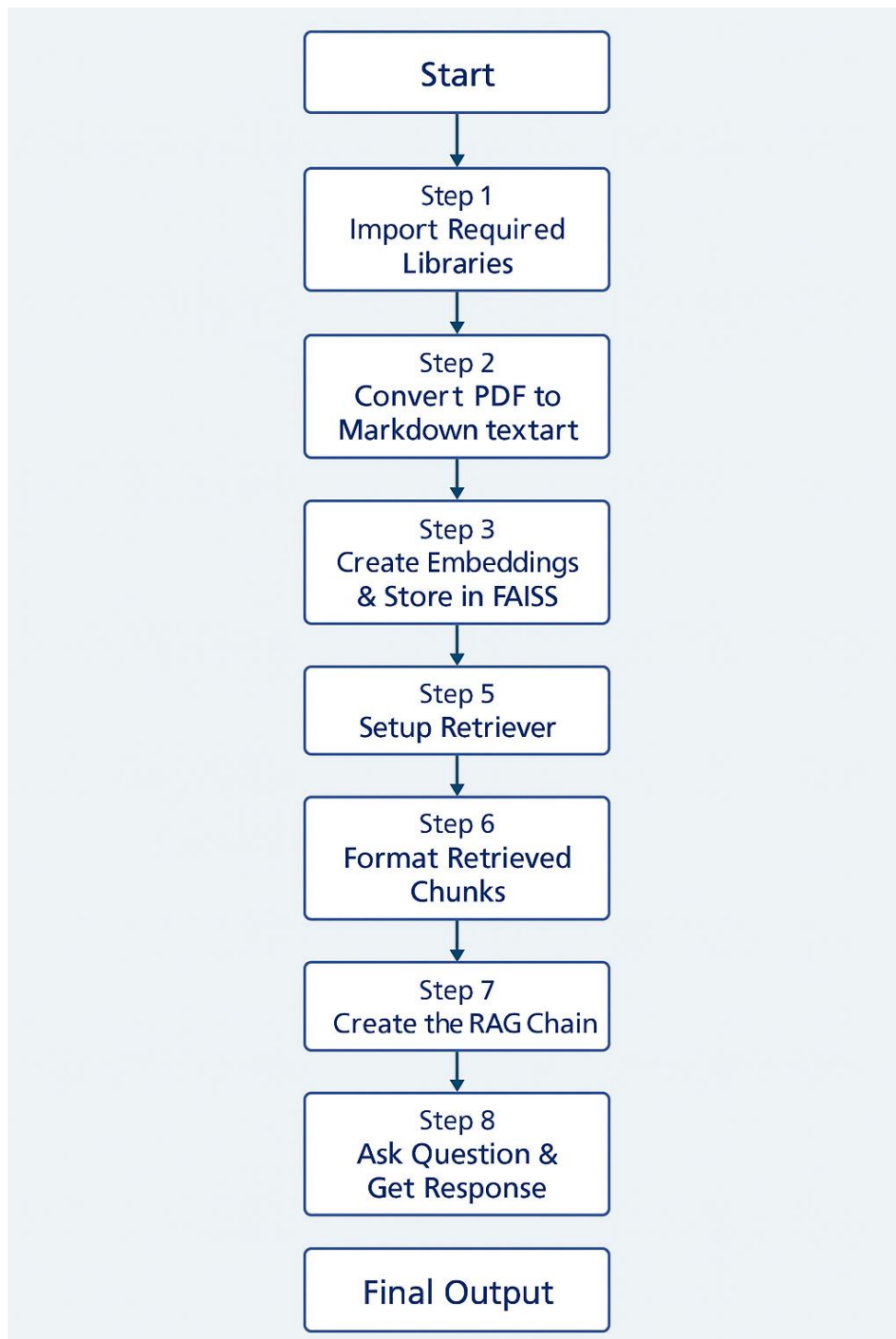


Documentation of how to implement a **Retrieval-Augmented Generation (RAG) chatbot** using **LangChain**, **FAISS**, and **Ollama** to answer questions based on the content of a PDF document.

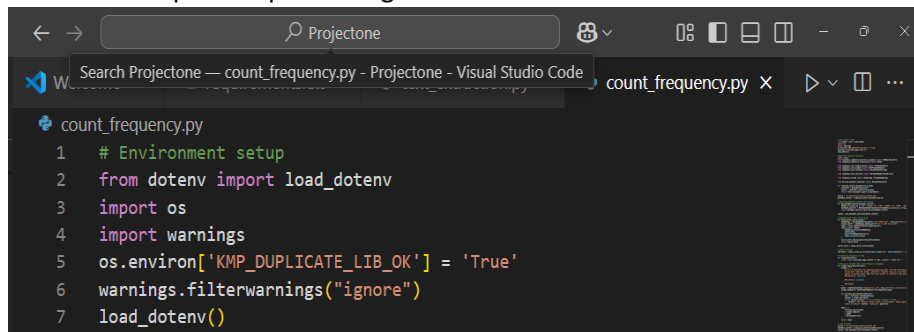
**Flowchart:**



## Code breakdown:

### 1. Environment Setup:

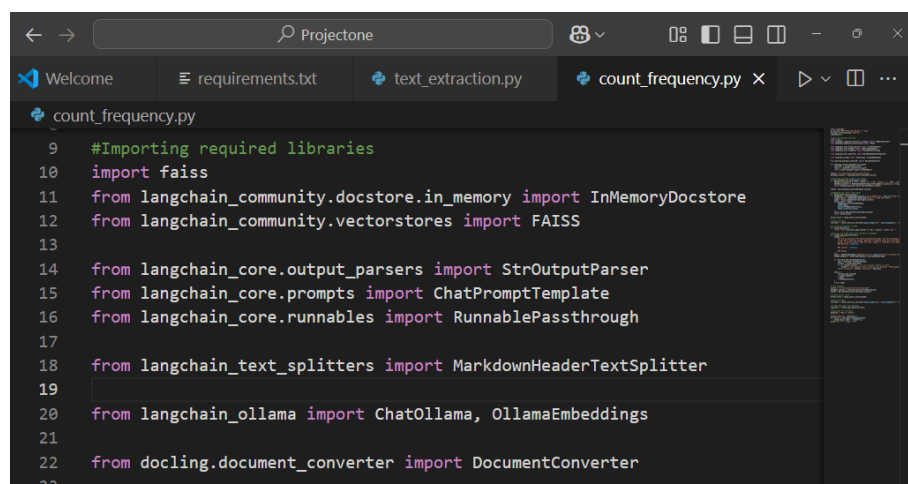
- Loads environment variables and sets an environment variable to avoid potential conflicts with parallel processing libraries.



```
count_frequency.py
1 # Environment setup
2 from dotenv import load_dotenv
3 import os
4 import warnings
5 os.environ['KMP_DUPLICATE_LIB_OK'] = 'True'
6 warnings.filterwarnings("ignore")
7 load_dotenv()
```

### 2. Importing Required Libraries:

- FAISS: Used for vector storage and retrieval
- LangChain Modules: Used for document processing, prompting, embedding running chains.
  - LangChain is an open-source framework used to develop applications that use LLMs and LLMs are deep learning models that can generate responses to the user queries.
  - Framework is like a template which eliminates the need of writing a code from scratch and helps to make the code clean, well-tested, bugs and errors free.
- Ollama: Provides LLM models for chat responses.
  - Ollama is a free, open-source tool that allows users to run large language models (LLMs) on their local machine.
- Docling: Converts PDFs into Markdown for easier text processing.



```
count_frequency.py
9 #Importing required libraries
10 import faiss
11 from langchain_community.docstore.in_memory import InMemoryDocstore
12 from langchain_community.vectorstores import FAISS
13
14 from langchain_core.output_parsers import StrOutputParser
15 from langchain_core.prompts import ChatPromptTemplate
16 from langchain_core.runnables import RunnablePassthrough
17
18 from langchain_text_splitters import MarkdownHeaderTextSplitter
19
20 from langchain_ollama import ChatOllama, OllamaEmbeddings
21
22 from docling.document_converter import DocumentConverter
23
```

### 3. Convert PDF to Markdown:

- Uses DocumentConverter to extract text from the PDF and convert it into Markdown format.
- This makes it easier to split the content into sections.

```
count_frequency.py
21 from docling.document_converter import DocumentConverter
22
23 #Convert PDF to Markdown
24 def load_and_convert_document(file_path):
25     converter = DocumentConverter()
26     result = converter.convert(file_path)
27     return result.document.export_to_markdown()
28
29 source = "E:\\Projectone\\mental_health.pdf"
30 markdown_content = load_and_convert_document(source)
31
```

### 4. Splitting Markdown into chunks:

- Splits the Markdown text based on headers (#,##,###).
  - Headers represent sections or topics within the document.
  - Splitting text based on headers keeps related information together.
- This helps in creating structured text chunks for retrieval.

```
31
32 # Splitting markdown content into chunks
33 def get_markdown_splits(markdown_content):
34     headers_to_split_on = [("#", "Header 1"), ("##", "Header 2"), ("###", "
35     markdown_splitter = MarkdownHeaderTextSplitter(headers_to_split_on, str
36     return markdown_splitter.split_text(markdown_content)
37
38 chunks = get_markdown_splits(markdown_content)
39
```

### 5. Embedding and Storing the Text in FAISS:

- Uses OllamaEmbeddings to convert text into embeddings.
- Initializes a FAISS index to store and retrieve these embeddings.
  - FAISS, developed by Facebook AI Research, is a library for fast, dense vector similarity search and grouping.
- Stores the text chunks in FAISS.

```
← → Projectone
Welcome requirements.txt text_extraction.py count_frequency.py
count_frequency.py
38 chunks = get_markdown_splits(markdown_content)
39
40 # Embedding and vector store setup
41 def setup_vector_store(chunks):
42     embeddings = OllamaEmbeddings(model='nomic-embed-text', base_url="http:
43     single_vector = embeddings.embed_query("this is some text data")
44     index = faiss.IndexFlatL2(len(single_vector))
45     vector_store = FAISS(
46         embedding_function=embeddings,
47         index=index,
48         docstore=InMemoryDocstore(),
49         index_to_docstore_id={}
50     )
51     vector_store.add_documents(documents=chunks)
52     return vector_store
53
54 vector_store = setup_vector_store(chunks)
55
```

## 6. Setting-up Retriever:

- Converts the vector store into a retriever that fetches top-k relevant chunks using the Maximal Marginal Relevance (MMR) strategy.

```
55
56 # Setup retriever
57 retriever = vector_store.as_retriever(search_type="mmr", search_kwargs={'k': 3})
58
```

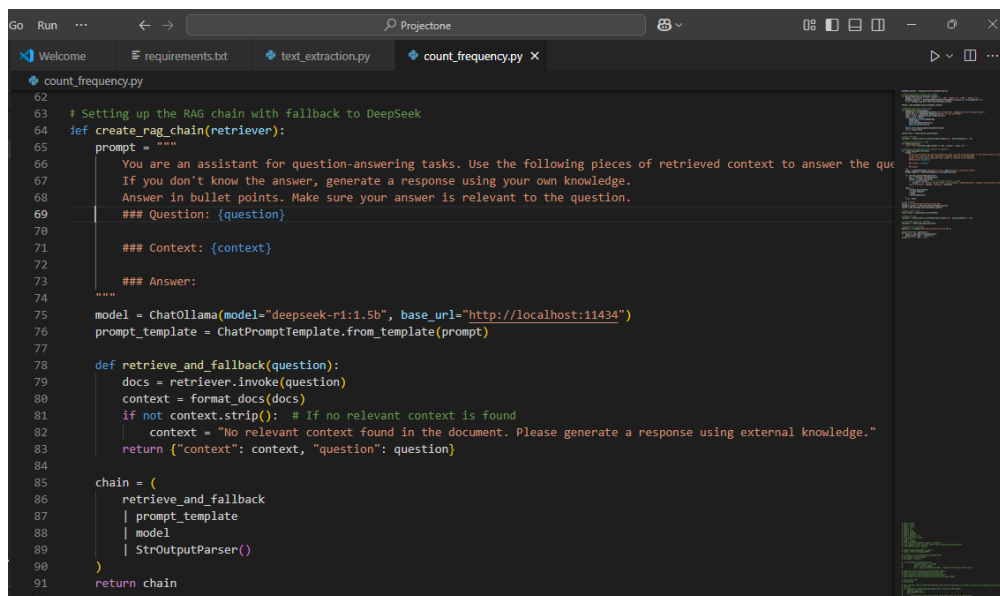
## 7. Formatting retrieved documents:

- Joins retrieved documents into a single string for passing into the LLM.

```
58
59 # Formatting documents for RAG
60 def format_docs(docs):
61     return "\n\n".join([doc.page_content for doc in docs]) if docs else ""
62
```

## 8. Creating the RAG Chain:

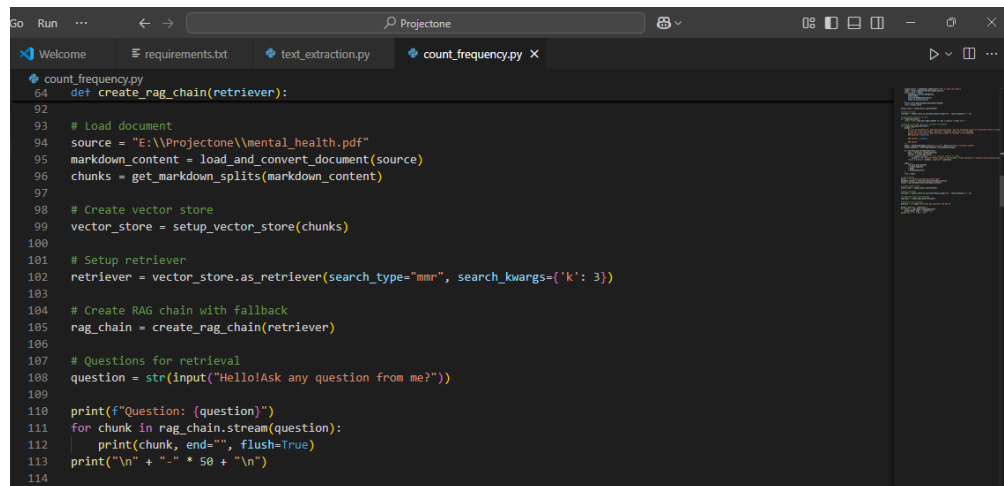
- Defines a prompt template to instruct the chatbot:
  - Only answer using the retrieved context.
  - Respond in bullet points.
  - If the answer is unknown, say so.
- Uses **ChatOllama (deepseek-r1:1.5b)** to generate responses.
- Create a RAG pipeline:
  - Retrieve context from the FAISS store.
  - Format it for the prompt.
  - Generate a response using the LLM.



```
Go Run ... < -> Projectone
Welcome requirements.txt text_extraction.py count_frequency.py X
count_frequency.py
62
63 # Setting up the RAG chain with fallback to DeepSeek
64 def create_rag_chain(retriever):
65     prompt = """
66     You are an assistant for question-answering tasks. Use the following pieces of retrieved context to answer the question.
67     If you don't know the answer, generate a response using your own knowledge.
68     Answer in bullet points. Make sure your answer is relevant to the question.
69     ### Question: {question}
70
71     ### Context: {context}
72
73     ### Answer:
74     """
75     model = ChatOllama(model="deepseek-r1:1.5b", base_url="http://localhost:11434")
76     prompt_template = ChatPromptTemplate.from_template(prompt)
77
78     def retrieve_and_fallback(question):
79         docs = retriever.invoke(question)
80         context = format_docs(docs)
81         if not context.strip(): # If no relevant context is found
82             context = "No relevant context found in the document. Please generate a response using external knowledge."
83         return {"context": context, "question": question}
84
85     chain = (
86         retrieve_and_fallback
87         | prompt_template
88         | model
89         | StrOutputParser()
90     )
91     return chain
92
```

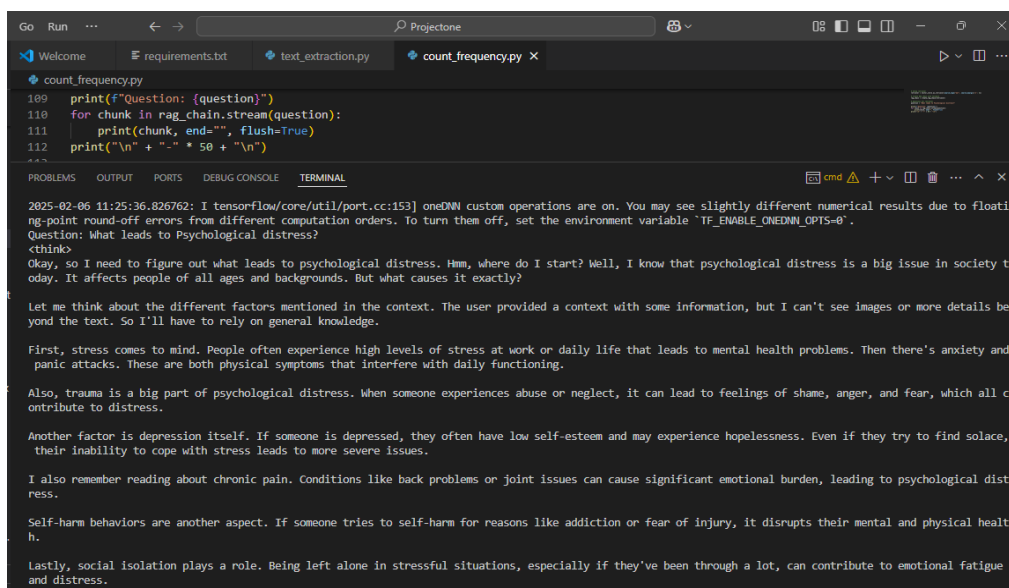
## 9. Running the RAG Chatbot:

- Reloads the document, splits it, embeds it, and sets up the RAG chain.
- Asks a question and streams the response from the chatbot.



```
count_frequency.py
64 def create_rag_chain(retriever):
92
93 # Load document
94 source = "E:\\Projectone\\mental_health.pdf"
95 markdown_content = load_and_convert_document(source)
96 chunks = get_markdown_splits(markdown_content)
97
98 # Create vector store
99 vector_store = setup_vector_store(chunks)
100
101 # Setup retriever
102 retriever = vector_store.as_retriever(search_type="mmr", search_kwargs={'k': 3})
103
104 # Create RAG chain with fallback
105 rag_chain = create_rag_chain(retriever)
106
107 # Questions for retrieval
108 question = str(input("Hello! Ask any question from me?"))
109
110 print(f"Question: {question}")
111 for chunk in rag_chain.stream(question):
112     print(chunk, end="", flush=True)
113 print("\n" + "-" * 50 + "\n")
114
```

## 10. Output:



```
count_frequency.py
109 print(f"Question: {question}")
110 for chunk in rag_chain.stream(question):
111     print(chunk, end="", flush=True)
112 print("\n" + "-" * 50 + "\n")

2025-02-06 11:25:36.026762: I tensorflow/core/util/port.cc:153] oneDNN custom operations are on. You may see slightly different numerical results due to floating-point round-off errors from different computation orders. To turn them off, set the environment variable 'TF_ENABLE_ONEDNN_OPTS=0'.
Question: What leads to Psychological distress?
<think>
Okay, so I need to figure out what leads to psychological distress. Hmm, where do I start? Well, I know that psychological distress is a big issue in society today. It affects people of all ages and backgrounds. But what causes it exactly?

Let me think about the different factors mentioned in the context. The user provided a context with some information, but I can't see images or more details beyond the text. So I'll have to rely on general knowledge.

First, stress comes to mind. People often experience high levels of stress at work or daily life that leads to mental health problems. Then there's anxiety and panic attacks. These are both physical symptoms that interfere with daily functioning.

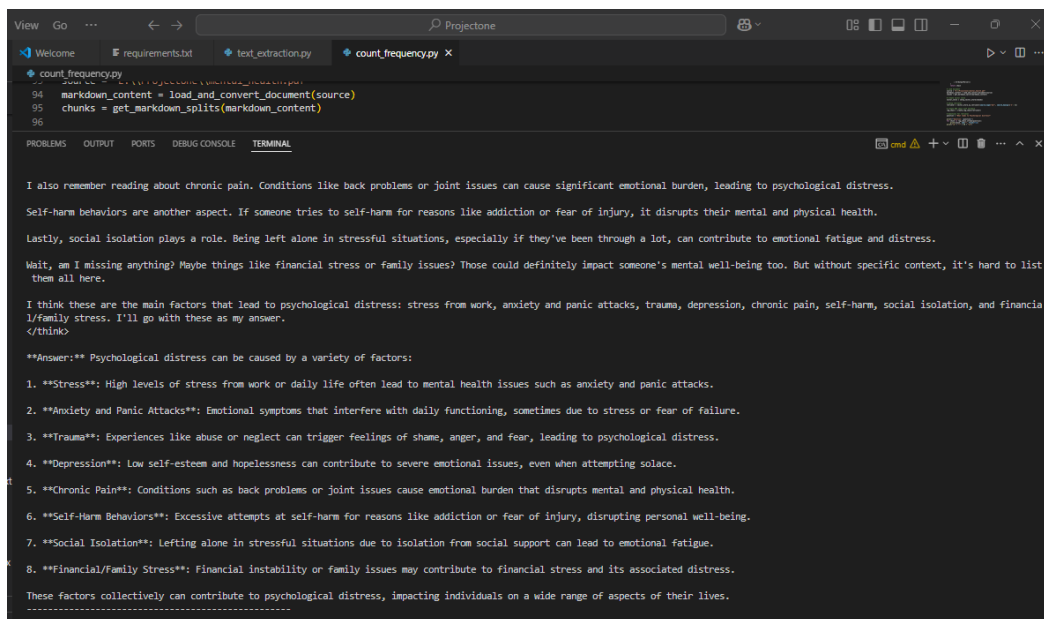
Also, trauma is a big part of psychological distress. When someone experiences abuse or neglect, it can lead to feelings of shame, anger, and fear, which all contribute to distress.

Another factor is depression itself. If someone is depressed, they often have low self-esteem and may experience hopelessness. Even if they try to find solace, their inability to cope with stress leads to more severe issues.

I also remember reading about chronic pain. Conditions like back problems or joint issues can cause significant emotional burden, leading to psychological distress.

Self-harm behaviors are another aspect. If someone tries to self-harm for reasons like addiction or fear of injury, it disrupts their mental and physical health.

Lastly, social isolation plays a role. Being left alone in stressful situations, especially if they've been through a lot, can contribute to emotional fatigue and distress.
```



The screenshot shows a Jupyter Notebook with two tabs: 'text\_extraction.py' and 'count\_frequency.py'. The 'text\_extraction.py' tab is active, showing a Python script with the following code:

```
94 markdown_content = load_and_convert_document(source)
95 chunks = get_markdown_splits(markdown_content)
96
```

The 'count\_frequency.py' tab is also visible, showing a similar script. The terminal window at the bottom displays the output of the chatbot, which is a list of factors contributing to psychological distress:

```
I also remember reading about chronic pain. Conditions like back problems or joint issues can cause significant emotional burden, leading to psychological distress.

Self-harm behaviors are another aspect. If someone tries to self-harm for reasons like addiction or fear of injury, it disrupts their mental and physical health.

Lastly, social isolation plays a role. Being left alone in stressful situations, especially if they've been through a lot, can contribute to emotional fatigue and distress.

Wait, am I missing anything? Maybe things like financial stress or family issues? Those could definitely impact someone's mental well-being too. But without specific context, it's hard to list them all here.

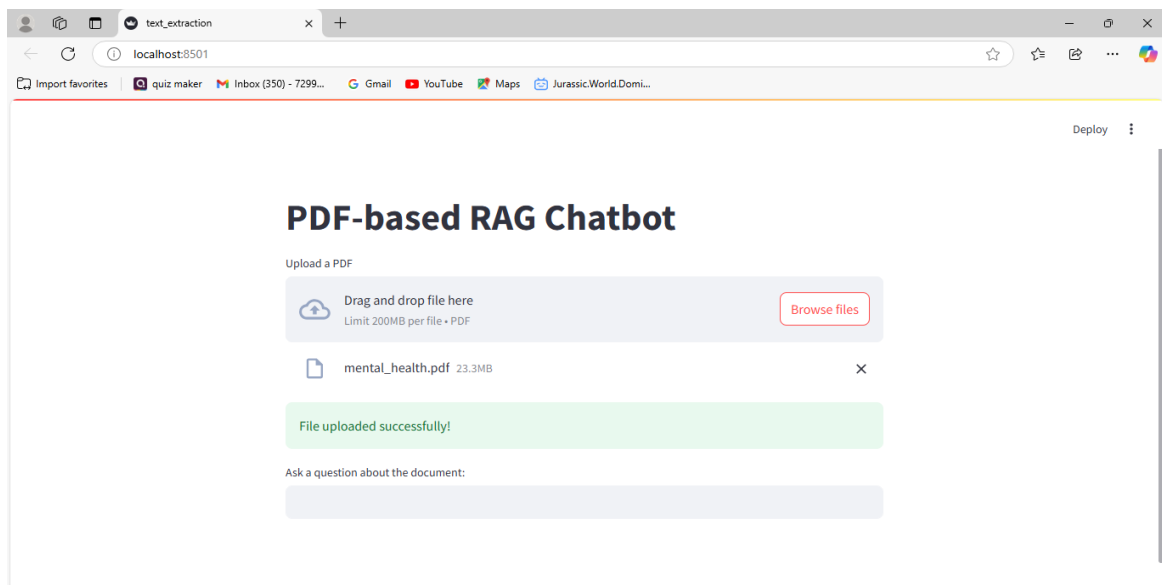
I think these are the main factors that lead to psychological distress: stress from work, anxiety and panic attacks, trauma, depression, chronic pain, self-harm, social isolation, and financial stress. I'll go with these as my answer.
</think>

**Answer:** Psychological distress can be caused by a variety of factors:

1. **Stress**: High levels of stress from work or daily life often lead to mental health issues such as anxiety and panic attacks.
2. **Anxiety and Panic Attacks**: Emotional symptoms that interfere with daily functioning, sometimes due to stress or fear of failure.
3. **Trauma**: Experiences like abuse or neglect can trigger feelings of shame, anger, and fear, leading to psychological distress.
4. **Depression**: Low self-esteem and hopelessness can contribute to severe emotional issues, even when attempting solace.
5. **Chronic Pain**: Conditions such as back problems or joint issues cause emotional burden that disrupts mental and physical health.
6. **Self-Harm Behaviors**: Excessive attempts at self-harm for reasons like addiction or fear of injury, disrupting personal well-being.
7. **Social Isolation**: Left alone in stressful situations due to isolation from social support can lead to emotional fatigue.
8. **Financial/Family Stress**: Financial instability or family issues may contribute to financial stress and its associated distress.

These factors collectively can contribute to psychological distress, impacting individuals on a wide range of aspects of their lives.
```

After adding streamlit interface:



text\_extraction

localhost:8501

Import favoritesquiz makerInbox (350) - 7299...GmailYouTubeMapsJurassicWorld.Domi...

Deploy

File uploaded successfully!

Ask a question about the document:

What is happiness?

Question: What is happiness?

Answer:

<think> Okay, so the user has given me a context and a question about happiness. Let me break this down step by step.  
First, I need to understand what the context says. The provided text seems to be related to India's Mental Health Policy from 2014. It mentions the Ministry of Health & Family Welfare, which is part of the government in New Pathways New Hope. But looking at the content, it seems like there are no specific details about happiness mentioned here.  
  
The question is asking for an answer on "What is happiness?" So I should consider common definitions and sources. Generally, happiness refers to overall well-being, satisfaction, and fulfillment. There's also a broader concept called "net positive happiness," which combines happiness with the state of society.  
  
Since the context doesn't provide specific information about happiness in this region or its cultural implications, I can only offer a general definition based on common understanding. It's important to

Deploy

<think> Okay, so the user has given me a context and a question about happiness. Let me break this down step by step.  
First, I need to understand what the context says. The provided text seems to be related to India's Mental Health Policy from 2014. It mentions the Ministry of Health & Family Welfare, which is part of the government in New Pathways New Hope. But looking at the content, it seems like there are no specific details about happiness mentioned here.  
  
The question is asking for an answer on "What is happiness?" So I should consider common definitions and sources. Generally, happiness refers to overall well-being, satisfaction, and fulfillment. There's also a broader concept called "net positive happiness," which combines happiness with the state of society.  
  
Since the context doesn't provide specific information about happiness in this region or its cultural implications, I can only offer a general definition based on common understanding. It's important to mention that happiness is subjective and varies across individuals, cultures, and times.  
  
I should structure my answer clearly, perhaps bullet points as requested, but since it's more of an explanation rather than a list, I'll use paragraphs for clarity. </think>  
  
Happiness is a subjective experience characterized by well-being, satisfaction, and fulfillment. It can vary widely from person to person, depending on cultural contexts, personal values, and life experiences. Net positive happiness combines happiness with the state of society, while traditional happiness often refers to individual contentment without societal factors.