



PRODUCT RECOMMENDATION USING RETRIEVAL-AUGMENTED GENERATION (RAG)

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INTRODUCTION

- Overview of project
- Key focus: System architecture, tech choices, hybrid query routing

TECH STACK - EMBEDDINGS MODEL

Used **all-mpnet-base-v2** over **all-MiniLM-L6-v2** as it has:

- Best-in-class accuracy for semantic search.
- Suitability for long sequential data.
- Dense 768-dimensional vectors capturing meaning.
- Utilized Kaggle's GPU for faster processing.

TECH STACK - VECTOR DATABASE & RETRIEVAL

- Stored vector embeddings in a Pandas DataFrame.
- Used cosine similarity for retrieval.
- Experimented with Pinecone but found it unnecessary for small datasets (~2,600 rows).
- Pandas DataFrame made debugging and manipulation easier.

TECH STACK - LANGUAGE MODEL



Used o3-mini via OpenAI's API for:

- Speed and optimization for RAG.
- Strong reasoning for complex queries.
- Effective query classification for hybrid routing.
- High token limit (TPM).

Experimented with Llama-3.3-70B-Versatile (open-source, free) but faced issues due to its 6,000-token limit.

TECH STACK - FRAMEWORK



- Built with Python, Pandas, and Scikit-learn.
- Integrated LangChain for structured prompting and LLM interactions.

IMPLEMENTATION DETAIL -DATA PREPROCESSING:

- Data Preprocessing:
- Cleaned and restructured product data from an Excel file.
- Removed duplicates, handled missing values.
- Used BeautifulSoup and NLTK for text normalization (spell-checking, removing HTML tags, punctuation).



IMPLEMENTATION DETAIL -EMBEDDING GENERATION:

Created three types of embeddings:

- Description-based embeddings
- Tags-based embeddings
- Combined embeddings(concat of Description and tags column)

IMPLEMENTATION DETAIL -QUERY PROCESSING & SIMILARITY SEARCH:

- Converted user queries into embeddings using mpnet-base-v2.
- Calculated cosine similarity with stored embeddings.
- Used a linear combination of similarity scores to rank results.
- Returned the top 7 most similar products along with descriptions.



IMPLEMENTATION DETAILS -HYBRID QUERY ROUTING:

Intent detection Classified queries into:

- Product recommendation queries → processed via the product database and then to LLM.
- General skincare queries → routed to the LLM for response. Tried web search via DuckDuckGo API, but found LLM responses equally effective.



IMPLEMENTATION DETAIL -HYBRID QUERY ROUTING:

Used Two main Algorithms/ Heuristics for classification

- keyword matching and
- query structure analysis

CHALLENGES & LEARNINGS- CHOOSING THE RIGHT TECH STACK:

Experimented with different

- databases, and encoding models,
- LLMs
- prompts,
- context sizes
- token limits.

Iterative process led to the most efficient setup.



THANK
YOU

Product Recommendation Queries

user_query = "Recommend a moisturizer for oily skin under 1000 rupees."

Here are some great options based on what you're looking for! 😊

Recommended Products

- ◆ Apifil Oil Free Moisturiser (₹309)
👉 Buy Here : <https://www.clinikally.com/products/apifil-oil-free-moisturiser>
💡 Key Benefit: Its oil-free, non-greasy formula helps regulate excess sebum while keeping your skin smooth.
- ◆ Hydravo Skin Renewing Moisturizer (₹499)
👉 Buy Here : <https://www.clinikally.com/products/hydravo-skin-renewing-moisturizer>
💡 Key Benefit: A lightweight, versatile moisturizer that hydrates without clogging pores.

Other options you might like:

- ★ Clinikally Hydrasoothe Moisturiser - ₹899 (Loved for its soothing, barrier-strengthening benefits)
- ★ Cosrx Lightweight Soothing Moisturizer - ₹1189 (Ideal if you can stretch your budget for gentle hydration on acne-prone skin)
- ★ Navitus Ultra Advance Moisturizing Lotion - ₹1099 (Perfect for long-lasting hydration with a protective twist)
- ★ Glintra Foaming Face Wash - ₹419 (A refreshing cleanser to prep oily skin for moisturizer use)

Let me know if you need more recommendations! 😊

General Queries

user_query="How often should I exfoliate my face?"

Here's what I found on the web! 😊 Exfoliating one to two times per week is generally ideal, but it depends on your skin type. If you have sensitive or dry skin, starting with once a week might be best to avoid irritation. For oilier or acne-prone skin, you could consider twice a week, ensuring you follow up with a moisturizer and sunscreen. Listen to your skin and adjust accordingly! Hope that helps!

Product Information Queries(not asking for recommendation rather information about a product)

user_query="Benifits of Episoft AC Moisturiser"

Here's what I found on the web! 😊 Episoft AC Moisturiser is a multifunctional product that hydrates and soothes acne-prone skin while providing broad-spectrum protection with SPF 30. Its lightweight, non-greasy, and hypoallergenic formula ensures irritation-free hydration, shielding your skin from harmful UVA and UVB rays for a radiant, blemish-free complexion. Hope that helps!

Unrelated Queries

user_query="What is the capital of Argentina?"

Oh no! That's a bit outside my expertise. But if you have any skincare, haircare, or health-related questions, I'd love to help! 😊