Butterfly Image Classification

Using Deep Learning

1. Introduction

- **Project Title:** Enchanted Wings : Marvels of Butterfly Species
- **Team Members:** Udayagiri Poorna Akshaya (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: git clone https://github.com/Prasana2005/butterfly-classifier-app.git
  2. Navigate to project folder.
  3. Install dependencies: pip install -r requirements.txt
  4. 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
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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. Screenshots or Demo

- Live Demo: https://butterfly-classifier-app-easyclassy.streamlit.app/

11. 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

12. 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.