**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.