Project Definition Document

# Why is the project being undertaken?

## Background

All over the world, there is growing issue regarding mental health due to the huge increase in the number of people experiencing mental health problems such as depression, stress, and anxiety. Mental health services are often overwhelmed, and many people feel reluctant to seek help due to stigma, fear, or lack of access. A digital solution like chatbots can offer a way to provide an initial level of support, which can help users feel heard and direct them to further professional care when necessary.

## Rationale

This project is valuable because it addresses gaps in early intervention for mental health, utilising AI to provide support in ways that traditional mental health services can’t. Chatbots can offer users privacy, 24/7 access, and a non-judgmental environment to explore their feelings, which is vital for those not yet ready or able to access professional care.

## Expected Benefits

**Users**: The chatbot can help users identify mental health issues early on and provide coping mechanisms, basic information, basic support, and resources to seek professional help.

**Mental Health Services**: It reduces the initial pressure on healthcare services by helping individuals in the early stages of mental distress. It can also allow for users to get the right help needed by being well informed on their issues and the help they need.

**Community**: It can raise awareness about mental health issues and reduce stigma by making it easier to access information and support. Also allowing for users to feel less burdened for reaching out for help if they feel uncomfortable with talking to someone about their issues.

# What will the project deliver?

## Scope

The primary goal is to develop an AI-driven chatbot that can offer preliminary mental health support using publicly available datasets and an already existing open-source language model. It will recognize common mental health issues, provide supportive conversation, and guide users toward professional resources if necessary.

## Primary Objectives

* Develop a chatbot capable of offering basic mental health support.
* Train the chatbot on public datasets (forums, Q&A, etc.) for accurate responses.
* Ensure the chatbot directs users to additional resources or professionals if needed.

## Secondary Objectives

* Implement basic sentiment analysis to detect the severity of user issues.
* Provide personalized recommendations based on user input (e.g., coping strategies).

## Success Criteria

* The chatbot can provide accurate, empathetic, and relevant responses.
* It can identify when a user needs to be directed to professional help.
* User testing shows a reduction in distress for users after interaction with the bot.

# How will the project be delivered

## Methodology:

* **Data Gathering**: Use publicly available mental health forums, Q&A datasets, and relevant resources.
* **Development**: Implement the chatbot using natural language processing (NLP) models, such as GPT or similar, trained on mental health-related data.
* **Testing**: Conduct testing with users to refine its ability to respond empathetically and appropriately.

## Tools

* **Programming**: For model training I will use Python with libraries like TensorFlow or PyTorch, which I will decide the one I choose for my final project after experimenting to see which one I am more comfortable using.
* **NLP**: Python from an open source pre trained language model (Llama)
* **Sentiment Analysis**: Tools like VADER or custom sentiment analysis algorithms to detect user emotions.

## Experiments:

* Perform user testing to evaluate the chatbot’s performance.
* Conduct surveys with users to gather feedback on how helpful and empathetic the bot was.
* Evaluate data-driven results by comparing chatbot responses against ideal responses from trained mental health professionals.
* **Evaluation**: Success will be measured by the accuracy of responses, user satisfaction, and the chatbot’s ability to offer appropriate emotional support.

# Task Plan

## Project Planning and Setup

* The first stage of the project planning is to define the specific scope and objectives for the chatbot.
* I then need to research, identify, and secure access to the relevant public datasets, which can consist of mental health forums(Mind National website, etc), Q&A datasets, and other mental health pages.
* I need to conduct market research analysis on already existing solutions, to gain inspiration for my project and to gain competitive insights.
* The next step is to create a project timeline.

## Data Gathering and Preprocessing

* I will collect publicly available mental health related datasets from the sources I mentioned prior and other reliable sources I may encounter down the line.
* I will filter and preprocess the data I gathered, to remove irrelevant information, to ensure that the data is in a suitable format to train my model.
* I need to separate and annotate my datasets with the relevant labels, issues and problems like depression, anxiety and stress, to guide and make the training process more efficient.
* I need to make sure I adhere to ethical standards like data privacy and consent, making sure my project complies with regulations and legislations like the GDPR.

## Model Selection and Development

* I will research and compare different NLP models, to decipher which models are most suitable for mental health related conversations (e.g. Llama, GPT)
* I will test pre-trained open-source models (like Llama) to determine which works best for my chatbot’s objects.
* I then need to fine tune the selected model on the pre-processed mental health datasets to maintain relevance.
* I will try to implement basic sentiment analysis tools (like VADER) or custom algorithms) to detect emotions.

## Developing The System/Interface

* I will create a user flow diagram, which will map out interaction paths for the users.
* I will develop a simple interface, which I will further develop and improve on as the project develops.
* I will then ensure the interface is responsive and easy to use.
* I will implement direct communication between the interface and the chatbot model.
* I will ensure secure handling of user input and data, making sure the data is locally stored with no external communication.
* I will perform usability tests on the system and refine it based on feedback I receive.

## Chatbot Functionality Development

* I will design the chatbot’s conversational flow, to include greetings, supportive responses, and links to professional help for users to be directed to.
* I will implement key functionalities like basic issue recognition (to identify different issues like anxiety or stress) and offering initial coping mechanisms (based on the user’s issues).
* I will build a feature to recommend resources (links to help lines or mental health pages) based on the user’s inputs.

## Testing and Validation

* I will complete testing to ensure the chatbot responds accordingly to the different mental health scenarios.
* I will find users to complete testing for me to gather feedback on the functionality of the system without bias.
* I will develop the chatbot responses based on the testing data I have gathered.
* I will compare the chatbot responses from competitors and trained mental health professionals.

## Evaluation and Monitoring Performance

* I will collect and analyse user feedback to check the quality of the chatbot’s responses and the overall performance.
* I will regularly update the chatbot with new data I find from further research or new updates to keep it up to date with new trends in mental health issues.

## Documentation and Reporting

* I will Document the development process, keeping note of decisions that have been made around the model selection and data sources.
* I will create reports on the chatbot’s performance and user’s satisfaction and feedback from testing.

# Gantt Chart

# What is the timescale for the project

## Timeline Breakdown

## Dependencies

* + Availability of appropriate datasets.
  + Access to users for testing and feedback.
  + Model performance in understanding mental health-related inputs.

# What risks and constraints might affect the completion of your project?

## Risks And Mitigation Plan

### Data Quality Risks

* Risk: The mental health datasets might not be comprehensive or diverse, which can lead to inaccuracy or biased responses.
* Mitigation: Use multiple high quality and diverse data sources, preprocessing them to improve data accuracy.

### Data Privacy Compliance

* Risk: There is a risk of violating user privacy or GDPR regulations, especially if user data is involved during testing.
* Mitigation: Make sure all data is anonymous, get user consent during testing and make sure to stick to GDPR standards through this project.

### Technical Limitations

* Risk: Fine tuning NLP models to handle sensitive mental health issues and detecting emotional states accurately can be hard to achieve.
* Mitigation: Use well established pre trained models (Llama in my case), regularly test and adjust my model accuracy, and use a sentiment analysis tool like Vader to compare results to refine the capabilities of sentiment detection.

### Ethical Concerns

* Risk: The chatbot could potentially give inaccurate advice that could negatively affect the user’s mental health instead of helping them.
* Mitigation: Before processing with the user’s inputs, clearly inform the users that the chatbot is not a substitute for professional help. Keep checking and updating the chatbot’s responses based on feedback from mental health professionals (HEY Mind) or mental health forums.

### Limited Access to Users for Testing

Risk: It could be difficult to find a sufficient amount of users to test the chatbot and provide unbiased feedback.

Mitigation: Find fellow students & friends as potential test users.

### Legal Risks

Risk: Legal issues could arise if users interpret the chatbot’s advice as guaranteed medical guidance.

Mitigation: Include a disclaimer to inform users that the chatbot is not a substitute for professional mental health advice and should only be used for basic and initial support.

# What are the ethical and legal issues involved in conducting the project?

## Ethical Concerns:

* Mental health support is sensitive, and there’s a risk of giving incorrect or unhelpful advice, which could harm users.
* Ensuring user privacy and confidentiality is vital, even during testing.

## Legal Considerations:

* Adhering to GDPR for data protection, particularly if any user data is collected during testing.
* The chatbot should have a disclaimer that it is not a substitute for professional medical advice.

# What are the commercial factors of the project?

**Cost**: The project will mostly require investment in software tools, training models, and possibly user testing.

## Commercial Exploitation:

* The chatbot could be marketed to mental health organizations, online therapy platforms, or as a freemium tool for general users.
* Potential partnerships with health service providers who could integrate the bot as a first line of support.

## Market and Competition:

* There's a growing demand for digital mental health services, but competition includes existing chatbots like Woebot and Wysa. The key to standing out will be the quality of responses and integration with mental health resources.

# How will you evaluate the project at the end

## Evaluation Criteria:

* **Accuracy of Responses**: The chatbot should provide accurate responses based on the datasets it was trained on.
* **User Satisfaction**: Positive feedback from user testing (through surveys or interviews) showing that users felt heard and supported.
* **Emotional Impact**: Reduction in distress levels measured by user-reported feelings before and after interaction.
* **Technical Metrics**: Assess the chatbot’s performance using precision, recall, and F1 scores to ensure it provides meaningful responses.
* **Usage Metrics**: Track how often users engage with the chatbot and whether they follow recommended resources.