PDF-based Q and A BOT

## Objective

The goal of this task was to build an AI-powered PDF question-answering system. The system should be capable of:  
- Reading content from a PDF document  
- Processing natural language questions from users  
- Returning context-aware answers using an LLM (Large Language Model)  
The solution must be lightweight, open-source, and interactive.

## Technologies Used

|  |  |
| --- | --- |
| Tool/Library | Purpose |
| LlamaIndex | PDF parsing, document chunking, retrieval |
| SentenceTransformers | Embedding model (all-MiniLM-L6-v2) |
| Transformers (FLAN‑T5) | Lightweight open-source LLM |
| Gradio | User interface for chatbot interactions |
| Google Colab | Development environment |
| Python | Backend and processing |

## Approach

The system is built using the following pipeline:  
  
1. PDF Upload  
2. PDF Processing  
3. Semantic Embedding  
4. User Question Input  
5. Chunk Retrieval  
6. LLM Answering  
7. Interactive Output

## Sample Q&A Output

|  |  |
| --- | --- |
| Question | Answer |
| What is this course about? | The course discusses Artificial Intelligence and related domains. |
| Is this course suitable for beginners? | Yes, the document mentions it is beginner-friendly. |
| What is the project deadline? | The deadline for submission is August 5, 2025. |

## Interface Screenshots

Screenshots are included in the screenshots/ folder of the GitHub repository.

## Project Structure

PDF\_QA\_Bot/  
├── LLM\_QandA.ipynb  
├── README.md  
├── report.pdf  
├── requirements.txt  
├── pdf\_samples/sample.pdf  
└── screenshots/

## Optional Features Explored

- Hugging Face model token support  
- Local-only LLM (FLAN‑T5)  
- PDF change option via the Gradio interface  
- File visibility in chatbot UI

## Challenges Faced

- OpenAI rate limits were encountered; hence a switch to HuggingFace FLAN‑T5  
- Integration with Gradio while preserving index states  
- Ensuring embeddings matched with chunked PDF content for relevant answers

## Result

- Fully working PDF Q&A system  
- Uses open-source LLMs only  
- Interactive UI for PDF upload + chatbot  
- Successfully completes Task 1 criteria

## Repository & Demo

- GitHub: [Santhiyagithub/llm-pdf-qa: LLM-based PDF Q&A chatbot using Gradio and FLAN-T5](https://github.com/Santhiyagithub/llm-pdf-qa)  
- Gradio Public Link: since it is a sample Gradio it will be openly accessed for a week

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## Final Note

This task demonstrates my ability to integrate NLP, semantic search, and interactive UI components into a deployable AI solution. I look forward to contributing further in the internship program at eMedlogix.