

Digital Counsellor: Generative based chatbot using a rank based approach on training data

Manav Saini, Navidha Jain, Tanishqa Shital Singh, Anishka, Ashwin Tomer, Dux Pal Singh

1 Abstract

This paper proposes the development of a digital counselling chatbot that utilizes a generative model with a rank-based approach to training data. The chatbot aims to provide accessible and affordable mental health support to a wide range of people by providing a safe and confidential space for users to discuss their concerns and receive practical advice and information. The chatbot is trained on a dataset scraped from Counsel Chat, a platform that hosts certified counselors whose answers are ranked with upvotes. A medium version of GPT2 has been used and fine-tuned on the dataset to generate intelligent responses. The paper compares the proposed chatbot with a baseline model and evaluates the technical performance using metrics such as BLEU, METEOR, and NIST. Overall, the proposed chatbot with the rank-based approach and generative model shows promising results for providing digital counselling. The paper contributes to the growing body of literature on the use of digital technology for mental health care and highlights the potential of chatbots to provide accessible and affordable mental health support.

Keywords: digital counselling chatbot, generative model, rank-based approach

2 Introduction

In recent years, the use of digital technology has transformed the field of mental health care. One area in which this technology has been particularly useful is in the development of digital counselling chatbots. These chatbots are designed to provide support and guidance to people experiencing mental health issues by engaging in conversation with them. As the world becomes increasingly digital, it is important to explore how technology can be used to help those in need of mental health support. Mental health issues are a growing concern worldwide, and the demand for mental health services is increasing. However, many people are hesitant to seek help due to stigma, lack of access to services, or concerns about the cost of care. In addition, mental health professionals may not always be available when people need support.

Digital counselling chatbots have the potential to address some of these challenges by providing accessible and affordable mental health support to a wide range of people. This project aims to develop a digital

counselling chatbot that is designed to offer support and guidance to people experiencing mental health issues. The chatbot will be designed to provide a safe and confidential space for users to discuss their concerns and receive practical advice and information.

3 Problem Statement and Motivation

Our aim was to develop a chatbot using a generative model that used a rank-based approach training data. To obtain this training data, we scraped data from Counsel Chat which is a platform that hosts certified counselors whose answers are ranked with upvotes. We used this data with GPT2, a generative model that has demonstrated state-of-the-art performance in tasks such as question answering, summarization, reading comprehension, and translation[4].

The motivation behind creating a digital counselor with a dataset that incorporates human judgement is to provide individuals with a more accessible and efficient means of seeking mental health support. With the increasing demand for mental health services and limited resources, many people face long wait times or struggle to find affordable and convenient counseling options. A digital counselor with human judgment incorporated dataset would offer a scalable and cost-effective solution that could be accessed from anywhere at any time. While digital counseling can be effective for some people, it is not a substitute for traditional face-to-face therapy. That is why incorporating a human judgment dataset can enhance the effectiveness of digital counseling by providing personalized and empathetic responses to individuals.

This technology has the potential to fill the gaps in traditional mental health services and help individuals overcome barriers to care.

4 Background

Mental health issues are a major concern worldwide. These disorders can have a significant impact on a person's quality of life and can also affect their ability to work, socialize, and carry out daily activities. While mental health services are available in many countries, there are still significant barriers to accessing these services, including stigma, lack of availability, and high costs.

The use of digital technology in mental health care has been shown to have a positive impact on outcomes, and there is a growing body of evidence to support the use of digital interventions in mental health care. Chatbots are computer programs that are designed to simulate conversation with human users, and they can be programmed to provide support and guidance to people experiencing mental health issues. In particular, digital counselling chatbots have been shown to be effective in providing support and guidance to people experiencing mental health issues. They offer a potential solution to these challenges by providing accessible and affordable mental health support. These chatbots are available 24/7 and can be accessed from anywhere with an internet connection, making them a convenient and accessible option for people in need of support.

5 Literature Review

[1]Counsellor Chatbot: The article presents a study on developing a chatbot named Xen, which uses Retrieval and Generative techniques, including AIML and K-Means self-learning, to provide counseling services and advice based on user input. The chatbot is trained on three datasets, resulting in three types of chatbots: Retrieval Pattern Matching, Retrieval Rule-Based AIML, and Generative. The text describes the different chatbot architectures, including retrieval-based, AIML-based, and generative, and also discusses techniques such as NER and skip-thought vectors for improving chatbot performance. Overall, the article provides an overview of various techniques used in chatbot development.

[2]Chatbot for Mental Well-being: This paper aims to develop a therapy chatbot that can provide easy access to hassle-free mental health services. The proposed chatbot uses two major modules: an SVM classifier to detect the user's mood based on their input and a Seq2Seq model that generates appropriate responses to the user's input. From the Dataset each of the 32 Emotions was mapped to a unique number. The SVM algorithm generates a numerical output that corresponds to a particular mood based on the input provided by the user, while the Seq2Seq model uses an encoder-decoder architecture to generate an appropriate response to the user's input. The project utilizes the Empathetic Dialogues dataset for mood classification and the Keras and Sklearn libraries for model development. The chatbot's primary goal is to help ease the user's state of mind and keep track of their mood over a span of time.

[3]A Chatbot for Psychiatric Counseling in Mental Healthcare Service Based on Emotional Dialogue Analysis and Sentence Generation: The paper proposes the use of an AI-powered counseling chatbot for mental health care services. The chatbot utilizes deep learning-based emotion classification models and NLP

methods to understand the consultation content and respond appropriately. It also uses additional user information, such as facial expression, age, sex, spatial context, location context, and bio-signals collected via wearable devices to personalize the interaction. The chatbot aims to communicate emotionally with the user by developing a personalized dialog system based on the user's recognized emotions, age, and gender. The paper emphasizes the importance of tracking persistent emotional changes to enhance counseling effectiveness. Overall, the proposed chatbot technology aims to provide a personalized and user-customized correspondence platform that communicates through speech, text, audio, and visual representation.

[4]An Evaluation of Generative Pre-Training Model-Based Therapy Chatbot for Caregivers: The study developed and evaluated a chatbot for mental health support to caregivers using the GPT-2 generative pre-training model. The model was fine-tuned on 306 therapy session transcripts involving 152 family caregivers. Evaluation criteria included non-word proportion, sentence length, and sentiment analysis. The findings showed that the fine-tuned model generated responses that resembled those of actual therapists, with better sentence length and sentiment analysis than the GPT-2 model. However, the fine-tuned model had more negative sentiment responses than actual therapists. The study highlights the limitations of generative-based chatbots for therapy contexts and the challenges of designing human-AI interaction for therapy. Nevertheless, the fine-tuned model has potential to provide support to caregivers in situations where access to actual therapists may be limited. Further research is needed to improve chatbots' accuracy and effectiveness for mental health support.

[5]The article discusses the development of a chatbot designed to provide mental health support and information in a conversational way. The chatbot offers customized advice and resources based on the user's responses, and uses emojis to allow users to select their mood or feeling. The chatbot aims to make accessing mental health information more engaging and user-friendly, and could also be used for mental health screening. The article highlights the importance of ongoing development and evaluation to ensure the chatbot's effectiveness and safety. The chatbot is designed to be incorporated into a wider web application and uses AI. The article emphasizes the potential of chatbots to provide accessible and personalized mental health support, but also discusses ethical considerations in the development process.

6 Novelty

According to the literature review that we did the two main problems identified in the digital counselling sec-

tor is a lack of high quality data and a lack of human judgement metric. Through Digital Counsellor we are giving a solution for both the problems. We have scraped and created a database of questions and answers given by certified counsellors with years of experience with the data of up votes on each answer which can be used as a pre result human input metric.

counselchat.com is a website on which people post their problems and a number of certified counsellors try to help them by posting an answer. There is a feature of upvote just below each answer which a user can select if he/she finds the answer to be good or effective. 1. We scraped the counsel chat website in the form of question, answer, profile link of counsellor, upvotes and built a database of size of 45000 2. We pre processed all the questions and answers to remove all the redundant characters and ranked the data according to the upvotes. 3. We splitted the data into train, test and val and converted each of them into a text file which can be used to finetune GPT 2 4. We finetuned GPT2 on different hyperparameters and saved the models. 5. On the basis of human judgement and the wordcloud generated from the predicted data from the test case the model with hyper parameters as top_k=10, top_p=0.7, temperature = 0.8, nsamples=1, batch_size=1, run_name='run1', truncate= ' <lendofxtxt>', include_prefix=False worked the best.

The dataset has 45,514 rows, and each row consists of five columns: 'topic', 'question', 'answer', 'therapist', and 'link'.

Dataset used for training, testing and validation purposes consists of 2130 rows and columns as questionID, questionTitle, questionText, questionLink, topic, therapistInfo, therapistURL, answerText, upvotes, views, split.

We have used BLEU, METEOR and NIST metrics to evaluate the technical performance of our baseline model. Five different metrics have been used to know whether our chatbot is generating human like responses or not. The following scores were obtained:

Table 1: Model Performance with 5000 steps finetuning

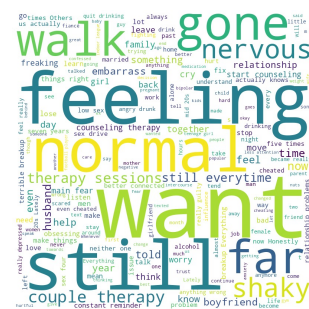


Figure 1: Wordcloud of Test query data



Figure 2: Wordcloud of Test answer data

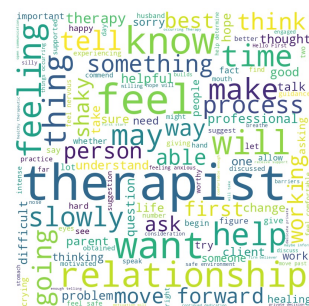


Figure 3: Wordcloud of Test predicted data

Question: "I'm facing severe depression and anxiety and I just feel like I'm going through a lot. This really distracts me and I cant get my mind off the things that are bothering me. How do I overcome this anxiety and depression?"

Answer = "Have you used meditation or hypnosis? Relaxing the mind and connecting with your true self is a great way to calm your thoughts and get to peace and calm. Hypnosis and meditation have helped a lot of people with anxiety and depression. Google hypnotherapists near me or write for a while about what is going on."

Question: "Every winter I find myself getting sad because of the weather. How can I fight this?"

Answer= "Seasonal Affective Disorder (S.A.D.) is a term that reflects how many people are affected by the changing seasons, especially fall to winter. Everyone suffers with some form of this (lessened activity levels, increased isolation, etc.) while some find that this time of year can put them into a deeper depression. If you have noticed that this happens frequently, there are some ways you can definitely help yourself going forward:1. Attend therapy to learn strategies and tools to help you to manage your mood. It's important to stay within the therapy until you feel you have mastered these tools. 2. Push yourself to interact more with your social groups and other positive activities. It's easy to go out and spend the day outside in the summer months, when the temperature is warm and the sun shines for long periods of the day, but it seems harder to find fun ways to spend your time when the temperature drops and darkness comes on so quickly. Perhaps winter time could become the time of year where you and your friends have weekly board game nights, complete with hot chocolate and a fire³. You may want to consider the purchase of a S.A.D. Light. These are lights that expose you to additional ultra violet light to increase the vitamin D in our bodies, as well as the release of growth hormone (which releases when we wake up). There are mixed reviews of these products, however, and they can be expensive."

Question: ""I have so many issues to address. I have a history of sexual abuse, I'm a breast cancer survivor and I am a lifetime insomniac. I have a long history of depression and I'm beginning to have anxiety. I have low self esteem but I've been happily married for almost 35 years. I've never had counseling about any of this. Do I have too many issues to address in counseling?""

Answer = "You do not have too many issues to address in counseling. And your perseverance will serve you well if you choose to engage in therapy. The trauma and medical event you experienced topped off with chronic sleepless nights would lead to feelings of depression for many. The emotional reaction you've had to these experiences sounds normal albeit troublesome and I would imagine intensely painful at times as well. Therapy can help prioritize what is the most impactful issue you are grappling with. I find in therapy that when the central issue is revealed, understood, processed, and understood again in its current context, many other areas of the person's internal experience improve. It sounds as though something has prevented you from seeking help from a counselor in the past, and it sounds as though you are more seriously considering it now. Therapy helps and it can help you when you're ready."

Figure 4: Results

10 Contributions

Dux Pal Singh, Anishka: Data collection, pre-processing of data, identification of different models to be tested, final evaluation

Manav Saini, Navidha Jain: Implementation of different models for generation task and choosing the best one, Improving baseline scores

Ashwin Tomer, Tanishqa Shital Singh: Implementation of different models for response generation and choosing the best one, Improving baseline scores

Report writing: All members

11 Citations and Bibliographies

[1] <https://www.academia.edu/download/56261875/07.MRCS10087.pdf>

[2] https://www.itm-conferences.org/articles/itmconf/abs/2021/05/itmconf_icacc2021_03019/itmconf_icacc2021_03019.html

[3] <https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7962482&tag=1>

[4] <https://arxiv.org/pdf/2107.13115.pdf>

[5] <https://www.scienceopen.com/hosted-document?doi=10.14236/ewic/HCI2017.24>