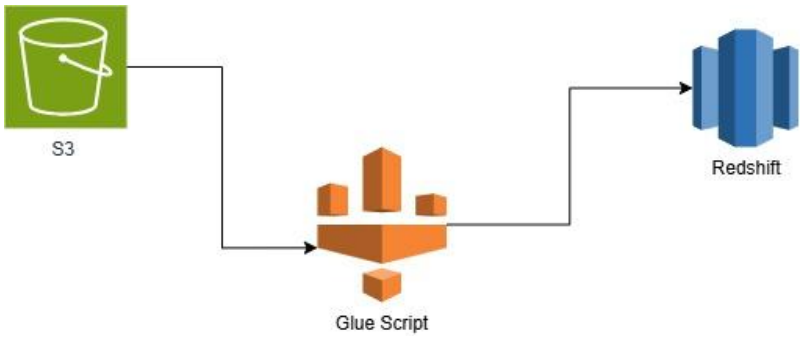
Project Report:

Personalized Travel Recommendation

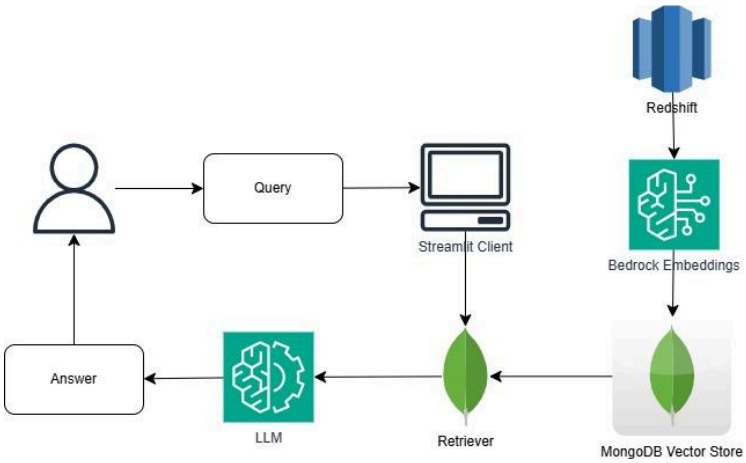
1. Project Overview

This project implements an end-to-end AI-powered travel recommendation system. It processes and stores travel data from CSV files in Amazon S3, ingests the data into Amazon Redshift, and leverages LangChain, MongoDB with Vector Search, and Amazon Bedrock embeddings to generate personalized recommendations using GPT-4. A Streamlit-based client provides an interactive interface for querying and receiving recommendations based on a member's travel history.

Data Ingestion



RAG Implementation



2. Data Source

S3: members_trips_bucket

File Name: trip_records.csv

The source data is stored as a CSV file in an Amazon S3 bucket. The schema for the dataset is as follows:

```
member_trips_table(
   MemberID VARCHAR(50),
   Name VARCHAR(50),
   Age INTEGER,
   Location VARCHAR(50),
   TripDestination VARCHAR(50),
   TripDate TIMESTAMP,
   TripDuration INTEGER,
   TripCost FLOAT8,
   TripActivities VARCHAR(50),
   UpdatedAt TIMESTAMP
);
```

This data records individual members' travel histories, including destinations, activities, and associated metadata.

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3. Data Pipeline

Step 1: Ingest CSV from S3 to Redshift

A Python-based AWS Glue script was written to read CSV files from the S3 bucket and append the data into a Redshift table. The script used the **Redshift Connector** to manage the data load efficiently and append new records incrementally.

Step 2: Export Redshift Table as DataFrame

Using Python, the Redshift table (member_trips_table) was read into a **Pandas DataFrame** via an SQL query over the Redshift connection. This DataFrame serves as the intermediate source for generating vector embeddings.

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4. Vector Store Creation and Retrieval Engine

Embedding Generation

- **Amazon Bedrock** was used to generate vector embeddings for the trip records
- Embeddings were generated per record to allow semantic search and similarity-based retrieval.

MongoDB Integration

- The embeddings were stored in **MongoDB** using **Atlas Vector Search**, enabling efficient similarity search over vectorized travel data.
- Each vector is stored alongside the original metadata, allowing retrieval of context-rich records.

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5. Recommendation System with LangChain + GPT-4

A **LangChain-based retrieval pipeline** was created with the following components:

- **Retriever**: Uses MongoDB vector store to retrieve relevant past travel records for a given member.
- **LLM (GPT-4 via Amazon Bedrock)**: Processes the retrieved data and generates contextual travel recommendations tailored to the user's profile and past activities.

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6. Streamlit Interface

A **Streamlit web client** was developed to provide a user-friendly interface for querying the system.

User Inputs:

- MemberID or Name

Features:

- On input, the system fetches the relevant member profile and historical trip data.
- Triggers the LangChain pipeline to retrieve similar trip records from MongoDB.
- Displays personalized travel recommendations from GPT-4.

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7. Trade-offs and Assumptions

Highlights:

- Scalable and serverless data ingestion using AWS Glue and Redshift
- Quick Semantic search using vector embeddings stored in MongoDB
- LLM-powered clean and personalized recommendations with LangChain and GPT-4
- Simple and interactive front end with Streamlit
- Assumption that data already present on S3 from different source
- Manual Glue script run for data ingestion. Can be scheduled.
- AWS Bedrock for embeddings

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8. Sample Output

Personalized Travel Recommendation

Deploy

Enter Member Query:

M060 Diana

Get response

Response: Hello Diana,

Based on your trip details, I have curated the following recommendations for your journey to Tokyo:

1. Flight: You can consider booking a direct flight from New York to Tokyo. They offer great service and it's a comfortable journey. Try booking in advance to get the best deals.
2. Stay: Tokyo is known for its unique mix of traditional and contemporary accommodations. If you're looking for a luxurious stay, consider booking a room at the Aman Tokyo or The Ritz-Carlton. For more budget-friendly options, Sakura Hotel Jimbocho or Wired Hotel Asakusa could be ideal.
3. Hiking: Since you're interested in hiking, make sure to visit Mount Takao, Mount Mitake, or Okutama. All these places offer beautiful hiking trails.
4. Food: Don't miss out on Tokyo's fantastic food scene. Sushi at Sukiyabashi Jiro, Ramen at Ichiran, and street food at Tsukiji Market are must-tries.
5. Sightseeing: Visit the Tokyo Skytree for a panoramic view of the city. Also, make time for Senso-ji, Tokyo Disneyland, and the Meiji Shrine.