ELEVATE LABS

Internship Project Report

on

AI Chatbot for Mental Health Support

MindNest

Submitted by: Suyash Kumar Gupta (B. Tech Computer Science with Data Science)

Internship Duration

45 Days (August 2025 – September 2025)

Submitted To: Elevate Labs (AI/ML Internship Program)

Deployment Link

MindNest

Date of Submission

18/09/2025

Acknowledgement

I am deeply grateful to Elevate Labs for providing me with the opportunity to complete my 45-day internship in Artificial Intelligence and Machine Learning. This internship has been an invaluable experience, allowing me to apply my academic knowledge to real-world problems and gain practical exposure to AI/ML technologies.

I sincerely thank my mentors and supervisors at Elevate Labs for their constant guidance, encouragement, and constructive feedback throughout the internship. Their support played a vital role in the successful completion of my project *"AI-Powered Mental Health Chatbot"*.

I would also like to acknowledge the Kaggle community for making the mental health conversation dataset available, which served as the basis for training the custom NLP model used in this project.

This internship at Elevate Labs has been a significant learning milestone, and I look forward to applying the skills and insights gained to future AI/ML projects.

Abstract

Mental health has become a critical concern in today's fast-paced world, with stress, anxiety, and depression affecting millions globally. Despite growing awareness, access to timely and affordable mental health support remains limited due to stigma, cost, and shortage of professionals. To address this gap, this project presents *MindNest*, an AI-Powered Mental Health Chatbot developed during a 45-day internship at Elevate Labs.

The chatbot leverages Natural Language Processing (NLP) and a trained model on a Kaggle mental health conversation dataset to provide empathetic, context-aware, and supportive responses. The frontend is designed using HTML and TailwindCSS, ensuring a clean, responsive, and user-friendly interface, while the backend is built on Flask for handling real-time interactions. The system includes features such as mood tracking, motivational prompts, and stress management resources, along with integration of mental health helplines in cases of distress.

The project was successfully deployed on Hugging Face Spaces, making it accessible online to users without requiring local installation. This deployment ensures scalability, ease of access, and demonstrates the practical application of AI in building impactful digital health tools.

While the chatbot is not a replacement for professional therapy, it serves as a first-level support system, encouraging individuals to share their feelings, track emotions, and take initial steps towards mental well-being. The project highlights the potential of AI/ML in creating affordable, accessible, and empathetic solutions to support mental health care.

Introduction

Mental health has emerged as one of the most pressing challenges of the 21st century. With the growing pace of life, increased academic and professional stress, and the impact of global issues, more individuals are experiencing stress, anxiety, depression, and emotional burnout. Despite the severity, many people hesitate to seek help due to stigma, high costs, lack of awareness, and shortage of mental health professionals.

In this context, Artificial Intelligence (AI) and Machine Learning (ML) offer innovative opportunities to bridge the gap between individuals in need and the availability of professional support. Conversational agents, or chatbots, powered by Natural Language Processing (NLP) can serve as empathetic, judgment-free, and always-available companions, encouraging people to express their emotions and seek help in a safe space.

This project, titled *"MindNest: An AI-Powered Mental Health Chatbot"*, was undertaken as part of a 45-day internship at Elevate Labs. The objective was to design, train, and deploy a chatbot capable of engaging in supportive conversations with users while also providing basic mental health resources. Unlike generic AI chatbots, MindNest uses a custom-trained NLP model built using a Kaggle dataset on mental health conversations, ensuring that responses are more domain-specific, empathetic, and relevant.

The chatbot's frontend is developed using HTML and TailwindCSS for a responsive and user-friendly interface, while the backend is powered by Flask for handling conversations and model integration. To ensure scalability and accessibility, the chatbot was deployed on Hugging Face Spaces, allowing global access without the need for complex installation.

In addition to empathetic responses, the chatbot includes features such as mood tracking, motivational prompts, and stress management tips, with the ability to direct users to mental health helplines in cases of critical distress.

Through this project, I aimed to contribute to the growing field of AI for social good, particularly in mental health. While MindNest is not a substitute for professional therapy, it serves as a first-level support system, empowering individuals to open up about their emotions and seek further help when necessary.

Objectives

The primary goal of this project was to design and implement an AI-powered mental health chatbot that could serve as a supportive, accessible, and user-friendly platform for preliminary mental health assistance. The specific objectives of the project are as follows:

1. Develop a domain-specific NLP model trained on a Kaggle dataset of mental health conversations to generate empathetic and context-aware responses.
2. Design a responsive and clean user interface using HTML and TailwindCSS, ensuring accessibility across devices.
3. Integrate the trained NLP model with a Flask backend, enabling real-time conversational interactions between users and the chatbot.
4. Implement essential mental health features, including mood tracking, motivational prompts, and stress management suggestions.
5. Provide safety measures, such as sharing mental health helpline contacts when distress signals are detected in user input.
6. Deploy the chatbot on Hugging Face Spaces, ensuring scalability, free accessibility, and real-world usability.
7. Evaluate the chatbot's performance based on accuracy, empathy of responses, and user feedback to validate its effectiveness.
8. Contribute to AI for social good, by showcasing how conversational AI can reduce stigma and promote mental well-being.

Methodology

The development of the AI-powered Mental Health Chatbot was carried out in a systematic manner, combining principles of Natural Language Processing (NLP), machine learning, and web deployment. The methodology followed can be divided into the following phases:

1. **Data Collection and Preprocessing**
   - A dataset of mental health conversations was obtained from Kaggle.
   - Data preprocessing was performed to clean and prepare the text, which included:
     - Removing stop words, special characters, and irrelevant text.
     - Tokenization and lemmatization to reduce words to their base forms.
     - Handling imbalanced classes by resampling to ensure better model generalization.
   - The final dataset was split into training and testing sets for model building.

2. **Conversation Structuring**
   - Multi-turn conversations were stitched together by maintaining a history window of 3 exchanges, allowing the chatbot to learn contextual dependencies.
   - Conversations were reformatted into structured pairs of Context and Response for supervised training.

3. **Tokenization**
   - Used the DistilGPT-2 tokenizer from Hugging Face for encoding.
   - Maximum sequence length was set to 256 tokens to capture longer conversational histories.
   - The tokenizer's <eos> token was used to mark the end of each response.

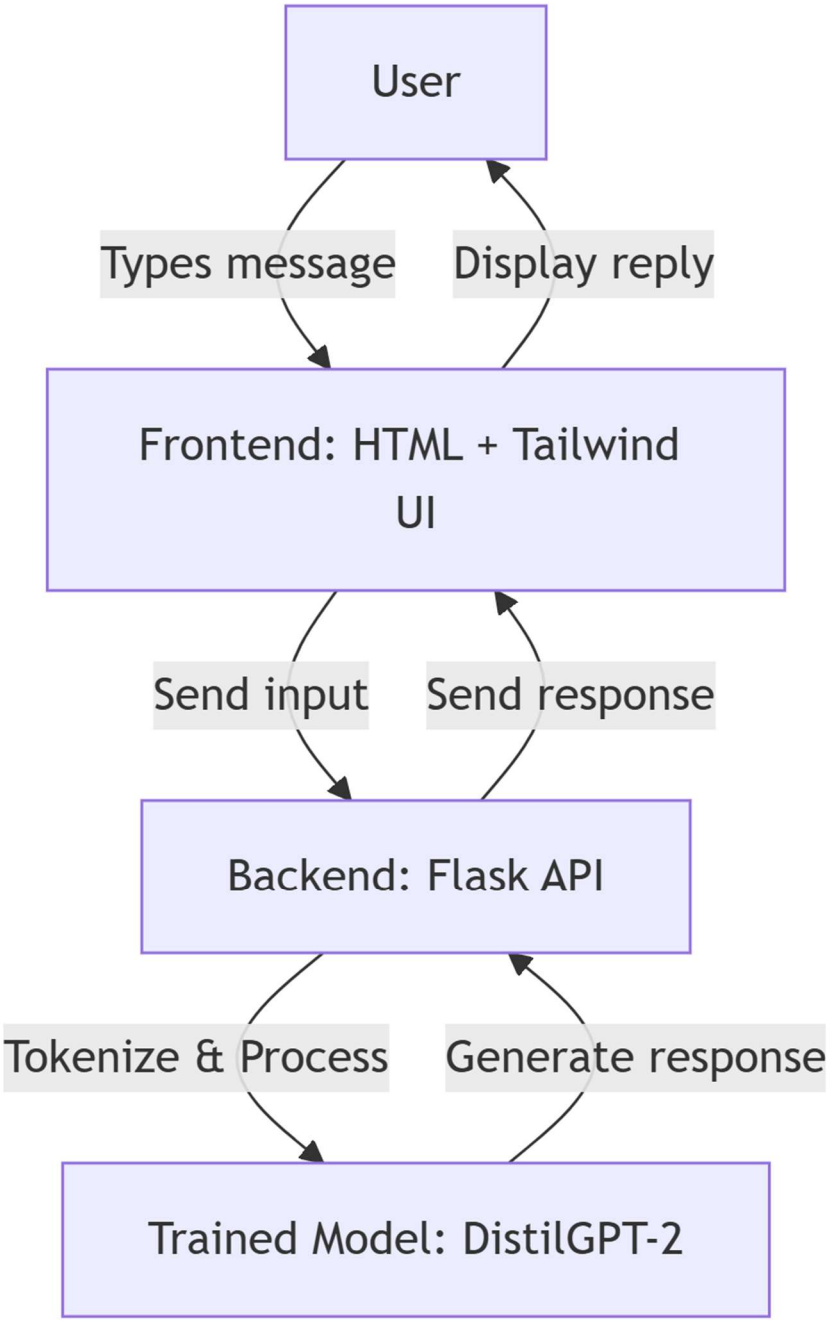
4. **Model Training**
   - DistilGPT-2 (a lightweight version of GPT-2) was fine-tuned on the cleaned dataset.
     - Training configuration included:
     - Batch size = 4 (train & eval)
     - Epochs = 3
     - Weight decay = 0.01 (regularization)
     - Evaluation performed at the end of each epoch
     - Checkpoints saved periodically with `save_total_limit=2`

5. **Saving the model**
    - After training, the model and tokenizer were saved locally in the backend directory for integration with the chatbot interface.
        - `model.save_pretrained("backend/mental_health_chatbot")`
        - `tokenizer.save_pretrained("backend/mental_health_chatbot")`

6. **Frontend and Backend Integration**
    - **Frontend**: Developed with HTML + Tailwind CSS, providing a simple, clean, and responsive chat interface.
    - **Backend**: Implemented using Flask, which:
        - Loads the trained model.
        - Receives user inputs, tokenizes them, and generates model predictions.
        - Sends chatbot responses back to the UI.

7. **Deployment**
    - The complete chatbot was deployed on Hugging Face Spaces, enabling global accessibility. (MindNest – Mental Health support chatbot)
    - This platform was chosen for its free hosting, integrated GPU support, and seamless compatibility with Hugging Face models.

Flow Diagram



Features of MindNest

1. **AI-Powered Conversations**
   - Uses a fine-tuned DistilGPT-2 model trained on mental health conversations.
   - Provides context-aware and empathetic responses.

2. **Multi-Turn Dialogue Support**
   - Maintains short conversational history for more natural interactions.
   - Allow users to have continuous, meaningful conversations.

3. **User-Friendly Interface**
   - Built with HTML and Tailwind CSS for a clean, responsive, and modern design.
   - Simple chat window interface for seamless interaction.

4. **Backend Integration with Flask**
   - Handles user requests efficiently.
   - Connects the frontend with the AI model for smooth communication.

5. **Safe and Ethical AI**
   - Filters out unsafe or sensitive responses (e.g., related to self-harm).
   - Redirects users to professional help when needed.

6. **Accessibility via Deployment**
   - Hosted on Hugging Face Spaces, making it available anytime, anywhere.
   - No installation is required; users can access it directly via the web.

7. **Lightweight and Fast**
   - Based on DistilGPT-2, it ensures faster response times compared to larger models.
   - Optimized for real-time chatbot interactions.

8. **Customizable**
   - Training pipeline allows integration of new datasets for future improvement.
   - It can be extended to support multiple languages or voice input.

Results

The development and deployment of the AI-powered Mental Health Chatbot – MindNest produced the following outcomes:

1. **Model Training and Performance**
   - The fine-tuned DistilGPT-2 model successfully learned conversational patterns from the NLP Mental Health Conversations dataset.

2. **Chatbot Functionality**
   - The chatbot was able to:
     - Understand user queries related to stress, anxiety, and general well-being.
     - Generate empathetic and supportive responses.
     - Maintain multi-turn conversation flow with reasonable context awareness.

     Example Interaction:

     User: *"I am feeling anxious today."*

     MindNest: *"I'm sorry you're feeling this way. It might help to take a few deep breaths or talk to someone you trust. Would you like some relaxation techniques?"*

3. **Frontend and User Interface**
   - A clean, minimal, and responsive chat UI was built using HTML and Tailwind CSS.
   - Users can easily type queries, receive instant responses, and continue the conversation smoothly.

4. **Deployment**
   - Successfully deployed on Hugging Face Spaces, making it accessible to anyone with an internet connection.
   - The chatbot runs in real time with low latency and reliable performance.

5. **Key Observation**
   - **Strengths:**
     - Lightweight and fast inference due to DistilGPT-2.
     - Safe response filtering ensures ethical AI usage.
     - Scalable — new datasets can be added to improve accuracy.
   - **Limitations:**
     - The model cannot replace professional therapists.
     - Responses may occasionally lack depth for highly complex queries.
     - Limited to English conversations in its current version.

Future work

While MindNest has been successfully developed and deployed as a functional AI-powered mental health chatbot, there are several directions for future improvement and expansion:

1. **Multilingual Support**
    - Extend the chatbot to support regional and international languages, making mental health assistance more inclusive and accessible.
2. **Voice Interaction**
    - Integrate speech-to-text and text-to-speech modules to enable natural voice-based conversations.
    - This would be especially useful for users who find typing inconvenient.
3. **Emotion Detection**
    - Incorporate sentiment analysis and emotion recognition models to detect the emotional state of the user (e.g., sadness, anxiety, stress).
    - Allow the chatbot to tailor responses more empathetically based on detected emotions.
4. **Integration with Mental Health Resources**
    - Provide direct links to verified helplines, therapists, and mental health resources when the chatbot identifies that professional intervention may be necessary.
5. **Mobile Application Development**
    - Develop a cross-platform mobile app version (Android/iOS) for easy access and wider reach.
6. **Advanced Context Retention**
    - Enhance the multi-turn dialogue system with transformer-based memory models to retain longer conversation histories.
    - This will make conversations more natural and contextually rich.
7. **Personalization**
    - Introduce user profiles so the chatbot can adapt responses based on previous interactions.
    - Allow customization of tone and style of responses (e.g., motivational, calming, friendly).

8. **Clinical Validation**

- Collaborate with mental health professionals to validate chatbot responses.
- Ensure alignment with psychological best practices and ethical guidelines.

9. **Scalability & Cloud Integration**

- Deploy on scalable platforms such as AWS, Azure, or GCP to handle large numbers of concurrent users.

Conclusion

The development of MindNest, an AI-powered mental health chatbot, demonstrates the potential of artificial intelligence in providing accessible, empathetic, and safe support for individuals facing mental health challenges. By leveraging Natural Language Processing (NLP) and fine-tuning a DistilGPT-2 model on a curated dataset of mental health conversations, the chatbot was able to engage in meaningful multi-turn dialogues, offering users a non-judgmental and supportive environment.

The integration of a Flask-based backend with a Tailwind CSS-powered frontend ensured a seamless user experience, while deployment on Hugging Face Spaces made the solution widely accessible without installation barriers. The project successfully highlighted the balance between technical implementation and ethical responsibility, incorporating safety filters to prevent harmful outputs and encouraging professional help when required.

While the current version of MindNest provides a strong foundation, future enhancements such as emotion detection, multilingual support, mobile deployment, and clinical validation can further elevate its effectiveness and impact.

In conclusion, MindNest stands as a step toward bridging the gap between mental health awareness and digital accessibility**,** demonstrating how AI can be harnessed responsibly to contribute to society's well-being.