

Intelligent Email Parsing and Information Retrieval with RAGs

"AI-powered email insights, one query at a time."

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Problem Statement & Solution

- **Problem Statement:**

Emails are not just a primary mode of communication but also a personal repository of critical information about an individual. Despite their importance, there is a disconnect between large language models (LLMs) and email data, limiting their potential as truly personalized assistants.

- **Solution:**

To bridge this gap, I developed a **Retrieval-Augmented Generation (RAG)** pipeline, leveraging LLMs to tap into email data and transform it into actionable insights. This approach unlocks the ability to create a highly personalized assistant tailored to an individual's unique context and needs.

Initial Approach

Plan: Real-time email processing via GCP and a marketplace app.

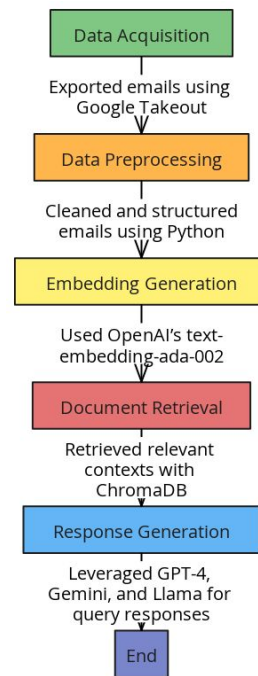
Challenges:

- High complexity and cost.
- Extended implementation time.
- Pivoted to a local development approach for efficiency.

Workflow Overview

Steps:

1. **Data Acquisition:** Exported emails using Google Takeout.
2. **Data Preprocessing:** Cleaned emails to extract metadata and content.
3. **Embedding Generation:** Used OpenAI's text-embedding-ada-002 for semantic understanding.
4. **Document Retrieval:** Leveraged ChromaDB for context retrieval.
5. **Response Generation:** Queries answered using GPT-4 (gpt-4), Gemini (gemini-1.5-flash), and Llama (llama3.1-70b).



Queries

```
prompts = [  
    "Search for coupons or deals for Jockey for black friday.",  
    "How many job applications I have applied to till now",  
    "Are there any pending returns for any orders?",  
    "How much have I spend on electronics till now",  
    "Which company sends me the most promotional emails",  
    "How many credit cards do I own",  
    "What are the best restaurants in San Jose?",  
    "Explain quantum computing in simple terms.",  
    "How does the stock market work?",  
    "List all the subscriptions I am currently paying for.",  
    "What is the total amount spent on food delivery this month?",  
    "Which email contains the details of my last flight booking?",  
    "Are there any overdue bills or payments in my emails?",  
    "How many emails contain attachments in the last month?",  
    "Search for bank statement of chase bank for the month of october",  
    "How many emails have I received from Netflix?",  
    "Do I have any emails with gift card codes or promo codes that I haven't used yet?",  
    "Are there any pending refunds for canceled orders?",  
    "How much have I spent on food delivery apps this year?", #19  
    "What is the most frequent discount percentage offered in my emails?",  
    "How many credit card bills are due this month?",  
    "Which bank sends me the most updates or alerts?",  
    "How many credit cards have I applied for in the last six months?",  
    "Did I missed any credit card payments?",  
    "How much loans I have on me?",  
    "Which investment platform sends me the most frequent updates?", #26  
    "Which job portals send me the most recommendations?",  
    "Do I have any pending tasks or follow-ups mentioned in my emails?",  
    "How many companies have I applied to in the last month?",  
    "Are there any emails about discounts on flights or hotels?",  
    "How much have I spent on travel bookings this year?",  
    "Give me the best laptop deal that anyone has sent me.",  
    "What are the most common themes in my academic or research emails?",  
    "What are some good productivity tips?",  
    "How can I save more money every month?",  
]
```

GEMINI Responses

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Q: Search for coupons or deals for Jockey for black friday.

A: The email indicates that Jockey is offering deals and free shipping as part of their Black Friday/Cyber Monday sale. However, specific coupon codes are not provided in this email. The email emphasizes that this early access ends tonight (November 27th). To find specific coupons or deals, you should check the Jockey website directly.

Q: How many job applications I have applied to till now

A: This email doesn't state the total number of job applications you've submitted. It only indicates that there are updates to your applications this week. To see the total number, you need to check your LinkedIn job applications page.

Q: Are there any pending returns for any orders?

A: The email mentions "Free returns," but it doesn't state that any returns are pending for order 1108896463145491. The email focuses on the outstanding payment for this order.

Q: How much have I spend on electronics till now

A: This email doesn't contain information about how much you've spent on electronics in the past. It only advertises a deal on Samsung products and mentions a potential trade-in credit, but provides no details about your past purchases.

Q: Which company sends me the most promotional emails

A: Based on the provided email headers, ET Prime, from newsletter@notifications-economictimes.com, is the company sending you promotional emails.

Q: How many credit cards do I own

A: This email does not contain information about the number of credit cards you own. It only mentions a potential increase to your existing credit limit.

Q: What are the best restaurants in San Jose?

A: This email from Eventbrite advertises events in San Jose, not restaurants. Therefore, I cannot answer your question about the best restaurants in San Jose using the provided context.

LLAMA Responses

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Q: Search for coupons or deals for Jockey for black friday.

A: Based on the email, it seems like Jockey is offering early access to their best Black Friday deals, which includes FREE shipping. However, the email doesn't provide a specific coupon code.

To find more deals or coupons for Jockey's Black Friday sale, I would suggest:

1. Visiting Jockey's website (shopjockey.com) to explore their Black Friday sale section.
2. Checking Jockey's social media pages (e.g., Facebook, Twitter, Instagram) for any promo

Q: How many job applications I have applied to till now

A: Unfortunately, the provided email does not mention the total number of job applications you have applied to. It only mentions that there are new application updates from the past week, but it does not provide a specific number or a list of all your job applications. To check the status of your applications, you would need to log in to your LinkedIn account and view your application history.

Q: Are there any pending returns for any orders?

A: No, there are no pending returns mentioned in the email. In fact, the email mentions "Free returns" but it's more of an advertisement or a reminder of the service, rather than an indication of a pending return. The main focus of the email is on completing the payment for the order.

Q: How much have I spend on electronics till now

A: Based on the provided email context, it seems that you have accumulated 147 points, which is equivalent to \$0.73. However, this information does not provide a comprehensive view of your total spending on electronics. The points mentioned appear to be part of a rewards program, and the value is relatively low.

To determine your total spending on electronics, more information would be required, such as your purchase history or account details. The provided email context does not contain this information.

Q: Which company sends me the most promotional emails

A: Based on the provided context, it appears that ET Prime (Economic Times) sends you the most promotional emails, as both emails are from the same sender (newsletter@notifications-economictimes.com) and have similar content, offering discounts and promotions.

Q: How many credit cards do I own

GPT4 Responses

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Q: Search for coupons or deals for Jockey for black friday.

A: The email does not provide specific information about any coupons or deals for Jockey for Black Friday. It does mention there are some deals and also free shipping being offered, but it does not detail what these deals are. It is advisable to visit their official website or contact them for more detailed information on any Black Friday deals or coupons they may be offering.

Q: How many job applications I have applied to till now

A: The email does not provide information on the total number of job applications you have applied to till now.

Q: Are there any pending returns for any orders?

A: The email does not provide information about any pending returns for orders.

Q: How much have I spend on electronics till now

A: The information provided does not specify how much you've spent on electronics until now.

Q: Which company sends me the most promotional emails

A: The company that sends you the most promotional emails is Bennett, Coleman & Co. Ltd, under the name ET Prime.

Q: How many credit cards do I own

A: The email does not provide information on the number of credit cards you own.

Q: What are the best restaurants in San Jose?

A: The context provided in the email does not include information on the best restaurants in San Jose.

Q: Explain quantum computing in simple terms.

A: Quantum computing is a type of computing technology that utilizes the principles of quantum mechanics. Unlike classical computers that use bits as their most basic units of information (either a 1 or 0), quantum computers use quantum bits, or qubits. Qubits are special because they can exist in a state of 1, 0, or both simultaneously due to a property called superposition. Moreover, qubits can be connected via a phenomenon known as entanglement, in which the state of one qubit can be dependent on the state of another, no matter the distance between them. These features of superposition and entanglement give quantum computers the potential to process massive amounts of data and solve complex problems much faster than classical computers.

Results

Evaluation:

- Tested 30+ diverse queries across GPT-4, Gemini, and Llama.
- Responses stored separately for comparison.

Observations:

- **GPT-4 (gpt-4)**: Delivered detailed and coherent answers but struggled when the context lacked specific information.
- **Gemini (gemini-1.5-flash)**: Efficient for direct queries but limited in handling ambiguous prompts.
- **Llama (llama3.1-70b)**: Consistent with simple queries but lacked depth in complex scenarios.

Key Limitation:

- All models were constrained by the provided context. Missing or insufficient details in emails led to incomplete responses, highlighting the importance of improving document retrieval.

Improvements

Challenges:

- Retrieval precision impacted response quality.
- Aggregation across emails was limited.

Improvements:

- Fine-tune embeddings for domain-specific data.
- Enhance retrieval with advanced similarity metrics and clustering.
- Optimize ChromaDB indexing for scalability.

Conclusion

Success: Built an effective RAG pipeline for email management.

Future Scope: Personalized retrieval, real-time implementation, and scalable cloud solutions.

Impact: Unlocks smarter, faster email management for diverse applications.