**MentAura Project Documentation**

**1. Title Page**

* **Project Title**: MentAura - AI-Powered Chatbot for Mental Health and Emotional Support
* **Team Name**: [Strange Sliders]
* **Author(s)**: [Mohamed Hafid, Sanjay, Daniel Felix]
* **Version**: 1.0

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**3. Introduction**

**Overview**  
MentAura is an AI-powered chatbot assistant designed to offer mental health and emotional support to students. The chatbot uses cutting-edge natural language understanding (NLU) and empathy models to engage in meaningful conversations, helping students deal with stress, anxiety, and emotional difficulties.

**Objective**  
The primary goal of MentAura is to provide personalized mental health support by leveraging AI models built on Google’s Vertex AI and integrating natural language understanding capabilities from the Gemini API.

**Scope**  
The project aims to focus on real-time, empathetic responses to mental health queries, using AI to enhance the well-being of students through scalable and accessible mental health solutions.

**4. Project Description**

**Use Case**  
MentAura targets students facing mental health challenges by offering a platform to talk through their emotional issues. It acts as a support system for students who may not have immediate access to professional mental health resources.

**Features**

* AI-powered conversational chatbot
* Emotional and mental health support based on NLU
* Empathy-driven response generation
* Anonymous and confidential user interactions
* Continuous learning for improved responses over time

**Target Audience**  
The primary users of MentAura are students between the ages of 16 and 25, who require emotional or mental health support in a non-judgmental, AI-powered environment.

**5. System Requirements**

**Hardware Requirements**

* Basic computer or server to run the chatbot.
* Optional: Cloud infrastructure for scalability (Google Cloud Platform).

**Software Requirements**

* **Google Cloud Platform** (GCP): For hosting the chatbot and Vertex AI Agent.
* **Vertex AI**: To build, deploy, and manage machine learning models.
* **Gemini API**: For natural language understanding and empathetic responses.
* **Python**: Backend programming language.
* **Flask or Django**: Web framework for chatbot API integration.
* **Frontend Framework**: HTML, CSS, JavaScript (React or Angular for web deployment).

**Dependencies**

* Google Cloud SDK
* Python Libraries: tensorflow, transformers, scikit-learn, flask, google-cloud-ai-platform

**6. Architecture**

**System Architecture Overview**

* **Frontend**: Interface for users to interact with the chatbot.
* **Backend**: Google Cloud services handling AI model inference, integrated with Vertex AI.
* **Model Training**: Models are built and trained on Google’s Vertex AI, fine-tuned for mental health dialogue using conversational datasets.
* **Gemini API Integration**: The Gemini API is responsible for handling natural language understanding, sentiment analysis, and empathetic response generation.
* **Database**: Optional for storing anonymized conversation logs for continuous improvement.

**Architecture Diagram** ![Architecture Diagram Placeholder] (You can add a diagram later.)

**7. Implementation**

**Setup Instructions**

* **Google Cloud Setup**: Set up a Vertex AI project on GCP and configure necessary APIs.
* **Gemini API Integration**: Use the Gemini API for sentiment analysis and NLU.
* **Frontend**: Develop a basic web interface using React or HTML/JS for users to interact with the chatbot.
* **Backend**: Implement a Flask or Django API for chatbot interaction, connected to Vertex AI models.

**Installation Guide**

* Set up the Python environment: pip install -r requirements.txt
* Configure Google Cloud credentials.
* Set up Vertex AI agent for model deployment.

**8. Functionality**

**Features Overview**

* Students can chat with MentAura about emotional struggles.
* The chatbot responds with empathetic and thoughtful advice, powered by AI.
* A real-time feedback loop improves the quality of the chatbot’s responses over time.

**User Guide**

* Access the chatbot through a web interface.
* Engage in a conversation about any mental health issue.
* Receive thoughtful, AI-generated advice and emotional support.

**Screenshots** Add screenshots of the chatbot interface for illustration.

**9. Testing**

**Testing Strategy**

* **Unit Testing**: For individual components (API endpoints, sentiment analysis).
* **Integration Testing**: To ensure smooth interaction between the frontend, backend, and AI models.
* **User Testing**: Conduct trials with a group of students to get feedback on response quality.

**Test Cases**

* Test for accurate sentiment analysis.
* Test chatbot responses based on various emotional inputs.
* Test system scalability with multiple users.

**Results**  
Present test outcomes, accuracy of sentiment detection, and feedback from user tests.

**10. Challenges and Limitations**

**Challenges**

* Handling complex emotional queries in a way that is empathetic and helpful.
* Ensuring real-time response while maintaining a high level of understanding.
* Maintaining user privacy and ensuring anonymity.

**Limitations**

* AI responses are still limited to predefined training data.
* The chatbot is not a substitute for professional mental health care.
* Real-time data analysis may be resource-intensive.

**11. Future Improvements**

* Integration of real-time counseling by licensed therapists through the platform.
* Expanding to support multiple languages for broader accessibility.
* Continuous improvement through more diverse training data and user feedback loops.

**12. Conclusion**

MentAura provides a meaningful solution for students needing mental health support, using AI to deliver empathetic, real-time responses. With the power of Vertex AI and the Gemini API, MentAura is scalable, impactful, and designed to promote mental wellness in an accessible manner.

**13. References**

* Gemini API Documentation
* Google Vertex AI Documentation
* Research papers on AI in mental health
* Python and TensorFlow Libraries

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