

## **Problem Statement: Space Exploration Chatbot (with LangSmith)**

Build a Space Exploration Chatbot using LangChain and a Retrieval-Augmented Generation (RAG) pipeline to answer questions about space missions and astronomy from a PDF knowledge base.

### **Requirements**

- **PDF Ingestion:**
  - Load space\_exploration.pdf using PyPDFLoader.
  - Split using CharacterTextSplitter (chunk\_size=120, chunk\_overlap=15).
- **Vector Store (choose one):**
  - Chroma or FAISS with OllamaEmbeddings (granite-embedding:latest).
  - Store under collection/index: space\_missions.
- **LLM Integration (choose one):**
  - HuggingFaceEndpoint (e.g., Menlo/Jan-nano-128k) or
  - Local Ollama model (e.g., llama3, mistral).
- **Chat Logic:**
  - Use RetrievalQA with a custom prompt template.
  - Track conversation with InMemoryChatMessageHistory.
- **LangSmith:**
  - Enable tracing with LangSmith.
  - Use environment variables for API key and project name.
- **UI:**
  - Gradio interface with:
    - Text input and response area.
    - Submit and Clear History buttons.
    - Greeting: "Hello, I am SpaceBot, your guide to space exploration. Ask me about missions or astronomy!"
- **Deliverable:**

- Submit a single `space_chatbot.py` that:
  - Loads and splits the PDF.
  - Initializes Chroma or FAISS.
  - Connects to Ollama or Hugging Face model.
  - Implements LangSmith tracing.
  - Runs Gradio UI with history support.