SOMAIYA VIDYAVIHAR UNIVERSITY

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Batch: A-4	**Roll No.:** 16010122151
Experiment No 1	
Group No: 5	

Title: Introduction of Mini Project

Objective: Compose Chapter No.1 of Mini Project Report

Expected Outcome of Experiment:

	At the end of successful completion of the course the student will be able to
CO1	Define the problem statement and scope of problem
CO2	Identify various hardware and software requirements for problem solution
CO5	Prepare a technical report based on the Mini project.

Books/ Journals/ Websites referred:

1.
2.
3.

This write will expect students to prepare chapter no 1 in the format given below

Chapter 1

Introduction

This chapter presents a brief idea about basics of Sentiments and Opinions. It deals with the purpose of taking up the project with certain motivation, scope and objectives to fulfill it.

1.1 Introduction

The rapid digitalization of documents has transformed the way information is stored, accessed, and utilized. However, extracting relevant insights from large PDF documents remains a significant challenge, often requiring **manual effort and time-consuming searches**. This project, **Chat with PDF**, addresses this issue by providing an **interactive AI-powered chatbot** that allows users to query PDF content efficiently and receive meaningful insights beyond simple text retrieval.

At its core, the project leverages **Flask for backend processing, PyPDF2/pdfplumber for text extraction, and Groq's Llama 3 API**, a **Large Language Model (LLM),** to generate intelligent responses. Instead of implementing NLP techniques manually, the project harnesses the **pre-trained capabilities of the LLM**, enabling seamless **natural language understanding** and **contextual responses**.

Key Concepts and Real-World Applications

This system has **two primary functionalities**:

1. **Chat with the PDF** – Users can upload a document and ask **context-specific questions**, enabling quick and efficient information retrieval without the need for manual scanning.
2. **Intelligent Problem-Solving Assistance** – The chatbot goes beyond simple text extraction; it can **analyze the content of the PDF** and provide recommendations, solutions, and strategies.
    - For example, if a user uploads a **PDF containing problem statements from a hackathon**, the chatbot can help:

- **Understand the problem statement**
- **Suggest an appropriate problem-solving approach**
- **Recommend a suitable tech stack**
- **Provide insights on similar projects and best practices**

Relevance and Challenges in the Domain

With the increasing reliance on **digital documentation in industries such as education, law, research, and corporate sectors**, there is a growing need for tools that can provide **instant access to information**. Traditional keyword-based searches within documents often fail to understand **contextual meaning**, making retrieval inefficient. By integrating **LLM-powered AI** with **document processing**, this project overcomes these limitations and enhances **knowledge accessibility**.

Contribution to Engineering and Technology

This project aligns with advancements in **artificial intelligence, document automation, and conversational AI**. It serves as a practical application of **LLM-based interaction with structured content**, offering a real-world demonstration of how AI can **bridge the gap between unstructured text and user queries**.

By evaluating the effectiveness of **AI-driven document interactions**, this project contributes to the broader scope of engineering and technology, showcasing how LLMs can be integrated into practical solutions that **enhance productivity, streamline research, and improve accessibility** in various domains. This experiment will help assess the chatbot's ability to **not only retrieve relevant information but also provide actionable insights** for problem-solving and decision-making.

1.2 Motivation

The motivation behind this project stems from the growing reliance on **digital documents** across various domains and the **challenges associated with retrieving meaningful insights** from large PDFs. Manually searching for information within documents is often time-consuming and inefficient, making it difficult for users to

extract relevant knowledge quickly. This project aims to bridge that gap by providing an **AI-powered chatbot** that enables **interactive and intelligent document querying**.

1️⃣ Practical Significance

The project addresses a **critical inefficiency** in handling textual data within PDFs. Traditional keyword-based search methods fail to **understand context**, leading to **irrelevant or incomplete results**. By integrating **Large Language Models (LLMs)** with document processing, this project offers a **conversational approach** to querying documents, making information retrieval **more intuitive, efficient, and accurate**.

Furthermore, beyond just **retrieving text**, the chatbot can provide **insights and recommendations** based on document content. For example, if a **hackathon problem statement PDF** is uploaded, the chatbot can **suggest problem-solving strategies, relevant technologies, and potential approaches**, effectively acting as an **AI-powered assistant** for decision-making.

2️⃣ Personal and Academic Interest

This project aligns with the **growing trend of AI-powered document processing** and **intelligent chatbots**, an area that is gaining momentum in both **academia and industry**. The interest in **leveraging AI for real-world problem-solving** motivated the development of this system, combining:

- **Machine Learning-powered language models** for contextual understanding
- **Flask for web-based interactions**
- **Document processing tools** for text extraction

Additionally, the project serves as an **academic exploration of AI integration in information retrieval**, providing a learning opportunity in **LLM-based applications, API utilization, and full-stack development**.

3️⃣ Industry Relevance

With industries shifting towards **automation and AI-driven solutions**, this project aligns with **modern technological advancements** in document intelligence. Fields such as:

- **Education** – Helping students and researchers extract knowledge from textbooks, research papers, and study materials
- **Legal & Corporate Sectors** – Assisting professionals in retrieving legal clauses, corporate policies, and contracts
- **Software Development & Hackathons** – Helping developers analyze problem statements and determine optimal **problem-solving approaches and tech stacks**

This project demonstrates how **AI-powered tools can streamline workflows** and **enhance accessibility** to critical information. It showcases the potential of **LLMs in document processing**, proving its relevance in real-world applications.

1.3 Scope

✅ Inclusions (What the Project Will Cover)

1️⃣ Core Functionalities:

- **Ability to upload a PDF and interact with it through natural language queries.**
- **Text extraction from PDFs using PyPDF2/pdfplumber.**
- **Use of Groq's Llama 3 API (LLM) to provide contextual responses based on extracted text.**
- **Dual functionality:**
  - **PDF-Based Chat – Users can ask questions specifically about the content of the uploaded document.**
  - **Intelligent Query Expansion – The chatbot can suggest solutions, problem-solving approaches, and tech stacks based on PDF content.**

2️⃣ Technologies and Methodologies Used:

- **Backend: Flask (Python-based web framework)**
- **Frontend: HTML, CSS, JavaScript (for user interaction)**
- **Text Processing: PyPDF2/pdfplumber (for extracting content from PDFs)**
- **AI Model: Groq's Llama 3 API (for generating intelligent responses)**
- **Hosting: Render (for deployment and accessibility)**
- **Integration: API calls to process user queries and return AI-generated responses**

3️⃣ Target Audience:

- **Students & Researchers – To retrieve information from textbooks, research papers, and study materials.**
- **Software Developers & Hackathon Participants – To analyze problem statements and get AI-driven insights on tech stacks and problem-solving approaches.**
- **Legal & Corporate Professionals – To extract key insights from legal documents, contracts, and corporate policies.**
- **General Users – Who want to efficiently retrieve information from PDFs without manually searching through documents.**

❌ Exclusions (What the Project Will Not Cover)

1️⃣ Extended Features & Advanced AI Capabilities:

- **The chatbot will not generate content beyond the capabilities of Groq's API. It only processes the given PDF and provides relevant insights.**
- **The project does not train a custom NLP model; instead, it relies on a pre-trained LLM (Groq API).**
- **No image-based PDF processing (e.g., scanned PDFs or handwritten documents). It will only handle text-based PDFs.**

2️⃣ Unrelated Functionalities & Integrations:

- **The project does not support real-time document collaboration, editing, or annotation.**
- **No speech-to-text integration for voice-based queries.**
- **No integration with third-party storage systems like Google Drive or Dropbox.**

⚠ Constraints & Limitations

- **File Size Limit: PDFs must be under 200MB. Larger files will not be processed.**
- **PDF-Only Processing: The system does not support other file formats like `.docx`, `.txt`, `.jpeg`, `.png`, etc. It strictly processes only PDFs.**
- **Context Window Constraints: Since LLMs process a limited amount of text at once, queries beyond the model's capacity may not retrieve full document details.**
- **API Dependency: The chatbot's performance and accuracy depend on the Groq API, and response times may vary based on external API availability.**

1.4 Objectives

The **Chat with PDF** project aims to create an **AI-powered document interaction system** that allows users to query PDFs conversationally and receive **intelligent insights** beyond simple text retrieval. The project's objectives are structured into **primary, secondary, and tertiary** goals to define its scope and expected outcomes.

✅ Primary Objectives (Main Goals)

1️⃣ **Develop an AI-Driven PDF Chatbot** – Enable users to upload PDFs and interact with them through **natural language queries** to efficiently retrieve relevant information.

2️⃣ **Implement Text Extraction from PDFs** – Use **PyPDF2/pdfplumber** to extract **structured text** from uploaded PDF files, ensuring accurate data retrieval.

3️⃣ **Leverage an LLM for Intelligent Responses** – Utilize **Groq's Llama 3 API** to process user queries and generate **contextual answers based on PDF content**.

4️⃣ **Provide Dual Functionality** – Allow users to:

- **Ask document-specific questions** to retrieve relevant information.
- **Seek AI-generated insights and recommendations**, such as **problem-solving strategies and tech stack suggestions for hackathons**.

✅ Secondary Objectives (Enhancing the Primary Goals)

5️⃣ **Develop an Intuitive and Responsive Web Interface** – Ensure a **user-friendly** frontend using **HTML, CSS, and JavaScript**, making interactions smooth and accessible.

6️⃣ **Ensure Efficient File Processing** – Set a **200MB file limit** and restrict input to **only PDF formats**, ensuring smooth functionality and preventing unsupported files.

7️⃣ **Optimize AI Responses for Clarity** – Format chatbot responses into **structured answers** (e.g., **bullet points, numbered lists, or multiple paragraphs**) for better readability.

8️⃣ **Deploy the System for Public Use** – Host the application on **Render**, making it accessible to users for real-world testing and use.

9️⃣ **Implement Google OAuth Authentication** – Allow users to **sign in with Google**, ensuring secure and convenient authentication.

🔟 **Implement GitHub OAuth Authentication** – Provide an alternative **GitHub-based login option** to enhance accessibility.

1️⃣1️⃣ **Create a Database to Store Previous Chats** – Develop a system to **store user chat history**, allowing users to **review past interactions and maintain continuity** in their conversations.

✅ Tertiary Objectives (Future Expansion & Advancements)

1️⃣2️⃣ **Explore OCR Capabilities** – In the future, integrate **OCR (Optical Character Recognition)** to process **scanned PDFs and image-based documents**.

1️⃣3️⃣ **Enhance AI Personalization** – Allow the chatbot to **learn from user interactions** and refine responses based on previous queries.

1️⃣4️⃣ **Expand File Format Support** – Extend compatibility to **Word documents (`.docx`), text files (`.txt`), and markdown (`.md`)** for broader usability.

1️⃣5️⃣ **Develop Multi-PDF Querying** – Enable users to **upload multiple PDFs** and ask cross-document queries to compare and analyze information across different files.

1.5 Organization of the report

The report is organized as follows:

- Chapter 2: A brief literature survey
- Chapter 3: It describes the proposed system, workflow of the project, and modules involved in the system.
- Chapter 4: This covers the detailed implementation of the proposed model, and its technical requirements.
- Chapter 5: Conclusion and Future work.