Shop Smart AI Recommender - LLMOps Project

Welcome to the **Shop Smart AI Recommender**! This project showcases a complete, end-to-end LLMOps pipeline for a conversational AI application. The system provides intelligent product recommendations based on real customer reviews, all wrapped in a modern, cloud-native architecture.

Project Overview

This application provides intelligent product recommendations using a Retrieval-Augmented Generation (RAG) architecture. It demonstrates:

- **Local Development**: Building a robust Python application with a clear, modular structure.
- **Containerization**: Packaging the application and its dependencies using Docker for portability.
- **Cloud Deployment**: Orchestrating the entire application stack on a Google Cloud VM using Kubernetes (Minikube).
- **Secure Configuration**: Managing secrets and API keys safely with Kubernetes Secrets.
- **Real-time Monitoring**: Observing application health and performance with Prometheus and Grafana.
- **CI/CD Ready**: A clean project structure ready for future automation workflows.

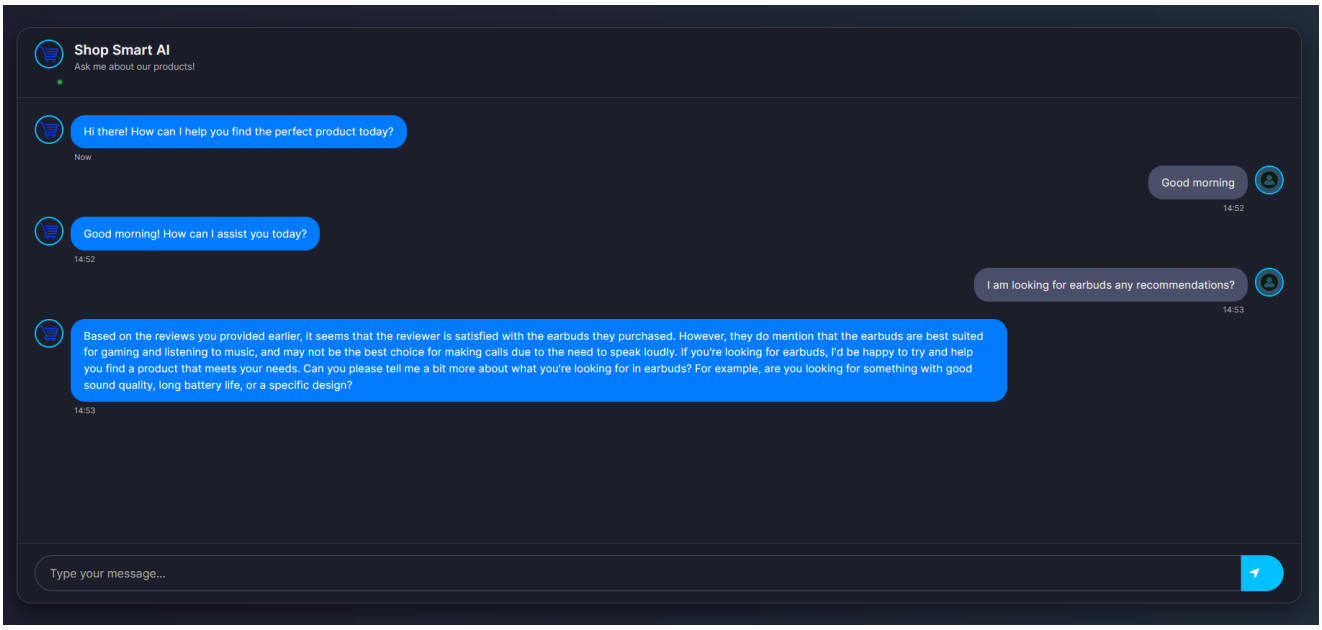
Tech Stack

Tool	Purpose
Python	Core application development
LangChain	Framework for building the RAG chain
Groq & Hugging Face	LLM and embedding models
Flask	Web framework for the backend API
Astra DB	Cloud-native vector database
Docker	Containerization
Kubernetes (Minikube)	Orchestration and deployment
GCP	Infrastructure hosting
Prometheus & Grafana	Observability and monitoring

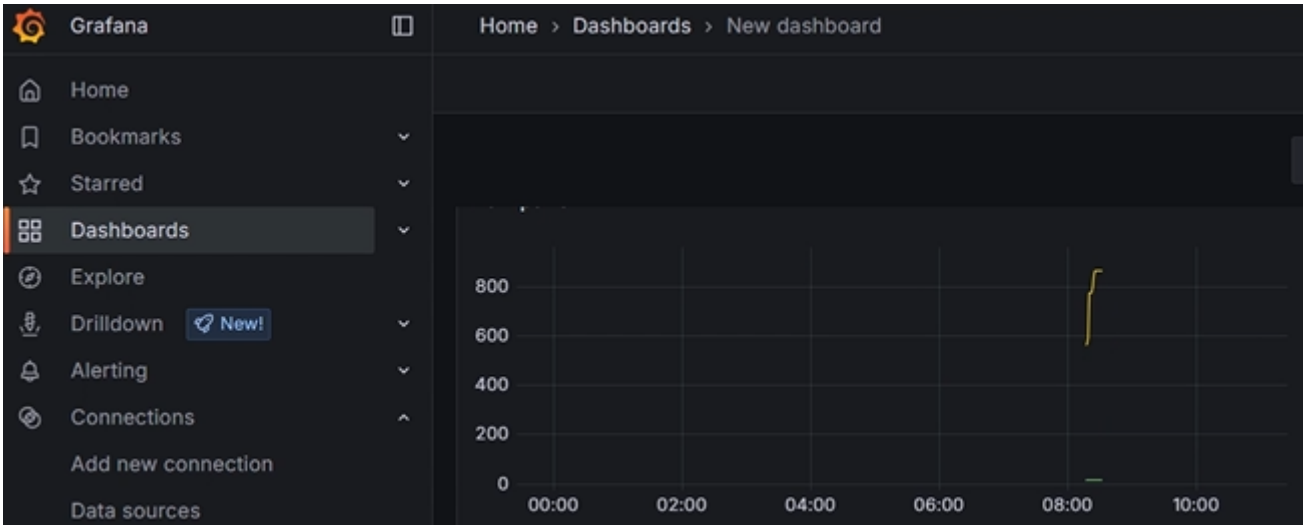
Screenshots

Here are a few snapshots of the deployed Shop Smart AI Recommender in action:

Chat Interface



Monitoring Dashboard



Project Structure

```
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├── assets/                 # Project images and screenshots
│   └── shop_smart_ai_pic2.png
├── chain/                  # Core RAG chain logic
│   ├── __init__.py
│   └── rag_chain.py
├── config/                 # Application configuration
│   ├── __init__.py
│   └── config.py
├── data/                   # Raw dataset
│   └── flipkart_product_review.csv
├── grafana/                # Grafana Kubernetes manifests
│   └── grafana-deployment.yaml
├── prometheus/             # Prometheus Kubernetes manifests
```

```
│   ├── prometheus-configmap.yaml
│   └── prometheus-deployment.yaml
├── static/                 # CSS and other static assets
│   └── style.css
├── templates/              # HTML templates
│   └── index.html
├── utils/                  # Reusable helper modules
│   ├── __init__.py
│   ├── custom_exception.py
│   ├── data_converter.py
│   ├── data_ingestion.py
│   └── logger.py
├── .env                    # (Local Only) Secret keys and APIs
├── .gitignore              # Files to be ignored by Git
├── app.py                  # Main Flask application entry point
├── Dockerfile              # Instructions to build the container image
├── flask-deployment.yaml   # Kubernetes manifest for the Flask app
├── requirements.txt        # Python dependencies
└── setup.py                # Project packaging script
```

⚙️ Setup and Deployment Instructions

For a detailed guide on local setup and cloud deployment, please refer to our comprehensive **Project Documentation**.

The guide includes:

- GitHub setup and initial push 📤
- Local setup with a Python virtual environment 🌀
- Docker image build process 🤜
- Kubernetes and Minikube configuration on a GCP VM ☁️
- Prometheus and Grafana integration for monitoring 📊

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