropriate for the task at hand. For example, if the task is machine translation, the output might be a translated version of the input text in a different language.
  6. Output: The model produces an output in the form of text, which can then be used for various language-related tasks, such as summarization, question-answering, and text classification.
- Overall, the LLaMA 7B model is a powerful tool that relies on deep learning and attention mechanisms to process natural language and generate accurate outputs for a wide range of language tasks.

2) *Alpaca 7B.*

Alpaca was trained using 52K instruction-following examples created by text-davinci-003 after being fine-tuned from Meta's LLaMA 7B model. The researchers see that Alpaca has many of the same tendencies as OpenAI's text-davinci-003, but is also unusually tiny and easy to replicate. They have made the training algorithm and data available, and they plan to make the model weights available in the near future.





Fig. 2 Example of output generation form Alpaca 7B using ggerganov/llama.cpp on GitHub.

The researchers also held an interactive demonstration to help the scientific community comprehend Alpaca behavior. They propose visitors to report any troubling actions in the web demonstration in order for them to gain further insight and mitigate these tendencies. The researchers emphasize, however, that Alpaca is solely designed for academic research and therefore any commercial use is restricted.

The researchers extended the self-instruct method by using the 175 human-written instruction-output pairs from the self-instruct seed set to generate instruction-following demonstrations. Text-davinci-003 was then used to generate more instructions using the seed set as in-context examples. The researchers reduced the cost of the generation pipeline by simplifying it. Using the OpenAI API, this process produced 52K unique instructions and the corresponding outputs for less than \$500. They upgraded the LLaMA models adopting Hugging Face's training framework, which included techniques like Fully Sharded Data Parallel and mixed precision training. On 8 80GB A100s, which cost less than \$100 on most cloud compute providers, fine-tuning a 7B LLaMA model took 3 hours. The researchers suggest that training efficiency should be improved to further reduce costs.

D. Output and Estimation

Thus, we have run our alpaca model and we have got our output as:

**Question:** "My wife and mother are having tense disagreements. In the past, they've had minor differences. For example, my wife would complain to me my mother is too overbearing; my mother would complain my wife is lazy. However, it's intensified lately. I think the cause is my wife talked back to her once. Now, any little disagreement is magnified, leading to major disagreements. What can I do?"

**Answer:** "It sounds like there's a lot of tension between your wife and mother. It might be helpful to have a conversation together about how to manage their differences in a healthier way. It could be beneficial to set some boundaries and agree on communication methods that promote understanding rather than argument. Having open, honest conversations where all parties are respectful and understanding of each other can help diffuse any potential tension before it arises."

**Question:** "I'm planning to have baby, so I have to quit smoking - but it's hard. Sometimes it's not a physical need, it's mental. I cannot help myself from thinking about smoking. What can I do to get rid of this addiction?"

**Answer:** "It sounds like you really want to quit and are struggling with the thoughts that come up when you try to resist. It might be helpful to have a plan, so that when the urge to smoke arises, you know what to do next. You can also practice deep breathing or yoga poses to distract yourself from the cravings. Additionally, it could help to talk to someone about how you're feeling and why you want to quit. It might be helpful to connect with other people who are trying to quit smoking too, so you can share your experiences."

**Question:** "I have secrets in my mind, and I don't know what to do with them. I don't want to tell my wife and mom because I don't want to hurt them. But I'm not sure how long that I can keep the secret to myself. What should I do? It's becoming annoying and making me anxious. Help me out"

**Answer:** "It sounds like you are feeling overwhelmed by these secrets in your mind. Is there anything specific that you need help with or just want to talk about? Maybe there is someone who can help you process some of the feelings associated with them."





IV. EVALUATION AND ANALYSIS

We tasked GPT 4 to score the responses from the dataset and the generated responses on a scale of 1-10. The following are the mean scores obtained by this evaluation.

TABLE I COMPARATIVE EVALUATION OF COUNSEL-CHAT DATASET AGAINST ALPACA7B, SCORING BY GPT 4

Dataset	Mean score (out of 10)
Therapist responses	8.12
Chat-bot responses (Alpaca 7B)	6.13

The overall performance of 199 prompts was scored by GPT 4 as shown in fig. 3

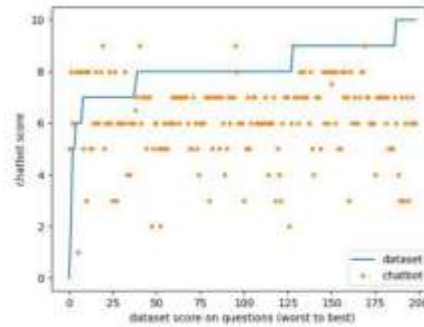


Fig. 3: GPT 4 scores for Alpaca 7B generated output (orange dots) compared to therapist responses (blue line)

V. CONCLUSION

We find that Alpaca7B, despite being the most lightweight of the Alpaca models, performs just slightly worse when compared to available online services that connect real therapists to patients. While this does not replace the knowledge and experience of actual therapists, it serves to show how modern AI models compare to the human performance.

VI. FUTURE WORK

The methods in this paper may be used to evaluate other larger or newer models. Public surveys to find if the GPT4 scoring is biased is also another direction to take. The models used in this paper will be further refined, at which point further evaluation can be conducted.

REFERENCES

[1]. A. Thieme, D. Belgrave, G. Doherty, "Machine Learning in Mental Health: A Systematic Review of the HCI Literature to Support the Development of Effective and Implementable ML Systems". Microsoft Research, Trinity College Dublin, August 2020, doi : 10.1145/3398069  
 [2]. T. Althoff, K. Clark, J. Leskovec, "Large-scale Analysis of Counseling Conversations: An Application of Natural Language Processing to Mental Health". Stanford University, May 2016, doi: 10.1162/tacl\_a\_00111.  
 [3]. V. Mody, V. Mody, "Mental Health Monitoring System using Artificial Intelligence: A Review". B. Tech Department of Computer Engineering, NMIMS-MPSTME, March 2019, doi: 10.1109/I2CT45611.2019.9033652



- [4]. O. Romanovskyi, N. Pidbutska, A. Knyslysh, "Elomia Chatbot: the Effectiveness of Artificial Intelligence in the Fight for Mental Health". National technical university "Kharkiv polytechnic institute", Kyrpychova str. 2, Kharkiv, 61002, Ukraine, April 2021.
- [5]. D. Luitse, W. Denkena, "The great transformer: Examining the role of large language models in the political economy of AI", July 2021, Doi: 10.1177/20539517211047734M. Wegmuller, J. P. von der Weid, P. Oberson, and N. Gisin, "High resolution fiber distributed measurements with coherent OFDR," in Proc. ECOC'00, 2000, paper 11.3.4, p. 109.
- [6]. J. Howard, S. Ruder, "Universal Language Model Fine-tuning for Text Classification", University of San Francisco, Jan 2018, doi: 10.48550/arXiv.1801.06146
- [7]. R. Taori, I. Gulrajani, T. Zhang, Y. Dubois, X. Li, C. Guestrin, P. Liang, T. Hashimoto, "Alpaca: A Strong, Replicable Instruction-Following Model".
- [8]. B. Peng, C. Li, P. He, M. Galley, J. Gao, "Instruction Tuning With GPT-4". Microsoft Research, April 2023, doi: <https://doi.org/10.48550/arXiv.2304.03277>
- [9]. H. Touvron, T. Lavril, G. Izacard, X. Martinet, M. Lachaux, T. Lacroix, B. Rozière, N. Goyal, E. Hambro, F. Azhar, A. Rodriguez, A. Joulin, G. Lample, "LLaMA: Open and Efficient Foundation Language Models". Meta Research, Feb 2023, doi: <https://doi.org/10.48550/arXiv.2302.13971>

## **PROJECT GROUP MEMBER**

### **1. Lokesh Premkumar Chandak**

Address: Gowardhan Appartments,  
Boripura Khamgaon, Dist. Buldhana.  
Email id: [lokeshchandak2@gmail.com](mailto:lokeshchandak2@gmail.com)  
Mobile No: 8668364117

### **2. Siddhi Rajesh Taori**

Address: House no 1382, Back side of  
Janta College Malkapur, Dist. Buldhana.  
Email id: [taorisiddhi@gmail.com](mailto:taorisiddhi@gmail.com)  
Mobile No: 8766523113

### **3. Shreyash Sudhakar Rane**

Address: 303 B-wing Rachna Sayantara Phase 1,  
Saroj Nagar, Hajari Pahad, Nagpur Dist. Nagpur  
Email id: [shreyashrane547@gmail.com](mailto:shreyashrane547@gmail.com)  
Mobile no: 9146485479

### **4. Sanjana Manoj Dhopte**

Address: Siddharth Ward, Changediya Layout  
Warora, Dist. Chandrapur.  
Email id: [sanjanadhopte2019@gmail.com](mailto:sanjanadhopte2019@gmail.com)  
Mobile no: 9730077946

### **5. Tejaswini Sunil Rakhonde**

Address: Near D.Ed college, Bhavani  
Mata Chowk Nandura Dist Buldhana.  
Email id: [tejusrakhonde@gmail.com](mailto:tejusrakhonde@gmail.com)  
Contact no: 8975286829