## ****GEN AI PROJECT PHASE 3 SUBMISSION DOCUMENT****

### ****Phase 3: Final Report and Submission****

### ****1. Project Title:****

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

### ****2. Summary of Work Done****

#### ****Phase 1 – Proposal and Idea Submission :****

We proposed the idea of building an intelligent **Mental Wellness Chatbot** that provides empathetic and evidence-based responses to mental health-related queries. This solution leverages **Retrieval-Augmented Generation (RAG)** and **Large Language Models (LLMs)**.

**Objectives:**

* Collect and process real-world mental wellness content (anxiety, stress, etc.)
* Use sentence-transformer embeddings and semantic search to retrieve relevant context
* Generate emotionally intelligent responses using a pre-trained LLM (LLaMA-3 via Groq)
* Design a simple, accessible web interface using Streamlit

#### ****Phase 2 – Execution and Demonstration :****

In Phase 2, the core system was implemented and connected end-to-end. Major tasks included:

* **Scraping Web Articles:** Relevant mental health content was scraped using requests and saved under topic-wise folders.
* **HTML to Text Extraction:** Extracted clean paragraphs and headers using BeautifulSoup.
* **Embedding and Vector Store:** Chunks were embedded using all-MiniLM-L6-v2 and stored in **ChromaDB**.
* **RAG-Based Retrieval and LLM Generation:** Retrieved the top 5 semantically matched text chunks per query and used them as context in a prompt to generate responses using **llama-3.3-70b-versatile** via **Groq API**.
* **Web Interface:** Built a user-friendly Streamlit chat UI to interact with the bot in real-time.

Sample outputs and the complete code were documented and submitted.

### ****3. GitHub Repository Link****

You can access the complete codebase, README instructions, and any related resources at the following GitHub link:

🔗 <https://github.com/anibjee/IBM-Adroit-Project-Mental-Wellness-Chatbot>

### ****4. Testing Phase****

#### ****4.1 Testing Strategy****

The chatbot system was evaluated across multiple fronts:

* **Content Retrieval Accuracy:** Ensured that the correct topic-wise documents are selected for each query.
* **Response Quality:** Assessed empathy, usefulness, and structure of chatbot replies.
* **Interface Usability:** Validated the user experience for smoothness and accessibility.

#### ****4.2 Types of Testing Conducted****

1. **Unit Testing**
   * Each function and module (like the sentence generation function, UI components, and API) was tested independently to ensure they work correctly.
2. **Integration Testing**
   * The integration of the GPT-2 model with the Streamlit interface was tested to ensure smooth interaction between the model and the web interface.
3. **User Testing**
   * A group of test users interacted with the system to assess its ease of use, interface design, and output relevance. Feedback was collected and used for improvements.
4. **Performance Testing**
   * The system was tested with various input sentence lengths to observe any potential delays or slow responses in generating predictions.

#### ****4.3 Results****

 **Empathy & Relevance:** Responses demonstrated compassion and context awareness, following a structured format (empathy → suggestions → encouragement).

 **Accuracy:** The top 5 retrieved chunks were consistently relevant to user queries.

 **Response Time:** The system generated results within 3–6 seconds, depending on LLM and network latency.

 **Edge Case Handling:** The system gracefully handled abstract, vague, or incomplete queries by falling back on general CBT and wellness practices.

### ****5. Future Work****

While the project successfully implements the **Mental Wellness Chatbot**, there are several avenues for future enhancement:

**Model Fine-tuning**

* Fine-tuning the llama model on a more accurate domain-specific corpus (e.g., news articles, technical documentation) to generate more accurate and context-aware sentences for specific use cases.

**Feedback Loop**

* Let users rate chatbot responses. Ratings can be used for continual improvement.

**Daily Journaling & Mood Tracker**

* Add features that let users track their mental state over time.

**Personalization**

* Incorporate user profiles to provide personalized advice based on previous interactions.

**Multi-language Support**

* Enable multilingual retrieval and generation for broader accessibility.

**Voice Assistant Integration**

* Integrate with voice interfaces for auditory interaction.

### ****6. Conclusion****

The **Mental Wellness Buddy Chatbot** is a successful demonstration of how **Generative AI**, **RAG architecture**, and **empathetic NLP prompting** can be combined to deliver real-world mental health support. The system is modular, scalable, and showcases modern AI’s ability to assist in sensitive human-centric applications like mental health guidance.