Implementation of AI Chatbot Application for Social Anxiety Problem

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Abstract— **The past decade has witnessed the rapid development of Artificial Intelligence (AI)[1]. AI nowadays, are becoming more popular and integrated in every aspect of the world. Using Ai chatbot as a companion partner has been a thing since a few years ago, but with the development of AI, it is possible to inject personality into those chatbots now. With the increasing growth of social anxiety issues, it is possible to implement AI chatbot as a way to train social skills into people. Past researches have already created a chatbot that is solely for the purpose of depression in a one-on-one chatting environment. In order to create a working training regime, it is necessary to give the user the ability to change from a fully AI environment to slowly integrate with humans. The present paper considers the ability of personality trained AI chatbots and environment as a way to help people learn to socialize. This research aims to help provide a cheaper and reliable alternative for therapists by using AI chatbots as a guide for socially anxious people.**

Keywords— Artificial Intelligence, Chatbot, Social Anxiety.

I. INTRODUCTION

At this time the use of science and technology is developing very quickly and producing new innovations that must be balanced with the ability to adapt to these technologies.[2] The past decade has witnessed the rapid development of Artificial Intelligence (AI).[1] The rise of artificial intelligence (AI) as an enabling technology for economic growth and social empowerment has attracted researchers to systematically explore the current challenges and report the associated opportunities.[3] Contemporary AI research focuses on shaping our daily lives, solving complex societal problems, and countering environmental issues to protect the global ecosystem and sustainability.[4]–[7] The communication between online users and organizations is shifting towards interactions with AI-driven systems.[8] A chatbot is one example of technology that is used in computer-mediated communication where AI agents increasingly occupy roles once served by humans.[9] This leads to a high level of exposure of chatbot to human interaction. The use of technology may lead to unpleasant side effects, which may include strong, negative emotional feelings that arise due to the uneasiness of the situation.[10] Some examples that might happens are a sense of detachment to society, dependency, to even the lack of thinking by humans. While those side effects are there, there

are also other ways to use AI chatbots to improve human qualities, especially in the some prevalent social problems such as loneliness and social anxiety.

Socially anxious individuals are shy and feel uncomfortable when they are in the presence of unfamiliar people or observed by other people.[11] They often avoid face-to-face interactions to escape their social fears.[12] Seeing how AI can be used as a chat partner, it can be used as a training partner for socially anxious people to try to have a conversation with someone. When the source of interaction is a machine (e.g., computer), people automatically apply stereotypes about a computer such that it is mechanistic, objective, unemotional, and cold.[13] After the development of AI, we can inject personality into AI which leads to them being able to give more feel in their answers. Using this personalized AI, creating a chatbot as a training program for socially anxious people can give them a sense of safety.

Underlying problem of socially anxious people is the fear and paranoia of strangers. There is also the problem of the other person being too pushy or as socially anxious as the user that there won't be any conversation going on. By using AI chatbots, the environment that the user will be in can give them the secure and supervised environment to make them be able to grow more. The objective of this research is to design an environment that can give a sense of protection to the user while maximizing the growth of the user.

II. LITERATURE REVIEW

Current research regarding the use of AI chatbots and its effects has shown quite ranging results, from the more negative side to using AI robots as a practice company for a wide range of activities.

A. Socially anxious individuals are shy and feel uncomfortable when they are in the presence of unfamiliar people or observed by other people.

The growing prevalence of conversational artificial intelligence (CAI), digital agents that talk and respond socially to users, has increased the likelihood of over-dependency on this new technology. Drawing on the

interaction of person-affect-cognition-execution model, this study examined how social anxiety, loneliness, and rumination contribute to the problematic use of CAI (PUCAI).[14] Studies have shown that social anxiety is a predisposing factor in the problematic use of various technologies, including mobile phones [15] social media [16], and the Internet. [17] This study shows that the appearance of AI chatbots has given a negative impact on society, which increase the over dependency and might even create a dysfunctional relationship between the user and their environment.

B. Artificial Intelligence–Based Chatbot for Anxiety and Depression in University Students: Pilot Randomized Controlled Trial

This paper research method used a pilot randomized controlled parallel-group trial. The experimental group had access to Tess for 8 weeks and the control group to a psychoeducation electronic book.[18] The conversations offered by Tess were based on the cognitive behavioral model [19], emotion-focused therapy [20], solution-focused brief therapy [21], and motivational interviewing [22]. The use of chatbots (ie, conversational agents) to address mental health conditions may contribute to the treatment of large populations and attend to the needs of those who do not have access to treatment. The research conducted in this paper saw no statistically significant differences between groups, with the experimental group showed that Tess has a moderate effect on anxiety and no effect on depression.

C. Emotional Support from AI Chatbots: Should a Supportive Partner Self-Disclose or Not?

This study examined how and when a chatbot's emotional support was effective in reducing people's stress and worry.[23] Considering the general view of chatbot vs human when it comes to emotional support chat partner, people see chatbots as ungenuine and as a less likely emotional support. While humans on the other hand, creates a more understanding nature and can be considered as a real source of emotional support. The research have found that emotional support from both a chatbot and a human partner contributed to stress and worry reduction fully mediated through perceived supportiveness of the partner.[23] The successfulness rate of the conversation also depends on the awareness of the user regarding whether it is a chatbot or a human behind it.

III. RESEARCH METHODOLOGY & DESIGN

The methodology chosen for this research aims to enhance the ability and the quality of chatbots that has been given a personality. The methodology design starts with a predefined personality that will be based on an already established or popular characters. To create a more advanced personality, higher level of machine learning and AI will be needed and those personality will then be more focused on different aspects of social anxiety and the causes.

Further learning will be more heavily leaned on unsupervised learning to recognize social anxiety and its root problems from the end user to define the best route of action to take.

An Important consideration for this current stage of developing the AI would be the how human the AI can be / feel like. Based on the literature review and the general consensus of human vs chatbot therapist, people tend to feel more genuine connection with another human being. While in this case we would be focusing more on the socially anxious people and help them train using the AI, we would need to make a more human like AI for further development of their social skill.

Trial Design

The method will be using a pilot randomized controlled parallel group trial. The experimental group will be given access to the chatbot for 8 weeks and the control group will be given a psychoeducation electronic book.

Participants

The participants will be people who have scored > 65 on the Liebowitz Social Anxiety Scale. The people who have different levels of social anxiety will be marked.

Intervention

Experimental Group

The experimental group will be using the chatbot as a chatting partner and environment. Each person will be given their own environment based on the severity of their social anxiety. The chatbot will keep the user company while giving reminders and/or encouragements in introducing the social world to them. The chatbot will then use the user's respond as a way to decide whether they can push on or coax the user more.

Control Group

The control group will be given a psychoeducation group focusing on how to deal with the symptoms of the social anxiety. This will help the people to identify and focus on the treatment of their social anxiety issues.

Measures

The Liebowitz Social Anxiety Scale is a self-reporting questionnaire comprising of 24 points with the level of fear and avoidance as a measurement. Each of the items have 4 levels of fear (None, Mild, Moderate, Severe) and 4 levels of Avoidance (Never, Occasionally, Often, Usually). The total score ranging from 0 to 29 are interpreted as no social anxiety, from 30 to 49 as mild social anxiety, from 50 to 64 as moderate social anxiety, from 65 to 79 as marked social anxiety, from 80 to 94 as severe social anxiety, and > 95 as very severe social anxiety.

Design

The design of the self-replying system relies on the capability to utilize REST API provided by the chosen LLM, in this case OpenAI's ChatGPT. To replicate long-term memorization capability, vector database is needed as it is more suitable than other database types such as NoSQL or Graph database due to vector database's friendly nature to non-deterministic aspect of natural language. For each interactions, prompt and response are recorded within vector database as unit of memory, in which the ID of the bot are attached to identify whose memory does it originates from. The general flow of the system is illustrated as the following.
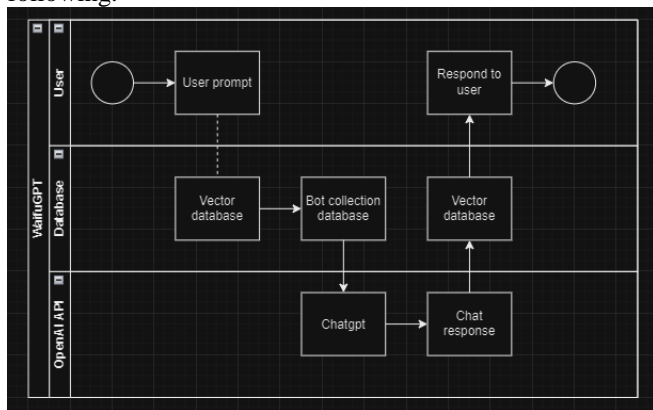

Figure 1. The Process Starts from a user prompt

The process starts from a user prompt (message) in the chatroom, the message that has been inputted from the user will then be stored in a vector database. The information that will be passed on to the API will consist of the newest user input and past inputs such as chat history and their respective responses from the chatbot for a better contextual understanding of the flow of the conversation. The other information that will be send to the API is the bot persona (the personality of the bot that is currently replying to the user), this information will be fetched from the bot collection database to process along with the chat data. The API will then process the input and send an output in the form of a response for the latest input from the user and show it to the frontend. The response will also be stored in the vector database for future references.

IV. RESULTS AND IMPLEMENTATION

Implementation

The implementation of the design will further give more details on the process of the system. Further frontend and user engagement will be needed while the main system will still depend on the REST API provided by OpenAI API. In the implementation, the user would need to create a chatroom and decide the number of bots or in this case chat companion that will be present in that chatroom with each of the bots having a randomly chosen predetermined personality. The general flow of the implementation is illustrated as the following.
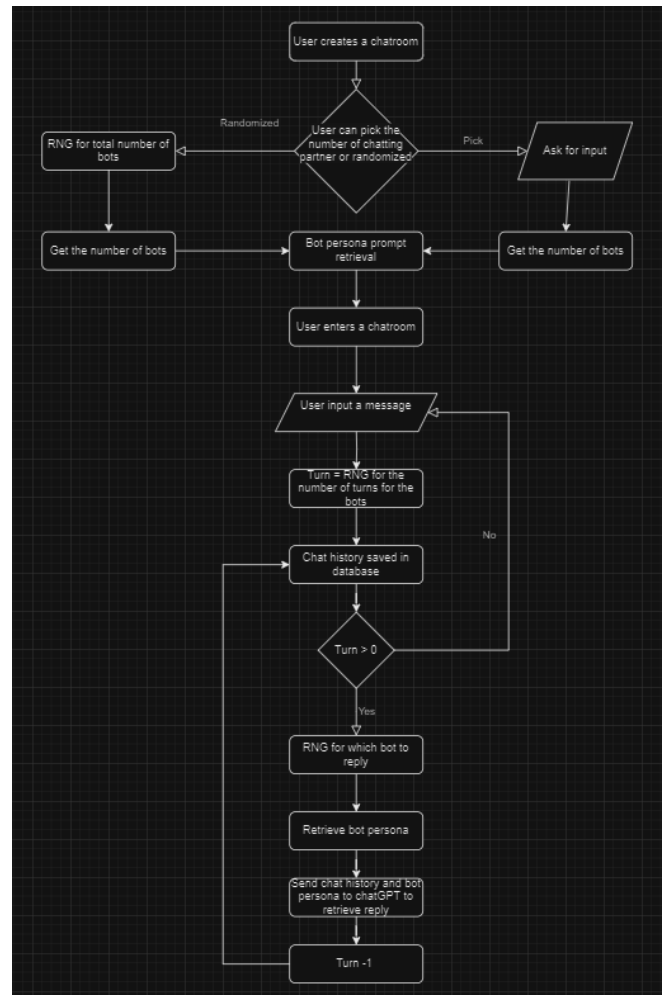

Figure 2. FlowChart Creat a Chatroom

Before going to the actual self-replying system, first the user would need to create a chatroom. In this particular implementation, the user can either choose a random number of bots to be present in the chatroom or based on how many they want. Each of those bots will then be given a personality using the personality prompt that is already available in the database. The user then enters the already created chatroom and input a message to the other bots in the chatroom. The chatroom works by selecting a number from a random number generator as the number of turns in which the bot has to respond. The input from the user will then be recorded to the database as the information that will be send to the API.
Based on the already established number of turns, there will be a looping mechanism in the system that for each turn that is greater than 0, there would be another random number generator in the system to decide which bot will reply. Based on that, the bot persona will then be retrieved from the database collection and be send to chatGPT along with the chat history to get a response. This response will also be stored in the database for further use and for a better contextual understanding. The bot will each respond in the chatroom until the turn reaches 0 which then the user will be able to send a message again. This will continue until the user decides to exit the chatroom.

Figure 3. List of Characters

The list of the characters that are stored in the database can be seen and modified by the admin of the system. In this example of the implementation, there are 20+ characters that can be randomly chosen as a personality for the bot in the chatroom.

Figure 4. Implementation of the system chatbot

The example of the implementation of the system in a one on one chat basis. The user will send a message and then the bot will reply based on the latest message and the chat history of that particular chatroom. The response would also be based on the bot personality to mimic a more natural conversation. There would also be a collection of other chatrooms that can be joined again by the user unless the user deletes that chatroom.

Result

The current result of the implementation of this system is still lacking in the mental guidance prospect of the chatbot. It already serves as a chat companion that has a personality that mimics a human like natural conversation, but the flow of the conversation is still driven by the user. The contextual understanding and the memorization of past conversation is already available, but with further development, there will be even more improvement to make the chatbot more human like. The problem with the perfectness of a chatbot is that they never forget, while real life human has limited storage for remembering past occurrences, being able to give some holes in the chatbot memory can create a more life like experience for the user.

The expected output of this study is to deliver an environment where social anxious people can train to be more social. This contribution will lead to the implementation of AI "therapist" for social education and anxiety problem which gives a more viable option globally. Realizing the further advancement and the impact that can be given using AI when it comes to mental health issues can give us the opportunity to further research mental health issues while also giving a more feasible solution for the people who need it.

The objective of the experimental work is to look into the performance of AI chatbot for social anxiety problems which can be more focused into (i) a real-time chatting partner, (ii) relieving social anxiety via chatting, and (iii) the introduction of social world by integrating the topics to the real world little by little. AI is chosen due to its ability to learn and the availability of it for mass produced and feasible environment. The result of the usage can be measured using the Liebowitz Social Anxiety Scale.

V. CONCLUSIONS AND FUTURE WORKS

Using AI chatbot as a way to lessen the social anxiety problem can be used a cheaper and reliable alternative than therapist. Implementation of this has to be done in a way that can cater to almost every part of the society. To ensure the usage of this is

Further research in terms of giving a more natural personality for AI and the incorporation of social anxiety training method will provide a better result. Future development of this would be an environment that can be customized for each end user to give them the experience of socializing by implementing different levels of the AI and introducing them to the human environment little by little. In implementing an effective chatbot for social anxiety problems, understanding of the root cause of social anxiety and the approach to the society regarding this issue is important.

ACKNOWLEDGEMENT

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