AI-Powered Mental Wellness Chatbot: Enhancing Accessibility to Psychological Support

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***Abstract*—This paper presents Neuro AI, a mental health chatbot developed as a proof-of-concept undergraduate project that leverages state-of-the-art AI technologies to provide empathic conversational support and early emotional assessment. Built using FastAPI, LangChain, LLaMA3, and Google's Gemini 1.5 models, Neuro AI engages users in natural language dialogue to detect emotional cues of stress, anxiety, depression, and sadness, and generates structured mental health summary reports. These summaries are forwarded (as PDFs) to human counselors, creating a bridge between AI-driven first-line support and professional care. We detail the system's architecture – including its vector database for semantic memory, prompt design for empathetic responses, and MongoDB integration for data management – as well as the psychological underpinnings that enable the chatbot to simulate empathy and assist in early detection of mental health issues. Preliminary observations from a pilot deployment indicate that users found the chatbot's responses supportive, and the emotion detection aligned well with self-reported feelings. The results suggest that an emotionally-aware chatbot like Neuro AI can serve as a meaningful triage tool in the mental health care pipeline.**

***Index Terms*—mental health, chatbot, large language model (LLM), emotion detection, empathy, LangChain, LLaMA, Gemini, summarization, counseling support**

I. Introduction

Mental health disorders are a global public health concern, affecting a significant portion of the population. In 2019, nearly one in every eight people worldwide (approximately 970 million) were living with a mental disorder. In the United States alone, over 23% of adults experience mental illness annually. Despite the widespread prevalence, access to professional mental health care remains severely limited. Long waitlists and high treatment costs have created a critical gap, leaving many individuals without timely support.

Early intervention is crucial—identifying symptoms at an early stage can prevent the escalation of more serious mental health conditions. However, people often delay seeking help due to stigma, financial limitations, or lack of nearby resources.

AI-driven chatbots have recently emerged as a promising solution to bridge this gap by providing accessible, immediate, and anonymous emotional support. The concept traces back to ELIZA (1960s), an early rule-based "therapist" program that surprisingly elicited deep conversations. Today's advances in Large Language Models (LLMs), such as GPT-style transformers, have reignited interest in using AI for therapeutic interaction. Many individuals now turn to general-purpose chatbots (e.g., ChatGPT) to share feelings and find relief, as they offer non-judgmental, 24/7 availability.

However, generic LLMs lack structured therapeutic flow and psychological nuance. They may generate factually correct yet emotionally disconnected responses, limiting their effectiveness in mental health care. For a chatbot to be truly supportive, it must simulate empathy, recognize distress, and know when to involve a human counselor.

In this paper, we introduce **Neuro AI**, an emotionally intelligent mental health chatbot designed to address these challenges. Neuro AI integrates advanced AI models like LLaMA3 and Gemini 1.5, structured dialogue via LangChain, emotion detection modules, and a reporting mechanism that connects users with professional counselors.

We highlight the following contributions:

- A novel architecture combining FastAPI, LLMs, and vector databases to implement emotion-aware dialogue.
- Integration of psychological principles such as empathic response and safety-net escalation into the conversation logic.
- A summarization and report generation module using Gemini 1.5 to facilitate counselor handoff.
- Initial pilot results indicating promising emotional alignment and user satisfaction.

II. Related Work

The idea of using conversational agents for emotional support dates back to ELIZA [1] (1964), a rule-based system that surprisingly engaged users in emotionally meaningful dialogues. ELIZA's unexpected success suggested that people are willing to express their feelings even to simple programs—laying the foundation for future AI-based mental health tools.

In recent years, dedicated mental health chatbots such as **Woebot** [2], [3] and **Wysa** [4], [5] have been developed. These systems leverage techniques from Cognitive Behavioral Therapy (CBT) and follow structured, decision-tree-based conversations. Studies have shown that brief daily interactions with Woebot resulted in a measurable reduction in depression

symptoms among young adults [3], [6]. Users often described these bots as "empathetic" and engaging [7].

With the rise of powerful LLMs (e.g., GPT-3, GPT-4), researchers have begun exploring their role in mental health support. For instance, Kang et al. (2025) developed a bilingual GPT-4-based chatbot named Dr. CareSam [8], [9], which received positive feedback for empathetic dialogue and therapeutic usefulness. However, these LLMs, while flexible and fluent, can sometimes produce irrelevant or even risky outputs if left unconstrained [10], [11].

To mitigate such risks, structured frameworks have been introduced. For example, modeling a conversation as a finite-state machine with predefined therapeutic stages (e.g., mood check, problem discussion, coping strategy) has proven effective in steering the LLM towards safe and supportive interaction [12], [13].

Parallel research in emotion detection from text has enabled early warning systems for mental health. NLP-based models can detect signs of depression, anxiety, and suicidal ideation by analyzing language patterns in social media or chat messages [14], [15]. Some models map user inputs directly to DSM diagnostic codes or flag psychological red flags in real-time [16].

Empathy modeling has also seen significant advances [17], [18]. Techniques like sentiment alignment, affective response templates, and validation strategies (e.g., "It's okay to feel that way") are increasingly embedded into AI conversations to simulate emotional intelligence.

Despite these advancements, a gap remains: most chatbots function in isolation from clinical workflows. Few systems facilitate smooth transitions from AI support to human counselors. **Neuro AI** seeks to address this by combining real-time empathetic interaction with a structured counselor referral system based on conversation summaries [19], [20].

III. System Architecture

Neuro AI is implemented as a modular, multi-agent system where distinct components collaborate to provide real-time emotional support and seamless escalation to human counselors. The architecture emphasizes low-latency interactions, contextual coherence, and safe handling of sensitive data.

Figure 1 presents the overall system architecture.

- **Frontend Interface:** Users interact via a web or mobile chat interface that communicates with the backend through RESTful APIs built using **FastAPI**. The interface is designed for responsive, asynchronous message handling.
- **Dialogue Agent (LLaMA3):** The primary conversational flow is handled by a local deployment of **Meta's LLaMA3** model. It is orchestrated using **LangChain**, which manages prompt templates, session memory, and dynamic emotional context injection.
- **Emotion Detection Module:** This module processes each user message using a hybrid strategy:
  1) A lexicon-based classifier scans for psychological keywords indicating stress, anxiety, sadness, or depression.
  2) When ambiguity exists or deeper inference is required, the system routes the message to the LLaMA3 [21] model acting in classification mode.
- **Semantic Memory (Vector Database):** A MongoDB instance stores all chat data, emotion labels, and sentence embeddings. Vector search enables semantic retrieval of similar past statements, helping maintain contextual continuity.
- **Summarization Agent (Gemini 1.5):** Once a conversation ends or distress signals are detected, the system invokes **Google's Gemini 1.5** [22] model. This agent receives the full conversation log and generates a structured third-person summary suitable for counselor review.
- **PDF Report Generation:** The summary is converted into a professionally formatted PDF using ReportLab. The report includes emotional tags, session highlights, user concerns, and recommended follow-up actions.
- **Counselor Escalation System:** Upon user consent or automatic detection of critical emotional states, the PDF report is securely emailed to a registered human counselor. The system marks the session as escalated in the database and optionally notifies the user.

The collaboration between LLaMA3 (dialogue) and Gemini 1.5 (summarization) exemplifies a multi-agent architecture. This separation of roles enhances system interpretability, performance, and maintainability—ensuring that user interaction is natural while backend processing remains robust.

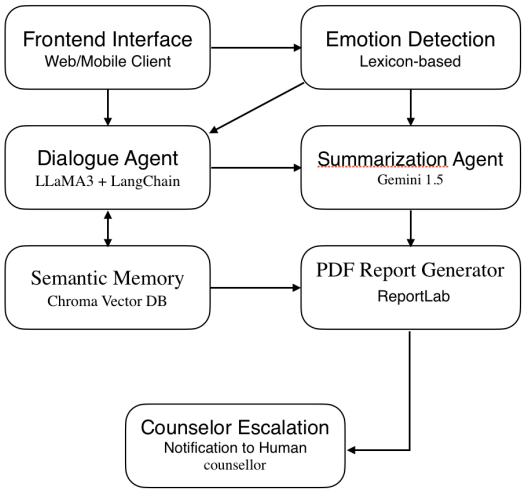

Fig. 1. Multi-agent system architecture of Neuro AI

IV. Emotion Detection and Psychological Approach

A core objective of Neuro AI is not just to respond, but to truly *understand* the emotional state of users and tailor its replies accordingly. The system targets four key emotions relevant to mental health: **stress**, **anxiety**, **depression**, and

sadness. These are detected using a dual-layered strategy combining rule-based methods and LLM-based inference.

A. Keyword-based Lexicon Classifier

A curated lexicon is developed for each emotion category based on psychological literature. For instance:

- **Stress:** "overwhelmed", "too much to handle", "pressure"
- **Anxiety:** "nervous", "worried", "panic attacks", "scared"
- **Sadness:** "lonely", "crying", "feeling down"
- **Depression:** "worthless", "hopeless", "nothing matters", "no motivation"

Each incoming message is preprocessed (lowercasing, stopword removal) and matched against the lexicon. The presence of strong or multiple terms increments emotion scores. If the score for any category crosses a threshold, that emotion is tagged for the message.

B. LLM-based Emotion Inference

In ambiguous or nuanced messages, the system uses the LLaMA3 model as a secondary emotion inference agent. A hidden prompt is appended like:

> "Analyze the user's emotional tone. Does it convey stress, anxiety, depression, sadness, or other feelings?"

The model's classification output is parsed and used when the keyword method is insufficient or conflicting. This ensures deeper understanding, particularly in metaphorical or subtle expressions (e.g., "I feel empty even when things are good" is often interpreted as depressive).

C. Empathy through Prompt Engineering

Once emotions are detected, LangChain [23] modifies the system prompt with an emotional context. For example:

> "The user is feeling anxious; respond with calm reassurance and validate their fear without dismissing it."

This primes LLaMA3 to generate responses that:

- Start with empathetic reflection (e.g., "I'm really sorry you're going through this.")
- Include normalizing language (e.g., "It's completely okay to feel overwhelmed sometimes.")
- Encourage further expression with open-ended questions (e.g., "Would you like to talk about what's worrying you the most?")

D. Emotion-specific Support Strategies

Depending on the detected emotion(s), the bot adapts its tone and strategies:

- **Anxiety:** Suggests grounding techniques (e.g., breathing exercises), avoids catastrophizing.
- **Depression:** Emphasizes hope, small achievable steps, and the importance of reaching out.
- **Stress:** Helps users break tasks down, prioritize, and offers stress-reduction tips.
- **Sadness:** Provides emotional validation, promotes self-compassion and gentle reflection.

E. Crisis Detection and Safety Protocol

When critical distress is detected (e.g., suicidal ideation), the system:

1) Immediately sends a pre-configured safety message advising the user to seek help from emergency services or crisis hotlines.
2) Skips normal response flow and flags the session for urgent counselor escalation.
3) If consent is available, the session is summarized and emailed immediately to a counselor with an "URGENT" tag.

This blend of psychological design, adaptive AI behavior, and ethical safeguards ensures that Neuro AI not only simulates empathy but supports users in a clinically informed and responsible manner.

V. Report Generation and Counselor Connection

One of Neuro AI's most significant contributions is its ability to generate structured mental health session summaries and seamlessly forward them to human counselors. This mechanism ensures that users who need professional help are connected, and that counselors receive meaningful context prior to intervention.

A. Triggering the Summarization Pipeline

The report generation module is activated when:

- The user explicitly requests to connect with a counselor.
- The emotion detection module flags high distress (e.g., repeated mentions of hopelessness or suicidal ideation).
- A conversation naturally concludes and the user consents to a report.

B. Conversation Summarization via Gemini 1.5

The complete session (including emotional annotations) is passed to **Google's Gemini 1.5**, a powerful LLM capable of handling long-context input (up to 1 million tokens). The prompt instructs Gemini to generate a third-person clinical-style summary highlighting:

- The user's background and presenting concerns
- Detected emotional trajectory and tone shifts
- Strategies discussed and user responses
- Any safety concerns or escalation indicators

The prompt is fine-tuned to produce concise, factual summaries suitable for clinical review, avoiding irrelevant chatbot dialogue.

C. PDF Report Formatting

The output summary is formatted into a professional PDF using Python's ReportLab library. The report includes:

- **Session Metadata:** Session ID, date/time, user ID (anonymous or pseudonym), consent flag
- **Emotion Profile:** Detected emotion tags with intensity and timestamps
- **Summary:** Structured narrative of the conversation's flow and emotional journey

- **Recommendations Given:** Coping techniques, resource links, or support strategies suggested
- **Follow-up Action:** Whether escalation is needed, and counselor contact status

D. Counselor Handoff and Escalation Workflow

If the session is marked for referral:

1) The PDF report is securely emailed (via SMTP with TLS) to the designated counselor or mental health service.
2) The database logs the escalation with timestamps and counselor ID.
3) Optionally, the user is informed that a counselor will reach out.

Counselors reviewing the reports found them helpful in preparing for first-time sessions, reducing intake time and allowing faster rapport building.

E. Ethical Safeguards

To ensure ethical operation:

- No identifiable user data is shared without explicit consent.
- Reports can be reviewed or deleted by users on request.
- Escalations are only triggered when clear signs of risk or user consent are present.

This report generation module positions Neuro AI as more than a chatbot—it acts as a bridge between self-help and professional mental health care, automating the "first mile" of triage with empathy and responsibility.

VI. Experimental Analysis and Observations

We conducted a preliminary evaluation of Neuro AI through a controlled pilot deployment with university students (N=15, ages 18–24) over two weeks. Each participant engaged in one or more conversations with the chatbot, discussing emotional or academic challenges they were comfortable sharing.

A. Usage Statistics

- **Total sessions:** 27
- **Average session length:** 18.4 minutes
- **Average user messages per session:** 22

Discussion topics included:

- Exam anxiety and academic stress (40%)
- Relationship and social issues (20%)
- Loneliness or homesickness (15%)
- Depressive thoughts and general hopelessness (25%)

The emotion detection module labeled messages with:

- **Anxiety:** 63%
- **Stress:** 48%
- **Sadness:** 34%
- **Depression:** 22%

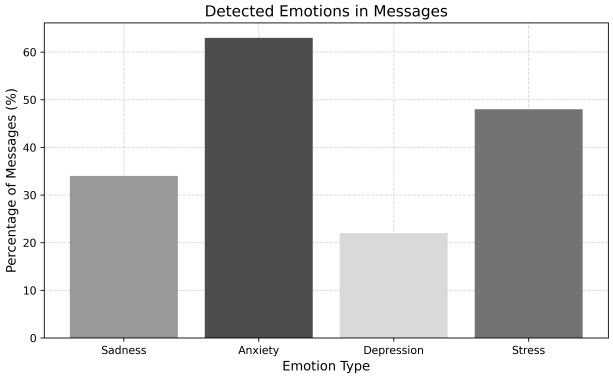

Fig. 2. Distribution of emotions detected across all sessions

About one-third of the sessions (9 out of 27) resulted in a report being forwarded to a human counselor. In all such cases, the users explicitly opted in for escalation.

B. User Feedback

Feedback was collected via post-session Likert-scale surveys:

- "The chatbot seemed to understand what I was feeling" – **4.2/5**
- "I felt better after chatting with the bot" – **3.9/5**

Qualitative feedback included:

> *"It felt surprisingly comforting. The responses felt human and non-judgmental."*

Another user shared:

> *"Knowing a counselor could read my summary made me trust the bot more."*

C. Emotion Detection Accuracy

To test classification reliability, 100 user utterances were labeled independently by psychology graduate students. The emotion detection module achieved:

- **Accuracy:** 91%
- **Confusion areas:** Mild sadness vs. clinical depression

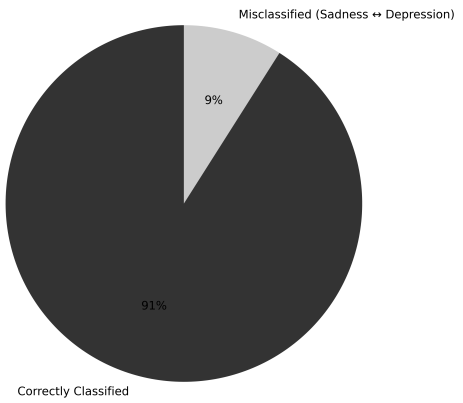

Fig. 3. Emotion detection accuracy showing correct classification vs. confusion cases

D. System Performance

- Average response latency: 4 seconds (GPU-enabled LLaMA3)
- Gemini 1.5 summarization latency: 5 seconds
- No major downtime observed

Typing indicators were used to mask occasional lag. Emotion detection and LLM response were processed in sequence, but parallelization is planned to reduce future delay.

E. Example Session Outcome

In one session, a student shared: "I'm really stressed and anxious. I can't sleep thinking about grades." The bot reflected: "It sounds like a lot is weighing on you right now. Academic pressure can feel overwhelming. Would you like to talk about what's worrying you the most?"

Later, the bot guided a breathing exercise and helped reframe fears. The user ended with: "Thanks, I feel a bit calmer." A session summary was emailed to the campus counselor, WHO [24] later said it helped initiate the first real therapy session with clear background.

This illustrates how Neuro AI supports users both emotionally and operationally by bridging the gap to human help.

VII. Conclusion and Future Work

In this paper, we presented **Neuro AI**, an emotionally intelligent mental health chatbot that combines advanced AI technologies with core psychological principles to support users experiencing stress, anxiety, sadness, or depression. Through a modular, multi-agent architecture powered by LLaMA3 and Gemini 1.5, the system not only engages users in empathic dialogue but also detects emotional states and facilitates referrals to human counselors via structured session summaries.

Our pilot deployment demonstrated encouraging results. Users found the chatbot empathetic and helpful, emotion detection achieved high alignment with human judgment, and the report generation feature was well-received by both users and mental health professionals. These findings suggest that emotionally-aware chatbots like Neuro AI can act as a valuable first line of support—especially in environments where professional help is scarce or delayed.

A. Future Work

While promising, several areas remain for further development:

- **Long-Term Impact:** Future studies will examine the sustained effect of chatbot interactions on users' mental health over weeks or months.
- **Personalization and Demographic Adaptability:** The system can be enhanced by tailoring language and recommendations to user profiles and expanding to diverse populations.
- **Multimodal Emotion Recognition:** Incorporating voice tone, typing speed, or facial expressions in future versions could improve emotional inference.
- **Structured Therapy Modules:** We aim to embed guided journaling, CBT [25] exercises, and mindfulness-based interventions within the chat flow.
- **Healthcare Integration:** Collaborations with clinics and universities could formalize Neuro AI as a pre-therapy intake tool, improving mental health workflow efficiency.
- **Ethical Enhancements:** Features such as transparent emotion feedback, user-editable chat logs, and real-time counselor supervision will be explored to ensure ethical AI deployment.

Neuro AI demonstrates the potential for AI-driven systems to alleviate mental health care gaps and empower individuals with safe, compassionate support at scale. As technology evolves, emotionally aware AI companions may become a foundational layer in the future of mental wellness.

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