Project Proposal

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MindMend : Chatbot for mental health organization

Problem Statement:

Almost 57% people in the USA face mental health issues some time in their life. Mental health issues are generally considered a taboo and are not discussed much. People are often reluctant to visit a therapist to solve their mental health issues. Most of the moderate level issues can be solved talking to a therapist but the therapist/doctor cannot be available 24x7 to the patient. These issues are mostly triggered at night and hence cannot be discussed with the therapist immediately. Apart from that, a patient will be comfortable discussing his/her issues with only a particular (regular) therapist they visit. To solve the issue of therapist unavailability and specificity- I propose 'MindMend' which can assist the patient as and when required with the perspective and principles of the patient's own therapist. The problem being tackled by LLM is continuous conversation and most importantly answering the patient based on thinking and guidelines of his/her own therapist. For examples for a particular questions, different therapists will have different solutions but MindMend will provide an answer closely aligned with the thinking process of a particular doctor based on RAG based approach.

Project Objectives:

Following listed are the goals and expected outcomes of the project:

- Create a chatbot that answers questions and has an engaging conversation with the user. It should have a usable UI.
- Using RAG, the chatbot should be able to answer questions based on specific thinking process and point of view of a specific doctor/ therapist to the patient.
- The chatbot should never give answers that trigger anxiety, depression or suicidal thoughts.
- The chatbot should be able to summarize and make notes list to be discussed with the doctor in the next available slot. Here we do NOT aim to eliminate the doctor but just want to help patients till the doctor get available.

Methodology:

- **Approach:** I am building a new system that to my knowledge has never been idealized. This can serve a particular doctor, hospital or mental health NGO.
- **LLMs and Techniques:** I plan to use retrieval Augmented Generation for giving the LLM the context and perspective of the specific doctor. I plan to use multi modal data for the system in order to capture maximum possible information. I will test and finalize a particular LLM among llama 3.2 (since is a small model and can run locally easily), GPT 4 and Gemini. I will also use frameworks like Flask to create a User interface for my

chatbot. Apart from that, I will try deploy the chatbot on Heroku. I will also explore the possibility of running the entire system locally but I am not sure upon that yet as my system is still not being able to download and run the llama 7B. However a sincere attempt will be made because this particular application will have personal chats and its best to run that locally.

- **Architecture/ Process:**
  The workflow will be as follows:
  1. Data collection: I plan to use multimodal data including text (blogs), audio (podcasts) and video (youtube videos)
  2. Data Pre-processing: I will preprocess all these modalities into text.
  3. Building a vanilla chatbot with the selected large language model.
  4. Performing Retrieval Augmented Generation based on the preprocessed data with the chatbot.
  5. Building a usable UI.
  6. Deploying the model or running it on local system.
- **Data:** I will use online available data of one of NGOs/ Mental Health Organizations. These NGO has many blogs, youtube videos and podcasts publicly available on the internet. I will preprocess all the non-text data into text using transcription. Further the text data preprocessing steps will be performed.
- **Evaluation:** I plan to measure the success using accuracy and F1 score.

Related Work:

Existing systems: There are multiple chatbots about mental health chat including:

1. **Woebot Health:** Chats with user to solve and discuss mental health issues. Detects if something is concerning and gves doctor helplines. Clearly claims its not full proof and can be misleading.
2. **Wysa** : Conversational AI with chats. It also suggests various activities to users. This acts like a doctor to help user through suggestions, activities and chats.

Positioning: I am addressing the main gap of the chatbot being personalized to a doctor. Considering any mental health scenario, a patient wants to stick and is safe only with one doctor. Therapists have different styles and while all might be good- they can contradict each other at some stage or the other. Now if the therapist tells the patient to do A and the chatbots tells B then it's a big issue. To avoid this I am positioning my system in an area where the chatbot ideas align with the therapist. Apart from that I do NOT try to replace a doctor. I am just trying to make the patient comfortable in normal situations and/or till the doctor get available. The available systems try to replace a doctor which is very wrong considering the current development in AI. Mental health issues can lead to steps as bad as a suicide or self harm which can NOT be tackled by AI.

Timeline:

Phase1: I plan to finish the following in first 1 month

1. Collect Data (Blogs, Audio, Podcasts)
2. Building the vanilla chatbot that answers questions based on LLM

Phase 2:

1. Integrate RAG using the data collected with the vanilla chatbot.
2. Evaluate the answers generated by the bot.
3. Create a usable UI
4. Deploy the bot OR run locally.

Milestones:

1. Data Collection : 10th October
2. Building vanilla chatbot : 20th October
3. Testing the basic bot : 25th October
4. Integrating RAG : 15th November
5. Deployment or local run : 30th November
6. Submission : 2nd December

Challenges and Risks:

One of the risk associated with the system is the patient replacing a doctor with this chatbot. I don't believe that any AI system can completely replace a doctor – atleast in the current development of the AI. Secondly, I think to make the bot efficient, a LOT of data will be required. Apart from that, I think the chats need to be kept secure and personal. Ay user/ patient would never want to discuss their mental health issues publicly. Thus, the chats should be secure.
To solve the issues related to doctor's replacement- I think we can keep giving prompts and warming to consult a doctor based on questions. I can write this in my LLM prompt. Maybe a doctor can be notified directly about the report of every chat so such situations can be avoided. For the data- I think a big organization who uses this bot will have enough data. Finally, for the security, we can either use secure cloud platforms for deployment or run the model locally. Local run will be most idea case but in the current edge compute it might be a little challenging.

Resources Needed:

Hardware/ Software: I will need a vector DB, A deployment platform like Heroku or a good machine to run the model locally.

Data Requirement: Blogs, YouTube videos and podcasts that are publicly available.

Expected Deliverables:

Code: Will have code files for RAG, UI for the chatbot, prompts, evaluations, Training.
Final Report: The report will consists of Introduction to problem statement, Literature review, Methodology, Results, examples of chats and future scope.
Additional Artifacts: Presentation, Demo for chatbot.