Recipe Recommendation AI Project - Documentation

Overview

This project implements a recipe recommendation system based on semantic search using embeddings and FAISS. It also supports multilingual output (English, Portuguese, and Spanish) and integrates Stable Diffusion to generate AI-generated images for the recommended recipes.

Features

- **Recipe Search:** Users can input a dish name or description to find relevant recipes.

- **Multilingual Support:** Users can choose English, Portuguese, or Spanish for the displayed results.

- **FAISS-Based Search:** Fast and scalable nearest neighbor search using precomputed recipe embeddings.

- **Stable Diffusion Image Generation:** Generates realistic images for recommended recipes.

- **Seamless Execution:** The script integrates all steps, making it easy to run without separate setup steps.

Installation

To run this project, you need the following dependencies:

pip install diffusers transformers accelerate torch deep_translator faiss-cpu pandas

Ensure that your environment has CUDA support for optimal performance.

How It Works

1. Load Dependencies and Models

- Loads a dataset of recipes.

- Initializes the FAISS index for fast similarity search.

- Loads a Sentence Transformer model for embedding generation.

- Loads Stable Diffusion for AI-generated images.

2. User Input

- The user selects the language of preference.

- The user enters a recipe name or description.

3. Search and Retrieval

- The system encodes the input text using jonny9f/food_embeddings.

- Searches in FAISS to retrieve the most similar recipes.

- Translates results if necessary.

4. Display Results

- The system displays the top k recommended recipes with:

  - Recipe title

  - List of ingredients

  - Preparation instructions

  - FAISS similarity score

  - AI-generated image of the dish

Code Structure

```
# Install dependencies

pip install diffusers transformers accelerate torch deep_translator faiss-cpu
pandas


# Import required libraries

import torch

import faiss

import pandas as pd

from deep_translator import GoogleTranslator

from diffusers import StableDiffusionPipeline

from sentence_transformers import SentenceTransformer

from IPython.display import display


# Load dataset and models

dataset_path = "path/to/processed_dataset.csv"

df = pd.read_csv(dataset_path)
```

```
model = SentenceTransformer("jonny9f/food_embeddings", device="cuda")
```

```
faiss_index_path = "path/to/faiss_index.bin"
```

```
faiss_index = faiss.read_index(faiss_index_path)
```

```
pipe = StableDiffusionPipeline.from_pretrained("CompVis/stable-diffusion-v1-4").to("cuda")
```

Running the Script

Simply execute the script in a Python environment or Jupyter Notebook. It will guide the user through language selection, input query, and display results dynamically.

Deployment Considerations

- **Colab Usage:** The script runs efficiently in Google Colab with a GPU runtime.

- **Model Storage:** FAISS and embeddings should be precomputed and stored in a shared location (e.g., Google Drive).

- **GitHub Readiness:** Ensure all dependencies and environment configurations are included in a requirements.txt file.

Next Steps

- **Improve Vector Search:** Fine-tune the embedding model or apply re-ranking techniques.

- **Optimize Image Generation:** Adjust Stable Diffusion prompts for better food-related outputs.

- **Expand Language Support:** Add more languages for a broader user base.

- **Deploy as API:** Consider wrapping the logic into a REST API for wider accessibility.

Summary

This project effectively combines NLP-based search with generative AI to deliver a robust recipe recommendation system. While improvements can be made in retrieval quality, the current implementation serves as a functional proof of concept.