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GEN AI PROJECT PHASE 1 SUBMISSION DOCUMENT

Phase 1: Proposal & Idea Submission

1. Project Title:

Mental Wellness Buddy Chatbot using Generative AI, Transformers Model and Retrieval-Augmented Generation (RAG)

2. Domain:

Generative AI | NLP | Mental Health | Chatbot | RAG Architecture | Transformers Model

3. Problem Statement:

Understanding and generating coherent text is a critical challenge in NLP. The ability to predict the next sentence based on context is fundamental to building intelligent applications such as chatbots, content generators, and summarizers. The project aims to build a Gen AI-based system that can predict or suggest the most appropriate next sentence for a given input.

According to the World Health Organization, one in four people will experience a mental health issue at some point in their lives. Yet, many face significant obstacles:

- **Stigma:** Over 70% of individuals with anxiety or depression report reluctance to seek help due to fear of judgment.
- **Resource Scarcity:** India has fewer than 0.3 psychiatrists per 100,000 people, highlighting a stark gap in mental health services.
- **Cost & Accessibility:** Professional therapy in India may cost 1,000–3,000 per session, often with wait times of several days.

These challenges underscore the need for an always-available, complementary tool that can guide users through initial self-assessment, coping strategies, and signpost professional resources when necessary.

Mental health support is a growing need in today's fast-paced and often isolating environment. Many individuals struggle with stress, anxiety, depression, and related issues, yet access to personalized mental health assistance remains limited. Purely generative chatbots risk hallucinating or offering generic advice. The challenge lies in creating a system that can offer empathetic, evidence-based guidance while maintaining contextual understanding. We need a system that

- (a) understands user sentiment empathetically,
- (b) retrieves factual, relevant coping strategies from trusted sources, and
- (c) weaves these into context-aware, compassionate guidance.

This project proposes the development of a RAG-based Generative AI chatbot that acts as a mental wellness companion, offering context-aware, factually correct tips to overcome that problem and emotionally supportive responses.

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4. Proposed Solution:

The proposed solution involves the design and implementation of a **Mental Wellness Buddy Chatbot**, which leverages a **Retrieval-Augmented Generation (RAG)** pipeline combined with **Large Language Models (LLMs)** to provide responses grounded in reliable mental health information.

The system works as follows:

Mental Wellness Buddy Chatbot powered by a **RAG pipeline + LLM**, with these steps:

1. User Query Input

- Captures free-form user concerns.

2. Vector-DB Semantic Search

- Embeds a curated corpus of mental-health articles by topic (Anxiety, Depression, Nutrition, Stress).
- Retrieves the **top 5 chunks** most semantically aligned with the user's text.

3. Contextual Prompting

- Feeds retrieved chunks + user query into a carefully engineered prompt that enforces:
 1. Empathy acknowledgment
 2. Practical, evidence-based suggestions
 3. Encouragement and next-step guidance

4. LLM Response Generation

- Uses a high-capacity model (llama-3.3-70b-versatile via Groq API) at temperature 0 for consistency.

5. Streamlit Web Interface

- Displays a chat UI that streams responses word-by-word for conversational feel.

5. Objectives:

- To build a fully functional mental wellness chatbot that integrates RAG and LLM technologies.

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- To curate and preprocess high-quality web content for anxiety, depression, nutrition, and stress topics.

- To create a semantic vector database for efficient and relevant information retrieval.

- To ensure empathetic, evidence-based, and safe response generation through prompt engineering.

- To develop and deploy a user-friendly web interface for real-time interaction.

6. Expected Outcome:

- A deployed **chatbot web application** capable of responding to mental health queries with contextual and supportive responses.

- An **LLM-powered backend** integrated with a **vector database** for retrieving relevant mental health insights.

- Structured response generation that includes empathy, guidance, and encouragement tailored to the user's emotional state.

- Optional extension to allow category-specific responses and mood-based suggestions.

7. Tools & Technologies to be Used:

- **Python** (Primary language)

- **Streamlit** (Web interface)

- **HuggingFace Transformers** and **Sentence-Transformers** for embeddings

- **BeautifulSoup** for HTML content extraction

- **LangChain**, **ChromaDB** for RAG pipeline and vector storage

- **LLM:** llama-3.3-70b-versatile via **Groq API**

- **Jupyter Notebook (Local Machine)** for experimentation

- **GitHub** and **Streamlit Cloud** for hosting and deployment

8. References:

- HuggingFace Transformers & Sentence-Transformers documentations

- LangChain RAG tutorials

- Streamlit chat components guide

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- Cognitive Behavioral Therapy (CBT) best practices

- Articles of MedicalNewsToday and Healthline

- Open-source RAG chatbot examples on GitHub

[https://github.com/Chando0185/Multiverse of 100-](https://github.com/Chando0185/Multiverse_of_100-)

[data science project series/tree/main/Mental%20Health%20Chatbot](https://github.com/Chando0185/Multiverse_of_100-data_science_project_series/tree/main/Mental%20Health%20Chatbot)