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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.

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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.

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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

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- 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.