Butterfly Image Classification

Using Deep Learning

1. Introduction

- **Project Title:** Enchanted Wings : Marvels of Butterfly Species
- **Team Members:** CHIMATA RAGHURAM (Developer & Designer)

2. Project Overview

- **Purpose:** The goal of this project is to accurately classify butterfly species using a deep learning model trained on a dataset of 75 butterfly classes. This helps in biodiversity research and automates the species identification process

- **Features:** The web application allows users to upload an image of a butterfly and instantly get a prediction of the species name. It includes a clean interface, real-time image inference, and support for 75 species.

3. Architecture

- **Frontend:** Built using Streamlit, providing an interactive and minimal UI for image upload and prediction display.

- **Backend:** TensorFlow/Keras handles model loading and prediction logic within the same Streamlit script.
- **Dataset :** Picked the dataset from Kaggle.com

4. Setup Instructions

- **Prerequisites:** Python 3.9+, TensorFlow, Streamlit, NumPy, Pandas, Pillow
- **Installation:**
  1. Clone the repository
- https://github.com/chimataraghuram/Enchanted-Wings-Marvels-of-butterfly-species.git
  1. Navigate to project folder.
  2. Install dependencies: pip install -r requirements.txt
  3. Run the app: streamlit run.

5. Folder Structure

- **Client:** Not applicable, as Streamlit combines frontend and backend in a single Python script..
- **Server:** Contains the model (.keras file), label mapping (class_indices.pkl), and app script.

6. Running the Application

- Use the following command to launch the application locally: streamlit run app.py

7. API Documentation

- The application does not expose a REST API; all logic is contained within the Streamlit interface.

8. User Interface

- A clean and intuitive Streamlit UI allows users to upload an image and view classification results
- A clean and intuitive Streamlit UI allows users to upload an image and view classification results.

9. Testing

- Manual testing was performed using a variety of butterfly images across different classes to validate prediction accuracy
- - Model performance was measured using accuracy during training (reached over 90.69%)

10. Known Issues

- Some visually similar species may be misclassified due to overlapping patterns.
- Predictions are based on training data only; no additional data augmentation or ensemble methods used

11. Future Enhancements

- Improve accuracy with advanced data augmentation and more robust CNN architectures.
- Add a REST API for wider integration.
- Include confidence score and top-3 predictions in the UI.
- Add multilingual support and save classification history.