

Project Proposal 1: Flag Identifier

Flag Identifier: Country Recognition and Educational Explanation Using a Custom Generation System

Objective

The goal of this project is to build an ML model capable of recognizing national flags and generating informative descriptions of the corresponding countries. Using image classification and an LLM-based custom-built knowledge-based generation system, the solution will provide users with both identification and educational content.

The user will then choose the specific field of interest — such as geography, history, culture, economy, politics, tourism, cuisine, or sports — for which the system will generate targeted information.

This interactive approach not only enhances user engagement but also transforms a simple recognition task into an enriching learning experience. By combining the accuracy of image recognition with the flexibility of AI-generated content, the project aims to deliver a comprehensive and customizable tool for education and exploration.

In the future, the system could be expanded to include multi-language support, audio narration, and even gamified quizzes to further elevate the user experience.

Additionally, the platform could integrate detailed images — such as famous touristic sites, cultural symbols, and traditional dishes — to provide a richer and more immersive experience.

Dataset

Source:

The dataset will be built primarily from publicly available flag images on the internet. The goal is to cover approximately 200 countries, ensuring global representation.

Data Collection Process:

A custom Python script will be developed to automate the image retrieval process. This script will:

- Query search engines or image databases (e.g., Google Images, Wikimedia Commons) using country names as search keywords.
- Download images in **PNG** or **JPEG** formats.
- Filter and validate images to ensure correct flag representation and quality.
- Organize the images into structured folders, with one folder per country, following this hierarchy:

/dataset /France france_flag1.png france_flag2.jpg /Japan japan_flag1.png

This structured dataset will facilitate easy integration with image classification

Data Format:

The dataset will consist of high-resolution PNG or JPEG images (minimum 512x512), organized by country folders as class labels. To enhance model robustness, data augmentation techniques can be applied.

Countries Metadata Collection:

In addition to images, **metadata for each country** will be collected to enrich the educational experience.

- A second custom Python script will automate the retrieval of country-specific information mainly from Wikipedia and other open-source knowledge bases.
- The metadata will cover fields such as:
 - **History:** (Independence date, major historical events)
 - **Geography:** (Capital, Region, Neighboring Countries)
 - **Culture:** (Languages, festivals, traditions)
 - **Economy:** (Currency, major exports, GDP)
 - **Tourism:** (Famous sites, natural wonders)
 - **Cuisine:** (National dishes, culinary heritage)
 - **Sports:** (Popular sports, famous athletes)
 - **Fun Facts:** (Unique trivia, interesting facts)

This information will be stored in a structured format making it easy to query later with the LLM.

LLM Integration:

The metadata will be used in conjunction with the Large Language Model (LLM). When a user selects a specific field of interest, the LLM will retrieve and process the corresponding metadata to generate natural language explanations.

Machine Learning Tasks

1. Image Classification:

- **Model:** CNN architecture
- **Output:** Predicted country name from the input flag image.

2. Language Generation:

- **Model:** LLM-based system using structured metadata (geography, history, culture, economy, tourism, cuisine, sports, fun facts).
- **Output:** Generate a tailored educational description based on the user's selected field of interest.

Steps

1. User uploads a flag image.
2. The image classification model predicts the country.
3. User chooses the specific field
3. The predicted country name is used to retrieve a description from the custom-built knowledge base.
4. The system generates a descriptive paragraph about the country.

Evaluation

- **Classification Model:** Accuracy, Precision, Recall.
- **Description Output:** Human evaluation of text relevance and accuracy.

Improvement Plan

- Hyperparameter tuning to optimize classification model performance.
- Dataset augmentation for better generalization.
- Expanding and refining the knowledge base for improved descriptive outputs.

Deliverables

- User Friendly Interface
- Fully trained classification model.
- Custom generation system based on knowledge base.
- Image-to-description pipeline.
- Final report and presentation.