Promptly Data Pipeline

Index

Detailed Report can be found in assets folder -> Project Data Pipeline
Google Doc link

Overview

Promptly is an AI-powered document-based Q&A system designed to retrieve answers from user-uploaded documents (PDFs, text files) using a **Retrieval-Augmented Generation (RAG) pipeline**. The system processes user queries, cleans and validates data, stores embeddings in Supabase, and utilizes **Google Cloud Storage (GCS), Airflow DAGs, and DVC** for **data processing, tracking, and versioning**.

This repository hosts the **data pipeline** for managing document processing, query handling, and RAG workflows.

Data Source

1. User Queries

- Source: Retrieved from the conversations table in Supabase.
- Description: This table contains user-generated queries, which we have pre-filled with custom data to simulate various interaction scenarios.

2. Documents

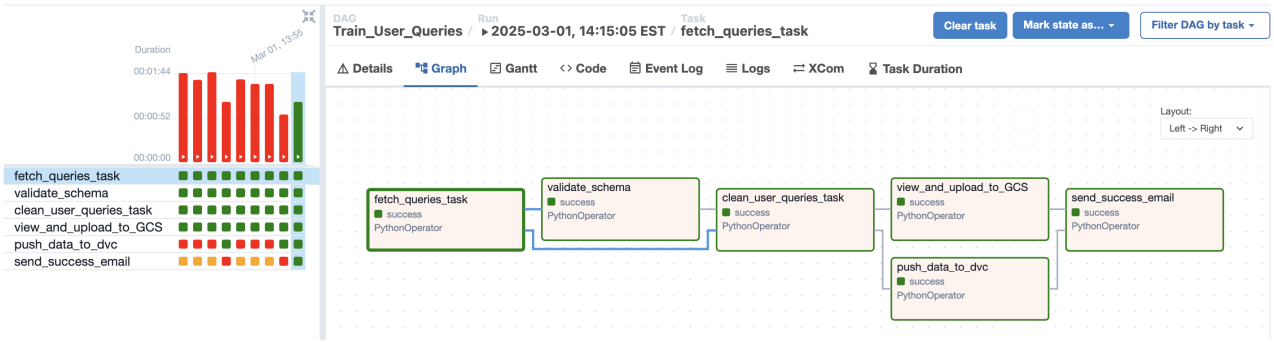
- Source: Focused on IT specifications, we have curated data from publicly available requirements documents.
- Description: We have selectively gathered documents that provide detailed IT specifications, particularly from the PURE dataset, which comprises 79 publicly available natural language requirements documents collected from the web.
- Reference: https://zenodo.org/records/5195084

Data Pipeline - Key Components & Workflow

1. User Queries Processing Pipeline

The pipeline processes user queries from **Supabase** and prepares them for retrieval tasks:

- **Fetch Queries**: Retrieves queries from the Supabase database.
- **Validate Schema**: Ensures that queries match expected format.
- **Clean & Preprocess**: Tokenizes, lemmatizes, and removes noise.
- **Upload to GCS**: Saves processed queries as CSV files in GCS.
- **Push to DVC**: Enables version control for reproducibility.
- **Trigger Model Training** (if needed).
- **Send Notifications**: Sends a success email when tasks complete.



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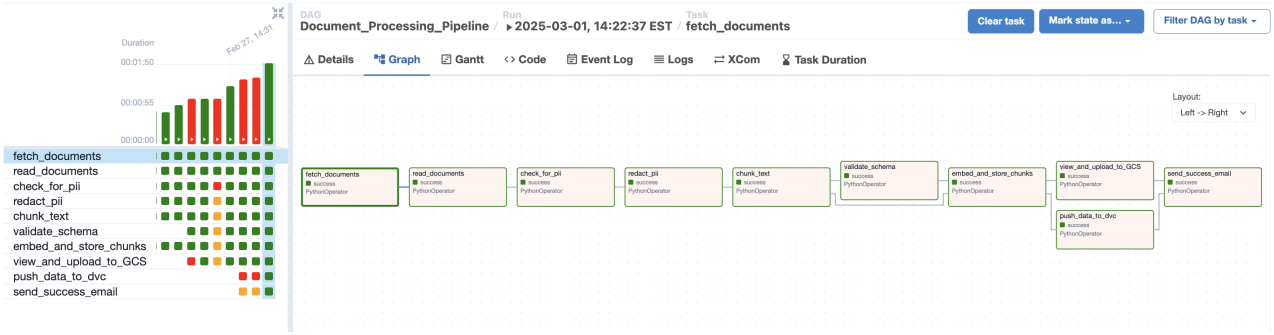
2. Document Processing & RAG Pipeline

This pipeline processes and indexes uploaded documents for retrieval:

- **Fetch Documents**: Collects uploaded PDFs & text files.
- **Read Documents**: Extracts text content using `pymupdf4llm`.
- **PII Detection & Redaction**: Uses **Presidio-based Named Entity Recognition (NER)** to identify and redact sensitive data.
- **Chunk Text**: Splits documents into structured sections.
- **Validate Schema**: Ensures processed text follows expected format.
- **Embed & Store**:
  - **Generate embeddings** using `Nomic`.
  - **Store in Supabase** (using `pgvector` for semantic search).
- **Upload to GCS**: Saves processed chunks for backup.
- **Push to DVC**: Ensures version control for document processing.

- **Send Notifications**: Triggers email alerts upon completion.



Data Storage

The processed data is stored across multiple locations:

- **Google Cloud Storage (GCS)**: Stores raw & processed data.
- **Supabase**: Hosts document metadata & vector embeddings for retrieval.
- **DVC (Data Version Control)**: Tracks dataset versions for reproducibility.

Airflow DAGs Overview

1. **User Queries DAG (Train_User_Queries)**

Processes user queries and prepares them for retrieval:

- `fetch_queries_task`: Retrieves queries from Supabase.
- `validate_schema`: Ensures data consistency.
- `clean_user_queries_task`: Cleans and preprocesses queries.
- `view_and_upload_to_GCS`: Saves processed data to GCS.
- `push_data_to_dvc`: Tracks query versions in DVC.
- `send_success_email`: Notifies of completion.

2. **Document Processing DAG (Document_Processing_Pipeline)**

Processes uploaded PDFs and prepares them for retrieval:

- `fetch_documents`: Retrieves documents.
- `read_documents`: Extracts text from PDFs/TXT files.
- `check_for_pii`: Detects sensitive information.
- `redact_pii`: Redacts or masks sensitive data.
- `chunk_text`: Splits text into meaningful chunks.
- `validate_schema`: Ensures chunked data structure is valid.
- `embed_and_store_chunks`: Generates embeddings and stores them in Supabase.
- `view_and_upload_to_GCS`: Uploads processed chunks to GCS.
- `push_data_to_dvc`: Tracks query versions in DVC.
- `send_success_email`: Notifies of completion.

Project Directory Structure

```
├── assets/
│   ├── process_user_queries_dag.png  # User Query Pipeline Worflow
Diagram
│   ├── rag_data_pipeline_dag.png  # Data Pipeline Workflow Diagram
│
├── data_pipeline/
│   ├── dags/
│   │   ├── dataPipeline.py  # User Queries DAG
│   │   ├── rag_data_pipeline.py  # Document Processing DAG
│   │   ├── scripts/
│   │   │   ├── email_utils.py  # Email notifications
│   │   │   ├── upload_data_GCS.py  # GCS Uploading
│   │   │   ├── data_preprocessing/
│   │   │   │   ├── check_pii_data.py  # PII Detection
│   │   │   │   ├── validate_schema.py  # Schema Validation
│   │   │   │   ├── data_utils.py  # Query Cleaning Functions
│   │   │   ├── supadb/
│   │   │   │   ├── supabase_utils.py  # Supabase Integration
│   │   │   ├── rag/
│   │   │   │   ├── validate_schema.py  # Schema Validation
│   │   │   │   ├── rag_utils.py  # Chunking & Embeddings
│   │   ├── tests/
│   │   │   ├── test_data_pii_redact.py  # Unit tests for PII detection
and redaction
│   │   │   ├── test_rag_pipeline.py  # Unit tests for the RAG document
chunking pipeline
│   │   │   ├── test_user_queries.py  # Unit tests for the user queries
processing pipeline
│   ├── config.py  # API Keys & Configurations
│   ├── README.md  # Data Pipeline Documentation
│
├── data/
│   ├── rag_documents/  # Original PDFs & Text Files
│   ├── preprocessed_docs_chunks.csv/  # Cleaned & Chunked Data
│   ├── preprocessed_user_data.csv  # Processed User Queries
│
├── .dvc/  # DVC Configuration
├── .gitignore
├── .dvcignore
├── README.md  # Project Overview
├── requirements.txt  # Dependencies
```

Setup & Deployment

Prerequisites

Ensure you have the following installed:

- **Google Cloud SDK** (`gcloud` CLI)
- **Python 3.8+**

- **DVC** (`pip install dvc[gdrive]`)
- **Airflow** (`pip install apache-airflow`)

1. Environment Setup

1. Clone the repository:

```
git clone https://github.com/your-repo/promptly-data-pipeline.git
cd promptly-data-pipeline
```

2. Install dependencies:

```
pip install -r requirements.txt
```

3. Set up Google Cloud authentication:

```
gcloud auth login
gcloud auth application-default login
For SSL certificate auth: export SSL_CERT_FILE=$(python -m certifi)
```

4. Initialize DVC:

```
dvc init
dvc remote add gcs_remote gs://promptly-chat
dvc pull
```

2. Running Airflow DAGs

1. Start Airflow:

```
airflow db init
airflow scheduler & airflow webserver
```

2. Trigger DAGs via the Airflow UI or CLI:

```
airflow dags trigger Train_User_Queries
airflow dags trigger Document_Processing_Pipeline
```

3. Monitoring & Logs

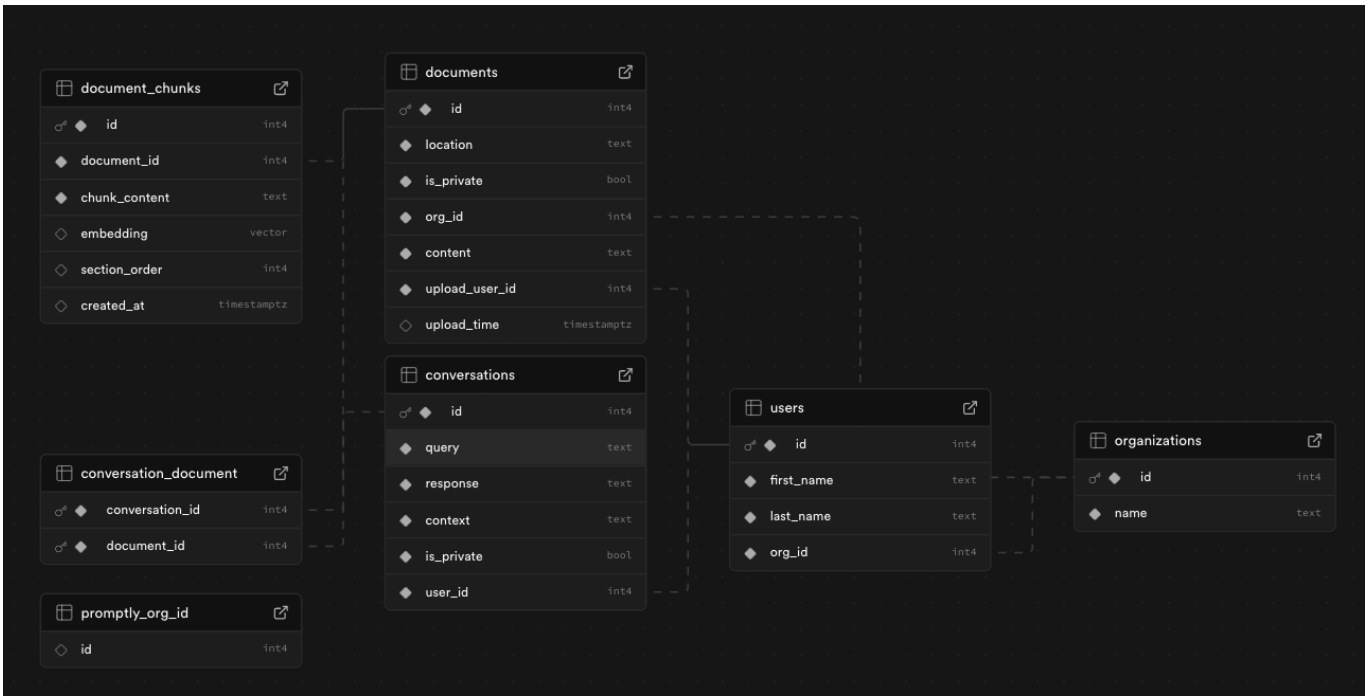
- Check Airflow logs:

```
airflow tasks logs <dag_id> <task_id>
```

- Supabase logs can be viewed via the web dashboard.

Supabase Database Schema

- We are using Supabase as our database and embedding store to store user conversations, documents and embedding chunks.
- Our project has 6 Tables:
  - users
  - organizations
  - documents
  - document_chunks
  - conversations
  - conversation_document
- Here's the full view of schema:

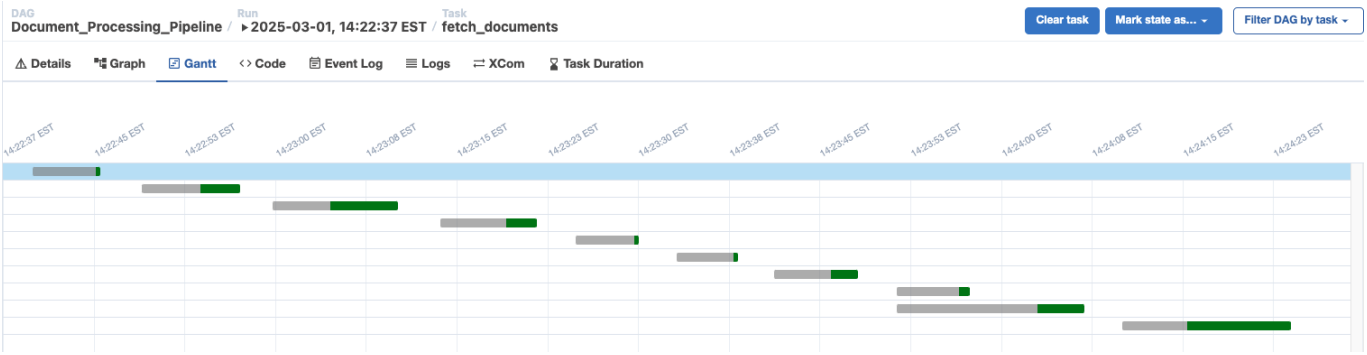


Anomaly Detection and Alerts

- We have written custom code to detect any anomalies in our data pipeline.
- Missing Data Checks: Handled in validate_schema.py.
- Unexpected Formats Detection: Managed in validate_schema.py and data_utils.py.
- Anomaly Alerts: Sends email notifications for irregularities.

Pipeline Flow Optimization

- We have tracked the Gantt chart for both DAGs that we have created, we make sure that every task is modular and consumes minimal time for execution.
- We have also implemented parallelization in some of our later processing functions.
- We have optimized our resources to optimise the cost and wait time for each pipeline task.(for example, reducing time from 5min->3min for one of the DAGs)



CI/CD & Model Versioning

- **DVC tracks dataset versions** for reproducibility.
- **GitHub Actions (future enhancement)** handles automated deployments.
- **MLflow (future enhancement)** for tracking model performance.

Contributing

We welcome contributions to improve this pipeline! To contribute:

1. Fork this repository.
2. Create a new branch.
3. Commit changes and push them.
4. Submit a Pull Request.

License

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Contact

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