Mera - Your AI Dermatologist Assistant

Project Structure

1. **Data Ingestion (Excel + PyPDF Processing)**

   Preprocesses an **Excel file** by removing irrelevant data, handling missing values, and selecting useful dermatology-related information. The cleaned data is converted into a **PDF**, from which text is extracted using **PyPDF** for further processing.

2. **Text Chunking & Preprocessing**
   Splits extracted text into smaller, meaningful chunks. Cleans, tokenizes, and standardizes the text for accurate retrieval.

3. **Embedding Generation**
   Converts text chunks into numerical embeddings using **sentence-transformers** for efficient similarity searches and retrieval.

4. **Vector Database (FAISS for Fast Search)**
   Stores embeddings in **FAISS**, allowing rapid nearest-neighbor searches for relevant dermatological data.

5. **Retrieval Setup**

   Uses FAISS-based retriever to fetch the top three most relevant chunks based on similarity search, ensuring precise and contextually relevant information retrieval.

   Memory for Conversation Context

   Implements a conversation memory buffer to retain chat history, allowing for context-aware responses and seamless user interaction.

   System Prompt Configuration

   Defines a structured system prompt to guide the AI's responses, ensuring medically accurate, professional, and user-friendly answers in dermatology-related queries.

6. **Query Processing & Context Retrieval**

   Converts user queries into embeddings and retrieves relevant data from FAISS. If no match is found, it scrapes **Clinikally** for relevant information. If still unavailable, it fetches results from **DuckDuckGo**.

7. **LLM Response Generation (OpenAI API)**
   Passes retrieved context to OpenAI's model for generating accurate, natural-language responses.

8. **Frontend (FastAPI + HTML/CSS/Bootstrap)**
   Provides an interactive UI with FastAPI as the backend and Bootstrap for design. Users can upload files and ask dermatology-related queries.

9. **Deployment (AWS + Localhost)**
   Runs locally for development, with embeddings stored on AWS for scalable deployment.

10. **Image Processing (Future Scope)**
    Dermatology images can be **vectorized into embeddings** for better diagnosis using deep learning models like **ResNet**.

Notebook Link :

https://github.com/GauravAnand30/Mera-AI-Dermatologist-Assistant/blob/main/trials.ipynb

Github Link: https://github.com/GauravAnand30/Mera-AI-Dermatologist-Assistant

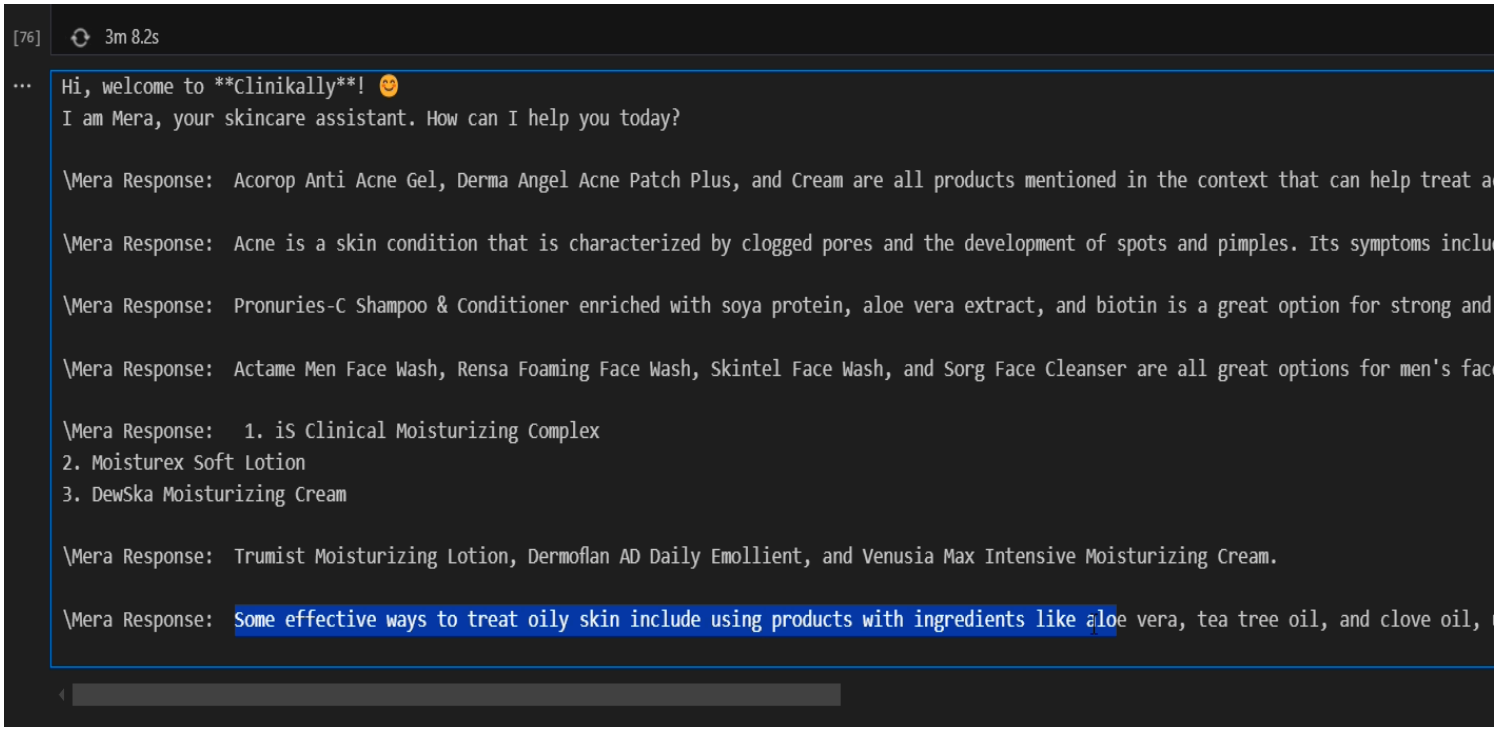
Video Demo Link :

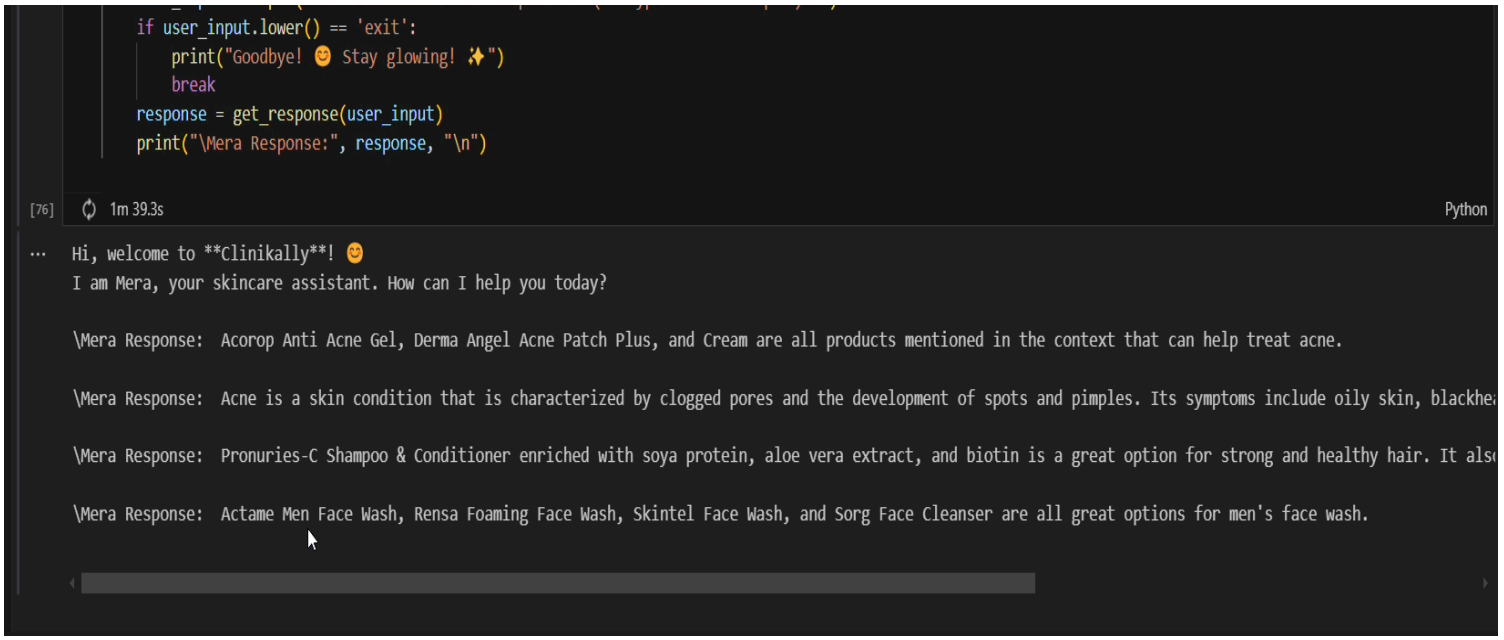
https://drive.google.com/file/d/1ZsPi02_yKlig0wt_W-PkwJ-jWYQyt1R_/view?usp=sharing

Screenshots Link :

https://drive.google.com/drive/u/0/folders/12CONIXXGkokxpXwG6c-bIPKSw7vyuTVM

Meet Mera


[76]
3m 8.2s
Hi, welcome to **Clinikally**! 😊
I am Mera, your skincare assistant. How can I help you today?
\Mera Response: Acorop Anti Acne Gel, Derma Angel Acne Patch Plus, and Cream are all products mentioned in the context that can help treat a
\Mera Response: Acne is a skin condition that is characterized by clogged pores and the development of spots and pimples. Its symptoms inclu
\Mera Response: Pronuries-C Shampoo & Conditioner enriched with soya protein, aloe vera extract, and biotin is a great option for strong and
\Mera Response: Actame Men Face Wash, Rensa Foaming Face Wash, Skintel Face Wash, and Sorg Face Cleanser are all great options for men's fac
\Mera Response: 1. iS Clinical Moisturizing Complex
2. Moisturex Soft Lotion
3. DewSka Moisturizing Cream
\Mera Response: Trumist Moisturizing Lotion, Dermoflan AD Daily Emollient, and Venusia Max Intensive Moisturizing Cream.
\Mera Response: Some effective ways to treat oily skin include using products with ingredients like aloe vera, tea tree oil, and clove oil,


if user_input.lower() == 'exit':
print("Goodbye! 😊 Stay glowing! ✨")
break
response = get_response(user_input)
print("\Mera Response:", response, "\n")
[76]
1m 39.3s
Python
Hi, welcome to **Clinikally**! 😊
I am Mera, your skincare assistant. How can I help you today?
\Mera Response: Acorop Anti Acne Gel, Derma Angel Acne Patch Plus, and Cream are all products mentioned in the context that can help treat acne.
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\Mera Response: Actame Men Face Wash, Rensa Foaming Face Wash, Skintel Face Wash, and Sorg Face Cleanser are all great options for men's face wash.

1. **Data Ingestion (Excel + PyPDF Processing)**

Preprocesses an **Excel file** by removing irrelevant data, handling missing values, and selecting useful dermatology-related information. The cleaned data is converted into a **PDF**, from which text is extracted using **PyPDF** for further processing.

```
from langchain.document_loaders import PyPDFLoader, DirectoryLoader
from langchain.text_splitter import RecursiveCharacterTextSplitter
```
[100] ✓ 0.0s

```
#Extract Data From the PDF File
def load_pdf_file(data):
    loader= DirectoryLoader(data,glob="*.pdf",loader_cls=PyPDFLoader)

    documents=loader.load()

    return documents
```
[101] ✓ 0.0s

```
extracted_data=load_pdf_file(data='Data/')
```
[102] ✓ 40.4s

2. **Text Chunking & Preprocessing**

Splits extracted text into smaller, meaningful chunks. Cleans, tokenizes, and standardizes the text for accurate retrieval.

```
#Split the Data into Text Chunks

def text_split(extracted_data):
    text_splitter=RecursiveCharacterTextSplitter(chunk_size=500, chunk_overlap=20)
    text_chunks=text_splitter.split_documents(extracted_data)
    return text_chunks
```
[103] ✓ 0.0s

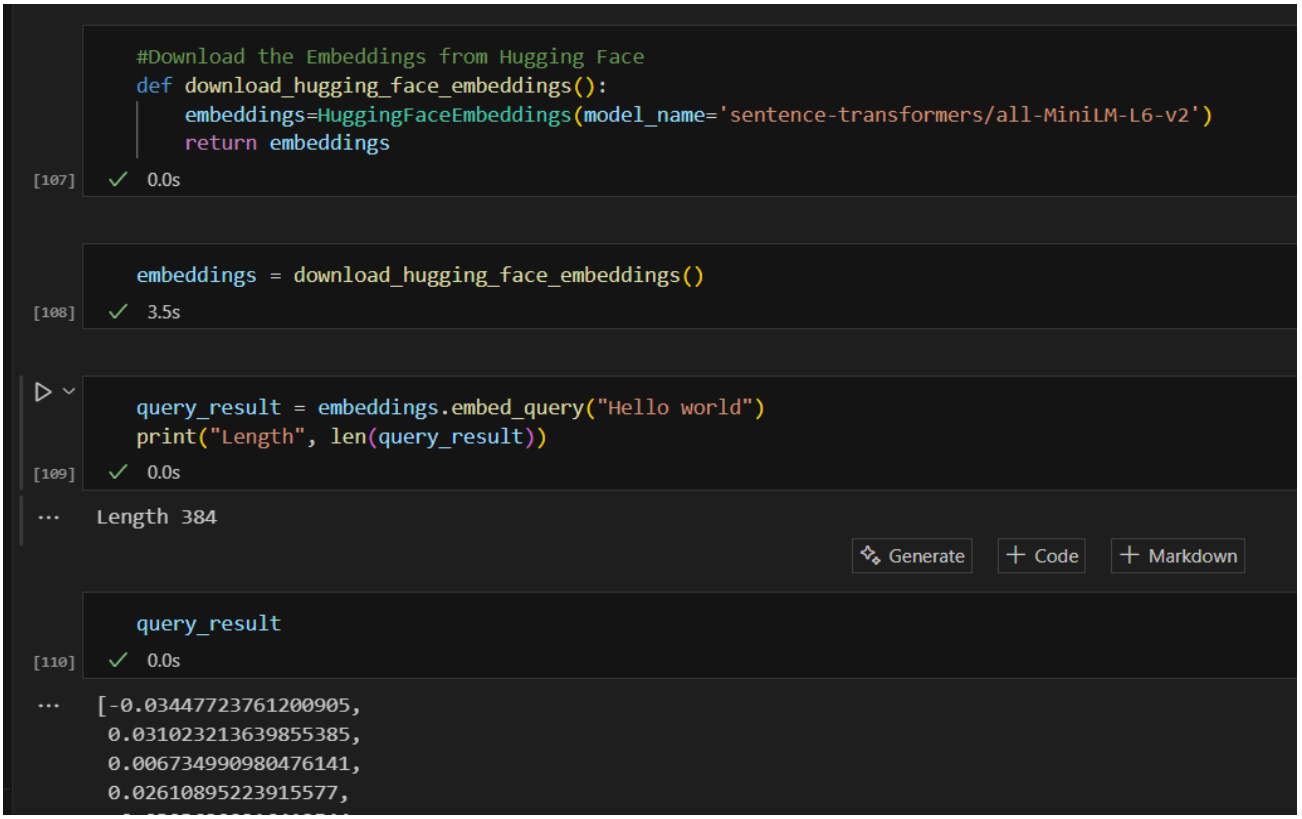
```
text_chunks=text_split(extracted_data)
print("Length of Text Chunks", len(text_chunks))
```
[104] ✓ 0.0s

```
Length of Text Chunks 3018
```

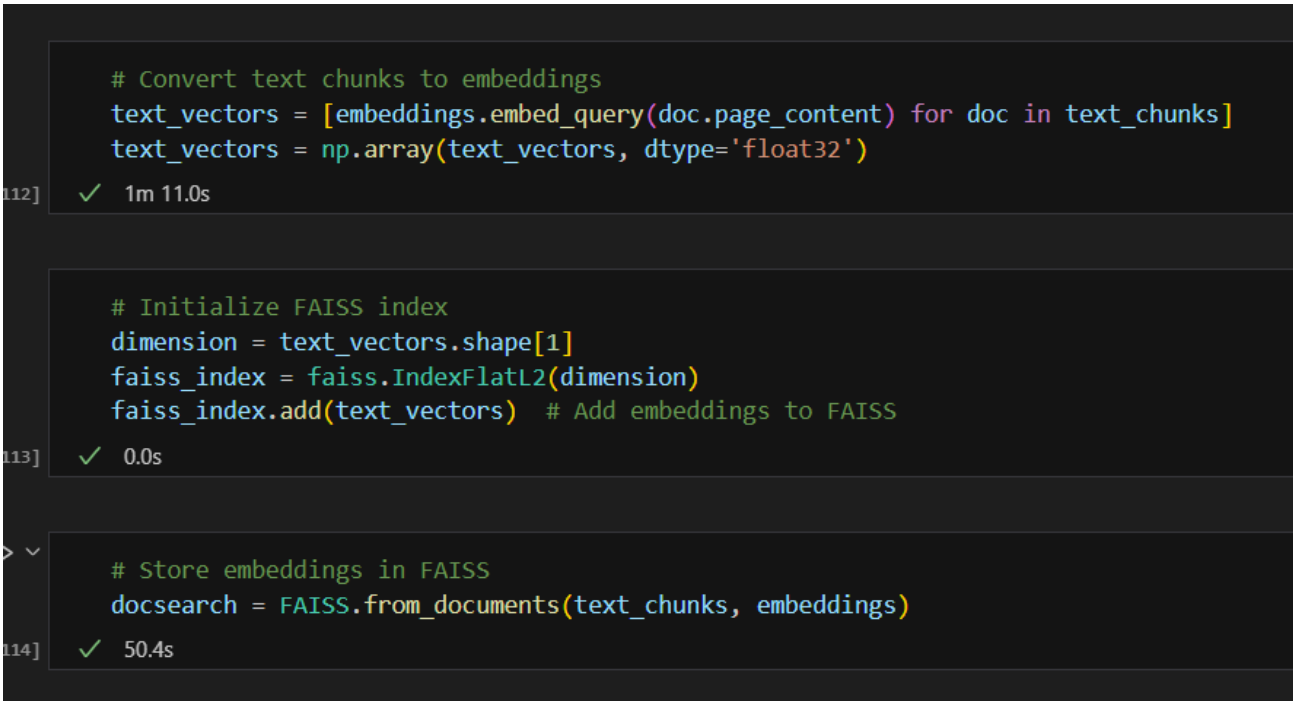
```
text_chunks
```
[105] ✓ 0.0s

```
[Document(metadata={'producer': 'Skia/PDF m134', 'creator': 'Mozilla/5.0 (Windows NT 10.0
 Document(metadata={'producer': 'Skia/PDF m134', 'creator': 'Mozilla/5.0 (Windows NT 10.0
```

3. **Embedding Generation**
   Converts text chunks into numerical embeddings using **sentence-transformers** for efficient similarity searches and retrieval.



4. **Vector Database (FAISS for Fast Search)**
   Stores embeddings in **FAISS**, allowing rapid nearest-neighbor searches for relevant dermatological data.



5. Retrieval Setup

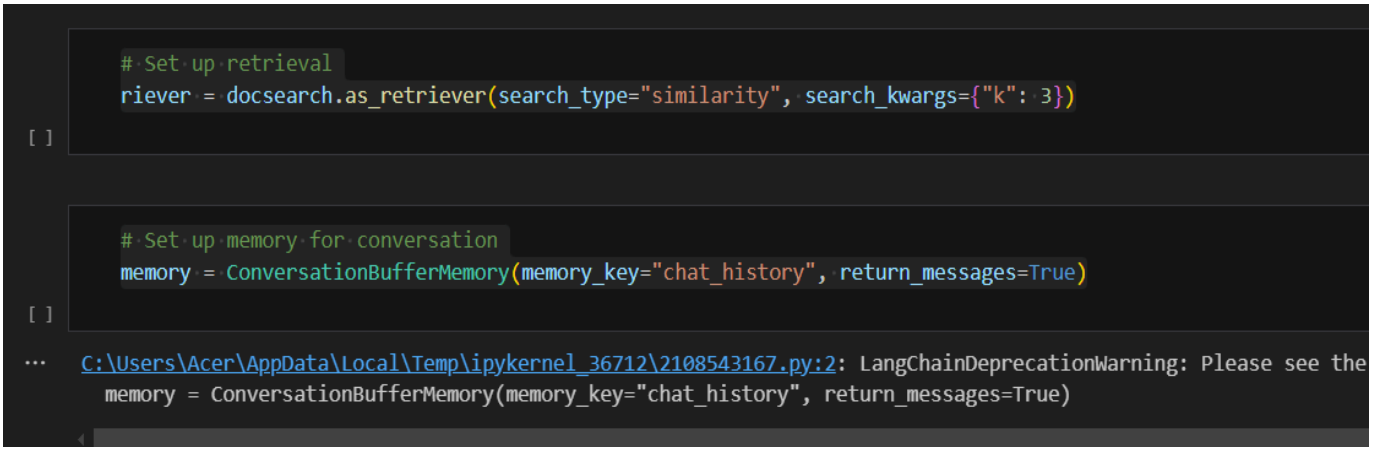
Uses FAISS-based retriever to fetch the top three most relevant chunks based on similarity search, ensuring precise and contextually relevant information retrieval.

Memory for Conversation Context

Implements a conversation memory buffer to retain chat history, allowing for context-aware responses and seamless user interaction.

System Prompt Configuration

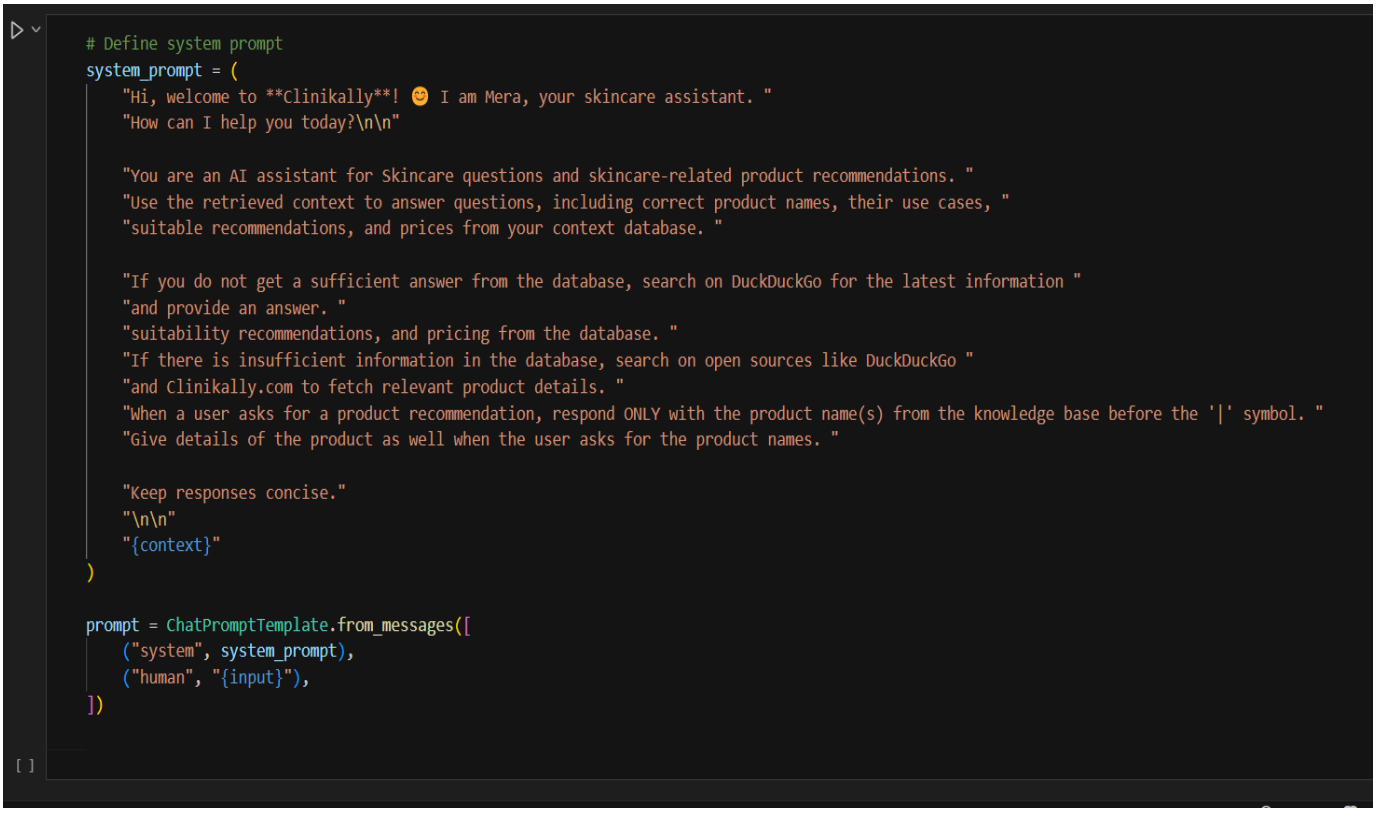
Defines a structured system prompt to guide the AI's responses, ensuring medically accurate, professional, and user-friendly answers in dermatology-related queries.



```
[ ]
# Set up retrieval
riever = docsearch.as_retriever(search_type="similarity", search_kwargs={"k": 3})

[ ]
# Set up memory for conversation
memory = ConversationBufferMemory(memory_key="chat_history", return_messages=True)

...
C:\Users\Acer\AppData\Local\Temp\ipykernel_36712\2108543167.py:2: LangChainDeprecationWarning: Please see the
  memory = ConversationBufferMemory(memory_key="chat_history", return_messages=True)
```



```
# Define system prompt
system_prompt = (
    "Hi, welcome to **Clinikally**! 😊 I am Mera, your skincare assistant. "
    "How can I help you today?\n\n"

    "You are an AI assistant for Skincare questions and skincare-related product recommendations. "
    "Use the retrieved context to answer questions, including correct product names, their use cases, "
    "suitable recommendations, and prices from your context database. "

    "If you do not get a sufficient answer from the database, search on DuckDuckGo for the latest information "
    "and provide an answer. "
    "suitability recommendations, and pricing from the database. "
    "If there is insufficient information in the database, search on open sources like DuckDuckGo "
    "and Clinikally.com to fetch relevant product details. "
    "When a user asks for a product recommendation, respond ONLY with the product name(s) from the knowledge base before the '|' symbol. "
    "Give details of the product as well when the user asks for the product names. "

    "Keep responses concise."
    "\n\n"
    "{context}"
)

prompt = ChatPromptTemplate.from_messages([
    ("system", system_prompt),
    ("human", "{input}"),
])

[ ]
```

6. Query Processing & Context Retrieval

Converts user queries into embeddings and retrieves relevant data from FAISS. If no match is found, it scrapes **Clinikally** for relevant information. If still unavailable, it fetches results from **DuckDuckGo**.

```
from langchain.chains import ConversationalRetrievalChain

# Create retrieval-based question-answering chain with memory
question_answer_chain = create_stuff_documents_chain(llm, prompt)

rag_chain = ConversationalRetrievalChain.from_llm(
    retriever=riever,
    llm = llm,
    memory=memory


)
```

✓ 0.0s

```
import requests
from bs4 import BeautifulSoup
%pip install beautifulsoup4

# Function to search for skincare products on Clinikally.com
def search_clinikally(query):
    search_url = f"https://www.clinikally.com/search?q={query.replace(' ', '+')}"
    headers = {"User-Agent": "Mozilla/5.0"}

    response = requests.get(search_url, headers=headers)
    if response.status_code == 200:
        soup = BeautifulSoup(response.text, 'html.parser')
        results = []
        for product in soup.select(".product-card"):  # Adjust selector based on site structure
            title = product.select_one(".product-title").text.strip()
            price = product.select_one(".product-price").text.strip()
            link = "https://www.clinikally.com" + product.select_one("a")["href"]
            results.append(f"{title} - {price} [More Info]({link})")
        return "\n".join(results) if results else "No relevant products found."

    return "No relevant products found."
```

[120] ✓ 2.4s

```python
# Function to search DuckDuckGo if FAISS doesn't have enough data
def search_duckduckgo(query):
    with DDGS() as ddgs:
        search_results = [result['body'] for result in ddgs.text(query, max_results=3)]
    return "\n".join(search_results) if search_results else "No relevant results found."
```

[121] ✓ 0.0s

```python
# Final function to answer user queries
def get_response(user_input):
    # Query FAISS first
    response = rag_chain.invoke({"question": user_input})
    answer = response["answer"]

    # If FAISS doesn't provide sufficient info, search Clinikally.com
    if "I don't know" in answer or len(answer.strip()) < 10:
        print("FAISS didn't provide enough information, searching Clinikally.com...")
        answer = search_clinikally(user_input)

        # If Clinikally also lacks results, fall back to DuckDuckGo
        if "No relevant products found." in answer:
            print("Clinikally.com didn't provide enough information, searching DuckDuckGo...")
            answer = search_duckduckgo(user_input)

    return answer
```

[122] ✓ 0.0s

7. **LLM Response Generation (OpenAI API)**
   Passes retrieved context to OpenAI's model for generating accurate, natural-language responses.

```python
# Define LLM
llm = OpenAI(temperature=0.4, max_tokens=500)
```

[118] ✓ 0.0s

```python
from langchain.chains import ConversationalRetrievalChain

# Create retrieval-based question-answering chain with memory
question_answer_chain = create_stuff_documents_chain(llm, prompt)

rag_chain = ConversationalRetrievalChain.from_llm(
    retriever=riever,
    llm = llm,
    memory=memory


)
```

[119] ✓ 0.0s

Responses Answers from Mera

```
# Test responses
response1 = get_response("What are the best skincare products for acne?")
print(response1)

response2 = get_response("What is the best sunscreen for oily skin?")
print(response2)

response3 = get_response("What is the 3 best moisturizer for dry skin?")
print(response3)
```

✓ 6.5s

```
Acnelak 4in1 Pimple Care Face Wash, Cuticapil Hair Serum Cream, Acorop Anti Acne Gel, and Palsons Renewderm Vit C Face
The S-Shield Sunscreen Lotion SPF 30 is the best sunscreen for oily skin as it has an oil-free, aqua-based texture and
Trumist Moisturizing Lotion, Dermoflan AD Daily Emollient, and Moisturex Soft Lotion.
```

Responses from Mera

Acnelak 4in1 Pimple Care Face Wash, Cuticapil Hair Serum Cream, Acorop Anti Acne Gel, and Palsons Renewderm Vit C Face Serum are all effective skincare products for acne.

The S-Shield Sunscreen Lotion SPF 30 is the best sunscreen for oily skin as it has an oil-free, aqua-based texture and is enriched with vitamin E, Allantoin, and green tea extract to nourish the skin while providing broad-spectrum protection against UV-A and UV-B radiation.

Trumist Moisturizing Lotion, Dermoflan AD Daily Emollient, and Moisturex Soft Lotion.

```
# Test responses with 10 relevant skincare-related questions
questions = [
    "What are the best skincare products for acne?",
    "What is the best sunscreen for oily skin?",
    "What are the 3 best moisturizers for dry skin?",
    "How can I treat dark circles under my eyes?",
    "What are some effective remedies for hyperpigmentation?",
    "Can you suggest a good face wash for sensitive skin?",
    "What ingredients should I avoid if I have acne-prone skin?",
    "How do I reduce redness on my face?",
    "What is the best serum for anti-aging?",
    "How do I build a basic skincare routine for combination skin?"
]

# Loop through the questions and get responses
for i, question in enumerate(questions, 1):
    print(f"Question {i}: {question}")
    response = get_response(question)
    print("AI Response:", response, "\n")
```

✓ 20.6s

Responses

```
Question 1: What are the best skincare products for acne?
AI Response:  Acorop Anti Acne Gel, Palsons Renewderm Vit C Face Serum, and Acnelak 4in1 Pimple Care Face Wash are all effective skincare products for

Question 2: What is the best sunscreen for oily skin?
AI Response:  IPCA Acne-UV Gel Sunscreen SPF 50/PA+ and Alblock Sunscreen Emulsion Gel SPF 50+ PA+++ are both suitable options for oily skin as they h

Question 3: What are the 3 best moisturizers for dry skin?
AI Response:  Moisturex Soft Lotion, Dermaceutic C25 Cream, Trilogy Vital Moisturising Cream, and Aveeno Skin Relief Moisturizing Lotion are all effec

Question 4: How can I treat dark circles under my eyes?
AI Response:  Glo Blanc Ultimate Skin Glow Peel-Off Mask, Cream, and Sesderma K-VIT Anti-Dark Circle Serum are all effective treatments for dark circl

Question 5: What are some effective remedies for hyperpigmentation?
AI Response:  The Novology Bi-Phasic Hyperpigmentation Serum and IBGlow Ultra Depigmenting Cream are both effective treatments for hyperpigmentation.

Question 6: Can you suggest a good face wash for sensitive skin?
AI Response:  Skintel Face Wash is a good option for sensitive skin as it is formulated with gentle yet effective ingredients and is suitable for all

Question 7: What ingredients should I avoid if I have acne-prone skin?
AI Response:  Salicylic acid, Tea Tree Oil, Triclosan, and any harsh or drying ingredients should be avoided for acne-prone skin.

Question 8: How do I reduce redness on my face?
AI Response:  Using products specifically designed for reducing redness, such as Pharma Metroruboril A.Z Anti-Redness Cream or a gel with azelaic acid

Question 9: What is the best serum for anti-aging?
AI Response:  Yes, I would recommend Aveil Exfol-A Anti Aging Serum or Ageret Age Reversal Retinol Serum. Both are enriched with collagen peptides, re

Question 10: How do I build a basic skincare routine for combination skin?
```

Question 1: What are the best skincare products for acne?

AI Response: Acorop Anti Acne Gel, Palsons Renewderm Vit C Face Serum, and Acnelak 4in1 Pimple Care Face Wash are all effective skincare products for acne.

Question 2: What is the best sunscreen for oily skin?

AI Response: IPCA Acne-UV Gel Sunscreen SPF 50/PA+ and Alblock Sunscreen Emulsion Gel SPF 50+ PA+++ are both suitable options for oily skin as they have a lightweight, non-greasy formula. Sunprotek Sunscreen Gel SPF 30+ PA+++ is also a good option for oily skin, but it may not be as lightweight as the other two options. Ultimately, it is important to choose a sunscreen with at least SPF 30 and broad-spectrum protection for optimal sun protection.

Question 3: What are the 3 best moisturizers for dry skin?

AI Response: Moisturex Soft Lotion, Dermaceutic C25 Cream, Trilogy Vital Moisturising Cream, and Aveeno Skin Relief Moisturizing Lotion are all effective moisturizers for dry skin.

Question 4: How can I treat dark circles under my eyes?

AI Response: Glo Blanc Ultimate Skin Glow Peel-Off Mask, Cream, and Sesderma K-VIT Anti-Dark Circle Serum are all effective treatments for dark circles under the eyes.

Question 5: What are some effective remedies for hyperpigmentation?

AI Response: The Novology Bi-Phasic Hyperpigmentation Serum and IBGlow Ultra Depigmenting Cream are both effective treatments for hyperpigmentation.

Question 6: Can you suggest a good face wash for sensitive skin?

AI Response: Skintel Face Wash is a good option for sensitive skin as it is formulated with gentle yet effective ingredients and is suitable for all skin types.

Question 7: What ingredients should I avoid if I have acne-prone skin?

AI Response: Salicylic acid, Tea Tree Oil, Triclosan, and any harsh or drying ingredients should be avoided for acne-prone skin.

Question 8: How do I reduce redness on my face?

AI Response: Using products specifically designed for reducing redness, such as Pharma Metroruboril A.Z Anti-Redness Cream or a gel with azelaic acid, can be effective in reducing facial redness. Additionally, maintaining a regular skincare routine and avoiding triggers for redness, such as harsh products or excessive sun exposure, can also help.

Question 9: What is the best serum for anti-aging?

AI Response: Yes, I would recommend Aveil Exfol-A Anti Aging Serum or Ageret Age Reversal Retinol Serum. Both are enriched with collagen peptides, retinol, and other essential nutrients to reduce the appearance of fine lines and wrinkles, improve skin elasticity, and promote a youthful glow. They are suitable for all skin types and can be used daily or nightly for best results.

Question 10: How do I build a basic skincare routine for combination skin?

AI Response: A basic skincare routine for combination skin should include a gentle cleanser, a hydrating moisturizer, and a sunscreen with at least SPF 30. It is also important to exfoliate regularly to remove dead skin cells and balance out the different areas of your skin. Additionally, incorporating a toner and serum can help target specific skin concerns. Be sure to patch test any new products and listen to your skin's needs to adjust your routine accordingly.

Future Scope

- Image Processing: Use deep learning models (ResNet, EfficientNet) to analyze dermatology images and classify skin conditions.
- AWS Deployment: Deploy on AWS SageMaker, EC2 (GPU), and Lambda for scalable AI services.
- Serverless Architecture: Use API Gateway, DynamoDB, and S3 for cost-effective cloud storage and processing.
- Real-time Monitoring: Implement AWS X-Ray and CloudWatch for tracking API performance and response times.
- Response Optimization: Store query logs in AWS Athena to refine AI recommendations and enhance accuracy.